CITY OF SALEM, OREGON

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) PERMIT

(Permit Number 101513, File Number 108919)

ANNUAL REPORT

FY 2011/12

October 29, 2012

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Francis Kessler, Operations Division Manager 10/29/12 **Date**

Prepared by
City of Salem Public Works Department

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LIST OF ACRONYMS

ACWA	Association of Clean Water Agencies
BMP	Best Management Practice
CFR	Code of Federal Regulations
CIP	Capital Improvement Plan
COE	U.S. Army Corps of Engineers
CON	Construction-related BMPs
DEQ	Oregon Department of Environmental Quality
EPA	U.S. Environmental Protection Agency
EPSC	Erosion Prevention and Sediment Control
ES	Environmental Services (City of Salem)
FEMA	Federal Emergency Management Act
GIS	Geographic Information System
IDEP	Illicit Discharge Elimination Program
IGA	Inter-governmental Agreement
ILL	Illicit discharge-related BMPs
IND	Industrial-related BMPs
MEP	Maximum Extent Practicable
mg/L	Milligrams per liter
MOA	Memorandum of Agreement
MS4	Municipal Separate Storm Sewer System
ODOT	Oregon Department of Transportation
ppm	Parts per million
RC	Residential and commercial area-related BMPs
SDC	System Development Charge
SRC	Salem Revised Code
SSORP	Sanitary Sewer Overflow Response Plan
SWMP	Stormwater Management Plan
TMDL	Total Maximum Daily Load

1 INTRODUCTION

1.1 Background

In 1990, the United States Environmental Protection Agency (EPA) published its Phase I regulations governing stormwater discharges under the National Pollutant Discharge Elimination System (NPDES) program of the Clean Water Act. In Oregon, EPA has delegated the permitting of NPDES municipal separate storm sewer system (MS4) discharges to the Oregon Department of Environmental Quality (DEQ).

Under EPA's initial Phase I implementation of the program, municipalities having a population greater than 100,000 were required to obtain an NPDES MS4 Permit. The City of Salem (the City) passed that threshold with the 1990 Census and was included in the program by the DEQ, with the Oregon Department of Transportation (ODOT) originally designated as a co-permittee with Salem.

The regulations established a two-part application process for obtaining an NPDES Permit to discharge municipal stormwater to "waters of the state." The City submitted the Part 1 NPDES Stormwater Permit Application in April 1994. The supplemental Part 2 Application and associated Stormwater Management Plan (SWMP) were subsequently finalized and submitted to DEQ in July 1996. DEQ issued the City's initial MS4 Permit in December 1997, with an expiration date of September 2002.

In April 2002, the City submitted an application for renewal of its NPDES MS4 Permit, along with a revised SWMP that outlined the City's stormwater management efforts for the next five-year permit period. The DEQ issued the renewed MS4 permit in March 2004. In accordance with that permit's conditions, the City evaluated and updated the SWMP in conjunction with the 2nd Annual Report submitted to DEQ on November 1, 2005. The 2004 MS4 permit (and updated 2005 SWMP) expired on February 28, 2009, and was administratively extended by the DEQ.

The City submitted its NPDES MS4 permit renewal application to DEQ on September 2, 2008. Along with other required documents for the permit renewal process, the application included a revised SWMP. This SWMP (2008 SWMP) was developed in part using the EPA document *Municipal Separate Storm Sewer System Program Evaluation Guidance* (January 2008), followed by continued evaluation and revision of the 2005 SWMP. Following permit negotiations, this updated SWMP was further revised and submitted to the DEQ on August 13, 2010.

The City of Salem received a renewed MS4 permit on December 30, 2010. Consistent with requirements of Schedule D.6 of the renewed MS4 permit, the City re-submitted the SWMP (revised 2010 SWMP) to the DEQ on March 17, 2011. This Annual Report (FY 2011-2012) describes the status of BMP-related activities in the 2010 SWMP. The renewed MS4 permit and revised 2010 SWMP are available on the City's website (www.cityofsalem.net).

1.2 Purpose and Scope

The MS4 permit area is defined as being within the current City Limits, as exhibited in Figure 1. Land use within this permit area is exhibited in Figure 2.

This NPDES MS4 Annual Report summarizes stormwater-related activities listed in the 2010 SWMP that were completed during the period of July 1, 2011, through June 30, 2012, as required by the City's current MS4 permit. The information presented in this report is based on the requirements listed in Schedule B.5 of the renewed MS4 Permit (see Table 1).

Table 1. Annual Reporting Requirements for the MS4 Permit

Permit Section	Reporting Requirement	Location in Annual Report
B(5)(a)	The status of implementing the stormwater management program and each SWMP program element, including progress in meeting the measurable goals identified in the SWMP.	Section 2
B(5)(b)	Status or results, or both, of any public education program effectiveness evaluation conducted during the reporting year and a summary of how the results were or will be used for adaptive management.	Section 2 (RC 5-1)
B(5)(c)	A summary of the adaptive management process implementation during the reporting year, including any proposed changes to the stormwater management program (e.g., new BMPs) identified through implementation of the adaptive management process.	Section 1.3
B(5)(d)	Any proposed changes to SWMP program elements that are designed to reduce TMDL pollutants.	Section 1.3
B(5)(e)	A summary of total stormwater program expenditures and funding sources over the reporting fiscal year, and those anticipated in the next fiscal year.	Section 3
B(5)(f)	A summary of monitoring program results, including monitoring data that are accumulated throughout the reporting year and/or assessments or evaluations.	Section 2 (MON 1-1, 1-2, and 1-3), Appendix C
B(5)(g)	Any proposed modifications to the monitoring plan that are necessary to ensure that adequate data and information are collected to conduct stormwater program assessments.	Appendix C
B(5)(h)	A summary describing the number and nature of enforcement actions, inspections, and public education programs, including results of ongoing field screening and follow-up activities related to illicit discharges.	Section 2 (ILL 2-4), Section 4, Appendix A, Appendix B
B(5)(i)	An overview, as related to MS4 discharges, of concept planning, land use changes and new development activities that occurred within the Urban Growth Boundary (UGB) expansion areas during the reporting year, and those forecast for the following year including the number of new post-construction permits issued, and the estimate of the total new or replaced impervious surface area related to new development and redevelopment projects commenced during the reporting year.	Section 5
B(5)(j)	Results of ongoing field screening and follow-up activities related to illicit discharges.	Section 2 (ILL 2-4)

1.3 Adaptive Management

The stormwater management program that is described in the City of Salem's current SWMP is the result of adaptively managing (e.g., implementing, evaluating, and adjusting) the program since first being issued a MS4 permit in 1997. The history of this adaptive management approach may be found in Section 2 of the City of Salem's "National Pollutant Discharge Elimination System Municipal Separate Storm Sewer System Permit Renewal (September 2, 2008)," and describes how the current DEQ approved SWMP meets the 'maximum extent practicable' requirement. By adaptively managing its stormwater management program, the City of Salem continues to reduce the discharge of pollutants from its stormwater sewer system.

Consistent with Schedule D.4 of the renewed MS4 permit, City staff submitted an "Adaptive Management Approach" to the DEQ on October 24, 2011 that will be followed through expiration of the MS4 permit on December 29, 2015. This approach involves both an annual review of BMP activities and collected data, as well as a comprehensive assessment of BMP activities in preparation for MS4 permit renewal.

In preparation of this annual report and as described in the Adaptive Management Approach, City staff were asked to consider if changes in BMP activities were anticipated in next fiscal year (FY 2012/13). Staff reported on activities anticipated to support a number of specific BMP measurable goals or MS4 permit due dates (e.g., revisions to the City's stormwater design standards, creation of a stormwater chapter in Salem Revised Code, initiating a hydromodification study etc.). Based on staff feedback, at this time no specific changes are proposed to BMPs in the current SWMP.

Figure 1. Permit Area Map

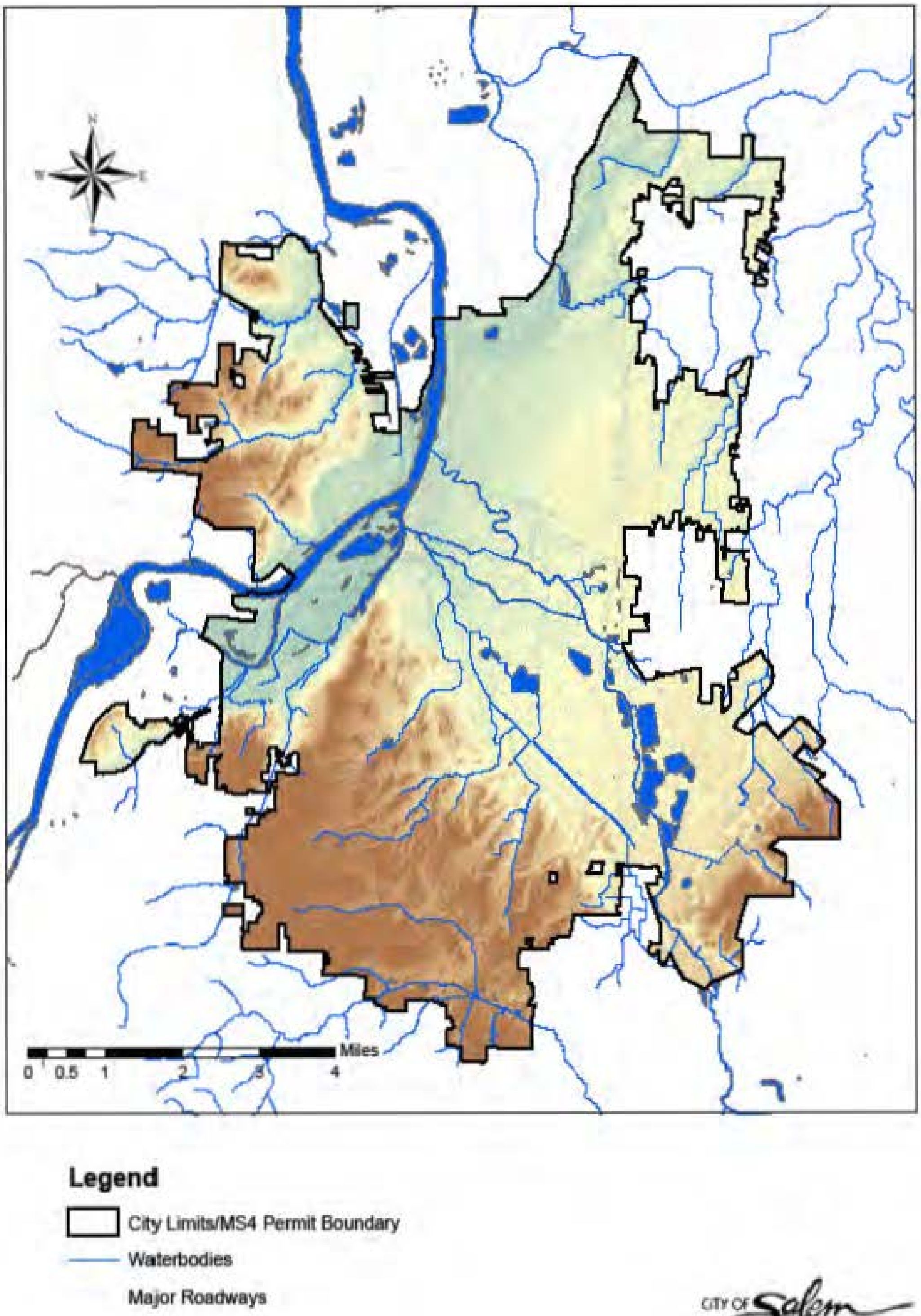

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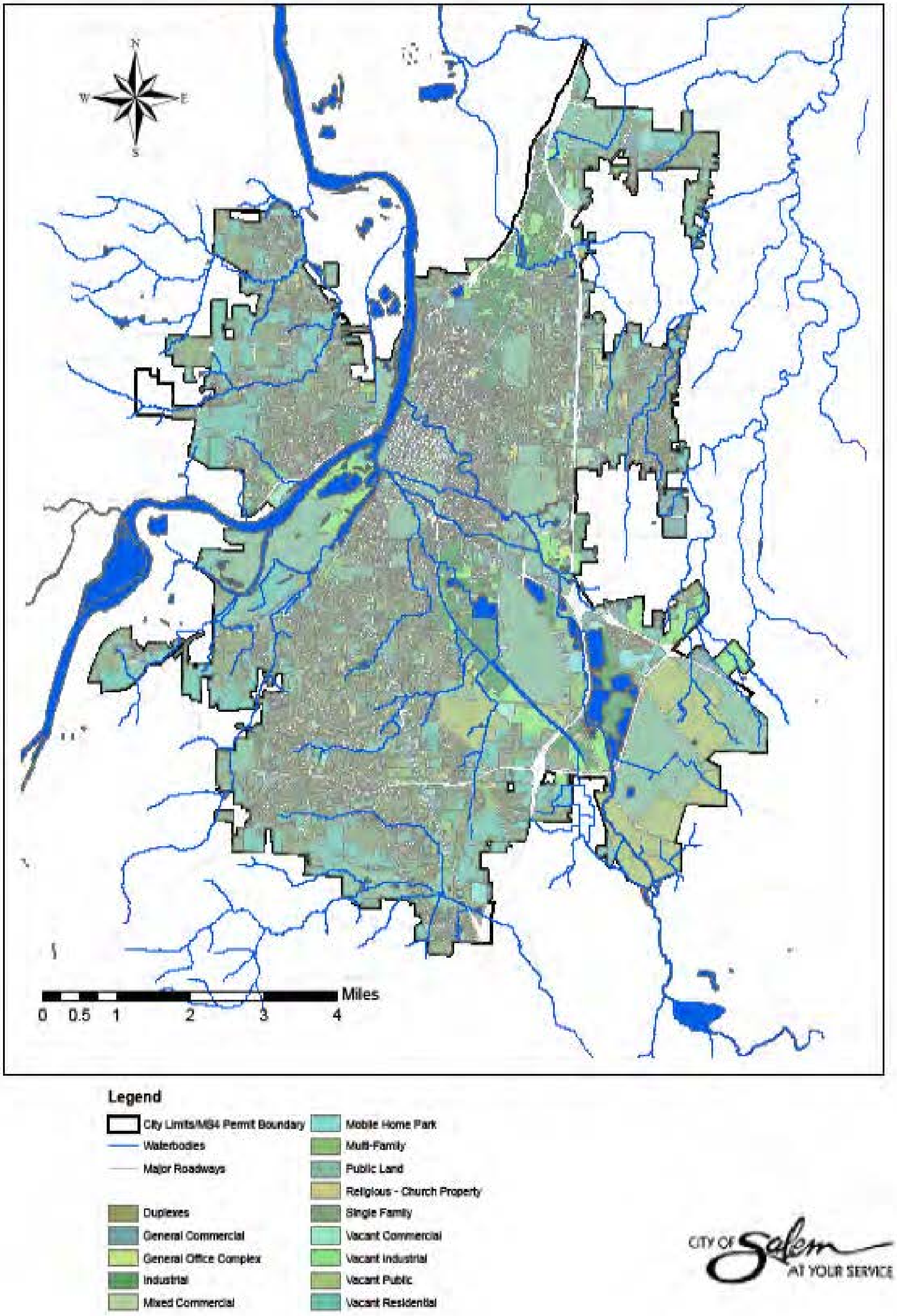
Figure 2. Land Use



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2 STATUS OF THE STORMWATER MANAGEMENT PLAN

The primary objective of the SWMP is to provide an outline of City activities that will satisfy the NPDES Phase I stormwater regulatory requirements (the MS4 permit) [40 CFR 122.26(d)(2)(iv)]. The intent of the regulations is to allow each permittee the opportunity to design a stormwater management program tailored to suit the individual and unique needs and conditions of the permit area, and reduce the discharge of pollutants from the stormwater sewer system to the maximum extent practicable.

The status of BMP activities listed in the 2010 SWMP are discussed in this section of the Annual Report. BMPs within the SWMP have been categorized into five types: structural and source controls for residential and commercial areas (RC); a program for the control of illicit discharges and improper disposal into the storm drainage system (ILL); a program to monitor and control pollutants from industrial facilities, hazardous waste treatment, storage and disposal facilities, and municipal landfills (IND); a program to implement and maintain structural and non-structural BMPs to reduce pollutants from construction sites (CON); and a program to conduct water quality monitoring activities within the MS4 drainage system and City waterways (MON).

Each BMP identified in the 2010 SWMP is discussed in this report with the following information:

1. A table describing BMP tasks, associated measurable goals, and tracking measures as stated in the 2010 SWMP.
2. A summary of activities completed during fiscal year 2011-2012 (July 1, 2011 through June 30, 2012) that demonstrate progress made in meeting the measurable goals and tracking measures.

2.1 RC1—Planning

RC1—PLANNING

Task Description	**Measurable Goals**	**Tracking Measures**
Provide City-wide Master Planning for stormwater to address both water quality and water quantity. As part of master planning efforts, continue to evaluate new detention and water quality opportunities within the Urban Growth Boundary (UGB), and consider sites in upstream areas that may affect Salem, and in downstream areas that may be affected by runoff from Salem.	• Maintain Master Plan and complete next update within the MS4 permit cycle.	• Track schedule for updating Master Plan. • Report on Master Plan update actions.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

Updating the Stormwater Master Plan has been incorporated into the work program of the Planning Services Section of Salem Public Works. As a listed project, it is slated for work in sequence following initial implementation of the Stormwater Utility in January 2013 and completion of revisions to the stormwater regulations (Salem Revised Code) and stormwater design standards in January 2014. The Citywide Stormwater Master Plan is scheduled to be completed before the end of the current MS4 permit cycle.

RC1—PLANNING, TASK 2

Task Description	**Measurable Goals**	**Tracking Measures**
Develop and maintain watershed management plans by developing a prioritized schedule and implementing watershed management plans based on available funding. Develop the Pilot Pringle Creek Watershed Management Plan as a model for the City's other prioritized urban watersheds. Identify capital improvement needs and potential "early action" activities and projects to ensure that the plan has a strong implementation component.	• Complete a hydromodification study and retrofit plan by November 1, 2014. • Incorporate recommendations and early action items of watershed management plans with completion of hydromodification study and retrofit plan. • Develop strategy for completing future watershed management plans by November 1, 2014.	• Report on completion of hydromodification study. • Report on completion of retrofit plan. • Track implementation actions of Pringle Creek Watershed Management Plan. • Report on strategy for completing future watershed management plans.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

In February 2012, the City issued a contract to ESA, Inc. (consultant) to conduct a Watershed Characterization of Salem area streams/watersheds. This assessment, which is Phase 1 of the City's Hydromodification Study, includes: 1. Identification of local variables contributing to hydromodification; 2. Compilation and review of existing data related to those variables; 3. A field assessment of local conditions; 4. A preliminary risk /susceptibility assessment based on current conditions; and 5. Identification of data and/or information gaps necessary to develop strategies and tools to address hydromodification. An Initial Watershed Characterization Report that includes items 1 and 2 (above) was completed on June 22, 2012. Field work will be completed during low stream flow conditions in August/September 2012, with the final report for the Phase 1 work to be completed by October 31, 2012. Phase 2 (to be completed by November 1, 2014) will develop strategies and tools for addressing the effects of hydromodification.

Findings and strategies resulting from the hydromodification study are anticipated to be useful in guiding development of future watershed management plans and the City's retrofit plan. Efforts toward preparing a retrofit plan will increase as the hydromodification study is being completed.

RC1—PLANNING, TASK 3

Task Description	**Measurable Goals**	**Tracking Measures**
City staff will continue to update the official "waterways" map for use by City staff in applying various regulations and standards. As studies are performed that warrant the revision of the designated waterways, including groundtruthing, that information will be incorporated into the update process.	• Compile database of maps and waterways references. • Complete field groundtruthing by end of FY 2011-12. • Update map by end of FY 2012-13.	• Track completion of groundtruthing and map updates.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

Groundtruthing was completed during the FY 2010-11 reporting period, which resulted in waterway map edits and significant improvement in map accuracy. These activities were completed ahead of the timeline stated in BMP measurable goals. A limited number of sections of piped waterways remain to be investigated in greater detail, and will be addressed as resources allow.

During this reporting period, minor updates were made to the Creeks GIS database as information was made available to the Records Section (GIS). The database is complete and no additional field work is planned unless errors are detected in the GIS database or more accurate information is required than what can be obtained from GIS. Map updates are on-going as edits are made to the database.

RC1—PLANNING, TASK 4

Task Description	**Measurable Goals**	**Tracking Measures**
City staff will meet a minimum of once per year to discuss coordination of efforts relating to stormwater. Topics may include the following, as they are applicable: grant funding, outreach, program review, annual report, monitoring, sharing of data, adaptive management, review/update of documents and programs, training needs, documentation of protocols, coordination of databases, involvement of inspections, maintenance, and operations in plan review and program development, checklists, effective Erosion Prevention and Sediment Control Program including enforcement, strategizing addressing hotspots, plan review, stormwater BMPs, and development of written enforcement strategy. Provide factsheets/manuals to new employees at the City to inform them about the City's efforts for pollution prevention. At least annual trainings will be provided to specified City of Salem employees involved in MS4-related activities regarding the permit, including its intentions and their responsibilities in relation to the MS4. Feedback for improving processes will be encouraged and brought to the coordination meeting(s). Training needs will be determined by City staff meeting mentioned above. Consider adding stormwater pollution prevention training as an action item of the FY 2011-12 Environmental Action Plan that addresses pollution prevention on a city-wide level.	• Conduct annual formal coordination meetings for stormwater, more often if necessary. • Conduct annual training of employees involved in MS4-related positions, more often if necessary.	• Prepare an annual meeting summary. • Track changes made to the implementation of the stormwater program based on coordination discussions. • Track major items of coordination. • Track training attendance. • Share and document training suggestions for MS4 implementation changes.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

In April 2012, five meetings were held with 29 key City staff involved with implementation of MS4 activities and reporting. Workgroups represented included: Environmental Services, Salem Fire, Stormwater Services, Wastewater Collections, Parks Operations, Streets/Sweeping, Engineering, Public Works Planning, Water and Environmental Resources, and Development Services. These meetings were similar in format to the MS4 permit 'kickoff' meetings held in early 2011, and provided staff with an update of progress toward completing significant MS4 permit deliverables and requirements. Discussion topics included the following:

- Annual reporting process

- Implementation of the DEQ-approved adaptive management process
- Update on activities completed by each Project Team (Code/Design Standards, Erosion Control, Hydromodification, Illicit Discharge, Outreach, Planning, and Retrofit)
- Preparation for anticipated MS4 program audit by EPA

Prior to conducting these meetings, on March 30, 2012, a memorandum was distributed to City management providing a similar overview of these MS4 Permit activities. Recipients of the memorandum included: City Manager's Office, Legal Department, Department Directors and Administrators, Fire Department, and Fleet Services. On March 13, 2012, Stormwater Services staff also presented information about MS4 Permit reporting requirements to the Public Works management team at an expanded staff meeting.

In addition, the seven Project Teams have each held meetings over the past year to coordinate completion of applicable deliverables, with the following highlights:

- Code/Design Standards –develop the Stormwater Management Manual for long-term maintenance of stormwater control facilities
- Hydromodification –develop and execute a Request for Proposals for anticipated first phase of completing a hydromodification assessment, and now working with the selected contractor
- Illicit Discharge –coordinate and document illicit discharge and spill response procedures
- Outreach – coordinate and implement the outreach plan, branding, and campaign efforts

Public Works staff continued with active participation in Oregon Association of Clean Water Agencies (ACWA) MS4 Phase I and Stormwater subcommittees (see RC1 Task 8). Staff also attended safety/training meetings every two weeks. Additionally, in cooperation with updating the "City of Salem Shops Complex Stormwater Pollution Control Plan," staff have initiated revisions to the training program for employees that use the Shops Complex. (see RC4 Task 4 and ILL1 Task 4).

RC1—PLANNING, TASK 5

Task Description	Measurable Goals	Tracking Measures
Coordinate with other agencies such as NGOs, private environmental groups, and watershed councils.	• Develop a list of contacts and identify issues of coordination.	• Document any MOAs.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

Consistent with this BMP measurable goal, points of contact and coordination efforts are maintained for the following activities:

Pringle Creek Watershed Council (http://www.pringlecreekwatershed.org/)

City staff, acting as a liaison to the council, attended the regular council meetings to provide input on City projects and other relevant watershed issues. The City liaison also provides technical assistance to the council on natural resource issues.

Claggett Creek Watershed Council (http://www.claggettcreekwatershedcouncil.org/index.asp)

The City liaison attended monthly meetings to provide updates on City programs/ activities and offer technical support. The primary focus of these monthly meetings was to organize for streamside planting events and strategize on opportunities for attracting new council members and volunteer support. During this reporting period the Claggett Creek Watershed Council coordinated 5 planting/weed removal and 1 stream cleaning project.

Glenn-Gibson Creeks Watershed Council (http://www.glenngibsonwatershedcouncil.org/)

During this past reporting year the City liason provided assistance with an invasive weed removal project, researched options for converting a neighborhood detention basin into a rain garden, assisted with the development of the council work plan, and organized a naturescaping presentation.

Mid-Willamette Outreach Group (M-WOG)

M-WOG is a stormwater-focused outreach group with members from City of Salem, City of Keizer, Marion County, and the Marion Soil and Water Conservation District. City staff work to implement regional outreach efforts through this cooperative group. During the reporting year this group coordinated an "Erosion Control Summit" on February 7, 2012, (See CON 1 Task 2) and began preparations for a second Erosion Control Summit in 2013.

Oregon Green Schools

Oregon Green Schools implements student-driven resource conservation in schools. City staff hopes to implement a water curriculum statewide through this organization. During this past year staff pursued work on updating the curriculum to incorporate water and energy and utilized a Willamette University student to create a communications plan for marketing the organization to businesses.

Friends of the Straub Environmental Learning Center (FSELC)

The Friends of the Straub Environmental Learning Center provides environmental education to the Mid-Willamette Valley community through programs that include the lecture series: nature kids, summer camp, amateur naturalist, and sustainability. During the 2011/12 fiscal year the FSELC provided environmental education to 2,300 adults and children and tracked an 18% increase in participation.

Community Forestry Advisory Committee

A Community Forestry Advisory Committee was formed in January 2012 to provide stakeholder vetted recommendations to the Public Works Director on setting a tree canopy goal and developing a strategic plan for protecting, increasing, and enhancing Salem's urban forest. The Committee includes a variety of stakeholders including the Chamber of Commerce, Homebuilders Association, local neighborhood associations, PGE, Oregon Departments of Administrative Services and Transportation, Willamette University, Glenn Gibson Watershed Council, local tree-related business, and citizens.

RC1—PLANNING, TASK 6

Task Description	**Measurable Goals**	**Tracking Measures**
The City will work with Marion and Polk Counties and the City of Keizer to coordinate stormwater management programs and activities within the greater Salem-Keizer Urban Growth Boundary. Coordination may include the establishment of appropriate intergovernmental agreements (IGAs) regarding potential uniform stormwater design standards, operations and maintenance activities, and public education and involvement efforts within the UGB.	• Review and update the October 2000 SKAPAC Stormwater Management Agreement by the end of the permit term to reflect each jurisdiction's respective MS4 Permit and SWMP.	• Report on significant coordination activities or programs. • Report on completion of SKAPAC Agreement and other IGAs.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

The City of Salem, Marion County, and the City of Keizer continued to meet on a regular basis through much of FY 2011/12. Several meetings focused on any changes that may be needed in the SKAPAC agreement. The participants also agreed to invite Polk County and the City of Turner to future meetings. Neither jurisdiction responded to the invitation or participated in any meetings.

The group ultimately decided not to make any changes to the existing SKAPAC agreement. The current language adequately addressed any concerns the jurisdictions had. The group also decided to reduce the number of meetings per year unless circumstances arose affecting one of the specific areas identified in the SKAPAC agreement. The group will meet regularly at least twice a year unless one of the parties sees a need to convene the group due to public projects or private developments in the areas noted in the SKAPAC agreement.

RC1—PLANNING, TASK 7

Task Description	**Measurable Goals**	**Tracking Measures**
Evaluate existing detention facilities and potential new detention sites for potential conjunctive uses (as water quality facilities and for retrofitting opportunities). Continue to perform facility site searches to locate ponds, wetlands, vegetated swales and other water quality facilities as existing water quantity and quality facilities are evaluated and potential new sites are identified. Coordinate with RC1-1 and RC1-2.	• Complete a retrofit plan before end of year four of the MS4 permit cycle. • Develop a strategy to identify and prioritize potential retrofit projects by November 1, 2013. • Identify a minimum annual budget for stormwater retrofit projects as part of the retrofit strategy by November 1, 2014.	• Report on available budget and completion of retrofit project efforts.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

In previous fiscal years, two existing publicly-owned detention basin facilities were evaluated to be retrofitted to incorporate vegetated treatment swales. During FY 2011/12 a retrofit of one of these basins was determined feasible and a design was prepared by City staff. Construction of these improvements is scheduled for the Fall of 2012.

Progress on the strategy to identify and prioritize potential retrofit projects included working with a Willamette University student to “pilot test” a methodology for retrofit identification. City staff assisted the student in conducting a GIS desktop analysis and a field inventory survey to determine feasible retrofit options in a commercial, residential, and parks-zoned area of West Salem. We concluded that a GIS desktop analysis, which incorporated soil types and infiltration rates, aided in narrowing the search for potential stormwater retrofit areas. For site-specific opportunities, we found that the Retrofit Reconnaissance Investigation (RRI) form, developed by the Center for Watershed Protection, was a useful tool in evaluating potential retrofit projects. These methodologies will be incorporated into our final retrofit strategy.

The Preliminary Capital Improvement Plan has dedicated $80,000 to the design and construction of a retrofit project that targets bacteria reduction. This project will be constructed during this permit term. Efforts to identify this specific retrofit project are currently underway.

RC1—PLANNING, TASK 8

Task Description	**Measurable Goals**	**Tracking Measures**
The City will continue to be an active member of the Oregon Association of Clean Water Agencies (ORACWA). The City will use this medium to obtain copies of materials that have been produced by others. City staff will stay current on latest available educational and technical guidance materials.	• Attend a minimum of one stormwater-related workshop or conference annually. Attend groundwater-related workshops and conferences as funds allow. • Make information obtained at these events available to other City staff.	• Report on City participation with ORACWA events.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

During FY 2011/12, Public Works staff participated in Oregon Association of Clean Water Agencies activities that included the following:

- Seven staff members attended the ACWA Stormwater Summit on May 9. Relevant materials from this event were distributed to other City staff. Specifically, Brian King's presentation "Preparing for an Agency Inspection of Your MS4 Program" was distributed and referenced by City staff in preparation for the audit of Salem's MS4 program in late July.
- Staff regularly participate in ACWA meetings for the Stormwater and MS4 Phase I subcommittees. Through the MS4 Phase I subcommittee, the City of Salem and other MS4 jurisdictions worked cooperatively to develop and document an Adaptive Management approach (submitted to DEQ consistent with MS4 Permit Schedule D.4). In November and December 2011, City staff utilized the Stormwater subcommittee to obtain extensive outreach and training materials for use while preparing revisions to the City's employee MS4 training program. Additionally, City staff participated in Stormwater subcommittee discussions that focused on the development of an Erosion Prevention and Sediment Control field manual, with efforts continuing through FY 2012/13.

Multiple staff attended the ACWA annual conference, where presentations on both stormwater and wastewater management were conducted.

2.2 RC2—Capital Improvements

RC2—CAPITAL IMPROVEMENTS, TASK 1

Task Description	Measureable Goals	Tracking Measures
Implement stormwater projects (including stormwater conveyance, quantity, quality, and stream/habitat improvement) based on priorities established under the Capital Improvement Program (CIP) and the Stormwater Master Plan consistent with available funding.	• Include a funding line item for CIPs in proposed stormwater budget. • Review and prioritize CIPs and budget annually. • Implement CIPs based on prioritization and available funding.	• Track number and description of projects completed. • Report updated CIP list annually.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

In FY 2011/12, $1,711,010 in utility rates and $805,380 in system development charges were newly adopted for Storm System improvements. Utilized asset management principles to prioritize funding for the current year and the four future years shown in the City's adopted CIP. The highest ranked projects were funded as stated in the FY 2011-12 budget and are programmed for implementation. The following Stormwater CIP projects were completed or worked on during the reporting year:

- Lower Lefelle Parking and Street Improvements - Stormwater quality - Construction Completed Fall 2011
- Former Battle Creek Golf Course Property - Stormwater quality and detention - In Construction, Completion 2013

Stormwater quality and quantity facilities were also incorporated into Parks and Transportation construction projects during FY 2011/12 as follows:

- Aumsville Highway Widening and Signals - Stormwater quality and detention - In Design, Construction 2013
- Pedestrian Safety Crossing (downtown) - Phase 1 - Stormwater quality - Construction in 2011
- Kuebler Blvd Widening (Commercial to Lone Oak) - Stormwater quality and detention - Construction in 2011
- Fairway Avenue Bridge Replacement - Stormwater quality - Construction in 2011
- Hawthorne Avenue Widening and Improvements - Stormwater quality and detention - Construction in 2012 & 2013
- Market/Lancaster Intersection - Stormwater quality - Construction in 2012
- Commercial Street Bridge Replacement - Stormwater quality - construction in 2012 and 2013

- Market/Swegle Transportation Improvements - Stormwater quality and detention - Construction in 2013 & 2014
- Eola Drive Transportation Improvements - Stormwater quality and detention - Construction in 2013
- Glenn Creek/Wallace Rd Transportation Improvements - Stormwater quality - Construction in 2014 & 2015
- Rosemont Pedestrian Crossing - Stormwater quality - Construction Completed Summer 2011
- Hoodview Neighborhood Park Improvements - Stormwater quality - In Construction, Completion 2012

RC2—CAPITAL IMPROVEMENTS, TASK 2

Task Description	Measureable Goals	Tracking Measures
Continue to coordinate capital improvement projects with the Water Resources Section to integrate multiple resource agency permitting needs. The review is intended to identify integrated opportunities and permitting needs to meet water quality-related requirements.	• Review and integrate multiple resource agency permitting needs, including MS4 permit requirements, into 100% of CIP projects.	• Track number of projects reviewed. • Track number of projects permitted.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

During the past fiscal year 25 CIP projects were reviewed by Water Resources staff for additional water quality-related permits.

RC2—CAPITAL IMPROVEMENTS, TASK 3

Task Description	**Measureable Goals**	**Tracking Measures**
The City continues to acquire physical access-easements for public and private stormwater facilities. This is done by identifying existing facilities for which easements, rights-of-way, or permit-of-entry agreements are needed for stormwater facilities; and developing a plan for acquiring the same, given current funding limitations.	• Within one year of completion of the hydromodification study and retrofit plan, prioritize easement acquisitions for stormwater facilities. • Following prioritization, identify funding source(s) for inclusion in budget.	• Report on easement acquisition and prioritization process.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

Activities associated with this BMP are planned to occur in 2014 following completion of the hydromodification assessment and retrofit strategy. The results of these two efforts will help identify areas where easement acquisition may be appropriate, and contribute to development of a prioritization process for acquisition.

During FY 2011/12, Public Works Engineering continued with revisions to the City's draft Stormwater Design Standards (see RC 3 Task 1). The draft standards discuss easement requirements for stormwater infrastructure. Currently, easements are acquired with new development for public stormwater infrastructure that is not located within the right-of-way.

2.3 RC3—Update of Stormwater Management Design Standards

RC3—STORMWATER MANAGEMENT DESIGN STANDARDS, TASK 1

Task Description	**Measureable Goals**	**Tracking Measures**
Continue to encourage the use of structural BMPs for stormwater quality improvement and flood peak reduction opportunities. Develop stormwater quality design and associated maintenance standards for new and redevelopment. Continue to evaluate opportunities to provide incentives for alternative stormwater management practices, including Low Impact Development (LID). Maintain and update the Stormwater Management Design Standards after they are developed.	• Develop incentives for LID and other stormwater quantity and quality management practices. • Develop updated stormwater design standards to include structural stormwater quality BMPs. • Maintain Stormwater Management Design Standards and update as needed.	• Document revisions made to Stormwater Management Design Standards. • Document the development of any incentives for implementation of LID techniques.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

During FY 2011/12 draft Stormwater Design Standards were developed which are consistent with Low Impact Development (LID) practices and include structural BMPs for stormwater quality improvement and flood peak reduction. An internal review of the new standards has been completed. A consultant was also hired to do an external review and provided comments to the City for consideration. The most recent draft also contains a number of changes regarding quantity control that are anticipated to help in the transition with the next update in the design standards (likely following findings of the hyrdomodification assessment). A copy of the draft Stormwater Design Standards was provided to DEQ for their review and comment in August, 2012.

Beginning in January 2013, Salem will implement a stormwater utility fee. The fee will be phased in over the next four rate cycles, with full implementation in January 2016. As part of the new stormwater fee, credits will be provided to qualified stormwater ratepayers that operate and maintain stormwater facilities, including LID-based systems.

RC3—UPDATE OF STORMWATER MANAGEMENT DESIGN STANDARDS, TASK 2

Task Description	Measureable Goals	Tracking Measures
Continue to implement process to identify and remove barriers for implementing LID techniques. Update the Stormwater Management Design Standards and associated Salem Revised Code (SRC) provisions as appropriate.	• Within three years of implementing the revised stormwater design standards, review and, as appropriate, modify design standards and SRC to minimize barriers to implementation of LID techniques.	• Document the review of design standards and SRC to minimize barriers to implementation of LID techniques.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

An internal committee was formed and met several times to evaluate barriers in existing *Salem Revised Code* that may limit or inhibit Low Impact Development practices. Identified barriers were given a relative priority rating, and *Code* revisions will be proposed as applicable to remove these barriers. Updates to the Stormwater Management Design Standards related to LID techniques are in progress (see RC3-1).

RC3—UPDATE OF STORMWATER MANAGEMENT DESIGN STANDARDS, TASK 3

Task Description	**Measureable Goals**	**Tracking Measures**
City staff is implementing the Water Quality Development Standards set forth by SRC Chapter 141 for all development requiring a Willamette Greenway Permit.	• Implement Water Quality Development Standards in Willamette Greenway.	• Track number of Willamette Greenway Permits issued and description of water quality measures employed. • Track number of new facilities constructed.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

One permit was issued for development in the Willamette Greenway during FY 2011/12. This permit, dated 04/04/2012 was issued for a 700 square foot expansion of an existing home. No water quality measures were identified for this permit.

RC3—UPDATE OF STORMWATER MANAGEMENT DESIGN STANDARDS, TASK 4

Task Description	**Measureable Goals**	**Tracking Measures**
Continue to review all residential, commercial, and industrial plans submitted for City-issued building permits for compliance with the City's Stormwater Management Design Standards. Conduct inspections of completed projects prior to the City's acceptance of those projects and project close-out to ensure work was done in accordance with approved plans. Maintain database of plans reviewed and final inspections conducted. See IND1-Task 2 for standards specific to industrial facilities.	• Review all residential, commercial, and industrial plans submitted for City-issued permits for compliance with the City's Stormwater Management Design Standards and associated SRC provisions. • Conduct inspections once construction is completed to ensure work was done in accordance with approved plans.	• Maintain database of plans reviewed and final inspections conducted.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

Plan review and inspection processes to ensure compliance with current Codes and Standards were already in place prior to FY 2011/12. An improvement to this activity was implemented during the previous fiscal year. Public Works is now coordinating most of the plan review through electronic distribution of the plans and comments. The comments received on the plans are now saved in a common directory. The plan reviews and inspections performed on development permit projects are tracked and maintained in our permit database (AMANDA).

2.4 RC4—Operations and Maintenance

RC4—OPERATIONS AND MAINTENANCE, TASK 1

Task Description	**Measurable Goals**	**Tracking Measures**
Continue with the existing street sweeping schedule for all areas, maintaining the record of observations, quantity, and quality of material collected in the daily log books. Collect and compile this information for making recommendations for modified methods, schedules, and for NPDES MS4 permit annual reporting and overall program evaluation.	• Review street sweeping program annually for effectiveness and any necessary revisions to sweeping schedule. • Continue sweeping City streets on four zone schedule, sweeping heaviest zone 8 times per year and lightest zone 2-3 times per year. • Continue sweeping City-owned parking lots as needed.	• Record quantity of material collected during sweeping operations. • Record number of curb-miles of streets swept. • Track and report changes made to sweeping schedule, if any.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

How many tons of material was collected?	1,892
What was the total number of curb-miles swept?	15,821

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

The City continued to utilize two regenerative air sweepers during this reporting year to sweep residential and collector streets that have been categorized as having *High, Medium, or Light* debris accumulation. The *Heavy* debris accumulation zone contains 19 routes and is swept 13 times per year. The *Medium* debris accumulation zone contains 15 routes and is swept 8 times per year. The *Light* debris accumulation zone contains 8 routes and is swept 6 times a year. The sweeping rate for these zones currently exceeds the measurable goal for this task. A fourth zone that encompasses the Central Business District (CBD) and Capitol Mall is swept at night on a weekly basis. Heavy debris areas within the CBD are also swept three times per week during summer and twice per week in fall through spring. Arterial streets are swept at night, approximately every four weeks. A third machine is operated during peak leaf season or when one of the other machines is broken down. Two operators sweep residential and collector streets during the day and two operators sweep arterial streets during the night time. City-owned parking lots are swept on an as-needed basis. The City does not sweep any commercial parking lots. During this reporting year the City swept a total of 15,821 miles, collected approximately 1,892 tons of street sweeping debris, and removed 4500 cubic yards of leaves. There were 5 snow and ice events during this reporting period. Of these 5 events, 3 required the application of sanding material to roadways. Sweeping of sanding rock commences immediately at the end of snow and ice mitigation. Once the roadways have been cleared the sweepers return to their scheduled routes.

RC4—OPERATIONS AND MAINTENANCE, TASK 2

Task Description	**Measureable Goals**	**Tracking Measures**
The City will continue to perform de-icing operations in a way that minimizes stormwater pollution through: conducting annual inspections and training to ensure proper operation of the de-icing chemical storage facility; training and verification that application equipment is applying deicer at 1/2 to 1/3 the industry standard; construction of an expanded covered storage area for de-icing aggregate materials combined with FEMA floodgates to mitigate migration of aggregates (2011) ; maintaining proper function of adjacent sediment traps and catch basins in the storage yard; sweeping removal of operational de-icing aggregate spillage; and coordinating de-icing activities with Airport Operations and their 1200-Z permit.	• Continue current de-icing operations to prevent stormwater pollution.	• Document dates of activities for annual inspections and training. • Document de-icing quantities applied annually.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

During FY 2011/12 construction was completed on a new de-icing aggregate storage facility with FEMA mandated flood control gates to prevent erosion and/or migration of aggregate into adjacent storm drainage facilities. Additionally, the liquid deicer application equipment passed annual inspection and adjustment to maintain application rates at 1/3 to 1/2 the industry standard; all storm drainage facilities adjacent to aggregate and liquid deicer storage facilities were inspected and protection measures were replaced as needed. Annual equipment inspections and training are conducted each fall. Regenerative air sweepers were utilized this last year to sweep up any spilled deicer aggregate immediately after conclusion of event response. The City is no longer providing de-icing activities for the airport as the materials we utilize in the public ROW are not approved by the FAA for airport use.

RC4—OPERATIONS AND MAINTENANCE, TASK 3

Task Description	**Measureable Goals**	**Tracking Measures**
Continue to review and update the O&M practices and activity schedules defined in the Drainage Program Evaluation Notebook (DPEN) (including updating GIS database). Utilize Hansen IMS data to develop and refine work programs. This review will serve as a basis for budgeting and allocating resources; scheduling work; and reporting on and evaluating the performance and costs for the overall O&M program and specific activities.	• Update DPEN and IMS database activities and schedules. • Create line items in budget for specific O&M activities. • Review and update O&M practices and activity schedules every 3 years.	• Track revisions made to O&M practices and activity schedules.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

During FY 2011/12 staff updated the Maintenance Management Plan to allow for program review and budgeting purposes. Work began to update the Hansen database and GIS to include stormwater quality facilities (see RC4 Task 9).

RC4—OPERATIONS AND MAINTENANCE, TASK 4

Task Description	Measureable Goals	Tracking Measures
Continue to improve the O&M training program and activities especially with regards to safety and protection of water quality.	• Conduct O&M safety meetings twice per month. • Attend ACWA committee meetings and workshops as scheduled. • Conduct weekly tailgate meetings with Operations crews.	• Document reviews and modifications to the O&M training program. • Record O&M training activities completed. • Document ACWA meetings and workshops attended.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

Bi-monthly safety meetings conducted during the FY 2011/12 reporting period included the following topics: MS4 spill prevention, Confined Space; Chemical/Gas Safety; Natural Gas; Hand Tool Safety; Environmental Hazards; Power Tools; Gas Detectors; Blood Borne Pathogens; Alcohol/Drug Awareness; Erosion Control; Haz-Mat Refresher; Excavations; Lifting/Back Safety; Heat Stress; Housekeeping (slips, trips, falls); Heavy Equipment; Self Defense; Personal Protection Equipment; Chainsaw Safety; Fire/Electrical Safety; Bypass Pumping; Lockout/Tagout; Asbestos; Vehicle Operation. Staff continued efforts to evaluate and revise the training program to include greater emphasis on stormwater-related topics. Training is being revised in coordination with the “City of Salem Shops Complex Stormwater Pollution Control Plan” (see ILL 1 Task 4).

Participation in Oregon Association of Clean Water Agencies (ACWA) continued during this reporting period. Staff attended stormwater and water quality committee meetings, the ACWA Stormwater Summit, and ACWA Annual Conference (refer to RC1 Task 8).

RC4—OPERATIONS AND MAINTENANCE, TASK 5

Task Description	**Measureable Goals**	**Tracking Measures**
Integrated Pest Management (IPM) Program: Salem Parks Operations Division will continue their program for careful monitoring and management of pesticides, herbicides and fertilizers, and will provide public information. Review and refine the IPM Program during the permit cycle, ensuring proper handling and storage of pesticides, herbicides, and fertilizers.	• Review and refine IPM Program during the MS4 permit cycle. • Routine inspections of storage facilities for proper storage of materials and chemicals.	• Document revisions made to IPM Program. • Document inspections of storage facilities.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

Quarterly inspections of the fertilizer storage facility and the pesticide storage facilities were performed during this reporting year. Based on these inspections, excess fertilizer and pesticides that no longer meet current standards or had expired were disposed of through the City's Environmental Services Section. Inspections of the Stormwater pesticide storage facilities were also performed on a quarterly schedule. In preparation for revising the City's pest management plan, during FY 2011/12 a review was conducted of similar plans from other municipalities.

RC4—OPERATIONS AND MAINTENANCE, TASK 6

Task Description	**Measureable Goals**	**Tracking Measures**
Continue the storm sewer cleaning and TV inspection program, concentrating on known areas of localized flooding complaints (this alerts the City to locations of debris build-up and minimizes erosion potential) and persistent operation and maintenance problems, and looking for potential illicit discharges and seepage from sanitary sewers, see ILL2. Also focus on significant industrial/commercial areas where potential illicit discharges may be of concern.	• Concentrate storm sewer cleaning and TV inspection on areas with historical problems and high potential for illicit discharges. • Inspect 120,000 LF of conveyance system annually.	• Track number of inspections; identify areas with persistent O&M problems. • Track number of cross-connections found. • Track length of conveyance system cleaned and inspected.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

How many inspections were completed this year?	831
How many linear feet of conveyance system were inspected?	146,103
How many linear feet of conveyance system were cleaned?	33,877
How many cross-connections were found (see also ILL 2 Task 3)?	1

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

During the reporting year TV crews completed the scheduled TV inspection of 120,000 linear feet as well as an additional 26,103 feet of unscheduled storm line inspections. Of the 146,103 feet inspected 6,742 was from new construction.

RC4—OPERATIONS AND MAINTENANCE, TASK 7

Task Description	**Measureable Goals**	**Tracking Measures**
Continue supporting annual Stream Cleaning Program. More than one half of the stream miles in the City of Salem are inspected annually by walking each stream segment. Using summer interns the City inspects the riparian areas and streams, picks up litter and garbage, inspects for illicit discharges (ILL2), addresses potential conveyance concerns, and evaluates areas for stream restoration.	• Walk 50% of the waterways within the City each year for stream cleanup and enhancement. • Complete one stream restoration project each year.	• Track length of waterways walked each year. • Document stream restoration projects completed each year. • Document the amount of litter and garbage removed each year.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

The 2011 Stream Cleaning Program (beginning of reporting period) consisted of 6 crewmembers and an environmental aide. The crew walked a total of 49 stream miles within the City, removing over 11,825 pounds of trash. They also removed approximately 83 cubic yards of natural debris (primarily Himalayan blackberry) from the creeks. In continuing recycling efforts, the crew sorted out 3,075 pounds of recyclable materials. An inmate crew was used to clean 4 miles of the East and West Fork Little Pudding River, which is included in the total 49 miles of waterways cleaned for this reporting period. The inmate crew removed over 500 cubic yards of invasive vegetation.

The 2011 stream cleaning crew completed a riparian restoration project along West Middle Fork of Pringle Creek, in the vicinity of Reed Lane and Baxter Road. The project incorporated the removal of invasive vegetation, installation of erosion control matting, seeding of native grasses and wildflowers, and the planting of 162 native trees, shrubs, rushes, and sedges.

The 2012 Stream Crew (end of reporting period) walked nearly 51 miles of Salem waterways, removing trash, debris jams, recyclable materials, and invasive vegetation. The crew of hard-working and dedicated college students removed 19,792 pounds of trash, over 4,605 pounds of recyclable material, and 269 cubic yards of natural debris.

Every year since 2000, the Stream Crew has completed one riparian restoration project. These projects are designed to provide bank stabilization, shade, wildlife habitat, and increase native plant diversity. This year the crew worked very closely with a property owner along Pringle Creek. The crew removed invasive vegetation, installed around 200 feet of coir logs and straw wattles for erosion prevention, and planted more than 170 native shrubs, trees, and grasses. With the commitment of the property owner to maintain the work that was accomplished, this year’s restoration project should be a success well into the future.

RC4—OPERATIONS AND MAINTENANCE, TASK 8

Task Description	**Measureable Goals**	**Tracking Measures**
Continue to regularly inspect and maintain public structural stormwater control facilities. Coordinate with RC4 Task 9.	• Regularly inspect all public detention and water quality facilities.	• Track number of public facilities inspected and maintained. • Track amount of sediment and debris removed from all facilities.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

How many public water quality facilities were inspected this year?	58
How many public detention facilities were inspected this year?	136
What were the total cubic yards of debris/sediment removed from all public and private facilities?	15

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

All publicly maintained stormwater quality and detention facilities were inspected by Stormwater staff quarterly during FY 2011/12.

RC4—OPERATIONS AND MAINTENANCE, TASK 9

Task Description	**Measureable Goals**	**Tracking Measures**
Develop and implement a long-term maintenance strategy for public and private stormwater control facilities. This strategy will identify procedures and/or priorities for inventorying, mapping, inspecting, and maintaining facilities.	• Document and implement a long-term maintenance strategy for public and private stormwater control facilities during the MS4 permit cycle.	• Track number of private facilities located, mapped, and inspected. • Track progress toward developing a facility long-term maintenance strategy.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

How many private and public water quality facilities were mapped this year?	52
How many private and public detention were mapped this year?	130
How many private water quality facilities were inspected this year?	5
How many private detention facilities were inspected this year?	822

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

959 detention basins, both private and public, were inspected during the past fiscal year as part of the City's detention basin inspection program. Informational letters were sent to local plumbers and real estate agencies to inform them of the presence of stormwater control facilities and facility maintenance requirements on private property.

During the past fiscal year, progress was made toward developing a comprehensive program to inventory, map, inspect, and maintain both public and private stormwater control facilities. This Operation and Maintenance program is expected to be completed by January 1, 2013, as required by the MS4 permit. Stormwater staff worked with GIS staff to develop a process of mapping new public and private stormwater facilities as new plans and field discoveries are submitted. A new asset numbering system for the Hansen database was implemented and the process was 'pilot tested' with known treatment tree boxes. The inventory, mapping, inspection, and maintenance process for tree boxes was successful, so staff continued to refine the process for other stormwater control facility types. In FY 2012/13, staff will continue to develop the Operation and Maintenance program, particularly focusing on documenting the inspection and outreach/education components. The draft Stormwater Management Manual developed by staff over the last year will guide this program.

RC4—OPERATIONS AND MAINTENANCE, TASK 10

Task Description	**Measureable Goals**	**Tracking Measures**
Ditch maintenance is performed to assure adequate conveyance, and consists of two components: (1) Ditch Cleaning – Cleaning consists of removal of sediment in the bottom of roadside ditches only as needed for proper conveyance, with limited vegetation disturbance and the use of straw wattles to reduce sedimentation and erosion within the ditch. (2) Ditch Mowing – Mowing is typically conducted by inmate crews using hand-held equipment. Vegetation cutting facilitates conveyance and reduces the risk of potential fires in summer months.	• Regularly inspect and maintain 100% of City ditches using appropriate water quality BMPs.	• Track length of ditch maintenance performed (cleaning and mowing). • Track amount of sediment and debris removed.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

How many miles of ditch were cleaned & mowed this year?	37
What were the total cubic yards of sediment/debris removed?	862

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

Stormwater staff cleaned and/or mowed 100% of Salem’s ditches in FY 2011/12.

RC4—OPERATIONS AND MAINTENANCE, TASK 11

Task Description	Measureable Goals	Tracking Measures
Public catch basins are cleaned on a regular basis with a Vactor truck. During catch basin cleaning activities, inspections are done and repairs are scheduled if needed.	• Clean and inspect 75% of catch basins annually. • Periodically analyze the material removed from the catch basins.	• Track the number and percent of catch basins cleaned annually. • Report on any analysis of removed material.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

During FY 2011/12, crews inspected 15,966 public catch basins, and cleaned them when necessary. This number represents more than 100% of the catch basin inventory as being inspected, with some being inspected and/or cleaned more than once. Through this process a total of 1,127 cu yards of debris was removed and 505 work orders generated for catch basin repairs. As resources allow, staff anticipate utilizing GIS to map debris accumulations so that a prioritization scheme may be developed for future inspections and cleanings.

RC4—OPERATIONS AND MAINTENANCE, TASK 12

Task Description	Measureable Goals	Tracking Measures
Continue to refine the maintenance program for public and private stormwater detention and water quality facilities. The City maintains an informational packet outlining ownership and maintenance responsibilities and compliance assurance procedures to encourage owners of private detention and water quality systems to perform maintenance. Coordinate with RC 4 Task 9.	• Maintain informational package for ownership maintenance responsibilities for detention and water quality facilities. • Implement maintenance activities and requirements identified in long-term maintenance strategy (RC4 Task 9).	• Track number of information packets distributed regarding private stormwater control facilities. • Track maintenance requirements of long-term maintenance strategy.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

City crews continued to inspect all public and private detention basins, and continued with development of an operation and maintenance program for stormwater control facilities (See RC 4 Task 9). During this reporting period, informational letters were sent to property owners, plumbers, and real estate agencies to inform them of detention basin maintenance requirements. It is anticipated that additional outreach materials will be sent to property owners once the operation and maintenance program is implemented.

2.5 RC5—Public Education and Participation

RC5—PUBLIC EDUCATION AND PARTICIPATION, TASK 1

Task Description	Measureable Goals	Tracking Measures
Develop and implement a public outreach and education strategy with goals, objectives, identified target audiences, partners, identified target contaminants, and messaging. Conduct a public education program effectiveness evaluation of outreach procedures/efforts. Adjust the program based on the results in year five. (See Table A.1 – Public Outreach Program Matrix, June 2008).	• Create two (2) public education campaigns* from the Public Outreach Program Matrix. • Support outreach and educational activities for other divisions**. • Conduct an effectiveness evaluation of the outreach program before the end of year four of the MS4 permit cycle.	• Document public outreach and involvement activities for two (2) education campaigns. • Document outreach activities for other divisions. • Document the results of the effectiveness evaluation and subsequent changes to the outreach procedures/efforts.
*A public education campaign focuses outreach efforts on a target contaminant. The Public Outreach Matrix (Table A.1) contains the outline for educational campaigns by target contaminant. The matrix is a complete list of prioritized outreach activities, tools, partners, key audiences, and measurable goals for Salem's stormwater management program. The City will develop robust educational campaigns for the top priority contaminants – focusing limited resources on the most critical contaminants first. Top priority contaminants were selected based on the review of monitoring data. **Many of the City's BMPs, in addition to RC5, contain outreach tasks. To ensure that all required outreach is being completed, outreach tasks from BMPs other than RC5 are included in the Public Outreach Matrix. RC4 – Inventory Private Stormwater Facilities is an example of a BMP that has an outreach task: Annual letters will be mailed to detention basin/water quality facility owners. That task is shown on the matrix and will be completed and documented each year.		

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 that demonstrate that Measurable Goals were attained or that progress was made.

The two selected campaigns are turbidity and *E. coli* bacteria, and these are both slated for the effectiveness evaluation study in 2014. A campaign task timeline was created for both campaigns to gear up for the effectiveness evaluation. The identified tasks are:

1. Gather background data
2. Design and conduct studies to determining behavior baselines
3. Create study report
4. Create communications plan and collateral material, and
5. Plan implementation

During FY2011/2012, the City hired an intern who completed the following tasks for the *E. coli* campaign:

- gathered background data, including the number and location of Marion and Polk County dog owners through the licensing database
- designed a pair-wise study to determine baseline behavior for follow-up effectiveness evaluation
- began study to determine baseline behavior

During FY 2011/2012, the design of the turbidity study was finalized. A pair-wise study will not be performed for turbidity. Instead, there will be an initial behavior study, with a follow-up study in 2014 to assess the effectiveness of the outreach.

In addition, a general stormwater quality campaign was developed during FY 2011/2012. This includes the development of a stormwater brand through the participation of focus group members, community interviews, and internal City staff.

Stormwater Retrofit Project:
On April 12, 2012, Operations staff supported staff from the Urban Development Department regarding the stormwater retrofits that will be occurring under the 2nd Street Redevelopment Project in West Salem. Staff attended the open house at Edgewater Medical Center to provide general stormwater information to the public.

Website Redesign:
Staff is working with all water-related groups to redevelop the City's website to improve its use as an outreach and educational tool. We have had many internal meetings to discuss the redesign. Affected groups are from PW Administration Division (Planning and Development Services), PW Operations Division (Stormwater Services, Wastewater Collection, Water Services, and Water and Environmental Services), Wastewater Treatment Division, and Information Technology Division. Web rewrites and updates have continued through June 30, 2012.

Riparian Protection and Free Tree Programs:
City staff from Planning and Development Services, Stormwater Services, and Water and Environmental Resources are coordinating efforts to use the riparian prioritization tool developed under the Riparian Protection Program to develop a more targeted outreach strategy for the Free Tree Program. Outreach priorities will be based on areas with low shade for the 2013 Free Tree Program. Staff have also discussed the use of a contracted service to assist with implementing outreach.

Radio advertisements:
The Public Works Department airs 30-second radio spots on local radio stations Monday through Friday every week of the year. We air 40 30-second spots per month on JC media and KBZY during the morning and evening drive times. The City also airs radio spots on the local Hispanic station La Pantera. The FY 2011-12 radio spots are divided into six categories/themes: stormwater messages and events (27 weeks), Marion County program support (12 weeks), safety and preparedness (10 weeks), wastewater protection (1 week), water conservation (1 week), and PW events (1 week).

Salem Weekly print advertisements:
The Public Works Department prints one ad in the bi-monthly free paper *Salem Weekly*. The FY 2011-12 print ads are divided into four categories/themes: stormwater messages and events (5 issues), Marion County program support (2 issues), water conservation (1 issue), and Public Works information (4 issues).

Community Connection articles and advertisements:
The Public Works Department prints articles and advertisement in the free City of Salem Publication *Community Connections*. The articles support the MS4 Permit and Stormwater Management Plan outreach. The FY 2011-12 articles and ads are divided into four categories/themes: stormwater messages and events (12 entries), Marion County program support (7 entries), City Green Award (1 entry), and natural resources (1 entry).

School Presentations:

Staff participated in 32 events or presentations during this reporting period and provided outreach to 1,337 students. Presentations were conducted for the following: Critters in the Creek, Salmon Watch, Take the Pledge, Watersheds, Geren Island Tour, Stormwater Commercials, The Water Cycle, Wetlands, Ms. Sally Swims Up Stream, Stormwater Pollution Prevention Race, and Water Quality Studies.

Youth Environmental Education Program (YEEP):

The YEEP Specialist performed 565 presentations and 6 discovery hikes to 14,920 students. Presentations were conducted for the following: All About Owls, Bird Nests, Frogs, Awesome Ospreys, Black Bears, Gray Whales, Beavers, Flying Squirrels, Neighborhood Birds, Raccoons, Slugs! Ugh!, Oregon Oaks, Red-tailed Hawks, Turtles, Great Blue Herons, Pikas, Sea Stars, Woody Woodpecker.

Free Tree Program

The City continued to offer the native trees and shrubs to riparian property owners within city limits during this FY 2011 reporting year. Free Tree offer letters were mailed out to over 1600 residents in the spring of 2012. Residents were informed of the benefits associated with native riparian vegetation and allowed to collect up to 7 free plants for placement along streams.

Public Works Day

City staff coordinated a Stormwater Pollution Control Relay on June 14, 2012 at Riverfront Park as part of Public Works Day. Children that participanted were asked to pick up plastic dog droppings and put them in the garbage, put household chemical containers in a secure place, make sure yard debris was put in a compost bin, “flow” through a stormwater pipe, and “fish” pollutants out of the stream. There were approximately 900 attendees at this years’ Public Works Day event.

RC5—PUBLIC EDUCATION AND PARTICIPATION, TASK 2

Task Description	Measureable Goals	Tracking Measures
Coordinate activities of various groups within the Public Works Department and other City departments assigned responsibility for public outreach and citizen contacts on stormwater matters.	• Quarterly meetings of various groups assigned responsibility for public outreach and citizen contacts on stormwater matters.	• Document quarterly meetings and outcomes.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

5-year Stormwater Plan:
During this reporting year 10 separate coordination meetings that were held to review the 5-year Stormwater Outreach Plan:

- September 7, 2011: Meeting with consultant to discuss plan schedule and year one implementation tasks (focus groups and community interviews, outreach plan, brand concepts, and website redesign)
- January 5, 2012: Community assessment memo sent to outreach group to review and provide feedback
- February 8, 2012: Created briefs regarding the stormwater brand
- January 13, 2012: Held “Water on the Web” meeting to discuss revisions to the City of Salem website
- February 23, 2012: Met with staff to discuss potential for water quality monitoring associated with upcoming outreach efforts
- March 9, 2012: Discussed the consultants' perspective on the website revisions
- April 17, 2012: Discussed the two outreach campaigns and alternative forms of effectiveness evaluations
- April 24, 2012: Provided background on branding process (focus groups and outreach group input) and final choice for the group
- April 27, 2012: Provided information and received feedback from staff regarding stormwater campaign and web redesign
- May 8, 2012: Received final brand approval and discussed options for consultant to work on final adjustments and documents

Riparian Outreach Plan:
There were 7 meetings held throughout this reporting year related to the Riparian Outreach Plan:

- September 7, 2011: Meeting with consultant to review draft Plan
- September 29, 2011: Meeting with staff to determine primary and secondary outreach targets for riparian outreach based upon land use activities
- November 7, 2011: Determined that 80 top priority residential sites will be target for outreach
- November 8, 2011: Discussed options for free tree program (i.e., revisions to the offer letter, information request, additional volunteer opportunities)
- December 7, 2011: Met to discuss the final mailing list for the Free Tree Program and the prioritization of the homeowners selected
- January 18, 2012: Met to review riparian factsheet and compile comments for the consultant

- April 17, 2012: Discussed FY 2012/13 outreach for the Free Tree Program and potential to hire a contractor to assist with outreach and implementation.

RC5—PUBLIC EDUCATION AND PARTICIPATION, TASK 3

Task Description	Measureable Goals	Tracking Measures
Increase the use of community partnerships to carry out outreach goals.	• Develop one new partnership per year to carry out outreach goals.	• Document partnerships and outcomes of partnership activities.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

Supporting the *E. coli* campaign, staff partnered with Marion County Dog Services for assisting with dog licensing information, event planning, and leads for dog-related businesses. In the first collaborative effort, an event is being planned for October 6, 2012.

In addition, staff from the City of Keizer and Marion County will be collaborating to develop a regional pet waste pledge and website. They will be working on details in the next fiscal year 2012/2013.

During this reporting year the Public Works Natural Area Specialist initiated the following partnership activities:

- Coordinated with the Boys & Girls Club to do invasive weed removal along a City-owned riparian restoration section of Gibson Creek and Fairview Mitigation Wetlands.
- Partnered with the Willamette University Biology Department to supply native wildflower seeds for wetlands restoration projects.

RC5—PUBLIC EDUCATION AND PARTICIPATION, TASK 4

Task Description	**Measureable Goals**	**Tracking Measures**
Investigate the use of a stormwater utility to provide an adequate funding base to support expanded public outreach (see RC6-2).	• Develop a yearly public education budget. • Document public education and outreach needs in the Stormwater Utility Implementation Plan.	• Document public education budget and expenditures. • Document Utility implementation plan showing public education and outreach needs.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

In mid-2012, staff resumed outreach efforts associated with the Stormwater Utility. This outreach targeted principle stakeholders, the Salem Chamber of Commerce, and neighborhood associations. A list of additional stormwater related public education budget requests for the FY 2012/13 budget has been included in Appendix B of this report.

2.6 RC6—Stormwater Management Program Financing

RC6—STORMWATER MANAGEMENT PROGRAM FINANCING, TASK 1

Task Description	**Measureable Goals**	**Tracking Measures**
In conjunction with the updated Stormwater Master Plan (RC1-1), review and update the Stormwater System Development Charge (SDC) methodology to address both stormwater quantity and quality.	• Adopt updated Stormwater SDC methodology by the end of the MS4 permit cycle.	• Report on update to Stormwater SDC methodology.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

Review and update of the Stormwater System Development Charge (SDC) methodology will be conducted in concert with updating the Stormwater Master Plan. (See Activities & Accomplishments under RC1 Task 1).

RC6—STORMWATER MANAGEMENT PROGRAM FINANCING, TASK 2

Task Description	**Measureable Goals**	**Tracking Measures**
Implement a new stormwater utility capable of generating stormwater fees historically paid for by water and/or sewer utility customers. The new utility will include incentives to encourage users to implement alternative stormwater management practices such as LID.	• Adopt new stormwater utility by the end of the MS4 permit cycle.	• Report on adoption of new stormwater utility.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

On December 6, 2010, the Salem City Council approved creation of a Stormwater Utility. The Council established an initial implementation date of January 2013, and a phase-in period of three years, with final implementation to be completed in January 2016.

During FY 2011/2012, staff prepared for implementation of the utility. Impervious surface areas were re-evaluated using more recent flyover imagery, customer accounts were reviewed, informational documents were updated, and new procedures for billing and accounting were developed.

RC6—STORMWATER MANAGEMENT PROGRAM FINANCING, TASK 3

Task Description	Measureable Goals	Tracking Measures
Identify and pursue grant opportunities for stormwater quality projects, including potential retrofit and LID project opportunities.	• Pursue grant opportunities as staff resources allow.	• Track number of grants applied for each year. • Track number of grants received each year.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

Initiated during FY 2010/11, the City was successful in acquiring a grant from the ODOT Retrofit Program for $1.9 million. This project will retrofit a total of 8.63 acres of impervious area on the Marion and Center Street Bridges with stormwater treatment facilities. Bioretention facilities will be built on the east and west sides of the Willamette River near the bridges. A second phase of the project will add piping to both bridges to convey stormwater from the bridges to the treatment facilities.

Design of this project was completed during FY 2011/12. Construction of the bioretention facilities will take place during FY 2012/13, with phase 2 of the project scheduled for construction in FY 2013/14.

2.7 RC7—Maintain and Update GIS System

RC7—MAINTAIN AND UPDATE GIS SYSTEM, TASK 1

Task Description	**Measurable Goals**	**Tracking Measures**
Continue maintenance of the GIS database and Hansen IMS database. These on-going updates will also reflect completion of any stormwater Master Plan capital improvement projects, new facilities added to the system, potential "hot-spots" for illicit discharges, refinement of data for the existing system, updated information on wetlands, perennial streams, waterways, and floodplain/floodway designations, and information updated on a periodic basis for the City's Urban Growth Boundary. The GIS database will be accessible by City departments for review purposes.	• Continue performing database updates annually. • Create record of GIS maintenance activities.	• Record maintenance / updates made to database.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

Standard GIS database maintenance occurred over the past year that results in an accurate and up-to-date database of Stormwater assets. The source of these edits is CIP, Permit, and in-house construction project plans and As-Constructed drawings. In addition to our standard database entry, the Records Section has also been entering information related to private stormwater systems, particularly private stormwater control facilities (coordinated with RC4 Task 9). This work will be on-going as historic data is acquired from a variety of sources and provided to the Records Section of GIS data entry.

RC7—MAINTAIN AND UPDATE GIS SYSTEM, TASK 2

Task Description	**Measurable Goals**	**Tracking Measures**
Integrate the information in the GIS and IMS. The City plans to integrate the data from both the GIS and Hansen IMS databases so that information in the Hansen IMS database can be visualized using the GIS system.	• Create an action plan for how the GIS and IMS system will be integrated and updated. • Implement action plan to integrate GIS and IMS.	• Track completion of action plan items. • Track implementation status of database integration.

MS4 Permit Requirements Addressed by this BMP

Not applicable for this task.

(refer to 2010 MS4 permit for details and deadlines)

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

Unfortunately, due to development and initial implementation of the new stormwater utility rate program, all resources that would have been used for the GIS/IMS integration were put on hold. Additionally, the Records Section lost a FTE due to retirement and currently has no plans to fill that position.

2.8 RC8—City Stormwater Grant Program

RC8—CITY STORMWATER GRANT PROGRAM, TASK 1

Task Description	**Measureable Goals**	**Tracking Measures**
Expand matching grant program for watershed protection and preservation to allow for funding of stormwater-related activities, such as promoting water-wise landscaping, reduction of stormwater discharges, restoring riparian areas, stormwater quantity reduction, stormwater quality/treatment, etc.	• Continue to fund $50,000 grant program. • Expand matching grant program for watershed protection. • Promote the grant program in conjunction with RC5 outreach activities.	• Maintain a list of grant awards tracking funding and projects.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

Watershed Protection and Preservation Grant funding was awarded to eight separate projects during the FY 2011/12 reporting period. Three grants were for riparian stabilization and planting projects ($12,780.00), two for the construction of rain gardens ($7,270), two for the design of stream bed/fish habitat improvement projects ($12,500), and one to administer a variety of smaller watershed improvement projects ($7,000).

2.9 Legal/Ordinances

RC9—LEGAL/ORDINANCES, TASK 1

Task Description	**Measureable Goals**	**Tracking Measures**
In process of revising the Stormwater Management Design Standards (RC 3 Task 1) and developing a stormwater-dedicated chapter to the SRC (RC 9 Task 3), coordinate with Community Development's effort to adopt a Unified Development Code (UDC). It is envisioned that the stormwater dedicated SRC would be integrated into the UDC framework.	• Adopt the UDC and integrate stormwater-related revisions to the SRC by the end of the MS4 permit cycle.	• Report on progress for adoption of UDC and integration of stormwater-related SRC.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

City staff continue to incorporate selected chapters of the Salem Revised Code (SRC) into a single, Unified Development Code (UDC). Led by the Community Development Department, the effort involves grouping related sections and subsections of existing chapters of the SRC into the more cohesive UDC format.

On June 18, 2012, City Council approved the staff recommendation to refer Ordinance Bill No.12 -12 to the Planning Commission for a public hearing and recommendation. This includes adopting eight new chapters of the UDC, renumbering the Annexation chapter, updating the City's procedures ordinance to reflect the proposed new chapters, and amending portions of the SRC to conform to the proposed amendments. The chapters proposed for adoption included:

- SRC Chapter 220 - Site Plan Review
- SRC Chapter 225 - Design Review
- SRC Chapter 240 - Conditional Use
- SRC Chapter 245 - Variances
- SRC Chapter 250 - Adjustments
- SRC Chapter 255 - Street Naming, Addressing, and Vacation of Public Property
- SRC Chapter 265 - Zone Changes
- SRC Chapter 270 - Non-Conforming Situations

RC9—LEGAL/ORDINANCES, TASK 2

Task Description	Measureable Goals	Tracking Measures
Continue to enforce the SRC and review and revise it as necessary to reflect the updated Stormwater Management Design Standards that principally focus on requirements associated with on-site water quality facilities for new development or redevelopment (RC3).	• Revise SRC (as needed).	• Track any MS4 stormwater pertinent revisions made to the SRC.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

The proposed Stormwater Code (see RC 9 Task 3) includes a new section on enforcement that will include a matrix-based penalty assessment, as well as clarified regulations related to Stop Work Orders and Notices of Violation. The enforcement section may be retained in the stormwater portion of the Salem Revised Code (Chapter 71) or it may be placed in the broader General Utilities (Chapter 70) so that it can be incorporated into the City's enforcement strategies for not only stormwater, but also water and wastewater.

This section will enhance the manner in which the City conducts enforcement actions. Provisions have been incorporated that will allow the City to issue a Notice of Violation to a responsible party and then assess the penalty based on eight factors. These factors include:

1. The risk to public health caused by the violation;
2. The environmental or infrastructure damage caused by the violation;
3. Whether the violation was committed by the responsible party intentionally, knowingly, recklessly, or negligently;
4. The actions of the party that caused the violation;
5. The responsiveness of the responsible party in correcting the violation;
6. Whether the violation involved the failure to obtain necessary permits or approval;
7. The economic benefit derived by the responsible party for failing to comply with the provision of this Chapter; and
8. The number of times the responsible party has violated any provision of this Chapter within the past 5 years.

The penalty will be determined by a point system and can range from $250 to $5,000 per violation.

Also incorporated into the new section of Chapter 70 are specific provisions related to issuing Stop Work Orders, Emergency Orders, and Voluntary Compliance Agreements.

The implementation phase of the new Stormwater Code will include training for development review staff in order to ensure that the new provision of the code and associated Stormwater Design Standards, including on-site water quality and water quantity requirements, are incorporated in proposed development plans.

RC9—LEGAL/ORDINANCES, TASK 3

	Measureable Goals	**Tracking Measures**
Develop a new SRC chapter dedicated solely to stormwater management. It is currently envisioned that this will be done after the City's renewed MS4 Permit is issued, and in conjunction with implementation of the new stormwater utility and updated Stormwater SDC Methodology (RC6) and the updated Stormwater Master Plan (RC1).	• Adopt the new SRC chapter for stormwater by the end of the MS4 permit cycle.	• Report on adoption of the new SRC chapter for stormwater, and processes/milestones enroute to formal adoption of the SRC revisions.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

Work continues on drafting a new chapter of the Salem Revised Code (SRC) that is specific to stormwater. In the current draft Chapter 71 of the *Salem Revised Code*, regulatory subsections that have been included are summarized below:

(1) *General Provisions*: Includes purpose and scope; and authority and applicability.

(2) *Definitions*: Defines the terms as needed to implement and interpret the chapter.

(3) *Code Exemptions, Adjustments, and Exceptions*: Provides procedures and criteria for allowing certain variations from the requirements contained in the chapter.

(4) *Prohibited and Non-Prohibited Discharges*: Prohibits discharging contaminants or pollutants into a storm drainage system or a receiving water. Currently lists 26 non-prohibited discharges, such as water line flushing and foundation drains, based on the provisions contained in the City's municipal stormwater NPDES discharge permit.

(5) *Minimum Requirements for All Real Property*: Provides general requirements for persons owning, operating, or occupying real property. This would include, for example, requirements to report spills and requirements to maintain all drainage control facilities. Also included in this subsection are requirements for onsite stormwater source control.

(6) *Minimum Requirements for Public Agency Projects*: Establishes that City projects are required to meet the requirements of the chapter and that when the City conducts projects, the work shall be inspected by the City to ensure the projects are done in a manner consistent with the requirements of this Chapter.

(7) *Minimum Requirements for All Projects*: Includes general requirements for projects, such as maintaining natural drainage patterns and eliminating illicit connections. This subsection also contains a requirement that all projects are to amend disturbed soils, preserve existing trees, plant new trees, and provide landscaping to the maximum extent feasible in order to minimize post-development runoff volumes and flow rates.

(8) *Minimum Requirements for Large Projects*: Adds requirements for large projects (defined as having 10,000 square feet or more of new and replaced impervious surface) to use project phasing and to size stormwater facilities for the entire subdivision.

(9) *Minimum Requirements for Single-family Residential Projects*: Establishes a threshold of 1,300 square feet of new plus replaced impervious surface and requires these projects to meet the minimum requirements for treatment.

(10) *Minimum Requirements for Parcel-based Projects and Roadway Projects*: Establishes a threshold of 10,000 square feet of new plus replaced impervious surface and requires these projects to meet the minimum requirements for both flow control and treatment.

(11) *Minimum Requirements for Flow Control*: Contains the performance standards for flow control, referencing the Administrative Rules and requires that projects implement green stormwater infrastructure to the maximum extent feasible.

(12) *Minimum Requirements for Treatment*: Contains the performance standards for treatment, referencing the Administrative Rules and requires that projects implement green stormwater infrastructure to the maximum extent feasible.

(13) *Fee-in-Lieu Authorized*: Provides authority and includes criteria for the City Manager to allow a developer to voluntarily enter into an agreement with the City for the payment of a fee-in-lieu of constructing a drainage control facility.

(14) *Drainage Control Review and Application Requirements*: Establishes submittal requirements for plan review and approval.

(15) *Maintenance and Inspections*: Clarifies responsibilities for owners and other responsible parties for operating and maintaining drainage control facilities. Also includes provisions for inspections by City staff.

Work on the Stormwater Code is linked to revisions currently underway on the City's Engineering Design Standards, which are now approaching final draft form. Next steps on the Stormwater Code include briefings to City Council, forming a citizen advisory committee, and conducting a robust public outreach and engagement effort.

2.10 ILL—Spill Prevention and Response Program

ILL1—SPILL PREVENTION & RESPONSE PROGRAM, TASK 1

Task Description	Measurable Goals	Tracking Measures
Continue to review and refine the existing spill prevention and emergency response program to protect ground and surface water quality. New activities will be proposed and implemented as appropriate, and coordination and cooperation among other relevant agencies and ODOT will be maintained and improved. This review will be coordinated with the de-icing activities of the Airport Operations and their 1200-Z permit, and possibly the Oregon Air National Guard.	• Continue to implement the spill prevention and emergency response program and review and revise as needed.	• Document refinements to cleanup procedures for vehicular accidents and structural fires.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

Salem Fire continues to respond to emergencies related to vehicular crashes and structure fires, utilizing *Salem Fire Standard Operation Guideline (SOG) Tactical Guideline #4.16 – Minor Spill Response.* This Tactical Guideline provides guidance on BMP's for preventing discharge into storm drains. Salem Fire will continue to respond to any spill or leak of de-icing material at the Salem Airport and identified additional BMPs related to the prevention and/or control of materials related to firefighter training activities. *Salem Fire Standard Operation Guideline (SOG) #2.6.3 – Live Fire Training* has been updated to include a site survey and procedures to eliminate runoff/discharge from firefighting training exercises into storm drain systems.

ILL1—SPILL PREVENTION & RESPONSE PROGRAM, TASK 2

Task Description	**Measurable Goals**	**Tracking Measures**
Continue to coordinate timely responses to, and clean-up of emergency response sites and structural fires among Fire, Building and Safety, Development Services, and Environmental Services staff. The Fire Department has the lead role for response at emergency response and structural fire sites and all major vehicular accidents. Environmental Services (ES) staff will provide assistance when requested by the on-scene incident commander. One of the ES responsibilities is to make sure that the cleanup activities are conducted in an environmentally sensitive manner.	• Develop a review schedule with a checklist for the spill response plan.	• Track the number and category of spill events responded to, including an estimate of the amount of spilled materials collected and any associated enforcement actions.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

How many spill events did Fire Department staff respond to from the following categories?	
Chemical leaks or spills	25
Vehicle accidents	905
Fuel or oil spills	120
How many spill responses did ES staff respond to?	361
How many water quality issues did ES staff respond to?	153

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

Salem Fire will continue to respond to any spill as requested by our emergency dispatch center. If spills and/or leaks are beyond our capability or exceed the amount of equipment carried on our response vehicles, the Fire Department incident commander will request assistance from Environmental Services.

ILL1—SPILL PREVENTION & RESPONSE PROGRAM, TASK 3

Task Description	**Measurable Goals**	**Tracking Measures**
Continue to conduct daily City vehicle and equipment inspections for leaks and repairs as needed. Staff will review current procedures on an ongoing basis and implement improvements as necessary.	• Continue to implement the daily equipment inspection program.	• Report revisions to the daily inspection program

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

At each of the 12 monthly safety committee meetings, emphasis is made in the importance of completing daily vehicle inspections by all employees.

ILL1—SPILL PREVENTION & RESPONSE PROGRAM, TASK 4

Task Description	Measurable Goals	Tracking Measures
Develop an updated Operations Pollution Prevention Plan; incorporating new/expanded/relocated Operations-oriented facilities.	• Update the Operations Pollution Prevention Plan by the end of the MS4 permit cycle. • Implement the updated Operations Prevention Plan upon completion.	• Track progress toward updating the Operations Pollution Prevention Plan. • Track implementation of the Operations Pollution Prevention Plan.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

The Draft "City of Salem Shops Complex Stormwater Pollution Control Plan" was prepared during this reporting year. For ease in use, content and formatting of the plan is consistent with DEQ's 1200-Z industrial stormwater permit requirements. The plan will be sent out for final review by the Shops Complex Yardmaster Committee in summer of 2012, and final adoption is anticipated by the end of 2012. Following adoption of the plan, the training program for Shops employees will be revised to include targeted messaging and education materials.

2.11 ILL2—Illicit Discharge Elimination System Program

ILL2—ILLICIT DISCHARGE ELIMINATION PROGRAM, TASK 1

Task Description	**Measurable Goals**	**Tracking Measures**
Continue to respond to reports of unusual discharges or suspicious water quality conditions within the stormwater system and urban streams. Where able, identify sources/causes and implement appropriate corrective actions. Utilize database to document associated activities.	• Respond to reports of illicit discharges and suspicious water quality conditions. • Maintain database to document unusual/suspicious discharges, sources found, and corrective actions taken.	• Track calls and mitigation actions taken in database.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

Environmental Services continues to provide staff to respond, 24/7, to reports of unusual discharges or suspicious water quality conditions. Staff responded to 153 water quality related responses during the reporting year. All responses and corrective measures are tracked in the Hansen system database. A summary of enforcement actions and inspections is provided in Section 4 of this report. Appendix A contains a complete list of MS4 violations for FY 2011/12.

ILL2—ILLICIT DISCHARGE ELIMINATION PROGRAM, TASK 2

Task Description	**Measurable Goals**	**Tracking Measures**
Environmental Services staff will continue inspections of the City's wastewater users, through the pretreatment program, verifying the proper handling and disposal of both wastewater and stormwater.	• Inspect City's wastewater users for proper management of wastewater and stormwater.	• Track number of inspections and associated findings.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Total number of wastewater discharge inspections/business contacts?	1,240
Total number of industrial and commercial facilities screened this year?	462

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

Through FY 2011/12 Environmental Services staff continued to inspect industrial wastewater users for proper handling and disposal of wastewater and stormwater, as summarized in the table above.

ILL2—ILLICIT DISCHARGE ELIMINATION PROGRAM, TASK 3

Task Description	**Measurable Goals**	**Tracking Measures**
Work with Wastewater Collection Services to identify and correct cross-connections between the sanitary sewer and stormwater systems.	• Review stormwater and ambient stream monitoring data to identify possible cross-connection discharges into the stormwater system. • Maintain communications with Wastewater Collections and other City staff to identify any system cross connection problems.	• Document number of cross-connections identified and corrective actions taken.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

Wastewater Collections also provide smoke and dye inspection of lines to identify cross connections. One cross-connection was identified in FY 2011/12 on July 29, 2011. A citation was issued for the cross-connection and details have been documented in the Hansen database.

ILL2—ILLICIT DISCHARGE ELIMINATION PROGRAM, TASK 4

Task Description	**Measurable Goals**	**Tracking Measures**
Develop and update a storm sewer outfall dry weather inspection and monitoring prioritization plan.	• Prioritize outfalls for storm sewer outfall inspection and monitoring, and inspect annually. • Coordinate prioritization process with ILL 2 Task 5.	• Document review of outfall monitoring plan. • Document priorities established for monitoring and inspection. • Track dry weather inspections conducted and results of inspection.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

How many outfalls were inspected during the reporting period?	25
How many inspected outfalls displayed dry-weather flow?	10
Total number of outfalls with illicit discharges?	0

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

On June 27, 2012 the "City of Salem's Dry Weather Outfall and Illicit Discharge Screening Plan" was submitted to DEQ to fulfill requirements identified in Schedule A.4.a.iii-vi and xi-xii of the City's MS4 Permit. This plan describes an updated prioritization process for the selection of outfalls for conducting dry weather screening activities. The plan includes maps that identify each prioritized outfall that will be monitored and inspected annually for the remainder of this permit cycle.

Prior to implementation of the plan, during the summer of 2011, dry weather inspections were conducted on 25 previously identified priority outfalls. Of the 25 outfalls inspected, 10 exhibited dry-weather flow and were subsequently tested for pH, temperature, conductivity, and chlorine. Two of these also tested positive for fluoride, which prompted an investigation to determine the source. Investigation suggested the water source to be from leaking water mains. The City's Water Section was notified.

ILL2—ILLICIT DISCHARGE ELIMINATION PROGRAM, TASK 5

Task Description	**Measurable Goals**	**Tracking Measures**
Identify and map contaminated sites in the GIS system. With input from other City departments, identify a list of areas where there either has been a substantial spill or there is the potential for a spill or illicit discharge. These areas are identified based on activities on site, history of problems, or specific industry, for example. These areas will be mapped in the GIS system for use across City departments.	• Continue to identify and map contaminated sites in the GIS system.	• Track number of contaminated sites added to the GIS system.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

How many contaminated sites were added to the GIS system during the FY 2010/2011 reporting period?	7

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

Environmental Services provides information on any newly discovered contaminated sites to the Public Works GIS Supervisor in the Engineering Division. This Division adds new sites to the City GIS mapping system used throughout the City. A variety of sources/activities can lead to site contamination: leaks from storage tanks and process lines, releases during loading or off-loading activities, or discharges during accidents or emergencies. During FY 2011/2012 there were seven sites added to Public Works GIS. All 7 sites were contaminated with petroleum based materials.

2.12 ILL3—Illegal Dumping Control Program

ILL3—ILLEGAL DUMPING CONTROL PROGRAM, TASK 1

Task Description	**Measurable Goals**	**Tracking Measures**
Continue to sponsor the Adopt-a-Street Program. The program is an effective way to get residents involved in keeping the community's streets clean and consequently preventing trash and debris from entering the storm drainage system.	• Continue to support the Adopt-a-Street Program.	• Record the miles of adopted streets, number of participating groups, and volume of litter collected through the Adopt-a-Street Program.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

How many street miles were maintained?	172
What was the number of participating groups?	86
How many volunteers were involved?	1,573
What was the total pounds of litter removed?	7,440

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

The City continued to sponsor the Adopt-a-Street Program during this last reporting year and utilized an internal database to track active/inactive volunteer group activity, dates of cleanup activities, total pounds of trash removed, and miles of street right-of-way maintained.

ILL3—ILLEGAL DUMPING CONTROL PROGRAM, TASK 2

Task Description	**Measurable Goals**	**Tracking Measures**
Continue to provide the 24-hour Public Works Dispatch Reporting Center to receive and respond to calls regarding illegal dumping and other environmental complaints/problems and responses thereto. Continue to advertise hotline on City website, utility bill inserts, business cards, public brochures, and consumer confidence reports. As circumstances warrant, publicly report illicit discharges through use of various media outlets.	• Continue to operate the 24-hour Public Works Dispatch Reporting Center. • Assign reports to appropriate City staff for action, including actions taken under ILL2-1.	• Record number and types of reported illegal dumping incidents. • Track media outreach when a discharge warrants.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

How many prohibited discharge violations did ES staff issue during the reporting period?	20

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

Environmental Services provides staff to respond, 24/7, to reports of illegal dumping and environmental complaints received through the Public Works Dispatch Center. Water Resources provides public education and outreach to inform the public of environmental issues. Actions taken when responding to calls includes the completion of "Service Requests", a computerized record of calls received and actions taken. This database is in the Public Works Dispatch Center. Refer to Section 4 and Appendix A for a list of MS4 related enforcement actions during the reporting year.

ILL3—ILLEGAL DUMPING CONTROL PROGRAM, TASK 3

Task Description	**Measurable Goals**	**Tracking Measures**
Continue to support the Adopt-a-Stream program, which involves teachers and students in gathering water quality data from streams, thereby providing water resource education to students through experience. The City supports the program by facilitating projects and providing technical assistance and resources.	• Continue to support the Adopt-A-Stream Program.	• Maintain a descriptive list of adopt a stream program projects, objectives, outcomes upon completion, and number of participants.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 that demonstrate that Measurable Goals were attained or that progress was made.

To support the Adopt-A-Stream (AAS) Program during school year 2011/12, staff provided training assistance to teachers, as well as presentations and water quality kits. The program maintains a small supply budget to assist with projects or will loan AAS teachers the tools needed. There is also $1,000 in the budget for teachers who wish to use those funds for field trips. Refer to Appendix B for a complete list of Adopt-A-Stream projects in FY 2011/12.

ILL3—ILLEGAL DUMPING CONTROL PROGRAM, TASK 4

Task Description	**Measurable Goals**	**Tracking Measures**
Continue to support Marion County in their efforts to provide convenient alternatives for legal disposal of household hazardous wastes and other recyclable materials.	• Continue to support Marion County in providing alternatives for household hazardous waste disposal.	• Document frequency and type of support activities

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

The City continued to help advertise Marion County programs through advertisements on JC Media and KBZY Radio, in the Community Connections Newsletter, and in the Salem Weekly Newspaper. These advertisements include such topics as: household hazardous waste disposal, compact fluorescent lamp disposal, the Fall Leaf Haul event, and e-cycling. Please see Appendix B for a list of activities completed during the FY 2011/12 reporting year.

ILL3—ILLEGAL DUMPING CONTROL PROGRAM, TASK 5

Task Description	**Measurable Goals**	**Tracking Measures**
Continue to support the annual yard debris cleanup effort.	• Support the annual yard debris cleanup effort.	• Record amount of debris cleaned up and level of participation.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

Approximately 720 cubic yards of leaves were collected at the Annual Fall Leaf Haul on December 3, 2011. This event was supported by City staff, garbage haulers, Marion County Solid Waste Management, and an additional 80 community volunteers.

2.13 IND1—Industrial Stormwater Discharge Program

IND1—INDUSTRIAL STORMWATER DISCHARGE PROGRAM, TASK 1

Task Description	Measurable Goals	Tracking Measures
Environmental Services will inspect stormwater systems while conducting inspections of City-permitted industrial wastewater users, and work with DEQ to coordinate the permitting and compliance processes for industrial users in the Salem area, including DEQ-issued 1200-Z permitted sources, underground storage tank (UST) removal, and site remediation permits issued by DEQ for sources/sites within the City. Coordination options include: receiving information on proposed 1200-Z permits, commenting on proposed permits, and meeting periodically with DEQ on coordination efforts.	• Inspect stormwater systems while conducting inspections of City-permitted wastewater users. • Develop process to coordinate with DEQ on industrial permits within the City.	• Track coordination efforts with DEQ. • Include stormwater observations as appropriate on inspection reports and follow-up actions.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

Environmental Services continued to inspect area stormwater systems as part of facility inspections performed under the industrial pretreatment program. Inspection records are maintained in the Environmental Services database. The Department of Environmental Quality (DEQ) includes Salem in notification of DEQ regulated remediation of contaminated sites affecting the Salem area. Salem is not a permitting agent for DEQ's 1200-Z program but has been developing a process (consistent with the MS4 permit) to notify the DEQ when a site in Salem is undergoing development which may be subject to State permitting. The Plan Review process, using an AMANDA data program, will be used to help with this notification process. Refer to ILL2 Task 2 for a summary of facility inspections, and IND1 Task 2 for a summary of facility plans reviewed.

IND1—INDUSTRIAL STORMWATER DISCHARGE PROGRAM, TASK 2

Task Description	**Measurable Goals**	**Tracking Measures**
During plan review, review industrial facilities for the potential of requiring pretreatment of stormwater prior to discharge based on the industrial activities of the specific facility. Conduct inspections of industrial facilities requiring stormwater pretreatment to ensure structural controls have been built according to approved plans.	• Review industrial plans as necessary for additional stormwater treatment. • Conduct inspections once construction is completed to ensure work was done in accordance with approved plans.	• Maintain database of plans reviewed and final inspections conducted.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

How many industrial plans were reviewed by City staff during the reporting period?	230
How many post-construction inspections were completed by City staff during the reporting period?	205

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

Environmental Services continued to participate in the plan review and inspection processes to help insure appropriate treatment is included during construction, or remodel, of industrial sites. All plans reviewed and inspections completed are tracked in the Amanda database. The number of plans reviewed and post-construction inspections completed during the reporting year is provided in the table above.

IND1—INDUSTRIAL STORMWATER DISCHARGE PROGRAM, TASK 3

Task Description	**Measurable Goals**	**Tracking Measures**
Surveys are sent to applicable business classes (restaurants, metal finishers/platers, radiator shops, dry cleaners, printing shops, photo processors, etc.) as part of the pretreatment business survey database, part of the industrial pretreatment program for wastewater. Customers will be surveyed on major on-site activities to identify potential locations for public education, future sampling, and tracking down illicit discharges. Illicit stormwater discharges from these business groups are address in ILL2.	• Send surveys to new customers as accounts are opened. • Enter survey results into database – on-going as surveys are returned.	• Track number of surveys sent out. • Track number of surveys returned and entered into database. • Track targeted public education activities for specific industries.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

How many surveys were distributed as part of the pretreatment business survey database?	46
Of the surveys distributed, how many were returned and entered into the database?	31

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

Environmental Services continued to send surveys to newly identified targeted businesses, at least twice annually. Businesses failing to return the survey were visited by an inspector to obtain the necessary information.

IND1—INDUSTRIAL STORMWATER DISCHARGE PROGRAM, TASK 4

Task Description	**Measurable Goals**	**Tracking Measures**
Continue the semi-annual Technical Bulletin for the City's industrial users and produce other materials for these users. This activity is principally associated with the City's wastewater Pretreatment Program, but will be used as a vehicle to address stormwater related issues as well.	• Produce two technical bulletins for industrial users each year.	• Track published technical materials prepared for industrial users each year.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

How many technical bulletins did the City produce for industrial users during the reporting period?	2

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

Environmental Services continued to publish semi-annual Technical Bulletin's in FY 2011/12. Bulletin's were mailed to industrial users, as well as included on the City website for public access.

2.14 CON1—Construction Site Control Program

CON1—CONSTRUCTION SITE CONTROL PROGRAM, TASK 1

Task Description	Measureable Goals	Tracking Measures
Continue implementation of the Erosion Prevention and Sediment Control program for developments that meet or exceed the threshold indicated in SRC Chapter 75, which includes the submission of erosion prevention and sediment control plans with structural and non-structural BMPs. Review program experiences annually and implement improvements as appropriate including Code amendments if needed.	• Implement SRC 75. • Conduct annual program reviews. • Implement appropriate improvements and/or Code amendments. • Perform plan reviews for erosion control requirements.	• Track number of erosion control plans reviewed for compliance with SRC 75.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

How many Erosion Control Inspections were completed during the reporting period?	619
How many Erosion Control permits were issued during the reporting period?	256

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

Erosion control plans are required based on provisions of Salem Revised Code (SRC) Chapter 75. Plans are routed to Administration, Engineering, and Operations staff for review. Corrections are compiled and returned to the applicant prior to permit issuance. After permits are issued, the AMANDA permit tracking system has been revised to require bi-weekly inspections of active sites. The system will continue to automatically schedule inspections every 2 weeks until the inspection report is listed as “Final Approved”.

CON1—CONSTRUCTION SITE CONTROL PROGRAM, TASK 2

Task Description	**Measureable Goals**	**Tracking Measures**
Continue to train and educate City staff and private contractors about stormwater pollution at construction sites, with an emphasis on prevention and control BMPs. Provide notice to construction site operators concerning where education and training to meet erosion and sediment control requirements can be obtained.	• Provide annual erosion control training to City staff and private contractors.	• Track education and training programs conducted and number of staff/public trained.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

Four inspectors attended training at ODOT to receive certification as trained erosion control inspectors. Two inspectors also attended National Stormwater Center training for erosion control inspection. Engineers attended seven different training sessions regarding stormwater and stormwater treatment. As part of the Mid-Willamette Outreach Group (M-WOG), Salem staff supported a training opportunity titled “Erosion Control Summit” at Keizer City Hall on February 7, 2011 (See RC1 Task 5) that was geared toward local contractors.

CON1—CONSTRUCTION SITE CONTROL PROGRAM, TASK 3

Task Description	**Measureable Goals**	**Tracking Measures**
Document and streamline site plan review, inspection, and enforcement procedures for the construction site runoff control program.	• Complete documentation of site plan review, inspection, and enforcement procedures before the end of year four of the MS4 permit cycle.	• Track completion of documented procedures.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

During this reporting year staff developed inspection process guidelines and maintained inspection records in AMANDA system as well as in hard copy. In addition, staff organized a photo log that can be easily accessed and attached to inspection reports. A comprehensive review and refinement of plan review, inspection, and enforcement procedures is planned to be completed by the 4th year of this permit cycle.

CON1—CONSTRUCTION SITE CONTROL PROGRAM, TASK 4

Task Description	**Measureable Goals**	**Tracking Measures**
Continue to review and update the Erosion Prevention and Sediment Control Technical Guidance Handbook.	• Update Technical Guidance Handbook before the end of year four of the MS4 permit cycle.	• Track updates made to the Technical Guidance Handbook.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

Continuing from the previous fiscal year, City staff participated in a sub-group of the Association for Clean Water Agencies (ACWA) Stormwater Committee to develop an erosion control field guide for inspectors. This guide is intended to be a subset of the Technical Guidance Handbook.

CON1—CONSTRUCTION SITE CONTROL PROGRAM, TASK 5

Task Description	**Measureable Goals**	**Tracking Measures**
Continue to coordinate with the City's 1200-CA Permit for City construction projects subject to its program.	• Requirements for 1200-CA compliance incorporated into City construction plans, specifications, and contract documents. • Make erosion prevention and sediment control a key agenda item at all pre-construction conferences. • Include inspection of all site erosion prevention and sediment control measures as part of City projects.	• Track renewal of 1200-CA permit.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

How many EPSC inspection reports were completed for City construction projects during the reporting period?	267

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

1200-CA Permit coordination activities continued through the FY 2011/12 reporting year. This coordination includes the following activities:

- Contract documents include a copy of the 1200CA Permit and erosion control plans. Specifications are developed to comply with 1200CA Permit requirements for Capital Improvement Projects.
- Project Managers distribute the City of Salem Erosion Prevention and Sediment Control (EPSC) Manual at preconstruction meetings and discuss the seriousness of complying with City permit and ordinance requirements.
- Inspection of erosion control measures are made on a daily basis and recorded in a daily inspection report. Project Managers are performing, at a minimum, a weekly inspection of the erosion control measures.

2.15 MON1—Monitoring

MON1—MONITORING, TASK 1

Task Description	Measurable Goals	Tracking Measures
Continue to install and maintain flow and water quality monitoring stations in City waterways to support selection of capital improvement projects, update the hydrologic-hydraulic computer model, and help direct policies to protect the health of these water bodies. The actual rate of installation and the total number of stations will be based on the maintenance requirements of the stations, available funding, and coordination with urban watershed assessments/plans.	• Install additional monitoring stations. • Monitor the station alarms in conjunction with the illicit discharge control program (ILL2, Task 1). • Follow up on potential hotspots or problem areas as may be identified through data analyses.	• Track number of additional monitoring stations implemented.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

How many monitoring stations were installed during the reporting period?	3
How many station alarms did City staff respond to as part of the illicit discharge control program during the reporting period?	81
How many hotspots or problem areas did City staff follow up on that were identified through data analyses during the reporting period?	38

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

During FY 2011/12 the City installed three new monitoring stations; one on Pringle Creek (stage only), one on the West Fork Little Pudding River (stage only), and one on Shelton Ditch (complete water quality and stage). All three stations were constructed during FY 2011/12,however the stations did not start collecting usable data until July 2012 (start of FY 2012/13). Due to budget constraints, no new monitoring stations are projected for installation in the foreseeable future.

Environmental Services staff responded to 81 alarms during FY 2011/12. Of the 81 alarms, 14 were deemed erroneous due to instrument error. Of the remaining 67 alarms, 29 occurred during storm conditions and 38 occurred during dry conditions. Some alarms were caused by permissible activities (e.g. in water work permits or MS4 permit non-prohibited discharges), and some are the result of wildlife activities and/or kids playing in the creek. Regardless of what caused the alarm, each of the 81 alarms elicited some type of follow up response. All alarms that occurred during dry conditions were considered hot spot/problem areas that prompted field investigation. Dry condition alarms that showed a recurring pattern often resulted in TV inspection, smoke testing, and other forms of source tracking activities.

MON1—MONITORING, TASK 2

Task Description	**Measurable Goals**	**Tracking Measures**
Continue the urban stream and Willamette River water quality sampling program, with emphasis on reviewing and evaluating sampling data to prioritize investigations and improvement/maintenance projects. This sampling augments the monitoring plan included in the City's 2008 NPDES MS4 Permit Renewal application.	• Update database for collected data. • Review collected data for purposes of trending and benchmarking by the end of the permit term. • Follow-up on potential hotspots or problem areas as may be identified by the data review.	• Document findings regarding trends.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

All data collected under this task have been entered into an Environmental Services Access Database and verified for accuracy. Appendix C contains summary statistics for all sampling conducted during FY 2011/12.

Consistent with the MS4 permit, zinc, copper, and lead (total and dissolved for each) were added parameters for the Monthly Instream sampling for sites located on Pringle and Clark Creeks. Additionally, Total Suspended Solids was added for the West Fork Little Pudding River.

Special Condition #2 from "Table B-1 Environmental Monitoring" in Salem's MS4 Permit states "Monthly instream monitoring for metals and hardness conducted in Pringle Creek between May and September each year may be eliminated after December 2011 if statistical analysis of the monitoring results indicates concentrations below the reporting limits". This special condition was not met; therefore the City will continue to collect these additional parameters. This will aid in the trending and benchmark analysis to be completed by the end of the permit term.

Follow up tracking of E. Coli was done at several sites when numbers seemed too high for the conditions. The second E. Coli sample was always taken within the same month as the original and in all cases the second sample showed levels had returned to normal. Review of the data collected did not prompt any other follow up investigation.

MON1—MONITORING, TASK 3

Task Description	Measurable Goals	Tracking Measures
Continue to implement all components (MS4 outfall, instream, pesticide, and macro-invertebrate) of the City's "Surface Water and Stormwater Monitoring Plan."	• Implement the City's Stormwater Monitoring Plan, including MS4 outfall, instream, pesticide, and macro-invertebrate monitoring components.	• Provide summary statistics for sampling results from each wet-weather season. • Track any modifications to the monitoring plan.

FY 2011-12 ACTIVITIES & ACCOMPLISHMENTS

Briefly summarize specific activities completed in FY 2011/2012 which demonstrate that Measurable Goals were attained or that progress was made.

During FY 2011/12, City staff implemented the "Surface Water and Stormwater Monitoring Plan" with the following completed sampling events: six Instream Storm, four Stormwater, one Pesticide, one Macroinvertebrate, and two Mercury sampling events. Appendix C contains summary statistics for all sampling conducted during FY 2011/12.

3 PROGRAM EXPENDITURES AND FUNDING SOURCES

Stormwater-related program costs in Salem are presently funded through wastewater rates, which are comprised of a water consumption (flow) component and a fixed user charge. The Water/Wastewater Task Force began researching options for the development of a stormwater utility in 2009. This utility would be funded by a separate stormwater service charge. Salem City Council approved the adoption of a stormwater utility on December 6, 2010, with an effective date of January 1, 2013.

The purpose of developing a stormwater utility is to implement an equitable way of paying for Salem's stormwater programs by more accurately and fairly linking the stormwater impacts of the ratepayer's property to the rate paid by each ratepayer. The stormwater service charge will be based on each property's impervious surface and an assessment of stormwater programmatic costs that are shared equally among all ratepayers. Additionally, properties that take steps to reduce their impervious surface areas or that have onsite facilities that reduce stormwater impacts will have an opportunity to reduce their stormwater service charge.

City staff continued to perform community outreach, collected impervious surface data, and updated customer accounts and, developed new stormwater billing procedures during the FY 2011/12 reporting year (See RC 6 Task 2). Table 2 provides a summary of the total stormwater program expenditures for the current reporting year, as well as those anticipated through the next (FY 2012/13) as identified in the adopted budget.

Table 2. Stormwater Expenditures

Stormwater Operating Costs	**FY 2011-12 Budget**	**FY 2012-13 Budget**
Stormwater Operations & Maintenance	$1,840,780	1,908,170
Stormwater Quality	$1,480,740	1,567,700
Cleaning	$504,590	513,058
T.V. Inspection	$188,273	184,985
Water and Environmental Resources	$322,292	165,018
Environmental Services	$246,138	243,673
Planning & Development	$483,964	515,860
Laboratory	$36,023	33,877
Operations Administration	$124,480	125,136
Utility Billing	$287,969	303,960
Dispatch	$50,923	66,311
Debt for Capital	$766,642	770,957
Department Administration and Indirect Costs (Nondivisional)	1,300,082 (1)	1,705,904
Nondivisional (Street Sweeping, Watershed Grants, HazMat/Emergency Mgmt.)	1,102,230 (2)	1,207,070
Budgeted Capital Improvements	$4,549,390	$6,621,520
TOTAL:	**13,284,516**	**$15,933,199**

(1) Adjusted in FY 2011/12 to include indirect costs to Stormwater Program.
(2) Value corrected from FY 2010/11 MS4 Annual Report.

4 ENFORCEMENT ACTIONS, INSPECTIONS, AND OUTREACH

Environmental Services staff responded to 153 water quality responses and reported 21 violations of the Municipal Separate Storm Sewer System (MS4). Of the 21 violations, 20 were prohibited discharges. Enforcement actions related to these violations included warnings, citations, notice of violations (refer to Appendix A).

Erosion control and 1200-CA Permit requirements are an integral part of all city-issued construction plans and specifications. The City of Salem continues to coordinate efforts with Department of Environmental Quality (DEQ) staff regarding 1200-C permitted sites. During the FY 2011/12 reporting period, 619 erosion control-related inspections were conducted by Public Works Development Services Inspectors and a total of 256 erosion control permits were issued (refer to CON 1 Task 1 through 5).

A complete description of outreach activities that occurred during this reporting year can be found in Section 2 of this report.

5 PLANNING, LAND USE CHANGES, AND DEVELOPMENT

The City of Salem Public Works Department Stormwater Management Design Standards (Design Standards) are currently being revised. The purpose of these Design Standards is to provide uniformity under which the City's stormwater infrastructure is designed, constructed, operated, and maintained.

Revisions to the Design Standards to reflect the post-construction requirements presented in the renewed MS4 Permit continued through FY 2011-12. These updates will be adopted via the City's relatively new administrative rule process. This requires Salem Revised Code changes in the form of a new stand-alone stormwater chapter (SRC 71) before the Design Standards can be formally adopted. Adoption of the revised Design Standards will follow shortly thereafter, with an anticipated effective date during FY 2013-14.

The City's Community Development Department is developing a Uniform Development Code (UDC) for City Council adoption that principally focuses on revisions to the City's Zoning Ordinance as set forth by Salem Revised Code (SRC) Title X, Chapters 110 through 166. The UDC is targeted for adoption in FY 2012-2013.

5.1 Land Use Changes

Approximately 62 acres of residential land was added to the city limits in March of 2012 from delayed annexations which were approved by the voters in 2009. There are 11 annexations that total approximately 51 acres which will appear on the November 2012 ballot for approval by the Salem voters.

5.2 New Development

The City of Salem has seen a number of developments in the past year, and continues to see a steady stream of new projects at all phases of development. During the reporting period, there was the addition of 1,523,448 square feet of new or replaced impervious surface area related to development projects in Salem. Below are several noteworthy projects that are moving forward in the development process:

Under Construction:

- South Salem (Battle Creek) School, scheduled completion date Fall 2012.
- East Salem School (Walker/Sunnyview), scheduled completion date Fall 2012.
- Bonaventure Development, 3400 Boone Road S, Phase I just completed, permits being reviewed for Phase II.
- Capitol Auto, Salem Industrial Drive NE, scheduled completion date Fall 2012.
- PacTrust medical office and shopping center, 4826 Battle Creek Rd. SE, grading permits issued. Scheduled completion date unknown.
- Redevelopment of existing building and new parking lot on Fairview Industrial drive SE for State of Oregon Fish and Wildlife.

- Madras Apartments at Wiltsey/Reed/Madras Rd, Phase I under construction, Phase II plans under review, 111 units total. Scheduled completion date Fall 2013.
- Orchard Ridge Apartments (180 units) and residential care facility (119 units), Linwood Street NW. Scheduled completion date Fall 2013.

Estimate of Potential Future Development:

- Pringle Square mixed-use development at the Boise Cascade property on Commercial Street SE.
- Salem Renewable Energy and Technology Center, an 80-acre technology center on Gaffin Road SE.
- Mill Creek Corporate Center, a 500- acre industrial development between Highway 22, Kuebler Boulevard SE, Turner Road SE, and Deer Park Road SE.
- Aspen Grove apartments on Wallace Road NW, plans in for review, 78 units total.
- 23rd Street apartments, plans under review for 96 units total.
- Fairview Hills multi-family development at Fairview site (Reed Rd), 435 units total, and 22,000 square feet of commercial buildings, Refinement Plan under review.
- Salem Hospital new parking lot at old School for the Blind site.
- Power Auto Group at Market St/I-5, Conditional Use for expansion and redevelopment under review.
- Cordon Rd and Highway 22 Comprehensive Plan and Zone Change to Industrial Commercial under review.

APPENDIX A. MS4 VIOLATIONS FY 2011/12

MS4 Violations For July 1, 2011 to June 30, 2012

Record	Business Name	Date	Violation	Enforcement	Action Taken	Outfall	Response	Received	Citation	Amount	Court Date	Paid Date	Compliance	Discharge	SRC1	SRC2	SRC3	Address	Zipcode
1447	Can and Bottle Redemption Center	2/2/2012	Prohibited Discharge To The Storm Sewer	2/2/2012	Warning	Storm							2/2/2012	Plaster Wash Water	73.160			4815 Commercial St SE	97302
8298	Cinebarre Theater	1/31/2012	Prohibited Discharge To The Environment	1/31/2012	Warning	Storm	Yes	2/22/2012					2/25/2012	Grease	73.160	73.165	76.015	501 Marion St NE	97301
1157	Color Tile and Carpet of Salem	9/30/2011	Prohibited Discharge To The Storm Sewer	9/30/2011	Warning	Storm							9/30/2011	Carpet Wash Water	73.160			1110 Lancaster Dr NE	97301
6983	Colson & Colson Construction Company	1/4/2012	Prohibited Discharge To The Storm Sewer	1/4/2012	Warning	Storm							1/4/2012	Construction Debris	73.160			510 Hawthorne Ave SE	97302
3730	Food 4 Less	7/15/2011	Prohibited Discharge To The Storm Sewer	9/12/2011	Notice of Violation	Sanitary	Yes	10/13/2011					10/13/2011	Dumpster Leakage	73.160	73.165		3695 Devonshire Ave NE	97305
8672	John Mills Concrete Contractor	1/4/2012	Prohibited Discharge To The Environment	1/4/2012	Warning	Environment							1/10/2012	Construction Debris				2252 Judson St SE	97302
1069	Keller Supply Company	9/21/2011	Prohibited Discharge To The Environment	9/21/2011	Warning	Storm							9/21/2011	Diesel Fuel	73.160	76.105		1590 Sunnyview Rd NE	97301
5559	McDonald's Restaurant	10/5/2011	Prohibited Discharge To The Storm Sewer	10/10/2011	Notice of Violation	Storm	Yes	1/10/2012					1/10/2012	Untreated Wastewater	73.160	73.165		3995 Rickey St SE	97317
2005	Oregon State Fair and Exposition Center	8/31/2011	Prohibited Discharge To The Environment	8/31/2011	Warning	Environment							8/31/2011	Wash Water	73.165			2330 17th St SE	97301
8636	Painting Oregon	10/16/2011	Prohibited Discharge To The Storm Sewer	10/19/2011	Warning	Storm							10/19/2011	Paint Wash Water	73.160			455 Airport Rd SE	97301
8700	Private Residence-Bishop-Paint Wash Down to Storm	3/12/2012	Prohibited Discharge To The Storm Sewer	3/12/2012	Warning	Storm							3/12/2012	Paint	73.160			1877 Mousebird Ave NW	97304
8635	Private Residence-Cara-Pressure Wash to Storm Drain	10/17/2011	Prohibited Discharge To The Storm Sewer	10/17/2011	Warning	Storm							10/17/2011	Wash Water	73.160			5314 Snowflake St SE	97306
8686	Private Residence-Connes-Pollutants To Storm Sewer	1/31/2012	Prohibited Discharge To The Storm Sewer	1/31/2012	Citation	Storm			197155	$300	2/15/2012	2/15/2012	2/15/2012	Pollutants To Storm Sewer	73.160			336 Log Cabin St	97351
8665	Private Residence-Digsby-Sewage Spill	12/22/2011	Prohibited Discharge To The Environment	12/22/2011	Warning	Environment							12/22/2011	Sewage	73.160	74.050		3375 Duncan Ave NE	97301
8610	Private Residence-Heinrichs-Oil Spill	8/19/2011	Prohibited Discharge To The Storm Sewer	8/19/2011	Warning	Storm							8/19/2011	Oil	73.165			1773 Narcissus Ct NW	97304
8693	Private Residence-Jackson-Granite Sediment to Storm	2/28/2012	Prohibited Discharge To The Storm Sewer	2/28/2012	Warning	Storm							2/28/2012	Wash Water	73.160			5469 Compton Ln SE	97306
8596	Private Residence-Mahoney-Concrete Wash Water	7/20/2011	Prohibited Discharge To The Storm Sewer	7/21/2011	Warning	Storm							7/21/2011	Concrete Wash Water	73.160	73.185	73.165	850 Thompson Ave NE	97301
8614	Private Residence-Parker-Working in Creek	8/22/2011	Prohibited Work In Stream Without Protection	8/22/2011	Warning	Storm							8/22/2011	Silt and Dirt	75.010			3821 Seneca Ave SE	97302
8320	Private Residence-Singh-Illicit Discharge	7/29/2011	Prohibited Discharge To The Storm Sewer	7/29/2011	Citation	Both			138584	$300.00	8/17/2011	8/19/2011	8/19/2011	Illicit Discharge of Food Preparation	73.160			2266 Treemont Ct S	97302
666	River Bend Sand and Gravel	2/28/2012	Prohibited Discharge To The Storm Sewer	2/28/2012	Warning	Storm							2/28/2012	Concrete Wash Water	73.160	73.165		2608 Cascadia Industrial St SE	97302
5900	Willamette Burger Company	10/13/2011	Prohibited Discharge To The Storm Sewer	10/13/2011	Warning	Storm							10/13/2011	Grease Wash Water	73.160	73.165	73.185	1405 Broadway St NE	97303

APPENDIX B. STORMWATER OUTREACH ACTIVITIES

Adopt-A-Stream Activities	
School:	Forest Ridge Elementary
Total students:	178
Outcome:	Forest Ridge Elementary continues to implement AAS supported education with the following grade level focus that culminates in the annual”Down by the Riverside” event:
	1st grade - Enviroscape Model + Introduction to Aquatic Macroinvertebrates
	2nd grade - Kids Care About Conservation - Salmon Study - WET Pledge
	3rd grade - Introduction to Riparian Zone
	4th grade - Water Quality Testing
School:	Chapman Hill Elementary School
Total students:	60
Outcome:	• Stream studies at Glenn Creek (Orchard Heights Park in Fall and Spring)
	• Salmon release in Glenn Creek
	• Ivy pull and native planting along Glenn Creek
School:	Mark Twain Middle School
Total students:	28
Outcome:	Students performed water quality tests for their school projects
School:	Early College High School
Total students:	12
Outcome:	Water quality testing at Packsaddle Park and small stream that feeds Claggett Creek
School:	South Salem High School
Total students:	85
Outcome:	Held 3 Clark Creek events this year. In October and April we held our usual weed/trash removal project. In March we planted 50 new native plant species.
School:	Candalaria
Total students:	27
Outcome:	Ivy removal in the 5-acre forest below Candalaria school
School:	Jane Goodall Environmental School
Total students:	35
Outcome:	• Plantings at the new wetland site at McKay high school
	• Picked up trash along Pringle Creek near Leslie Middle School
	• Fish and macroinvertebrate surveys along Pringle Creek
	• Planting at in the fall

Radio/Print Advertisements

Topic	Medium	Dates
Mixed Organic Cart	Radio: 30 second ads	July 1 – 5, 2011
Compact Fluorescent Lamp Disposal	Radio: 30 second ads	September 12 – 16, 2011
Household Hazardous Waste Disposal	Radio: 30 second ads	October 3 – 7, 2011
Drug Turn-in	Radio: 30 second ads	October 17 – 21, 2011
Fall Leaf Haul	Radio: 30 second ads	November 28 – December 2, 2011
E-Cycle	Radio: 30 second ads	December 26 – 30, 2011
Tree Recycling	Radio: 30 second ads	January 2 – 6, 2012
Drug Turn-in	Radio: 30 second ads	January 16 – 20, 2012
Household Hazardous Waste Disposal	Radio: 30 second ads	February 6 – 10, 2012
Compact Fluorescent Lamp Disposal	Radio: 30 second ads	April 23 – 27, 2012
Grasscycle	Radio: 30 second ads	May 7 – 11, 2012
Alternatives to Pesticides	Radio: 30 second ads	May 14 – 18, 2012
Fall Leaf Haul	Salem Weekly print ad: 2-week run	November 2011
Drug Turn-in	Salem Weekly print ad: 2-week run	December 2011
Fall Leaf Haul	Ad in the monthly Community Connection newsletter	October 2011
Drug Turn-in	Article in the monthly Community Connection newsletter	November 2011
Re-Leaf Composting	Article in the monthly Community Connection newsletter	November 2011
Fall Leaf Haul	Ad in the monthly Community Connection newsletter	November 2011
Fall Leaf Haul	Ad in the monthly Community Connection newsletter	December 2011
E-Cycling	Article in the monthly Community Connection newsletter	January 2012
Poison Prevention: Household Hazardous Waste Disposal	Article in the monthly Community Connection newsletter	March 2012

Radio Stations: KBZY and JC Media – 24 ads/week

FY 2012/13 Stormwater Outreach Budget		
Supplies	Requested	Received
Multimedia materials	$500	$500
YEEP materials	$720	$740
Outreach promos, WQ kits, etc	$1550	$1550
Outside Print		
Printing and duplication services	$1000	$800
Advertising		
Program-related outreach	$4000	$1500
Other Professional Services		
Outreach and Education to support BMPs/Permit Requirements:	$13,300	$13,300
Membership		
International Association of Public Participation	$150	$150
Copies		
City charges for printing services such as desktop publishing, bindary, etc. Printing of public outreach information and grease disposal posters for restaurants, tri-fold brochures.	$3200	$3200
Additional Staff		
Stormwater Outreach Assistant	1 FTE	0

APPENDIX C. SUMMARY OF WATER QUALITY DATA FOR FISCAL YEAR 2011/12

City of Salem
National Pollutant Discharge Elimination System (NPDES)
Municipal Separate Storm Sewer System (MS4)

Summary of Water Quality Data
For Fiscal Year 2011/2012

Prepared by: City Salem Public Works Department
Stormwater Services

October 2012

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Attachment A. Analytical Report for Pesticide Screening, Pacific Agricultural Laboratory; received May 1, 2012.

Attachment B. “Results of Benthic Macroinvertebrate Sampling, Fish Sampling, and Physical Habitat Data Collection for Pringle Creek and Clark Creek in Salem, Oregon", Pacific Habitat Services, Inc.; June 28, 2012.

Attachment C. “Results of Benthic Macroinvertebrate Sampling, Fish Sampling, and Physical Habitat Data Collection for Waln Creek and Battle Creek in Salem, Oregon", Pacific Habitat Services, Inc.; February 29, 2012.

Attachment D. City of Salem Comment on EPA Proposed Additions to 2010 303(d) Integrated Report; April 27, 2012

1.0 Introduction

This document provides monitoring data collected during the previous NPDES MS4 reporting period, from July 1, 2011, to June 30, 2012. The City's "Surface Water and Stormwater Monitoring Plan" was not approved by the Oregon Department of Environmental Quality (DEQ) until June 29, 2011, therefore, this is the first reporting period that sampling was completed for monitoring elements: Instream Storm, Stormwater, Mercury, Pesticide, and Macroinvertebrates. A background narrative for each monitoring element is provided below, and all collected data are provided in the tables, figures, and attachments[1].

2.0 Monitoring Elements

Specific details for each monitoring element can be found in the City's "Stormwater and Surface Water Monitoring Plan." Progress toward meeting monitoring requirements of the MS4 Permit are summarized in Table 1. Monitoring site locations and parameters for each monitoring element are described in Tables 2 and 3, respectively.

2.1 Monthly Instream

Monthly Instream[2] monitoring of urban streams is conducted on a predetermined schedule. This monitoring element includes the collection of grab samples and field measurements on 11 of Salem's MS4 stormwater runoff receiving streams. Ten of the monitored streams are paired with upstream (at or near where the stream enters the City's jurisdiction) and downstream (at or near where the stream exists the City's jurisdiction or enters a receiving stream) site locations. Additionally, there is a downstream monitoring site on the West Fork Little Pudding River. Since the West Fork Little Pudding River starts in the greater Salem area and runs dry during the summer months, an upstream site was not selected. Figure 1 details the locations of each site.

Water quality parameters collected at all sites include:

- Temperature
- Turbidity
- Specific Conductivity
- pH
- Dissolved Oxygen (DO)
- Nitrate + Nitrite as Nitrogen (NO_3+NO_2-N)
- Escherichia coli (E.coli)
- Biochemical Oxygen Demand (BOD_{stream})

Additional water quality parameters were added for the sites within the Pringle Creek Watershed (PRI1, PRI5, CLA1, and CLA10; refer to Table 2 for list of site names) to meet requirements of the MS4 Permit. These additional parameters include:

- Zinc (total recoverable and dissolved)
- Copper (total recoverable and dissolved)

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[1] All tables, figures and attachments are at the end of this document and are not necessarily discussed in the order that they appear.

[2] Identified as Urban Streams monitoring in the City of Salem Stormwater Management Plan 2010

- Lead (total recoverable and dissolved)
- Hardness

Special Condition #2 of Table B-1 in the City’s MS4 Permit states the following, “Monthly Instream monitoring for metals and hardness conducted in Pringle Creek between May and September each year may be eliminated after December 2011 if statistical analysis of the monitoring results indicates concentrations below the reporting limits.” This condition was not met, and therefore the City will continue to collect metals and hardness data, which will aid in the 303(d) evaluation report to be completed by the end of the Permit term.

In addition, total suspended solids (TSS) was added to the list of parameters for the West Fork Little Pudding site.

Data for this monitoring element is provided as follows:

- Table 5 - Monthly medians for collected data
- Table 6 - Number of water quality criteria exceedances
- Table 7 - All raw monthly data
- Figure 2 - Graphs of mean value comparison for dry and rain conditions
- Figure 3 - Upstream/downstream comparison of E.Coli data

2.2 Continuous Instream

The City maintains a network of Continuous Instream monitoring sites located on urban streams within the city. For the July 1, 2011, thru June 30, 2012, reporting period, there were 11 sites located on 5 different streams. One of the sites, MIC1, was decommissioned in April 2012. In anticipation of the decommissioning, this station was not identified in the NPDES MS4 Permit, and therefore data collected at the MIC1 site was not included in this data summary. Also during this reporting period, one continuous water quality/gauging site (Shelton Ditch) and two gauge only sites (Pringle Creek and West Fork Little Pudding River) were added to the network. Data collection from these sites did not start until late June 2012, therefore these data will not be included in this year’s Annual Report.

The site locations for this monitoring element are positioned in an upstream/downstream configuration. The upstream sites are adjacent to where the stream enters the City and the downstream sites are either above the confluence with another stream or where the stream exits the City’s jurisdictional boundary.

Continuous data collected includes:

- Temperature
- DO
- Specific Conductivity
- pH
- Turbidity
- Stage

All data are recorded in 15 minute intervals. All continuous statistical data summaries presented in the various tables and figures were computed using grade A and/or grade B data. Qualification of what constitutes grade A and grade B data are provided in Table 8.

The Continuous Instream monitoring element incorporates an alarm system that supports the City's Illicit Discharge Detection and Elimination (IDDE) program. The alarm system is able to record, notify, and prompt investigation of water quality abnormalities that may be indicative of illicit discharges. It serves as an important tool to aid in the elimination of periodic illicit discharges, while also helping to prioritize dry weather outfall screening activities, and providing outreach/education opportunities for residents.

Monthly medians for collected data are summarized in Table 9. Plots of continuous data and a summary of system alarms are provided in Figures 4 through 7.

2.3 Instream Storm Monitoring

Instream Storm refers to the monitoring of MS4 receiving streams during defined storm events. Sampling occurs at three sites in the Pringle Creek Watershed (continuous instream monitoring sites PRI12, PRI3, and CLK1). Data collected is intended to increase understanding of receiving waters within the Pringle Creek Watershed, and help guide Salem's stormwater management strategies in watersheds throughout the city. This is a new monitoring element that is expected to continue beyond the current MS4 Permit cycle; ultimately providing a dataset for long-term trending and spatial analyses.

Sampling consists of flow weighted composite samples, grab samples, and field measurements. Parameters include:

- TSS
- BOD_{stream}
- Total Phosphorus (TP)
- Ortho Phosphorus
- NO_3+NO_2-N
- Ammonia Nitrogen (NH_3)
- Copper (Total Recoverable and Dissolved)
- Lead (Total Recoverable and Dissolved)
- Zinc (Total Recoverable and Dissolved)
- Hardness
- Specific Conductivity
- DO
- Temperature
- pH
- E. Coli

Data for this monitoring element are provided in Table 10.

2.4 Stormwater Monitoring

The City has collected water quality samples from a number of sites throughout the MS4 system since 1995. Following the current monitoring plan and strategy, there are three monitoring sites, one for each of the land uses of residential, commercial, and industrial use. The commercial and industrial sites are new, while the residential site was also sampled during the previous MS4 Permit cycle. Data from this monitoring element are intended to be aggregated with previous data from similar land use types. The aggregated datasets will be used to characterize MS4 stormwater runoff pollutant concentrations.

Sampling consists of flow weighted composite samples, grab samples, and field measurements. Parameters include:

- TSS
- $BOD_{5\text{-day}}$
- TP
- Ortho Phosphorus
- NH_3
- NO_3+NO_2-N
- Copper (Total Recoverable and Dissolved)
- Lead (Total Recoverable and Dissolved)
- Zinc (Total Recoverable and Dissolved)
- Hardness
- Specific Conductivity
- Temperature
- pH
- DO
- E.Coli

Data for this monitoring element are provided in Table 11.

2.5 Pesticide Monitoring

Monitoring for the presence of pesticides in MS4 stormwater runoff is a new requirement of the MS4 Permit. Pesticide monitoring occurs at the same three sites where Stormwater monitoring is conducted. Consistent with Table B-1 of the MS4 Permit, halogenated pesticide and chlorinated herbicide screens are performed. For the July 1st, 2011, thru June 30th, 2012, reporting period, one set of pesticide samples were collected at each of the three sites. In addition to the requirements of Table B-1, additional analyses included: organophosphorous, organosulfur, organonitrogen, phenylurea, and carbamate pesticide screens. This resulted in a screening for 188 pesticides at each site.

Detected pesticides are summarized in Table 12, and a complete data report is provided in Attachment A.

2.6 Stormwater-Mercury Monitoring

Monitoring of low-level mercury and methyl mercury (total recoverable and dissolved) in MS4 discharges during storm events is a new requirement of the MS4 Permit. Monitoring occurs twice per year at the residential and commercial land use sites for Stormwater and Pesticide monitoring. EPA Method 1669 ultra clean sampling protocol was followed to collect all samples.

Due to the monitoring plan not being approved by the DEQ until June 29th, 2011, and insufficient runoff-producing rain events, staff were unable to conduct sampling during the summer of 2011. However, both a winter and summer storm was sampled in 2012.

The DEQ provided a table[3] that contained the parameters listed below that DEQ staff collect during low-level mercury sampling. It was decided that it would be in the best interest of the city to collect these additional parameters while performing the low-level mercury monitoring. However, since the table of parameters was received after the collection of samples for the winter storm, Staff were only able to collect these additional parameters during the June 2012 sampling event. For all future low-level mercury monitoring, City staff will collect the following surrogate parameters:

- TSS
- Dissolved Organic Carbon (DOC)
- Total Organic Carbon (TOC)
- Sulfate
- Temperature
- pH
- Redox
- DO
- Alkalinity
- Conductivity
- Light Extinction Coefficient

Mercury data collected for this monitoring element are provided in Table 13 and additional data collected are provided in Table 14.

2.7 Benthic Macroinvertebrate Monitoring

Benthic Macroinvertebrate Monitoring is a new requirement of the MS4 Permit. Sampling for this monitoring element was conducted at sites along Pringle and Clark Creeks. The three sites, two on Pringle Creek and one on Clark Creek, were selected because of their close proximity to where benthic macroinvertebrate and physical habitat data were collected during 2000 and 2001.

The City utilized a consultant, Pacific Habitat Services, to collect benthic macroinvertebrates and physical habitat data, and also conduct fish sampling. Data collection was performed in June 2012, and is anticipated to occur again in June 2013 at the same sites. A summary of collected data is provided in Tables 15 through 17, and the complete data report is provided in Appendix B.

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[3] Table provided in an email, dated May 7th, 2012, from Agnes Lut, Oregon DEQ Willamette Basin Phase 2 Mercury TMDL Coordinator.

In addition to the benthic macroinvertebrate monitoring required by the MS4 Permit, the same consultant conducted benthic macroinvertebrate sampling, physical habitat collection, and fish sampling in the vicinity of Waln Creek and Battle Creek. A technical memorandum and collected data are provided in Attachment C. Sampling was conducted in September 2011 to provide a “before” look at aquatic conditions and communities in these two streams prior to development of a large restoration project. The project included widening, terracing, and reshaping a portion of Waln Creek to add sinuosity, as well as adding large root balls and native plants to sections of both streams. The restoration project began in the summer of 2012. A similar data collection effort will occur once the project is completed and stabilized.

2.8 Willamette River Water Quality Data

Willamette River Water Quality Data is collected by staff at the City’s Willow Lake Water Pollution Control Facility upstream and downstream of the treatment plant to document any affects that the effluent may have on the Willamette River. This monitoring *is not* a requirement of the MS4 Permit, nor is it identified in the monitoring plan. However, collected data are being provided because the Willamette River water quality sampling program is referenced in the City of Salem Stormwater Management Plan 2010 (Best Management Practice MON1 Task 2).

Willamette River water quality data are provided in Table 18.

3.0 EPA Additions to the 2010 303(d) Integrated Report

In April 2012, City staff reviewed the Environmental Protection Agency’s (EPA) proposed additions to the 2010 303(d) Integrated Report. A number of discrepancies were found, and as a result, concerns and comments were provided in a letter to the EPA. A copy of the letter, dated April 27th, 2012, is provided in Attachment D. To date, the City has not received any response from the EPA on the comments provided or a final determination of whether additional waters will be added to the 2010 303(d) Integrated Report.

4.0 Conclusion

The City completed monitoring required for this reporting year by the MS4 Permit, and is on track to meet all of the minimum monitoring requirements due before MS4 Permit expiration (December 29, 2015). Cumulatively, data collected throughout this MS4 Permit cycle will be utilized to meet monitoring objectives identified in the City’s monitoring plan, while also supporting data analyses that will be conducted in preparation of a MS4 Permit renewal package.

Table 1.
Progress Towards Completion of Table B-1 Environmental Monitoring Elements

Monitoring Type	# of sites	Total "Events" Needed	Completed 2010/2011	Completed 2011/2012	Remaining
Monthly Instream	21	48 / site	12[1]	12[1]	24[1]
Continuous Instream	10	On going	NA	NA	NA
Instream Storm	3	25 / site	0[3]	6	19
Stormwater (MS4)	3	15 / site	0[3]	4	11
Pesticides	3	4 / site	0[3]	1	3
Mercury	2	2 / site / year	0[3]	2	2[2]
Macroinvertebrates	3	2 / site	0[3]	1	1

[1] 5 of the 21 sites had less than 12 data collection events due to no flow or access issues; however, all sites are on pace to meet the minimum permit requirements

[2] Following Table B-1 Special Condition #6 of the City's NPDES MS4 permit, the City anticipates requesting of the Department to eliminate the mercury and methyl mercury monitoring requirement after two years of monitoring.

[3] Because the monitoring plan was not approved by the Department until June 29th, 2011, no sampling was conducted for this element

Table 2.
Site Locations for Each Monitoring Element

Monthly Instream	
Site ID	Site Location
BAT 1	Commercial St SE
BAT 12	Rees Hill Rd SE
CGT 1	Mainline Dr NE
CGT 5	Hawthorne St NE @ Hyacinth St NE
CLA 1	Bush Park
CLA 10	Ewald St SE
CRO 1	Courthouse Athletic Club
CRO 10	Ballantyne Rd S
GIB 1	Wallace Rd NW
GIB 15	Brush College Rd NW
GLE 1	River Bend Rd NW
GLE 10	Hidden Valley Dr NW
LPW 1	Cordon Rd NE
MIC 1	Front St Bridge
MIC 10	Turner Rd SE
MRA 1	High St SE
MRA 10	Mill Race Park
PRI 1	Riverfront Park
PRI 5	Bush Park
SHE 1	Church St SE
SHE 10	State Printing Office

Continuous Instream	
Site ID	Site Location
BAT3	Commercial St SE
BAT12	Lone Oak Rd SE
CLK1[1]	Bush Park
CLK12	Ewald St SE
GLE3	Wallace Rd NW
GLE12	Hidden Valley Dr NW
MIC3	North Salem High School
MIC12	Turner Rd SE
PRI3[1]	Pringle Park
PRI12[1]	Trelstad Ave SE

[1] Instream Storm sampling done at these sites

Stormwater / Pesticides / Mercury	
Site Id	Site Location
Electric	Electric St. SE and Summer St. SE
Hilfiker	Hilfiker Ln. SE and Commercial St. SE
Salem Industrial[1]	Salem Industrial Dr. NE and Hyacinth St. NE

[1] Mercury monitoring not done at this site

Willamette River	
Site ID	Site Location (Approximate River Mile)
Wheatland Ferry	71
Spongs Landing	77
WLTP[1]	78
Sunset Park	81
Mill Creek	82.9
Railroad Bridge[2]	83

[1] Willow Lake Pollution Control Facility- 150 feet downstream from effluent diffuser

[2] Field duplicates taken at this site

BAT = Battle Creek, CGT = Claggett Creek, CLA and CLK = Clark Creek, CRO = Croisan, GIB = Gibson Creek, GLE = Glenn Creek, MIC = Mill Creek, MRA = Mill Race, PRI = Pringle Creek, SHE = Shelton Ditch, LPW = West Fork Little Pudding River

Table 3.
Parameters for Each Monitoring Element

Parameter	**Units**	**Monitoring Element**				
		Instream Storm	**Stormwater**	**Monthly Instream**	**Continuous Instream**	**Willamette River**
Alkalinity	mg/L					**x**
Biological Oxygen Demand (BOD_{stream})	mg/L	**x**		**x**		**x**
Biological Oxygen Demand (BOD_{5day})	mg/L		**x**			
Specific Conductivity	µS/cm	**x**	**x**	**x**	**x**	**x**
Copper (Total Recoverable and Dissolved)	mg/L	**x**	**x**	**x**[1]		
Dissolved Oxygen (DO)	mg/L	**x**	**x**	**x**	**x**	**x**
E. coli	MPN/100 mL	**x**	**x**	**x**		**x**
Hardness	mg/L	**x**	**x**	**x**[1]		
Lead (Total Recoverable and Dissolved)	mg/L	**x**	**x**	**x**[1]		
Ammonia Nitrogen (NH_3-N)	mg/L	**x**	**x**			**x**
Nitrate and Nitrite ($NO_{3+}NO_2$)	mg/L	**x**	**x**	**x**		**x**
pH	S.U.	**x**	**x**	**x**	**x**	**x**
Total Dissolved Solids (TDS)	mg/L					**x**
Temperature	˚C	**x**	**x**	**x**	**x**	**x**
Total Phosphorus (TP)	mg/L	**x**	**x**			**x**
Ortho Phosphorus	mg/L	**x**	**x**			
Total Solids (TS)	mg/L					**x**
Total Suspended Solids (TSS)	mg/L	**x**	**x**	**x**[2]		**x**
Turbidity	NTU			**x**	**x**	**x**
Zinc (Total Recoverable and Dissolved)	mg/L	**x**	**x**	**x**[1]		

[1] Pringle Creek Watershed sites only (PRI1, PRI5, CLA1, and CLA10)

[2] West Fork of Little Pudding River site only (LPW 1)

Table 4.
Water Quality Criteria for Monitored Streams

Parameter	Season	Criteria	Applicable Waterbody
Dissolved Oxygen	January 1-May 15	Spawning: Not less than 11.0 mg/L or 95% saturation	Battle Creek*, Claggett Creek*, Croisan Creek*, Glenn Creek*, West Fork Little Pudding River*
	October 1- May 31	Spawning: Not less than 11.0 mg/L or 95% saturation	Gibson Creek*□ , Glenn Creek
	October 15 - May 15	Spawning: Not less than 11.0 mg/L or 95% saturation	Mill Creek, Pringle Creek*[1], Shelton Ditch*
	Year Around (Non-spawning)	Cold water: Not less than 8.0 mg/L or 90% saturation	Battle Creek*, Croisan Creek*, Clark Creek, Pringle Creek[2]
		Cool water: Not less than 6.5 mg/L	Claggett Creek*, Glenn Creek*, Mill Creek, Pringle Creek[1], Shelton Ditch, West Fork Little Pudding River
pH	Year Around	Must be within the range of 6.5 to 8.5 pH units	All Monitoring Streams
Temperature	October 15 - May 15	Salmon and steelhead spawning: 13˚C 7-day average maximum	Mill Creek*, Pringle Creek[1], Shelton Ditch
	October 1- May 31	Salmon and steelhead spawning: 13˚C 7-day average maximum	Gibson Creek□
	Year Around (Non-spawning)	Salmon and trout rearing and migration: 18˚C 7-day average maximum	All Monitoring Streams
E. coli	Fall-Winter-Spring	30 day log mean of 126 E. coli organisms per 100 ml (or) no single sample > 406 organisms per 100 ml	All Monitoring Streams
	Summer	30 day log mean of 126 E. coli organisms per 100 ml (or) no single sample > 406 organisms per 100 ml	All Monitoring Streams
Copper	Year Around	Freshwater Acute and Chronic Criteria: 18 and 12 µg/L respectively with values calculated for a hardness of 100 mg/L	Pringle Creek*[3]
Lead	Year Around	Freshwater Acute and Chronic Criteria: 82 and 3.2 µg/L respectively with values calculated for a hardness of 100 mg/L	Pringle Creek*[3]
Zinc	Year Around	Freshwater Acute and Chronic Criteria: 120 and 110 µg/L respectively with values calculated for a hardness of 100 mg/L	Pringle Creek*[3]

Note: All waterbodies in this table are included under the Willamette Basin or Molalla-Pudding Subbasin TMDL for Temperature and E. coli

* Oregon's 2010 Integrated Report Section 303(d) listed

□ Gibson Creek is referred as Gibson Gulch in Oregon’s 2010 Integrated Report

[1] Applies to Pringle Creek from river mile 0 to 2.6

[2] Applies to Pringle Creek from river mile 2.6 to 6.2

[3] Applies to Pringle Creek from river mile 0 to 6.2

Table 5.
Median Values for Monthly Instream Sites (Reporting Year 2011/12)

Station	Number of Samples	Temperature (C)	DO (mg/L)	Specific Conductivity (µS/cm)	Turbidity (NTUs)	pH (S.U.)	E. Coli (MPN/100 mL)	NO_3+NO_2-N (mg/L)	BOD_{stream} (mg/L)
BAT 1	12	10.1	10.5	47.2	9.2	7.2	254.0	0.75	1.25
BAT 12	12	9.3	10.4	42.4	7.2	7.3	216.5	0.60	1.04
CGT 1	12	13.4	9.9	195.5	5.0	7.0	122.5	0.23	2.00
CGT 5	10	9.7	8.5	117.0	13.6	7.0	518.0	0.26	1.82
CLA 1	12	11.6	10.6	89.7	5.3	7.0	287.0	0.79	2.00
CLA 10	12	12.3	9.9	69.9	4.4	7.0	278.0	1.40	1.79
CRO 1	12	9.1	10.6	69.3	8.4	7.1	326.5	0.47	1.22
CRO 10	12	9.6	9.6	49.9	8.0	7.2	43.5	0.42	1.17
GIB 1	12	11.7	9.8	88.2	9.1	7.0	82.0	1.21	1.41
GIB 15	12	11.4	9.9	94.7	10.0	7.1	83.5	2.10	1.23
GLE 1	12	11.4	9.5	98.3	8.1	7.0	269.5	0.84	1.59
GLE 10	12	10.6	10.5	66.3	8.0	7.2	56.0	0.82	1.03
LPW 1	8	9.5	10.6	173.3	15.6	6.9	375.0	0.54	1.64
MIC 1	12	11.0	10.7	73.2	6.3	7.2	186.0	0.81	1.47
MIC 10	12	10.3	11.0	72.0	6.6	7.1	120.5	0.85	1.47
MRA 1	12	11.0	11.2	73.7	6.9	7.0	146.0	0.82	1.62
MRA 10	12	10.5	10.3	73.2	6.9	6.8	170.5	0.79	1.37
PRI 1	12	10.8	11.2	72.8	6.7	7.0	166.0	0.83	1.61
PRI 5	12	11.3	10.6	81.0	5.8	7.1	164.5	0.75	1.84
SHE 1	12	10.6	11.0	73.1	7.1	7.0	96.0	0.82	1.42
SHE 10	11	10.9	10.6	69.6	7.2	6.7	129.0	0.79	2.00

Table 6.
Water Quality Criteria Exceedances for Monthly Instream Sites (Reporting Year 2011/12)

Station	Number of Samples	DO	pH	E. Coli			Copper		Lead		Zinc	
				Total #	Dry[2]	Rain[3]	Total	Dissolved	Total	Dissolved	Total	Dissolved
BAT 1	12	5	1	3	3	0						
BAT 12	12	2	0	1	1	0						
CGT 1	12	4	0	5	2	3						
CGT 5	10	4	0	7	4	3						
CLA 1	12	0	1	5	2	3	3	1	0	0	2	0
CLA 10	12	0	0	4	2	2	3	0	0	0	2	0
CRO 1	12	3	0	3	2	1						
CRO 10	12	1	1	0	0	0						
GIB 1	12	6[1]	1	2	0	2						
GIB 15	12	4[1]	0	2	2	0						
GLE 1	12	3	2	4	2	2						
GLE 10	12	3	0	1	1	0						
LPW 1	8	4	0	4	2	2						
MIC 1	12	3	0	1	0	1						
MIC 10	12	2	0	2	1	1						
MRA 1	12	NA	2	2	1	1						
MRA 10	12	NA	4	1	0	1						
PRI 1	12	1	3	1	0	1	0	0	0	0	1	0
PRI 5	12	3	2	2	1	1	0	1	0	0	1	0
SHE 1	12	2	3	1	0	1						
SHE 10	11	2	5	2	1	1						

Note: Copper, lead, and zinc collected at Pringle Creek Watershed sites only (PRI1, PRI5, CLA1, and CLA10)

NA = Not available (City staff was unable to find dissolved oxygen water quality criteria associated with this waterbody)

[1] City staff was unable to find year around dissolved oxygen water quality criteria associated with this waterbody

[2] Dry is < 0.05 inches of rainfall in previous 24 hours

[3] Rain is ≥ 0.05 inches of rainfall in previous 24 hours

Table 7.
Monthly Instream Data

Site ID	Date	Time	Weather	Sampler Initials	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	FLAG?	Rainfall previous 24 hours
BAT 1	7/19/2011	10:55	Cloudy/No Rain	SC	15.5	8.45	51.4	8.4	6.41	1046	0.64	2		0.01
BAT 1	8/16/2011	11:10	Sunny	SC	16.6	8.39	54.6	9	6.64	816	0.39	2		0
BAT 1	9/20/2011	11:00	Sunny	JVH	14.6	7.31	65	14.8	7.03	1553	0.38	2.7		0
BAT 1	10/18/2011	11:10	Sunny	JVH	11.2	9.35	54.5	9.5	7	228	0.54	2		0
BAT 1	11/8/2011	10:50	Sunny	JVH	8.6	10.19	53.5	8.6	7.18	179	0.5	0.87		0.04
BAT 1	12/6/2011	11:05	Cloudy/No Rain	JVH	5.4	11.37	47.5	7.2	7.44	108	1.02	1.29		0
BAT 1	1/24/2012	11:00	Heavy Rain	JVH	7.6	10.89	41.2	25.6	7.53	248	1.29	1.14		0.41
BAT 1	2/14/2012	11:05	Cloudy/No Rain	JVH	7.6	10.9	45.7	12.2	7.2	70	1.06	0.8		0.04
BAT 1	3/13/2012	11:25	Heavy Rain	JVH	6.4	11.06	40.6	22.3	7.22	365	0.86	1.23		1.76
BAT 1	4/17/2012	11:30	Cloudy/No Rain	JVH	8.9	10.87	44.2	6.6	7.26	99	1.05	1.04		0
BAT 1	5/15/2012	11:15	Sunny	JVH	12.6	10.01	43.6	7.5	7.32	326	0.91	0.74	Ducks, Geese upstream	0
BAT 1	6/12/2012	11:20	Cloudy/No Rain	JVH	13.9	9.24	46.8	9.4	7.22	260	0.58	1.27		0.14
Median					**10.05**	**10.1**	**47.15**	**9.2**	**7.21**	**254**	**0.75**	**1.25**		

Site ID	Date	Time	Weather	Sampler Initials	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	FLAG?	Rainfall previous 24 hours
BAT 12	7/19/2011	10:30	Cloudy/No Rain	SC	15.5	9.07	44.7	7	6.56	308	0.36	2		0.01
BAT 12	8/16/2011	10:35	Sunny	SC	16.2	8.92	47.7	9.6	6.75	308	0.17	2		0
BAT 12	9/20/2011	10:45	Sunny	JVH	14.2	8.66	55.7	10	7.14	205	0.08	2		0
BAT 12	10/18/2011	10:50	Sunny	JVH	10.1	9.93	48.5	8.7	7.21	921	0.21	2		0
BAT 12	11/8/2011	10:30	Sunny	JVH	8.0	10.45	46.6	6	7.29	272	0.21	0.81		0.04
BAT 12	12/6/2011	10:45	Cloudy/No Rain	JVH	5.4	11.78	42.5	4.6	7.48	63	1.04	1.12		0
BAT 12	1/24/2012	10:40	Heavy Rain	JVH	7.4	10.9	41.5	17.8	7.47	54	1.73	0.95		0.41
BAT 12	2/14/2012	10:45	Cloudy/No Rain	JVH	7.2	11.22	42.2	4.9	7.27	38	1.29	0.8		0.04
BAT 12	3/13/2012	11:05	Heavy Rain	JVH	6.1	11.1	39.7	15.4	7.21	48	1.27	0.68		1.76
BAT 12	4/17/2012	11:15	Cloudy/No Rain	JVH	8.5	11.05	38.5	5.9	7.3	57	1.02	1.2		0
BAT 12	5/15/2012	11:00	Sunny	JVH	12.0	10.27	38.5	6.8	7.3	228	0.82	0.72		0
BAT 12	6/12/2012	11:00	Cloudy/No Rain	JVH	13.4	9.77	40	7.3	7.4	238	0.37	0.82		0.14
Median					**9.3**	**10.36**	**42.35**	**7.15**	**7.28**	**216.5**	**0.60**	**1.04**		

Note: Data in red exceed applicable water quality criteria (see Table 4)

Table 7.
Monthly Instream Data

Site ID	Date	Time	Weather	Sampler Initials	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	FLAG?	Rainfall previous 24 hours
CGT 1	7/19/2011	13:45	Cloudy/No Rain	SC	19.8	7.45	191.1	4.0	6.84	108	0.23	2		0.01
CGT 1	8/16/2011	13:35	Sunny	SC	22.8	8.11	232	4.8	6.97	2420	0.11	2		0
CGT 1	9/20/2011	13:35	Sunny	JVH	19.4	9.95	243	4	7.08	687	0.07	2		0
CGT 1	10/18/2011	13:50	Sunny	JVH	14.9	7.67	238	3.7	6.98	58	0.14	2	dam upstream	0
CGT 1	11/8/2011	13:35	Cloudy/No Rain	JVH	11.3	5.75	209.6	3.9	6.99	23	0.12	1.45	dam upstream	0.03
CGT 1	12/6/2011	13:55	Cloudy/No Rain	JVH	6.1	7.77	199.8	3.9	7.04	24	0.51	1.49		0.01
CGT 1	1/24/2012	13:55	Heavy Rain	JVH	7.1	10.93	52.6	22.2	7.28	613	0.46	2.1		0.38
CGT 1	2/14/2012	13:40	Cloudy/No Rain	JVH	8.0	9.86	155.6	11.7	6.82	101	0.68	1.2		0.09
CGT 1	3/13/2012	13:55	Heavy Rain	JVH	6.3	11.74	64	26.6	7.22	1203	0.42	2.16		1.63
CGT 1	4/17/2012	13:55	Cloudy/No Rain	JVH	11.9	10.64	169.5	5.2	6.85	137	0.4	1.94		0
CGT 1	5/15/2012	13:55	Sunny	JVH	20.6	12.09	228	6.8	7.18	45	0.17	2.91		0
CGT 1	6/12/2012	13:55	Cloudy/No Rain	JVH	18.1	10.34	174.2	6.9	7.06	687	0.22	2.44		0.14
Median					**13.4**	**9.91**	**195.45**	**5**	**7.02**	**122.5**	**0.23**	**2**		

Site ID	Date	Time	Weather	Sampler Initials	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	FLAG?	Rainfall previous 24 hours
CGT 5	7/19/2011	13:25	Cloudy/No Rain	SC	17.3	6.15	120.6	9.3	6.84	579	0.14	2		0.01
CGT 5	8/16/2011	13:20	Sunny	SC									No Flow	0
CGT 5	9/20/2011	13:20	Sunny	JVH									No Flow	0
CGT 5	10/18/2011	13:30	Sunny	JVH	12.4	3.89	98.7	36.9	7.01	435	0.05	2.8	dam upstream	0
CGT 5	11/8/2011	13:05	Cloudy/No Rain	JVH	8.9	7.32	72.4	10.8	7.09	107	0.05	1.46	dam upstream	0.03
CGT 5	12/6/2011	13:40	Cloudy/No Rain	JVH	2.3	9.66	149.9	16.3	7.18	345	0.46	1.59		0.01
CGT 5	1/24/2012	13:25	Heavy Rain	JVH	7.3	10.74	59	24.5	7.27	548	0.59	1.61		0.38
CGT 5	2/14/2012	13:25	Cloudy/No Rain	JVH	8.1	11.1	139.4	21.7	6.87	238	0.74	1.45		0.09
CGT 5	3/13/2012	13:40	Cloudy/No Rain	JVH	6.5	11.65	66.7	26.8	6.98	548	0.52	1.96		1.63
CGT 5	4/17/2012	13:40	Cloudy/No Rain	JVH	10.5	11.8	151.2	6	6.91	488	0.33	2		0
CGT 5	5/15/2012	13:35	Sunny	JVH	16.1	5.89	217.8	8.4	6.9	579	0.09	1.67		0
CGT 5	6/12/2012	13:35	Cloudy/No Rain	JVH	16.8	7.42	113.3	10.8	7.02	1986	0.19	2.32		0.14
Median					**9.7**	**8.54**	**116.95**	**13.55**	**7.00**	**518**	**0.26**	**1.82**		

Note: Data in red exceed applicable water quality criteria (see Table 4)

Table 7. Monthly Instream Data

Site ID	Date	Time	Weather	Sampler Initials	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	FLAG?	Rainfall previous 24 hours	Total Copper (mg/L)	Dissolved Copper (mg/L)	Total Lead (mg/L)	Dissolved Lead (mg/L)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Hardness
CLA 1	7/19/2011	10:50	Cloudy/No Rain	BF	16.1	9.27	90.5	4.2	6.98	313	0.88	2		0.01	<0.0050	<0.0050	<0.0005	<0.0010	0.0115	<0.0100	30
CLA 1	8/16/2011	10:55	Sunny	JVH	16.2	9.3	93.7	3	7.03	166	0.65	2		0	<0.0025	<0.0025	<0.0005	<0.0005	0.003	<0.0025	30
CLA 1	9/20/2011	11:10	Sunny	BF	15.4	9.43	94.1	7.8	6.86	1120	0.57	2		0	<0.0050	<0.0050	<0.0005	<0.0005	<0.0100	<0.0100	30
CLA 1	10/18/2011	11:30	Sunny	BF	12.7	10.08	91.3	3.3	6.5	261	0.76	2		0	<0.002	<0.0025	<0.0010	<0.0010	0.004	0.0026	28
CLA 1	11/8/2011	10:35	Cloudy/No Rain	BF	10.3	10.82	89.1	1.7	5.9	248	0.82	0.66		0.04	<0.0025	<0.0025	<0.0010	<0.0010	0.0053	0.0047	30
CLA 1	12/6/2011	11:15	Cloudy/No Rain	BF	7	11.82	93.3	6.5	6.75	85	1.06	1.36		0	<0.0025	<0.0025	<0.0005	<0.0005	0.0062	0.0056	26
CLA 1	1/24/2012	10:40	Heavy Rain	BF	7.8	11.43	50.6	27.3	6.97	866	0.57	2.21		0.41	0.0047	<0.0025	0.0037	<0.0010	0.031	0.0133	16
CLA 1	2/14/2012	10:40	Sunny	BF	9	11.09	88.8	9.5	7.09	461	1.27	1.25		0.04	0.0026	<0.0025	0.0008	<0.0005	0.0209	0.0106	34
CLA 1	3/13/2012	11:30	Heavy Rain	BF	6	11.85	46.7	30.5	7.15	548	0.62	2.71		1.76	0.0061	<0.0025	0.0049	<0.0005	0.0569	0.0192	14
CLA 1	4/17/2012	11:10	Cloudy/No Rain	BF	10.5	11.24	90.2	3.8	7.1	148	1.13	1.39		0	<0.0025	<0.0025	<0.0005	<0.0005	0.009	0.0085	29
CLA 1	5/15/2012	11:00	Sunny	BF	13.5	10.28	87.9	4.5	7.57	222	1	1.13		0	<0.00250	<0.00250	<0.0005	<0.0005	0.0113	0.0085	26
CLA 1	6/12/2012	10:15	Light Rain	BF	14.9	9.29	71.7	6	7.22	2420	0.68	2.97		0.14	0.0074	0.006	<0.0010	<0.0010	0.0126	0.0103	23
Median					**11.6**	**10.55**	**89.65**	**5.25**	**7.01**	**287**	**0.79**	**2**									**28.5**

Site ID	Date	Time	Weather	Sampler Initials	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	FLAG?	Rainfall previous 24 hours	Total Copper (mg/L)	Dissolved Copper (mg/L)	Total Lead (mg/L)	Dissolved Lead (mg/L)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Hardness
CLA 10	7/19/2011	9:00	Cloudy/No Rain	SC	14.9	9.15	69.7	4.1	6.57	1120	1.62	2		0.01	<0.0050	<0.0025	0.0005	<0.0010	0.0126	<0.0100	18
CLA 10	8/16/2011	9:15	Sunny	SC	15.6	9.16	70.7	4.7	6.71	308	1.41	2		0	<0.0025	<0.0025	<0.0005	<0.0005	0.0036	0.0029	20
CLA 10	9/20/2011	9:40	Sunny	JVH	14.8	9.14	73.6	5.5	6.97	1120	1.29	2		0	<0.0050	<0.0050	<0.0005	<0.0005	<0.0100	<0.0100	21
CLA 10	10/18/2011	9:50	Sunny	JVH	13.6	9.43	70.1	3.7	6.96	205	1.48	2		0	<0.002	<0.0025	<0.0005	<0.0005	0.005	0.0039	21
CLA 10	11/8/2011	9:35	Cloudy/No Rain	JVH	12.1	9.96	68.7	3.2	7.11	248	1.37	0.54		0.04	<0.0025	<0.0025	<0.0005	<0.0010	0.0058	0.005	20
CLA 10	12/6/2011	9:50	Cloudy/No Rain	JVH	10.1	10.27	70.9	2.3	7.04	34	1.57	1		0	<0.0025	<0.0025	<0.0005	<0.0005	0.008	0.0061	21
CLA 10	1/24/2012	9:45	Heavy Rain	JVH	7.6	11.26	38.5	20.1	7.12	1986	0.91	1.58		0.41	0.0033	<0.0025	0.0019	<0.0010	0.0211	0.011	12
CLA 10	2/14/2012	9:50	Cloudy/No Rain	JVH	8.9	10.61	56.1	56.5	6.93	387	0.77	2.43	turbid	0.04	0.007	<0.0025	0.0024	<0.0005	0.0544	0.0177	28
CLA 10	3/13/2012	10:15	Heavy Rain	JVH	8.4	10.73	60.5	11.4	6.91	1553	1.39	0.9		1.76	<0.0025	<0.0025	<0.0005	<0.0005	0.0144	0.0116	16
CLA 10	4/17/2012	10:10	Cloudy/No Rain	JVH	10.5	10.34	71	2.5	6.92	31	1.65	1.12		0	<0.0025	<0.0025	<0.0005	<0.0005	0.0067	0.0075	16
CLA 10	5/15/2012	9:55	Sunny	JVH	12.4	9.86	69	3.7	6.97	22	1.71	0.87		0	0.0066	0.0038	<0.0005	<0.0005	0.0088	0.0096	21
CLA 10	6/12/2012	9:55	Light Rain	JVH	13.5	9.01	71.1	5.2	7.01	197	1.33	4.16		0.14	0.0033	0.0025	<0.0010	<0.0010	0.0211	0.0196	21
Median					**12.25**	**9.91**	**69.9**	**4.4**	**6.97**	**278**	**1.4**	**1.79**									**20.5**

Note: Data in red exceed applicable water quality criteria (see Table 4). Medians not calculated for metals due to the large number of censored values

Table 7.
Monthly Instream Data

Site ID	Date	Time	Weather	Sampler Initials	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	FLAG?	Rainfall previous 24 hours
CRO 1	7/19/2011	9:25	Cloudy/No Rain	SC	15.4	8.36	81.5	8.7	6.92	345	0.4	2		0.01
CRO 1	8/16/2011	9:45	Sunny	SC	15.4	7.24	90.6	20.5	6.88	517	0.33	2	shallow	0
CRO 1	9/20/2011	10:00	Sunny	JVH	13.7	7.28	97.5	9.1	7.04	308	0.26	2		0
CRO 1	10/18/2011	10:05	Sunny	JVH	9.5	9.74	89.9	5.9	7.07	345	0.37	2		0
CRO 1	11/8/2011	9:55	Cloudy/No Rain	JVH	7.5	10.71	84.2	3.8	7.22	1414	0.27	0.71		0.04
CRO 1	12/6/2011	10:05	Cloudy/No Rain	JVH	4	12.19	69.6	3.5	7.31	86	0.85	1.51		0
CRO 1	1/24/2012	10:00	Heavy Rain	JVH	7.5	11.45	53.2	25.7	7.26	126	1.31	0.89		0.41
CRO 1	2/14/2012	10:05	Cloudy/No Rain	JVH	7.1	11.57	61.4	8.1	7.03	55	0.92	0.82		0.04
CRO 1	3/13/2012	10:35	Heavy Rain	JVH	6.5	11.48	57.8	26.3	7.25	155	0.93	0.92		1.76
CRO 1	4/17/2012	10:35	Cloudy/No Rain	JVH	8.7	11.4	59.7	5.5	7.06	23	0.63	1.33		0
CRO 1	5/15/2012	10:10	Sunny	JVH	12.2	10.39	64.1	6.3	6.98	345	0.54	0.94		0
CRO 1	6/12/2012	10:10	Cloudy/No Rain	JVH	13.6	9.5	68.9	9.5	7.13	1733	0.31	1.1		0.14
Median					**9.1**	**10.55**	**69.25**	**8.4**	**7.07**	**326.5**	**0.47**	**1.22**		

Site ID	Date	Time	Weather	Sampler Initials	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	FLAG?	Rainfall previous 24 hours
CRO 10	7/19/2011	9:50	Cloudy/No Rain	SC	14.7	8.7	59.8	7.5	6.45	61	0.3	2		0.01
CRO 10	8/16/2011	10:10	Sunny	SC	14.4	8.11	67	8.5	6.52	64	0.25	2		0
CRO 10	9/20/2011	10:25	Sunny	JVH	12.8	8.73	71.3	10.9	7.03	172	0.14	2	stagnant	0
CRO 10	10/18/2011	10:30	Sunny	JVH	10.4	8.8	62.8	10.8	7.03	140	0.19	2		0
CRO 10	11/8/2011	10:15	Sunny	JVH	8	9.26	59.8	5	7.19	19	0.08	1.2		0.04
CRO 10	12/6/2011	10:30	Cloudy/No Rain	JVH	4.6	11.32	49.4	4.3	7.2	19	0.94	1.53		0
CRO 10	1/24/2012	10:20	Heavy Rain	JVH	7.3	11.18	46.7	20.3	7.47	22	1.56	1		0.41
CRO 10	2/14/2012	10:25	Cloudy/No Rain	JVH	6.9	11.25	45.6	6.5	7.11	10	1.03	0.51		0.04
CRO 10	3/13/2012	10:50	Heavy Rain	JVH	6.1	11.38	45.3	21	7.29	55	1.24	1.05		1.76
CRO 10	4/17/2012	10:55	Cloudy/No Rain	JVH	8.7	11.01	43.5	6.6	7.13	11	0.7	1.14		0
CRO 10	5/15/2012	10:45	Sunny	JVH	12.6	9.76	46.3	7.1	7.28	32	0.54	0.75		0
CRO 10	6/12/2012	10:30	Cloudy/No Rain	JVH	13.2	9.35	50.4	8.9	7.2	261	0.27	0.87		0.14
Median					**9.55**	**9.56**	**49.9**	**8**	**7.16**	**43.5**	**0.42**	**1.17**		

Note: Data in red exceed applicable water quality criteria (see Table 4)

Table 7.
Monthly Instream Data

Site ID	Date	Time	Weather	Sampler Initials	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	FLAG?	Rainfall previous 24 hours
GIB 1	7/19/2011	11:35	Cloudy/No Rain	BF	17.2	7.95	104.4	8.2	6.91	131	0.97	2		0
GIB 1	8/16/2011	13:15	Sunny	JVH	16.3	7.84	111.1	7.5	6.98	59	0.58	2	stagnant	0
GIB 1	9/20/2011	13:20	Sunny	BF	15.8	7.36	116.3	9.9	6.89	93	0.33	2	slow current	0
GIB 1	10/18/2011	13:20	Sunny	BF	12.9	9.22	121.1	21.1	7.17	81	1.09	2		0
GIB 1	11/8/2011	12:35	Cloudy/No Rain	BF	8.5	10.18	116.8	5.3	6.1	59	1.13	0.92		0
GIB 1	12/6/2011	13:20	Cloudy/No Rain	BF	4.5	11.94	86.3	5.8	7.37	14	1.37	1.52		0
GIB 1	1/24/2012	13:15	Heavy Rain	BF	8.5	10.84	71.8	28.2	7.07	83	1.59	1.03		0.31
GIB 1	2/14/2012	12:45	Cloudy/No Rain	BF	8.9	10.94	78.7	10.7	6.85	488	1.63	1.06		0.16
GIB 1	3/13/2012	13:20	Cloudy/No Rain	BF	7.1	11.11	70.5	45.7	7.25	921	1.29	1.39		1.47
GIB 1	4/17/2012	13:15	Cloudy/No Rain	BF	10.5	10.85	78.8	7.3	7.15	14	1.48	1.43		0
GIB 1	5/15/2012	13:10	Sunny	BF	16.8	9.4	80.1	12.5	7.33	76	1.36	0.79		0
GIB 1	6/12/2012	13:00	Light Rain	BF	16	8.55	90.1	8.3	7.02	118	0.83	1.01		0.1
Median					**11.7**	**9.79**	**88.2**	**9.1**	**7.05**	**82**	**1.21**	**1.41**		

Site ID	Date	Time	Weather	Sampler Initials	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	FLAG?	Rainfall previous 24 hours
GIB 15	7/19/2011	13:45	Cloudy/No Rain	BF	17.9	8.51	113.8	NA	7.06	190	2.58	2	Turbidity sensor error. No readings.	0
GIB 15	8/16/2011	13:35	Sunny	JVH	20.2	7.94	112.8	15.6	7.13	816	1.57	2		0
GIB 15	9/20/2011	13:35	Sunny	BF	17.1	8.3	117.3	31.2	7.2	2420	0.61	2.3	little flow	0
GIB 15	10/18/2011	13:40	Sunny	BF	12.6	9.1	95	18	7.11	161	1.01	2		0
GIB 15	11/8/2011	12:46	Cloudy/No Rain	BF	7.9	10.44	103.6	5.2	6.55	53	0.81	1.22		0
GIB 15	12/6/2011	13:30	Cloudy/No Rain	BF	4.6	11.61	94.4	8	7.25	26	2.54	1.59		0
GIB 15	1/24/2012	13:30	Heavy Rain	BF	8.6	10.86	81.7	29.8	7.05	46	2.48	0.8		0.31
GIB 15	2/14/2012	13:10	Cloudy/No Rain	BF	8.3	11.22	87.5	9.7	6.52	33	2.17	1.11		0.16
GIB 15	3/13/2012	13:30	Heavy Rain	BF	7.4	11.19	73.6	48.4	7.26	248	1.68	1.07		1.47
GIB 15	4/17/2012	13:30	Cloudy/No Rain	BF	10.2	11.11	88.6	6	7.33	19	2.44	1.23		0
GIB 15	5/15/2012	13:20	Sunny	BF	16.1	9.43	90.6	10	7.28	114	2.34	1.23		0
GIB 15	6/12/2012	13:20	Light Rain	BF	16.3	9	99.3	8.2	7.15	43	2.03	1		0.1
Median					**11.4**	**9.94**	**94.7**	**10**	**7.14**	**83.5**	**2.1**	**1.23**		

Note: Data in red exceed applicable water quality criteria (see Table 4)

Table 7.
Monthly Instream Data

Site ID	Date	Time	Weather	Sampler Initials	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	FLAG?	Rainfall previous 24 hours
GLE 1	7/19/2011	11:55	Cloudy/No Rain	BF	16.1	8.55	112.6	8.9	6.95	387	0.93	2		0
GLE 1	8/16/2011	13:00	Sunny	JVH	17.2	7.81	126.4	7.4	7	435	0.67	2	stagnant	0
GLE 1	9/20/2011	13:00	Sunny	BF	15.9	7.82	137.9	8.8	6.6	435	0.57	2	almost dry	0
GLE 1	10/18/2011	13:00	Sunny	BF	12.8	9.15	120.4	11	6.72	156	0.71	2		0
GLE 1	11/8/2011	12:15	Cloudy/No Rain	BF	9.9	9.79	107.4	5.5	6.07	194	0.45	1.14		0
GLE 1	12/6/2011	13:00	Cloudy/No Rain	BF	5.3	11.83	105.6	3.6	7.36	29	1.27	1.58		0
GLE 1	1/24/2012	13:00	Heavy Rain	BF	8.2	11.1	75	30.2	7.01	148	1.51	1.21		0.31
GLE 1	2/14/2012	12:30	Sunny	BF	8.2	11.2	81.3	24.1	6.1	345	1.24	1.62		0.16
GLE 1	3/13/2012	13:00	Cloudy/No Rain	BF	7	11.38	69.2	38.6	7.15	411	0.98	1.37		1.47
GLE 1	4/17/2012	13:00	Cloudy/No Rain	BF	9.9	11.18	80.3	6.3	7.44	23	1.41	1.5		0
GLE 1	5/15/2012	12:45	Sunny	BF	16.2	9.22	87.9	5.6	6.95	172	0.74	1.09		0
GLE 1	6/12/2012	12:45	Light Rain	BF	15.2	9.09	91	6.6	7.26	488	0.68	1.59		0.1
Median					**11.35**	**9.51**	**98.3**	**8.1**	**6.98**	**269.5**	**0.84**	**1.59**		

Site ID	Date	Time	Weather	Sampler Initials	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	FLAG?	Rainfall previous 24 hours
GLE 10	7/19/2011	14:25	Cloudy/No Rain	BF	14.6	9.47	72.4	NA	6.83	88	0.57	2	Turbidity error. No readings.	0
GLE 10	8/16/2011	13:55	Sunny	JVH	15	8.56	91.6	5.2	7.02	276	0.32	2		0
GLE 10	9/20/2011	13:55	Sunny	BF	13.9	8.47	118.8	26.9	7.25	1553	0.06	2		0
GLE 10	10/18/2011	14:00	Sunny	BF	11.7	8.24	89.8	3.8	7.45	129	0.14	2		0
GLE 10	11/8/2011	13:10	Cloudy/No Rain	BF	8	10.87	78.8	4.5	6.75	58	0.13	0.99		0
GLE 10	12/6/2011	14:00	Cloudy/No Rain	BF	4.8	11.98	68.6	4.4	7.3	26	1.16	1.06		0
GLE 10	1/24/2012	13:50	Heavy Rain	BF	8	11.26	53.8	19.5	7.24	25	1.8	0.82		0.31
GLE 10	2/14/2012	13:30	Cloudy/No Rain	BF	7.7	11.38	56.2	12.7	6.65	31	1.28	0.79		0.16
GLE 10	3/13/2012	13:50	Heavy Rain	BF	6.9	11.46	54.9	40.1	7.37	125	1.56	0.97		1.47
GLE 10	4/17/2012	13:50	Cloudy/No Rain	BF	9.4	11.21	53.9	8	7.24	14	1.29	1.12		0
GLE 10	5/15/2012	13:45	Sunny	BF	13.2	10.09	57.2	8.1	7.43	54	1.03	0.74		0
GLE 10	6/12/2012	13:45	Light Rain	BF	13.6	10	64	6.6	7.6	52	0.61	0.81		0.1
Median					**10.55**	**10.48**	**66.3**	**8**	**7.25**	**56**	**0.82**	**1.03**		

Note: Data in red exceed applicable water quality criteria (see Table 4)

Table 7.
Monthly Instream Data

Site ID	Date	Time	Weather	Sampler Initials	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	FLAG?	Rainfall previous 24 hours	TSS
LPW 1	7/19/2011	13:00	Cloudy/No Rain	SC	18.4	4.25	152.2	26.2	6.7	770	0.14	7.3	Looks really bad and stagnant	0.01	27
LPW 1	8/16/2011	13:10	Sunny	SC									No Flow	0	
LPW 1	9/20/2011	13:10	Sunny	JVH									No Flow	0	
LPW 1	10/18/2011	13:15	Sunny	JVH									No Flow	0	
LPW 1	11/8/2011	12:45	Cloudy/No Rain	JVH									No Flow	0.03	
LPW 1	12/6/2011	13:00	Cloudy/No Rain	JVH	3.3	10.76	189.8	13.9	7.15	489	0.63	1.56		0.01	10
LPW 1	1/24/2012	13:00	Heavy Rain	JVH	7.3	10.42	85.1	36.4	7.21	261	1.27	1.18		0.38	18
LPW 1	2/14/2012	13:05	Light Rain	JVH	8.2	13.43	197.5	17.3	6.74	65	1.48	1.18	TSS dumped at lab	0.09	
LPW 1	3/13/2012	13:15	Cloudy/No Rain	JVH	6.5	12.14	78.6	58.2	6.93	866	1	1.99		1.63	44
LPW 1	4/17/2012	13:15	Light Rain	JVH	10.8	11.66	164.8	4.3	6.9	238	0.44	1.81		0	4
LPW 1	5/15/2012	13:10	Sunny	JVH	16.6	8.38	277	5.4	6.91	166	0.22	1.36		0	5
LPW 1	6/12/2012	13:10	Cloudy/No Rain	JVH	16.3	5.21	181.8	5.5	6.9	866	0.11	1.72		0.14	20
Median					**9.5**	**10.59**	**173.3**	**15.6**	**6.91**	**375**	**0.54**	**1.64**			**18**

Site ID	Date	Time	Weather	Sampler Initials	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	FLAG?	Rainfall previous 24 hours
MIC 1	7/19/2011	8:30	Cloudy/No Rain	SC	16.5	9.18	61.6	8.6	7.03	261	0.51	2		0.01
MIC 1	8/16/2011	8:45	Sunny	SC	17.9	9.06	62.2	5.5	7.06	140	0.23	2		0
MIC 1	9/20/2011	9:10	Sunny	JVH	15.5	9.6	56	6.5	7.13	225	0.1	2		0
MIC 1	10/18/2011	9:25	Sunny	JVH	11.4	10.4	84.6	3.8	7.13	276	0.53	2		0
MIC 1	11/8/2011	9:10	Cloudy/No Rain	JVH	8.4	11.32	85.1	3.6	7.2	125	0.77	1.19		0.04
MIC 1	12/6/2011	9:20	Cloudy/No Rain	JVH	4.4	12.66	96.6	3.5	7.23	147	2.99	1.47		0
MIC 1	1/24/2012	9:20	Heavy Rain	JVH	7.4	11.56	77	21.3	7.19	127	2.76	0.91		0.41
MIC 1	2/14/2012	9:20	Light Rain	JVH	7.3	11.67	89.7	7.6	6.92	130	2.59	1.01		0.04
MIC 1	3/13/2012	9:40	Heavy Rain	JVH	5	11.89	68.7	118	7.2	1986	1.32	2.13	high flow, turbid	1.76
MIC 1	4/17/2012	9:45	Cloudy/No Rain	JVH	10.5	10.98	81.6	10.9	7.16	345	1.52	1.47		0
MIC 1	5/15/2012	9:25	Sunny	JVH	15.6	9.48	69.4	4.1	7.19	99	0.85	1.01		0
MIC 1	6/12/2012	9:30	Cloudy/No Rain	JVH	15.7	9.51	57.6	6	7.25	260	0.47	1.06		0.14
Median					**10.95**	**10.69**	**73.2**	**6.25**	**7.18**	**186**	**0.81**	**1.47**		

Note: Data in red exceed applicable water quality criteria (see Table 4)

Table 7.
Monthly Instream Data

Site ID	Date	Time	Weather	Sampler Initials	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	FLAG?	Rainfall previous 24 hours
MIC 10	7/19/2011	11:25	Cloudy/No Rain	SC	16.2	9.48	53.6	8.4	7.08	210	0.36	2		0.01
MIC 10	8/16/2011	11:40	Sunny	SC	18	9.58	53	6.1	7.1	102	0.22	2		0
MIC 10	9/20/2011	12:50	Sunny	JVH	15.8	10.18	49.1	6.5	7.28	86	0.08	2		0
MIC 10	10/18/2011	11:30	Sunny	JVH	11.1	10.64	74.9	4.9	7.18	137	0.53	2		0
MIC 10	11/8/2011	11:15	Sunny	JVH	8.1	11.76	83.4	4.2	7.19	104	0.89	0.95		0.04
MIC 10	12/6/2011	11:30	Cloudy/No Rain	JVH	4.4	12.56	90.4	4.2	7.19	53	3.11	1.34		0
MIC 10	1/24/2012	11:20	Heavy Rain	JVH	7.1	10.88	77.2	21.7	7.03	88	2.99	0.81		0.41
MIC 10	2/14/2012	11:30	Light Rain	JVH	7.2	11.37	85	7.3	6.9	88	2.79	1.22		0.04
MIC 10	3/13/2012	11:45	Heavy Rain	JVH	4.7	11.34	69.1	67.2	6.95	830	1.72	1.94		1.76
MIC 10	4/17/2012	11:50	Cloudy/No Rain	JVH	9.5	11.38	77.5	8.4	7.04	240	1.52	1.59		0
MIC 10	5/15/2012	11:40	Sunny	JVH	14.5	11.17	59	6.7	7.29	435	0.8	1.31		0
MIC 10	6/12/2012	11:40	Cloudy/No Rain	JVH	14.8	9.82	54.9	6.5	7.12	179	0.43	1.06		0.14
Median					**10.3**	**11.025**	**72**	**6.6**	**7.11**	**120.5**	**0.85**	**1.47**		

Site ID	Date	Time	Weather	Sampler Initials	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	FLAG?	Rainfall previous 24 hours
MRA 1	7/19/2011	10:10	Cloudy/No Rain	BF	16.3	9.45	61	8.4	7.01	261	0.46	2		0.01
MRA 1	8/16/2011	10:20	Sunny	JVH	18	9.3	60.9	6.1	7.18	172	0.22	2		0
MRA 1	9/20/2011	10:05	Sunny	BF	15.4	9.82	52.8	6.7	7.15	131	0.06	2.2		0
MRA 1	10/18/2011	10:30	Sunny	BF	11.1	10.75	75.8	7	6.25	299	0.49	2		0
MRA 1	11/8/2011	9:55	Cloudy/No Rain	BF	8.3	11.62	85	4.2	6.05	91	0.84	0.96		0.04
MRA 1	12/6/2011	10:30	Cloudy/No Rain	BF	4.4	12.83	98.1	4	7.27	87	3	1.56		0
MRA 1	1/24/2012	10:05	Heavy Rain	BF	7.2	11.73	78.3	30	6.66	76	2.75	0.93		0.41
MRA 1	2/14/2012	10:15	Light Rain	BF	7.2	11.94	90.3	9.1	7.05	88	2.66	0.68		0.04
MRA 1	3/13/2012	10:20	Heavy Rain	BF	5.5	12	71.5	91.8	6.68	2420	1.25	2.08		1.76
MRA 1	4/17/2012	10:30	Cloudy/No Rain	BF	10.9	11.83	81.2	11.8	7.39	548	1.74	1.67		0
MRA 1	5/15/2012	10:15	Sunny	BF	15.9	10	68.6	5.9	7.49	161	0.8	1.1		0
MRA 1	6/12/2012	9:50	Light Rain	BF	15.6	9.23	55.1	5	6.9	77	0.41	1.2		0.14
Median					**11**	**11.185**	**73.65**	**6.85**	**7.03**	**146**	**0.82**	**1.62**		

Note: Data in red exceed applicable water quality criteria (see Table 4)

Table 7.
Monthly Instream Data

Site ID	Date	Time	Weather	Sampler Initials	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	FLAG?	Rainfall previous 24 hours
MRA 10	7/19/2011	9:35	Cloudy/No Rain	BF	16.1	8.83	61.1	7.7	7.39	345	0.42	2		0.01
MRA 10	8/16/2011	9:35	Sunny	JVH	17.7	8.63	61.4	5.5	7.04	162	0.18	2		0
MRA 10	9/20/2011	9:25	Sunny	BF	15	9.11	52.7	7.5	6.8	179	0.05	2.5		0
MRA 10	10/18/2011	9:40	Sunny	BF	10.6	9.88	75.9	6.1	6.3	328	0.48	2		0
MRA 10	11/8/2011	9:20	Cloudy/No Rain	BF	8.1	10.64	86	4.7	5.8	147	0.81	1.07		0.04
MRA 10	12/6/2011	9:45	Cloudy/No Rain	BF	4.3	12.34	98.3	4.3	6.4	74	3.01	1.54		0
MRA 10	1/24/2012	9:30	Heavy Rain	BF	7.3	11.2	79.7	21	6.81	93	2.86	1.13		0.41
MRA 10	2/14/2012	9:40	Light Rain	BF	7.1	11.44	90.5	8.1	7.06	88	2.64	1		0.04
MRA 10	3/13/2012	9:45	Heavy Rain	BF	4.9	11.49	70.5	123	6.3	2420	1.45	1.13		1.76
MRA 10	4/17/2012	9:55	Cloudy/No Rain	BF	10.3	11.33	82	10.5	6.77	248	1.73	1.99		0
MRA 10	5/15/2012	9:35	Sunny	BF	15.4	9.63	68.7	5	6.86	142	0.77	1.14		0
MRA 10	6/12/2012	9:20	Light Rain	BF	15.7	8.78	57.4	6.2	7.01	260	0.38	1.2	almost shut off	0.14
Median					**10.45**	**10.26**	**73.2**	**6.85**	**6.81**	**170.5**	**0.79**	**1.37**		

Site ID	Date	Time	Weather	Sampler Initials	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	FLAG?	Rainfall previous 24 hours	Total Copper (mg/L)	Dissolved Copper (mg/L)	Total Lead (mg/L)	Dissolved Lead (mg/L)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Hardness
PRI 1	7/19/2011	9:50	Cloudy/No Rain	BF	16.2	9.49	60.5	6.4	7.45	326	0.44	2		0.01	<0.0050	<0.0050	<0.0002	<0.0010	0.0146	<0.0100	21
PRI 1	8/16/2011	10:00	Sunny	JVH	17.9	9.58	60.2	5.4	7.17	86	0.24	2		0	<0.0025	<0.0025	<0.0005	<0.0005	<0.0025	<0.0025	21
PRI 1	9/20/2011	9:40	Sunny	BF	15.3	9.82	54	8.4	6.93	276	0.05	2		0	<0.0050	<0.0050	<0.0005	<0.0005	<0.0100	<0.0100	20
PRI 1	10/18/2011	10:00	Sunny	BF	11.2	11.01	76.7	4.4	7.1	185	0.47	2		0	<0.002	<0.0025	<0.0010	<0.0010	<0.002	<0.0025	28
PRI 1	11/8/2011	9:35	Cloudy/No Rain	BF	8.4	11.67	86.4	3.4	5.85	66	0.81	0.85		0.04	0.0052	0.0025	<0.0010	<0.0010	0.0025	<0.0025	31
PRI 1	12/6/2011	10:00	Cloudy/No Rain	BF	4.4	12.87	95.8	6.5	7.11	104	2.9	1.63		0	<0.0025	<0.0025	0.0006	<0.0005	0.0038	0.0025	32
PRI 1	1/24/2012	9:45	Heavy Rain	BF	7.4	11.5	75.5	25	6.1	166	2.52	1.38		0.41	0.0035	<0.0025	0.001	<0.0010	0.039	0.0196	25
PRI 1	2/14/2012	10:00	Light Rain	BF	7	11.83	90.3	8.2	6.82	93	2.68	0.88		0.04	<0.0025	<0.0025	<0.0005	<0.0005	0.0265	0.0196	33
PRI 1	3/13/2012	10:05	Heavy Rain	BF	5.1	11.85	70.1	130	6.1	1300	1.38	2.56		1.76	0.003	<0.0025	0.0012	<0.0005	0.0262	0.0136	22
PRI 1	4/17/2012	10:10	Cloudy/No Rain	BF	10.3	11.31	81.5	9.9	6.95	261	1.5	1.58		0	<0.0025	<0.0025	<0.0005	<0.0005	0.0097	0.0083	28
PRI 1	5/15/2012	9:45	Sunny	BF	15.2	9.9	66.7	6.1	7.32	88	0.85	1		0	<0.00250	<0.00250	<0.0005	<0.0005	0.0053	0.004	27
PRI 1	6/12/2012	9:40	Light Rain	BF	15.7	9.47	59.7	6.9	6.95	166	0.49	1.14		0.14	<0.0025	<0.0025	<0.0010	<0.0010	0.0065	0.0056	22
Median					**10.75**	**11.16**	**72.8**	**6.7**	**6.95**	**166**	**0.83**	**1.61**									**26**

Note: Data in red exceed applicable water quality criteria (see Table 4). Medians not calculated for metals due to the large number of censored values

Table 7. Monthly
Instream Data

Site ID	Date	Time	Weather	Sampler Initials	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	FLAG?	Rainfall previous 24 hours	Total Copper (mg/L)	Dissolved Copper (mg/L)	Total Lead (mg/L)	Dissolved Lead (mg/L)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Hardness
PRI 5	7/19/2011	11:00	Cloudy/No Rain	BF	18.1	8.81	76	4.1	7.05	236	0.43	2		0.01	0.0059	<0.0050	0.0005	<0.0010	0.046	<0.0100	84
PRI 5	8/16/2011	11:00	Sunny	JVH	18.8	8.74	80.6	4	7.09	291	0.25	2		0	<0.0025	<0.0025	<0.0010	<0.0010	0.0026	<0.0025	28
PRI 5	9/20/2011	11:20	Sunny	BF	17	8.95	83.9	3.9	7.1	921	0.12	2		0	0.0097	<0.0050	0.0033	<0.0005	0.0602	<0.0100	31
PRI 5	10/18/2011	11:20	Sunny	BF	11.8	10.22	81.4	6.6	6.35	98	0.51	2		0	0.004	<0.0025	0.0033	<0.0010	0.035	<0.0025	35
PRI 5	11/8/2011	10:45	Cloudy/No Rain	BF	9	10.95	82.2	4	6.22	156	0.73	1.28		0.04	<0.0025	<0.0025	<0.0010	<0.0010	0.0045	0.0038	37
PRI 5	12/6/2011	11:25	Cloudy/No Rain	BF	5.7	11.9	91.3	8.4	6.88	44	1.22	1.53		0	<0.0025	<0.0025	<0.0005	<0.0005	0.0083	0.0053	31
PRI 5	1/24/2012	10:45	Heavy Rain	BF	7.7	11.05	71	24.3	6.85	326	0.8	1.33		0.41	0.0031	<0.0025	0.0011	<0.0010	0.0198	0.0105	24
PRI 5	2/14/2012	11:00	Sunny	BF	8	11.4	89.5	7.5	6.71	41	1.06	1		0.04	<0.0025	<0.0025	<0.0005	<0.0005	0.015	0.0113	35
PRI 5	3/13/2012	11:15	Heavy Rain	BF	6.5	11.14	65.3	30.5	7.08	173	0.9	1.51		1.76	0.0031	<0.0025	0.0011	<0.0005	0.0267	0.0147	23
PRI 5	4/17/2012	11:00	Cloudy/No Rain	BF	10.8	11.46	78	7.2	7.5	75	0.89	1.84		0	<0.0025	<0.0025	<0.0005	<0.0005	0.0073	0.0061	25
PRI 5	5/15/2012	10:45	Sunny	BF	16.2	10.14	83.7	3.7	7.33	62	0.76	1.93		0	<0.00250	<0.00250	<0.0005	<0.0005	0.0102	0.0069	29
PRI 5	6/12/2012	10:20	Light Rain	BF	16	9.14	71.1	5	7.17	411	0.49	1.83		0.14	0.0076	0.0057	<0.0010	<0.0010	0.0188	0.0176	25
Median					**11.3**	**10.585**	**81**	**5.8**	**7.07**	**164.5**	**0.75**	**1.835**									**30**

Site ID	Date	Time	Weather	Sampler Initials	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	FLAG?	Rainfall previous 24 hours
SHE 1	7/19/2011	10:30	Cloudy/No Rain	BF	16.1	9.39	57.8	15.7	7.02	236	0.43	2		0.01
SHE 1	8/16/2011	10:35	Sunny	JVH	17.7	9.2	57.3	5.1	6.99	82	0.24	2		0
SHE 1	9/20/2011	10:20	Sunny	BF	15.2	9.76	52.2	7.7	6.3	249	0.11	2		0
SHE 1	10/18/2011	11:00	Sunny	BF	10.9	10.68	75.8	6.5	6.68	53	0.47	2		0
SHE 1	11/8/2011	10:15	Cloudy/No Rain	BF	8.1	11.48	87.2	4.3	6.08	58	0.8	0.8		0.04
SHE 1	12/6/2011	10:45	Cloudy/No Rain	BF	4.2	12.82	94.9	5.5	6.11	292	3.02	1.3		0
SHE 1	1/24/2012	10:20	Heavy Rain	BF	7.7	11.48	78.8	21	6.77	20	2.8	0.79		0.41
SHE 1	2/14/2012	10:30	Sunny	BF	7.2	11.64	89.3	11.1	7.21	99	2.79	0.82		0.04
SHE 1	3/13/2012	10:30	Heavy Rain	BF	5.1	11.77	70.4	95.4	7.02	2420	1.46	2.31		1.76
SHE 1	4/17/2012	10:45	Cloudy/No Rain	BF	10.2	11.33	81.2	9.3	7.23	219	1.56	1.54		0
SHE 1	5/15/2012	10:30	Sunny	BF	15.2	9.86	64.7	4.4	7.52	64	0.84	1.15		0
SHE 1	6/12/2012	10:00	Light Rain	BF	15.5	9.53	58.1	6	7.05	93	0.45	0.93		0.14
Median					**10.55**	**11.005**	**73.1**	**7.1**	**7.01**	**96**	**0.82**	**1.42**		

Note: Data in red exceed applicable water quality criteria (see Table 4). Medians not calculated for metals due to the large number of censored values

Table 7.
Monthly Instream Data

Site ID	Date	Time	Weather	Sampler Initials	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	FLAG?	Rainfall previous 24 hours
SHE 10	7/19/2011	9:10	Cloudy/No Rain	BF	16	9.41	56.8	9.4	7.32	411	0.4	2		0.01
SHE 10	8/16/2011	9:15	Sunny	JVH	17.5	9.37	56.7	5.4	6.98	129	0.31	2		0
SHE 10	9/20/2011	9:10	Sunny	BF	15	9.81	51.7	7.2	6.42	236	0.05	2		0
SHE 10	10/18/2011	9:25	Sunny	BF	10.9	10.64	78.2	4.4	6.4	84	0.5	2		0
SHE 10	11/8/2011	9:00	Cloudy/No Rain	BF	8.1	11.45	86.4	3.9	5.88	56	0.87	1.02		0.04
SHE 10	12/6/2011	9:30	Cloudy/No Rain	BF	4.7	12.62	93.6	4.9	5.92	218	3.05	1.44		0
SHE 10	1/24/2012	9:26	Heavy Rain	BF									No sample road closed	0.41
SHE 10	2/14/2012	9:20	Light Rain	BF	7.4	11.58	88.6	7.9	7.13	99	2.83	1.24		0.04
SHE 10	3/13/2012	9:30	Heavy Rain	BF	5.2	11.58	69.6	176	5.85	1686	1.49	2.83		1.76
SHE 10	4/17/2012	9:45	Cloudy/No Rain	BF	10.2	11.29	80.7	29.5	6.65	249	1.58	2.37		0
SHE 10	5/15/2012	9:20	Sunny	BF	14.9	10.03	64.1	7.8	6.8	84	0.79	1.16		0
SHE 10	6/12/2012	9:00	Light Rain	BF	15.3	9.62	57.3	6.3	6.7	116	0.5	1.09		0.14
Median					**10.9**	**10.64**	**69.6**	**7.2**	**6.65**	**129**	**0.79**	**2**		

Note: Data in red exceed applicable water quality criteria (see Table 4)

Table 7. Monthly
Instream Data

Site ID	Date	Time	Weather	Sampler Initials	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO2&NO3 (mg/L)	BOD (mg/L)	Winkler DO (mg/L)	Total Copper (mg/L)	Dissolved Copper (mg/L)	Total Lead (mg/L)	Dissolved Lead (mg/L)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Hardness	FLAG
GIB 15 Dup	7/19/2011	13:45	Cloudy/No Rain	BF	17.9	8.51	114		7.1	579	2.56	2	Winkler DO = 9.0								Turbidity sensor error. No
CRO 10 Dup	7/19/2011	9:50	Cloudy/No Rain	SC	14.7	8.7	59.8	7.9	6.47	73	0.31	2	Winkler DO = 8.72								
BAT 12 Dup	8/16/2011	10:35	Sunny	SC	16.2	8.92	47.7	9.4	6.66	387	0.17	2	Winkler DO = 9.0								
GLE 10 Dup	8/16/2011	13:55	Sunny	JVH	15	8.56	91.6	5.1	7.04	517	0.32	2	Winkler DO = 9.0								
SHE 10 Dup	9/20/2011	9:10	Sunny	BF	15	9.81	51.7	7.3	6.41	238	0.06	2	Winkler DO = 10.0								
BAT 1 Dup	9/20/2011	11:00	Sunny	JVH	14.6	7.31	65	15.3	6.91	1203	0.37	2.3	Winkler DO = 7.0								
MIC 10 Dup	10/18/2011	11:30	Sunny	JVH	11.1	10.65	74.9	5.1	7.19	148	0.52	2	Winkler DO = 10.71								
MRA 10 Dup	10/18/2011	9:40	Sunny	BF	10.6	9.87	75.9	6.1	6.35	272	0.43	2	Winkler DO = 9.80								
PRI 1 Dup	11/8/2011	9:35	Cloudy/No	BF	8.4	11.66	86.4	3.3	5.82	70	0.79	1	Winkler DO = 11.61	0.0052	0.0025	<0.0010	<0.0010	<0.0025	<0.0025	31	
CGT 5 Dup	11/8/2011	13:05	Cloudy/No Rain	JVH	8.9	7.32	72.4	10.7	7.01	98	0.56	1.29	Winkler DO = 7.27								
MRA 1 Dup	12/6/2011	10:35	Cloudy/No Rain	BF	4.4	12.85	95.6	4	7.3	80	3.01	1.45	Winkler DO = 12.83								
LPW 1 Dup	12/6/2011	13:00	Cloudy/No Rain	JVH	3.3	10.78	189.9	13.9	7.09	365	0.62	1.34	Winkler DO = 11.11								
CGT 5 Dup	1/24/2012	13:25	Heavy Rain	JVH	7.3	10.74	59.1	24.4	7.04	411	0.61	1.55	Winkler DO = 10.60								
SHE 1 Dup	1/24/2012	10:20	Heavy Rain	BF	7.7	11.49	78.7	21	6.75	67	2.81	0.85	Winkler DO = 11.40								
CGT 1 Dup	2/14/2012	13:40	Cloudy/No Rain	JVH	8	9.86	155.6	11.8	6.81	105	0.68	1.26	Winkler DO = 9.84								
CLA 1 Dup	2/14/2012	10:40	Sunny	BF	9	11.1	89	11	7.25	238	1.19	1.1	Winkler DO = 11.10	0.0072	0.0025	0.0006	<0.0005	0.0212	0.0101	32	
PRI 5 Dup	3/13/2012	11:15	Heavy	BF	6.5	11.16	65.2	30.4	7.09	276	0.84	1.34	Winkler DO = 11.15	0.0033	<0.0025	0.0011	<0.0005	0.0277	0.0151	22	
MIC 1 Dup	3/13/2012	9:40	Heavy Rain	JVH	5	11.89	68.7	118	7.2	2420	1.36	2.62	Winkler DO = 11.66								
GLE 1 Dup	4/17/2012	13:01	Cloudy/No Rain	BF	9.9	11.2	80.2	6.3	7.4	26	1.44	1.21	Winkler DO = 11.16								
CLA 10Dup	4/17/2012	10:10	Cloudy/No Rain	JVH	10.5	10.34	71	2.4	6.77	16	1.65	1.24	Winkler DO = 10.55	<0.0025	<0.0025	<0.0005	<0.0005	0.0084	0.0067	20	
CRO 1 Dup	5/15/2012	10:10	Sunny	JVH	12.2	10.39	64.1	6.2	7.02	387	0.51	0.78	Winkler DO = 11								
GIB 1 Dup	5/15/2012	13:08	Sunny	BF	16.8	9.4	57.4	8.2	7.46	43	1.38	0.93	Winkler DO = 10								
CRO 10 Dup	6/12/2012	10:30	Cloudy/No Rain	JVH	13.2	9.36	50.4	8.7	7.05	172	0.23	1.07	Winkler DO = 9.30								
GIB 15 Dup	6/12/2012	13:20	Light Rain	BF	16.3	9.01	99.3	8	7.16		1.98	0.75	Winkler DO = 9.00								

Table 8.
Continuous Instream Grade A and Grade B Data Qualifications

Grade Values	Temperature (˚C)	pH	Specific Conductivity (µS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)
A	± < 0.5	± ≤ 0.30	≤ 10%	± ≤ 3 or 5% (whichever is greater)	± ≤ 0.3
B	± 0.51 to 2.00	± > 0.3 to 0.50	> 10% to ≤ 15%	± ≤ 5 or 30% (whichever is greater)	± > 0.3 to ± ≤ 1.0

Note: As stated in the "Continuous Water Quality Monitoring Program Quality Assurance Project Plan", data grades are a result of the absolute difference (value or percent) of station instrument reading and audit instrument reading at the time of site audit

Table 9.

Monthly Medians Values for Continuous Instream Data

Monthly Medians for Turbidity at Continuous Instream Sites

	Jul 2011	Aug 2011	Sep 2011	Oct 2011	Nov 2011	Dec 2011	Jan 2012	Feb 2012	Mar 2012	Apr 2012	May 2012	Jun 2012
Station Name	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)
BAT3	NA	NA	20.25	20.93	10.87	8.60	21.28	12.19	NA	8.18	12.25	14.20
BAT12	8.64	6.97	6.95	8.67	7.78	5.19	15.50	8.17	15.06	10.77	9.02	9.59
CLK1	5.13	4.99	5.70	4.34	5.97	3.30	6.28	6.11	21.23	4.73	4.53	4.82
CLK12	5.36	7.58	8.61	5.00	4.67	2.98	4.17	4.44	NA	4.42	5.25	6.32
GLE3	NA	8.40	9.10	6.00	10.50	4.10	9.50	NA	13.10	8.50	5.30	6.00
GLE12	8.30	6.30	8.60	2.30	1.70	2.60	11.10	7.70	NA	9.30	3.00	2.40
MIC3	9.38	7.92	7.55	6.06	10.13	5.90	13.22	8.19	13.36	9.93	9.09	10.77
MIC12	10.43	9.86	NA	NA	13.20	NA	NA	NA	NA	NA	9.04	10.13
PRI3	5.39	NA	5.48	6.59	8.31	4.69	11.35	9.36	NA	7.54	3.72	6.63
PRI12	10.33	NA	11.37	11.27	NA	7.40	18.58	18.11	30.69	11.23	8.24	8.94

Monthly Medians for Specific Conductivity at Continuous Instream Sites

	Jul 2011	Aug 2011	Sep 2011	Oct 2011	Nov 2011	Dec 2011	Jan 2012	Feb 2012	Mar 2012	Apr 2012	May 2012	Jun 2012
Station Name	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)
BAT3	53.9	61.2	62.2	56.0	54.6	51.1	48.3	47.8	45.7	44.2	44.4	47.9
BAT12	46.8	48.9	52.9	49.4	44.6	41.7	39.5	45.5	36.6	40.1	43.7	40.5
CLK1	95.5	98.1	101.4	93.2	90.4	94.4	95.8	95.2	92.9	89.7	87.4	88.0
CLK12	72.2	73.6	76.5	73.0	72.0	73.0	76.3	75.7	75.5	72.4	69.7	68.1
GLE3	NA	128.0	134.0	125.0	112.0	109.0	87.0	93.0	97.0	88.0	95.0	109.0
GLE12	77.0	101.0	129.0	91.0	81.0	68.0	63.0	59.0	63.0	59.0	62.0	67.0
MIC3	62.2	62.2	54.5	83.1	97.2	97.9	87.1	93.0	81.0	81.8	70.4	56.9
MIC12	57.0	54.4	58.7	71.5	93.2	90.7	91.4	85.8	75.0	75.7	74.3	53.4
PRI3	89.6	97.2	96.8	94.1	93.3	99.4	95.8	93.7	84.0	84.1	87.8	86.3
PRI12	66.1	66.3	60.9	102.3	104.3	96.0	86.3	85.3	69.5	71.0	71.3	72.9

Presented median values consist of A and B grade data

NA = 60% of the continuous record for a given month is not represented by A and B grade data

Table 9.

Monthly Medians Values for Continuous Instream Data

Monthly Medians for Temperature at Continuous Instream Sites

	Jul 2011	Aug 2011	Sep 2011	Oct 2011	Nov 2011	Dec 2011	Jan 2012	Feb 2012	Mar 2012	Apr 2012	May 2012	Jun 2012
Station Name	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)
BAT3	16.24	17.47	16.22	13.11	9.38	6.53	7.86	7.72	8.14	10.23	12.06	14.07
BAT12	15.72	16.79	14.82	11.50	7.58	5.56	7.07	6.83	7.30	9.34	11.10	13.38
CLK1	16.29	17.28	16.75	14.30	11.10	7.96	9.26	9.14	9.54	11.57	13.10	14.58
CLK12	15.03	16.05	16.06	14.63	12.38	10.46	10.32	10.13	10.06	11.01	12.27	13.56
GLE3	NA	16.97	15.92	13.19	9.69	6.46	7.95	8.11	8.66	11.15	12.9	14.69
GLE12	14.32	15.59	15.14	11.85	7.96	5.35	7.18	7.30	7.77	9.81	10.97	12.38
MIC3	18.40	19.95	17.15	13.10	8.57	5.07	6.75	7.23	7.77	11.41	13.42	15.53
MIC12	17.80	19.42	16.60	12.75	8.95	5.61	7.10	7.45	8.00	11.44	13.05	15.63
PRI3	18.35	18.98	17.63	13.81	9.92	6.37	8.00	8.18	8.86	12.09	14.41	15.58
PRI12	17.60	18.57	16.39	12.93	9.13	6.33	7.91	7.89	9.02	9.45	13.22	15.57

Monthly Medians for pH at Continuous Instream Sites

	Jul 2011	Aug 2011	Sep 2011	Oct 2011	Nov 2011	Dec 2011	Jan 2012	Feb 2012	Mar 2012	Apr 2012	May 2012	Jun 2012
Station Name	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH
BAT3	6.65	6.91	6.70	6.39	6.75	6.83	6.38	6.57	6.55	6.51	6.82	6.95
BAT12	6.83	7.31	7.31	NA	6.99	7.20	6.99	7.33	6.79	7.25	7.17	7.20
CLK1	6.93	7.09	6.94	7.32	7.13	7.22	7.15	7.00	6.58	6.93	7.12	NA
CLK12	6.73	6.79	6.90	6.86	6.84	7.13	6.87	6.77	6.48	6.48	6.65	6.07
GLE3	NA	7.43	7.50	7.45	7.20	7.32	7.07	7.14	7.05	7.12	7.15	7.14
GLE12	7.18	7.22	7.05	7.20	7.12	7.08	7.08	7.10	7.12	7.14	7.12	7.27
MIC3	6.96	7.50	7.45	7.70	7.51	7.61	7.48	7.69	7.48	7.46	7.67	7.63
MIC12	7.25	7.11	7.15	7.32	7.18	7.20	6.83	7.05	6.83	7.02	7.19	7.17
PRI3	7.16	7.15	7.32	7.17	7.16	7.43	7.51	7.59	7.21	7.35	7.43	7.54
PRI12	6.61	6.49	6.44	7.03	6.87	6.66	6.51	6.46	6.20	6.27	6.91	7.09

Presented median values consist of A and B grade data

NA = 60% of the continuous record for a given month is not represented by A and B grade data

Table 9.

Monthly Medians Values for Continuous Instream Data

Monthly Medians for Dissolved Oxygen at Continuous Instream Sites

	Jul 2011	Aug 2011	Sep 2011	Oct 2011	Nov 2011	Dec 2011	Jan 2012	Feb 2012	Mar 2012	Apr 2012	May 2012	Jun 2012
Station Name	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)
BAT3	8.72	7.99	7.59	8.57	9.30	11.16	11.00	11.14	NA	10.33	9.84	9.17
BAT12	9.31	8.77	8.71	10.34	11.55	12.52	11.89	11.85	11.68	11.16	10.58	9.93
CLK1	9.29	9.13	9.14	9.60	10.49	11.66	11.29	11.30	11.02	10.44	9.91	9.47
CLK12	9.09	9.03	8.89	9.28	9.92	10.23	10.48	10.52	10.53	10.18	9.68	9.07
GLE3	NA	8.86	8.94	9.93	11.08	11.86	10.78	11.46	11.40	10.80	10.18	9.60
GLE12	9.65	9.11	8.71	10.23	11.06	11.75	NA	11.71	NA	10.92	10.67	10.08
MIC3	8.95	8.60	9.16	9.78	10.84	12.49	11.91	11.78	11.45	10.81	10.12	9.65
MIC12	8.85	8.67	9.47	10.03	10.61	12.21	11.24	11.29	10.92	10.27	9.87	9.53
PRI3	8.57	8.14	8.49	9.41	10.44	11.89	11.66	11.52	11.22	10.35	9.36	8.57
PRI12	8.53	8.17	8.58	9.02	9.26	10.54	10.29	10.35	9.91	10.01	9.23	8.64

Monthly Medians for Stage at Continuous Instream Sites

	Jul 2011	Aug 2011	Sep 2011	Oct 2011	Nov 2011	Dec 2011	Jan 2012	Feb 2012	Mar 2012	Apr 2012	May 2012	Jun 2012
Station Name	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)
BAT3	4.17	4.08	4.06	4.11	4.31	4.36	5.31	4.71	5.65	4.81	4.47	4.32
BAT12	4.09	3.95	3.83	3.99	4.09	4.42	4.88	5.06	5.34	5.10	4.94	4.83
CLK1	3.94	3.90	3.89	4.07	4.24	4.07	4.38	4.34	4.65	4.35	4.25	4.19
CLK12	3.98	3.97	3.96	3.98	4.11	4.02	4.19	4.12	4.36	4.12	4.07	4.02
GLE3	4.17	4.1	4.07	4.17	4.4	4.27	4.79	4.65	5.43	4.75	4.5	NA
GLE12	0.70	0.63	0.60	0.69	0.74	0.79	0.97	0.94	1.21	1.05	0.87	0.80
MIC3	5.37	5.23	5.10	4.97	5.32	5.34	6.49	5.95	7.01	6.24	5.75	5.97
MIC12	7.22	7.11	7.15	6.80	6.93	7.09	8.20	7.85	8.61	7.93	7.53	7.45
PRI3	4.24	4.17	4.15	4.21	4.36	4.31	4.62	4.54	4.90	4.56	4.39	4.34
PRI12	4.41	4.27	4.28	4.05	4.22	4.17	4.64	4.42	5.26	4.78	4.32	4.25

Presented median values consist of A and B grade data

NA = 60% of the continuous record for a given month is not represented by A and B grade data

Table 10.
Instream Storm Monitoring Data

Site Name: **CLK1**
Site Description: Lower Clark Creek just before confluence with Pringle Creek

Sample Collection Date/Time	E. Coli	Diss. Oxygen	pH	temp	Sp. Cond, field	Sp. Cond, comp	Cu	Cu diss	Zn	Zn diss	Pb	Pb diss	Hardness	NH3	NO3+NO2	Ortho P	TP	BODs	TSS
mm/dd/yyyy HH:MM	MPN/100 mL	mg/L	S.U	˚C	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
10/04/2011 17:47	770.1	9.33	6.69	15.7	50.3														
10/04/2011 17:57 - dup		9.33	6.7	15.7	49.9														
10/05/2011 11:30						53.8	0.0105	0.0047	0.0997	0.0285	0.0066	< 0.0010	17	0.105	0.39	0.034	0.209	4.0	65
11/16/2011 08:45	1986.3	10.67	6.93	9.65	76.07														
11/16/2011 08:46 - dup	1300	10.7	6.95	9.64	76.23														
11/17/2011 08:20						73.8	0.0045	< 0.0025	0.0404	0.0191	0.0069	< 0.0010	30	< 0.050	0.64	0.048	0.125	3.5	30.8
12/27/2011 16:54	1046.2	11.03	7.21	9.1	86.33														
12/29/2011 09:58						43.4	0.007	< 0.002	0.061	0.017	0.0056	< 0.0005	17	< 0.050	0.44	0.029	0.213	2.35	70.5
03/29/2012 13:32	6130	10.64	6.66	11	61.5														
03/30/2012 10:01						52.9	0.0069	< 0.0025	0.06	0.0181	0.0076	< 0.0005	20	< 0.050	0.81	0.032	0.203	2.3	81
04/19/2012 10:51	8164	10.73	7.12	10.94	48.82														
04/20/2012 09:25						73.1	0.0048	< 0.0025	0.0354	0.0128	0.0029	< 0.0005	23	< 0.050	0.96	0.014	0.106	3.87	33
06/07/2012 05:56	816	9.76	7.14	13.9	50.79														
06/08/2012 08:27						48.2	0.0081	< 0.0025	0.0613	0.0249	0.0128	< 0.0010	32	< 0.050	0.48	0.019	0.208	3.59	81.2
Median	**1300**	**10.66**	**6.94**	**10.97**	**56.15**	**53.35**	**0.00695**	**NA**	**0.0605**	**0.0186**	**0.0068**	**NA**	**21.5**	**NA**	**0.56**	**0.0305**	**0.2055**	**3.55**	**67.8**

Site Name: **PRI3**
Site Description: Lower Pringle Creek in Pringle Park, just upstream of confluence with Shelton Ditch

Sample Collection Date/Time	E. Coli	Diss. Oxygen	pH	temp	Sp. Cond, field	Sp. Cond, comp	Cu	Cu diss	Zn	Zn diss	Pb	Pb diss	Hardness	NH3	NO3+NO2	Ortho P	TP	BODs	TSS
mm/dd/yyyy HH:MM	MPN/100 mL	mg/L	S.U	˚C	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
10/04/2011 18:12	770.1	8.91	7.2	15.4	76.9														
10/05/2011 12:00						70.7	0.0048	0.0026	0.0232	0.0078	0.0019	< 0.0010	24	< 0.050	0.3	0.023	0.107	2.7	26
11/16/2011 09:11	172.2	10.54	7.08	8.23	87.34														
11/17/2011 09:00						76.2	0.0075	< 0.0025	0.0593	0.0191	0.0107	< 0.0010	31	< 0.050	0.44	0.037	0.214	QNS	QNS
12/27/2011 17:22	95.9	11.26 (11.06)	7.29	7.7	103.8														
12/29/2011 10:12						QNS	0.022	< 0.002	0.182	0.03	0.0197	0.0006	QNS	< 0.050	0.89	QNS	QNS	QNS	QNS
03/29/2012 13:46	2420	10.99	6.82	10.2	72.3														
03/30/2012 10:25						51.5	0.0071	< 0.0025	0.0607	0.0213	0.0056	< 0.0005	20	< 0.050	0.63	0.02	0.218	2.39	97
04/19/2012 11:23	1986	10.68 (10.55)	7.2	11.04	68.03														
04/20/2012 09:39						82.6	0.0062	0.0031	0.0136	0.008	0.0008	< 0.0005	29	< 0.050	0.93	0.011	0.042	1.44	10.5
06/07/2012 06:22	921	9.19	7.17	14.5	65.6														
06/07/2012 06:23 - dup	687	9.18	7.16	14.5	65.02														
06/08/2012 08:11						63.1	0.0037	< 0.0025	0.0278	0.0163	0.0034	< 0.0010	26	< 0.050	0.54	0.016	0.102	2.09	32
Median	**770.1**	**9.19**	**7.17**	**11.04**	**72.3**	**70.7**	**0.00665**	**NA**	**0.04355**	**0.0177**	**0.0045**	**NA**	**26**	**NA**	**0.585**	**0.02**	**0.107**	**2.24**	**29.0**

Site Name: **PRI12**
Site Description: Upper East Fork Pringle Creek

Sample Collection Date/Time	E. Coli	Diss. Oxygen	pH	temp	Sp. Cond, field	Sp. Cond, comp	Cu	Cu diss	Zn	Zn diss	Pb	Pb diss	Hardness	NH3	NO3+NO2	Ortho P	TP	BODs	TSS
mm/dd/yyyy HH:MM	MPN/100 mL	mg/L	S.U	˚C	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
10/04/2011 18:43	307.6	8.97 (8.75)	6.86	13.5	69														
10/05/2011 10:05						74.4	0.0068	0.0026	0.0195	0.0062	0.0006	< 0.0010	25	0.108	0.57	0.027	0.098	< 2.0	12
11/16/2011 09:34	161.6	9.56	6.66	7.4	111.9														
11/17/2011 10:25						94	0.0064	0.0025	0.0342	0.0138	0.0035	< 0.0010	39	< 0.050	0.93	0.024	0.17	2.6	34.8
12/27/2011 18:06	108.1	10.24	6.82	7.7	89.6														
12/27/2011 18:08 - dup	105																		
12/29/2011 09:16						71.6	0.005	< 0.002	0.017	0.006	0.0015	< 0.0005	28	< 0.050	1.02	0.022	0.216	1.57	45.5
03/29/2012 14:09	25	10.95	6.71	9.9	70.7														
03/30/2012 09:05						67.1	0.0032	< 0.0025	0.013	0.008	0.0009	< 0.0005	24	< 0.050	1.28	0.021	0.143	1.27	27
04/19/2012 12:22	135	10.22	6.82	10.29	77.82														
04/20/2012 08:43						81.9	< 0.0025	< 0.0025	0.0165	0.0083	< 0.0005	< 0.0005	29	< 0.050	1.37	0.01	0.042	0.84	10
06/07/2012 06:47	119	8.35	6.8	13.2	76.05														
06/08/2012 08:53						83.7	0.0067	0.0038	0.0324	0.0227	< 0.0010	< 0.0010	37	< 0.050	0.9	0.01	0.036	1.19	9.6
Median	**119**	**10.22**	**6.81**	**10.10**	**76.94**	**78.15**	**0.0064**	**0.0026**	**0.01825**	**0.00815**	**0.0012**	**NA**	**28.5**	**NA**	**0.975**	**0.0215**	**0.1205**	**1.27**	**19.5**

NA= Median not calculated because ≥ 50% of values were censored values

QNS= Quantity not Sufficient

Data in red exceed applicable water quality criteria (see Table 4)

Data in blue are QA/QC dissolved oxygen readings done using Winkler Titration

Table 11. Stormwater Monitoring Data

Site Name: **Electric**
Land use Type: Residential

Sample Collection Date/Time	E. Coli	Diss. Oxygen	pH	temp	Sp. Cond, field	Sp. Cond, comp	Cu	Cu diss	Zn	Zn diss	Pb	Pb diss	Hardness	NH3	NO3+NO2	Ortho P	TP	BOD5	TSS
mm/dd/yyyy HH:MM	MPN/100 mL	mg/L	S.U	˚C	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
10/04/2011 17:11	866.4	9.18	6.59	17.3	41.1														
10/4/2011 17:12 - dup	920.8																		
10/05/2011 11:00						37.4	0.0081	0.0049	0.0288	0.0164	0.0026	< 0.0010	13	< 0.050	0.22	0.075	0.178	4.9	27.5
11/16/2011 07:03	1046.2	10.56	6.97	11.3	67.41														
11/17/2011 08:40						70.5	0.005	0.0035	0.038	0.0298	0.0031	< 0.0010	23	< 0.050	0.67	0.148	0.21	7.4	12
03/29/2012 13:00	1733	10.59	6.57	11.6	35														
03/30/2012 09:37						38.4	0.0056	< 0.0025	0.0345	0.0214	0.0036	< 0.0005	15	< 0.050	0.4	0.047	0.214	2.7	37
04/19/2012 11:05	13000	10.62	6.69	11.68	23.97														
04/19/2012 11:06 dup	17330	10.62	6.73	12.21	26.59														
04/20/2012 09:12						63.3	0.0042	< 0.0050	0.0211	0.0158	0.0012	< 0.0005	21	< 0.050	0.74	0.046	0.089	3.6	11
Median	**1389.6**	**10.59**	**6.69**	**11.68**	**35**	**50.85**	**0.0053**	**0.0042**	**0.03165**	**0.0189**	**0.00285**	**NA**	**18**	**NA**	**0.535**	**0.061**	**0.194**	**4.25**	**19.75**

Site Name: **Hilfiker**
Land use Type: Commercial

Sample Collection Date/Time	E. Coli	Diss. Oxygen	pH	temp	Sp. Cond, field	Sp. Cond, comp	Cu	Cu diss	Zn	Zn diss	Pb	Pb diss	Hardness	NH3	NO3+NO2	Ortho P	TP	BOD5	TSS
mm/dd/yyyy HH:MM	MPN/100 mL	mg/L	S.U	˚C	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
10/04/2011 16:38	920.8	9.09	6.57	16.5	30.7														
10/04/2011 16:44 - dup		9.17	6.33	16.2	27.9														
10/05/2011 10:30						15.8	0.0122	0.0034	0.0746	0.0277	0.007	< 0.0010	6	0.154	< 0.05	0.014	0.184	4.6	61
11/16/2011 07:32	10460	11.82	6.38	7.28	37.19														
11/17/2011 09:20						25.1	0.0092	0.0058	0.1131	0.089	0.008	0.0021	13	0.062	0.14	0.053	0.139	15.1	23.6
03/29/2012 12:36	118	9.03	6.11	12	45.8														
03/30/2012 09:21						26	0.0075	0.0025	0.0598	0.0345	0.0051	< 0.0005	10	0.051	0.41	< 0.010	0.109	2.9	46
04/19/2012 10:45	248	10.53	6.38	11.37	11.98														
04/20/2012 08:57						14	0.0061	0.0028	0.0501	0.0274	0.0027	< 0.0005	6	0.07	0.15	0.01	0.074	7.0	25.5
Median	**584.4**	**9.17**	**6.38**	**12.00**	**30.70**	**20.45**	**0.00835**	**0.0031**	**0.0672**	**0.0311**	**0.00605**	**NA**	**8**	**0.066**	**0.15**	**0.014**	**0.124**	**5.8**	**35.75**

Site Name: **Salem Industrial**
Land use Type: Industrial

Sample Collection Date/Time	E. Coli	Diss. Oxygen	pH	temp	Sp. Cond, field	Sp. Cond, comp	Cu	Cu diss	Zn	Zn diss	Pb	Pb diss	Hardness	NH3	NO3+NO2	Ortho P	TP	BOD5	TSS
mm/dd/yyyy HH:MM	MPN/100 mL	mg/L	S.U	˚C	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
10/04/2011 19:16	866.4	8.25	6.01	14.7	31.7														
10/05/2011 12:30						32.6	0.0089	0.0046	0.1394	0.1127	0.0011	< 0.0010	11	< 0.050	0.15	0.052	0.208	2.8	24
11/16/2011 10:12	365.4	10.59	6.27	9.2	35.61														
11/17/2011 10:57						40.1	0.010	0.0041	0.129	0.0769	0.0037	< 0.0010	30	< 0.050	0.12	0.046	0.23	4.9	49.6
03/29/2012 09:30	44	10.47	6.93	9	28.7														
03/29/2012 9:31 - dup	68	10.54	6.86	8.8	25.7														
03/30/2012 10:53						25.7	0.0109	0.0033	0.167	0.133	0.002	< 0.0005	14	< 0.050	0.05	0.027	0.344	4.0	75
04/19/2012 11:55	291	9.93	6.52	11.5	20.37														
04/20/2012 10:18						24.2	0.0179	0.0059	0.137	0.094	0.0025	< 0.0005	11	< 0.050	0.08	0.026	0.319	4.2	109
Median	**291**	**10.47**	**6.52**	**9.2**	**28.70**	**29.15**	**0.01045**	**0.00435**	**0.1382**	**0.10335**	**0.00225**	**NA**	**12.5**	**NA**	**0.1**	**0.0365**	**0.2745**	**4.1**	**62.3**

NA= Median not calculated because ≥ 50% of values were censored values

Table 12. Pesticide Monitoring Data

Sample Date	Time:	Site Name	Land Use Type	Analyte	Amount Detected (µg/L)	Limit of Quantitation (µg/L)
4/16/2012	7:02	Electric	Residential	2,4-D	0.26	0.08
4/16/2012				MCPA	0.38	0.08
4/16/2012	7:04	Electric Dup	Residential	2,4-D	0.26	0.08
4/16/2012				MCPA	0.36	0.08
4/16/2012	6:48	Hilfiker	Commercial	Diuron	0.29	0.12
4/16/2012				2,4-D	0.093	0.08
4/16/2012	7:28	Salem Industrial	Industrial	Propiconazole	1.1	0.20
4/16/2012				Ethofumesate	0.35	0.30
4/16/2012				2,4-D	0.087	0.08

Note: Results only given for those analytes that were detected. See Attachement A for full suite of compounds that were analyzed

Table 13.
Mercury Monitoring Data

Sample Date	Time:	Site Name	Analyte	Result (ng/L)	MDL (ng/L)	MRL (ng/L)
2/28/2012	17:45	Electric-blank	Total Hg	U	0.15	0.40
2/28/2012	17:49	Electric-native	Total Hg	4.47	0.15	0.41
	18:04		Diss. Hg	1.63	0.15	0.40
	17:57		Total MeHg	0.147	0.02	0.05
	18:15		Diss. MeHg	0.085	0.02	0.05
	17:52	Electric-dup	Total Hg	4.32	0.15	0.40
	18:12		Diss. Hg	9.17	0.3	0.81
	18:01		Total MeHg	0.136	0.02	0.05
	18:19		Diss. MeHg	0.082	0.02	0.05
2/28/2012	16:51	Hilfiker-blank	Total Hg	U	0.15	0.41
2/28/2012	16:56	Hilfiker-native	Total Hg	4.32	0.62	1.66
	17:08		Diss. Hg	2.14	0.15	0.40
	17:03		Total MeHg	0.221	0.02	0.05
	17:14		Diss. MeHg	0.14	0.02	0.05
2/28/2012	16:59	Hilfiker-dup	Total Hg	8.79	0.62	1.66
	17:12		Diss. Hg	1.99	0.15	0.40
	17:06		Total MeHg	0.184	0.02	0.05
	17:17		Diss. MeHg	0.132	0.02	0.05

Note: Brooks Rand Labs used for analysis. Samples not composited and were field filtered in lab by City of Salem staff

Sample Date	Time:	Site Name	Analyte	Result (ng/L)	MDL (ng/L)	MRL (ng/L)
6/4/2012	7:37	Electric-blank	Total Hg	ND	0.08	0.50
6/4/2012	7:41	Electric-native	Total Hg	4.87	0.08	0.50
	7:47		Diss. Hg	3.02	0.08	0.50
	7:52		Total MeHg	0.139	0.026	0.05
	7:57		Diss. MeHg	0.088	0.026	0.05
	7:44	Electric-dup	Total Hg	4.89	0.08	0.50
	7:50		Diss. Hg	3.02	0.08	0.50
	7:55		Total MeHg	0.116	0.026	0.05
	7:59		Diss. MeHg	0.081	0.026	0.05
6/4/2012	7:06	Hilfiker-native	Total Hg	6.28	0.08	0.50
	7:08		Diss. Hg	4.63	0.08	0.50
	7:10		Total MeHg	0.139	0.026	0.05
	7:13		Diss. MeHg	0.086	0.026	0.05

Note: Frontier Global Sciences used for analysis. Samples were composited to help eliminate discrepancies in data due to length of time between total and dissolved Hg and MeHg sample collection

U= Result is ≤ the MDL

ND = Non Detect

Table 14.

Mercury Monitoring - Additional Data

Site Name:	**Electric**						
Sample Date/Time:	**Sulfate**	**TSS**	**Alkalinity**	**DOC**	**TOC**	**pH**	**Sp. Cond**
06/04/2012 08:03	3.79	3.60	23.40				
06/04/2012 08:04				5.25			
06/04/2012 08:06					5.51		
06/04/2012 08:10						6.86	78.50
Site Name:	**Electric-duplicate**						
Sample Date/Time:	**Sulfate**	**TSS**	**Alkalinity**	**DOC**	**TOC**	**pH**	**Sp. Cond**
06/04/2012 08:08	3.92	U	21.90				
06/04/2012 08:09				5.08			
06/04/2012 08:15						6.86	80.40
Site Name:	**Hilfiker**						
Sample Date/Time:	**Sulfate**	**TSS**	**Alkalinity**	**DOC**	**TOC**	**pH**	**Sp. Cond**
06/04/2012 07:15	0.80	3.60	U				
06/04/2012 07:16				4.46			
06/04/2012 07:18					5.34		
06/04/2012 07:20						6.20	23.76
Reporting Limit:	**0.10 mg/L**	**2.0 mg/L**	**4.0 mg/L**	**0.5 mg/L**	**0.5 mg/L**		

U= Not detected at specified reporting limit

Note: CH2MHill used for analysis; pH and specific conductivity are field measurements

Table 15.

Benthic Macroinvertebrate Monitoring Data (Reporting Year 2011/12)

Benthic Invertebrate Index of Biological Integrity-BIBI (modified Karr 1998)

Metric	**Clark Creek**		**East Fork Pringle Creek**		**Pringle Creek**	
	Value	**Score**[a]	**Value**	**Score**[a]	**Value**	**Score**[a]
Total Number of Taxa[b]	30	3	35	3	34	3
Number of Ephemeroptera Taxa[b]	1	1	1	1	1	1
Number of Plecoptera Taxa[b]	0	1	0	1	0	1
Number of Trichoptera Taxa[b]	1	1	0	1	2	1
Number of Long-lived Taxa[b]	3	3	3	3	4	3
Number of Intolerant Taxa[b]	2	1	1	1	1	1
Percent Tolerant Taxa[c]	20.13	3	51.49	1	17.85	5
Percent Predators[b]	4.63	1	3.12	1	1.46	1
Number of Clinger Taxa[b]	6	1	10	1	10	1
Percent Dominance (3 Taxa)[c]	46.99	5	63.65	3	53.36	3
Total BIBI Score[d]:	**n/a**	**20**	**n/a**	**16**	**n/a**	**20**
Biological Condition:	**Low**		**Low**		**Low**	

Notes:
a. Each metric scored: 1 = Low; 3 = Moderate; 5 = High
b. Metric value generally decreases with declining biological integrity
c. Metric value general increases with declining biological integrity
d. Key to Total BIBI Scores:

BIBI scores 0 – 24 = Low biological integrity   BIBI scores 25 – 39 = Moderate biological integrity   BIBI scores 39 – 50 = High biological integrity

Source: "Results of Benthic Macroinvertebrate Sampling, Fish Sampling, and Physical Habitat Data Collection for Pringle Creek and Clark Creek in Salem, Oregon", Pacific Habitat Services, Inc.; June 28, 2012. See Attachment B

Table 16.

Benthic Macroinvertebrate Monitoring Data (Reporting Year 2011/12)

Other Community Composition Metrics that are Indicative of Biological Condition

Metric	**Clark Creek**		**East Fork Pringle**		**Pringle Creek**	
	Value	**Score**[a]	**Value**	**Score**[a]	**Value**	**Score**[a]
Total Abundance[b]	998	L	1840	H	2736	H
EPT Taxa Richness[b]	2	L	1	L	3	L
Predator Richness[b]	4	L	6	L	2	L
Scraper Richness[b]	2	L	3	L	3	L
Shredder Richness[b]	2	L	1	L	2	L
Percent Intolerant Taxa[b]	20.37	H	1.48	L	0.29	L
Percent *Baetis tricaudatus* [c]	8.33	H	0.59	H	7.75	H
Percent Collector[c]	76.39	L	43.77	M	66.08	L
Percent Parasite[c]	0.93	H	2.97	H	1.61	H
Percent Oligochaeta[c]	18.75	L	6.23	L	24.42	L
Number of Tolerant taxa[c]	9	M	12	L	10	L
Percent Simuliidae[c]	3.47	H	12.02	L	4.97	H
Percent Chironomidae	55.09	L	25.22	M	50.73	L

Notes:

a. Low (L), moderate (M), and high (H) scores compared with a Pacific Northwest montane stream with high biological integrity.

b. Metric value generally decreases with declining biological integrity

c. Metric value generally increases with declining biological integrity

Source: "Results of Benthic Macroinvertebrate Sampling, Fish Sampling, and Physical Habitat Data Collection for Pringle Creek and Clark Creek in Salem, Oregon", Pacific Habitat Services, Inc.; June 28, 2012. See Attachment B

Table 17.

Benthic Macroinvertebrate Monitoring Data (Reporting Year 2011/12)

Fish Sampling Results

Fish Species	**Sampling Reach**		
	East Fork Pringle Creek	**Clark Creek**	**Pringle Creek**[a]
Sculpin	14	52	-
Redside Shiner	47	52	-
Three-spine Stickleback	3	-	-
Cutthroat trout	1	-	-
Speckled Dace	35	7	-
Total	**100**	**111**	**-**

Notes: a. Reach not sampled because necessary permit from NMFS could not be obtained in time to meet schedule constraints.

Source: "Results of Benthic Macroinvertebrate Sampling, Fish Sampling, and Physical Habitat Data Collection for Pringle Creek and Clark Creek in Salem, Oregon", Pacific Habitat Services, Inc.; June 28, 2012. See Attachment B

Table 18.
Willamette River Water Quality Data

Willamette River at River Mile 83

	Date	Alkalinity	BODs	Sp. Cond, field	DO	DO %Saturation	Ecoli,QT	NH3-ISE, lo-level	NO3+NO2	pH, field	TDS calc.	Temp, field	T-Phos	TS	TSS	Turb, field
Site Name	m/dd/yyyy	mg/L	mg/L	µS/cm	mg/L		MPN/100mL	mg/L	mg/L	S.U	mg/L	ºC	mg/L	mg/L	mg/L	NTU
Railroad Bridge	7/26/2011	25	0.58	49.7	8.9	96	5	< 0.05	0.16	7.44	57	18.8	0.034	60	3.2	1.72
Railroad Bridge	8/9/2011	24	0.50	50.6	9.1	96	10	< 0.05	0.13	7.48	60	18.2	0.038	64	3.6	2.32
Railroad Bridge	8/16/2011	26	0.56	49.7	9.2	98	1	< 0.05	0.1	7.4	57	18.4	0.032	61	4	2.42
Railroad Bridge	9/13/2011	24	0.93	47.4	9.3	96	11	< 0.05	0.07	7.43	52	17.2	0.035	61	8.8	3.43
Railroad Bridge	9/27/2011	22	0.60	46.4	9.7	97	13	< 0.05	0.08	7.31	51	15.3	0.036	59	8.4	3.02
Railroad Bridge	10/11/2011	24	0.70	45.6	9.9	96	22	< 0.05	0.09	7.34	49	13.9	0.047	57	7.6	3.75
Railroad Bridge	11/15/2011	25	0.77	49.1	10.9	97	9	< 0.05	0.09	7.27	61	10.1	0.03	65	3.6	2.68
Railroad Bridge	2/28/2012	23	1.43	49.2	11.6	94	28	< 0.05	0.39	7.23	64	6.3	0.052	72	8	11.4
Railroad Bridge	4/24/2012	21	0.68	38.9	10.0	94	20	< 0.05	0.22	7.3	52	12.6	0.04	60	8	8.31
Railroad Bridge	5/22/2012	24	1.01	46.9	10.3	96	28	< 0.05	0.16	7.3	48	12.4	0.029	52	3.6	3.6
Railroad Bridge	5/29/2012	23	0.75	40.7	10.7	99	24	< 0.05	0.07	7.3	43	12.0	0.032	48	5.2	5.47
Railroad Bridge	6/12/2012	26	0.73	38.3	10.1	98	21	< 0.05	0.07	7.29	45	14.1	0.034	52	7.2	6.27
Railroad Bridge	6/19/2012	27	0.54	45.0	9.7	98	10	< 0.05	0.11	7.23	54	15.8	0.025	58	4.4	2.39
	Median	**24**	**0.7**	**46.9**	**9.9**	**96**	**13.4**	**N/A**	**0.1**	**7.3**	**52.2**	**14.1**	**0.034**	**60**	**5.2**	**3.43**

Willamette River at River Mile 83 (Field Duplicate taken at Railroad Bridge)

	Date	Alkalinity	BODs	Sp. Cond, field	DO	DO %Saturation	Ecoli,QT	NH3-ISE, lo-level	NO3+NO2	pH, field	TDS calc.	Temp, field	T-Phos	TS	TSS	Turb, field
Site Name	m/dd/yyyy	mg/L	mg/L	µS/cm	mg/L		MPN/100mL	mg/L	mg/L	S.U	mg/L	ºC	mg/L	mg/L	mg/L	NTU
Field Duplicate	7/26/2011	25	0.63	49.8	8.9	95	4	< 0.05	0.14	7.46	63	18.8	0.033	66	3.2	1.93
Field Duplicate	8/9/2011	24	0.50	50.5	9.1	96	4	< 0.05	0.12	7.48	75	18.2	0.036	79	4	2.26
Field Duplicate	8/16/2011	26	0.57	50.1	9.2	98	2	< 0.05	0.1	7.51	60	18.3	0.033	64	4.4	1.78
Field Duplicate	9/13/2011	24	0.86	47.4	9.3	96	11	< 0.05	0.06	7.45	52	17.2	0.035	59	6.8	3.91
Field Duplicate	9/27/2011	24	0.51	46.4	9.8	98	9	< 0.05	0.08	7.39	51	15.3	0.037	59	7.6	2.82
Field Duplicate	10/11/2011	24	0.62	45.5	9.8	96	25	< 0.05	0.08	7.37	52	13.9	0.048	59	7.2	4.11
Field Duplicate	11/15/2011	25	0.87	49.0	10.8	96	3	< 0.05	0.08	7.37	61	10.1	0.032	64	2.8	2.9
Field Duplicate	2/28/2012	23	1.37	49.3	11.6	94	12	< 0.05	0.32	7.28	63	6.3	0.052	70	7.2	11.6
Field Duplicate	4/24/2012	21	0.75	39.0	10.0	94	10	< 0.05	0.19	7.31	51	12.6	0.041	59	8	8.52
Field Duplicate	5/22/2012	24	0.94	46.8	10.5	98	19	< 0.05	0.16	7.32	53	12.4	0.028	57	4	2.75
Field Duplicate	5/29/2012	24	0.74	40.9	10.5	98	20	< 0.05	0.06	7.35	50	12.1	0.032	56	5.6	5.07
Field Duplicate	6/12/2012	26	0.62	38.2	10.0	97	23	< 0.05	0.06	7.33	42	14.1	0.033	49	6.8	6.43
Field Duplicate	6/19/2012	27	0.57	44.9	9.7	98	10	< 0.05	0.11	7.3	55	15.8	0.027	59	3.6	2.7
	Median	**24**	**0.63**	**46.8**	**9.8**	**96**	**10**	**N/A**	**0.1**	**7.37**	**53**	**14.1**	**0.033**	**59**	**5.6**	**2.9**

Note: Willamette River monitoring is not identified in the City's Surface and Stormwater Monitoring Plan: however, it is identified in the City of Salem Stormwater Management Plan 2010

Table 18.
Willamette River Water Quality Data

Willamette River at River Mile 82.9

	Date	Alkalinity	BODs	Sp. Cond, field	DO	DO %Saturation	Ecoli,QT	NH3-ISE, lo-level	NO3+NO2	pH, field	TDS calc.	Temp, field	T-Phos	TS	TSS	Turb, field
Site Name	m/dd/yyyy	mg/L	mg/L	µS/cm	mg/L		MPN/100mL	mg/L	mg/L	S.U	mg/L	ºC	mg/L	mg/L	mg/L	NTU
Mill Creek	7/26/2011	26	0.79	50.2	9.4	100	161	< 0.05	0.28	7.6	69	18.4	0.05	75	6.4	5.42
Mill Creek	8/9/2011	26	0.66	50.6	9.4	98	29	< 0.05	0.15	7.48	62	17.7	0.041	68	5.6	3.17
Mill Creek	8/16/2011	26	0.60	50.3	9.0	96	72	< 0.05	0.18	7.56	54	18.1	0.041	59	4.8	4.03
Mill Creek	9/13/2011	24	0.83	42.4	9.4	98	172	< 0.05	0.12	7.53	46	17.6	0.049	53	6.8	5.52
Mill Creek	9/27/2011	25	1.53	45.0	9.8	99	687	< 0.05	0.16	7.42	59	15.5	0.061	68	9.2	9.04
Mill Creek	10/11/2011	32	1.22	58.2	10.0	97	980	< 0.05	0.44	7.46	68	14.0	0.07	76	8.4	7.51
Mill Creek	11/15/2011	32	1.21	64.5	11.2	98	89	< 0.05	0.57	7.38	77	9.4	0.06	79	2.4	3.16
Mill Creek	2/28/2012	23	1.54	66.4	12.1	98	23	< 0.05	2.14	7.33	70	6.4	0.04	73	3.2	7.49
Mill Creek	4/24/2012	**No Sample**														
Mill Creek	5/22/2012	25	1.34	47.7	10.3	96	727	< 0.05	0.69	7.33	51	12.4	0.049	59	7.6	7.37
Mill Creek	5/29/2012	24	0.67	44.1	10.6	99	29	< 0.05	0.14	7.38	52	12.2	0.033	57	4.8	4.61
Mill Creek	6/12/2012	26	0.85	45.2	9.6	97	345	< 0.05	0.53	7.32	48	15.8	0.043	56	8	7.09
Mill Creek	6/19/2012	28	0.73	43.9	9.8	97	162	< 0.05	0.48	7.37	54	14.8	0.048	61	6.8	6.56
	Median	**26**	**0.84**	**48.95**	**9.8**	**98**	**161.35**	**N/A**	**0.36**	**7.4**	**56.5**	**15.15**	**0.0485**	**64.5**	**6.6**	**6.04**

Willamette River at River Mile 81

	Date	Alkalinity	BODs	Sp. Cond, field	DO	DO %Saturation	Ecoli,QT	NH3-ISE, lo-level	NO3+NO2	pH, field	TDS calc.	Temp, field	T-Phos	TS	TSS	Turb, field
Site Name	m/dd/yyyy	mg/L	mg/L	µS/cm	mg/L		MPN/100mL	mg/L	mg/L	S.U	mg/L	ºC	mg/L	mg/L	mg/L	NTU
Sunset Park	7/26/2011	25	0.66	50.0	9.2	99	11	< 0.05	0.16	7.52	67	19.0	0.036	73	5.6	2.88
Sunset Park	8/9/2011	26	0.54	52.1	9.4	101	11	0.06	0.1	7.55	58	18.6	0.036	63	4.8	2.51
Sunset Park	8/16/2011	26	0.61	50.9	9.3	100	3	< 0.05	0.1	7.49	57	18.6	0.034	62	4.8	2.52
Sunset Park	9/13/2011	25	0.83	47.5	9.5	99	12	< 0.05	0.06	7.47	56	17.3	0.036	65	8.8	4.17
Sunset Park	9/27/2011	24	0.70	46.3	9.7	97	76	< 0.05	0.08	7.43	56	15.3	0.037	62	5.6	3.14
Sunset Park	10/11/2011	24	0.68	46.2	9.9	96	67	< 0.05	0.08	7.43	54	13.9	0.048	61	6.8	4.33
Sunset Park	11/15/2011	25	0.83	49.7	11.2	99	10	< 0.05	0.08	7.34	59	10.1	0.032	63	3.6	2.66
Sunset Park	2/28/2012	23	1.43	50.7	11.6	94	20	< 0.05	0.44	7.28	66	6.2	0.053	73	6.8	11.1
Sunset Park	4/24/2012	22	0.85	40.0	10.1	95	26	< 0.05	0.22	7.22	56	12.8	0.042	64	8	8.18
Sunset Park	5/22/2012	26	0.95	47.4	10.4	98	78	< 0.05	0.2	7.33	52	12.5	0.029	56	4.4	3.36
Sunset Park	5/29/2012	24	0.65	40.6	10.6	99	23	< 0.05	0.11	7.36	49	12.2	0.034	54	5.2	4.83
Sunset Park	6/12/2012	25	0.65	39.0	10.0	98	30	< 0.05	0.08	7.33	45	14.3	0.034	51	6.4	5.85
Sunset Park	6/19/2012	31	0.69	45.3	9.8	99	18	< 0.05	0.13	7.32	56	15.9	0.027	60	4	4.11
	Median	**25**	**0.69**	**47.4**	**9.9**	**99**	**20**	**N/A**	**0.1**	**7.36**	**56**	**14.3**	**0.036**	**62**	**5.6**	**4.11**

Note: Willamette River monitoring is not identified in the City's Surface and Stormwater Monitoring Plan: however, it is identified in the City of Salem Stormwater Management Plan 2010

Table 18.
Willamette River Water Quality Data

Willamette River at River Mile 78

	Date	Alkalinity	BODs	Sp. Cond, field	DO	DO %Saturation	Ecoli,QT	NH3-ISE, lo-level	NO3+NO2	pH, field	TDS calc.	Temp, field	T-Phos	TS	TSS	Turb, field
Site Name	m/dd/yyyy	mg/L	mg/L	µS/cm	mg/L		MPN/100mL	mg/L	mg/L	S.U	mg/L	ºC	mg/L	mg/L	mg/L	NTU
WLTP 150 feet	7/26/2011	26	0.67	52.8	9.1	98	4	0.13	0.14	7.53	77	19.1	0.053	82	4.8	1.89
WLTP 150 feet	8/9/2011	27	0.60	55.2	9.2	99	5	0.15	0.12	7.5	65	18.6	0.051	69	4	2.42
WLTP 150 feet	8/16/2011	27	0.65	55.4	9.4	101	3	0.18	0.11	7.46	56	18.7	0.055	61	5.2	2.44
WLTP 150 feet	9/13/2011	26	0.92	49.7	9.4	97	6	0.08	0.06	7.45	57	17.3	0.046	66	8.8	2.94
WLTP 150 feet	9/27/2011	25	0.58	49.9	9.8	98	30	0.08	0.09	7.42	55	15.3	0.044	60	4.8	3.7
WLTP 150 feet	10/11/2011	25	0.69	47.7	10.0	97	34	0.11	0.09	7.47	49	13.9	0.058	57	7.6	3.87
WLTP 150 feet	11/15/2011	25	0.86	51.3	10.8	96	6	0.17	0.1	7.36	68	10.1	0.044	72	3.6	2.86
WLTP 150 feet	2/28/2012	24	1.94	50.9	11.8	96	12	0.05	0.41	7.34	64	6.4	0.057	71	7.2	11.9
WLTP 150 feet	4/24/2012	23	0.79	39.8	10.1	95	12	< 0.05	0.22	7.25	54	12.7	0.043	61	7.2	8.21
WLTP 150 feet	5/22/2012	26	0.86	47.7	10.5	98	36	< 0.05	0.18	7.34	36	12.5	0.034	40	3.6	3
WLTP 150 feet	5/29/2012	25	0.72	41.3	10.6	99	23	0.06	0.1	7.36	53	12.2	0.041	58	5.2	5.11
WLTP 150 feet	6/12/2012	24	0.64	40.2	10.0	98	23	< 0.05	0.08	7.29	46	14.3	0.035	52	6.4	4.83
WLTP 150 feet	6/19/2012	32	0.65	46.3	9.8	100	17	0.05	0.11	7.34	58	16.0	0.035	62	4	2.76
	Median	**25**	**0.69**	**49.7**	**10**	**98**	**12**	**0.09**	**0.11**	**7.36**	**56**	**14.3**	**0.044**	**61**	**5.2**	**3**

Willamette River at River Mile 77

	Date	Alkalinity	BODs	Sp. Cond, field	DO	DO %Saturation	Ecoli,QT	NH3-ISE, lo-level	NO3+NO2	pH, field	TDS calc.	Temp, field	T-Phos	TS	TSS	Turb, field
Site Name	m/dd/yyyy	mg/L	mg/L	µS/cm	mg/L		MPN/100mL	mg/L	mg/L	S.U	mg/L	ºC	mg/L	mg/L	mg/L	NTU
Spongs Landing	7/26/2011	24	0.66	51.4	9.4	101	8	0.05	0.17	7.59	67	19.1	0.041	72	4.8	1.92
Spongs Landing	8/9/2011	26	0.60	53.3	9.4	101	4	0.09	0.13	7.55	60	18.7	0.048	64	4	3.13
Spongs Landing	8/16/2011	27	0.61	53.9	9.5	102	3	0.10	0.1	7.58	60	18.8	0.046	64	4.4	2.02
Spongs Landing	9/13/2011	25	0.84	48.6	9.5	99	11	0.05	0.06	7.53	55	17.3	0.041	61	6.4	3.01
Spongs Landing	9/27/2011	25	0.54	48.3	9.8	98	21	0.06	0.08	7.45	55	15.3	0.042	60	4.8	3.05
Spongs Landing	10/11/2011	24	0.78	47.2	10.0	97	33	0.08	0.08	7.51	47	14.0	0.056	55	8	3.89
Spongs Landing	11/15/2011	26	1.05	50.1	10.9	97	5	0.06	0.09	7.49	60	10.1	0.036	64	3.6	2.82
Spongs Landing	2/28/2012	23	1.41	50.3	11.8	96	11	0.06	0.38	7.36	66	6.4	0.057	74	7.6	11.5
Spongs Landing	4/24/2012	22	0.82	40.5	10.1	95	16	< 0.05	0.23	7.3	52	12.7	0.042	60	8	8.55
Spongs Landing	5/22/2012	26	1.04	47.7	10.4	98	50	< 0.05	0.17	7.39	36	12.5	0.032	40	4.4	3.25
Spongs Landing	5/29/2012	24	0.73	40.9	10.7	100	25	< 0.05	0.1	7.42	52	12.2	0.039	57	5.2	4.85
Spongs Landing	6/12/2012	28	0.72	38.8	10.1	99	15	< 0.05	0.06	7.38	39	14.3	0.037	45	6.4	5.32
Spongs Landing	6/19/2012	32	0.66	45.6	9.9	101	12	< 0.05	0.11	7.4	55	16.0	0.031	59	4	2.79
	Median	**25**	**0.73**	**48.3**	**10**	**99**	**12**	**0.06**	**0.1**	**7.45**	**55**	**14.3**	**0.041**	**60**	**4.8**	**3.13**

Note: Willamette River monitoring is not identified in the City's Surface and Stormwater Monitoring Plan: however, it is identified in the City of Salem Stormwater Management Plan 2010

Table 18.
Willamette River Water Quality Data

Willamette River at River Mile 71																
	Date	Alkalinity	BODs	Sp. Cond, field	DO	DO %Saturation	Ecoli,QT	NH3-ISE, lo-level	NO3+NO2	pH, field	TDS calc.	Temp, field	T-Phos	TS	TSS	Turb, field
Site Name	m/dd/yyyy	mg/L	mg/L	µS/cm	mg/L		MPN/100mL	mg/L	mg/L	S.U	mg/L	ºC	mg/L	mg/L	mg/L	NTU
Wheatland Ferry	7/26/2011	24	0.72	52.6	9.1	99	10	0.07	0.19	7.49	59	19.4	0.047	63	3.6	2.33
Wheatland Ferry	8/9/2011	27	0.68	54.0	9.2	99	6	0.08	0.14	7.54	63	19.0	0.045	67	3.6	2.62
Wheatland Ferry	8/16/2011	27	0.77	53.7	9.4	102	2	0.06	0.12	7.51	60	19.0	0.048	65	5.2	2.07
Wheatland Ferry	9/13/2011	25	0.95	49.4	9.3	97	14	< 0.05	0.08	7.46	65	17.4	0.046	72	6.8	3.04
Wheatland Ferry	9/27/2011	25	0.60	47.6	9.8	98	20	< 0.05	0.09	7.41	56	15.4	0.043	63	7.2	3.29
Wheatland Ferry	10/11/2011	25	0.70	48.0	10.0	97	36	0.07	0.09	7.49	51	14.0	0.056	59	7.6	3.88
Wheatland Ferry	11/15/2011	**No Sample**														
Wheatland Ferry	2/28/2012	25	1.45	52.1	11.8	96	26	0.07	0.4	7.34	59	6.4	0.06	67	7.6	11.6
Wheatland Ferry	4/24/2012	23	0.85	40.0	10.1	95	11	< 0.05	0.2	7.21	57	12.8	0.044	64	7.2	7.88
Wheatland Ferry	5/22/2012	27	0.97	49.1	10.4	98	32	< 0.05	0.19	7.32	42	12.5	0.034	46	3.6	3.33
Wheatland Ferry	5/29/2012	24	0.68	40.8	10.7	100	22	< 0.05	0.09	7.32	51	12.3	0.043	56	4.8	6.07
Wheatland Ferry	6/12/2012	28	0.77	39.9	10.1	99	19	< 0.05	0.09	7.28	41	14.3	0.041	48	6.8	5.34
Wheatland Ferry	6/19/2012	32	0.72	46.3	9.8	100	8	< 0.05	0.14	7.43	56	16.1	0.035	61	4.8	2.3
	Median	**25**	**0.75**	**48.55**	**9.9**	**98.5**	**16.25**	**0.07**	**0.13**	**7.42**	**56.5**	**14.85**	**0.0445**	**63**	**6**	**3.31**

Note: Willamette River monitoring is not identified in the City's Surface and Stormwater Monitoring Plan: however, it is identified in the City of Salem Stormwater Management Plan 2010

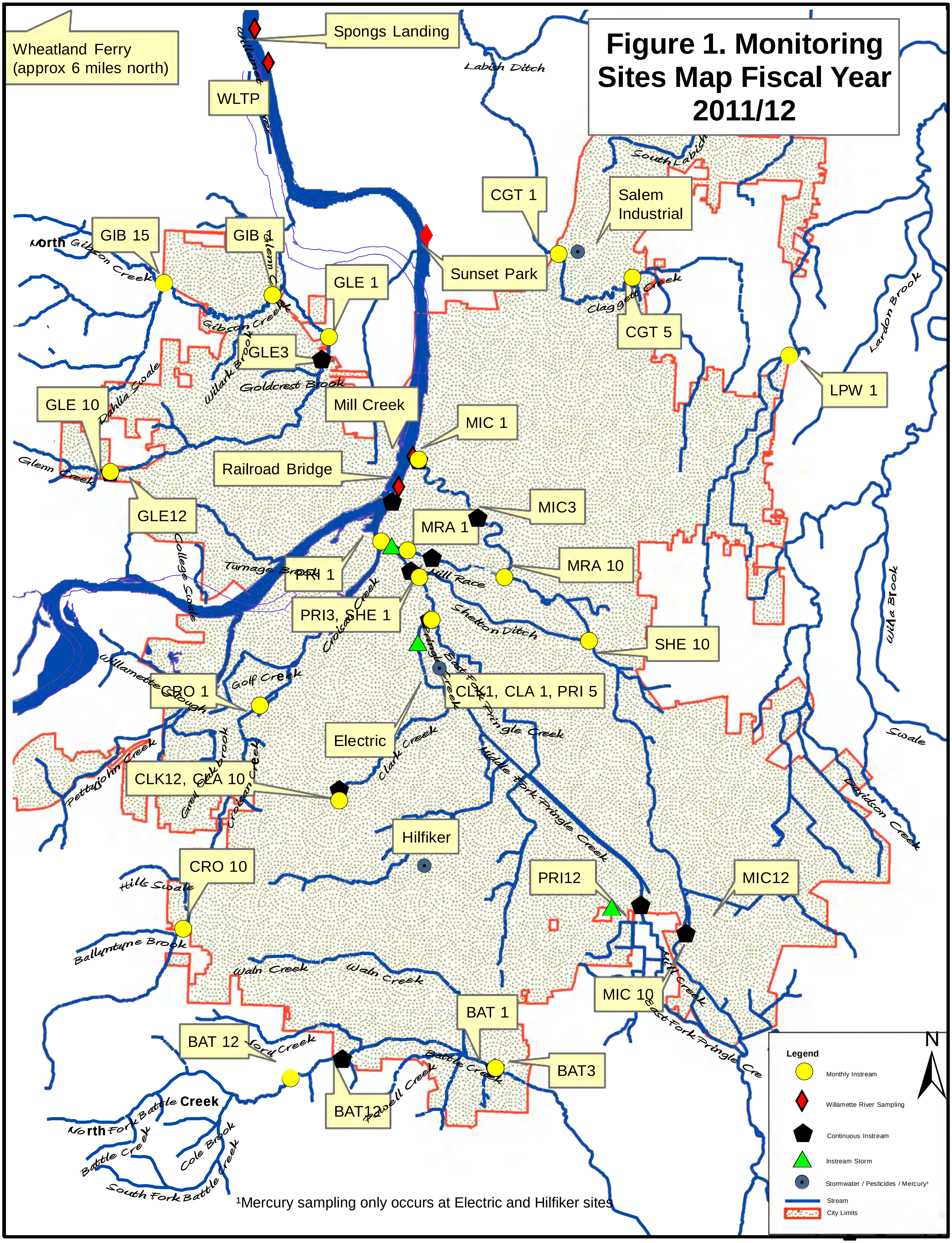
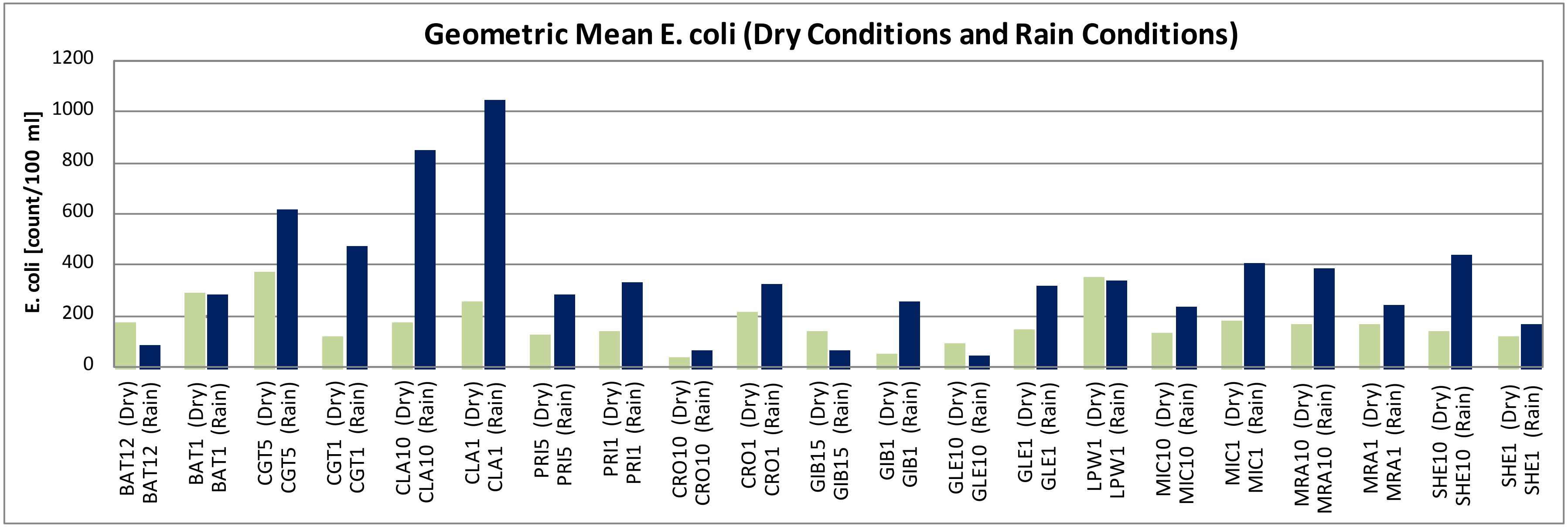


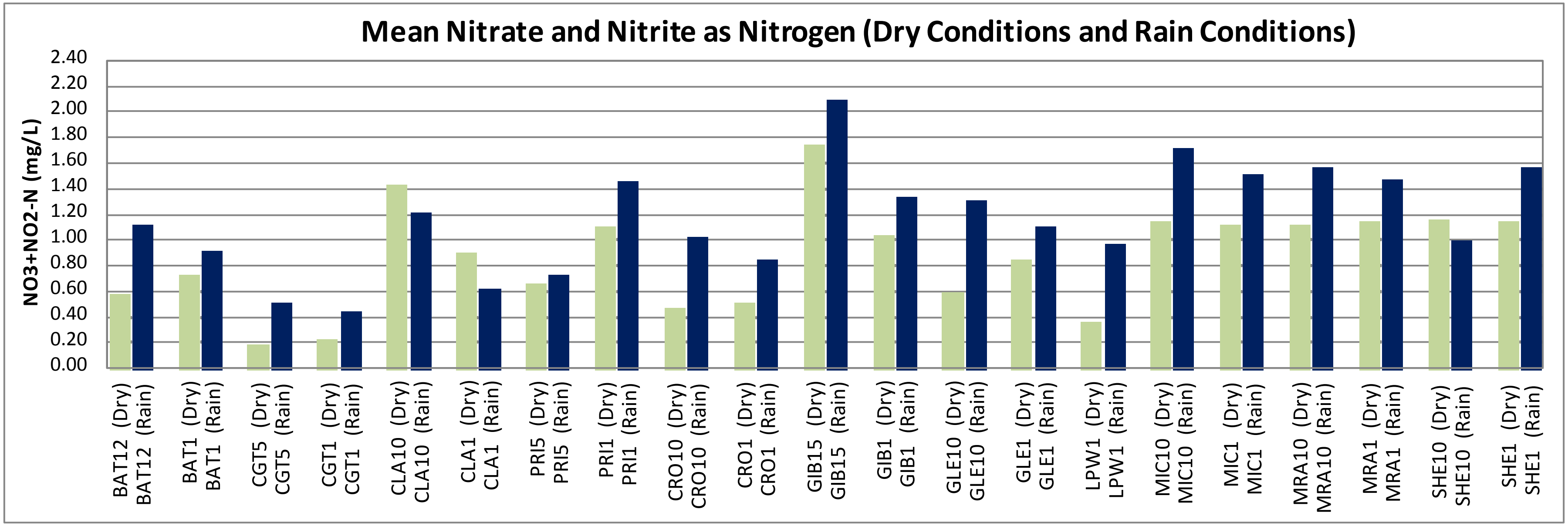
Figure 1. Monitoring Sites Map Fiscal Year 2011/12

¹Mercury sampling only occurs at Electric and Hilfiker sites

Figure 2

Monthly Instream Mean Value Comparison for Dry and Rain Conditions (Reporting Year 2011/12)

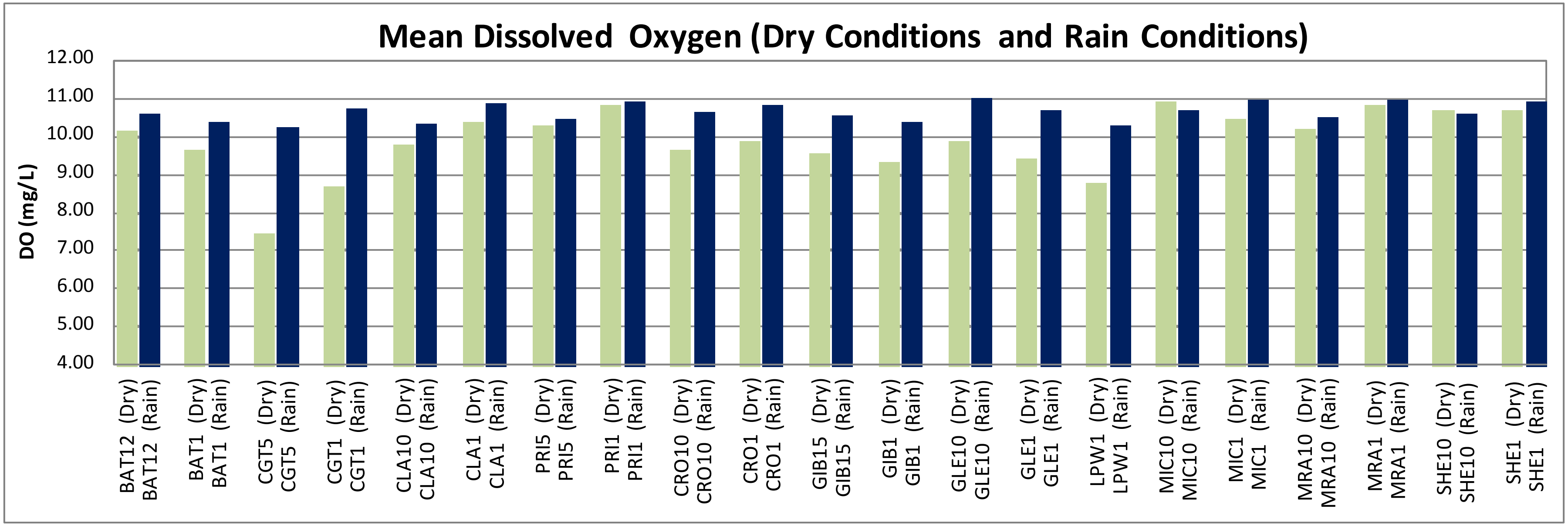


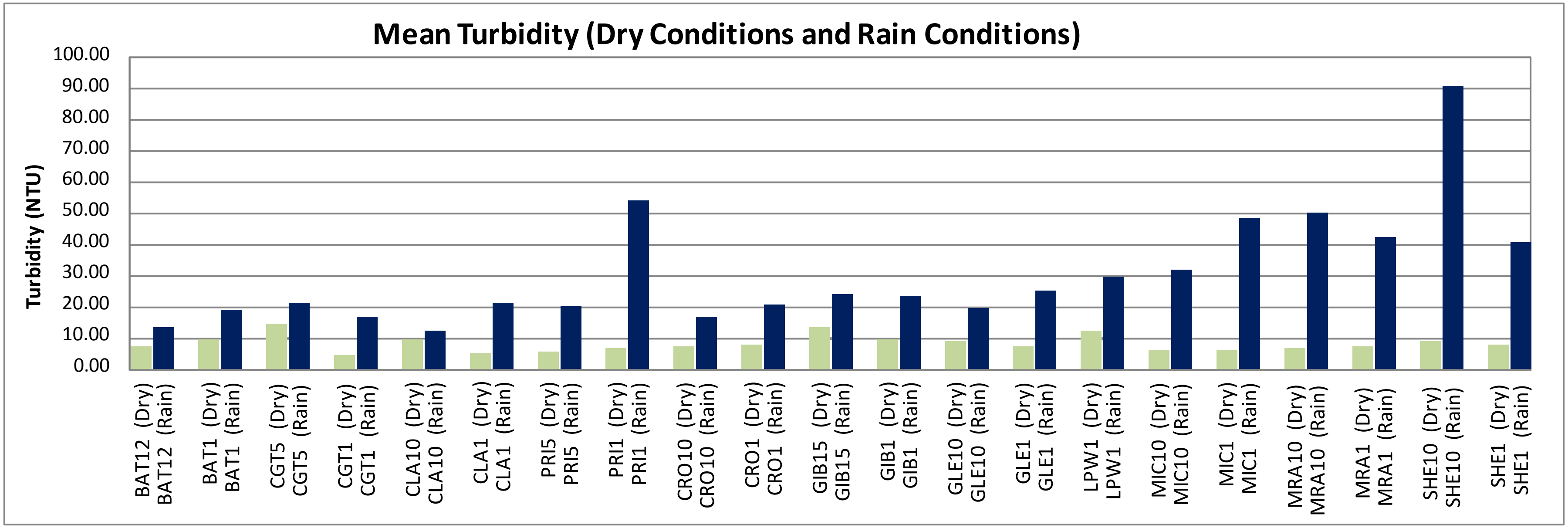


Dry conditions defined as less than 0.05 inches and rain conditions defined as greater than or equal to 0.05 inches of rainfall in the 24 hours prior to sample collection

Figure 2

Monthly Instream Mean Value Comparison for Dry and Rain Conditions (Reporting Year 2011/12)





Dry conditions defined as less than 0.05 inches and rain conditions defined as greater than or equal to 0.05 inches of rainfall in the 24 hours prior to sample collection

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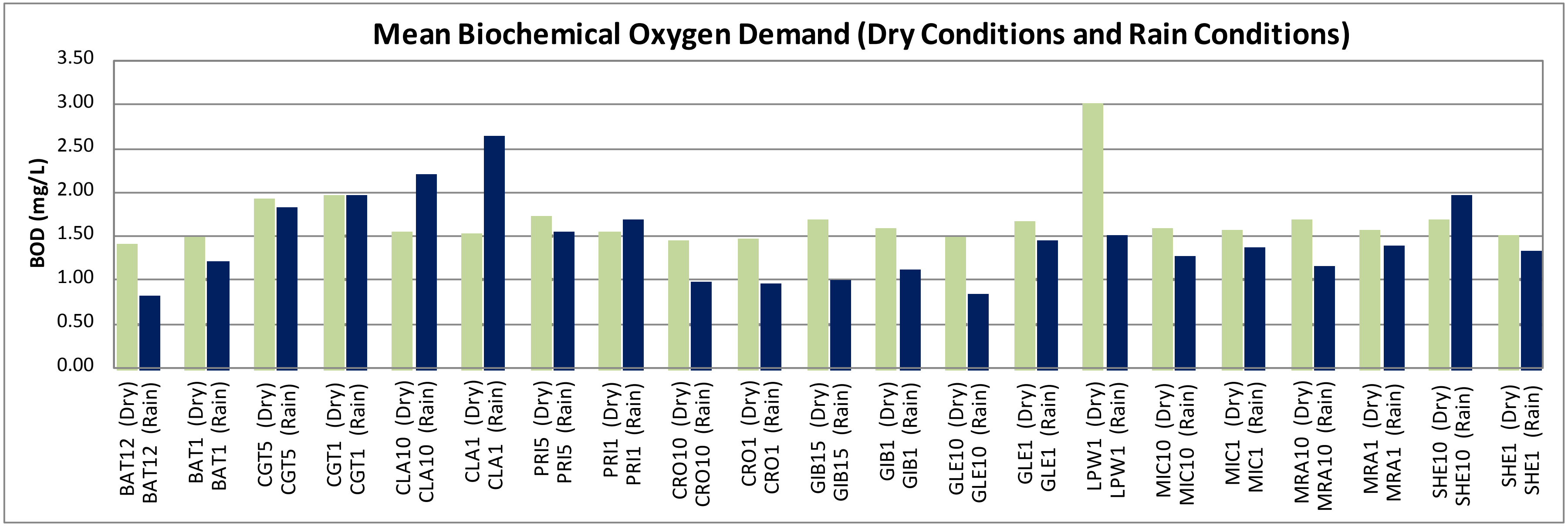
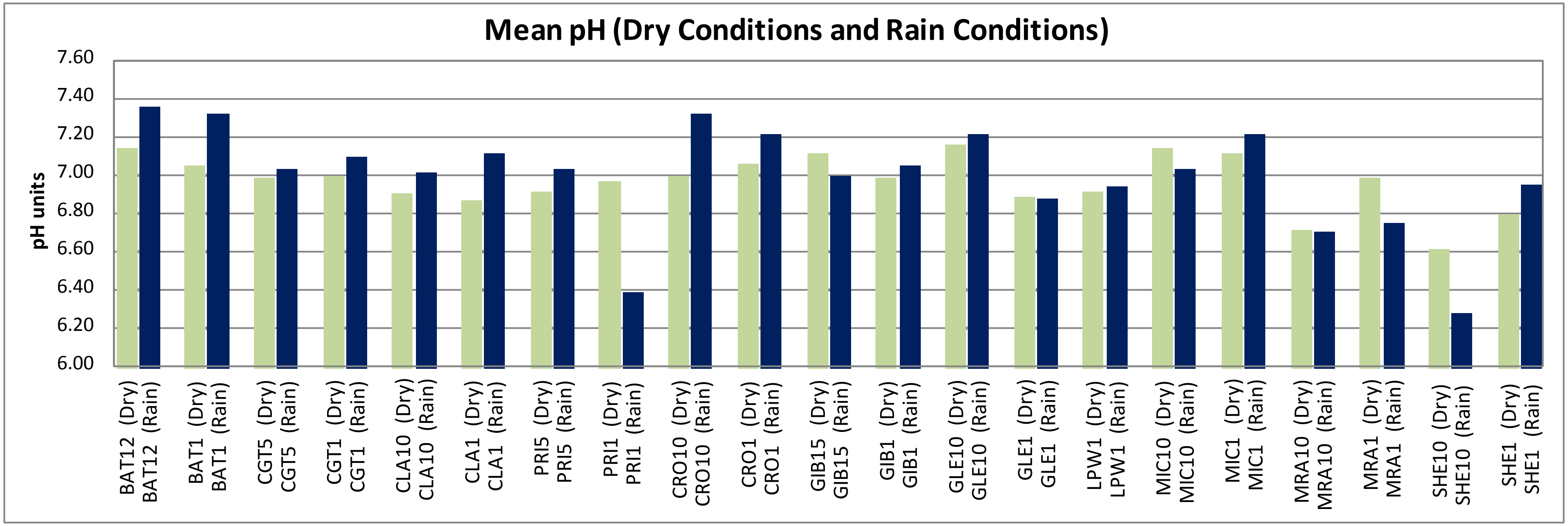
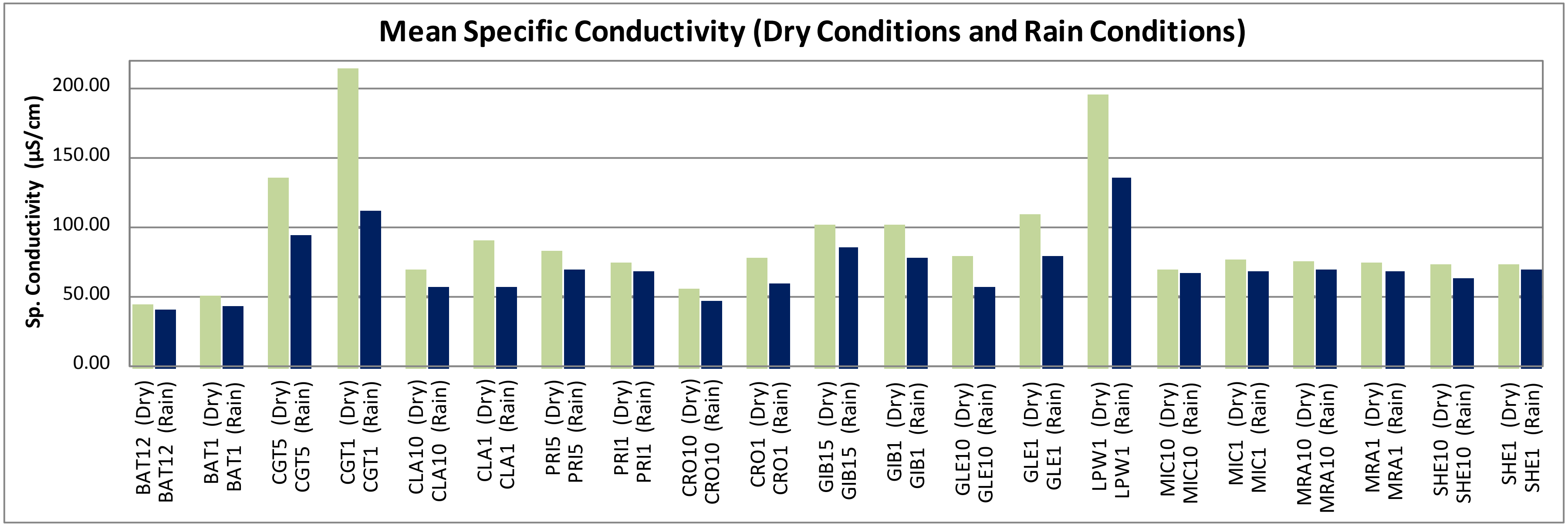




Dry conditions defined as less than 0.05 inches and rain conditions defined as greater than or equal to 0.05 inches of rainfall in the 24 hours prior to sample collection

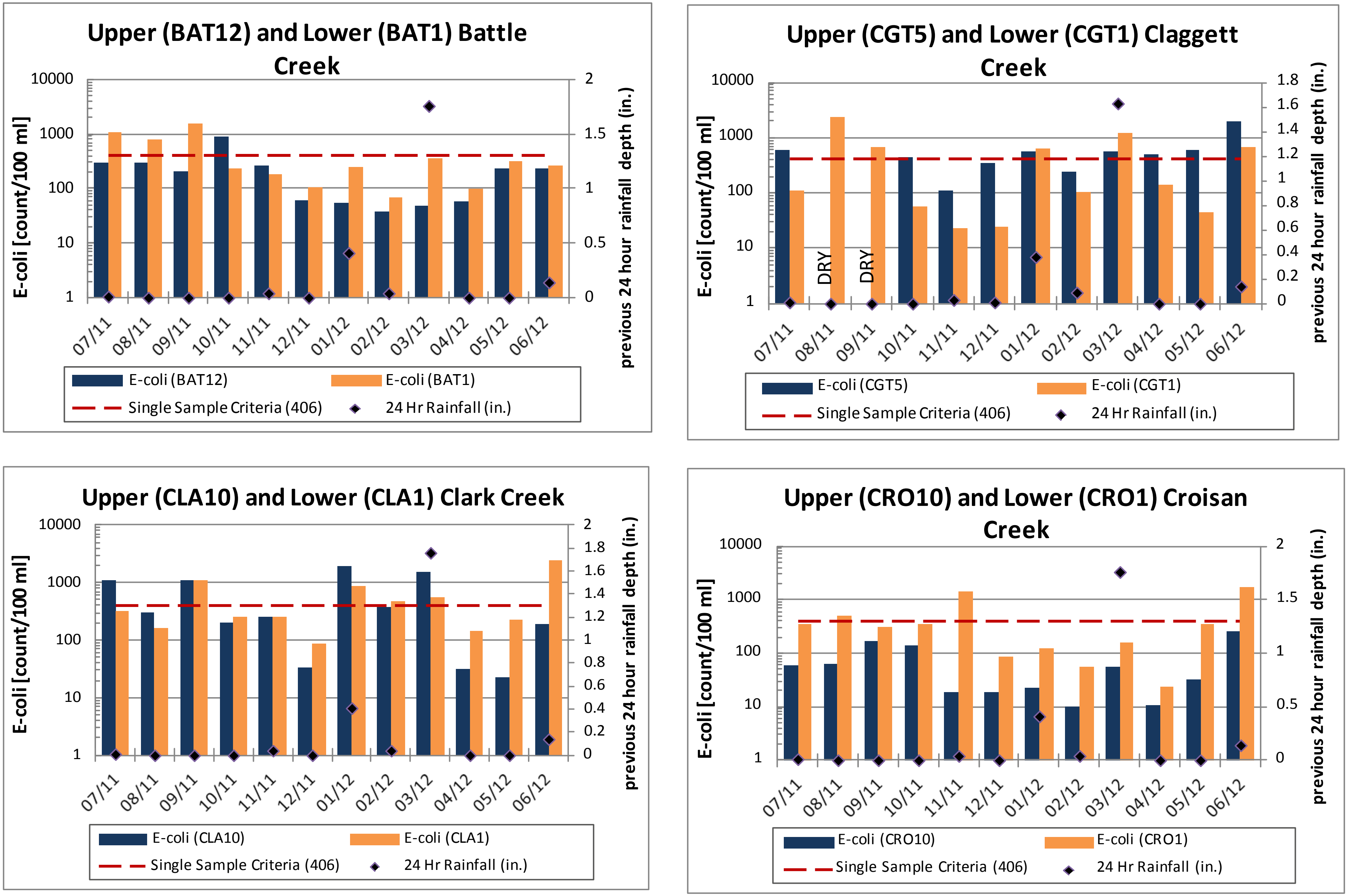
Figure 2

Monthly Instream Mean Value Comparison for Dry and Rain Conditions (Reporting Year 2011/12)



Dry conditions defined as less than 0.05 inches and rain conditions defined as greater than or equal to 0.05 inches of rainfall in the 24 hours prior to sample collection

Figure 3
Monthly Instream E. Coli Upstream / Downstream Site Comparison



Upper (BAT12) and Lower (BAT1) Battle Creek

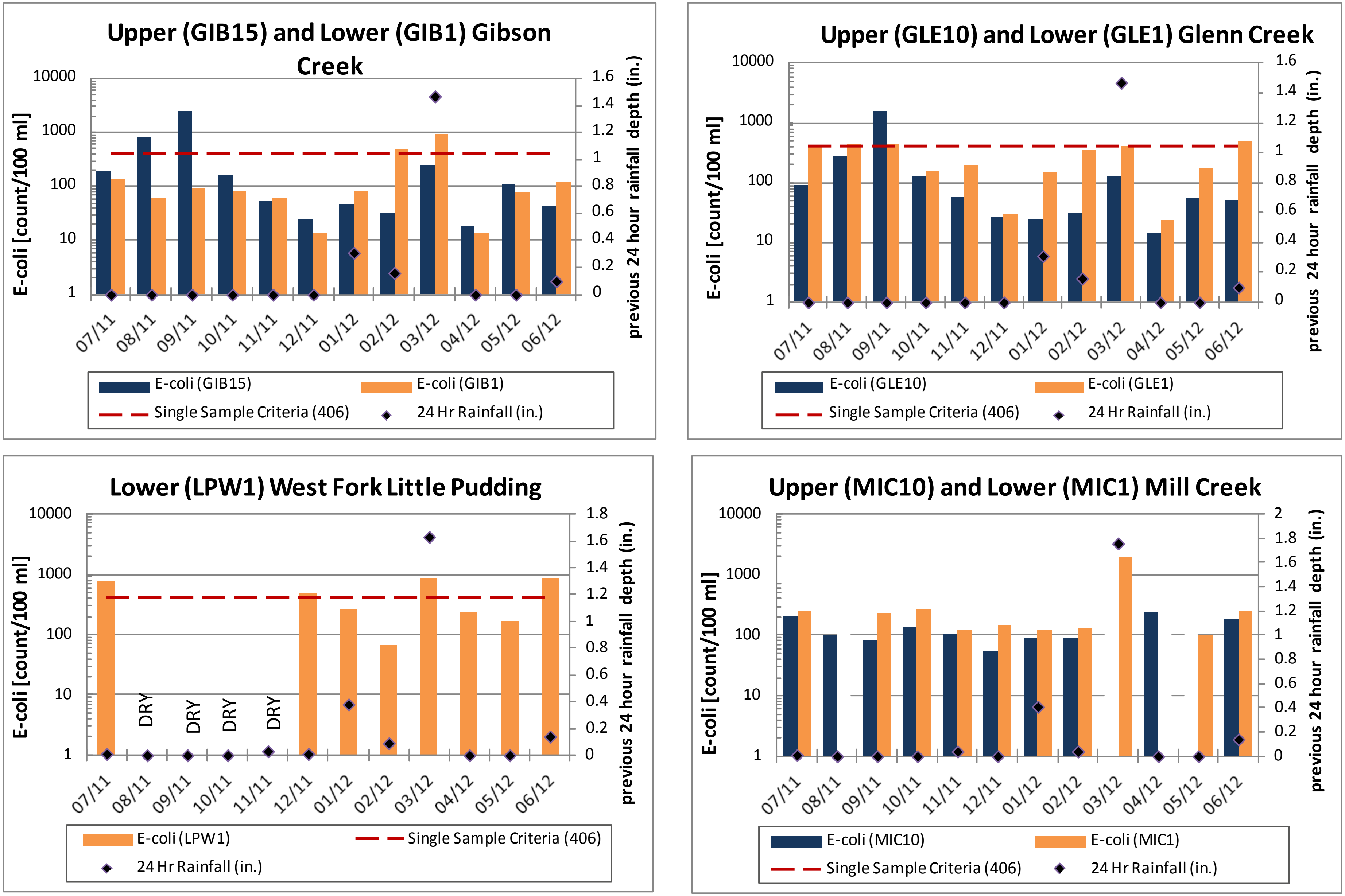
Upper (CGT5) and Lower (CGT1) Claggett Creek

Upper (CLA10) and Lower (CLA1) Clark Creek

Upper (CRO10) and Lower (CRO1) Croisan Creek

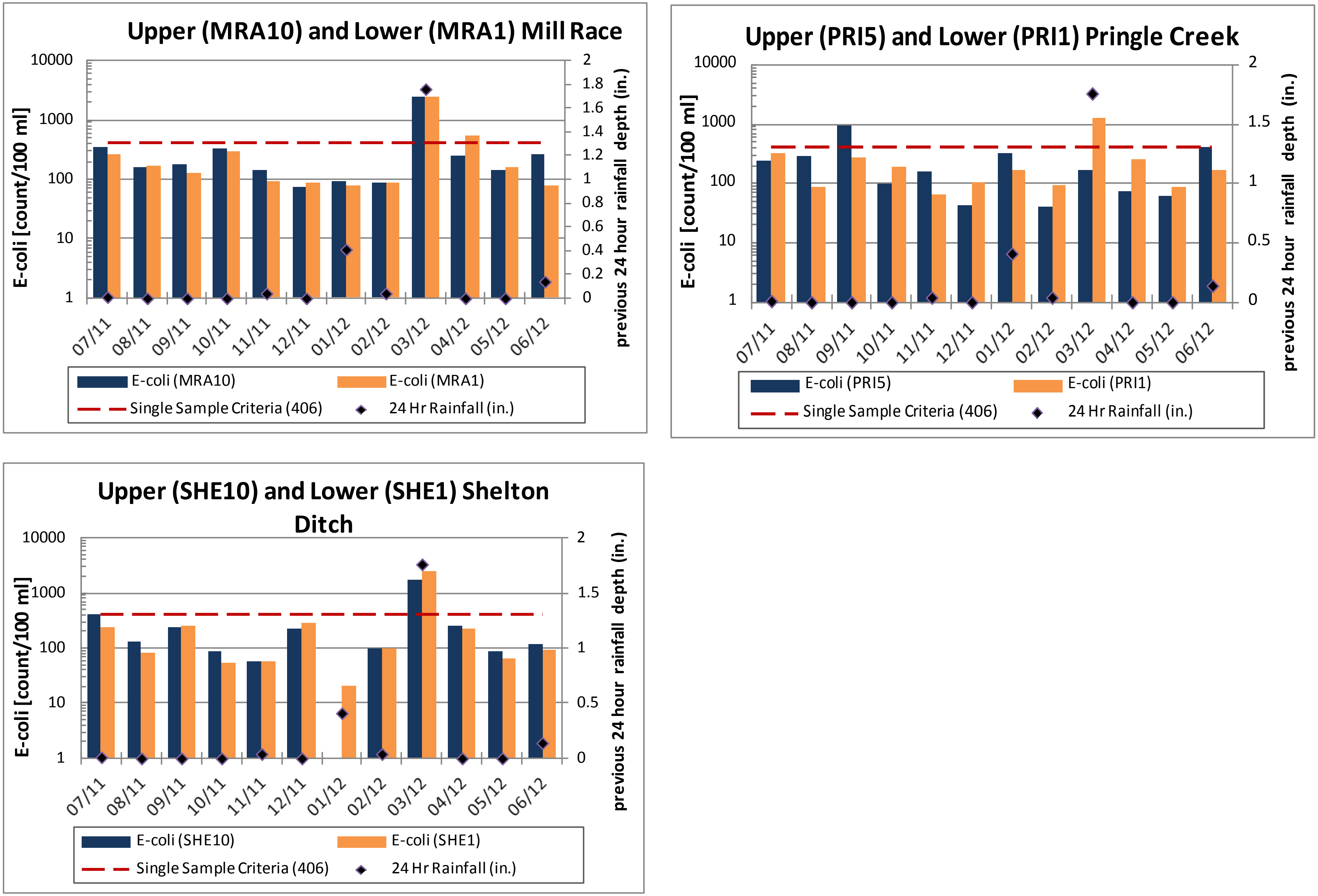
If 24 hour rainfall depth prior to sample collection differed between upstream and downstream sites, the average rainfall was used

Figure 3
Monthly Instream E. Coli Upstream / Downstream Site Comparison



If 24 hour rainfall depth prior to sample collection differed between upstream and downstream sites, the average rainfall was used

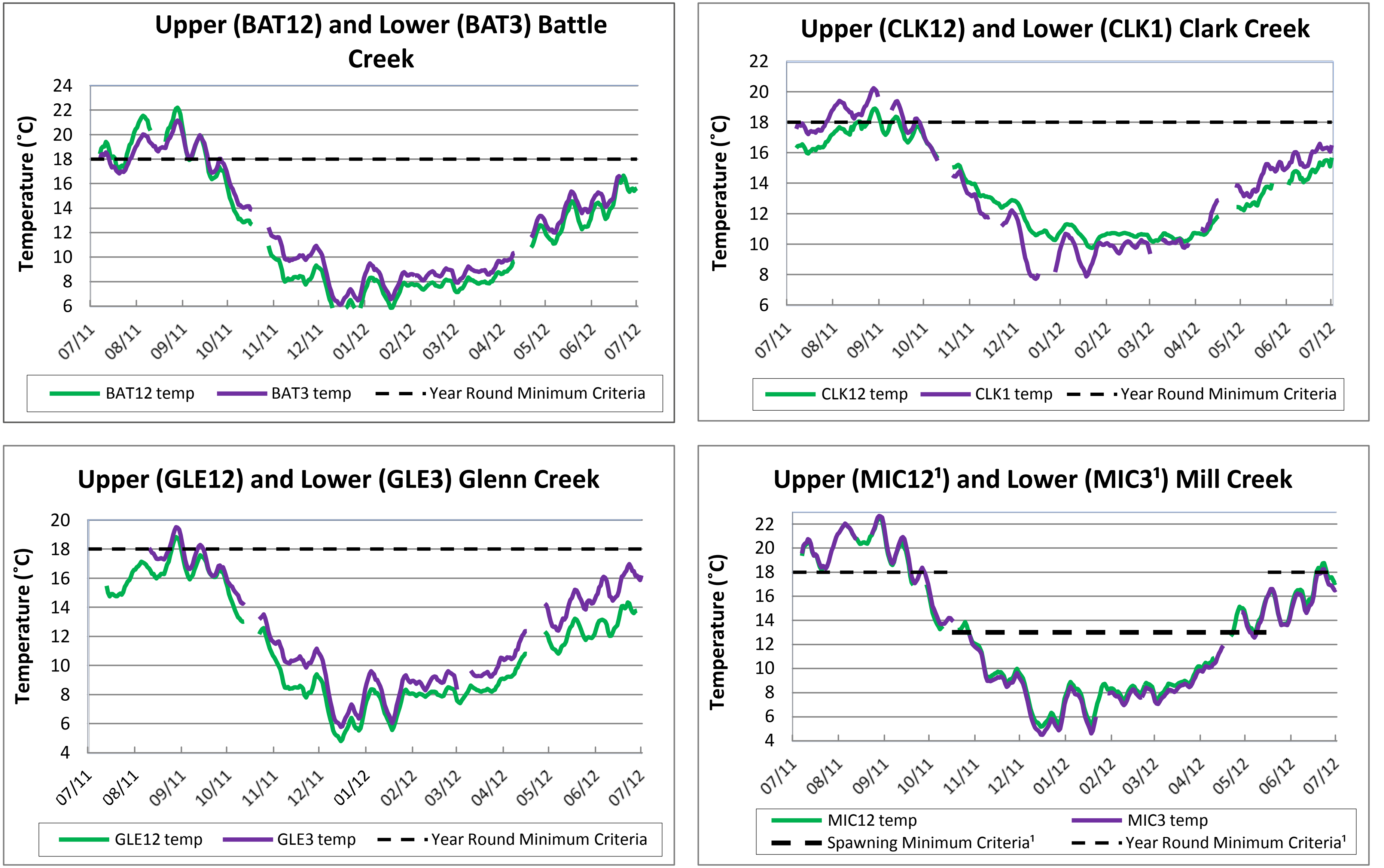
Figure 3
Monthly Instream E. Coli Upstream / Downstream Site Comparison



If 24 hour rainfall depth prior to sample collection differed between upstream and downstream sites, the average rainfall was used

Figure 4

Continuous Instream Temperature 7-Day Moving Average Maximum



Presented temperature data consists of A grade data with greater than 80% of data points collected per day

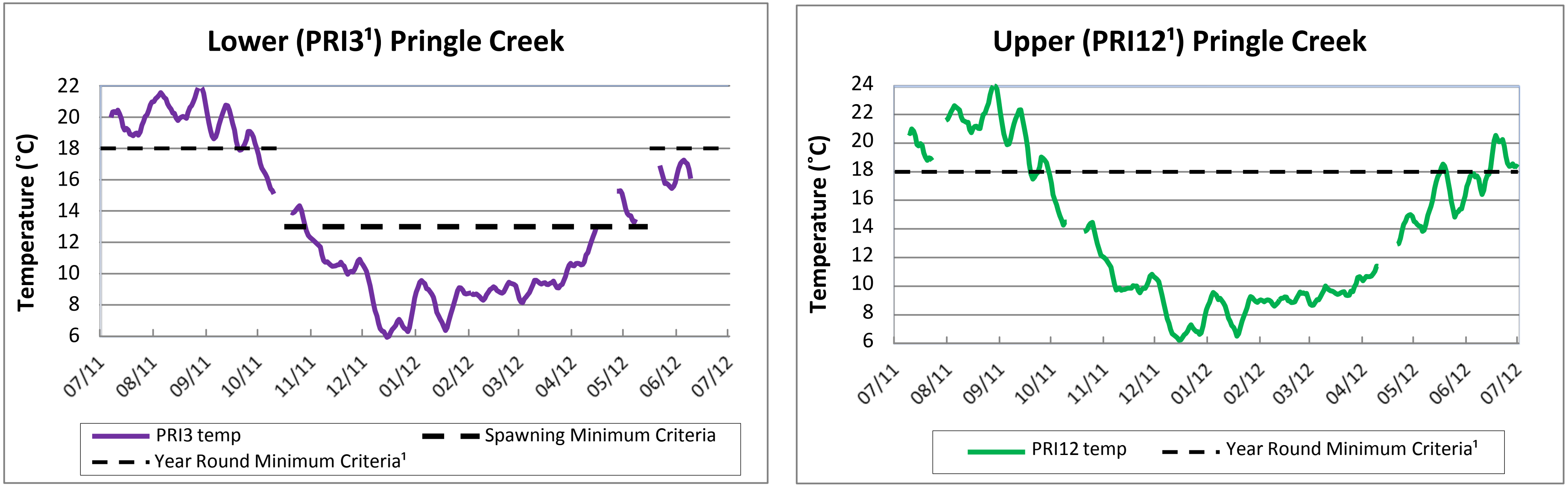
Temperature Criteria as defined in OAR 340-041-0028 and OAR-340-0340, Tables 340A and 340B

- Spawning Minimum Criteria for applicable streams may not exceed 7-day average maximum of 13˚C
- Year Round Minimum Criteria may not exceed 7-day average maximum of 18˚C

[1] Oregon's 2010 Integrated Report Section 303(d) listed

Figure 4

Continuous Instream Temperature 7-Day Moving Average Maximum



Presented temperature data consists of A grade data with greater than or equal to 80% of data points collected per day

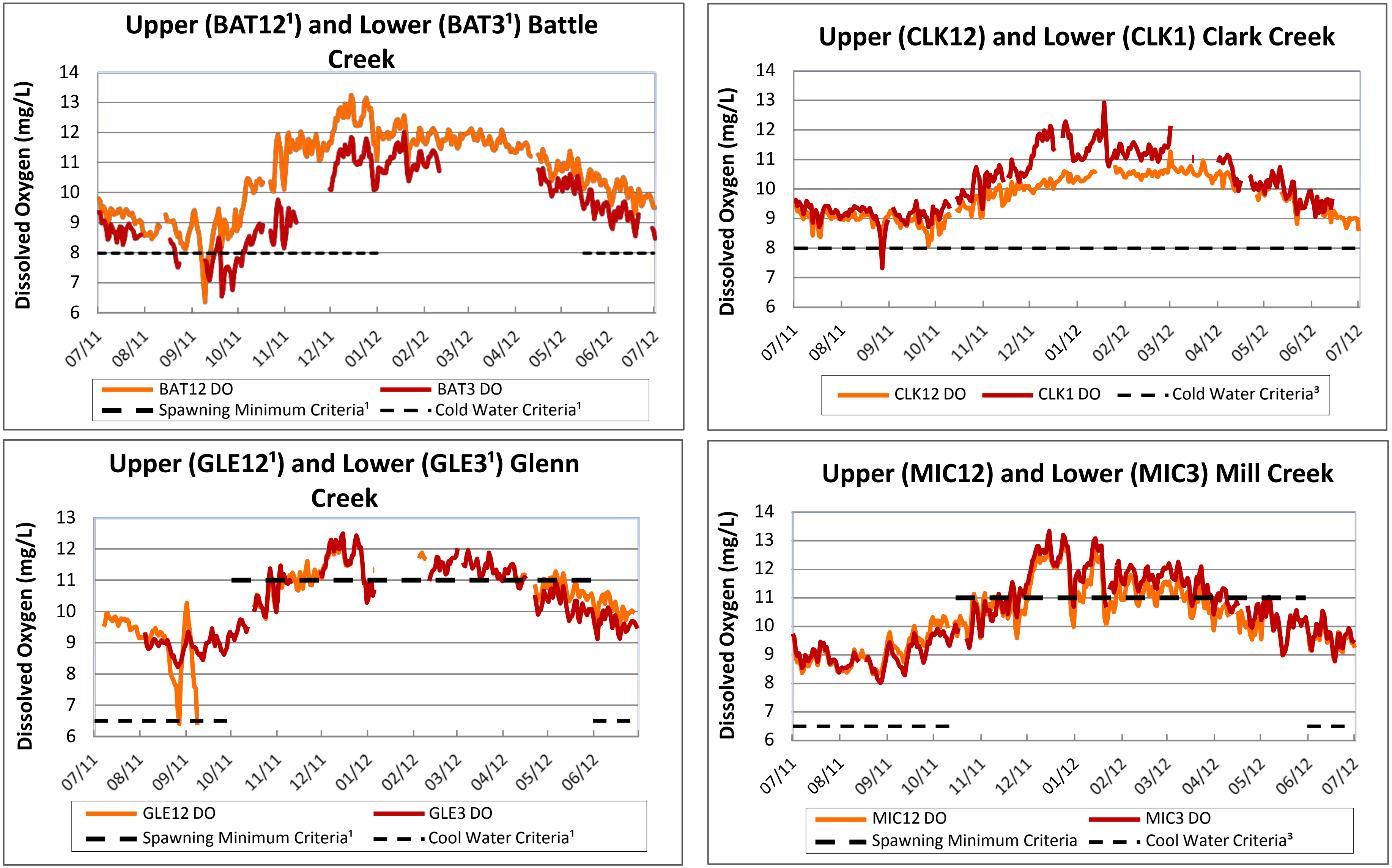
Temperature Criteria as defined in OAR 340-041-0028 and OAR-340-0340, Tables 340A and 340B

- Spawning Minimum Criteria for applicable streams may not exceed 7-day average maximum of 13˚C
- Year Round Minimum Criteria may not exceed 7-day average maximum of 18˚C

[1] Oregon's 2010 Integrated Report Section 303(d) listed

Figure 5

Continuous Instream Dissolved Oxygen Daily Mean



Presented DO data consists of A and B grade data with greater than or equal to 80% of data points collected per day

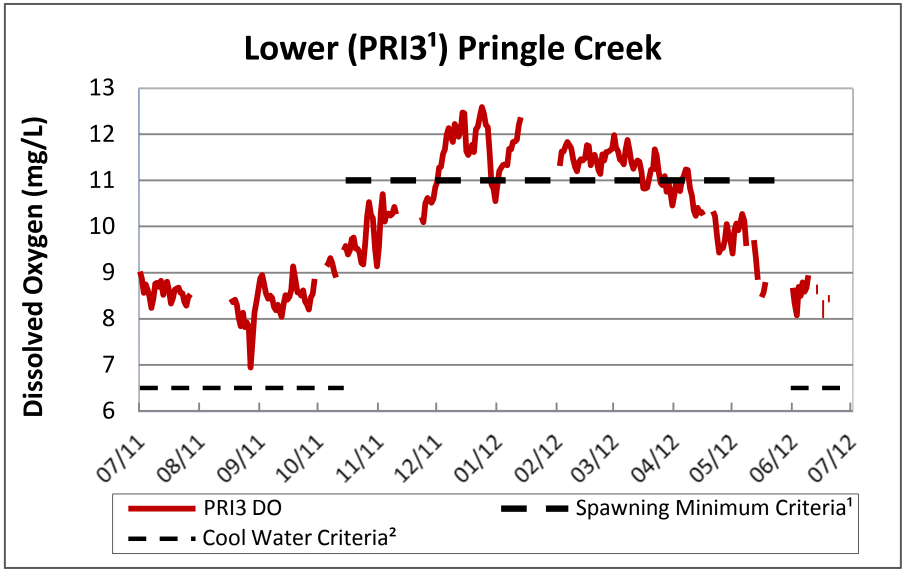
DO Criteria as defined in OAR 340-041-0016 and OAR-340-0340, Tables 340A and 340B

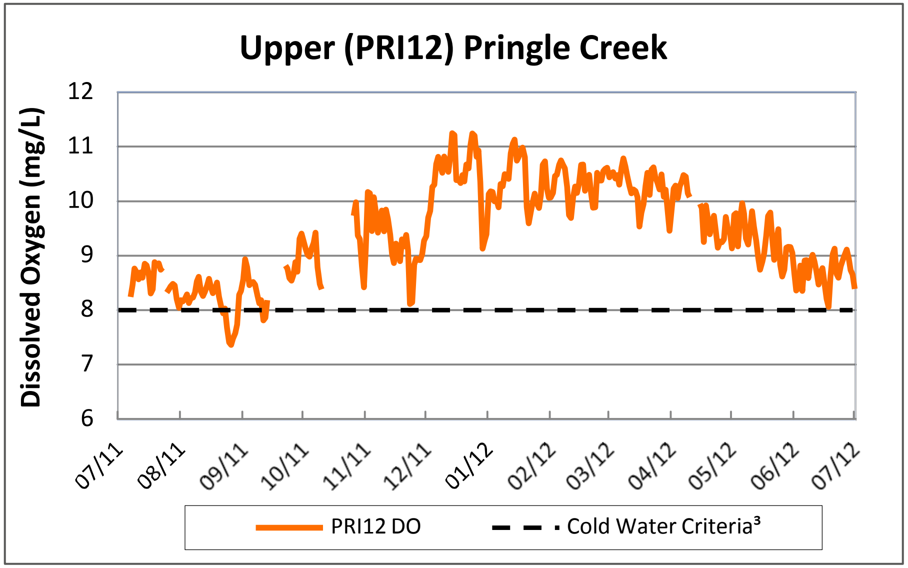
- Spawning Minimum Criteria for applicable streams may not be less than 11 mg/L
- Cold Water Criteria for applicable streams may not be less than 8 mg/L
- Cool Water Criteria for applicable streams may not be less than 6.5 mg/L

[1] Oregon's 2010 Integrated Report Section 303(d) listed

[3] Oregon's 2010 Integrated Report, Category 3

Figure 5
Continuous Instream Dissolved Oxygen Daily Mean





Presented DO data consists of A and B grade data with greater than or equal to 80% of data points collected per day

DO Criteria as defined in OAR 340-041-0016 and OAR-340-0340, Tables 340A and 340B

- Spawning Minimum Criteria for applicable streams may not be less than 11 mg/L
- Cold Water Criteria for applicable streams may not be less than 8 mg/L
- Cool Water Criteria for applicable streams may not be less than 6.5 mg/L

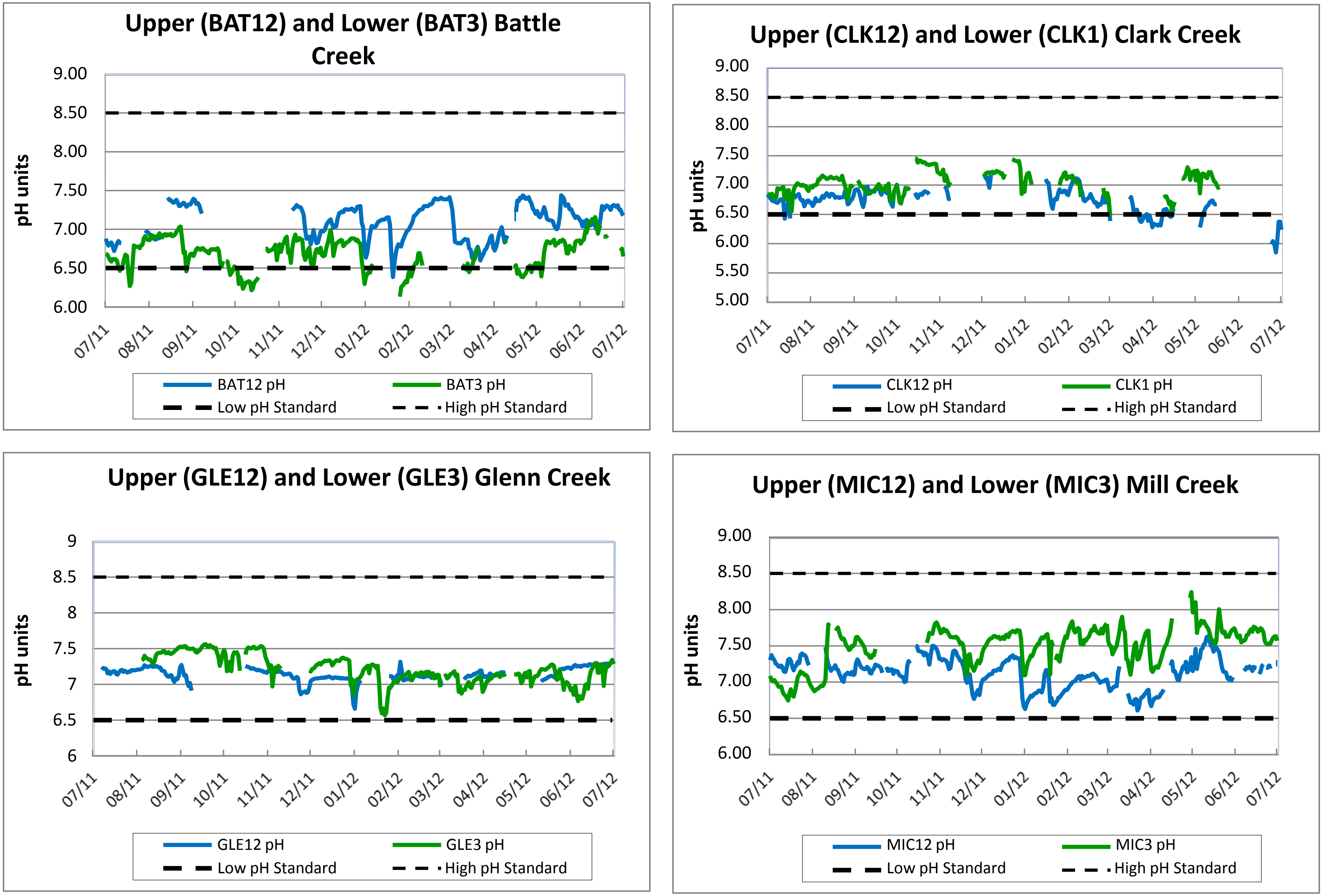
[1] Oregon's 2010Integrated Report Section 303(d) listed

[2] Oregon's 2010 Integrated Report, Category 2

[3] Oregon's 2010 Integrated Report, Category 3

Figure 6

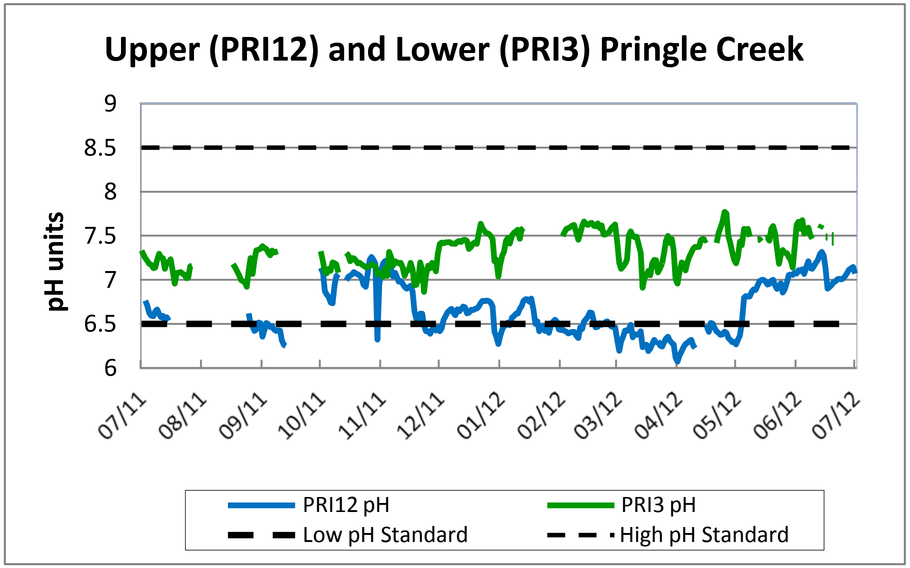
Continuous Instream pH Daily Mean



Presented pH data consists of A and B grade data with greater than or equal to 80% of data points collected per day

As defined in OAR 341-041-0035, Water Quality Standards for the Willamette Basin, pH may not fall outside the ranges of 6.5 to 8.5

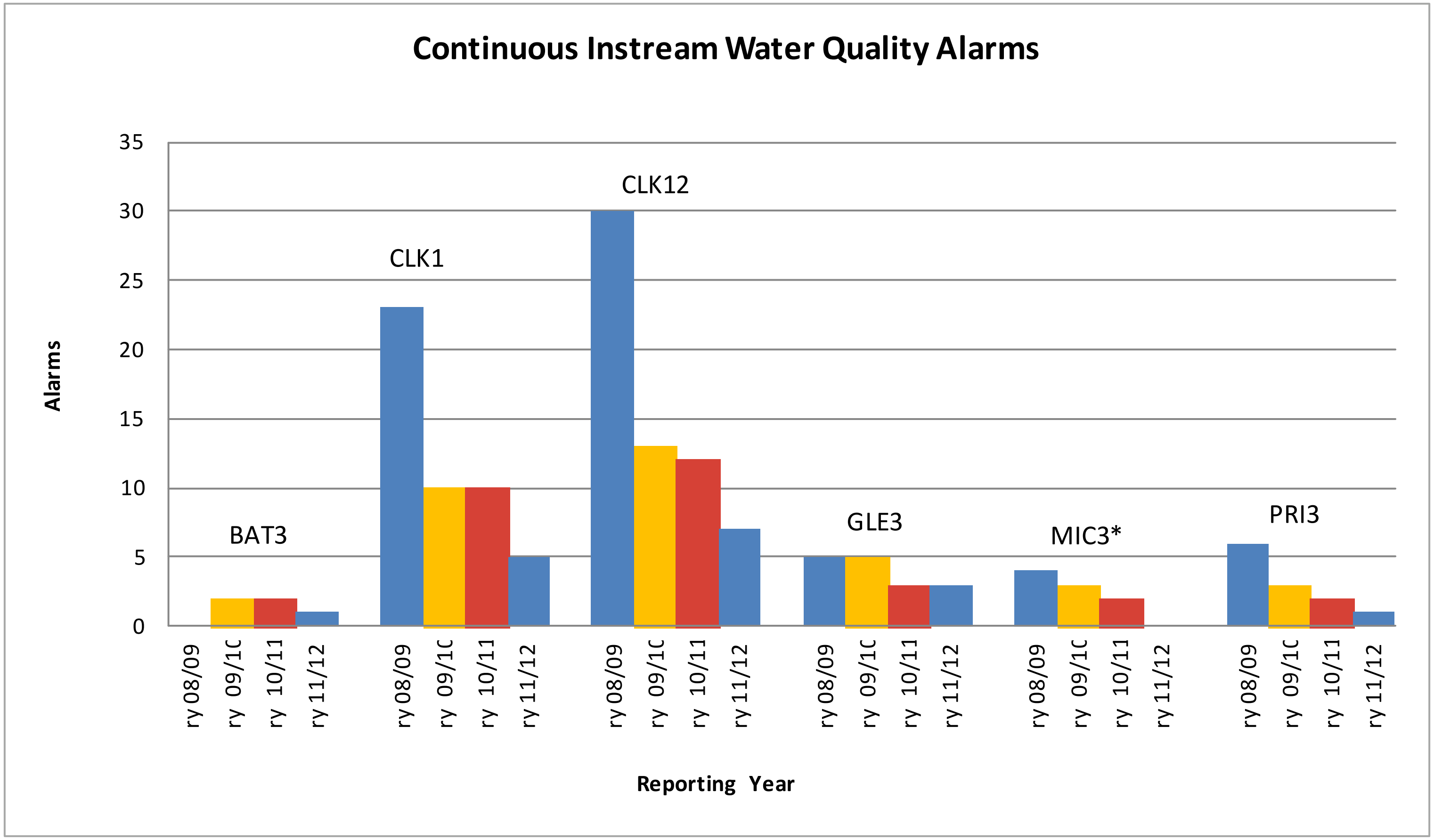
Figure 6
Continuous Instream pH Daily Mean



Presented pH data consists of A and B grade data with greater than or equal to 80% of data points collected per day

As defined in OAR 341-041-0035, Water Quality Standards for the Willamette Basin, pH may not fall outside the ranges of 6.5 to 8.5

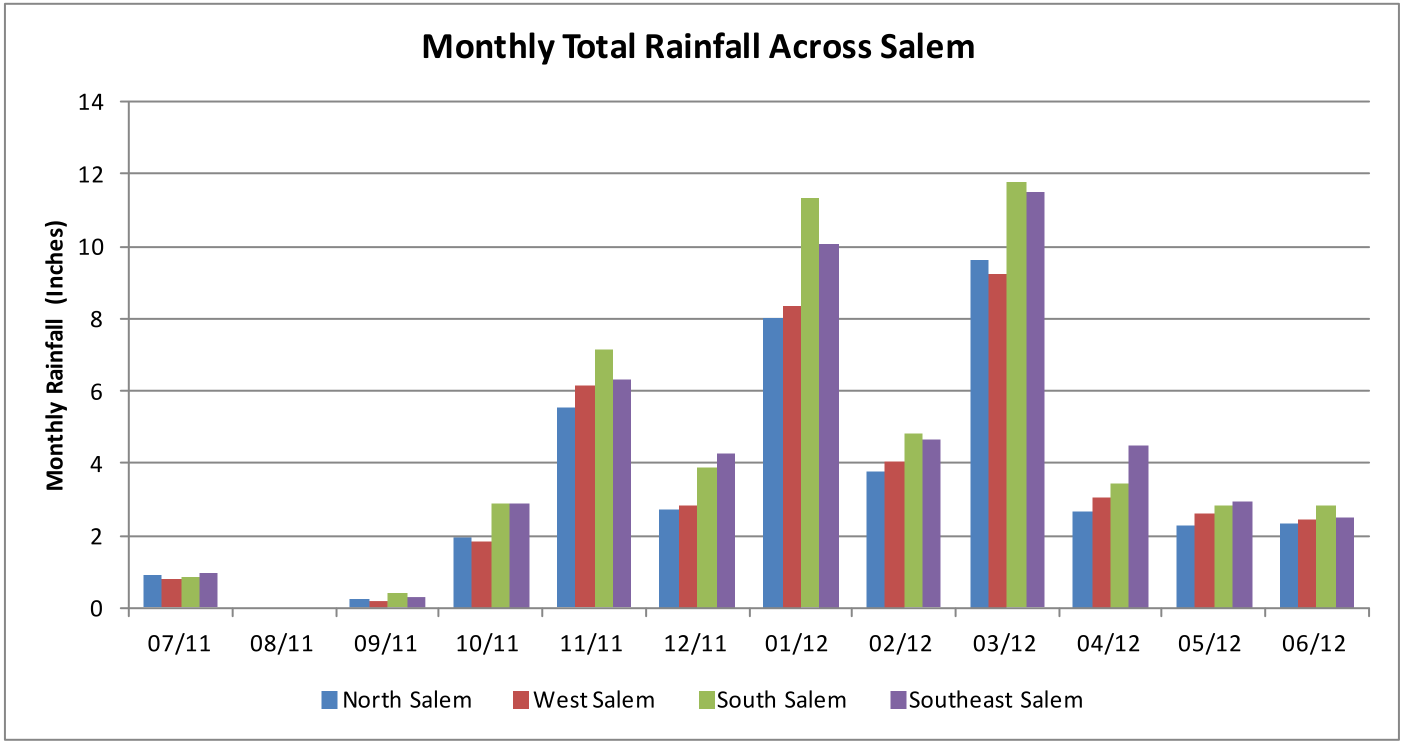
Figure 7
Continuous Instream Water Quality Alarms



*MIC3 and MIC1 have been combined and labeled MIC3. Both stations are downstream of outfalls within the City's jurisdiction on Mill Creek. Note: The alarm counts have been filtered , based on best professional judgment, to remove alarms resulting from: rain events, non-prohibited activities identified in Schedule A.4.a.xii in the City's NPDES MS4 permit, permitted activities during the in-water work period, and wildlife activity.

Figure 8

Monthly Total Rainfall Across Salem



Rainfall data is from rain gauges maintained by City of Salem

ATTACHMENT A. Analytical Report for Pesticide Screening, Pacific Agricultural Laboratory (May 1, 2012).

PAL
Pacific Agricultural Laboratory
12505 N.W. Cornell Rd. • Portland, OR 97229-5651 • Ph 503.626.7943 • Fx 503.641.0644

City of Salem
1410 20th St. SE Building 2
Salem, OR 97302

Report Number: P120261
Report Date: May 01, 2012
Client Project ID: [none]

Analytical Report

Client Sample ID: Electric
Matrix: water

PAL Sample ID: P120261-01
Sample Date: 4/16/12

Extraction Date	Analysis Date	Analyte	Amount Detected	Limit of Quantitation	Notes
Method: Multiresidue Profile					
4/19/12	4/27/12	MR Pesticides	Not Detected	See Analyte List	

Surrogate Recovery: 84 %
Surrogate Recovery Range: 32-160
(DCBP used as Surrogate)

Client Sample ID: Electric Dup
Matrix: water

PAL Sample ID: P120261-02
Sample Date: 4/16/12

Extraction Date	Analysis Date	Analyte	Amount Detected	Limit of Quantitation	Notes
Method: Multiresidue Profile					
4/19/12	4/27/12	MR Pesticides	Not Detected	See Analyte List	

Surrogate Recovery: 86 %
Surrogate Recovery Range: 32-160
(DCBP used as Surrogate)

Client Sample ID: Salem Industrial
Matrix: water

PAL Sample ID: P120261-03
Sample Date: 4/16/12

Extraction Date	Analysis Date	Analyte	Amount Detected	Limit of Quantitation	Notes
Method: Multiresidue Profile					
4/19/12	4/27/12	Propiconazole	1.1 ug/L	0.20 ug/L	
4/19/12	4/20/12	Ethofumesate	0.35 ug/L	0.30 ug/L	
4/19/12	4/27/12	Other Pesticides	Not Detected	See Analyte List	

Surrogate Recovery: 82 %
Surrogate Recovery Range: 32-160
(DCBP used as Surrogate)

Rick Jordan, Laboratory Manager

City of Salem
1410 20th St. SE Building 2
Salem, OR 97302

Report Number: P120261
Report Date: May 01, 2012
Client Project ID: [none]

Analytical Report

Client Sample ID: Hilfiker
Matrix: water

PAL Sample ID: P120261-04
Sample Date: 4/16/12

Method: Multiresidue Profile

Extraction Date	Analysis Date	Analyte	Amount Detected	Limit of Quantitation	Notes
4/19/12	4/26/12	Diuron	0.29 ug/L	0.12 ug/L	
4/19/12	4/27/12	Other Pesticides	Not Detected	See Analyte List	

Surrogate Recovery: 72 %
Surrogate Recovery Range: 32-160
(DCBP used as Surrogate)

Rick Jordan, Laboratory Manager

City of Salem
1410 20th St. SE Building 2
Salem, OR 97302

Report Number: P120261
Report Date: May 01, 2012
Client Project ID: [none]

Quality Assurance

Method Blank Data **Matrix:** water

Extraction Date	Analysis Date	Batch QC Sample #	Analyte	% Recovery	Expected % Recovery	Notes
Method: Multiresidue Profile						
4/18/12	4/27/12	2041802-BLK1	MR Pesticides	Not Detected	<LoQ	

Blank Spike Data **Matrix:** water

Extraction Date	Analysis Date	Batch QC Sample #	Analyte	% Recovery	Expected % Recovery	Notes
4/18/12	4/20/12	2041802-BS1	Atrazine	88	49-100	
4/18/12	4/20/12	2041802-BSD1	Atrazine	76	49-100	
4/18/12	4/26/12	2041802-BS1	Bendiocarb	82	11-100	
4/18/12	4/26/12	2041802-BSD1	Bendiocarb	84	11-100	
4/18/12	4/24/12	2041802-BS1	Diazinon	112	34-145	
4/18/12	4/24/12	2041802-BSD1	Diazinon	115	34-145	
4/18/12	4/27/12	2041802-BS1	Dieldrin	91	48-152	
4/18/12	4/27/12	2041802-BSD1	Dieldrin	94	48-152	
4/18/12	4/20/12	2041802-BS1	Ethofumesate	91	51-101	
4/18/12	4/20/12	2041802-BSD1	Ethofumesate	87	51-101	
4/18/12	4/24/12	2041802-BS1	Ethoprop	102	39-126	
4/18/12	4/24/12	2041802-BSD1	Ethoprop	101	39-126	
4/18/12	4/26/12	2041802-BS1	Monuron	82	46-122	
4/18/12	4/26/12	2041802-BSD1	Monuron	85	46-122	
4/18/12	4/27/12	2041802-BS1	Oxadiazon	109	71-129	
4/18/12	4/27/12	2041802-BSD1	Oxadiazon	113	71-129	

Rick Jordan, Laboratory Manager

City of Salem
1410 20th St. SE Building 2
Salem, OR 97302

Report Number: P120261
Report Date: May 01, 2012
Client Project ID: [none]

Project Information

Methodology Employed

Modified EPA 8081B (GC-ECD)
Modified EPA 8141B (GC-FPD)
Modified EPA 8270D (GC-MS SIM)
Modified EPA 8321B (HPLC-MS)

Analyte Information

Method: Modified EPA 8321B (HPLC-MS)
DCPMU is the primary breakdown product of Diuron.

Rick Jordan, Laboratory Manager

City of Salem
1410 20th St. SE Building 2
Salem, OR 97302

Report Number: P120261
Report Date: May 01, 2012
Client Project ID: [none]

Multiresidue Analyte List

Organophosphorous and Organosulfur Pesticides

Analyte	Reporting Limit	Analyte	Reporting Limit
Aspon	0.30 ug/L	Azinphos-methyl	0.30 ug/L
Carbofenothion	0.30 ug/L	Chlorfenvinphos	0.30 ug/L
Chlorpyrifos-methyl	0.30 ug/L	Coumaphos	0.30 ug/L
Demeton	0.30 ug/L	Diazinon	0.30 ug/L
Dichlorofenthion	0.30 ug/L	Dichlorvos	0.30 ug/L
Dicrotophos	0.30 ug/L	Dimethoate	0.30 ug/L
Disulfoton	0.30 ug/L	EPN	0.30 ug/L
Ethion	0.30 ug/L	Ethoprop	0.30 ug/L
Famphur	0.30 ug/L	Fenamiphos	0.30 ug/L
Fenitrothion	0.30 ug/L	Fensulfothion	0.30 ug/L
Fenthion	0.30 ug/L	Malathion	0.30 ug/L
Merphos	0.30 ug/L	Methidathion	0.30 ug/L
Mevinphos	0.30 ug/L	Monocrotophos	0.30 ug/L
Parathion	0.30 ug/L	Parathion methyl	0.30 ug/L
Phorate	0.30 ug/L	Phosmet	0.30 ug/L
Phosphamidon	0.30 ug/L	Pirimiphos-methyl	0.30 ug/L
Ronnel	0.30 ug/L	Sulprofos	0.30 ug/L
Terbufos	0.30 ug/L	Tetrachlorvinphos	0.30 ug/L
Tokuthion	0.30 ug/L	Trichloronate	0.30 ug/L
Chlorpyrifos	0.080 ug/L	Propargite	0.60 ug/L

Rick Jordan, Laboratory Manager

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Halogenated Pesticides

Analyte	Reporting Limit	Analyte	Reporting Limit
Acetochlor	0.20 ug/L	Alachlor	0.080 ug/L
Aldrin	0.080 ug/L	Benfluralin	0.080 ug/L
Bifenthrin	0.080 ug/L	a-BHC	0.080 ug/L
b-BHC	0.080 ug/L	d-BHC	0.080 ug/L
g-BHC	0.080 ug/L	Captafol	0.080 ug/L
Captan	0.20 ug/L	Chlordane	0.80 ug/L
Chlorobenzilate	0.20 ug/L	Chloroneb	0.20 ug/L
Chlorothalonil	0.080 ug/L	Cyfluthrin	0.80 ug/L
Cyhalothrin	0.80 ug/L	Cypermethrin	0.80 ug/L
p,p'-DDD	0.080 ug/L	p,p'-DDE	0.080 ug/L
p,p'-DDT	0.080 ug/L	Dacthal	0.080 ug/L
Deltamethrin	0.80 ug/L	Dichlobenil	0.080 ug/L
Dicloran	0.080 ug/L	Dicofol	0.20 ug/L
Dieldrin	0.080 ug/L	Dithiopyr	0.080 ug/L
Endosulfan I	0.080 ug/L	Endosulfan II	0.080 ug/L
Endosulfan sulfate	0.080 ug/L	Endrin	0.080 ug/L
Endrin aldehyde	0.080 ug/L	Endrin ketone	0.080 ug/L
Esfenvalerate	0.080 ug/L	Ethalfluralin	0.080 ug/L
Etridiazole	0.080 ug/L	Fenarimol	0.080 ug/L
Fenvalerate	0.080 ug/L	Flutolanil	0.80 ug/L
Folpet	0.20 ug/L	Heptachlor	0.080 ug/L
Heptachlor epoxide	0.080 ug/L	Hexachlorobenzene	0.080 ug/L
Iprodione	0.080 ug/L	Methoxychlor	0.080 ug/L
Metolachlor	0.20 ug/L	Mirex	0.080 ug/L
Norflurazon	0.080 ug/L	Ovex	0.080 ug/L
Oxadiazon	0.080 ug/L	Oxyfluorfen	0.080 ug/L
PCNB	0.080 ug/L	Permethrin	0.80 ug/L
Prodiamine	0.080 ug/L	Pronamide	0.080 ug/L
Propachlor	0.20 ug/L	Propanil	0.080 ug/L
Propiconazole	0.20 ug/L	Terbacil	0.080 ug/L
Toxaphene	4.0 ug/L	Trifloxystrobin	0.080 ug/L
Triflumizole	0.080 ug/L	Trifluralin	0.080 ug/L
Vinclozalin	0.080 ug/L		

Rick Jordan, Laboratory Manager

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Report Number: P120261
Report Date: May 01, 2012
Client Project ID: [none]

Organonitrogen Pesticides

Analyte	Reporting Limit	Analyte	Reporting Limit
Ametryn	0.30 ug/L	Amitraz	0.60 ug/L
Atrazine	0.30 ug/L	Azoxystrobin	0.12 ug/L
Bensulide	0.12 ug/L	Boscalid	0.12 ug/L
Bromacil	0.12 ug/L	Bromopropylate	0.60 ug/L
Carfentrazone-ethyl	0.12 ug/L	Clothianidin	0.12 ug/L
Cyanazine	0.60 ug/L	Diclofop-methyl	0.60 ug/L
Dimethenamid	0.30 ug/L	Diphenylamine	0.12 ug/L
Ethofumesate	0.30 ug/L	Fenbuconazole	0.60 ug/L
Fenoxaprop-ethyl	0.60 ug/L	Fipronil	0.60 ug/L
Fluazifop-p-butyl	0.60 ug/L	Fludioxonil	0.60 ug/L
Flumioxazin	0.12 ug/L	Fluometuron	0.12 ug/L
Fluroxypyr-meptyl	0.30 ug/L	Hexazinone	0.30 ug/L
Imidacloprid	0.12 ug/L	Isoxaben	0.12 ug/L
Mefenoxam	0.30 ug/L	Metalaxyl	0.30 ug/L
Metribuzin	0.60 ug/L	Myclobutanil	0.60 ug/L
Napropamide	0.60 ug/L	Pendimethalin	0.080 ug/L
Pirimicarb	0.30 ug/L	Prometon	0.60 ug/L
Prometryn	0.30 ug/L	Propazine	0.30 ug/L
Pyraclostrobin	0.12 ug/L	Pyridaben	0.60 ug/L
Pyrimethanil	0.12 ug/L	Sethoxydim	6.0 ug/L
Simazine	0.60 ug/L	Simetryn	0.30 ug/L
Sulfentrazone	0.12 ug/L	Tebuconazole	0.60 ug/L
Tebuthiuron	0.60 ug/L	Thiabendazole	0.12 ug/L
Triadimefon	0.60 ug/L		

Phenylurea Pesticides

Analyte	Reporting Limit	Analyte	Reporting Limit
DCPMU	0.12 ug/L	Diuron	0.12 ug/L
Fenuron	0.12 ug/L	Linuron	0.12 ug/L
Monuron	0.12 ug/L	Neburon	0.12 ug/L
Siduron	0.12 ug/L		

Carbamate Pesticides

Analyte	Reporting Limit	Analyte	Reporting Limit
3-Hydroxycarbofuran	0.12 ug/L	Aldicarb	0.12 ug/L
Aldicarb Sulfone	0.12 ug/L	Aldicarb sulfoxide	0.12 ug/L
Bendiocarb	0.12 ug/L	Carbaryl	0.12 ug/L
Carbofuran	0.12 ug/L	Fenobucarb	0.12 ug/L
Methiocarb	0.12 ug/L	Methomyl	0.12 ug/L
Oxamyl	0.12 ug/L	Propoxur	0.12 ug/L
Thiobencarb	0.12 ug/L		

Rick Jordan, Laboratory Manager

PAL
Pacific Agricultural Laboratory
12505 N.W. Cornell Rd. • Portland, OR 97229-5651 • Ph 503.626.7943 • Fx 503.641.0644

City of Salem
1410 20th St. SE Building 2
Salem, OR 97302

Report Number: P120261
Report Date: May 01, 2012
Client Project ID: [none]

Analytical Report

Client Sample ID: Electric
Matrix: water

PAL Sample ID: P120261-01
Sample Date: 4/16/12

Method: EPA Method 8321B, Phenoxy Herbicides (HPLC-MS)

Extraction Date	Analysis Date	Analyte	Amount Detected	Limit of Quantitation	Notes
4/18/12	4/23/12	2,4,5-T	Not Detected	0.080 ug/L	
4/18/12	4/23/12	2,4,5-TP	Not Detected	0.080 ug/L	
4/18/12	4/23/12	2,4-D	0.26 ug/L	0.080 ug/L	
4/18/12	4/23/12	2,4-DB	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Acifluorfen	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Bentazon	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Clopyralid	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Dicamba	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Dichlorprop	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Dinoseb	Not Detected	0.080 ug/L	
4/18/12	4/23/12	MCPA	0.38 ug/L	0.080 ug/L	
4/18/12	4/23/12	MCPP	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Picloram	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Quinclorac	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Triclopyr	Not Detected	0.080 ug/L	

Surrogate Recovery: 67 %
Surrogate Recovery Range: 22-111
(DCPAA used as Surrogate)

Rick Jordan, Laboratory Manager

City of Salem
1410 20th St. SE Building 2
Salem, OR 97302

Report Number: P120261
Report Date: May 01, 2012
Client Project ID: [none]

Analytical Report

Client Sample ID: Electric Dup
Matrix: water

PAL Sample ID: P120261-02
Sample Date: 4/16/12

Method: EPA Method 8321B, Phenoxy Herbicides (HPLC-MS)

Extraction Date	Analysis Date	Analyte	Amount Detected	Limit of Quantitation	Notes
4/18/12	4/23/12	2,4,5-T	Not Detected	0.080 ug/L	
4/18/12	4/23/12	2,4,5-TP	Not Detected	0.080 ug/L	
4/18/12	4/23/12	2,4-D	0.26 ug/L	0.080 ug/L	
4/18/12	4/23/12	2,4-DB	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Acifluorfen	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Bentazon	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Clopyralid	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Dicamba	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Dichlorprop	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Dinoseb	Not Detected	0.080 ug/L	
4/18/12	4/23/12	MCPA	0.36 ug/L	0.080 ug/L	
4/18/12	4/23/12	MCPP	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Picloram	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Quinclorac	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Triclopyr	Not Detected	0.080 ug/L	

Surrogate Recovery: 70 %
Surrogate Recovery Range: 22-111
(DCPAA used as Surrogate)

Rick Jordan, Laboratory Manager

City of Salem
1410 20th St. SE Building 2
Salem, OR 97302

Report Number: P120261
Report Date: May 01, 2012
Client Project ID: [none]

Analytical Report

Client Sample ID: Salem Industrial
Matrix: water

PAL Sample ID: P120261-03
Sample Date: 4/16/12

Method: EPA Method 8321B, Phenoxy Herbicides (HPLC-MS)

Extraction Date	Analysis Date	Analyte	Amount Detected	Limit of Quantitation	Notes
4/18/12	4/23/12	2,4,5-T	Not Detected	0.080 ug/L	
4/18/12	4/23/12	2,4,5-TP	Not Detected	0.080 ug/L	
4/18/12	4/23/12	2,4-D	0.087 ug/L	0.080 ug/L	
4/18/12	4/23/12	2,4-DB	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Acifluorfen	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Bentazon	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Clopyralid	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Dicamba	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Dichlorprop	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Dinoseb	Not Detected	0.080 ug/L	
4/18/12	4/23/12	MCPA	Not Detected	0.080 ug/L	
4/18/12	4/23/12	MCPP	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Picloram	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Quinclorac	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Triclopyr	Not Detected	0.080 ug/L	

Surrogate Recovery: 66 %
Surrogate Recovery Range: 22-111
(DCPAA used as Surrogate)

Rick Jordan, Laboratory Manager

City of Salem
1410 20th St. SE Building 2
Salem, OR 97302

Report Number: P120261
Report Date: May 01, 2012
Client Project ID: [none]

Analytical Report

Client Sample ID: Hilfiker
Matrix: water

PAL Sample ID: P120261-04
Sample Date: 4/16/12

Method: EPA Method 8321B, Phenoxy Herbicides (HPLC-MS)

Extraction Date	Analysis Date	Analyte	Amount Detected	Limit of Quantitation	Notes
4/18/12	4/23/12	2,4,5-T	Not Detected	0.080 ug/L	
4/18/12	4/23/12	2,4,5-TP	Not Detected	0.080 ug/L	
4/18/12	4/23/12	2,4-D	0.093 ug/L	0.080 ug/L	
4/18/12	4/23/12	2,4-DB	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Acifluorfen	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Bentazon	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Clopyralid	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Dicamba	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Dichlorprop	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Dinoseb	Not Detected	0.080 ug/L	
4/18/12	4/23/12	MCPA	Not Detected	0.080 ug/L	
4/18/12	4/23/12	MCPP	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Picloram	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Quinclorac	Not Detected	0.080 ug/L	
4/18/12	4/23/12	Triclopyr	Not Detected	0.080 ug/L	

Surrogate Recovery: 69 %
Surrogate Recovery Range: 22-111
(DCPAA used as Surrogate)

Rick Jordan, Laboratory Manager

City of Salem
1410 20th St. SE Building 2
Salem, OR 97302

Report Number: P120261
Report Date: May 01, 2012
Client Project ID: [none]

Quality Assurance

Method Blank Data **Matrix:** water

Extraction Date	Analysis Date	Batch QC Sample #	Analyte	% Recovery	Expected % Recovery	Notes
4/17/12	4/23/12	2041701-BLK1	2,4,5-T	Not Detected	< 0.080 ug/L	
4/17/12	4/23/12	2041701-BLK1	2,4,5-TP	Not Detected	< 0.080 ug/L	
4/17/12	4/23/12	2041701-BLK1	2,4-D	Not Detected	< 0.080 ug/L	
4/17/12	4/23/12	2041701-BLK1	2,4-DB	Not Detected	< 0.080 ug/L	
4/17/12	4/23/12	2041701-BLK1	Acifluorfen	Not Detected	< 0.080 ug/L	
4/17/12	4/23/12	2041701-BLK1	Bentazon	Not Detected	< 0.080 ug/L	
4/17/12	4/23/12	2041701-BLK1	Clopyralid	Not Detected	< 0.080 ug/L	
4/17/12	4/23/12	2041701-BLK1	Dicamba	Not Detected	< 0.080 ug/L	
4/17/12	4/23/12	2041701-BLK1	Dichlorprop	Not Detected	< 0.080 ug/L	
4/17/12	4/23/12	2041701-BLK1	Dinoseb	Not Detected	< 0.080 ug/L	
4/17/12	4/23/12	2041701-BLK1	MCPA	Not Detected	< 0.080 ug/L	
4/17/12	4/23/12	2041701-BLK1	MCPP	Not Detected	< 0.080 ug/L	
4/17/12	4/23/12	2041701-BLK1	Picloram	Not Detected	< 0.080 ug/L	
4/17/12	4/23/12	2041701-BLK1	Quinclorac	Not Detected	< 0.080 ug/L	
4/17/12	4/23/12	2041701-BLK1	Triclopyr	Not Detected	< 0.080 ug/L	

Blank Spike Data **Matrix:** water

Extraction Date	Analysis Date	Batch QC Sample #	Analyte	% Recovery	Expected % Recovery	Notes
4/17/12	4/23/12	2041701-BS1	2,4-D	87	41-133	
4/17/12	4/23/12	2041701-BSD1	2,4-D	87	41-133	
4/17/12	4/23/12	2041701-BS1	Dicamba	91	38-122	
4/17/12	4/23/12	2041701-BSD1	Dicamba	89	38-122	
4/17/12	4/23/12	2041701-BS1	Triclopyr	83	46-111	
4/17/12	4/23/12	2041701-BSD1	Triclopyr	83	46-111	

Analyte Information

Method: EPA Method 8321B, Phenoxy Herbicides (HPLC-MS)

Chlorinated acids were converted to free acids. Residues were quantitated as free acids.

Rick Jordan, Laboratory Manager

ATTACHMENT B. Results of Benthic Macroinvertebrate Sampling, Fish Sampling, and Physical Habitat Data Collection for Pringle Creek and Clark Creek in Salem, Oregon; Pacific Habitat Services, Inc. (June 28, 2012).

Results of Benthic Macroinvertebrate Sampling, Fish Sampling, and Physical Habitat Data Collection for Pringle Creek and Clark Creek in Salem, Oregon

Prepared for

City of Salem
Attn: Anita Panko
Public Works Department
555 Liberty Street SE
Salem, Oregon 97301

Prepared by

Craig Tumer
Dale Groff
Pacific Habitat Services, Inc.
9450 SW Commerce Circle, Suite 180
Wilsonville, OR 97070
(503) 570-0800
(503) 570-0855 FAX

PHS Project Number: 5029

June 28, 2012

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1.0 INTRODUCTION

This report describes the results of the benthic macroinvertebrate sampling, fish sampling, and physical habitat characterization conducted in May and June 2012, fulfilling the “Benthic Macroinvertebrate Monitoring” requirements listed in Table B-1 of the City of Salem’s NPDES MS4 Permit. The field methodology and parameter collection used during this study follow procedures identified in the “Technical Memorandum for the City of Salem’s MS4 Permit Requirements for Benthic Macroinvertebrate Sampling and Hydromodification Assessment” (Pacific Habitat Services, Inc., March 21, 2011). Benthic macroinvertebrate sampling was conducted on May 24, 2012; fish sampling was conducted on June 13, 2012; and physical habitat characterization was conducted on June 12, 14, and 26, 2012. This memorandum provides the baseline existing conditions against which the results of future sampling efforts will be compared and will include the following:

- A description of sampling sites;
- Data from field sampling; and
- Summary of results and discussion of how the data might be used in the future to track changes in the project-area stream reaches.

2.0 STUDY AREA DESCRIPTION

In May and June 2012, PHS collected data on benthic macroinvertebrate communities, fish presence, and physical habitat characteristics at three sample reaches within the City of Salem. Each of the sample locations are in close proximity to previous macroinvertebrate sampling that was conducted during the 2000/2001 Pringle Creek Watershed Bioassessment Project. General locations of each of the sampling reaches are as follows:

- East Fork Pringle Creek where the stream enters the City (2000/2001 sampling site PR00-15),
- Pringle Creek below the confluence with Clark Creek and upstream of confluence with Shelton Ditch (2000/2001 sampling site PR00-02), and
- Clark Creek in Gilmore Field. (2000/2001 sampling site PR00-24)

The sampling locations were chosen because they meet the required sampling reach length (40 times the channel width or minimum of 150 meters), are fairly accessible, and are located near continuous water quality monitoring stations (or where a data sonde could be securely deployed). General descriptions of the reaches are provided below and the locations are depicted on Figures 1, 2, and 3 (Appendix A).

The East Fork Pringle Creek sampling reach is located downstream (north) of Trelstad Avenue SE and continuous monitoring station PRI12, near the Salem city limits. The upstream end of the reach begins just north of the riprap apron of the culverts that carry the stream under Trelstad Avenue and extends for 150 meters downstream. In this area, East Fork Pringle Creek has been channelized and straightened with a berm of discharged dredge material along the bank. A short concrete sluice is present near the downstream end of the reach. The substrate of the stream is generally dominated by fine gravel and smaller sediments.

The Pringle Creek sampling reach is located within Bush's Pasture Park, approximately 10 meters downstream of the confluence of Clark Creek and Pringle Creek and upstream of continuous monitoring station PRI3. Within this reach, Pringle Creek is gently meandering. The stream banks are generally low and gently to moderately sloped, though vertical and undercut, eroding banks are present in some areas. A vertical concrete wall is present along the right bank near the upstream limits of the sampling reach, where private residences occur in close proximity to the stream. Substrates within the channel are generally dominated by cobbles and coarse gravel.

The Clark Creek sampling reach is located within Gilmore Field, just south of Hoyt Street SE. The downstream end of the project reach begins upstream of the detention structure south of Hoyt Street SE and continues upstream along the west side of Gilmore Field. In general, the stream banks are steep and the stream channel is incised. Substrates within the channel are generally dominated by silt and fine gravel, with areas of exposed clay hardpan.

3.0 METHODOLOGY

As recommended in the *Technical Memorandum for the City of Salem's MS4 Permit Requirements for Benthic Macroinvertebrate Sampling and Hydromodification Assessment,* dated March 21, 2011, PHS followed the Oregon Department of Environmental Quality's *Water Monitoring and Assessment Mode of Operations Manual* (*MOMs*) (June 2010) transect sampling approach for collecting benthic macroinvertebrate samples and the methodologies found in the Environmental Protection Agency's *Environmental Monitoring and Assessment Program - Surface Waters: Western Pilot Study Field Operations Manual for Wadeable Streams* (EMAP-SW) for collecting physical habitat data within the project area. Both protocols require the collection of data at evenly spaced transects within the sampling reach. Therefore, prior to the initiation of sampling and data collection, PHS established permanent transects within each of the three sampling reaches.

Both the MOMs and EMAP-SW protocols specify that the length of the sampling reach is forty times the average wetted width of the channel or a minimum of 150 meters long, when the average wetted width is less than four meters. Because the average wetted widths of East Fork Pringle and Clark Creeks are less than four meters, PHS determined that the reach length for each of the reaches on these streams is 150 meters. PHS measured the wetted width of the Pringle Creek at five representative locations and determined that the average wetted width is approximately 7.31 meters and the total reach length is 292.5 meters.

PHS identified the upstream end of the East Fork Pringle Creek reach (PC1) downstream of the pool below the culverts under Trelstad Avenue SE and flagged it as Transect "K". One-half-inch-diameter PVC pipe was pounded into the ground at the top of the bank on either side of the stream so that the transect crosses the stream perpendicular to the stream flow at the transect location. The PVC pipe was marked with "K" to indicate Transect K. Using a tape measure, PHS measured 15 meters downstream from Transect K and marked this spot as Transect J. PHS proceeded downstream with the tape measure and flagged the positions of 9 additional transects labeled "I" through "A", with Transect A being the transect marking the downstream limits of the sampling reach. PHS used the same general procedure to mark transects along the Clark

Creek and mainstem Pringle Creek sample reaches. For Clark Creek, measurement began at Transect A, the downstream end of the reach, at a point approximately 50 meters upstream of the detention basin control structure, which is located south of Hoyt Street SE, and transects were located every 15 meters along the reach. At the mainstem Pringle Creek reach, Transect K was located approximately 10 meters downstream of the confluence of Clark Creek and Pringle Creek, and transects were located every 29.25 meters. Following the identification of all transects along all sampling reaches, PHS located the endpoints of each transect using a handheld GPS. An electronic file of the transect locations will be provided to the City of Salem for future reference. Figure 4 shows representative transect layout along the East Fork Pringle Creek Reach.

3.1 Benthic Macroinvertebrate Sampling

Benthic macroinvertebrates were sampled using a transect sampling approach, as described in the Oregon Department of Environmental Quality's *Water Monitoring and Assessment Mode of Operations Manual* (*MOMs*) (June 2010).

One kick-net sample was collected at each of the eleven transects on the reach beginning at Transect A, which is located at the downstream end of the reach. The Transect A sample was collected from the middle of the left one-third of the stream; the Transect B sample was collected from the middle of the center one-third of the stream; and the Transect C sample was collected from the middle of the right one-third. For transect D, the sample was collected from the left one-third, and the cycle was repeated for all 11 transects. Samples were not collected from the stream margins.

At each sampling location, a D-frame kick net with 500 µm mesh net was placed in the stream with the flat part of the hoop resting on the streambed and perpendicular to the stream flow. Substrate preventing the flat part of the kicknet from sitting flush with the bottom was removed, when necessary.

Macroinvertebrate samples were collected from a one-square-foot sample area immediately upstream of the net. Before disturbing the substrate, this area was inspected for large macroinvertebrates such as mussels, and any such organisms were picked by hand and placed directly into the sieve. Within the sample area, all substrate particles larger than approximately five centimeters were carefully rubbed by hand in front of the net to dislodge any clinging macroinvertebrates. After rubbing, the substrate materials were placed outside of the sample plot. After all large substrate materials within the sample area were scrubbed by hand and removed from the sample area, the remaining substrate in the sample area was disturbed with the hands or feet for one minute. When samples were collected in slow-moving water where the water current was not strong enough to carry any dislodged organisms into the net, the net was pulled through the water as the substrate is disturbed to capture suspended organisms. After the sample was collected and the net removed from the stream, large substrate was returned to the sample area. Following collection of each sample, the contents of the net were placed in a 500µm mesh sieve, and the procedure was repeated at each transect, working from downstream (Transect A) to upstream (Transect K). The samples from each transect were composited into the sieve.

After the samples from all transects on the reach were completed and transferred to the sieve, large organic material and rocks were rinsed, carefully inspected for clinging macroinvertebrates, and removed. Fine sediment was washed away to the extent possible. The composite sample was placed in a jar labeled with the date and reach name and preserved with 95% denatured ethanol for transport to the lab for sorting and subsampling. A label with site information written in pencil on Rite in the Rain paper was placed inside the container. After all samples were collected, they were delivered to Aquatic Biology Associates, Inc. in Corvallis for sorting, subsampling, and data analysis.

3.2 Fish Sampling

An Oregon Scientific Take Permit (STP) must be obtained from the Oregon Department of Fish and Wildlife (ODFW) to conduct fish sampling within the State. Prior to conducting the fish sampling within the project area, PHS completed the online permit application (https://apps.nmfs.noaa.gov/) and obtained the necessary Oregon STP from ODFW. Due to the potential presence of salmonid species listed under the Endangered Species Act in the mainstem Pringle Creek reach, a permit from the National Marine Fisheries Service (NMFS) must also be obtained. Correspondence with NMFS personnel indicated that the turn-around time for such a permit would require a minimum of six months. Because of time constraints, PHS did not pursue the permit from the NMFS, and therefore, fish sampling was not conducted on the mainstem Pringle Creek reach. Fish sampling was conducted on the East Fork Pringle Creek and Clark Creek sampling reaches.

Starting at the downstream end of the sampling reach and working upstream along the reach, fish sampling was conducted using a Smith-Root backpack electrofishing unit. A second person followed the operator of the electrofishing unit with a dip net to retrieve stunned fish. All retrieved fish were transferred to a five-gallon bucket for later processing. Following completion of electrofishing at the upstream end of the sampling reach, all captured fish were identified and counted before being returned to the stream.

Following completion of the fish sampling, PHS completed the follow-up reporting required by the Oregon STP.

3.3 Physical Habitat Characterization

The EMAP-SW protocol was used to collect physical habitat data for the three stream reaches. The habitat characterization portion of the EMAP-SW protocol includes five components: thalweg profile; woody debris tally; channel and riparian characterization; assessment of channel constraint, debris torrents, and major floods; and discharge. While the characterization of all of these components is not especially useful for a hydromodification assessment, collection of certain data prescribed by the protocol may be useful. The following additional data, as described by the EMAP-SW habitat characterization protocol, were collected for future hydromodification analysis:

- Water Depth - The water depth is determined along the thalweg profile at low flow for 10 uniformly spaced intervals between transects.

- Wetted Width - The wetted width is determined at the 11 transects also used for macroinvertebrate sampling and at the mid-points of the intervals between those transects for a total of 21 measurements. In addition, the stream substrate is assessed at each of these transects at 5 points: left and right edge of water, midpoint of channel, and the two points midway between center of channel and water's edge. The substrate at these 5 points is characterized by size as boulders (> 250 mm), cobbles (>64 to 250 mm), coarse gravel (>16 to 64 mm), fine gravel (>2 to 16 mm), sand (>0.06 to 2 mm), and fines (<2 mm). Indications of burial around substrate particles at each of the substrate locations within a radius of 5 cm are used to assess the embeddedness as a fraction of the sediment particles surrounded by sand or finer particles.
- Water Surface Slope – Water surface slope is calculated for each of the ten intervals between transects within the assessment reach.
- Channel Morphology - The channel morphology is measured at the 11 transects also used for macroinvertebrate assays. The bank angles from the edge of water to the top of the stream bank are recorded. The distance of bank overhang (if occurring) is measured from the edge of water to the vertical projection of the edge of bank. The vertical distance from the water surface to the lowest floodplain terrace is recorded for each transect as well as the vertical distance to the bankfull elevation. The bankfull width is also recorded at each transect.

In addition to the information described above, PHS collected data related to riparian habitat condition. The methodologies used to collect the physical habitat data within the sampling reaches are described below. More detailed descriptions of the methodologies can be found in the EMAP-SW document.

Thalweg Profile

Beginning at the downstream end of the reach, measurement stations were established at intervals between transects. As recommended by the EMAP-SW protocol procedures for streams with a wetted width less than 2.5 meters wide. Stations were numbered "0" through "14" at one-meter intervals beginning at the downstream end of the first transect (Transect "A") and measuring upstream to the next transect. The wetted width of the stream was measured to the nearest 0.1 m at stations "0" and "7". At station 7 the substrate particle size at the tip of the depth measuring rod was classified at the left wetted margin and at positions 25%, 50%, 75%, and 100% of the distance across the wetted width of the stream. Because the average wetted width of Pringle Creek is greater than 2.5 meters, stations numbered "0" through "9" were spaced at 2.9-meter intervals (one-tenth the distance between transects), as recommended by the EMAP-SW protocol procedures. The wetted width of the stream was measured at stations 0 and 5, and the substrate particle size was measured at station 5.

The procedure for determining substrate particle size at the mid-way station is identical to the substrate size evaluation procedure described for regular channel cross-sections A through K, except that for these mid-way supplemental cross-sections, substrate size is entered on the Thalweg Profile side of the field form.

At each thalweg profile station, a meter ruler was used to locate the deepest point (the "thalweg"), and the thalweg depth was measured to the nearest cm. The depth was read on the side of the ruler to avoid inaccuracies due to the wave formed by the rod in moving water. At the point where the thalweg depth was measured, the presence or absence of "soft/small sediment" (defined as fine gravel, sand, silt, clay or muck readily apparent by "feeling" the bottom with the staff) was noted.

The channel unit code and pool forming element codes for the station were determined and recorded on the field data form using the standard codes provided on the form. According to the EMAP-SW protocol, the unit should be at least as long as the channel is wide to be recorded. The same measurements were recorded for all stations upstream to the next transect and for all stations to the upstream end of the sampling reach (Transect "K").

Large Woody Debris Tally

Large woody debris (LWD), defined by this methodology as woody material with a small end diameter of at least 10 cm and a length of at least 1.5 m, within the reach was tallied while working upstream to collect the thalweg profile data. All pieces of LWD that were at least partially in the baseflow channel, the "active channel" (flood channel up to bankfull stage), or spanning above the active channel were included in the tally. LWD in the active channel was tallied over the entire length of the reach, including the area between the channel cross-section transects. The procedure for tallying LWD is presented in more detail in Table 7-5 of the EMAP-SW methodology.

All pieces of LWD within the segment that are at least partially within the bankfull channel were tallied by class based on the diameter of the large end (0.1 m to < 0.3 m, 0.3 m to <0.6 m, 0.6 m to <0.8 m, or >0.8 m, and the class based on the length of the piece (1.5m to <5.0m, 5m to <15m, or >15m). A tally mark was placed in the appropriate box in the "Pieces All/Part In Bankfull Channel" section of the Thalweg Profile and Woody Debris Form.

All pieces of LWD within the segment that are not actually within the bankfull channel, but are at least partially spanning (bridging) the bankfull channel were tallied by class based on the diameter of the large end (0.1 m to < 0.3 m, 0.3 m to <0.6 m, 0.6 m to <0.8 m, or >0.8 m), and the length of the piece (1.5 m to <5.0 m, 5 m to <15 m, or >15 m). For each piece observed, a tally mark was placed in the appropriate box in the "Pieces Bridge Above Bankfull Channel" section of the Thalweg Profile and Woody Debris Form.

After all pieces within the segment were tallied and marked on the form, the total number of pieces for each class were written in the small box at the lower right-hand corner of each tally box.

Water Surface Slope

The water surface slope was measured by "backsighting" downstream between transects (e.g., transect "K" to "J", "J" to "I", etc.). The EMAP-SW protocol recommends using a clinometer to measure slope. However, because of the very shallow slopes of the streams within the project area, a clinometer was not used for this project.

For this project, the water surface slope was measured by two people, each with a surveyor's rod held vertically in the center of the stream at the upstream cross section and the next cross section downstream. The elevation of the water surface was measured to the nearest 0.01 feet and later converted to the metric equivalent for both the upstream and downstream transects. The person at the upstream cross section placed a level against the surveyor's rod and backsighted to the downstream rod, recording the elevation of the level on the upstream rod and the corresponding elevation on the downstream rod. These readings were then used to calculate the water surface slope between the transects. If it was not possible to see from one transect to the next due to the stream curvature, streamside vegetation, distance, or low light levels, supplementary slope measurements were taken between the transects.

Substrate Size/Channel Dimensions

The wetted channel width was divided into four equal segments to locate substrate measurement points on the cross-section. The distances corresponding to 0% (Left), 25% (LCtr), 50% (Ctr), 75% (RCtr), and 100% (Right) of the measured wetted width were recorded in the "DistLB" fields of the form. The distance recorded for the right bank was the same as the wetted channel width. At each measurement point on the cross section, (Left, LCtr, Ctr, RCtr, Right), the depth of the water was recorded. Because the left and right measurement points were at the limits of the wetted width of the stream, the water depth at these points was recorded as "0".

Substrate size and embeddedness were evaluated at each of the 11 cross-section transects. A substrate particle was picked up at each measuring point (unless the substrate was bedrock or consolidated hardpan material), and the size of the particle was visually estimated, according to the table on the Channel/Riparian Cross-section Form. The substrate embeddedness was also evaluated according to the guidelines on the form and in the EMAP-SW protocol and the value was recorded on the data form. By definition, sand and fine-grained sediments were considered 100 percent embedded; bedrock and hardpan were considered 0 percent embedded.

Bank Characteristics

Bank angle and bank undercut distance were determined on the left and right banks at each cross section transect. To measure bank angle, the surveyor's rod was laid against the bank, with one end at the water's edge. A clinometer was placed on the rod, and the bank angle in degrees was read from the external scale on the clinometer. The angle was recorded in the field for the left bank in the "Bank Measurement" section of the Channel/ Riparian Cross-section Form. If the bank was undercut, the horizontal distance of the undercutting (defined as the distance from the water's edge out to the point where a vertical plumb line from the bank would hit the water's surface) was measured to the nearest 0.01 m, and the distance was recorded on the field data form.

The incised height of the stream was measured by holding the surveyor's rod vertically, with its base at the water's edge. Using the surveyor's rod as a guide while examining both banks, the channel incision as the height up from the water surface to elevation of the first terrace of the valley floodplain was visually estimated, and the value was recorded in the "Incised Height" field of the bank measurement section on the field data form.

At each transect, both banks were examined to estimate and record the height of bankfull flow above the thalweg elevation. The EMAP-SW protocol calls for bankfull height to be measured relative to the water surface elevation at the time of sampling; however, recording bankfull height relative to the thalweg elevation allows for comparison from year to year without the need to account for differing flow conditions. Potential bankfull indicators looked for included the following:

- An obvious slope break that differentiates the channel from a relatively flat floodplain terrace higher than the channel;
- A transition from exposed stream sediments to terrestrial vegetation;
- Moss growth on the banks;
- Presence of drift material caught on overhanging vegetation; and/or
- Transition from flood- and scour-tolerant vegetation to that which is relatively intolerant of these conditions.

The procedure for obtaining bank and channel dimension measurements is presented in more detail in Table 7-8 of the EMAP-SW protocol.

Canopy Cover

Canopy cover over the stream was determined at each of the 11 cross-section transects using a Convex Spherical Densiometer taped as shown in the procedures outlined in the EMAP-SW protocol. The EMAP-SW protocol recommends obtaining six measurements at each cross-section transect (four measurements in four directions at mid-channel and one at each bank). The mid-channel measurements are used to estimate canopy cover over the channel. The two bank measurements complement your visual estimates of vegetation structure and cover within the riparian zone itself, and are particularly important in wide streams, where riparian canopy may not be detected by the densiometer when standing midstream. Because the stream channels within the project area are relatively narrow, only the four mid-channel measurements were collected for this project.

Facing upstream at mid-channel at each cross-section transect and with the densitometer held level at 0.3 m (1 ft.) above the surface of the stream the number of grid intersection points covered by either a tree, a leaf, or a high branch were counted. The value (0 to 17) was recorded in the “CenUp” field of the canopy cover measurement section of the Channel/Riparian Cross-section and Thalweg Profile Form. Canopy cover values were then determined for the left bank, downstream, and right bank and recorded in the appropriate spaces of the field data form.

Riparian Vegetation Structure

Riparian vegetation observations were made for a distance of 5 meters upstream and downstream of each of the 11 cross-section transects. The riparian vegetation observations were made for the visible area from the stream back a distance of 10m (30 ft.) shoreward from both the left and right banks, creating a 10 m × 10 m riparian plot on each side of the stream. The riparian plot dimensions were estimated and not measured.

Standing mid-channel at a cross-section transect, a 5-meter distance upstream and downstream was estimated for the purpose of assessing riparian vegetation cover. For one bank and then the other, a distance of 10 meters back into the riparian vegetation was estimated. Within this 10 m × 10 m area, the riparian vegetation was conceptually divided into three layers: a CANOPY LAYER (>5m high), an UNDERSTORY (0.5 to 5 m high), and a GROUND COVER layer (<0.5 m high), and the dominant vegetation type for the CANOPY LAYER (vegetation > 5 m high) was determined to be either Deciduous, Coniferous, broadleaf Evergreen, Mixed, or None.

The areal cover class of large trees (> 0.3 m [1 ft.] diameter at breast height [DBH]) and small trees (< 0.3 m DBH) within the canopy layer was determined separately, and the appropriate cover class was recorded on the field data form ("0"=absent: zero cover, "1"=sparse: <10%, "2"=moderate: 10-40%, "3"=heavy: 40-75%, or "4"=very heavy: >75%). Next, the dominant vegetation type for the understory layer was determined as described above for the canopy layer. The areal cover class for woody shrubs and saplings was determined separately from non-woody vegetation within the understory. Similarly, the areal cover class for woody shrubs and seedlings, non-woody vegetation, and the amount of bare ground present in the ground cover layer was determined as described above.

In stream Fish Cover, Algae, and Aquatic Macrophysics

The areal cover of all of the fish cover and other listed features that are in the water and on the banks 5 meters upstream and downstream of the cross-section were recorded in the “Fish Cover/Other” section of the Channel /Riparian Cross-section Form.

Standing mid-channel at a cross-section transect, a 5-meter distance upstream and downstream (10 m total length) was estimated for the purpose of evaluating fish cover. The water and the banks within the 10-m segment of stream were examined for the following features and types of fish cover:

- filamentous algae - long streaming algae that often occur in slow moving waters;
- aquatic saprophytes - are water-loving plants, including mosses, in the stream that could provide cover for fish or macroinvertebrates;
- large woody debris – the larger pieces of wood that can influence cover and stream morphology (i.e., those pieces that would be included in the large woody debris tally);
- brush and small woody debris – smaller wood pieces that primarily affect cover but not morphology;
- in-channel live trees or roots - living trees that are within the channel -- estimate the areal cover provided by the parts of these trees or roots that are inundated;
- overhanging vegetation - includes tree branches, brush, twigs, or other small debris that is not in the water but is close to the stream (within 1 m of the surface) and provides potential cover;
- undercut banks;
- boulders - typically basketball- to car-sized particles; and
- artificial structures - include those designed for fish habitat enhancement, as well as in-channel structures discarded (e.g., cars or tires) or purposefully placed for diversion, impoundment, channel stabilization, or other purposes.

For each cover type, the areal cover was estimated as follows and recorded in the “FISH COVER/OTHER” section of the Channel/Riparian Cross-section Form. According to the EMAP-SW protocol the cover classes of in stream fish cover features were estimated as follows:

"0"=absent: zero cover,
"1"=sparse: <10%,
"2"=moderate: 10-40%,
"3"=heavy: 40-75%, or
"4"=very heavy: >75%.

Human Influence

For the left and right banks at each of the 11 detailed Channel and Riparian Cross-Sections, the presence/absence and the proximity of 11 categories of human influences were evaluated.

Standing mid-channel at each cross-section transect, a 5-meter distance was estimated upstream and downstream (10 m total length), and a distance of 10 meters back into the riparian zone from each bank was estimated to define a riparian plot area. The channel, bank and riparian plot area adjacent to the defined stream segment were examined for the following human influences:

(1) walls, dikes, revetments, riprap, and dams;
(2) buildings;
(3) pavement/cleared lot (e.g., paved, graveled, dirt parking lot, foundation);
(4) roads or railroads,
(5) inlet or outlet pipes;
(6) landfills or trash (e.g., cans, bottles, trash heaps);
(7) parks or maintained lawns;
(8) row crops;
(9) pastures, rangeland, hay fields, or evidence of livestock;
(10) logging; and
(11) mining (including gravel mining).

For each type of influence, its presence or absence and its proximity to the stream and riparian plot area was determined. The human disturbance items were considered to be present if they were visible from the cross-section transect. For each type of influence, the appropriate proximity class was recorded in the “Human Influence” part of the “Visual Riparian Estimates” section of the Channel/Riparian Cross-section Form. The proximity classes are defined by the EMAP-SW protocol as follows:

B ("Bank”) - Present within the defined 10 m stream segment and located in the stream or on the stream bank.
C (“Close”) - Present within the 10 × 10 m riparian plot area, but away from the bank.
P (“Present”) - Present, but outside the riparian plot area.
O ("Absent”) - Not present within or adjacent to the 10 m stream segment or the riparian plot area at the transect

A particular influence may be observed outside of more than one riparian observation plot (e.g., at both transects “D” and “E”). In such situations, the influence was recorded as present at every transect from which it was observed without having to site through another transect or its 10 m × 10 m riparian plot.

Riparian “Legacy” Trees and Invasive Alien Plants

One tree was identified as a “legacy” tree at each transect, and at transect K, the legacy tree was identified as the largest tree within 4 channel widths upstream of the transect location. For each legacy tree, which was defined as the largest tree within sight of the transect, the following information was recorded:

- type of tree, and, the taxonomic group, as defined on the field data form and Table 7-13 of the EMAP-SW protocol;
- estimated height,
- diameter at breast height (dbh), and
- distance from the wetted margin of the stream.

At each transect, the presence of listed invasive plant species within the 10 m x 10 m riparian plots on either bank was recorded on the Riparian “Legacy” Trees and Invasive Alien Plants field form. In accordance with the EMAP-SW protocol, only the presence of plants which are targets in the state (as identified in the EMAP-SW protocol) were recorded, even though other invasive species may be present.

4.0 RESULTS AND DISCUSSION

4.1 Benthic Macroinvertebrate Sampling

Benthic macroinvertebrate sampling was conducted on May 24, 2012, and the benthic macroinvertebrate samples were processed by Aquatic Biology Associates, Inc. (ABA) in Corvallis, Oregon. Each sample was scored according to the Benthic Index of Biological Integrity (BIBI), modified from Karr 1998, which is a quantitative method for determining and comparing the biological condition of streams. The BIBI scoring system is composed of the 10 metrics:

- Total number of taxa;
- Number of Ephemeroptera taxa;
- Number of Plecoptera taxa;
- Number of Trichoptera taxa;
- Number of long-lived taxa;
- Number of intolerant taxa;
- Percent tolerant taxa;
- Percent predators;
- Number of clinger taxa; and
- Percent dominant taxa.

Each individual metric is given a score of 1 through 5, with higher numbers given to conditions representative of streams unaltered by anthropogenic influence and exhibiting higher biological integrity. These metrics are then added together for the single, integrated overall BIBI score.

Data and results from ABA's analysis are provided in Appendix B. The results of the BIBI scoring for each of the sample reaches are summarized in Table 1 and the text below. The descriptions of metrics that follow are summarized from The Puget Sound Stream Benthos website (www.pugetsoundstreambenthos.org).

Table 1. Benthic Invertebrate Index of Biological Integrity – BIBI (modified Karr 1998)

Metric	Clark Creek		East Fork Pringle Creek (PC1)		Pringle Creek (PC2)	
	Value	Score[a]	Value	Score[a]	Value	Score[a]
Total Number of Taxa[b]	30	3	35	3	34	3
Number of Ephemeroptera Taxa[b]	1	1	1	1	1	1
Number of Plecoptera Taxa[b]	0	1	0	1	0	1
Number of Trichoptera Taxa[b]	1	1	0	1	2	1
Number of Long-lived Taxa[b]	3	3	3	3	4	3
Number of Intolerant Taxa[b]	2	1	1	1	1	1
Percent Tolerant Taxa[c]	20.13	3	51.49	1	17.85	5
Percent Predators[b]	4.63	1	3.12	1	1.46	1
Number of Clinger Taxa[b]	6	1	10	1	10	1
Percent Dominance (3 Taxa)[c]	46.99	5	63.65	3	53.36	3
Total BIBI Score[d]:	**n/a**	**20**	**n/a**	**16**	**n/a**	**20**
Biological Condition:	**Low**		**Low**		**Low**	

Notes:
a. Each metric scored: 1 = Low; 3 = Moderate; 5 = High
b. Metric value generally decreases with declining biological integrity
c. Metric value general increases with declining biological integrity
d. Key to Total BIBI Scores:
    BIBI scores 0 – 24 = Low biological integrity
    BIBI scores 25 – 39 = Moderate biological integrity
    BIBI scores 39 – 50 = High biological integrity

Total Number of Taxa

The total number of taxa, or total taxa richness, is the total number of unique taxa identified within the sample. All types of invertebrates (mayflies, caddisflies, stoneflies, true flies, midges, clams, snails, and worms) collected from the sampling reach are included in this metric. The biodiversity of a stream declines as flow regimes are altered, habitat is lost, chemicals are introduced, energy cycles are disrupted, and alien taxa invade. The moderate scores given for total number of taxa in each of the sampling reaches indicates some level of disturbance within the assessment reaches.

Number of Ephemeroptera Taxa

The number of Ephemeroptera taxa, or Ephemeroptera taxa richness, is the total number of unique mayfly (Family Ephemeroptera) taxa identified within the sample. Typically, the diversity of mayflies declines in response to most types of human influence. Only one mayfly taxon was recorded within each of the sample reaches. Such low numbers are indicative of disturbed systems.

Number of Plecoptera Taxa

The number of Plecoptera taxa, or Plecoptera taxa richness, is the total number of unique stonefly (Family Plecoptera) taxa identified within the sample. In general, stoneflies are among the most sensitive benthic macroinvertebrates, and they are among the first macroinvertebrates to disappear from a stream as human disturbance increases. Many stoneflies are predators that stalk their prey and hide around and between rocks, and these hiding places are lost as sediment washes into a stream and the stream substrates become embedded. Like salmonids, most stoneflies require cool, well-oxygenated water, and increased stream temperatures adversely affect the stream’s ability to support stoneflies. The absence of stonefly taxa recorded within the assessment reaches is indicative of disturbed systems.

Number of Trichoptera Taxa

The number of Trichoptera taxa, or Trichoptera taxa richness, is the total number of unique caddisfly (Family Trichoptera) taxa identified within the sample. Caddisflies are a diverse family of insect. Various caddisfly taxa feed in a variety of ways: some spin nets to trap food, others collect or scrape food from the tops of exposed rocks. Many caddisflies build gravel or wood cases to protect them from predators, and others are predators themselves. Although caddisflies are a diverse family, taxa richness of caddisflies declines steadily as the variety and complexity of stream habitats decline. The very low numbers of caddisfly taxa recorded within the assessment reaches are indicative of disturbed systems.

Number of Long-Lived Taxa

The number of long-lived taxa is the total number of unique taxa that require more than one year to complete their life cycles. Because of their longer life cycles, these taxa are exposed to cumulatively more stream disturbances than taxa with shorter life cycles. If the stream is dry part of the year or subject to flooding, taxa with longer life cycles may disappear from the stream. Loss of long-lived taxa from a system may indicate an on-going problem that repeatedly interrupts their life cycles. The moderate scores given for total number of long-lived taxa in each of the sampling reaches indicates some level of disturbance within the assessment reaches.

Number of Intolerant Taxa

The number of intolerant taxa is the total number of unique taxa that are intolerant of stream pollution. Chironomids are not included in this metric. Benthic macroinvertebrates identified as intolerant are the most sensitive taxa and represent approximately five to ten percent of the taxa present in the region. These taxa are the first to disappear as stream degradation increases. The low scores given for the number of intolerant taxa in each of the sampling reaches indicate disturbance within the assessment reaches.

Percent Tolerant Taxa

The percent tolerant taxa is the total number of individuals belonging to taxa tolerant to stream degradation, divided by the total number of individuals within the sample, multiplied by 100. Chironomids are not included in this metric. Tolerant taxa are present within most streams, but as disturbance increases, tolerant taxa represent an increasingly large percentage of the total macroinvertebrate community. The low and moderate scores given for the percent tolerant taxa in the East Fork Pringle Creek and Clark Creek sampling reaches indicate some level of disturbance within the assessment reaches.

Percent Predators

The percent predators metric is the total number of predator individuals identified within the sample, divided by the total number of individuals within the sample, multiplied by 100. Predator taxa represent the peak of the food web and depend on a reliable source of other invertebrates that they can eat. The percentage of animals that are obligate predators provides a measure of the trophic complexity supported by a site. Less disturbed sites generally support a greater diversity of prey items and, therefore, a larger diversity of predators to feed on them.

Number of Clinger Taxa

This metric is the total number of unique clinger taxa within the sample. “Clingers” have physical adaptations that allow them to hold onto smooth substrates in fast water. These macroinvertebrates typically occupy the open areas between rocks and cobbles along the bottom of the stream; thus, they are particularly sensitive to fine sediments that fill these spaces and eliminate the variety and complexity of these small habitats. Sediment also prevents clingers from accessing the hyporheic zone of the stream bed. The low numbers of clinger taxa recorded within the assessment reaches are indicative of disturbed systems.

Percent Dominance

Percent dominance is the sum of the individuals of the three most abundant taxa in the sample, divided by the total number of individuals in the sample, multiplied by 100. In general, as diversity declines, a fewer number of taxa make up a larger percentage of the total macroinvertebrate community. In contrast to most other metrics examined, the scores for percent dominance within all of the sample reaches were within the “moderate” or “high” categories.

Total BIBI Score

Scores for all ten metrics are added together to arrive at a total BIBI score. The stream’s total BIBI score is a measure of the stream’s biological condition. Because there are ten metrics and each metric is scored 1 to 5, the total BIBI score can range from 10 to 50. A score closer to 50 indicates a high biotic condition similar to that found in a “natural” reference stream, which in the Willamette Valley Region is a relatively undisturbed Pacific Northwest montane stream. A score closer to 10 indicates a severely degraded stream with poor biological integrity. Total BIBI scores for the project area sampling reaches ranged from 16 to 20, in the low range for biological integrity.

4.1.1 Other Stream Assessment Metrics

ABA provided scores for thirteen other metrics that may be useful in assessing the biological integrity of the project area streams. Values and biological integrity scores for each of these metrics are provided in Table 2. For the first six metrics listed in Table 2 (total abundance, EPT taxa richness, predator richness, scraper richness, shredder richness, and percent intolerant taxa), the metric value generally decreases as biological integrity decreases. For the project-area sampling reaches, these metrics generally scored low overall, indicating low biological integrity for project area streams.

For the last seven metrics listed in Table 2 (percent *Baetis tricaudatus*, percent collector, percent parasite, percent Oligochaeta, number of tolerant taxa, percent Simuliidae, and percent Chironomidae), the metric value generally increases as biological integrity decreases. Though scores for these metrics were variable for the project-area sampling reaches, approximately half of the scores were in the moderate to high range, indicating impaired biological integrity for project-area streams.

Table 2. Other Community Composition Metrics that are Indicative of Biological Condition

Metric	Clark Creek		East Fork Pringle Creek (PC1)		Pringle Creek (PC2)	
	Value	Score[a]	Value	Score[a]	Value	Score[a]
Total Abundance[b]	998	L	1840	H	2736	H
EPT Taxa Richness[b]	2	L	1	L	3	L
Predator Richness[b]	4	L	6	L	2	L
Scraper Richness[b]	2	L	3	L	3	L
Shredder Richness[b]	2	L	1	L	2	L
Percent Intolerant Taxa[b]	20.37	H	1.48	L	0.29	L
Percent *Baetis tricaudatus*[c]	8.33	H	0.59	H	7.75	H
Percent Collector[c]	76.39	L	43.77	M	66.08	L
Percent Parasite[c]	0.93	H	2.97	H	1.61	H
Percent Oligochaeta[c]	18.75	L	6.23	L	24.42	L
Number of Tolerant taxa[c]	9	M	12	L	10	L
Percent Simuliidae[c]	3.47	H	12.02	L	4.97	H
Percent Chironomidae	55.09	L	25.22	M	50.73	L

Notes:
a. Low (L), moderate (M), and high (H) scores compared with a Pacific Northwest montane stream with high biological integrity.
b. Metric value generally decreases with declining biological integrity
c. Metric value generally increases with declining biological integrity

4.2 Fish Sampling

Table 3 summarizes the results of the fish sampling efforts within the project-sample reaches. As noted above, the purpose of this sampling was to document the types of fish inhabiting the project-area streams. The sampling effort was not designed to document the number of fish within the project-area reaches. As noted above, mainstem Pringle Creek was not sampled because it was not possible to get the necessary permits from the NMFS within the time constraints associated with this sampling effort.

Five fish taxa were identified within the two reaches in which fish were surveyed. All fish collected at both reaches were native to the Willamette river watershed, and appeared healthy except for the cutthroat trout (~90mm), which had a lesion on its left operculum. Redside shiners captured on Clark Creek ranged up to approximately130mm, which seems very large for such a small stream. PHS expected to find cutthroat and lamprey on Clark Creek since the reach has a nicely developed riparian canopy to shade the stream and reasonable habitat, however, they were not found during this sampling effort, suggesting that there may be some unknown temperature or other seasonally occurring water quality issue that was not reflected in the data collected during this analysis.

Table 3. Results of Fish Sampling for Project Area Sampling Reaches

Fish Species	Sampling Reach		
	East Fork Pringle Creek	Clark Creek	Pringle Creek[a]
Sculpin	14	52	-
Redside Shiner	47	52	-
Three-spine Stickleback	3	-	-
Cutthroat trout	1	-	-
Speckled Dace	35	7	-
Total	**100**	**111**	**-**

Notes: a. Reach not sampled because necessary permit from NMFS could not be obtained in time to meet schedule constraints.

4.3 Physical Habitat Characterization

Physical habitat data were collected to provide baseline information that could be compared with future data to assess changes and trends in water quality and the hydromodification in the streams. Data related to thalweg profile and presence of large woody debris, for each of the sampling reaches are provided on data forms derived from those provided in the EMAP-SW protocol. Data forms for each of the sampling reaches are in Appendices C, D, and E, respectively.

Because of the shallow slope of the project area streams, PHS determined the water surface slope using a level and surveyor’s rods rather than a clinometer, as described in the methodology section above. Therefore, the EMAP-SW data sheet for slope measurement was not used. Slope data for the four sampling reaches are presented in Table 4, below.

Table 4. Water Surface Slopes for the Four Project-Area Sampling Reaches

Transect	**Water Surface Slope (Percent)**		
	Clark Creek	**East Fork Pringle Creek (PC1)**	**Pringle Creek (PC2)**
A to B	1.22	1.69	2.11
B to C	1.12	1.58	1.57
C to D	1.00	0.93	0.71
D to E	0.89	0.96	0.98
E to F	1.32	1.52	1.02
F to G	1.56	1.24	0.84
G to H	1.58	0.85	2.66
H to I	1.65	0.77	0.94
I to J	1.32	0.93	1.56
J to K	0.24	0.26	1.29
Reach Average	**1.19**	**1.07**	**1.37**

The slope of the stream reach may be useful in three different ways. First, the overall stream gradient gives an indication of potential water velocities and stream power, which are in turn important controls on aquatic habitat and sediment transport within the reach. Second, the spatial variability of stream gradient is a measure of habitat complexity, as reflected in the diversity of water velocities and sediment sizes within the stream reach. Lastly, the water surface slope allows computation of residual pool depths and volumes from the multiple depth and width measurements taken in the thalweg profile.

The EMAP-SW protocol for physical habitat characterization is useful for longitudinal studies of changes in channel morphology due to urban changes in the stream hydrograph. Water depths at regular intervals along the thalweg are provided on the “Thalweg Profile & Woody Debris Form” for each of the sampled reaches. With the assumption of linear water surface slope between the 11 sample transects within the reach, a detailed longitudinal profile of the stream bed thalweg can be drawn from the assessment data. Such a profile could be compared to profiles drawn from subsequent year’s data to assess changes in the stream profile over time. Downstream discharge can be correlated with mean water depths over the sample reach to yield an average relative rating curve for the reach. Thalweg and water surface slope profiles for each sampling reach are provided in Figures 5, 6, and 7 in Appendix A.

Changes in the flow regime are likely to alter the longitudinal relations of bedforms within a sampled reach, so that repeated monitoring will record the changes in bed geometry as the stream bed is altered. Fourier analysis of the inferred relative bed elevations will reveal changes in the distribution of streambed features resulting from changes in the hydrograph.

Wetted width data are listed on the “Thalweg Profile & Woody Debris Form” and on the “Channel/Riparian Cross-Section Form” for each of the sampled reaches. Changes in the low-flow wetted width can be expected to result from hydrograph changes resulting from changes in surface properties of the watershed. While not so detailed as the bedform data, these data can be expected to show channel changes resulting from altered flow regimes. Comparison of the baseline data contained in this report to data obtained in subsequent monitoring efforts can document changes in the stream over time.

Substrate size is one of the most important determinants of habitat character for fish and macroinvertebrates in streams. Substrate data for each transect within the sampled reaches are provided on the “Channel/Riparian Cross-Section Form”. Along with bedform (e.g., riffles and pools), substrate influences the hydraulic roughness and consequently the range of water velocities in the channel. It also influences the size range of interstices that provide living space and cover for macroinvertebrates, salamanders, and sculpins. Substrate characteristics are often sensitive indicators of the effects of human activities on streams. Decreases in the mean substrate size and increases in the percentage of fine sediments, for example, may destabilize channels and indicate changes in the rates of upland erosion and sediment supply. Within the sampled reaches, substrates were quite variable. Substrates in Clark and East Fork Pringle Creek were dominated by fine gravels, sands, and finer sediments. In portions of the Clark Creek reach, substrates were dominated by hardpan consisting of consolidated clay layers, with fine silt dominating the substrate composition in deeper, slower-moving portions of the stream. Substrates in mainstem Pringle Creek were dominated by gravels and cobbles, with varying degrees of embeddedness throughout the reach.

Other channel morphology data, including bank angles, undercut measurements, bankfull heights, and incision heights are provided on the “Channel/Riparian Cross-Section Form” for each of the sampled reaches. The recorded bank angles from the edge of the low-flow wetted channel will show changes to the banks resulting from flows at or in excess of the bankfull discharge. If the channel is not greatly incised, bankfull channel height and incision height will be the same. However, if the channel is incised greatly, the bankfull level will be below the level of the first terrace of the valley floodplain, making bankfull channel height smaller than incision height. Throughout the East Fork Pringle Creek and Clark Creek reaches, the channels are relatively deeply incised under current conditions.

Qualitative assessments of riparian vegetation and land use characteristics along each of the sampled reaches are provided on the “Channel/Riparian Cross-Section Form” and the “Riparian ‘Legacy’ Trees and Invasive Alien Plants” forms. While these data cannot be used to directly describe hydromodification of the stream, the visual estimations of riparian condition are useful for evaluating the health and level of disturbance of the stream corridor. They also provide an indication of the present and future potential for various types of organic inputs and shading, which are important contributors to water quality and the aquatic ecosystem. Riparian canopy cover over a stream is important not only in its role in moderating stream temperatures through shading, but also as an indicator of conditions that control bank stability and the potential for inputs of coarse and fine particulate organic material. Organic inputs from riparian vegetation become food for stream organisms and structure to create and maintain complex channel habitat.

The field evaluation of the presence and proximity of various important types of human land use activities in the stream riparian area may be used in combination with mapped watershed land use information to assess the potential degree of disturbance of the sample stream reaches.

4.4 Summary

This report presents the results of benthic macroinvertebrate sampling, fish sampling, and physical habitat characterization conducted within three sampled reaches in the vicinity of existing monitoring stations operated by the City of Salem. This data is intended as baseline data against which the results of future monitoring efforts can be compared to assess the changes and trends in water quality and hydromodification.

Benthic Invertebrate Index of Biological Integrity (BIBI) scores derived from the benthic macroinvertebrate sampling effort indicate some level of water quality degradation in each of the three sampled reaches. Low biological integrity scores are often recorded in streams located within urban environments. Fish species were recorded during fish sampling efforts of Clark Creek and East Fork Pringle Creek. No non-native fish species were recorded.

Physical habitat characteristics of the three stream reaches examined by this study vary considerably; however, each of the reaches shows the effects of human influence. The East Fork Pringle Creek reach has been channelized into a straightened channel. Clark Creek skirts the edge of Gilmore Field and may have been channelized into its current location at some point in the past. The channels of both streams are somewhat incised. A control structure downstream of the reach turns Clark Creek and the adjacent Gilmore Field into a detention facility, preventing flooding of downstream neighborhoods, during high-flow events. Mainstem Pringle Creek is less incised than the other two reaches; however, portions of the bank are constrained by concrete and block retaining walls where the stream occurs in close proximity to private residences.

Substrates within the three reaches vary, as would be expected of streams of different sizes. Substrates within East Fork Pringle Creek and Clark Creek are dominated by fine gravel and other fine sediments. The substrate within portions of Clark Creek, however, is dominated by hardpan clay, indicating scour during high-flow events. The substrate within mainstem Pringle Creek is dominated by coarse gravel and cobbles.

In addition to substrate size class, data was collected on water depth, wetted width, bankfull height, bankfull width, bank angle, surface water slope and other measurements, as described above. Comparison of the results of future monitoring events with the baseline data collected in 2012 can be used to document changes in stream condition over time.

5.0 REFERENCES

Oregon Department of Environmental Quality. June 30, 2010. *Water Monitoring and Assessment Mode of Operations Manual* (*MOMs*), Version 3.3, DEQ03-LAB-0036-SOP, Laboratory and Environmental Assessment Division, Hillsboro, Oregon.

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Pacific Habitat Services, Inc. March 21, 2011. *Technical Memorandum for the City of Salem's MS4 Permit Requirements for Benthic Macroinvertebrate Sampling and Hydromodification Assessment*

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Appendix A

Figures

6/28/12
PHS #5029

Location of East Fork Pringle Creek Sampling Reach, Salem, Oregon.

FIGURE
1

Pacific Habitat Services, Inc.

Y:\AUTOCAD\4200\4268 Salem Shade\shade mapping\buffer and shade categories 110908.dwg, Fig 1 E Frk Pringle, 6/28/2012 2:22:53 PM

5/28/12
PHS #5029

Location of Pringle Creek Sampling Reach, Salem, Oregon.

FIGURE
2

Pacific Habitat Services, Inc.

Y:\AUTOCAD\4200\4268 Salem Shade\shade mapping\buffer and shade categories 110908.dwg, Fig 2 Pringle, 6/28/2012 2:25:34 PM

5/29/12
PHS #5029

Location of Clark Creek Sampling Reach, Salem, Oregon.

FIGURE
3

Pacific Habitat Services, Inc.

Y:\AUTOCAD\4200\4268 Salem Shade\shade mapping\buffer and shade categories 110908.dwg, Fig 3 Clark, 6/28/2012 2:28:49 PM

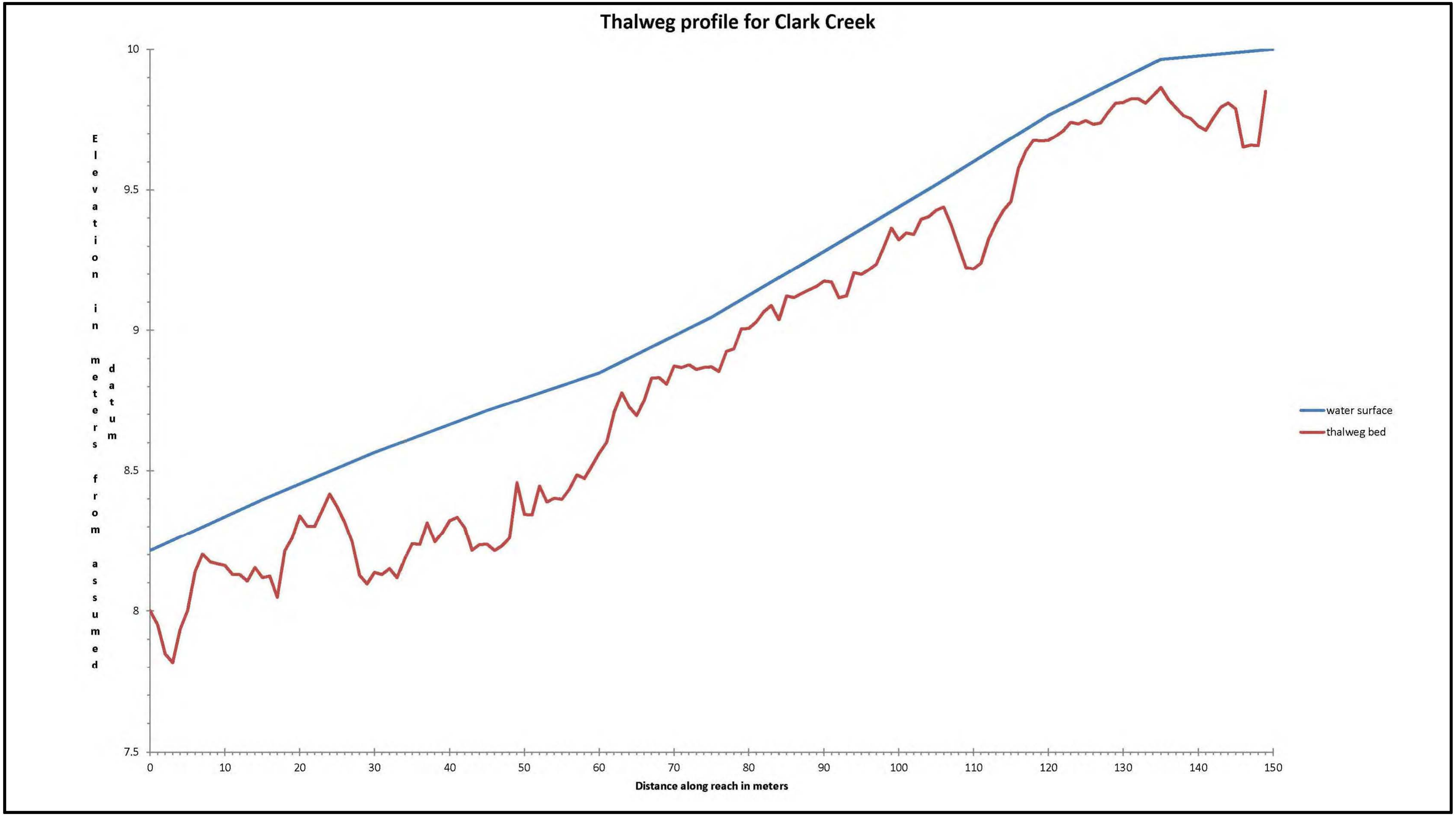
3/23/12
PHS #4891

Transect Layout along East Fork Pringle Creek, Salem, Oregon.

FIGURE 4

Pacific Habitat Services, Inc.

Y:\AUTOCAD\4200\4268 Salem Shade\shade mapping\buffer and shade categories 110908.dwg, Fig 4 Transects, 6/28/2012 2:33:42 PM

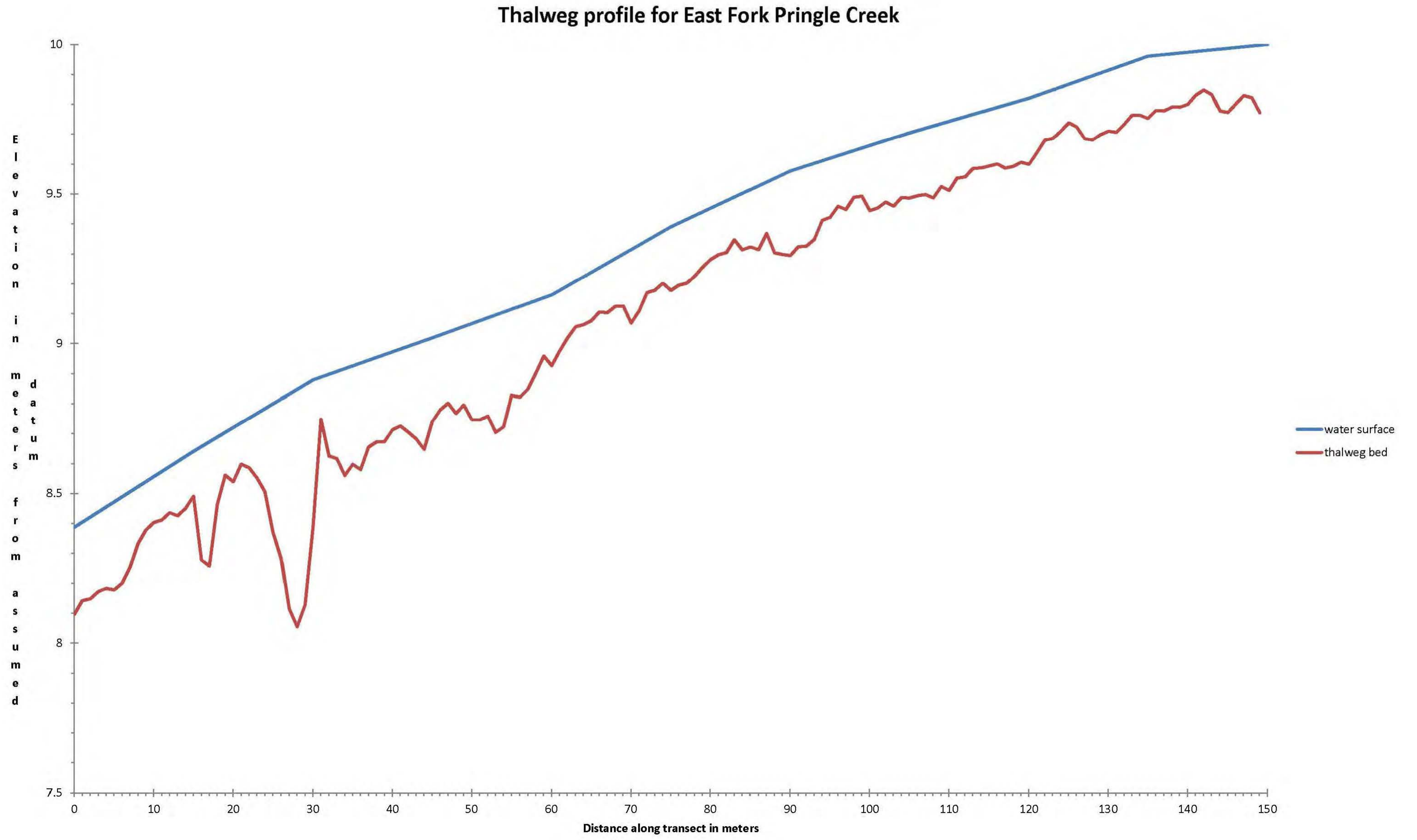


PHS #5029
6/28/12

Thalweg profile for Clark Creek Sampling Reach, Salem, Oregon.

FIGURE
5

Pacific Habitat Services, Inc.

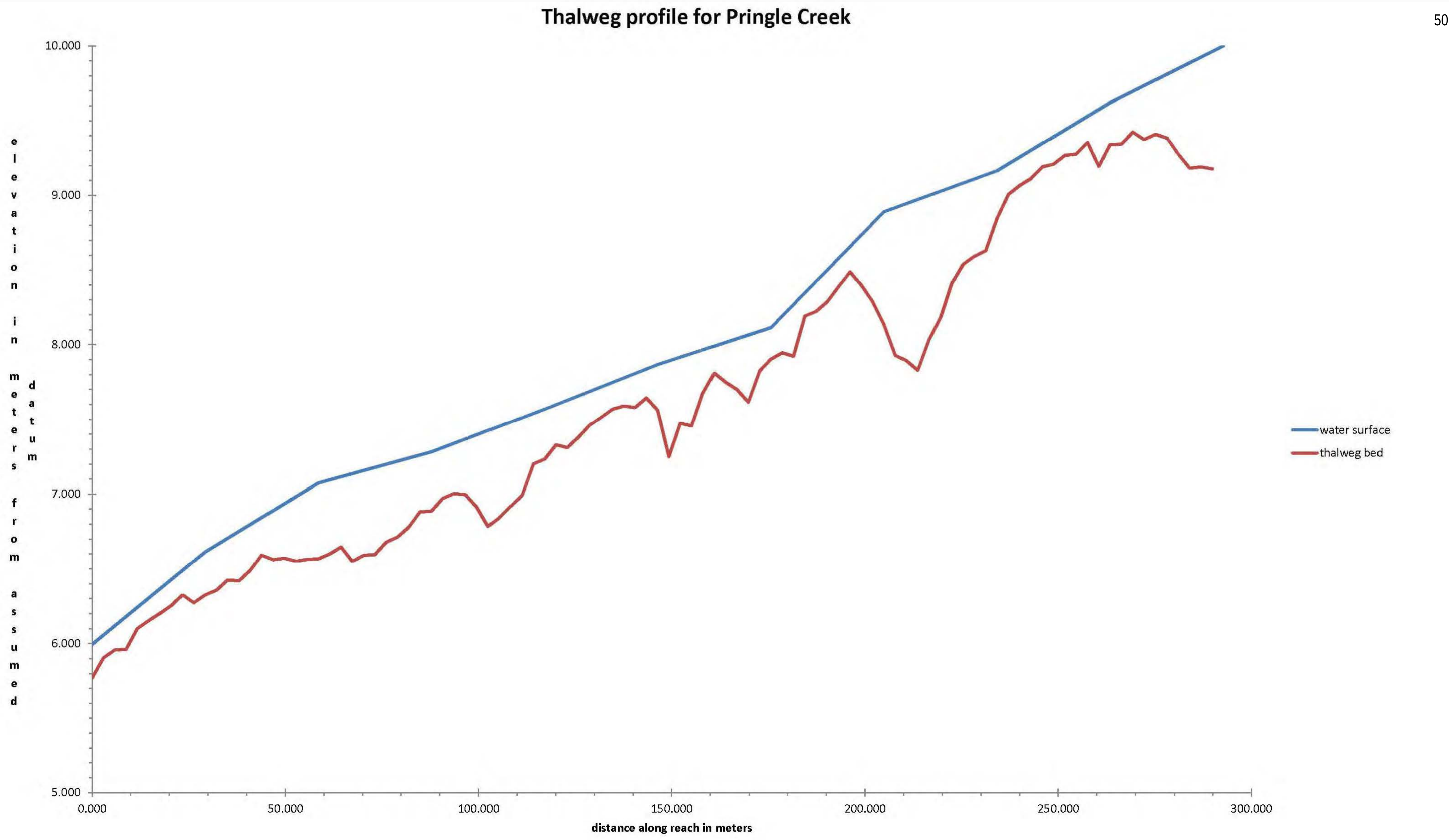


PHS #5029
6/28/12

Thalweg profile for East Fork Pringle Creek Sampling Reach, Salem, Oregon.

FIGURE
6

Pacific Habitat Services, Inc.



PHS #5029
6/28/12

Thalweg profile for Pringle Creek Sampling Reach, Salem, Oregon.

FIGURE
7

Pacific Habitat Services, Inc.

Appendix B

Benthic Macroinvertebrate Sampling Data

Client	**Pacific Habitat Services, Wilsonville, OR**
Client contact	Craig Tumer, ct@pacifichabitat.com
Project	**Clark and Pringle Creeks monitoring**
Project location	Salem, Oregon
Project objectives	Benthic biomonitoring for in-stream projects

Laboratory

Aquatic Biology Associates, Inc. (ABA3490 NW Deer Run Street, Corvallis, OR 97330
http://www.aquaticbio.com/

Robert Wisseman	general taxonomy, bobwisseman@mac.com
James DiGiulio	Chironomidae taxonomy, digiulio@peak.org
Jon Lee	mite taxonomy, jlee@humboldt1.com

Sampling protocol

Sampling gear	D-frame net
Mesh size	500 micron
Square area sampled	11 square feet
Habitat sampled	erosional

Laboratory protocol

Mesh size	500 micron
Subsampling target count	500 organism minimum
Subsampling device	Caton tray
Sorting efficacy	95+%
Standard taxonomic effort	Pacific Northwest level 2 (unpublished)
Chironomidae (midges)	genus/species group
Oligochaeta (segmented worms)	class Oligochaeta
Acari (mites)	subclass Acari
Taxa abundances	converted to a full sample and 1 square meter basis

Data analysis

Standard taxonomic effort (STE)	Version 2 ABA
Taxa traits (e.g. feeding group, etc.)	Version 2 ABA (see "Traits" tab in this output for documentation)

Programmed in R by Adam and Robert Wisseman
Version 2 of ABA STE and taxa traits is a draft version still under development.
Abundances converted to a standard full sample (if subsampled) and one square meter basis.

Explanation of sheets

Abundances are converted to a full sample (if subsampled) and one square meter basis
Indices= Karr benthic index of biological integrity (Karr BIBI), a general index for Pacific Northwest streams
Metrics= extensive list of metrics derived from taxonomic groups present, their abundances and ecological traits
Abundance= taxa abundances converted to a full sample (if subsampled) and one square meter basis
Percent abundance= percent contribution of each taxon to the total benthic community
Long output= record type file in Excel with taxon abundances converted to a full sample and one square meter basis
Traits= complete project taxa list and documentation of taxonomic hierarchy and ecological traits used for metrics
Metric explanation= documentation of how metrics are calculated
Record file= raw data file in record format in Excel

Date run:
Mon Jun 25 13:12:49 2012
Analysis program in developmental phase.

Benthic Invertebrate Index of Biological Integrity-BIBI (modified Karr 1998)

OR: City of Salem. Clark and Pringle Creeks. For Pacific Habitat Services, Wilsonville, OR.

Sampling method: riffle habitat, D-frame net, composite sample, 11 square feet total area , 500 micron mesh.

Subsampling: 500 organism minimum or entire sample. Level 3 PNW standard taxonomic effort.

Abundances adjusted to a full sample and square meter basis.

	Site	**Clark Creek**		**Pringle Creek**		**Pringle Creek**	
	Site code	**1**		**1**		**2**	
	Date	**5/24/2012**		**5/24/2012**		**5/24/2012**	
	METRIC	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
D	**Total number of taxa**	30	3	35	3	34	3
D	**Number Ephemeroptera taxa**	1	1	1	1	1	1
D	**Number Plecoptera taxa**	0	1	0	1	0	1
D	**Number Trichoptera taxa**	1	1	0	1	2	1
D	**Number of long-lived taxa**	3	3	3	3	4	3
D	**Number of intolerant taxa**	2	1	1	1	1	1
I	**% Tolerant taxa**	20.13	3	51.49	1	17.85	5
D	**% Predator**	4.63	1	3.12	1	1.46	1
D	**Number of clinger taxa**	6	1	10	1	10	1
I	**% Dominance (3 taxa)**	46.99	5	63.65	3	53.36	3
	TOTAL SCORE	🟥	**20**	🟥	**16**	🟥	**20**
	BIOLOGICAL CONDITION CATEGORY		**Low**		**Low**		**Low**

Maximum score of 50. Each metric scored: 1=low, 3=moderate, 5=high

OTHER COMMUNITY COMPOSITION METRICS THAT ARE INDICATIVE OF BIOLOGICAL CONDITION

	Total abundance (m2)	998	🟥	1840	🟩	2736	🟩
D	**EPT taxa richness**	2	🟥	1	🟥	3	🟥
D	**Predator richness**	4	🟥	6	🟥	2	🟥
D	**Scraper richness**	2	🟥	3	🟥	3	🟥
D	**Shredder richness**	2	🟥	1	🟥	2	🟥
D	**%Intolerant taxa**	20.37	🟩	1.48	🟥	0.29	🟥
I	***% Baetis tricaudatus***	8.33	🟩	0.59	🟩	7.75	🟩
I	**%Collector**	76.39	🟥	43.77	🟨	66.08	🟥
I	**%Parasite**	0.93	🟩	2.97	🟩	1.61	🟩
I	**%Oligochaeta**	18.75	🟥	6.23	🟥	24.42	🟥
I	**Number tolerant taxa**	9	🟨	12	🟥	10	🟥
I	**%Simuliidae**	3.47	🟩	12.02	🟥	4.97	🟩
I	**%Chironomidae**	55.09	🟥	25.22	🟨	50.73	🟥

L,M & H comparisons with a Pacific Northwest montane stream with high biological integrity.

I= Metric value generally increases with declining biological integrity.

D= Metric value generally decreases with declining biological integrity.

L= Low biological integrity.	🟥	BIBI scores between 0-24.
M= Moderate biological integrity.	🟨	BIBI scores between 25-39.
H= High biological integrity.	🟩	BIBI scores >40.

Abundances converted to a standard full sample (if subsampled) and one square meter basis.

Waterbody	Clark Creek	Pringle Creek	Pringle Creek
Site	1	1	2
Date	2012-05-24	2012-05-24	2012-05-24
Subsample count	432	674	684
Subsample correction factor to full sample	2.31	2.73	4
Area correction factor to square meter	1	1	1
SUMMARY METRICS			
Total taxa richness	30	35	34
Total abundance	998	1840	2736
EPT taxa richness	2	1	3
EPT abundance	102	11	288
DOMINANCE AND DIVERSITY			
% Dominant taxa	19.91	42.73	24.42
% Top 3 taxa	46.99	63.65	53.36
Shannon-Weaver Diversity (loge)	2.75	2.25	2.6
Shannon-Weaver Diversity (log2)	3.96	3.24	3.76
TOLERANT AND INTOLERANT TAXA			
% Total tolerant taxa	15.05	59.94	10.82
Total tolerant taxa richness	10	12	10
Total tolerant taxa abundance	150	1103	296
% Highly tolerant taxa	0.93	0.74	0.58
Highly tolerant taxa richness	2	2	2
Highly tolerant taxa abundance	9	14	16
% Moderately tolerant taxa	14.12	59.2	10.23
Moderately tolerant taxa richness	8	10	8
Moderately tolerant taxa abundance	141	1089	280
% Total intolerant taxa	20.37	1.48	0.29
Total intolerant taxa richness	2	1	1
Total intolerant taxa abundance	203	27	8
% Highly intolerant taxa	0	0	0
Highly intolerant taxa richness	0	0	0
Highly intolerant taxa abundance	0	0	0
% Moderately Intolerant taxa	20.37	1.48	0.29
Moderately intolerant taxa richness	2	1	1
Moderately intolerant taxa abundance	203	27	8
VOLTINISM (length of life cycle)			
% Semivoltine (> 1 year life cycle)	5.09	48.52	4.97
% Univoltine (1 year life cycle)	22.69	11.57	26.9
% Multivoltine (< 1 year life cycle)	72.22	39.91	68.13
Semivoltine taxa abundance	51	893	136
Univoltine taxa abundance	226	213	736
Multivoltine taxa abundance	721	734	1864

Waterbody	Clark Creek	Pringle Creek	Pringle Creek
Site	1	1	2
Date	2012-05-24	2012-05-24	2012-05-24
Semivoltine taxa richness	2	4	4
Univoltine taxa richness	6	6	5
Multivoltine taxa richness	22	25	25
GROWTH AND DEVELOPMENT			
% Fast seasonal life cycle	69.44	38.13	64.47
% Slow seasonal life cycle	30.56	56.68	33.92
% Nonseasonal life cycle	0	5.19	1.61
OCCURRENCE IN DRIFT			
% Rare in drift	32.64	60.24	32.89
% Common in drift	0.46	1.93	3.51
% Abundant in drift	66.9	37.83	63.6
SIZE AT MATURITY			
% Small size at maturity	66.9	44.96	68.42
% Medium size at maturity	28.01	11.72	28.07
% Large size at maturity	5.09	43.32	3.51
Small size at maturity abundance	668	827	1872
Medium size at maturity abundance	280	216	768
Large size at maturity abundance	51	797	96
Small size at maturity taxa richness	20	26	24
Medium size at maturity taxa richness	8	7	7
Large size at maturity taxa richness	2	2	3
RHEOPHILY AND HABITAT AFFINITY			
% Depositional only	8.1	4.01	21.93
% Depositional and erosional	88.43	83.98	73.1
% Erosional	3.47	12.02	4.97
THERMAL PREFERENCE			
% Cold stenothermal and cool eurythermal	20.37	1.48	0.29
% Cool/warm eurythermal	79.4	98.22	98.98
% Warm eurythermal	0.23	0.3	0.73
NON-INSECT AND INSECT ORDERS			
% Non-insect invertebrates	28.47	60.83	30.85
% Ephemeroptera (mayflies)	8.33	0.59	7.75
% Odonata (damsel- and dragonflies)	0	0	0
% Plecoptera (stoneflies)	0	0	0
% Hemiptera (true bugs)	0	0	0
% Megaloptera (alderflies and hellgramites)	0	0	0
% Trichoptera (caddisflies)	1.85	0	2.78
% Lepidoptera (moths)	0	0	0
% Coleoptera (beetles)	0	0.45	0
% Diptera (total)(true flies)	61.34	38.13	58.63
% Chironomidae (true flies- midges)	55.09	25.22	50.73

Waterbody	Clark Creek	Pringle Creek	Pringle Creek
Site	1	1	2
Date	2012-05-24	2012-05-24	2012-05-24
Non-insect taxa richness	7	7	10
Ephemeroptera taxa richness	1	1	1
Odonata taxa richness	0	0	0
Plecoptera taxa richness	0	0	0
Hemiptera taxa richness	0	0	0
Megaloptera taxa richness	0	0	0
Trichoptera taxa richness	1	0	2
Lepidoptera taxa richness	0	0	0
Coleoptera taxa richness	0	3	0
Diptera (total) taxa richness	21	24	21
Chironomidae taxa richness	17	21	16
Non-insect abundance	284	1119	844
Ephemeroptera abundance	83	11	212
Odonata abundance	0	0	0
Plecoptera abundance	0	0	0
Hemiptera abundance	0	0	0
Megaloptera abundance	0	0	0
Trichoptera abundance	18	0	76
Lepidoptera abundance	0	0	0
Coleoptera abundance	0	8	0
Diptera (total) abundance	612	702	1604
Chironomidae abundance	550	464	1388
INDICATOR TAXA			
Mollusca (snails and bivalves) taxa richness	2	4	5
Crustacea taxa richness	1	0	2
Baetidae (mayfly) taxa richness	1	1	1
Ephemerellidae (mayfly) taxa richness	0	0	0
Heptageniidae (mayfly) taxa richness	0	0	0
Nemouridae (stonefly) taxa richness	0	0	0
Rhyacophilidae (caddisfly) taxa richness	0	0	0
Hydropsychidae (caddisfly) taxa richness	0	0	0
Elmidae (riffle beetle) taxa richness	0	1	0
Oligochaeta (segmented worms) abundance	187	115	668
Mollusca abundance	39	950	108
Crustacea abundance	46	0	24
Acari (mites) abundance	5	35	24
Baetidae abundance	83	11	212
Baetis tricaudatus (mayfly) abundance	83	11	212
Ephemerellidae abundance	0	0	0
Heptageniidae abundance	0	0	0
Nemouridae abundance	0	0	0

Waterbody	Clark Creek	Pringle Creek	Pringle Creek
Site	1	1	2
Date	2012-05-24	2012-05-24	2012-05-24
Rhyacophililidae abundance	0	0	0
Hydropsychidae taxa abundance	0	0	0
Elmidae abundance	0	3	0
Simuliidae abundance	35	221	136
Tanytarsini midge abundance	0	5	100
% Oligochaeta (segmented worms)	18.75	6.23	24.42
% Mollusca	3.94	51.63	3.95
% Crustacea	4.63	0	0.88
% Acari	0.46	1.93	0.88
% Baetidae	8.33	0.59	7.75
% Baetis tricaudatus	8.33	0.59	7.75
% Ephemerellidae	0	0	0
% Heptageniidae	0	0	0
% Nemouridae	0	0	0
% Rhyacophilidae	0	0	0
% Hydropsychidae	0	0	0
% Elmidae	0	0.15	0
% Simuliidae	3.47	12.02	4.97
% Tanytarsini	0	0.3	3.65
FEEDING GROUPS			
Predator taxa richness	4	6	2
Parasite taxa richness	2	2	2
Collector-gatherer taxa richness	17	17	18
Collector-filterer taxa richness	1	3	3
Collector (total) taxa richness	18	20	21
Piercer herbivore taxa richness	0	0	1
Macrophyte herbivore taxa richness	1	2	1
Shredder taxa richness	2	1	2
Scraper taxa richness	2	3	3
Omnivore taxa richness	1	1	2
Unknown taxa richness	0	0	0
Predator abundance	46	57	40
Parasite abundance	9	55	44
Collector-gatherer abundance	728	489	1624
Collector-filterer abundance	35	317	184
Collector (total) abundance	762	805	1808
Piercer herbivore abundance	0	0	60
Macrophyte herbivore abundance	53	25	60
Shredder abundance	39	11	84
Scraper abundance	58	101	612
Omnivore abundance	30	786	28

Waterbody	Clark Creek	Pringle Creek	Pringle Creek
Site	1	1	2
Date	2012-05-24	2012-05-24	2012-05-24
Unknown abundance	0	0	0
% Predator	4.63	3.12	1.46
% Parasite	0.93	2.97	1.61
% Collector-gatherer	72.92	26.56	59.36
% Collector-filterer	3.47	17.21	6.73
% Collector (total)	76.39	43.77	66.08
% Piercer herbivore	0	0	2.19
% Macrophyte herbivore	5.32	1.34	2.19
% Shredder	3.94	0.59	3.07
% Scraper	5.79	5.49	22.37
% Omnivore	3.01	42.73	1.02
% Unknown	0	0	0
HABIT			
Skater taxa richness	0	0	0
Planktonic taxa richness	0	0	0
Diver taxa richness	0	0	0
Swimmer taxa richness	2	1	3
Clinger taxa richness	7	11	12
Sprawler taxa richness	11	12	11
Climber taxa richness	1	2	1
Burrower taxa richness	9	9	7
Unknowns taxa richness	0	0	0
Skater abundance	0	0	0
Planktonic abundance	0	0	0
Diver abundance	0	0	0
Swimmer abundance	51	35	48
Clinger abundance	261	1177	1380
Sprawler abundance	210	281	400
Climber abundance	18	5	16
Burrower abundance	457	341	892
Unknowns abundance	0	0	0
% Skater	0	0	0
% Planktonic	0	0	0
% Diver	0	0	0
% Swimmer	5.09	1.93	1.75
% Clinger	26.16	63.95	50.44
% Sprawler	21.06	15.28	14.62
% Climber	1.85	0.3	0.58
% Burrower	45.83	18.55	32.6
% Unknown	0	0	0

Abundances converted to a standard full sample (if subsampled) and one square meter basis.

							Waterbody	Clark Creek	Pringle Creek	Pringle Creek
							Site	1	1	2
							Date	2012-05-24	2012-05-24	2012-05-24
Taxon	Stage	Insect?	Origin	Higher classification	Order	Family	Common name	Abundance	Abundance	Abundance
Turbellaria	U	non-insect	Aquatic	Turbellaria	miscellaneous non-insect	x	flat worms	2		
Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	5	19	20
Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	187	115	668
Fluminicola	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lithoglyphidae	snails	9	68	28
Physa	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Physidae	snails			12
Ferrissia	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails		3	4
Juga	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Pleuroceridae	snails	30	786	24
Pisidium	U	non-insect	Aquatic	Mollusca: Bivalvia	x	Sphaeriidae	pea clams		93	40
Crangonyx	U	non-insect	Aquatic	Crustacea: Amphipoda	x	Crangonyctidae	scuds	46		20
Pacifastacus	U	non-insect	Aquatic	Crustacea: Decapoda	x	Astacidae	crayfish			4
Acari	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	5	35	24
Baetis tricaudatus	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	83	11	212
Hydroptila	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydroptilidae	caddisflies			60
Lepidostoma-panel case larvae	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	18		16
Microcylloepus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles		3	
Gyrinus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Gyrinidae	whirligig beetles		3	
Haliplus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Haliplidae	crawling water beetles		3	
Ceratopogoninae	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Ceratopogonidae	no-see-um midges	5	5	4
Dixella	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Dixidae	dixid midges			4
Psychoda	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Psychodidae	moth flies	2		4
Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	35	221	136
Tipula	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Tipulidae	crane flies	21	11	68
Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	21	5	84
Alotanypus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges		33	
Brillia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	49	22	72
Chironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	7	3	
Corynoneura	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	5	27	8
Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges		27	164
Cryptochironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	5	3	
Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	21	164	20
Eukiefferiella devonica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges		5	8
Heterotrissocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	5		
Limnophyes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	14	22	120
Metriocnemus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	12		
Micropsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges		3	92
Parakiefferiella	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges			20
Parametriocnemus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	21		8
Paratanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges		3	8
Paratendipes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges		35	
Phaenopsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	49	30	580
Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	53	22	60
Procladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges		11	

							Waterbody	Clark Creek	Pringle Creek	Pringle Creek
							Site	1	1	2
							Date	2012-05-24	2012-05-24	2012-05-24
Taxon	Stage	Insect?	Origin	Higher classification	Order	Family	Common name	Abundance	Abundance	Abundance
Prodiamesa	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Prodiamesinae	midges	199	27	8
Rheocricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	42	14	100
Smittia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	5		
Synorthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	12	3	
Thienemannimyia complex	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	35	3	36
Tvetenia bavarica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges		3	

Abundances converted to a standard full sample (if subsampled) and one square meter basis

							Waterbody	Clark Creek	Pringle Creek	Pringle Creek
							Site	1	1	2
							Date	2012-05-24	2012-05-24	2012-05-24
Taxon	Stage	Insect?	Origin	Higher classification	Order	Family	Common name	% abundance	% abundance	% abundance
Turbellaria	U	non-insect	Aquatic	Turbellaria	miscellaneous non-insect	x	flat worms	0.23		
Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	0.46	1.04	0.73
Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	18.75	6.23	24.42
Fluminicola	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lithoglyphidae	snails	0.93	3.71	1.02
Physa	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Physidae	snails			0.44
Ferrissia	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails		0.15	0.15
Juga	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Pleuroceridae	snails	3.01	42.73	0.88
Pisidium	U	non-insect	Aquatic	Mollusca: Bivalvia	x	Sphaeriidae	pea clams		5.04	1.46
Crangonyx	U	non-insect	Aquatic	Crustacea: Amphipoda	x	Crangonyctidae	scuds	4.63		0.73
Pacifastacus	U	non-insect	Aquatic	Crustacea: Decapoda	x	Astacidae	crayfish			0.15
Acari	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	0.46	1.93	0.88
Baetis tricaudatus	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	8.33	0.59	7.75
Hydroptila	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydroptilidae	caddisflies			2.19
Lepidostoma-panel case larvae	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	1.85		0.58
Microcylloepus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles		0.15	
Gyrinus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Gyrinidae	whirligig beetles		0.15	
Haliplus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Haliplidae	crawling water beetles		0.15	
Ceratopogoninae	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Ceratopogonidae	no-see-um midges	0.46	0.3	0.15
Dixella	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Dixidae	dixid midges			0.15
Psychoda	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Psychodidae	moth flies	0.23		0.15
Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	3.47	12.02	4.97
Tipula	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Tipulidae	crane flies	2.08	0.59	2.49
Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	2.08	0.3	3.07
Alotanypus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges		1.78	
Brillia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	4.86	1.19	2.63
Chironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	0.69	0.15	
Corynoneura	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0.46	1.48	0.29
Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges		1.48	5.99
Cryptochironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	0.46	0.15	
Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	2.08	8.9	0.73
Eukiefferiella devonica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges		0.3	0.29
Heterotrissocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0.46		
Limnophyes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	1.39	1.19	4.39
Metriocnemus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	1.16		
Micropsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges		0.15	3.36
Parakiefferiella	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges			0.73
Parametriocnemus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	2.08		0.29
Paratanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges		0.15	0.29
Paratendipes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges		1.93	
Phaenopsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	4.86	1.63	21.2
Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	5.32	1.19	2.19
Procladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges		0.59	
Prodiamesa	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Prodiamesinae	midges	19.91	1.48	0.29
Rheocricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	4.17	0.74	3.65
Smittia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0.46		
Synorthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	1.16	0.15	
Thienemannimyia complex	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	3.47	0.15	1.32
Tvetenia bavarica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges		0.15	

Waterbody	Site	Date	Taxon	Stage	Insect	Origin	Higher.classification	Order	Family	Common.name	Abundance
Clark Creek	1	2012-05-24	Turbellaria	U	non-insect	Aquatic	Turbellaria	miscellaneous non-insect	x	flat worms	2.31
Clark Creek	1	2012-05-24	Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	4.62
Pringle Creek	1	2012-05-24	Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	19.11
Pringle Creek	2	2012-05-24	Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	20
Clark Creek	1	2012-05-24	Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	187.11
Pringle Creek	1	2012-05-24	Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	114.66
Pringle Creek	2	2012-05-24	Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	668
Clark Creek	1	2012-05-24	Fluminicola	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lithoglyphidae	snails	9.24
Pringle Creek	1	2012-05-24	Fluminicola	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lithoglyphidae	snails	68.25
Pringle Creek	2	2012-05-24	Fluminicola	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lithoglyphidae	snails	28
Pringle Creek	2	2012-05-24	Physa	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Physidae	snails	12
Pringle Creek	1	2012-05-24	Ferrissia	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails	2.73
Pringle Creek	2	2012-05-24	Ferrissia	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails	4
Clark Creek	1	2012-05-24	Juga	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Pleuroceridae	snails	30.03
Pringle Creek	1	2012-05-24	Juga	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Pleuroceridae	snails	786.24
Pringle Creek	2	2012-05-24	Juga	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Pleuroceridae	snails	24
Pringle Creek	1	2012-05-24	Pisidium	U	non-insect	Aquatic	Mollusca: Bivalvia	x	Sphaeriidae	pea clams	92.82
Pringle Creek	2	2012-05-24	Pisidium	U	non-insect	Aquatic	Mollusca: Bivalvia	x	Sphaeriidae	pea clams	40
Clark Creek	1	2012-05-24	Crangonyx	U	non-insect	Aquatic	Crustacea: Amphipoda	x	Crangonyctidae	scuds	46.2
Pringle Creek	2	2012-05-24	Crangonyx	U	non-insect	Aquatic	Crustacea: Amphipoda	x	Crangonyctidae	scuds	20
Pringle Creek	2	2012-05-24	Pacifastacus	U	non-insect	Aquatic	Crustacea: Decapoda	x	Astacidae	crayfish	4
Clark Creek	1	2012-05-24	Acari	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	4.62
Pringle Creek	1	2012-05-24	Acari	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	35.49
Pringle Creek	2	2012-05-24	Acari	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	24
Clark Creek	1	2012-05-24	Baetis tricaudatus	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	83.16
Pringle Creek	1	2012-05-24	Baetis tricaudatus	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	10.92
Pringle Creek	2	2012-05-24	Baetis tricaudatus	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	212
Pringle Creek	2	2012-05-24	Hydroptila	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydroptilidae	caddisflies	60
Clark Creek	1	2012-05-24	Lepidostoma-panel case larvae	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	18.48
Pringle Creek	2	2012-05-24	Lepidostoma-panel case larvae	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	16
Pringle Creek	1	2012-05-24	Microcylloepus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	2.73
Pringle Creek	1	2012-05-24	Gyrinus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Gyrinidae	whirligig beetles	2.73
Pringle Creek	1	2012-05-24	Haliplus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Haliplidae	crawling water beetles	2.73
Clark Creek	1	2012-05-24	Ceratopogoninae	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Ceratopogonidae	no-see-um midges	4.62
Pringle Creek	1	2012-05-24	Ceratopogoninae	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Ceratopogonidae	no-see-um midges	5.46
Pringle Creek	2	2012-05-24	Ceratopogoninae	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Ceratopogonidae	no-see-um midges	4
Pringle Creek	2	2012-05-24	Dixella	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Dixidae	dixid midges	4
Clark Creek	1	2012-05-24	Psychoda	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Psychodidae	moth flies	2.31
Pringle Creek	2	2012-05-24	Psychoda	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Psychodidae	moth flies	4
Clark Creek	1	2012-05-24	Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	34.65
Pringle Creek	1	2012-05-24	Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	221.13
Pringle Creek	2	2012-05-24	Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	136
Clark Creek	1	2012-05-24	Tipula	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Tipulidae	crane flies	20.79
Pringle Creek	1	2012-05-24	Tipula	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Tipulidae	crane flies	10.92
Pringle Creek	2	2012-05-24	Tipula	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Tipulidae	crane flies	68
Clark Creek	1	2012-05-24	Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	20.79

Waterbody	Site	Date	Taxon	Stage	Insect	Origin	Higher.classification	Order	Family	Common.name	Abundance
Pringle Creek	1	2012-05-24	Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	5.46
Pringle Creek	2	2012-05-24	Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	84
Pringle Creek	1	2012-05-24	Alotanypus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	32.76
Clark Creek	1	2012-05-24	Brillia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	48.51
Pringle Creek	1	2012-05-24	Brillia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	21.84
Pringle Creek	2	2012-05-24	Brillia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	72
Clark Creek	1	2012-05-24	Chironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	6.93
Pringle Creek	1	2012-05-24	Chironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	2.73
Clark Creek	1	2012-05-24	Corynoneura	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	4.62
Pringle Creek	1	2012-05-24	Corynoneura	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	27.3
Pringle Creek	2	2012-05-24	Corynoneura	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	8
Pringle Creek	1	2012-05-24	Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	27.3
Pringle Creek	2	2012-05-24	Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	164
Clark Creek	1	2012-05-24	Cryptochironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	4.62
Pringle Creek	1	2012-05-24	Cryptochironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	2.73
Clark Creek	1	2012-05-24	Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	20.79
Pringle Creek	1	2012-05-24	Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	163.8
Pringle Creek	2	2012-05-24	Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	20
Pringle Creek	1	2012-05-24	Eukiefferiella devonica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	5.46
Pringle Creek	2	2012-05-24	Eukiefferiella devonica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	8
Clark Creek	1	2012-05-24	Heterotrissocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	4.62
Clark Creek	1	2012-05-24	Limnophyes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	13.86
Pringle Creek	1	2012-05-24	Limnophyes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	21.84
Pringle Creek	2	2012-05-24	Limnophyes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	120
Clark Creek	1	2012-05-24	Metriocnemus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	11.55
Pringle Creek	1	2012-05-24	Micropsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	2.73
Pringle Creek	2	2012-05-24	Micropsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	92
Pringle Creek	2	2012-05-24	Parakiefferiella	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	20
Clark Creek	1	2012-05-24	Parametriocnemus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	20.79
Pringle Creek	2	2012-05-24	Parametriocnemus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	8
Pringle Creek	1	2012-05-24	Paratanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	2.73
Pringle Creek	2	2012-05-24	Paratanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	8
Pringle Creek	1	2012-05-24	Paratendipes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	35.49
Clark Creek	1	2012-05-24	Phaenopsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	48.51
Pringle Creek	1	2012-05-24	Phaenopsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	30.03
Pringle Creek	2	2012-05-24	Phaenopsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	580
Clark Creek	1	2012-05-24	Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	53.13
Pringle Creek	1	2012-05-24	Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	21.84
Pringle Creek	2	2012-05-24	Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	60
Pringle Creek	1	2012-05-24	Procladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	10.92
Clark Creek	1	2012-05-24	Prodiamesa	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Prodiamesinae	midges	198.66
Pringle Creek	1	2012-05-24	Prodiamesa	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Prodiamesinae	midges	27.3
Pringle Creek	2	2012-05-24	Prodiamesa	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Prodiamesinae	midges	8
Clark Creek	1	2012-05-24	Rheocricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	41.58
Pringle Creek	1	2012-05-24	Rheocricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	13.65
Pringle Creek	2	2012-05-24	Rheocricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	100

Waterbody	Site	Date	Taxon	Stage	Insect	Origin	Higher.classification	Order	Family	Common.name	Abundance
Clark Creek	1	2012-05-24	Smittia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	4.62
Clark Creek	1	2012-05-24	Synorthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	11.55
Pringle Creek	1	2012-05-24	Synorthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	2.73
Clark Creek	1	2012-05-24	Thienemannimyia complex	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	34.65
Pringle Creek	1	2012-05-24	Thienemannimyia complex	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	2.73
Pringle Creek	2	2012-05-24	Thienemannimyia complex	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	36
Pringle Creek	1	2012-05-24	Tvetenia bavarica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	2.73

Taxon	Stage	Insect.	Origin	Higher.classification	Order	Family	Common.name	Range	Feeding.Group	CA.feeding.group	Habit	Tolerance	CTI.tolerance	PSSB.toler	CA.toleran	HDG.toler	PSSB.long	Voltinism	Developm	Occurrence	Size.at.ma	Rheophily	Thermal.pr	a	b
Turbellaria	U	non-insect	Aquatic	Turbellaria	miscellaneous non-insect	x	flat worms	0	PR	PR	CL	0.0	0	0	4	0	0	2	2	1	2	2	2	0.0082	2.168
Nemata	U	non-insect	Aquatic	Nemata	miscellaneous non-insect	x	round worms	0	PA	PR	BU	0.0	0	0	6	0	0	2	2	1	2	2	2	0.0758	0.74
Oligochaeta	U	non-insect	Aquatic	Annelida: Oligochaeta	miscellaneous non-insect	x	segmented worms	0	CG	CG	BU	0.0	0	0	5	0	0	2	2	1	2	2	2	0.0758	0.74
Juga	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Pleuroceridae	snails	0	OM	SC	CL	MT	0	0	7	0	0	1	2	1	3	2	2	0.0208	3.03
Fluminicola	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Lithoglyphidae	snails	0	SC	SC	CL	MT	0	0	5	0	0	2	2	1	2	2	2	0.0208	3.03
Crangonyx	U	non-insect	Aquatic	Crustacea: Amphipoda	x	Crangonyctidae	scuds	0	CG	CG	SW	MT	0	0	4	0	0	3	2	1	2	2	2	0.0058	3.015
Acari	U	non-insect	Aquatic	Arachnida: Acari	x	x	mites	0	PA	PR	SW	0.0	0	0	5	0	0	3	2	2	1	2	2	0.053	2.494
Baetis tricaudatus	L	insect	Aquatic	Arthropoda: Insecta	Ephemeroptera	Baetidae	mayflies	0	CG	CG	CL	0.0	0	0	6	0	0	3	1	3	1	2	2	0.0053	2.875
Lepidostoma-panel case larvae	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Lepidostomatidae	caddisflies	0	SH	SH	CM	0.0	0	0	1	0	0	2	1	1	2	1	2	0.0079	2.649
Ceratopogoninae	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Ceratopogonidae	no-see-um midges	0	PR	PR	SP	0.0	0	0	6	0	0	2	1	1	2	2	2	0.0025	2.469
Psychoda	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Psychodidae	moth flies	0	CG	CG	BU	HT	0	0	10	0	0	3	1	1	1	1	3	0.0025	2.692
Simulium	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Simuliidae	black flies	0	CF	CF	CL	0.0	0	0	6	0	0	3	1	3	1	3	2	0.002	3.011
Tipula	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Tipulidae	crane flies	0	SH	SH	BU	0.0	0	0	4	0	0	1	2	1	3	2	2	0.0029	2.681
Chironomidae	P	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae	midges	0	CG	CG	BU	0.0	0	0	6	0	0	3	1	3	1	2	2	0.0018	2.617
Brillia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	SH	SP	0.0	0	0	5	0	0	3	1	3	1	2	2	0.0018	2.617
Chironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	0	CG	CG	BU	HT	0	0	10	0	0	3	1	3	2	1	2	0.0018	2.617
Corynoneura	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	CG	SP	0.0	0	0	7	0	0	3	1	3	1	2	2	0.0018	2.617
Cryptochironomus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	0	PR	PR	SP	MT	0	0	8	0	0	3	1	3	1	1	2	0.0018	2.617
Eukiefferiella claripennis group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	OM	SP	MT	0	0	8	0	0	3	1	3	1	2	2	0.0018	2.617
Heterotrissocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	CG	SP	MI	0	0	0	0	0	3	1	3	1	2	1	0.0018	2.617
Limnophyes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	CG	SP	MT	0	0	8	0	0	3	1	3	1	2	2	0.0018	2.617
Metriocnemus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	CG	BU	MT	0	0	5	0	0	3	1	3	1	2	2	0.0018	2.617
Parametriocnemus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	CG	SP	0.0	0	0	5	0	0	3	1	3	1	2	2	0.0018	2.617
Phaenopsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	0	SC	SC	CL	0.0	0	0	7	0	0	3	1	3	1	1	2	0.0018	2.617
Polypedilum	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	0	MH	MH	CL	0.0	0	0	6	0	0	3	1	3	1	2	2	0.0018	2.617
Prodiamesa	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Prodiamesinae	midges	0	CG	CG	BU	MI	0	0	3	0	0	3	1	3	1	2	1	0.0018	2.617
Rheocricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	CG	SP	0.0	0	0	6	0	0	3	1	3	1	2	2	0.0018	2.617
Smittia	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	CG	BU	MT	0	0	6	0	0	3	1	3	1	2	2	0.0018	2.617
Synorthocladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	CG	SP	0.0	0	0	2	0	0	3	1	3	1	2	2	0.0018	2.617
Thienemannimyia complex	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	0	PR	PR	SP	0.0	0	0	6	0	0	3	1	3	1	2	2	0.0018	2.617
Pisidium	U	non-insect	Aquatic	Mollusca: Bivalvia	x	Sphaeriidae	pea clams	0	CF	CF	BU	0.0	0	0	8	0	0	1	3	1	1	2	2	0.0163	2.477
Ferrissia	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Planorbidae	snails	0	SC	SC	CL	MT	0	0	6	0	0	3	2	1	1	2	2	0.0208	3.03
Microcylloepus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Elmidae	riffle beetles	0	CG	CG	CL	MT	0	0	4	0	0	1	3	1	1	2	3	0.0074	2.879
Gyrinus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Gyrinidae	whirligig beetles	0	PR	PR	CM	MT	0	0	5	0	0	2	2	1	2	2	2	0.0077	2.91
Haliplus	L	insect	Aquatic	Arthropoda: Insecta	Coleoptera	Haliplidae	crawling water beetles	0	MH	MH	CM	MT	0	0	5	0	0	2	2	1	2	1	3	0.0077	2.91
Alotanypus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	0	PR	PR	BU	0.0	0	0	7	0	0	3	1	3	1	2	2	0.0018	2.617
Cricotopus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	CG	CL	0.0	0	0	7	0	0	3	1	3	1	2	2	0.0018	2.617
Eukiefferiella devonica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	OM	SP	0.0	0	0	8	0	0	3	1	3	1	2	2	0.0018	2.617
Micropsectra	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	0	CG	CG	CL	0.0	0	0	7	0	0	3	1	3	1	2	2	0.0018	2.617
Paratanytarsus	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae: Tanytarsini	midges	0	CF	CF	CL	0.0	0	0	6	0	0	3	1	3	1	2	2	0.0018	2.617
Paratendipes	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Chironominae	midges	0	CG	CG	BU	MT	0	0	8	0	0	3	1	3	1	1	2	0.0018	2.617
Procladius	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Tanypodinae	midges	0	PR	PR	SP	HT	0	0	9	0	0	3	1	3	1	2	2	0.0018	2.617
Tvetenia bavarica group	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	CG	SP	0.0	0	0	5	0	0	3	1	3	1	2	2	0.0018	2.617
Physa	U	non-insect	Aquatic	Mollusca: Gastropoda	x	Physidae	snails	0	CG	SC	CL	HT	0	0	8	0	0	3	2	2	2	2	3	0.0208	3.03
Pacifastacus	U	non-insect	Aquatic	Crustacea: Decapoda	x	Astacidae	crayfish	0	OM	OM	SP	0.0	0	0	6	0	0	1	3	1	3	2	2	0.0147	3.626
Hydroptila	L	insect	Aquatic	Arthropoda: Insecta	Trichoptera	Hydroptilidae	caddisflies	0	PH	PH	CL	MT	0	0	6	0	0	3	2	2	1	2	2	0.0056	2.839
Dixella	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Dixidae	dixid midges	0	CG	CG	SW	MT	0	0	2	0	0	3	1	3	1	2	3	0.0018	2.617
Parakiefferiella	L	insect	Aquatic	Arthropoda: Insecta	Diptera	Chironomidae: Orthocladiinae	midges	0	CG	CG	SP	0.0	0	0	4	0	0	3	1	3	1	2	2	0.0018	2.617

Explanation of metrics	All abundances and biomass converted to a full sample and 1 square meter basis.
Subsample count (raw)	Total count of subsample prior to correction factors being applied for subsampling and conversion to a 1 square meter basis.
Subsample correction factor to full sample	Multiplier to convert subsample abundances to a full sample basis, e.g. if 1/2 the sample was sorted, then the subsample correction is X2.
Area correction factor to square meter	Converts abundances of full sample to a 1 square meter basis, e.g. if 8 square feet was sampled, then the conversion to 1 square meter is X1.345
SUMMARY METRICS	
Total taxa richness	Total count of unique taxa in sample.
Total abundance	Total abundance in sample converted to a full sample and 1 square meter basis.
Total biomass (mg)	Total biomass in full sample adjusted to a 1 square meter basis as calculated by length/mass regressions.
EPT taxa richness	Taxa richness in the insect orders Ephemeroptera+Plecoptera+Trichoptera, or mayflies+stoneflies+caddisflies.
EPT abundance	
EPT biomass (mg)	
DOMINANCE AND DIVERSITY	Metrics that examine how dominated the community is by a single or few taxa.
% Dominant taxa	The % contribution of the most numerous taxon.
Biomass dominant taxa (mg)	
% Top 3 taxa	The % contribution of the 3 most numerous taxa.
Biomass top 3 taxa (mg)	
Shannon-Weaver Diversity (loge)	Information theory index that examines how evenly abundance is allocated among the taxa present in the community.
Shannon-Weaver Diversity (log2)	
TOLERANT AND INTOLERANT TAXA	Based on habitat association and best professional judgement (Wisseman unpublished). Water temperature and dissolved oxygen are the dominant environmental factors.
% Total tolerant taxa	Sum of the moderately and highly tolerant taxa. Taxa found frequently in habitats with warm water temperature and low dissolved oxygen. Eurythermal.
Total tolerant taxa richness	
Total tolerant taxa abundance	
Total tolerant taxa biomass (mg)	
% Highly tolerant taxa	Taxa highly tolerant of warm water and very low dissolved oxygen. Found often in stagnant and highly eutrophic habitat.
Highly tolerant taxa richness	
Highly tolerant taxa abundance	
Highly tolerant taxa biomass (mg)	
% Moderately tolerant taxa	Taxa moderately tolerant of warm water and low dissolved oxygen.
Moderately tolerant taxa richness	
Moderately tolerant taxa abundance	
Moderately tolerant taxa biomass (mg)	
% Total intolerant taxa	Sum of moderately intolerant and highly intolerant taxa. Cool and cold water biota found in habitats with high dissolved oxygen.
Total intolerant taxa richness	
Total intolerant taxa abundance	
Total intolerant taxa biomass (mg)	
% Highly intolerant taxa	Taxa generally found in habitats with year-round cold water temperatures and very high dissolved oxygen. Indicative of bull trout zone. Cold water biota, cold stenotherms.
Highly intolerant taxa richness	
Highly intolerant taxa abundance	
Highly intolerant taxa biomass (mg)	
% Moderately intolerant taxa	Taxa generally found in cool water habitats, cold to cool water eurythermal. Indicative of general salmonid zone.
Moderately intolerant taxa richness	
Moderately intolerant taxa abundance	
Moderately intolerant taxa biomass (mg)	
VOLTINISM (length of life cycle)	Modified from Poff et al. 2006
% Semivoltine (> 1 year life cycle)	Taxa where a significant proportion of individuals require more than one year to complete their life cycle.
% Univoltine (1 year life cycle)	Taxa where most individuals exhibit a one year life cycle.
% Multivoltine (< 1 year life cycle)	Taxa where a significant proportion of the population has more than one generation a year.
Semivoltine taxa abundance	
Univoltine taxa abundance	
Multivoltine taxa abundance	
Semivoltine taxa richness	

Univoltine taxa richness	
Multivoltine taxa richness	
Semivioltine taxa biomass (mg)	
Univoltine taxa biomass (mg)	
Multivoltine taxa biomass (mg)	
GROWTH AND DEVELOPMENT	Modified from Poff et al. 2006
% Fast seasonal life cycle	Taxa that grow and mature over a few months or a single season.
% Slow seasonal life cycle	Taxa where growth and maturation extends over several seasons.
% Nonseasonal life cycle	Taxa that exhibit asynchronous seasonal development, with multiple life stages present during most of the year.
OCCURRENCE IN DRIFT	Modified from Poff et al. 2006
% Rare in drift	Found rarely in stream drift. Drift occurs during catastrophic events (e.g. floods).
% Common in drift	Found commonly in stream drift.
% Abundant in drift	Dominant in stream drift, behavioral drifters.
SIZE AT MATURITY	Modified from Poff et al. 2006
% Small size at maturity	<9 mm long at maturity
% Medium size at maturity	9-16 mm long at maturity
% Large size at maturity	> 16 mm long at maturity
Small size at maturity abundance	
Medium size at maturity abundance	
Large size at maturity abundance	
Small size at maturity taxa richness	
Medium size at maturity taxa richness	
Large size at maturity taxa richness	
Small size at maturity taxa biomass (mg)	
Medium size at maturity taxa biomass (mg)	
Large size at maturity taxa biomass (mg)	
RHEOPHILY AND HABITAT AFFINITY	Modified from Poff et al. 2006
% Depositional only	Occurs primarily in lentic habitats, stream pools and alcoves, or low gradient slowly flowing streams.
% Depositional and erosional	Stream taxa found in both pools and riffles, though usually in protected pockets in riffles.
% Erosional	Stream taxa associated with moderate to fast water current.
THERMAL PREFERENCE	Modified from Poff et al. 2006
% Cold stenothermal and cool eurythermal	
% Cool/warm eurythermal	
% Warm eurythermal	
NON-INSECT AND INSECT ORDERS	
% Non-insect invertebrates	Hydroids, vermiform taxa, mollusks, crustaceans and mites.
% Ephemeroptera (mayflies)	
% Odonata (damsel- and dragonflies)	
% Plecoptera (stoneflies)	
% Hemiptera (true bugs)	
% Megaloptera (alderflies & hellgramites)	
% Trichoptera (caddisflies)	
% Lepidoptera (moths)	
% Coleoptera (beetles)	
% Diptera (total)(true flies)	Inclusive of the Chironomidae.
% Chironomidae (true flies-midges)	Dominant and ubiquitous aquatic dipteran family.
Non-insect taxa richness	
Ephemeroptera taxa richness	
Odonata taxa richness	
Plecoptera taxa richness	

Hemiptera taxa richness	
Megaloptera taxa richness	
Trichoptera taxa richness	
Lepidoptera taxa richness	
Coleoptera taxa richness	
Diptera (total) taxa richness	
Chironomidae taxa richness	
Non-insect abundance	
Ephemeroptera abundance	
Odonata abundance	
Plecoptera abundance	
Hemiptera abundance	
Megaloptera abundance	
Trichoptera abundance	
Lepidoptera abundance	
Coleoptera abundance	
Diptera (total) abundance	
Chironomidae abundance	
Non-insect biomass (mg)	
Ephemeroptera biomass (mg)	
Odonata biomass (mg)	
Plecoptera biomass (mg)	
Hemiptera biomass (mg)	
Megaloptera biomass (mg)	
Trichoptera biomass (mg)	
Lepidoptera biomass (mg)	
Coleoptera biomass (mg)	
Diptera (total) biomass (mg)	
Chironomidae biomass (mg)	
INDICATOR TAXA	
Mollusca (snails and bivalves) taxa richness	
Crustacea taxa richness	Benthic taxa include Ostracoda, Amphipoda, Isopoda, Decapoda, and the Chydoridae (Cladocera), but not water column associated microcrustaceans (e.g. Daphnidae and Copepoda)
Baetidae (mayfly) taxa richness	Common, ubiquitous and diverse family of minnow-like mayfles.
Ephemerellidae (mayfly) taxa richness	Common, ubiquitous and diverse family of mayflies with most taxa associated with cool-cold montane rivers. Many taxa intolerant.
Heptageniidae (mayfly) taxa richness	Common, ubiquitous and diverse family of mayflies. Rheophilic, scraper mayflies found over a broad longitudinal range in montane and foothill rivers and streams.
Nemouridae (stonefly) taxa richness	Common, ubiquitous, and diverse family of stoneflies. Broadly distributed along river systems with peak diversity in small, forested streams.
Rhyacophilidae (caddisfly) taxa richness	Common, ubiquitous and very diverse family of caddisflies. Primarily predators. Broadly distributed along river systems with peak diversity in small to mid-size, cool/cold montane streams.
Hydropsychidae (caddisfly) taxa richness	Common, ubiquitous, and diverse family of net spinning caddisflies.
Elmidae (riffle beetle) taxa richness	Common, ubiquitous, and diverse family of aquatic beetles.
Oligochaeta (segmented worms) abundance	
Mollusca abundance	
Crustacea abundance	
Acari (mites) abundance	
Baetidae abundance	
Baetis tricaudatus (mayfly) abundance	
Ephemerellidae abundance	
Heptageniidae abundance	
Nemouridae abundance	
Rhyacophilidae abundance	
Hydropsychidae taxa abundance	
Elmidae abundance	

Simuliidae (blackfly) abundance	
Tanytarsini (midge) abundance	
% Oligochaeta (segmented worms)	
% Mollusca	
% Crustacea	
% Acari	
% Baetidae	
% Baetis tricaudatus	
% Ephemerellidae	
% Heptageniidae	
% Nemouridae	
% Rhyacophilidae	
% Hydropsychidae	
% Elmidae	
% Simuliidae	
% Tanytarsini	
Oligochaeta biomass (mg)	
Mollusca biomass (mg)	
Crustacea biomass (mg)	
Acari biomass (mg)	
Baetidae biomass (mg)	
Baetis tricaudatus biomass (mg)	
Ephemerellidae biomass (mg)	
Heptageniidae biomass (mg)	
Nemouridae biomass (mg)	
Rhyacophilidae biomass (mg)	
Hydropsychidae biomass (mg)	
Elmidae biomass (mg)	
Simuliidae biomass (mg)	
Tanytarsini biomass (mg)	
FEEDING GROUPS	Functional feeding groups based on the mechanism by which taxa feed. Modified from Merritt et al. 2008.
Predator taxa richness	Taxa that are primarily predators, consuming living animal tissue by engulfing prey or piercing prey tissues and sucking fluids. Excluding parasites.
Parasite taxa richness	External parasites of invertebrates (e.g. Acari or mites), or internal parasites (e.g. Nemata or roundworms).
Collector-gatherer taxa richness	Utilize mouthparts and other structures to "gather" fine particulate organic matter (FPOM) that is mostly detritus but may include algae, bacteria, small animals, etc.
Collector-filterer taxa richness	Utilize nets, mothparts or other structures to capture and consume FPOM suspended in the water column. FPOM may include algae, bacteria, small animals, etc.
Collector (total) taxa richness	Sum of the collector-gatherer and collector-filterer.
Piercer herbivore taxa richness	Also called Macrophyte piercers. Pierce living tissue of aquatic macrophytes and suck fluids, e.g. some Hydroptilidae.
Macrophyte herbivore taxa richness	Chewers and miners of living macrophytes. Considered a subclass of shredders in Merritt et al. 2008.
Shredder taxa richness	Consume (chew) coarse particulate organic matter (CPOM) such as decaying leaves and wood.
Scraper taxa richness	"Scrape" periphyton (attached algae) and associated material from hard surfaces.
Omnivore taxa richness	Taxa exhibiting multiple feeding mechanisms (above), with no one mechanism clearly dominant.
Unknown taxa richness	No information available on how and what taxon feeds on.
Predator abundance	
Parasite abundance	
Collector-gatherer abundance	
Collector-filterer abundance	
Collector (total) abundance	
Piercer herbivore abundance	
Macrophyte herbivore abundance	
Shredder abundance	
Scraper abundance	
Omnivore abundance	
Unknown abundance	
% Predator	
% Parasite	

% Collector-gatherer	
% Collector-filterer	
% Collector (total)	
% Piercer herbivore	
% Macrophyte herbivore	
% Shredder	
% Scraper	
% Omnivore	
% Unknown	
Predator biomass (mg)	
Parasite biomass (mg)	
Collector-gatherer biomass (mg)	
Collector-filterer biomass (mg)	
Collector (total) biomass (mg)	
Piercer herbivore biomass (mg)	
Macrophyte herbivore biomass (mg)	
Shredder biomass (mg)	
Scraper biomass (mg)	
Omnivore biomass (mg)	
Unknown biomass (mg)	
HABIT	Mode of existence.
Skater taxa richness	Adapted for "skating" on the wayter surface. Generally excluded from benthic data sets.
Planktonic taxa richness	Inhabit the water column in lentic water or slow moving streams. Generally excluded from benthic data sets.
Diver taxa richness	Swim in the water column and along the benthos, but return to the water surface to obtain oxygen. Gnerally excluded from benthic data sets.
Swimmer taxa richness	Exhibit fishlike swimming in lotic or lentic waters, but return to the benthos between bursts of swimming. Included in benthic data sets.
Clinger taxa richness	Taxa that have behavioral (e.g. net spinners) or morphological adaptations (e.g. claws) to attach to hard substrates in faster water current.
Sprawler taxa richness	Found on the surface of fine sediments or floating leaves of macrophytes.
Climber taxa richness	Found on leaves and stems of aquatic macrophytes or submerged branches and roots.
Burrower taxa richness	Burrow into fine sediments or tunnel into plant stems, leaves or roots (miners)
Unknowns taxa richness	Not able to classify as above.
Skater abundance	
Planktonic abundance	
Diver abundance	
Swimmer abundance	
Clinger abundance	
Sprawler abundance	
Climber abundance	
Burrower abundance	
Unknowns abundance	
% Skater	
% Planktonic	
% Diver	
% Swimmer	
% Clinger	
% Sprawler	
% Climber	
% Burrower	
% Unknown	
Skater biomass (mg)	
Planktonic biomass (mg)	
Diver biomass (mg)	
Swimmer biomass (mg)	
Clinger biomass (mg)	
Sprawler biomass (mg)	
Climber biomass (mg)	

Burrower biomass (mg)	
Unknowns biomass (mg)	
STATE OF CALIFORNIA DESIGNATIONS	Traits coding according to CAMLnet January 27, 2003. List of California macroinvertebrate taxa and standard taxonomic effort.
CA % Sensitive EPT	Ephemeroptera, Plecoptera and Trichoptera with California Tolerance Value (CTV) of 0-2 on a 0-10 scaling.
CA % Intolerant individuals	All invertebrates with a CTV of 0-2 on a 0-10 scaling.
CA % Tolerant individuals	All invertebrates with a CTV of 8-10 on a 0-10 scaling.
CA weighted tolerance value	Calculates the Hilsenhoff Biotic Index using the California Toilerance Values (CTV)
CA % Predators	Primary designation of predator as classed by CA.
CA % Gatherers	Primary designation of gatherer as classed by collector-gatherer by CA.
CA % Filterers	Primary designation of fileter as classed by collector-filterer by CA.
CA % Scrapers	Primary designation of scraper as classed by CA.
CA % Shredders	Primary designation of shredder as classed by CA.

Waterbody	Site	Date	Taxon	Abundance	Stage	Subsample.correction.factor	Area.correction.factor
Clark Creek	1	05/24/2012 00:00:00	Turbellaria	1	U	2.31	1
Clark Creek	1	05/24/2012 00:00:00	Nemata	2	U	2.31	1
Clark Creek	1	05/24/2012 00:00:00	Oligochaeta	81	U	2.31	1
Clark Creek	1	05/24/2012 00:00:00	Juga	13	U	2.31	1
Clark Creek	1	05/24/2012 00:00:00	Fluminicola	4	U	2.31	1
Clark Creek	1	05/24/2012 00:00:00	Crangonyx	20	U	2.31	1
Clark Creek	1	05/24/2012 00:00:00	Acari	2	U	2.31	1
Clark Creek	1	05/24/2012 00:00:00	Baetis tricaudatus	36	L	2.31	1
Clark Creek	1	05/24/2012 00:00:00	Lepidostoma-panel case larvae	8	L	2.31	1
Clark Creek	1	05/24/2012 00:00:00	Ceratopogoninae	2	L	2.31	1
Clark Creek	1	05/24/2012 00:00:00	Psychoda	1	L	2.31	1
Clark Creek	1	05/24/2012 00:00:00	Simulium	15	L	2.31	1
Clark Creek	1	05/24/2012 00:00:00	Tipula	9	L	2.31	1
Clark Creek	1	05/24/2012 00:00:00	Chironomidae	9	P	2.31	1
Clark Creek	1	05/24/2012 00:00:00	Brillia	21	L	2.31	1
Clark Creek	1	05/24/2012 00:00:00	Chironomus	3	L	2.31	1
Clark Creek	1	05/24/2012 00:00:00	Corynoneura	2	L	2.31	1
Clark Creek	1	05/24/2012 00:00:00	Cryptochironomus	2	L	2.31	1
Clark Creek	1	05/24/2012 00:00:00	Eukiefferiella claripennis group	9	L	2.31	1
Clark Creek	1	05/24/2012 00:00:00	Heterotrissocladius	2	L	2.31	1
Clark Creek	1	05/24/2012 00:00:00	Limnophyes	6	L	2.31	1
Clark Creek	1	05/24/2012 00:00:00	Metriocnemus	5	L	2.31	1
Clark Creek	1	05/24/2012 00:00:00	Parametriocnemus	9	L	2.31	1
Clark Creek	1	05/24/2012 00:00:00	Phaenopsectra	21	L	2.31	1
Clark Creek	1	05/24/2012 00:00:00	Polypedilum	23	L	2.31	1
Clark Creek	1	05/24/2012 00:00:00	Prodiamesa	86	L	2.31	1
Clark Creek	1	05/24/2012 00:00:00	Rheocricotopus	18	L	2.31	1
Clark Creek	1	05/24/2012 00:00:00	Smittia	2	L	2.31	1
Clark Creek	1	05/24/2012 00:00:00	Synorthocladius	5	L	2.31	1
Clark Creek	1	05/24/2012 00:00:00	Thienemannimyia complex	15	L	2.31	1
Pringle Creek	1	05/24/2012 00:00:00	Nemata	7	U	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Oligochaeta	42	U	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Pisidium	34	U	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Ferrissia	1	U	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Juga	288	U	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Fluminicola	25	U	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Acari	13	U	2.73	1

Waterbody	Site	Date	Taxon	Abundance	Stage	Subsample.correction.factor	Area.correction.factor
Pringle Creek	1	05/24/2012 00:00:00	Baetis tricaudatus	4	L	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Microcylloepus	1	L	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Gyrinus	1	L	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Haliplus	1	L	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Ceratopogoninae	2	L	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Simulium	81	L	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Tipula	4	L	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Chironomidae	2	P	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Alotanypus	12	L	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Brillia	8	L	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Chironomus	1	L	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Corynoneura	10	L	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Cricotopus	10	L	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Cryptochironomus	1	L	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Eukiefferiella claripennis group	60	L	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Eukiefferiella devonica group	2	L	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Limnophyes	8	L	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Micropsectra	1	L	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Paratanytarsus	1	L	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Paratendipes	13	L	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Phaenopsectra	11	L	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Polypedilum	8	L	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Procladius	4	L	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Prodiamesa	10	L	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Rheocricotopus	5	L	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Synorthocladius	1	L	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Thienemannimyia complex	1	L	2.73	1
Pringle Creek	1	05/24/2012 00:00:00	Tvetenia bavarica group	1	L	2.73	1
Pringle Creek	2	05/24/2012 00:00:00	Nemata	5	U	4	1
Pringle Creek	2	05/24/2012 00:00:00	Oligochaeta	167	U	4	1
Pringle Creek	2	05/24/2012 00:00:00	Pisidium	10	U	4	1
Pringle Creek	2	05/24/2012 00:00:00	Ferrissia	1	U	4	1
Pringle Creek	2	05/24/2012 00:00:00	Physa	3	U	4	1
Pringle Creek	2	05/24/2012 00:00:00	Juga	6	U	4	1
Pringle Creek	2	05/24/2012 00:00:00	Fluminicola	7	U	4	1
Pringle Creek	2	05/24/2012 00:00:00	Crangonyx	5	U	4	1
Pringle Creek	2	05/24/2012 00:00:00	Acari	6	U	4	1

Waterbody	Site	Date	Taxon	Abundance	Stage	Subsample.correction.factor	Area.correction.factor
Pringle Creek	2	05/24/2012 00:00:00	Pacifastacus	1	U	4	1
Pringle Creek	2	05/24/2012 00:00:00	Baetis tricaudatus	53	L	4	1
Pringle Creek	2	05/24/2012 00:00:00	Hydroptila	15	L	4	1
Pringle Creek	2	05/24/2012 00:00:00	Lepidostoma-panel case larvae	4	L	4	1
Pringle Creek	2	05/24/2012 00:00:00	Dixella	1	L	4	1
Pringle Creek	2	05/24/2012 00:00:00	Ceratopogoninae	1	L	4	1
Pringle Creek	2	05/24/2012 00:00:00	Psychoda	1	L	4	1
Pringle Creek	2	05/24/2012 00:00:00	Simulium	34	L	4	1
Pringle Creek	2	05/24/2012 00:00:00	Tipula	17	L	4	1
Pringle Creek	2	05/24/2012 00:00:00	Chironomidae	21	P	4	1
Pringle Creek	2	05/24/2012 00:00:00	Brillia	18	L	4	1
Pringle Creek	2	05/24/2012 00:00:00	Corynoneura	2	L	4	1
Pringle Creek	2	05/24/2012 00:00:00	Cricotopus	41	L	4	1
Pringle Creek	2	05/24/2012 00:00:00	Eukiefferiella claripennis group	5	L	4	1
Pringle Creek	2	05/24/2012 00:00:00	Eukiefferiella devonica group	2	L	4	1
Pringle Creek	2	05/24/2012 00:00:00	Limnophyes	30	L	4	1
Pringle Creek	2	05/24/2012 00:00:00	Micropsectra	23	L	4	1
Pringle Creek	2	05/24/2012 00:00:00	Parakiefferiella	5	L	4	1
Pringle Creek	2	05/24/2012 00:00:00	Parametriocnemus	2	L	4	1
Pringle Creek	2	05/24/2012 00:00:00	Paratanytarsus	2	L	4	1
Pringle Creek	2	05/24/2012 00:00:00	Phaenopsectra	145	L	4	1
Pringle Creek	2	05/24/2012 00:00:00	Polypedilum	15	L	4	1
Pringle Creek	2	05/24/2012 00:00:00	Prodiamesa	2	L	4	1
Pringle Creek	2	05/24/2012 00:00:00	Rheocricotopus	25	L	4	1
Pringle Creek	2	05/24/2012 00:00:00	Thienemannimyia complex	9	L	4	1

Appendix C

Physical Habitat Data

East Fork Pringle Creek

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/12/12

TRANSECT: ☒ **A-B** ☐ **B-C** ☐ **C-D** ☐ **D-E** ☐ **E-F**
☐ **F-G** ☐ **G-H** ☐ **H-I** ☐ **I-J** ☐ **J-K**

THALWEG PROFILE

For Transect A-B ONLY

Increment (m)x.x:	1.0m	Total Reach Length (m)	150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[1] Present (Y/ N)	BAR WIDTH[1] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	29.2	2.4	N		N	GL	N	N	N		
1	26.3		N		N	GL	N	N	N		
2	27.4		N		N	GL	N	N	N		
3	26.7		N		N	GL	N	N	N		
4	27.3		N		N	GL	N	N	N		
5	29.5	-	N	-	N	GL	N	N	N		
6	29.0		N		N	GL	N	N	N		
7	25.4	217	N	N/A	N	GL	N	N	N		
8	19.0		N		N	RI	N	N	N		
9	16.1		N		N	RI	N	N	N		
10	15.3		N		N	RI	N	N	N		
11	16.2		N		N	RI	N	N	N		
12	15.4		N		N	RI	N	N	N		
13	18.1		N		N	RI	N	N	N		
14	17.3		N		N	RI	N	N	N		Yellow jacket nest at transect B in dense vegetation.

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	FN	GF	GC	GC	FN	

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES
RS = BEDROCK (SMOOTH)–(Larger than a car)
RR = BEDROCK (ROUGH)-(Larger than a car)
BL = BOULDER (250 to 400 mm)-(Basketball to car)
CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball)
GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball)
GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble)
SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size)
FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

POOL FORM CODES
N= Not a pool
W= Large Woody Debris
R = Rootwad
B = Boulder or Bedrock
F = Unknown, fluvial

COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES
PP = Pool, Plunge
PT = Pool, Trench
PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (≥10 cm small end diameter; ≥1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/12/12

TRANSECT: ☐ A-B ☒ B-C ☐ C-D ☐ D-E ☐ E-F ☐ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE

For Transect A-B ONLY

Increment (m)x.x: 1.0m Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH² Present (Y/ N)	BAR WIDTH² XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	15.0	164	N	-	N	RI	N	N	N		
1	37.9		N		N	GL	N	N	N		
2	41.6		N		N	GL	N	N	N		
3	22.5		N		N	RI	N	N	N		
4	14.3		N		N	RI	N	N	N		
5	18.1	-	N		N	RI	N	N	N		
6	13.8		N		N	RI	N	N	N		
7	16.6	180	N		N	GL	N	N	N		
8	21.6		N		N	GL	N	N	N		
9	27.8		N		N	PL	N	N	N		
10	42.7		N		N	PL	N	N	N		
11	53.0		N		N	PL	N	N	N		
12	71.7		N		N	PL	N	N	N		
13	79.2		N		N	PL	N	N	N		
14	73.5		N		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	FN	GC	GC	GC	FN	

FLAG	COMMENTS

LARGE WOODY DEBRIS (≥10 cm small end diameter; ≥1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

SUBSTRATE SIZE CLASS CODES

RS = BEDROCK (SMOOTH)–(Larger than a car)
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HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
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N= Not a pool
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Eg. WR, BR, WRB

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PT = Pool, Trench
PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: E. Fork Pringle Crk	DATE: 6/12/12	**TRANSECT:**	☐ **A-B** ☐ **B-C** ☒ **C-D** ☐ **D-E** ☐ **E-F** ☐ **F-G** ☐ **G-H** ☐ **H-I** ☐ **I-J** ☐ **J-K**

THALWEG PROFILE								For Transect A-B ONLY		Increment (m)x.x:	1.0m	Total Reach Length (m)	150m
STATION	**THALWEG DEPTH (cm) (xx.x)**	**WETTED WIDTH (m) (XXX.X)**	**BAR WIDTH[3] Present (Y/ N)**	**BAR WIDTH[3] XX.X**	**SOFT/ SMALL SEDIMENT (Y/N)**	**CHANNEL UNIT CODE**	**POOL FORM CODE**	**SIDE CHANNEL (Y/N)**	**BACK WATER (Y/N)**	**FLAG**	**COMMENTS**		
0	49.0	2.77	N		N	GL	N	N	N				
1	14.0		N		N	GL	N	N	N		Concrete sluice		
2	27.2		N		N	GL	N	N	N				
3	29.1		N		N	GL	N	N	N				
4	35.6		N		N	GL	N	N	N				
5	32.8	-	N	-	N	GL	N	N	N				
6	35.5		N		N	GL	N	N	N				
7	28.9	2.09	N		N	GL	N	N	N				
8	28.1		N		N	GL	N	N	N				
9	28.9		N		N	GL	N	N	N				
10	25.9		N		N	GL	N	N	N				
11	25.6		N		N	GL	N	N	N				
12	28.6		N		N	GL	N	N	N				
13	31.8		N		N	GL	N	N	N				
14	36.2		N		N	GL	N	N	N				

SUBSTRATE	**Station (5 or 7)**	**LFT**	**LCTR**	**CTR**	**RCTR**	**RGT**	**FLAG**
	7	FN	GC	GC	GF	FN	

FLAG	**COMMENTS**

LARGE WOODY DEBRIS (≥10 cm small end diameter; ≥1.5 m length)	**CHECK IF ALL UNMARKED BOXES ARE ZERO**	X	**FLAG**			
	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

SUBSTRATE SIZE CLASS CODES

RS = BEDROCK (SMOOTH)–(Larger than a car)
RR = BEDROCK (ROUGH)-(Larger than a car)
BL = BOULDER (250 to 400 mm)-(Basketball to car)
CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball)
GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball)
GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble)
SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size)
FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

POOL FORM CODES

N= Not a pool
W= Large Woody Debris
R = Rootwad
B = Boulder or Bedrock
F = Unknown, fluvial

COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES

PP = Pool, Plunge
PT = Pool, Trench
PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/12/12

TRANSECT: ☐ **A-B** ☐ **B-C** ☐ **C-D** ☒ **D-E** ☐ **E-F**
☐ **F-G** ☐ **G-H** ☐ **H-I** ☐ **I-J** ☐ **J-K**

THALWEG PROFILE

For Transect A-B ONLY | Increment (m)x.x: 1.0m | Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[4]		SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
			Present (Y/ N)	XX.X							
0	27.9	2.03	N	-	N	GL	N	N	N		
1	24.9		N		N	GL	N	N	N		
2	23.6		N		N	GL	N	N	N		
3	28.0		N		N	GL	N	N	N		
4	26.1		N		N	GL	N	N	N		
5	32.0	-	N	-	N	GL	N	N	N		
6	33.0		N		N	GL	N	N	N		
7	32.7	2.05	N		N	GL	N	N	N		
8	39.1		N		N	GL	N	N	N		
9	38.2		N		N	GL	N	N	N		
10	28.7		N		N	GL	N	N	N		
11	30.2		N		N	GL	N	N	N		
12	28.5		N		N	GL	N	N	N		
13	24.1		N		N	GL	N	N	N		
14	19.4		N		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	FN	GF	GF	GF	FN	

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES

RS = BEDROCK (SMOOTH)–(Larger than a car)
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COMBINATIONS:
Eg. WR, BR, WRB

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PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (≥10 cm small end diameter; ≥1.5 m length)				CHECK IF ALL UNMARKED BOXES ARE ZERO		X	FLAG
	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel			
Diameter Large End	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m	
0.1-<0.3 m							
0.3-0.5 m							
0.5-0.8 m							
>0.8 m							

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/12/12	**TRANSECT:**	☐	**A-B**	☐	**B-C**	☐	**C-D**	☐	**D-E**	☒
		☐	**F-G**	☐	**G-H**	☐	**H-I**	☐	**I-J**	☐

E-F / J-K

THALWEG PROFILE

For Transect A-B ONLY — Increment (m) x.x: 1.0m — Total Reach Length (m) 150m

STATION	**THALWEG DEPTH (cm) (xx.x)**	**WETTED WIDTH (m) (XXX.X)**	**BAR WIDTH[5]**		**SOFT/ SMALL SEDIMENT (Y/N)**	**CHANNEL UNIT CODE**	**POOL FORM CODE**	**SIDE CHANNEL (Y/N)**	**BACK WATER (Y/N)**	**FLAG**	**COMMENTS**
			Present (Y/ N)	**XX.X**							
0	23.6	1.56	N		N	RI	N	N	N		
1	20.2		N		N	RI	N	N	N		
2	17.4		N		N	RI	N	N	N		
3	15.2		N		N	RI	N	N	N		
4	16.0		N		N	RI	N	N	N		
5	16.2	-	N	-	N	RI	N	N	N		
6	14.8		N		N	RI	N	N	N		
7	16.6	2.47	N		N	RI	N	N	N		
8	16.0		N		N	RI	N	N	N		
9	17.4		N		N	RI	N	N	N		
10	24.6		N		N	RI	N	N	N		
11	22.1		N		N	RI	N	N	N		
12	17.5		N		N	RI	N	N	N		
13	18.2		N		N	GL	N	N	N		
14	17.4		N		N	GL	N	N	N		

SUBSTRATE	**Station (5 or 7)**	**LFT**	**LCTR**	**CTR**	**RCTR**	**RGT**	**FLAG**
	7	FN	CB	CB	GC	FN	

FLAG	**COMMENTS**

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

LARGE WOODY DEBRIS (≥10 cm small end diameter; ≥1.5 m length)				**CHECK IF ALL UNMARKED BOXES ARE ZERO**		X	**FLAG**
	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**			
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**	
0.1-<0.3 m	☐	☐	☐	☐	☐	☐	
0.3-0.5 m	☐	☐	☐	☐	☐	☐	
0.5-0.8 m	☐	☐	☐	☐	☐	☐	
>0.8 m	☐	☐	☐	☐	☐	☐	

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: E. Fork Pringle Crk	DATE: 6/12/12	**TRANSECT:**	☐ **A-B**	☐ **B-C**	☐ **C-D**	☐ **D-E**	☐ **E-F**
			☒ **F-G**	☐ **G-H**	☐ **H-I**	☐ **I-J**	☐ **J-K**

THALWEG PROFILE

For Transect A-B ONLY

Increment (m) x.x: 1.0m

Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[6] Present (Y/ N)	BAR WIDTH[6] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	21.3	1.68	N	-	N	GL	N	N	N		
1	20.8		N		N	GL	N	N	N		
2	21.4		N		N	GL	N	N	N		
3	20.3		N		N	GL	N	N	N		
4	18.5		N		N	GL	N	N	N		
5	17.2	-	N	-	N	GL	N	N	N		
6	16.8		N		N	GL	N	N	N		
7	17.3	2.40	N	-	N	GL	N	N	N		
8	14.3		N		N	GL	N	N	N		
9	18.9		N		N	GL	N	N	N		
10	191		N		N	GL	N	N	N		
11	21.3		N		N	GL	N	N	N		
12	17.1		N		N	GL	N	N	N		
13	24.8		N		N	GL	N	N	N		
14	26.6		N		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	FN	GC	GC	GC	FN	

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

LARGE WOODY DEBRIS (≥10 cm small end diameter; ≥1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG			
	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: E. Fork Pringle Crk	DATE: 6/12/12	**TRANSECT:**	☐ **A-B**	☐ **B-C**	☐ **C-D**	☐ **D-E**	☐ **E-F**
			☐ **F-G**	☒ **G-H**	☐ **H-I**	☐ **I-J**	☐ **J-K**

THALWEG PROFILE

For Transect A-B ONLY	Increment (m) x.x:	1.0m	Total Reach Length (m)	150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[7]		SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
			Present (Y/ N)	XX.X							
0	28.2	2.33	N	-	N	GL	N	N	N		
1	26.1		N		N	GL	N	N	N		
2	26.8		N		N	GL	N	N	N		
3	25.4		N		N	GL	N	N	N		
4	19.9		N		N	GL	N	N	N		
5	19.7	-	N	-	N	GL	N	N	N		
6	16.9		N		N	GL	N	N	N		
7	18.8	2.58	N		N	GL	N	N	N		
8	15.6		N		N	GL	N	N	N		
9	16.1		N		N	GL	N	N	N		
10	21.8		N		N	GL	N	N	N		Downstream of 12” RCP discharge, likely drain from field
11	21.7		N		N	GL	N	N	N		
12	20.6		N		N	GL	N	N	N		
13	22.8		N		N	GL	N	N	N		
14	20.8		N		N	GL	N	N	N		

SUBSTRATE	**Station (5 or 7)**	**LFT**	**LCTR**	**CTR**	**RCTR**	**RGT**	**FLAG**
	7	FN	GV	CB	GC	FN	

FLAG	**COMMENTS**

SUBSTRATE SIZE CLASS CODES
RS = BEDROCK (SMOOTH)–(Larger than a car)
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FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

POOL FORM CODES
N= Not a pool
W= Large Woody Debris
R = Rootwad
B = Boulder or Bedrock
F = Unknown, fluvial

COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES
PP = Pool, Plunge
PT = Pool, Trench
PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (≥10 cm small end diameter; ≥1.5 m length)			**CHECK IF ALL UNMARKED BOXES ARE ZERO**		X	**FLAG**	
	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**			
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**	
0.1-<0.3 m							
0.3-0.5 m							
0.5-0.8 m							
>0.8 m							

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/12/12

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F ☐ F-G ☐ G-H ☒ H-I ☐ I-J ☐ J-K

THALWEG PROFILE

For Transect A-B ONLY

Increment (m) x.x: 1.0m

Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[8] Present (Y/ N)	BAR WIDTH[8] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	21.8	2.58	N	-	N	GL	N	N	N		
1	21.8		N		N	GL	N	N	N		
2	22.2		N		N	GL	N	N	N		
3	24.1		N		N	GL	N	N	N		
4	21.1		N		N	GL	N	N	N		
5	23.1	-	N	-	N	GL	N	N	N		
6	19.8		N		N	GL	N	N	N		
7	20.2	2.40	N	-	N	GL	N	N	N		
8	18.1		N		N	GL	N	N	N		
9	18.7		N		N	GL	N	N	N		
10	18.8		N		N	GL	N	N	N		
11	18.9		N		N	GL	N	N	N		
12	21.1		N		N	GL	N	N	N		
13	21.3		N		N	GL	N	N	N		
14	20.7		N		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	FN	GC	GC	GC	FN	

FLAG	COMMENTS

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= Riffle RA =
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Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (≥10 cm small end diameter; ≥1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/12/12

TRANSECT: ☐ **A-B** ☐ **B-C** ☐ **C-D** ☐ **D-E** ☐ **E-F**
☐ **F-G** ☐ **G-H** ☒ **H-I** ☐ **I-J** ☐ **J-K**

THALWEG PROFILE

For Transect A-B ONLY | Increment (m) x.x: 1.0m | Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[9]		SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
			Present (Y/ N)	XX.X							
0	22.1	2.78	N	-	N	RI	N	N	N		
1	19.1		N		N	RI	N	N	N		
2	15.9		N		N	RI	N	N	N		
3	16.3		N		N	GL	N	N	N		
4	14.8		N		N	GL	N	N	N		
5	12.9	-	N	-	N	GL	N	N	N		
6	15.2		N		N	GL	N	N	N		
7	20.1	2.82	N		N	GL	N	N	N		
8	21.5		N		N	GL	N	N	N		
9	20.6		N		N	GL	N	N	N		
10	20.4		N		N	GL	N	N	N		
11	21.7		N		N	GL	N	N	N		
12	19.9		N		N	GL	N	N	N		
13	17.8		N		N	GL	N	N	N		
14	18.8		N		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	GC	GC	GC	GC	GF	

FLAG	COMMENTS

LARGE WOODY DEBRIS (≥10 cm small end diameter; ≥1.5 m length)			CHECK IF ALL UNMARKED BOXES ARE ZERO		X	FLAG	
	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel			
Diameter Large End	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m	
0.1-<0.3 m							
0.3-0.5 m							
0.5-0.8 m							
>0.8 m							

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PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/12/12

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F ☐ F-G ☐ G-H ☐ H-I ☐ I-J ☒ J-K

THALWEG PROFILE

For Transect A-B ONLY | Increment (m)x.x: 1.0m | Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[10]		SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
			Present (Y/ N)	XX.X							
0	20.8	2.43	N		N	GL	N	N	N		
1	18.4		N		N	GL	N	N	N		
2	18.8		N		N	GL	N	N	N		
3	17.8		N		N	GL	N	N	N		
4	18.1		N		N	GL	N	N	N		
5	17.4	-			N	GL	N	N	N		
6	14.6		N		N	GL	N	N	N		
7	13.1	2.18	N		N	GL	N	N	N		
8	14.9		N		N	GL	N	N	N		
9	20.7		N		N	GL	N	N	N		
10	21.4		N		N	GL	N	N	N		
11	18.8		N		N	GL	N	N	N		
12	16.3		N		N	GL	N	N	N		
13	17.3		N		N	GL	N	N	N		
14	22.6		N		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	FN	GC	GC	GF	FN	

FLAG	COMMENTS

LARGE WOODY DEBRIS (≥10 cm small end diameter; ≥1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO			FLAG		
	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

SUBSTRATE SIZE CLASS CODES

RS = BEDROCK (SMOOTH)–(Larger than a car)
RR = BEDROCK (ROUGH)-(Larger than a car)
BL = BOULDER (250 to 400 mm)-(Basketball to car)
CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball)
GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball)
GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble)
SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size)
FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

POOL FORM CODES

N= Not a pool
W= Large Woody Debris
R = Rootwad
B = Boulder or Bedrock
F = Unknown, fluvial

COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES

PP = Pool, Plunge
PT = Pool, Trench
PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/14/12

TRANSECT: ☒ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐
☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K**

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.60	26.2	GC	50	
Ctr	1.20	24.8	GF	60	
RCtr	1.80	25.7	GF	40	
Right	2.40	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)
(circle one)

FISH COVER/OTHER		FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 [✓ 2] 3 4	
Undercut Banks	0 [✓ 1] 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	0 **1** 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	[✓ 0] 1 2 3 4	0 1 2 [✓ 3] 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 3 [✓ 4]	0 1 2 [✓ 3] 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	[✓ 0] 1 2 3 4	0 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	0 1 2 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	

HUMAN INFLUENCE: 0= Not Present P= >10 m C= Within 10 m B= On Bank

HUMAN INFLUENCE	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	**0** P C B	
Row Crops	0 P [✓ C] B	**0** P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	79	0.00	
Right	296	0.13	
Wetted Width xxx.x m		2.40	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		2.95	
Bankfull Height xx.x m		0.62	
Incised Height xx.x m		0.98	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	12		CenR	12	
CenL	7		Left		
CenDwn	12		Right		

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/14/12

TRANSECT: ☐ **A** ☒ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐
☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K**

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.41	13.8	GC	10	
Ctr	0.82	15.1	GF	5	
RCtr	1.23	15.4	GF	5	
Right	1.64	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	**0** 1 2 3 4	
Macrophytes	**0** 1 2 3 4	
Woody Debris >0.3 m (Big)	**0** 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	**0** 1 2 3 4	
Live Trees or Roots	**0** 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 **2** 3 4	
Undercut Banks	0 **1** 2 3 4	
Boulders	**0** 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)	D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None	
RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M **N**	D C E M **N**	
Big Trees (Trunk >0.3 m DBH)	**0** 1 2 3 4	**0** 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	**0** 1 2 3 4	**0** 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	**D** C E M N	**D** C E M N	
Woody Shrubs and Saplings	**0** 1 2 3 4	**0** 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 3 **4**	0 1 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	**0** 1 2 3 4	**0** 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 3 **4**	0 1 2 3 **4**	
Barren, Bare Dirt or Duff	**0** 1 2 3 4	**0** 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	**0** P C B	**0** P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	**0** P C B	
Row Crops	0 P **C** B	**0** P C B	
Pasture/Range/Hay Field	**0** P C B	**0** P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	86	0	
Right	273	0.45	
Wetted Width xxx.x m		1.64	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		2.68	
Bankfull Height xx.x m		0.35	
Incised Height xx.x m		0.97	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	11		CenR	13	
CenL	9		Left	-	
CenDwn	7		Right	-	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	**Comments**

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: E. Fork Pringle Crk

DATE: 6/14/12

TRANSECT: ☐ A ☐ B ☒ C ☐ D ☐ E ☐ F ☐ G ☐ H ☐ I ☐ J ☐ K **X-tra Side Channel** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.69	34.2	OT	0	OT
Ctr	1.38	56.4	CB	20	
RCtr	2.07	46.3	GF	95	
Right	2.77	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 [✓ 2] 3 4	
Undercut Banks	0 [✓ 1] 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	0 1 [✓ 2] 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	0 1 2 [✓ 3] 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	[✓ 0] 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	0 1 2 [✓ 3] 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	0 P C [✓ B]	0 P C [✓ B]	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	[✓ 0] P C B	[✓ 0] P C B	
Row Crops	0 [✓ P] C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	83	0	
Right	74	0.16	
Wetted Width xxx.x m		2.77	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		3.73	
Bankfull Height xx.x m		0.87	
Incised Height xx.x m		1.42	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	12	
CenL	10		Left		
CenDwn	9		Right		

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: E. Fork Pringle Crk

DATE: 6/14/12

TRANSECT: ☐ A ☐ B ☐ C ☒ D ☐ E ☐ F **X-tra Side Channel** ☐
☐ G ☐ H ☐ I ☐ J ☐ K

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.51	23.8	GF	50	
Ctr	1.02	23.5	GF	50	
RCtr	1.53	26.5	GF	30	
Right	2.03	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)
(circle one)

		FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 [✓ 2] 3 4	
Undercut Banks	0 [✓ 1] 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	[✓ 0] 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	0 1 2 3 [✓ 4]	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	

0= Not Present P= >10 m C= Within 10 m B= On Bank

HUMAN INFLUENCE	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	[✓ 0] P C B	[✓ 0] P C B	
Row Crops	0 P [✓ C] B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	80	0	
Right	38	0	
Wetted Width xxx.x m		2.03	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		3.70	
Bankfull Height xx.x m		0.73	
Incised Height xx.x m		1.42	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	6		CenR	9	
CenL	9		Left		
CenDwn	10		Right		

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comments sections.

Flag	Comments

RM

SITE ID: E. Fork Pringle Crk	DATE: 6/14/12	TRANSECT:	☐ A ☐ B ☐ C ☐ D ☒ E ☐ F ☐ G ☐ H ☐ I ☐ J ☐ K	X-tra Side Channel ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.39	18.2	GC	25	
Ctr	0.78	21.6	GC	25	
RCtr	1.17	19.4	GC	35	
Right	1.56	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)
(circle one)

FISH COVER/OTHER		FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	0 [✓ 1] 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 [✓ 1] 2 3 4	
Undercut Banks	0 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	[✓ 0] 1 2 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	0 1 [✓ 2] 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	0 1 2 3 [✓ 4]	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	

0= Not Present P= >10 m C= Within 10 m B= On Bank

HUMAN INFLUENCE	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	**0** P C B	
Row Crops	**0** P [✓ C] B	**0** P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	46	0	
Right	80	0	
Wetted Width xxx.x m		1.56	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		3.54	
Bankfull Height xx.x m		0.73	
Incised Height xx.x m		1.20	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	0		CenR	6	
CenL	9		Left		
CenDwn	7		Right		

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/14/12

TRANSECT: ☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☒ **F** **X-tra Side Channel**
☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.42	18.2	GC	10	
Ctr	0.84	15.1	GC	10	
RCtr	1.26	16.4	GC	10	
Right	1.68	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	52	0	
Right	56	0	
Wetted Width xxx.x m		1.68	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		3.34	
Bankfull Height xx.x m		0.63	
Incised Height xx.x m		1.05	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	0 [✓ 1] 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 [✓ 1] 2 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	2		CenR	3	
CenL	8		Left		
CenDwn	3		Right		

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	0 [✓ 1] 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	0 1 2 [✓ 3] 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	**0** P C B	
Row Crops	0 P [✓ C] B	**0** P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/14/12

TRANSECT: ☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐
☒ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K**

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.58	21.8	GF	70	
Ctr	1.16	24.3	GF	50	
RCtr	1.74	21.1	GC	80	
Right	2.33	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	0 1 [✓ 2] 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 [✓ 2] 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	[✓ 0] 1 2 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	0 1 2 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	

0= Not Present P= >10 m C= Within 10 m B= On Bank

HUMAN INFLUENCE	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	**0** P C B	
Row Crops	0 P [✓ C] B	**0** P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	63	0	
Right	59	0	
Wetted Width xxx.x m		2.33	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		3.73	
Bankfull Height xx.x m		0.69	
Incised Height xx.x m		1.18	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	0		CenR	4	
CenL	2		Left		
CenDwn	0		Right		

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/14/12

TRANSECT: ☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel**
☐ **G** ☒ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	GC	80	
LCtr	0.65	14.0	GF	80	
Ctr	1.30	17.7	GF	40	
RCtr	1.95	18.9	GF	60	
Right	2.58	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 2 [✓ 3] 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	[✓ 0] 1 2 3 4	0 1 2 [✓ 3] 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	[✓ 0] 1 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	0 1 2 [✓ 3] 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	0 [✓ 1] 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	**0** P C B	
Row Crops	0 P [✓ C] B	**0** P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	77	0	
Right		0	
Wetted Width xxx.x m		2.58	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		3.45	
Bankfull Height xx.x m		0.71	
Incised Height xx.x m		1.25	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	3		CenR	3	
CenL	2		Left		
CenDwn	0		Right		

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	**Comments**

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: E. Fork Pringle Crk

DATE: 6/14/12

TRANSECT: ☐ A ☐ B ☐ C ☐ D ☐ E ☐ F **X-tra Side Channel**
☐ G ☐ H ☒ I ☐ J ☐ K ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.70	14.2	GC	40	
Ctr	1.40	15.4	GC	20	
RCtr	2.10	13.7	GF	50	
Right	2.78	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 [✓ 1] 2 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	0 1 2 [✓ 3] 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	**0** P C B	
Row Crops	0 P [✓ C] B	**0** P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	56	0	
Right	61	0	
Wetted Width xxx.x m		2.78	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		3.68	
Bankfull Height xx.x m		0.73	
Incised Height xx.x m		1.20	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	14		CenR	10	
CenL	15		Left		
CenDwn	11		Right		

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	**Comments**

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/14/12

TRANSECT: ☐ A ☐ B ☐ C ☐ D ☐ E ☐ F **X-tra Side Channel** ☐
☐ G ☐ H ☐ I ☒ J ☐ K

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.61	15.2	GF	30	
Ctr	1.22	12.2	GF	70	
RCtr	1.83	19.1	GC	40	
Right	2.43	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	0 [✓ 1] 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 [✓ 1] 2 3 4	
Undercut Banks	0 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	57	0	
Right	73	0	
Wetted Width xxx.x m		2.43	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		3.74	
Bankfull Height xx.x m		0.56	
Incised Height xx.x m		1.08	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	6		CenR	8	
CenL	5		Left		
CenDwn	4		Right		

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

VISUAL RIPARIAN ESTIMATES	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)	D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None	
RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	D C E M N	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	[✓ 0] 1 2 3 4	0 1 2 [✓ 3] 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	[✓ 0] 1 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 2 [✓ 3] 4	0 [✓ 1] 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	0 1 [✓ 2] 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	**0** P C B	
Row Crops	0 P [✓ C] B	**0** P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: E. Fork Pringle Crk DATE: 6/14/12

TRANSECT: ☐ A ☐ B ☐ C ☐ D ☐ E ☐ F **X-tra Side Channel** ☐ G ☐ H ☐ I ☐ J ☒ K ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.69	9.9	GF	20	
Ctr	1.38	16.2	GF	20	
RCtr	2.07	12.6	GC	70	
Right	2.75	0	GC	50	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	0 1 [✓ 2] 3 4	
Overhanging Veg. = <1 m of Surface	[✓ 0] 1 2 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 2 [✓ 3] 4	0 1 2 [✓ 3] 4	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	0 1 2 [✓ 3] 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	**0** P C B	
Row Crops	0 P [✓ C] B	**0** P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	59	0	
Right	54	0	
Wetted Width xxx.x m		2.75	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		3.84	
Bankfull Height xx.x m		0.67	
Incised Height xx.x m		1.18	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	15	
CenL	16		Left		
CenDwn	16		Right		

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	**Comments**

RIPARIAN “LEGACY” TREES AND INVASIVE ALIEN PLANTS

SITE ID: E. Fork Pringle Crk

DATE: 6/14/12

TRAN	LARGEST LEGACY TREE VISIBLE FROM THIS STATION						ALIEN PLANT SPECIES PRESENT IN LEFT AND RIGHT RIPARIAN PLOTS				
	Trees not Visible	DBH (m)	Height (m)	Dist. from wetted margin (m)	Type	Taxonomic Category	Check all that are present				
A	☐	☒0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☒<5 ☐5-15 ☐15-30 ☐>30	0	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Ash	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☐CanThis ☐M This	☒Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
B	☐	☒0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☒<5 ☐5-15 ☐15-30 ☐>30	0	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Ash	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt CEd ☒Can This ☐M This	☐Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
C	☒	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☐<5 ☐5-15 ☐15-30 ☐>30	0	☐Deciduous ☐Coniferous ☐Broadleaf Evergreen		☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☐Can This ☐M This	☐Hblack ☒Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol

INSTRUCTIONS

Legacy trees are defined as the largest tree within your search area, which is as far as you can see, but within maximum limits as follows:

Wadeable Streams: Confine search to no more than 50 m from left and right bank and extending upstream to next transect (for ‘K’ look upstream 4 channel widths)

Non-wadeable Rivers: Confine search to no more than 100 m from left and right bank and extending both upstream and downstream as far as you can see confidently.

Alien Plants: Confine search to riparian plots on left and right bank

Wadeable Streams: 10 m x 10 m
Non-wadeable Rivers: 10 m x 20 m

Not all aliens are to be identified in all states. See Field Manual and Plant Identification Guide.

TAXONOMIC CATEGORIES
Acacia/Mesquite Alder/Birch Ash Maple/Box elder Oak Poplar/Cottonwood Sycamore Willow Unknown or Other Deciduous
Cedar/Cypress/Sequoia Fir (including Douglas Fir and Hemlock) Juniper Pine Spruce Unknown or Other Deciduous
Unknown or Other Broadleaf Evergreen
Snag (Dead tree of any species)

ALIEN SPECIES		
RC Grass	Reed Canarygrass	*Phalaris arundinacea*
Engl Ivy	English Ivy	*Hedera Helix*
ChGrass	Cheat Grass	*Bromus tectorum*
Salt Ced	Salt Cedar	*Tamarix spp.*
Can This	Canada thistle	*Cirsium arvense*
M This	Musk thistle	*Carduus nutans*
Hblack	Himalayan blackberry	*Rubus discolor*
Teasel	Teasel	*Dipsacus fullonum*
Spurge	Leafy spurge	*Euphorbia esula*
G Reed	Giant Reed	*Arundo donax*
C Burd	Common burdock	*Arctium minus*
Rus Ol	Russian-olive	*Elaeagnus angustifolia*

COMMENTS

Transects D to K continued on next page

RIPARIAN “LEGACY” TREES AND INVASIVE ALIEN PLANTS

SITE ID: E. Fork Pringle Crk DATE: 6/14/12

TRAN	LARGEST LEGACY TREE VISIBLE FROM THIS STATION						ALIEN PLANT SPECIES PRESENT IN LEFT AND RIGHT RIPARIAN PLOTS	
	Trees not Visible	DBH (m)	Height (m)	Dist. from wetted margin (m)	Type	Taxonomic Category	Check all that are present	
D	☒	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐ .3-.75	☐<5 ☐5-15 ☐15-30 ☐>30		☐Deciduous ☐Coniferous ☐Broadleaf Evergreen		☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐CanThis ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
E	☒	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐ .3-.75	☐<5 ☐5-15 ☐15-30 ☐>30		☐Deciduous ☐Coniferous ☐Broadleaf Evergreen		☐ None	☒RC Grass ☐Salt CEd ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
F	☐	☒0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐ .3-.75	☒<5 ☐5-15 ☐15-30 ☐>30	10m	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Cottonwood	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
G	☐	☒0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐ .3-.75	☒<5 ☐5-15 ☐15-30 ☐>30	20m	☐Deciduous ☒Coniferous ☐Broadleaf Evergreen	Pine	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
H	☐	☒0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐ .3-.75	☒<5 ☐5-15 ☐15-30 ☐>30	10m	☐Deciduous ☐Coniferous ☐Broadleaf Evergreen	Cottonwood	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
I	☐	☒0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐ .3-.75	☒<5 ☐5-15 ☐15-30 ☐>30	1	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Maple	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
J	☐	☒0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐ .3-.75	☐<5 ☒5-15 ☐15-30 ☐>30	2	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Oak	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
K	☐	☒0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐ .3-.75	☒<5 ☐5-15 ☐15-30 ☐>30	0	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Willow	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol

Appendix D

Physical Habitat Data

Clark Creek

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Clark Crk	DATE: 6/12/12	**TRANSECT:**	☒ **A-B** ☐ **B-C** ☐ **C-D** ☐ **D-E** ☐ **E-F** ☐ **F-G** ☐ **G-H** ☐ **H-I** ☐ **I-J** ☐ **J-K**

THALWEG PROFILE

For Transect A-B ONLY

Increment (m)x.x: 1.0m — Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[1] Present (Y/ N)	BAR WIDTH[1] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	21.4	2.44	N	-	N	GL	N	N	N		
1	27.5		N		N	PL	F	N	N		
2	39.1		N		N	PL	F	N	N		
3	43.4		N		N	PL	F	N	N		
4	32.8		N		N	PL	F	N	N		
5	27.4	-	N	-	N	GL	N	N	N		
6	14.9				N	RI	N	N	N		
7	9.8	2.62	N		N	RI	N	N	N		
8	13.8		N		N	GL	N	N	N		
9	15.7		N		N	GL	N	N	N		
10	17.5		N		N	GL	N	N	N		
11	21.9		N		N	GL	N	N	N		
12	23.2		N		N	GL	N	N	N		
13	26.7		N		N	GL	N	N	N		
14	23.1		N		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	FN	GF	GF	GF	HP	

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

LARGE WOODY DEBRIS (≥10 cm small end diameter; ≥1.5 m length)			CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	
	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Clark Crk DATE: 6/12/12

TRANSECT: ☐ A-B ☒ B-C ☐ C-D ☐ D-E ☐ E-F ☐ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE

For Transect A-B ONLY

Increment (m)x.x: 1.0m Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH^2		SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
			Present (Y/ N)	XX.X							
0	27.9	2.92	N	-	N	GL	N	N	N		
1	28.5		N		N	GL	N	N	N		
2	37.1		N		N	GL	N	N	N		
3	21.8		N		N	RI	N	N	N		
4	18.2		N		N	RI	N	N	N		
5	11.4	-	N	-	N	RI	N	N	N		
6	16.2		N		N	RI	N	N	N		
7	17.3	2.40	Y	0.40	N	RI	N	N	N		
8	12.8		N		N	RI	N	N	N		
9	8.1		N		N	GL	N	N	N		
10	13.7		N		N	GL	N	N	N		
11	20.4		N		N	PL	F	N	N		
12	28.6		N		N	PL	F	N	N		
13	41.6		N		N	PL	F	N	N		
14	45.8		N		N	PL	F	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	FN	GF	GF	GF	HP	

FLAG	COMMENTS

LARGE WOODY DEBRIS (≥10 cm small end diameter; ≥1.5 m length)			CHECK IF ALL UNMARKED BOXES ARE ZERO			X
FLAG						
	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

SUBSTRATE SIZE CLASS CODES

RS = BEDROCK (SMOOTH)–(Larger than a car)
RR = BEDROCK (ROUGH)-(Larger than a car)
BL = BOULDER (250 to 400 mm)-(Basketball to car)
CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball)
GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball)
GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble)
SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size)
FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

POOL FORM CODES

N= Not a pool
W= Large Woody Debris
R = Rootwad
B = Boulder or Bedrock
F = Unknown, fluvial

COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES

PP = Pool, Plunge
PT = Pool, Trench
PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Clark Crk DATE: 6/12/12

TRANSECT: ☐ A-B ☐ B-C ☒ C-D ☐ D-E ☐ E-F
☐ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE

For Transect A-B ONLY | Increment (m)x.x: 1.0m | Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[3] Present (Y/ N)	BAR WIDTH[3] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	42.8	1.96	N	-	N	PL	F	N	N		
1	44.6		N		N	PL	F	N	N		
2	43.5		N		N	PL	F	N	N		
3	47.7		N		N	PL	F	N	N		
4	41.9		N		N	PL	F	N	N		
5	37.6	-	N	-	N	PL	F	N	N		
6	38.9		N		N	PP	F	N	N		
7	32.0	1.70	N	-	N	GL	N	N	N		
8	39.9		N		N	GL	N	N	N		
9	37.6		N		N	GL	N	N	N		
10	34.2		N		N	GL	N	N	N		
11	34.0		N		N	GL	N	N	N		
12	38.7		N		N	PL	F	N	N		
13	47.9		N		N	PL	F	N	N		
14	46.9		N		N	PL	F	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	7	HP	GF	HP	HP	HP		

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES
RS = BEDROCK (SMOOTH)–(Larger than a car)
RR = BEDROCK (ROUGH)-(Larger than a car)
BL = BOULDER (250 to 400 mm)-(Basketball to car)
CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball)
GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball)
GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble)
SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size)
FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

POOL FORM CODES
N= Not a pool
W= Large Woody Debris
R = Rootwad
B = Boulder or Bedrock
F = Unknown, fluvial

COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES
PP = Pool, Plunge
PT = Pool, Trench
PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (≥10 cm small end diameter; ≥1.5 m length)				CHECK IF ALL UNMARKED BOXES ARE ZERO		X	FLAG	
	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel				
Diameter Large End	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m		
0.1-<0.3 m								
0.3-0.5 m								
0.5-0.8 m								
>0.8 m								

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Clark Crk	DATE: 6/12/12	**TRANSECT:**	☐	**A-B**	☐	**B-C**	☐	**C-D**	☒	**D-E**	☐ **E-F**
			☐	**F-G**	☐	**G-H**	☐	**H-I**	☐	**I-J**	☐ **J-K**

THALWEG PROFILE

For Transect A-B ONLY	Increment (m)x.x:	1.0m	Total Reach Length (m)	150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH^4		SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
			Present (Y/ N)	XX.X							
0	47.8	1.92	N	-	N	PL	N	N	N		
1	50.9		N		N	PL	N	N	N		
2	50.1		N		N	PL	N	N	N		
3	48.2		N		N	GL	N	N	N		
4	29.3		N		N	GL	N	N	N		
5	41.4	-	N		N	GL	N	N	N		
6	42.5		N		N	GL	N	N	N		
7	33.1	1.50	N		N	GL	N	N	N		
8	39.7		N		N	GL	N	N	N		
9	39.2		N		N	GL	N	N	N		
10	40.5		N		N	GL	N	N	N		
11	37.9		N		N	GL	N	N	N		
12	33.6		N		N	GL	N	N	N		
13	35.8		N		N	GL	N	N	N		
14	32.3		N		N	GL	N	N	N		

SUBSTRATE	**Station (5 or 7)**	**LFT**	**LCTR**	**CTR**	**RCTR**	**RGT**	**FLAG**
	7	FN	OT	SA	HP	HP	

FLAG	**COMMENTS**

LARGE WOODY DEBRIS (≥10 cm small end diameter; ≥1.5 m length)			**CHECK IF ALL UNMARKED BOXES ARE ZERO**	X	**FLAG**	
	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

SUBSTRATE SIZE CLASS CODES

RS = BEDROCK (SMOOTH)–(Larger than a car)
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SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size)
FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

POOL FORM CODES

N= Not a pool
W= Large Woody Debris
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COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES

PP = Pool, Plunge
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PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Clark Crk DATE: 6/12/12

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☒ E-F ☐ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE

For Transect A-B ONLY

Increment (m) x.x: 1.0m

Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[5] Present (Y/ N)	BAR WIDTH[5] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	28.6	1.76	N	N	N	GL	N	N	N	N	
1	26.0		N		N	RI	N	N	N	N	
2	16.7		N		N	RI	N	N	N	N	
3	11.0		N		N	RI	N	N	N	N	
4	17.5		N		N	RI	N	N	N	N	
5	21.8	-	N		N	RI	N	N	N	N	
6	17.7		N		N	RI	N	N	N	N	
7	11.1	2.21	N		N	RI	N	N	N	N	
8	12.2		N		N	RI	N	N	N	N	
9	15.8		N		N	RI	N	N	N	N	
10	10.7		N		N	RI	N	N	N	N	
11	12.6		N		N	RI	N	N	N	N	
12	12.9		N		N	GL	N	N	N	N	
13	15.9		N		N	GL	N	N	N	N	
14	16.5		N		N	GL	N	N	N	N	

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	HP	SA	GF	GF	GF	

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES

RS = BEDROCK (SMOOTH)–(Larger than a car)
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FN = SILT/CLAY/MUCK-(Not gritty)
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Eg. WR, BR, WRB

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GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (≥10 cm small end diameter; ≥1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO		X	FLAG		
	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Clark Crk DATE: 6/12/12

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F ☒ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE

For Transect A-B ONLY Increment (m) x.x: 1.0m Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[6] Present (Y/ N)	BAR WIDTH[6] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	17.6	1.32	N/A	-	N	GL	N	N	N		
1	20.8		N		N	GL	N	N	N		
2	15.3		N		N	RI	N	N	N		
3	15.9		N		N	RI	N	N	N		
4	10.4		N		N	RI	N	N	N		
5	11.8	-	N	-	N	RI	N	N	N		
6	11.0		Y		N	RI	N	N	N		
7	9.0	2.75	N	-	N	RI	N	N	N		
8	8.3		N		N	RI	N	N	N		
9	14.9		N		N	RI	N	N	N		
10	8.1		N		N	GL	N	N	N		
11	10.2		N		N	GL	N	N	N		
12	10.3		N		N	GL	N	N	N		
13	10.6		N		N	GL	N	N	N		
14	10.9		N		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	HP	GF	GF	GF	HP	

FLAG	COMMENTS

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= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (≥10 cm small end diameter; ≥1.5 m length)				CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	
	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel			
Diameter Large End	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m	
0.1-<0.3 m							
0.3-0.5 m							
0.5-0.8 m							
>0.8 m							

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Clark Crk	DATE: 6/12/12	**TRANSECT:**	☐ **A-B**	☐ **B-C**	☐ **C-D**	☐ **D-E**	☐ **E-F**				
			☐ **F-G**	☒ **G-H**	☐ **H-I**	☐ **I-J**	☐ **J-K**				

THALWEG PROFILE

For Transect A-B ONLY

Increment (m) x.x:	1.0m	Total Reach Length (m)	150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[7] Present (Y/ N)	BAR WIDTH[7] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	10.6	2.42	N	-	N	GL	N	N	N		
1	12.5		N		N	GL	N	N	N		
2	19.7		N		N	GL	N	N	N		
3	20.6		N		N	GL	N	N	N		
4	13.9		N		N	GL	N	N	N		
5	16.1	-	N	-	N	GL	N	N	N		
6	16.0		N		N	GL	N	N	N		
7	15.6	2.5	N		N	GL	N	N	N		
8	11.1		N		N	GL	N	N	N		
9	5.9		N		N	GL	N	N	N		
10	11.7		N		N	GL	N	N	N		
11	10.8		N		N	GL	N	N	N		
12	12.9		N		N	GL	N	N	N		
13	9.1		N		N	GL	N	N	N		
14	9.8		N		N	GL	N	N	N		

SUBSTRATE	**Station (5 or 7)**	**LFT**	**LCTR**	**CTR**	**RCTR**	**RGT**	**FLAG**
	7	FN	GF	GF	GF	FN	

FLAG	**COMMENTS**

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

LARGE WOODY DEBRIS (≥10 cm small end diameter; ≥1.5 m length)	**CHECK IF ALL UNMARKED BOXES ARE ZERO**	X	**FLAG**			
	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Clark Crk DATE: 6/12/12

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F
☐ F-G ☐ G-H ☒ H-I ☐ I-J ☐ J-K

THALWEG PROFILE

For Transect A-B ONLY

Increment (m) x.x: 1.0m Total Reach Length (m) 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[8] Present (Y/ N)	BAR WIDTH[8] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	9.1	2.53	N		N	GL	N	N	N		
1	9.6		N		N	GL	N	N	N		
2	17.6		N		N	GL	N	N	N		
3	26.9		N		N	PL	F	N	N		
4	36.1		N		N	PL	F	N	N		
5	38.2	-	N	-	N	PL	F	N	N		
6	37.8		N		N	PL	F	N	N		
7	30.9	2.28	N	-	N	PL	F	N	N		
8	26.8		N		N	GL	N	N	N		
9	23.9		N		N	GL	N	N	N		
10	22.5		N		N	GL	N	N	N		
11	12.3		N		N	RI	N	N	N		
12	7.8		N		N	RI	N	N	N		
13	5.6		N		N	RI	N	N	N		
14	7.5		N		N	RI	N	N	N		

SUBSTRATE	**Station (5 or 7)**	**LFT**	**LCTR**	**CTR**	**RCTR**	**RGT**	**FLAG**
	7	FN	SA	GF	GF	FN	

FLAG	**COMMENTS**

LARGE WOODY DEBRIS (≥10 cm small end diameter; ≥1.5 m length)	**CHECK IF ALL UNMARKED BOXES ARE ZERO**	X	**FLAG**			
	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

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Eg. WR, BR, WRB

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PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Clark Crk

DATE: 6/12/12

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F ☐ F-G ☐ G-H ☐ H-I ☒ I-J ☐ J-K

THALWEG PROFILE

For Transect A-B ONLY

Increment (m) x.x:	1.0m	Total Reach Length (m)	150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[9]		SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
			Present (Y/ N)	XX.X							
0	8.9	2.69	N	-	N	RI	N	N	N		
1	8.7		N		N	RI	N	N	N		
2	8.1		N		N	RI	N	N	N		
3	6.4		N		N	RI	N	N	N		
4	8.3		N		N	RI	N	N	N		
5	8.4	-	N	-	N	RI	N	N	N		
6	11.1		n		N	RI	N	N	N		
7	11.9	2.73	N	-	N	RI	N	N	N		
8	9.5		N		N	RI	N	N	N		
9	7.6		N		N	RI	N	N	N		
10	8.6		N		N	RI	N	N	N		
11	8.7		N		N	GL	N	N	N		
12	9.9		N		N	GL	N	N	N		
13	12.8		N		N	GL	N	N	N		
14	11.6		N		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	FN	GF	GF	GF	HP	

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
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LARGE WOODY DEBRIS (≥10 cm small end diameter; ≥1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Clark Crk

DATE: 6/12/12

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F ☐ F-G ☐ G-H ☐ H-I ☐ I-J ☒ J-K

THALWEG PROFILE

For Transect A-B ONLY

Increment (m)x.x: 1.0m

Total Reach Length (m): 150m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[10] Present (Y/ N)	BAR WIDTH[10] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	9.9	3.20	N	-	N	GL	N	N	N		
1	14.4		N		N	GL	N	N	N		
2	17.6		N		N	GL	N	N	N		
3	20.6		N		N	GL	N	N	N		
4	21.9		N		N	GL	N	N	N		
5	24.8	-	N	-	N	GL	N	N	N		
6	26.5		N		N	GL	N	N	N		
7	22.4	2.61	N		N	GL	N	N	N		
8	18.9		N		N	GL	N	N	N		
9	17.6		N		N	GL	N	N	N		
10	19.9		N		N	GL	N	N	N		
11	33.8		N		N	PL	R	N	N		
12	33.4		N		N	PL	R	N	N		
13	33.8		Y		N	PL	R	N	N		
14	14.7		Y		N	RI	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	FN	GF	GF	GF	FN	

FLAG	COMMENTS

LARGE WOODY DEBRIS (≥10 cm small end diameter; ≥1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

SUBSTRATE SIZE CLASS CODES

RS = BEDROCK (SMOOTH)–(Larger than a car)
RR = BEDROCK (ROUGH)-(Larger than a car)
BL = BOULDER (250 to 400 mm)-(Basketball to car)
CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball)
GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball)
GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble)
SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size)
FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

POOL FORM CODES

N= Not a pool
W= Large Woody Debris
R = Rootwad
B = Boulder or Bedrock
F = Unknown, fluvial

COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES

PP = Pool, Plunge
PT = Pool, Trench
PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Clark Crk	DATE: 6/14/12	**TRANSECT:**	☒ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.61	5.8	GF	20	
Ctr	1.22	14.1	GF	30	
RCtr	1.83	16.0	SA	100	
Right	2.44	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	46	0	
Right	59	0	
Wetted Width xxx.x m		2.44	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		3.47	
Bankfull Height xx.x m		0.78	
Incised Height xx.x m		1.14	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 [✓ 1] 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 [✓ 1] 2 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	14		CenR	17	
CenL	15		Left		
CenDwn	15		Right		

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	0 1 [✓ 2] 3 4	
Small Trees (Trunk <0.3 m DBH)	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 [✓ 1] 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	0 1 2 [✓ 3] 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	0 1 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	**0** P [✓ C] B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

Flag	**Comments**

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Clark Crk	DATE: 6/14/12	**TRANSECT:**	☐ **A** ☒ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.73	8.1	GF	70	
Ctr	1.46	28.8	GF	20	
RCtr	2.19	16.9	HP	0	
Right	2.92	0	HP	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	0 1 [✓ 2] 3 4	
Brush/Woody Debris <0.3 (Small)	0 [✓ 1] 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 [✓ 1] 2 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
Small Trees (Trunk <0.3 m DBH)	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 2 [✓ 3] 4	0 [✓ 1] 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	0 1 [✓ 2] 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	[✓ 0] 1 2 3 4	0 [✓ 1] 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	0 1 2 [✓ 3] 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	0 [✓ 1] 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	0 P [✓ C] B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	63	0	
Right	76	0	
Wetted Width xxx.x m		2.92	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		3.86	
Bankfull Height xx.x m		0.91	
Incised Height xx.x m		1.37	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	14		CenR	11	
CenL	17		Left		
CenDwn	14		Right		

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Clark Crk DATE: 6/14/12

TRANSECT: ☐ **A** ☐ **B** ☒ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐
☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K**

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.49	32.1	FN	100	
Ctr	0.98	39.0	HP	0	
RCtr	1.47	23.9	HP	0	
Right	1.96	0	HO	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 [✓ 1] 2 3 4	
Live Trees or Roots	0 [✓ 1] 2 3 4	
Overhanging Veg. = <1 m of Surface	0 [✓ 1] 2 3 4	
Undercut Banks	0 [✓ 1] 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	0 1 2 [✓ 3] 4	0 1 2 [✓ 3] 4	
Small Trees (Trunk <0.3 m DBH)	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 [✓ 1] 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 [✓ 1] 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	0 1 2 [✓ 3] 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	[✓ 0] P C B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	47	0	
Right	272	0.08	
Wetted Width xxx.x m		1.96	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		2.41	
Bankfull Height xx.x m		0.75	
Incised Height xx.x m		1.31	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	15		CenR	17	
CenL	17		Left		
CenDwn	17		Right		

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Clark Crk DATE: 6/14/12

TRANSECT: ☐ A ☐ B ☐ C ☒ D ☐ E ☐ F **X-tra Side Channel**
☐ G ☐ H ☐ I ☐ J ☐ K ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.48	45.2	GF	40	
Ctr	0.96	33.6	GF	60	
RCtr	1.44	18.9	GF	80	
Right	1.92	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 1 [✓ 2] 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 [✓ 2] 3 4	
Undercut Banks	0 [✓ 1] 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	[✓ D] C E M N	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	0 [✓ 1] 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	0 1 [✓ 2] 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	[✓ 0] P C B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	K	K	F1
Right	57	0	
Wetted Width xxx.x m		1.92	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		2.52	
Bankfull Height xx.x m		0.85	
Incised Height xx.x m		1.42	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	10		CenR	11	
CenL	13		Left		
CenDwn	10		Right		

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comments sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Clark Crk

DATE: 6/14/12

TRANSCRIPT: ☐ A ☐ B ☐ C ☐ D ☒ E ☐ F **X-tra Side Channel** ☐
☐ G ☐ H ☐ I ☐ J ☐ K

SUBSTRATE CROSS-SECTIONAL INFORMATION					
	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.44	17.1	FN	100	
Ctr	0.88	23.8	GF	80	
RCtr	1.32	18.4	HP	0	
Right	1.76				

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 [✓ 1] 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 2 [✓ 3] 4	
Undercut Banks	0 [✓ 1] 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)	D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None	
RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	0 [✓ 1] 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 2 3 [✓ 4]	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	0 1 2 [✓ 3] 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	[✓ 0] 1 2 3 4	0 [✓ 1] 2 3 4	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	0 1 [✓ 2] 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	[✓ 0] P C B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS			
	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	K	0	F1
Right	297	0.20	
Wetted Width xxx.x m		1.76	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		2.74	
Bankfull Height xx.x m		0.49	
Incised Height xx.x m		1.25	

CANOPY COVER MEASUREMENTS					
DENSIOMETER (0-17 Max)					
		Flag			Flag
CenUp	10		CenR	9	
CenL	13		Left		
CenDwn	11		Right		

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	**Comments**

RM

SITE ID: Clark Crk	DATE: 6/14/12	**TRANSECT:**	☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☒ **F** **X-tra Side Channel** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	HP	0	
LCtr	0.33	14.1	GF	0	
Ctr	0.66	8.2	GF	10	
RCtr	0.99	4.0	GF	20	
Right	1.32	0	GF	20	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)
(circle one)

		FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 [✓ 1] 2 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	0 1 2 [✓ 3] 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 [✓ 1] 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	0 1 2 [✓ 3] 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	0 [✓ 1] 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	0 P [✓ C] B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	66	0	
Right	18	0	
Wetted Width xxx.x m		1.32	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		2.98	
Bankfull Height xx.x m		0.45	
Incised Height xx.x m		0.98	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	17	
CenL	17		Left		
CenDwn	17		Right		

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Clark Crk

DATE: 6/14/12

TRANSECT: ☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel**
☒ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.61	8.1	GF	0	
Ctr	1.22	6.6	GF	0	
RCtr	1.83	6.9	GF	90	
Right	2.42	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 [✓ 1] 2 3 4	
Live Trees or Roots	0 [✓ 1] 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 [✓ 2] 3 4	
Undercut Banks	0 [✓ 1] 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	0 1 2 [✓ 3] 4	0 1 [✓ 2] 3 4	
Small Trees (Trunk <0.3 m DBH)	0 1 [✓ 2] 3 4	0 1 2 [✓ 3] 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 [✓ 1] 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Barren, Bare Dirt or Duff	0 [✓ 1] 2 3 4	[✓ 0] 1 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	[✓ 0] P C B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	286	0.12	
Right	66	0	
Wetted Width xxx.x m		2.42	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		2.56	
Bankfull Height xx.x m		0.44	
Incised Height xx.x m		0.94	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	14	
CenL	17		Left		
CenDwn	17		Right		

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Clark Crk

DATE: 6/14/12

TRANSECT: ☐ A ☐ B ☐ C ☐ D ☐ E ☐ F **X-tra Side Channel** ☐
☐ G ☒ H ☐ I ☐ J ☐ K

SUBSTRATE CROSS-SECTIONAL INFORMATION					
	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.63	2.9	GF	30	
Ctr	1.26	5.9	GF	40	
RCtr	1.89	7.8	GF	50	
Right	2.53	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 [✓ 1] 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 [✓ 1] 2 3 4	
Undercut Banks	0 [✓ 1] 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

BANK MEASUREMENTS			
	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	44	0	
Right	281	0.06	
Wetted Width xxx.x m		2.53	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		2.94	
Bankfull Height xx.x m		0.53	
Incised Height xx.x m		1.06	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	17	
CenL	16		Left		
CenDwn	17		Right		

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

VISUAL RIPARIAN ESTIMATES	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)	D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None	
RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	0 1 [✓ 2] 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	0 1 2 [✓ 3] 4	0 1 [✓ 2] 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 2 [✓ 3] 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 2 [✓ 3] 4	0 1 2 [✓ 3] 4	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	0 1 [✓ 2] 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	0 P C B	0 P C B	
Buildings	0 P C B	0 P C B	
Pavement/Cleared Lot	0 P C B	0 P C B	
Road/Railroad	0 P C B	0 P C B	
Pipes (Inlet/Outlet)	0 P C B	0 P C B	
Landfill/Trash	0 P C B	0 P C B	
Park/Lawn	0 P C B	0 P [✓ C] B	
Row Crops	0 P C B	0 P C B	
Pasture/Range/Hay Field	0 P C B	0 P C B	
Logging Operations	0 P C B	0 P C B	
Mining Activity	0 P C B	0 P C B	

Flag	**Comments**

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Clark Crk

DATE: 6/14/12

TRANSECT: ☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐ ☐ **G** ☐ **H** ☒ **I** ☐ **J** ☐ **K**

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.67	6.9	GF	0	
Ctr	1.34	7.8	GF	0	
RCtr	2.01	4.1	GF	10	
Right	2.69	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	24	0	
Right	333	0.25	
Wetted Width xxx.x m		2.69	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		3.52	
Bankfull Height xx.x m		0.38	
Incised Height xx.x m		1.14	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 [✓ 1] 2 3 4	
Live Trees or Roots	0 [✓ 1] 2 3 4	
Overhanging Veg. = <1 m of Surface	0 [✓ 1] 2 3 4	
Undercut Banks	0 [✓ 1] 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	15		CenR	17	
CenL	17		Left		
CenDwn	17		Right		

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	0 1 [✓ 2] 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	0 1 [✓ 2] 3 4	0 1 2 [✓ 3] 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 2 [✓ 3] 4	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 2 [✓ 3] 4	[✓ 0] 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	0 1 [✓ 2] 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	[✓ 0] P C B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Clark Crk DATE: 6/14/12

TRANSECT: ☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel**
☐ **G** ☐ **H** ☐ **I** ☒ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.80	11.8	GF	40	
Ctr	1.60	9.2	GF	10	
RCtr	2.40	6.9	GF	90	
Right	3.20	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 1 [✓ 2] 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 [✓ 2] 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)	D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None	
RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E [✓ M] N	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	0 1 [✓ 2] 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	0 1 [✓ 2] 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Barren, Bare Dirt or Duff	0 [✓ 1] 2 3 4	[✓ 0] 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	0 P [✓ C] B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	41	0	
Right	72	0	
Wetted Width xxx.x m		3.20	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		3.66	
Bankfull Height xx.x m		0.47	
Incised Height xx.x m		1.20	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	17	
CenL	16		Left		
CenDwn	17		Right		

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	**Comments**

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Clark Crk DATE: 6/14/12

TRANSECT: ☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel**
☐ **G** ☐ **H** ☐ **I** ☐ **J** ☒ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.90	8.1	GF	0	
Ctr	1.80	0	K	K	F2
RCtr	2.70	6.8	GF	70	
Right	3.60	0	HP	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)
(circle one)

FISH COVER/OTHER		FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 [✓ 2] 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E [✓ M] N	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	0 1 [✓ 2] 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	0 1 2 [✓ 3] 4	0 1 [✓ 2] 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	D C E M N	
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	0 1 [✓ 2] 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	0 1 2 [✓ 3] 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	0 [✓ 1] 2 3 4	

HUMAN INFLUENCE

0= Not Present P= >10 m C= Within 10 m B= On Bank

HUMAN INFLUENCE	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	[✓ 0] P C B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	K	K	F1
Right	65	0	
Wetted Width xxx.x m		3.60	
Bar Width xx.x m		0.93	
Bankfull Width xxx.x m		3.83	
Bankfull Height xx.x m		0.36	
Incised Height xx.x m		1.21	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	17	
CenL	17		Left		
CenDwn	13		Right		

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

RIPARIAN “LEGACY” TREES AND INVASIVE ALIEN PLANTS

SITE ID: Clark Crk

DATE: 6/14/12

TRAN	LARGEST LEGACY TREE VISIBLE FROM THIS STATION						ALIEN PLANT SPECIES PRESENT IN LEFT AND RIGHT RIPARIAN PLOTS	
	Trees not Visible	DBH (m)	Height (m)	Dist. from wetted margin (m)	Type	Taxonomic Category	Check all that are present	
A	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒ .3-.75	☐<5 ☒5-15 ☐15-30 ☐>30	1	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Cherry	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐CanThis ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
B	☐	☐0-0.1 ☐.75-2 ☒.1-.3 ☐>2 ☐ .3-.75	☐<5 ☒5-15 ☐15-30 ☐>30	0	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Maple	☐ None	☒RC Grass ☐Salt CEd ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
C	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒ .3-.75	☐<5 ☒5-15 ☐15-30 ☐>30	20	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Cherry	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol

INSTRUCTIONS

Legacy trees are defined as the largest tree within your search area, which is as far as you can see, but within maximum limits as follows:

Wadeable Streams: Confine search to no more than 50 m from left and right bank and extending upstream to next transect (for ‘K’ look upstream 4 channel widths)

Non-wadeable Rivers: Confine search to no more than 100 m from left and right bank and extending both upstream and downstream as far as you can see confidently.

Alien Plants: Confine search to riparian plots on left and right bank

Wadeable Streams: 10 m x 10 m

Non-wadeable Rivers: 10 m x 20 m

Not all aliens are to be identified in all states. See Field Manual and Plant Identification Guide.

TAXONOMIC CATEGORIES
Acacia/Mesquite Alder/Birch Ash Maple/Box elder Oak Poplar/Cottonwood Sycamore Willow Unknown or Other Deciduous
Cedar/Cypress/Sequoia Fir (including Douglas Fir and Hemlock) Juniper Pine Spruce Unknown or Other Deciduous
Unknown or Other Broadleaf Evergreen
Snag (Dead tree of any species)

ALIEN SPECIES		
RC Grass	Reed Canarygrass	*Phalaris arundinacea*
Engl Ivy	English Ivy	*Hedera Helix*
ChGrass	Cheat Grass	*Bromus tectorum*
Salt Ced	Salt Cedar	*Tamarix spp.*
Can This	Canada thistle	*Cirsium arvense*
M This	Musk thistle	*Carduus nutans*
Hblack	Himalayan blackberry	*Rubus discolor*
Teasel	Teasel	*Dipsacus fullonum*
Spurge	Leafy spurge	*Euphorbia esula*
G Reed	Giant Reed	*Arundo donax*
C Burd	Common burdock	*Arctium minus*
Rus Ol	Russian-olive	*Elaeagnus angustifolia*

COMMENTS

Transects D to K continued on next page

RIPARIAN “LEGACY” TREES AND INVASIVE ALIEN PLANTS

SITE ID: Clark Crk

DATE: 6/14/12

TRAN	LARGEST LEGACY TREE VISIBLE FROM THIS STATION						ALIEN PLANT SPECIES PRESENT IN LEFT AND RIGHT RIPARIAN PLOTS	
	Trees not Visible	DBH (m)	Height (m)	Dist. from wetted margin (m)	Type	Taxonomic Category	Check all that are present	
D	☐	☐0-0.1 ☐.75-2 ☒.1-.3 ☐>2 ☐ .3-.75	☐<5 ☒5-15 ☐15-30 ☐>30	20	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Ash	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐CanThis ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
E	☐	☐0-0.1 ☐.75-2 ☒.1-.3 ☐>2 ☐ .3-.75	☐<5 ☒5-15 ☐15-30 ☐>30	1	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Ash	☐ None	☐RC Grass ☐Salt CEd ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
F	☐	☐0-0.1 ☐.75-2 ☒.1-.3 ☐>2 ☐ .3-.75	☐<5 ☒5-15 ☐15-30 ☐>30	1	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Maple	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
G	☐	☐0-0.1 ☐.75-2 ☒.1-.3 ☐>2 ☐ .3-.75	☐<5 ☒5-15 ☐15-30 ☐>30	1	☐Deciduous ☐Coniferous ☐Broadleaf Evergreen	Ash	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
H	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒ .3-.75	☐<5 ☐5-15 ☒15-30 ☐>30	25	☐Deciduous ☒Coniferous ☐Broadleaf Evergreen	Douglas Fir	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
I	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒ .3-.75	☐<5 ☐5-15 ☒15-30 ☐>30	25	☐Deciduous ☒Coniferous ☐Broadleaf Evergreen	Douglas Fir	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☒Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
J	☐	☐0-0.1 ☒.75-2 ☐.1-.3 ☐>2 ☐ .3-.75	☐<5 ☐5-15 ☐15-30 ☒>30	10	☐Deciduous ☒Coniferous ☐Broadleaf Evergreen	Douglas Fir	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
K	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒ .3-.75	☐<5 ☐5-15 ☐15-30 ☒>30	20	☐Deciduous ☒Coniferous ☐Broadleaf Evergreen	Douglas Fir	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☒Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol

Appendix E

Physical Habitat Data

Pringle Creek

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Pringle	DATE: 6/26/12	**TRANSECT:**	☒ **A-B** ☐ **B-C** ☐ **C-D** ☐ **D-E** ☐ **E-F** ☐ **F-G** ☐ **G-H** ☐ **H-I** ☐ **I-J** ☐ **J-K**

THALWEG PROFILE

For Transect A-B ONLY | Increment (m)x.x: 2.9 m | Total Reach Length (m) 292.68 m

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[1] Present (Y/ N)	BAR WIDTH[1] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	21.2	10.32	Y	4.73	N	RI	N	N	N		
1	22.5		Y		N	RI	N	N	N		
2	15.3		Y		N	RI	N	N	N		
3	16.2		Y		N	RI	N	N	N		
4	22.0		Y		N	RI	N	N	N		
5	14.3	13.57	N	-	N	R	N	N	N		
6	15.1		N		N	GL	N	N	N		
7	16.5	-	N	-	N	GL	N	N	N		
8	17.4		N		N	GL	N	N	N		
9	16.4		N		N	GL	N	N	N		
10	-										
11	-										
12	-										
13	-										
14	-										Yellow jacket nest at transect B in dense vegetation.

SUBSTRATE	**Station (5 or 7)**	**LFT**	**LCTR**	**CTR**	**RCTR**	**RGT**	**FLAG**
	5	FN	CB	CB	CB	FN	

FLAG	**COMMENTS**

SUBSTRATE SIZE CLASS CODES

RS = BEDROCK (SMOOTH)–(Larger than a car)
RR = BEDROCK (ROUGH)-(Larger than a car)
BL = BOULDER (250 to 400 mm)-(Basketball to car)
CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball)
GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball)
GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble)
SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size)
FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

POOL FORM CODES

N= Not a pool
W= Large Woody Debris
R = Rootwad
B = Boulder or Bedrock
F = Unknown, fluvial

COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES

PP = Pool, Plunge
PT = Pool, Trench
PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (≥10 cm small end diameter; ≥1.5 m length)			**CHECK IF ALL UNMARKED BOXES ARE ZERO**		X	**FLAG**	
	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**			
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**	
0.1-<0.3 m	☐	☐	☐	☐	☐	☐	
0.3-0.5 m	☐	☐	☐	☐	☐	☐	
0.5-0.8 m	☐	☐	☐	☐	☐	☐	
>0.8 m	☐	☐	☐	☐	☐	☐	

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Pringle

DATE: 6/26/12

TRANSECT: ☐ A-B ☒ B-C ☐ C-D ☐ D-E ☐ E-F ☐ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE

For Transect A-B ONLY

Increment (m)x.x:

Total Reach Length (m)

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH² Present (Y/ N)	BAR WIDTH² XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	27.9	9.40	N	-	N	GL	N	N	N		
1	28.9		N		N	GL	N	N	N		
2	30.4		N		N	GL	N	N	N		
3	28.1		N		N	GL	N	N	N		
4	33.2		N		N	GL	N	N	N		
5	30.8	8.59	N	-	N	GL	N	N	N		
6	25.2		N		N	GL	N	N	N		
7	32.8	-	N	-	N	PD	F	N	N		Upstream of manmade dam of cobble
8	36.4		N		N	PD	F	N	N		Upstream of manmade dam of cobble
9	43.1		N		N	PD	F	N	N		
10	-										
11	-										
12	-										
13	-										
14	-										

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	5	FN	CB	CB	CB	FN	

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES

RS = BEDROCK (SMOOTH)–(Larger than a car)
RR = BEDROCK (ROUGH)-(Larger than a car)
BL = BOULDER (250 to 400 mm)-(Basketball to car)
CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball)
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SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size)
FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

POOL FORM CODES

N= Not a pool
W= Large Woody Debris
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COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES

PP = Pool, Plunge
PT = Pool, Trench
PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (≥10 cm small end diameter; ≥1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG			
	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Pringle	DATE: 6/26/12	**TRANSECT:**	☐ **A-B** ☐ **B-C** ☒ **C-D** ☐ **D-E** ☐ **E-F** ☐ **F-G** ☐ **G-H** ☐ **H-I** ☐ **I-J** ☐ **J-K**

THALWEG PROFILE

For Transect A-B ONLY | Increment (m)x.x: 1.0 | Total Reach Length (m) 150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[3] Present (Y/ N)	BAR WIDTH[3] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	46.4	8.89	N	-	N	PD	F	N	N		
1	50.6		N		N	PD	F	N	N		
2	49.4		N		N	PL	F	N	N		
3	46.9		N		N	PL	F	N	N		
4	58.6		N		N	PL	F	N	N		
5	56.6	7.77	N	-	N	PL	F	N	N		
6	58.1		N		N	PL	F	N	N		
7	51.9	-	N	-	N	PL	F	N	N		
8	50.6		N		N	PL	F	N	N		
9	46.0		N		N	PL	F	N	N		
10	-										
11	-										
12	-										
13	-										
14	-										

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	5	GF	GC	GC	CB	WD	

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES

RS = BEDROCK (SMOOTH)–(Larger than a car)
RR = BEDROCK (ROUGH)-(Larger than a car)
BL = BOULDER (250 to 400 mm)-(Basketball to car)
CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball)
GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball)
GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble)
SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size)
FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

POOL FORM CODES

N= Not a pool
W= Large Woody Debris
R = Rootwad
B = Boulder or Bedrock
F = Unknown, fluvial

COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES

PP = Pool, Plunge
PT = Pool, Trench
PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (≥10 cm small end diameter; ≥1.5 m length)			CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	
	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m
0.1-<0.3 m	1 1					
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Pringle DATE: 6/26/12

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☒ D-E ☐ E-F ☐ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE	For Transect A-B ONLY	Increment (m)x.x:		Total Reach Length (m)	

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[4]		SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
			Present (Y/ N)	XX.X							
0	37.8	8.59	N	-	N		N	N	N		
1	39.5		N		N		N	N	N		
2	33.9		N		N		N	N	N		
3	33.5		N		N		N	N	N		
4	37.1		N		N		N	N	N		
5	48.2	7.77	N	-	N		N	N	N		
6	63.9		N		N		N	N	N		
7	61.0	-	N	-	N		N	N	N		
8	56.3		N		N		N	N	N		
9	51.9		N		N		N	N	N		
10	-										
11	-										
12	-										
13	-										
14	-										

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	5	CB	CB	CB	CB	FN	

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

LARGE WOODY DEBRIS (≥10 cm small end diameter; ≥1.5 m length)			CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	
	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Pringle DATE: 6/26/12

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☒ E-F
☐ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE

For Transect A-B ONLY
Increment (m) x.x:
Total Reach Length (m)

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[5]		SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
			Present (Y/ N)	XX.X							
0	33.8	6.96	N	-	N	GL	N	N	N		
1	33.5		N		N	GL	N	N	N		
2	26.9		N		N	GL	N	N	N		
3	31.8		N		N	GL	N	N	N		
4	27.7		N		N	GL	N	N	N		
5	22.6	7.22	N	-	N	GL	N	N	N		
6	20.5		N		N	GL	N	N	N		
7	18.0	-	N	-	N	GL	N	N	N		
8	18.8		N		N	GL	N	N	N		
9	22.8		N		N	GL	N	N	N		
10	-										
11	-										
12	-										
13	-										
14	-										

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	5	CB	GC	GC	GC	GC	

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES
RS = BEDROCK (SMOOTH)–(Larger than a car)
RR = BEDROCK (ROUGH)-(Larger than a car)
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CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball)
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GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble)
SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size)
FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

POOL FORM CODES
N= Not a pool
W= Large Woody Debris
R = Rootwad
B = Boulder or Bedrock
F = Unknown, fluvial

COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES
PP = Pool, Plunge
PT = Pool, Trench
PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (≥10 cm small end diameter; ≥1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m
0.1-<0.3 m	11 2					
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Pringle	DATE: 6/26/12	**TRANSECT:**	☐ **A-B** ☐ **B-C** ☐ **C-D** ☐ **D-E** ☐ **E-F** ☒ **F-G** ☐ **G-H** ☐ **H-I** ☐ **I-J** ☐ **J-K**

THALWEG PROFILE

For Transect A-B ONLY	Increment (m) x.x:		Total Reach Length (m)

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[6] Present (Y/ N)	BAR WIDTH[6] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	19.4	7.09	N/A	-	N	GL	N	N	N		
1	30.6		N		N	PL	F	N	N		
2	64.2		N		N	PL	F	N	N		
3	44.4		N		N	PL	F	N	N		
4	48.6		N		N	PL	F	N	N		
5	29.1	6.35	N	-	N	GL	N	N	N		
6	18.2		N		N	GL	N	N	N		
7	26.7	-	N	-	N	GL	N	N	N		
8	340		N		N	GL	N	N	N		
9	45.0		N		N	GL	N	N	N		
10	-										
11	-										
12	-										
13	-										
14	-										

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	5	GF	GC	GC	GC	FN	

FLAG	COMMENTS

LARGE WOODY DEBRIS (≥10 cm small end diameter; ≥1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG			
	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

SUBSTRATE SIZE CLASS CODES

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POOL FORM CODES

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Eg. WR, BR, WRB

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= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Pringle DATE: 6/26/12

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F ☐ F-G ☒ G-H ☐ H-I ☐ I-J ☐ J-K

For Transect A-B ONLY Increment (m) x.x: Total Reach Length (m)

THALWEG PROFILE

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH Present (Y/ N)	BAR WIDTH XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	26.6	6.66	N	-	N	RI	N	N	N		
1	21.0		Y		N	RI	N	Y	N		
2	24.6		Y		N	RI	N	Y	N		
3	34.6		Y		N	RI	N	Y	N		
4	15.5		Y		N	RI	N	Y	N		
5	20.2	18.80	Y	12.04	N	RI	N	Y	N		
6	21.5		Y		N	RI	N	Y	N		
7	19.0	-	Y	*	N	RI	N	Y	N		
8	16.9		Y		N	RI	N	Y	N		
9	33.6		Y		N	GL	N	Y	N		
10	-										
11	-										
12	-										
13	-										
14	-										

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	5	GC	CB	FN	CB	FN	

FLAG	COMMENTS

LARGE WOODY DEBRIS (≥10 cm small end diameter; ≥1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO			FLAG		
	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m
0.1-<0.3 m	1 1					
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

SUBSTRATE SIZE CLASS CODES
RS = BEDROCK (SMOOTH)–(Larger than a car)
RR = BEDROCK (ROUGH)-(Larger than a car)
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OT = OTHER (Write comment on back of form)

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N= Not a pool
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B = Boulder or Bedrock
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COMBINATIONS:
Eg. WR, BR, WRB

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= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Pringle DATE: 6/26/12

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F ☐ F-G ☐ G-H ☒ H-I ☐ I-J ☐ J-K

THALWEG PROFILE

For Transect A-B ONLY | Increment (m) x.x: | Total Reach Length (m)

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[8]		SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
			Present (Y/ N)	XX.X							
0	52.6	10.72	N	-	N	GL	N	N	N		Concrete wall on right bank
1	75.6		N		N	PL	F	N	N		Concrete wall on right bank
2	99.0		N		N	PL	F	N	N		Concrete wall on right bank
3	105.3		N		N	PL	F	N	N		Concrete wall on right bank
4	114.4		N		N	PL	F	N	N		Concrete wall on right bank
5	96.4	5.41	N	-	N	PL	F	N	N		Concrete wall on right bank
6	84.7		N		N	PL	F	N	N		Concrete wall on right bank
7	64.3	-	N	-	N	PL	F	N	N		Concrete wall on right bank
8	54.2		N		N	GL	N	N	N		Concrete wall on right bank
9	51.6		N		N	GL	N	N	N		Concrete wall on right bank
10	-										
11	-										
12	-										
13	-										
14	-										

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	5	FN	GC	GC	GF	OT	

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES

RS = BEDROCK (SMOOTH)–(Larger than a car)
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COMBINATIONS:
Eg. WR, BR, WRB

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PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (≥10 cm small end diameter; ≥1.5 m length)			CHECK IF ALL UNMARKED BOXES ARE ZERO		X	FLAG
	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Pringle DATE: 6/26/12

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F
☐ F-G ☐ G-H ☐ H-I ☒ I-J ☐ J-K

THALWEG PROFILE

For Transect A-B ONLY | Increment (m) x.x: | Total Reach Length (m)

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[9]		SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
			Present (Y/ N)	XX.X							
0	50.7	7.24	N	-	N	GL	N	N	N		Concrete wall on right bank
1	31.6		N		N	RI	N	N	N		Concrete wall on right bank
2	20.3		N		N	RI	N	N	N		Concrete wall on right bank
3	19.0		N		N	RI	N	N	N		No wall
4	18.9		N		N	RI	N	N	N		
5	15.7	11.33	N	-	N	RI	N	N	N		
6	18.4				N	GL	N	N	N		
7	17.2	-	N	-	N	GL	N	N	N		
8	20.9		N		N	GL	N	N	N		Under pedestrian bridge
9	17.8		N		N	GL	N	N	N		
10	-										
11	-										
12	-										
13	-										
14	-										

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	5	FN	GC	CB	CB	FN	

FLAG	COMMENTS

LARGE WOODY DEBRIS (≥10 cm small end diameter; ≥1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO			X	FLAG	
	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

SUBSTRATE SIZE CLASS CODES

RS = BEDROCK (SMOOTH)–(Larger than a car)
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COMBINATIONS:
Eg. WR, BR, WRB

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PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: Pringle	DATE: 6/26/12	**TRANSECT:**	☐	**A-B**	☐	**B-C**	☐	**C-D**	☐	**D-E**	☐ **E-F**
			☐	**F-G**	☐	**G-H**	☐	**H-I**	☐	**I-J**	☒ **J-K**

THALWEG PROFILE	For Transect A-B ONLY	Increment (m)x.x: 1.0	Total Reach Length (m) 150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[10] Present (Y/ N)	BAR WIDTH[10] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	38.2	8.59	N	-	N	GL	N	N	N		
1	28.3		N		N	GL	N	N	N		Immediately down from manmade cobble dam
2	31.8		N		N	PL	F	N	N		
3	27.3		N		N	PL	F	N	N		
4	36.1		N		N	PL	F	N	N		
5	36.4	8.08	N	-	N	PL	F	N	N		
6	42.6		N		N	PL	F	N	N		
7	57.4	-	N	-	N	PL	F	N	N		
8	70.4		N		N	PL	F	N	N		
9	73.4		N		N	PL	F	N	N		
10	-										
11	-										
12	-										
13	-										
14	-										

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	5	GF	GC	CB	GC	FN	

FLAG	COMMENTS

LARGE WOODY DEBRIS (≥10 cm small end diameter; ≥1.5 m length)				CHECK IF ALL UNMARKED BOXES ARE ZERO		x	FLAG
	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel			
Diameter Large End	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m	
0.1-<0.3 m							
0.3-0.5 m							
0.5-0.8 m							
>0.8 m							

SUBSTRATE SIZE CLASS CODES

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R = Rootwad
B = Boulder or Bedrock
F = Unknown, fluvial

COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES

PP = Pool, Plunge
PT = Pool, Trench
PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Pringle	DATE: 6/26/12	**TRANSECT:**	☒ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	2.58	18.0	GC	10	
Ctr	5.16	0	GC	10	
RCtr	7.74	2.0	GC	0	
Right	10.32	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	0 1 [✓ 2] 3 4	
Overhanging Veg. = <1 m of Surface	0 1 [✓ 2] 3 4	
Undercut Banks	0 [✓ 1] 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Small Trees (Trunk <0.3 m DBH)	0 [✓ 1] 2 3 4	0 1 [✓ 2] 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 2 [✓ 3] 4	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	0 [✓ 1] 2 3 4	
Barren, Bare Dirt or Duff	0 [✓ 1] 2 3 4	[✓ 0] 1 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	**0** P C B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	229	0.39	
Right	59	0	
Wetted Width xxx.x m		10.32	
Bar Width xx.x m		4.73	
Bankfull Width xxx.x m		70.62	
Bankfull Height xx.x m		0.58	
Incised Height xx.x m		0.58	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	12		CenR	13	
CenL	13		Left	K	
CenDwn	14		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Pringle	DATE: 6/26/12	**TRANSECT:**	☐ **A** ☒ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	2.35	18.5	GC	20	
Ctr	4.70	14.3	GC	5	
RCtr	7.05	21.0	CB	20	
Right	9.40	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 [✓ 1] 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 [✓ 1] 2 3 4	
Undercut Banks	0 [✓ 1] 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	0 1 [✓ 2] 3 4	0 1 2 [✓ 3] 4	
Small Trees (Trunk <0.3 m DBH)	0 [✓ 1] 2 3 4	0 1 [✓ 2] 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 2 [✓ 3] 4	0 1 2 [✓ 3] 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 [✓ 1] 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	0 1 2 [✓ 3] 4	
Barren, Bare Dirt or Duff	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P C B	**0** P C B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	288	0.13	
Right	43	0	
Wetted Width xxx.x m		9.40	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		10.37	
Bankfull Height xx.x m		0.43	
Incised Height xx.x m		0.43	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	11		CenR	14	
CenL	9		Left	K	
CenDwn	12		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Pringle	DATE: 6/26/12	**TRANSECT:**	☐ **A** ☐ **B** ☒ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	2.22	13.5	GF	20	
Ctr	4.44	26.0	GC	20	
RCtr	6.66	39.5	CB	0	
Right	8.89	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	0 [✓ 1] 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 [✓ 1] 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 [✓ 1] 2 3 4	
Undercut Banks	0 [✓ 1] 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	0 1 2 [✓ 3] 4	0 1 2 [✓ 3] 4	
Small Trees (Trunk <0.3 m DBH)	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	[✓ 0] 1 2 3 4	
Barren, Bare Dirt or Duff	0 1 [✓ 2] 3 4	[✓ 0] 1 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	**0** P [✓ C] B	**0** P C B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	21	0	
Right	306	0.30	
Wetted Width xxx.x m		8.89	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		9.86	
Bankfull Height xx.x m		0.70	
Incised Height xx.x m		0.70	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	16	
CenL	17		Left	K	
CenDwn	15		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	**Comments**

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Pringle	DATE: 6/26/12	**TRANSECT:**	☐ **A** ☐ **B** ☐ **C** ☒ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	2.15	38.3	GC	30	
Ctr	4.30	30.8	GF	50	
RCtr	6.45	25.1	GC	70	
Right	8.59	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 [✓ 1] 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 [✓ 2] 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	0 1 [✓ 2] 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	0 1 [✓ 2] 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	0 1 [✓ 2] 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	0 1 [✓ 2] 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	[✓ 0] P C B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	71	0	
Right	26	0	
Wetted Width xxx.x m		8.59	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		9.60	
Bankfull Height xx.x m		0.36	
Incised Height xx.x m		K	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	11		CenR	13	
CenL	13		Left	K	
CenDwn	17		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comments sections.

Flag	**Comments**

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Pringle DATE: 6/26/12

TRANSECT: ☐ **A** ☐ **B** ☐ **C** ☐ **D** ☒ **E** ☐ **F** **X-tra Side Channel** ☐
☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K**

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	CB	50	
LCtr	1.74	29.2	CB	50	
Ctr	3.48	23.8	GC	40	
RCtr	5.22	19.9	GC	50	
Right	6.96	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 [✓ 2] 3 4	
Undercut Banks	0 [✓ 1] 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D [✓ C] E M N	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	0 1 [✓ 2] 3 4	0 1 2 [✓ 3] 4	
Small Trees (Trunk <0.3 m DBH)	0 [✓ 1] 2 3 4	0 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 1 2 [✓ 3] 4	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	[✓ 0] 1 2 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	0 1 [✓ 2] 3 4	
Barren, Bare Dirt or Duff	0 [✓ 1] 2 3 4	[✓ 0] 1 2 3 4	

0= Not Present P= >10 m C= Within 10 m B= On Bank

HUMAN INFLUENCE	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	0 P [✓ C] B	**0** P C B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	83	0	
Right	287	0.15	
Wetted Width xxx.x m		6.96	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		7.52	
Bankfull Height xx.x m		0.62	
Incised Height xx.x m		K	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	13		CenR	14	
CenL	14		Left	K	
CenDwn	11		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

RM

SITE ID: Pringle	DATE: 6/26/12	**TRANSEPT:**	☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☒ **F** **X-tra Side Channel** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	GC	50	
LCtr	1.77	17.8	GC	10	
Ctr	3.54	21.1	GC	10	
RCtr	5.31	21.0	GF	40	
Right	7.09	0	GF	20	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	0 1 [✓ 2] 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 [✓ 1] 2 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D [✓ C] E M N	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	0 1 [✓ 2] 3 4	0 1 2 [✓ 3] 4	
Small Trees (Trunk <0.3 m DBH)	0 1 [✓ 2] 3 4	0 [✓ 1] 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	0 1 [✓ 2] 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Barren, Bare Dirt or Duff	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	

0= Not Present P= >10 m C= Within 10 m B= On Bank

HUMAN INFLUENCE	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	[✓ 0] P C B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	64	0	
Right	414	0	
Wetted Width xxx.x m		7.09	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		8.87	
Bankfull Height xx.x m		0.75	
Incised Height xx.x m		K	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	14		CenR	14	
CenL	13		Left	K	
CenDwn	12		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	**Comments**

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Pringle	DATE: 6/26/12	**TRANSECT:**	☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☒ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	1.67	2	GC	0	
Ctr	3.34	22.8	CB	0	
RCtr	5.01	39.6	CB	0	
Right	6.66	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 [✓ 1] 2 3 4	
Undercut Banks	0 [✓ 1] 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)	D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None	
RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D [✓ C] E M N	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	0 [✓ 1] 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 2 [✓ 3] 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Barren, Bare Dirt or Duff	0 [✓ 1] 2 3 4	[✓ 0] 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	0 P [✓ C] B	**0** P C B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	4	0	
Right	284	0.10	
Wetted Width xxx.x m		6.66	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		9.68	
Bankfull Height xx.x m		0.66	
Incised Height xx.x m		K	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	11		CenR	8	
CenL	8		Left	K	
CenDwn	5		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	**Comments**

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Pringle

DATE: 6/26/12

TRANSECT: ☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** ☐ **G** ☒ **H** ☐ **I** ☐ **J** ☐ **K** **X-tra Side Channel** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	2.68	0	GF	10	
Ctr	5.36	7.7	GC	20	
RCtr	8.04	22.8	GC	5	
Right	10.72	0	OT	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 2 [✓ 3] 4	
Undercut Banks	0 [✓ 1] 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	0 1 [✓ 2] 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	D C [✓ E] M N	
Woody Shrubs and Saplings	0 1 2 [✓ 3] 4	0 1 2 [✓ 3] 4	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	[✓ 0] 1 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	[✓ 0] 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	[✓ 0] 1 2 3 4	
Barren, Bare Dirt or Duff	0 [✓ 1] 2 3 4	[✓ 0] 1 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	[✓ 0] P C B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	280	0.16	
Right	90	0	
Wetted Width xxx.x m		10.72	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		11.08	
Bankfull Height xx.x m		0.82	
Incised Height xx.x m		K	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	7		CenR	13	
CenL	3		Left	K	
CenDwn	3		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments
F1	Concrete wall

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Pringle

DATE: 6/26/12

TRANSECT: ☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐
☐ **G** ☐ **H** ☒ **I** ☐ **J** ☐ **K**

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	2.21	16.0	GC	95	
Ctr	4.42	31.5	GC	75	
RCtr	6.63	46.3	CB	10	
Right	7.24	0	OT	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 [✓ 2] 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	[✓ D] C E M N	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	0 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	0 1 [✓ 2] 3 4	0 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	D C [✓ E] M N	
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	[✓ 0] 1 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	[✓ 0] 1 2 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	0 [✓ 1] 2 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	52	0	
Right	90	0	
Wetted Width xxx.x m		7.24	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		7.34	
Bankfull Height xx.x m		0.82	
Incised Height xx.x m		K	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	10		CenR	3	
CenL	9		Left	K	
CenDwn	1		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments
F1	Concrete and block wall

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Pringle DATE: 6/26/12

TRANSCEPT:

TRANSECT:						
☐ **A**	☐ **B**	☐ **C**	☐ **D**	☐ **E**	☐ **F**	**X-tra Side Channel**
☐ **G**	☐ **H**	☐ **I**	☒ **J**	☐ **K**		☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	GF	80	
LCtr	2.15	26.8	CB	5	
Ctr	4.30	6.4	GF	20	
RCtr	6.45	5.8	GC	40	
Right	8.59	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	308	0.21	
Right	304	0.30	
Wetted Width xxx.x m		8.59	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		8.69	
Bankfull Height xx.x m		0.62	
Incised Height xx.x m		K	

FISH COVER/OTHER

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)
(circle one)

FISH COVER/OTHER		FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	0 [✓ 1] 2 3 4	
Overhanging Veg. = <1 m of Surface	0 [✓ 1] 2 3 4	
Undercut Banks	0 [✓ 1] 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	16	
CenL	17		Left	K	
CenDwn	17		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	**Comments**

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	0 1 2 [✓ 3] 4	0 1 [✓ 2] 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	0 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 1 2 [✓ 3] 4	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	0 1 [✓ 2] 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	[✓ 0] 1 2 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Barren, Bare Dirt or Duff	0 1 2 [✓ 3] 4	[✓ 0] 1 2 3 4	

0= Not Present P= >10 m C= Within 10 m
B= On Bank

HUMAN INFLUENCE	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	0 P [✓ C] B	**0** P C B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: Pringle	DATE: 6/26/12	**TRANSECT:**	☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☒ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	2.28	73.7	CB	50	
Ctr	4.56	58.6	GC	50	
RCtr	6.84	39.7	GF	80	
Right	7.49	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)
(circle one)

FISH COVER/OTHER		FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 [✓ 2] 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	**0** 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	0 1 [✓ 2] 3 4	
Small Trees (Trunk <0.3 m DBH)	0 1 2 [✓ 3] 4	0 1 [✓ 2] 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	D C E M N	
Woody Shrubs and Saplings	0 1 2 [✓ 3] 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	0 1 2 [✓ 3] 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	0 1 [✓ 2] 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	

0= Not Present P= >10 m C= Within 10 m
B= On Bank

HUMAN INFLUENCE	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	**0** P C B	**0** P C B	
Pavement/Cleared Lot	**0** P C B	**0** P C B	
Road/Railroad	**0** P C B	**0** P C B	
Pipes (Inlet/Outlet)	**0** P C B	**0** P C B	
Landfill/Trash	**0** P C B	**0** P C B	
Park/Lawn	0 [✓ P] C B	**0** P C B	
Row Crops	**0** P C B	**0** P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	**0** P C B	**0** P C B	
Mining Activity	**0** P C B	**0** P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	K	-	F1
Right	33	0	
Wetted Width xxx.x m		7.49	
Bar Width xx.x m		-	
Bankfull Width xxx.x m		8.16	
Bankfull Height xx.x m		1.02	
Incised Height xx.x m		K	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	7		CenR	8	
CenL	15		Left	K	
CenDwn	12		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments
F1	Dense blackberries

RIPARIAN “LEGACY” TREES AND INVASIVE ALIEN PLANTS

SITE ID: Pringle DATE: 6/26/12

TRAN	LARGEST LEGACY TREE VISIBLE FROM THIS STATION						ALIEN PLANT SPECIES PRESENT IN LEFT AND RIGHT RIPARIAN PLOTS	
	Trees not Visible	DBH (m)	Height (m)	Dist. from wetted margin (m)	Type	Taxonomic Category	Check all that are present	
A	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒ .3-.75	☐<5 ☐5-15 ☒15-30 ☐>30	10	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Oak	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☒Engl Ivy ☐CanThis ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
B	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒ .3-.75	☐<5 ☐5-15 ☒15-30 ☐>30	5	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Ash	☐ None	☒RC Grass ☐Salt CEd ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
C	☐	☐0-0.1 ☒.75-2 ☐.1-.3 ☐>2 ☐ .3-.75	☐<5 ☐5-15 ☒15-30 ☐>30	1	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Ash	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol

INSTRUCTIONS

Legacy trees are defined as the largest tree within your search area, which is as far as you can see, but within maximum limits as follows:

Wadeable Streams: Confine search to no more than 50 m from left and right bank and extending upstream to next transect (for ‘K’ look upstream 4 channel widths)

Non-wadeable Rivers: Confine search to no more than 100 m from left and right bank and extending both upstream and downstream as far as you can see confidently.

Alien Plants: Confine search to riparian plots on left and right bank

Wadeable Streams: 10 m x 10 m
Non-wadeable Rivers: 10 m x 20 m

Not all aliens are to be identified in all states. See Field Manual and Plant Identification Guide.

TAXONOMIC CATEGORIES
Acacia/Mesquite Alder/Birch Ash Maple/Box elder Oak Poplar/Cottonwood Sycamore Willow Unknown or Other Deciduous
Cedar/Cypress/Sequoia Fir (including Douglas Fir and Hemlock) Juniper Pine Spruce Unknown or Other Deciduous
Unknown or Other Broadleaf Evergreen
Snag (Dead tree of any species)

ALIEN SPECIES		
RC Grass	Reed Canarygrass	*Phalaris arundinacea*
Engl Ivy	English Ivy	*Hedera Helix*
ChGrass	Cheat Grass	*Bromus tectorum*
Salt Ced	Salt Cedar	*Tamarix spp.*
Can This	Canada thistle	*Cirsium arvense*
M This	Musk thistle	*Carduus nutans*
Hblack	Himalayan blackberry	*Rubus discolor*
Teasel	Teasel	*Dipsacus fullonum*
Spurge	Leafy spurge	*Euphorbia esula*
G Reed	Giant Reed	*Arundo donax*
C Burd	Common burdock	*Arctium minus*
Rus Ol	Russian-olive	*Elaeagnus angustifolia*

COMMENTS

Transects D to K continued on next page

RIPARIAN “LEGACY” TREES AND INVASIVE ALIEN PLANTS

SITE ID: Pringle DATE: 6/26/12

TRAN	LARGEST LEGACY TREE VISIBLE FROM THIS STATION						ALIEN PLANT SPECIES PRESENT IN LEFT AND RIGHT RIPARIAN PLOTS				
	Trees not Visible	DBH (m)	Height (m)	Dist. from wetted margin (m)	Type	Taxonomic Category	Check all that are present				
D	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒ .3-.75	☐<5 ☐5-15 ☐15-30 ☒>30	7	☐Deciduous ☒Coniferous ☐Broadleaf Evergreen	Douglas Fir	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☐CanThis ☐M This	☒Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
E	☐	☐0-0.1 ☒.75-2 ☐.1-.3 ☐>2 ☐ .3-.75	☐<5 ☐5-15 ☐15-30 ☒>30	2	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Cottonwood	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt CEd ☐Can This ☐M This	☒Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
F	☐	☐0-0.1 ☒.75-2 ☐.1-.3 ☐>2 ☐ .3-.75	☐<5 ☐5-15 ☒15-30 ☐>30	10	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Cottonwood	☐ None	☒RC Grass ☒Engl Ivy ☐Ch Grass	☐Salt Ced ☐Can This ☐M This	☒Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
G	☐	☐0-0.1 ☒.75-2 ☐.1-.3 ☐>2 ☐ .3-.75	☐<5 ☐5-15 ☒15-30 ☐>30	10	☐Deciduous ☒Coniferous ☐Broadleaf Evergreen	Douglas Fir	☐ None	☒RC Grass ☒Engl Ivy ☐Ch Grass	☐Salt Ced ☐Can This ☐M This	☒Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
H	☐	☐0-0.1 ☒.75-2 ☐.1-.3 ☐>2 ☐ .3-.75	☐<5 ☐5-15 ☒15-30 ☐>30		☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Maple	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☐Can This ☐M This	☒Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
I	☐	☐0-0.1 ☒.75-2 ☐.1-.3 ☐>2 ☐ .3-.75	☐<5 ☐5-15 ☐15-30 ☒>30		☐Deciduous ☒Coniferous ☐Broadleaf Evergreen	Douglas Fir	☐ None	☒RC Grass ☒Engl Ivy ☐Ch Grass	☐Salt Ced ☐Can This ☐M This	☐Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
J	☐	☐0-0.1 ☒.75-2 ☐.1-.3 ☐>2 ☐ .3-.75	☐<5 ☐5-15 ☐15-30 ☐>30	2	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Maple	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☐Can This ☐M This	☒Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
K	☐	☐0-0.1 ☒.75-2 ☐.1-.3 ☐>2 ☐ .3-.75	☐<5 ☐5-15 ☐15-30 ☒>30	15	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Cottonwood	☐ None	☐RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☐Can This ☐M This	☐Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol

ATTACHMENT C. Results of Benthic Macroinvertebrate Sampling, Fish Sampling, and Physical Habitat Data Collection for Waln Creek and Battle Creek in Salem, Oregon; Pacific Habitat Services (February 29, 2012).

Results of Benthic Macroinvertebrate Sampling, Fish Sampling, and Physical Habitat Data Collection for Waln Creek and Battle Creek in Salem, Oregon

Prepared for

City of Salem
Attn: Heather Dimke
Public Works Department
555 Liberty Street SE
Salem, Oregon 97301

Prepared by

Craig Tumer
Dale Groff
Pacific Habitat Services, Inc.
9450 SW Commerce Circle, Suite 180
Wilsonville, OR 97070
(503) 570-0800
(503) 570-0855 FAX

PHS Project Number: 4891

February 29, 2012

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1.0 INTRODUCTION

PHS has developed a study design for a multi-year macroinvertebrate, fish, and physical data sampling and assessment effort to document the effects of proposed stream and floodplain restoration effort on Waln Creek. The field methodology and parameter collection will follow procedures identified in the "Technical Memorandum for the City of Salem's MS4 Permit Requirements for Benthic Macroinvertebrate Sampling and Hydromodification Assessment" (Pacific Habitat Services, Inc., March 21, 2011).

This report describes the results of the benthic macroinvertebrate sampling, fish sampling, and physical habitat characterization conducted in Fall 2011. Benthic macroinvertebrate sampling was conducted on September 29, 2011; fish sampling was conducted on September 28, 2011; and physical habitat characterization was conducted on October 6, October 26, November 10, December 1, December 7, and December 9, 2011 . This memorandum also provides the baseline existing conditions against which the results of future sampling efforts will be compared and will include the following:

- A description of sampling sites and rationale for site selection;
- Data from field sampling;
- Summary of results and discussion of how the data might be used in the future to track changes in the project-area stream reaches; and
- Description of recommended future sampling activities (post-restoration in 2012+).

2.0 STUDY AREA DESCRIPTION

The project study area is located at the site of the former Battle Creek Golf Course in Salem, Oregon. As part of the redevelopment of the former golf course site, a portion of Waln Creek will be relocated to the east of the current channel alignment. Under existing conditions, this portion of Waln Creek has been channelized and straightened. The stream is somewhat incised, and weirs have been placed across the channel in several locations. The stream floods frequently during periods of heavy precipitation. The relocated channel alignment will be more meandering, and floodplain terraces adjacent to the relocated channel will restore some of the streams flood function.

In Fall 2011, PHS collected data on benthic macroinvertebrate communities, fish presence, and physical habitat characteristics that could be used as baseline information for assessing the success of the Waln Creek stream restoration activities. These data were collected on four sample reaches, as described below and depicted on Figure 1 (Appendix A):

- **WC1:** Waln Creek, immediately upstream of its confluence with Battle Creek;
- **WC2:** Waln Creek, upstream of SE Wiltsey Road;
- **BC1:** Battle Creek, upstream from the culvert located near the eastern edge of the former Battle Creek Golf Course and downstream of the Waln Creek/Battle Creek confluence;
- **BC2:** Battle Creek, upstream of the Waln Creek/Battle Creek confluence and in the vicinity of previous City of Salem sampling efforts.

Reach WC1 is the reach of Waln Creek that will be relocated to the east of its current location. This reach was sampled in order to provide baseline data against which data from the relocated stream channel can be compared. Following the relocation of Waln Creek, this reach will no longer be part of the active stream channel. Reach WC1 will move to the relocated stream channel, immediately upstream from Waln Creek's confluence with Battle Creek in subsequent sampling years.

Reach WC2 is located approximately 1000 feet upstream of Reach WC1, upstream of Wiltsey Road. Data was collected along this portion of Waln Creek to document potential stream changes resulting from inputs occurring upstream of the project area. Between SE Madras Street and Wiltsey Road (between Reaches WC1 and WC2, Waln Creek is dammed and unsuitable for sampling.

Reach BC1 is located immediately downstream of the confluence of Waln Creek and Battle Creek. After it is relocated, Waln Creek will flow into Battle Creek near the upstream end of Reach BC1. Data collected in this stream was collected to document changes that might occur in Battle Creek following the Waln Creek restoration project.

Reach BC2 is located approximately 183 feet upstream of the confluence of Waln Creek and Battle Creek but still within the former Battle Creek Golf Course. Data was collected along this portion of Battle Creek to document potential stream changes resulting from inputs to Battle Creek occurring upstream of the project area. The City has benthic macroinvertebrate data from pervious sampling efforts near the location of Reach BC2. The data from this previous sampling effort may be used in conjunction with data collected during this study to evaluate pre-project conditions in Battle Creek.

3.0 METHODOLOGY

As recommended in the *Technical Memorandum for the City of Salem's MS4 Permit Requirements for Benthic Macroinvertebrate Sampling and Hydromodification Assessment*, dated March 21, 2011, PHS followed the Oregon Department of Environmental Quality's *Water Monitoring and Assessment Mode of Operations Manual* (*MOMs*) (June 2010) transect sampling approach for collecting benthic macroinvertebrate samples and the methodologies found in the Environmental Protection Agency's *Environmental Monitoring and Assessment Program - Surface Waters: Western Pilot Study Field Operations Manual for Wadeable Streams* (EMAP-SW) for collecting physical habitat data within the project area. Both protocols require the collection of data at evenly spaced transects within the sampling reach. Therefore, prior to the initiation of sampling and data collection, PHS established permanent transects within each of the four sampling reaches within the project area.

Both the MOMs and EMAP-SW protocols specify that the length of the sampling reach is forty times the average wetted width of the channel or a minimum of 150 meters long, when the average wetted width is less than four meters. Because the average wetted widths of both Battle and Waln Creeks are less than four meters, PHS determined that the reach length for each of the four project-area reaches is 150 meters.

PHS identified the downstream end of the lower Battle Creek reach (BC1) and flagged it as Transect "A". One-half-inch-diameter PVC pipe was pounded into the ground at the top of the bank on either side of the stream so that the transect crossed the stream perpendicular to the stream flow at the transect location. The PVC pipe was marked with "BC1-A" to indicate Battle Creek, Reach 1, Transect A. Using a tape measure, PHS measured 15 meters upstream from Transect A and marked this spot as Transect B, as described above for Transect A. PHS proceeded upstream with the tape measure and flagged the positions of 9 additional transects labeled "C" through "K", with Transect K being the transect marking the upper limits of the sampling reach. PHS used the same procedure to mark transects along the remaining three sample reaches. Following the identification of all transects along all four reaches, PHS located the endpoints of each transect using a handheld GPS. An electronic file of the transect locations will be provided to the City of Salem for future reference. Figure 2 shows the transect layout along Reach BC1.

3.1 Benthic Macroinvertebrate Sampling

Benthic macroinvertebrates were sampled using a transect sampling approach, as described in the Oregon Department of Environmental Quality's *Water Monitoring and Assessment Mode of Operations Manual* (*MOMs*) (June 2010).

One kick-net sample was collected at each of the eleven transects on the reach beginning at Transect A, which is located at the downstream end of the reach. The Transect A sample was collected from the middle of the left one-third of the stream; the Transect B sample was collected from the middle of the center one-third of the stream; and the Transect C sample was collected from the middle of the right one-third. For transect D, the sample was collected from the left one-third, and the cycle was repeated for all 11 transects. Samples were not collected from the stream margins.

At each sampling location, a D-frame kick net with 500 µm mesh net was placed in the stream with the flat part of the hoop resting on the streambed and perpendicular to the stream flow. Substrate preventing the flat part of the kicknet from sitting flush with the bottom was removed, when necessary.

Macroinvertebrate samples were collected from a one-square-foot sample area immediately upstream of the net. Before disturbing the substrate, this area was inspected for large macroinvertebrates such as mussels, and any such organisms were picked by hand and placed directly into the sieve. Within the sample area, all substrate particles larger than approximately five centimeters were carefully rubbed by hand in front of the net to dislodge any clinging macroinvertebrates. After rubbing, the substrate materials were placed outside of the sample plot. After all large substrate materials within the sample area were scrubbed by hand and removed from the sample area, the remaining substrate in the sample area was disturbed with the hands or feet for one minute. When samples were collected in slow-moving water where the water current was not strong enough to carry any dislodged organisms into the net, the net was pulled through the water as the substrate is disturbed to capture suspended organisms. After the sample was collected and the net removed from the stream, large substrate was returned to the sample area. Following collection of each sample, the contents of the net were placed in a 500µm mesh sieve, and the procedure was repeated at each transect, working from downstream (Transect A) to upstream (Transect K). The samples from each transect were composited into the sieve.

After the samples from all transects on the reach were completed and transferred to the sieve, large organic material and rocks were rinsed, carefully inspected for clinging macroinvertebrates, and removed. Fine sediment was washed away to the extent possible. The composite sample was placed in a jar labeled with the date and reach name and preserved with 95% denatured ethanol for transport to the lab for sorting and subsampling. A label with site information written in pencil on Rite in the Rain paper was placed inside the container. After all samples were collected, they were delivered to Aquatic Biology Associates, Inc. in Corvallis for sorting, subsampling, and data analysis.

3.2 Fish Sampling

An Oregon Scientific Take Permit (STP) must be obtained from the Oregon Department of Fish and Wildlife (ODFW) to conduct fish sampling within the State. Prior to conducting the fish sampling within the project area, PHS filled out the online permit application (https://apps.nmfs.noaa.gov/) and obtained the necessary Oregon STP from ODFW.

Starting at the downstream end of the sampling reach and working upstream along the reach, fish sampling was conducted using a Smith-Root backpack electrofishing unit. A second person followed the person operating the electrofishing with a dip net to retrieve stunned fish. All retrieved fish were transferred to a five-gallon bucket for later processing. The five gallon bucket was fitted with an aquarium air pump to supply oxygen to the water in the bucket and minimize stress on the captured fish. Following completion of electrofishing at the upstream end of the sampling reach, all captured fish were identified and counted before being returned to the stream.

Portions of reaches BC1, BC2, and particularly WC1 had dense thickets of vegetation overhanging the channel at the time of the fish sampling effort. The dense, tangled vegetation low over the stream channel made it impossible to navigate portions of the channel with the backpack electrofishing unit. Because the purpose of the fish survey was to document the species of fish present within the project area streams and not to estimate the population size of fish within the stream, only the accessible portions of the sampling reaches were sampled with the backpack electrofisher. As such, only a very small portion of Reach WC1 was sampled due to the extent of the vegetation obscuring the stream channel.

Following completion of the fish sampling, PHS completed the follow-up reporting required by the Oregon STP.

3.3 Physical Habitat Characterization

The EMAP-SW protocol was used to collect physical habitat data for the four stream reaches within the project area. The habitat characterization portion of the EMAP-SW protocol includes five components: thalweg profile; woody debris tally; channel and riparian characterization; assessment of channel constraint, debris torrents, and major floods; and discharge. While the characterization of all of these components is not especially useful for a hydromodification assessment, collection of certain data prescribed by the protocol may be useful. The following additional data, as described by the EMAP-SW habitat characterization protocol, were collected for future hydromodification analysis:

- Water Depth - The water depth is determined along the thalweg profile at low flow for 10 uniformly spaced intervals between channel transects.
- Wetted Width - The wetted width is determined at the 11 transects also used for macroinvertebrate sampling and at the mid-points of the intervals between those transects for a total of 21 measurements. In addition, the stream substrate is assessed at each of these transects at 5 points: left and right edge of water, midpoint of channel, and the two points midway between center of channel and water’s edge. The substrate at these 5 points is characterized by size as boulders (> 250 mm), cobbles (>64 to 250 mm), coarse gravel (>16 to 64 mm), fine gravel (>2 to 16 mm), sand (>0.06 to 2 mm), and fines (<2 mm). Indications of burial around substrate particles at each of the substrate locations within a radius of 5 cm are used to assess the embeddedness as a fraction of the sediment particles surrounded by sand or finer particles.
- Water Surface Slope – Water surface slope is calculated for each of the ten intervals between the transects within the assessment reach.
- Channel Morphology - The channel morphology is measured at the 11 transects also used for macroinvertebrate assays. The bank angles from the edge of water to the top of the stream bank are recorded. The distance of bank overhang (if occurring) is measured from the edge of water to the vertical projection of the edge of bank. The vertical distance from the water surface to the lowest floodplain terrace is recorded for each transect as well as the vertical distance to the bankfull elevation. The bankfull width is also recorded at each of the transects.

In addition to the information described above, PHS collected data related to riparian habitat condition. The methodologies used to collect the physical habitat data within the sampling reaches are described below. More detailed descriptions of the methodologies can be found in the EMAP-SW document.

Thalweg Profile

Beginning at the downstream end of the reach, measurement stations were established at one-meter intervals between the transects, as recommended by the EMAP-SW protocol procedures for streams with a wetted width less than 2.5 meters wide. Stations were numbered “0” through “14” beginning at the downstream end of the first transect (Transect “A”) and measuring upstream to the next transect. The wetted width of the stream was measured to the nearest 0.1 m at stations “0” and “7”. At station 7 the substrate particle size at the tip of the depth measuring rod was classified at the left wetted margin and at positions 25%, 50%, 75%, and 100% of the distance across the wetted width of the stream. This procedure is identical to the substrate size evaluation procedure described for regular channel cross-sections A through K, except that for these mid-way supplemental cross-sections, substrate size is entered on the Thalweg Profile side of the field form.

At each thalweg profile station, a meter ruler was used to locate the deepest point (the “thalweg”), and the thalweg depth was measured to the nearest cm. The depth was read on the side of the ruler to avoid inaccuracies due to the wave formed by the rod in moving water. At the point where the thalweg depth was measured, the presence or absence of “soft/small sediment” (defined as fine gravel, sand, silt, clay or muck readily apparent by "feeling" the bottom with the staff) was noted.

The channel unit code and pool forming element codes for the station were determined and recorded on the field data form using the standard codes provided on the form. According to the EMAP-SW protocol, the unit should be at least as long as the channel is wide to be recorded. The same measurements were recorded for all stations upstream to the next transect and for all stations to the upstream end of the sampling reach (Transect “K”).

Large Woody Debris Tally

Large woody debris (LWD), defined by this methodology as woody material with a small end diameter of at least 10 cm and a length of at least 1.5 m, within the reach was tallied while working upstream to collect the thalweg profile data. All pieces of LWD that were at least partially in the baseflow channel, the "active channel" (flood channel up to bankfull stage), or spanning above the active channel were included in the tally. LWD in the active channel was tallied over the entire length of the reach, including the area between the channel cross-section transects. The procedure for tallying LWD is presented in more detail in Table 7-5 of the EMAP-SW methodology.

All pieces of LWD within the segment that are at least partially within the bankfull channel were tallied by class based on the diameter of the large end (0.1 m to < 0.3 m, 0.3 m to <0.6 m, 0.6 m to <0.8 m, or >0.8 m, and the class based on the length of the piece (1.5m to <5.0m, 5m to <15m, or >15m). A tally mark was placed in the appropriate box in the “Pieces All/Part In Bankfull Channel” section of the Thalweg Profile and Woody Debris Form.

All pieces of LWD within the segment that are not actually within the bankfull channel, but are at least partially spanning (bridging) the bankfull channel were tallied by class based on the diameter of the large end (0.1 m to < 0.3 m, 0.3 m to <0.6 m, 0.6 m to <0.8 m, or >0.8 m), and the length of the piece (1.5 m to <5.0 m, 5 m to <15 m, or >15 m). For each piece observed, a tally mark was placed in the appropriate box in the “Pieces Bridge Above Bankfull Channel” section of the Thalweg Profile and Woody Debris Form.

After all pieces within the segment were tallied and marked on the form, the total number of pieces for each class were written in the small box at the lower right-hand corner of each tally box.

Water Surface Slope

The water surface slope was measured by "backsighting" downstream between transects (e.g., transect “K” to “J”, “J” to “I”, etc.). The EMAP-SW protocol recommends using a clinometer to measure slope. However, because of the very shallow slopes of the streams within the project area, a clinometer was not used for this project.

For this project, the water surface slope was measured by two people, each with a surveyor's rod held vertically in the center of the stream at the upstream cross section and the next cross section downstream. The elevation of the water surface was measured to the nearest 0.01 feet and later converted to the metric equivalent for both the upstream and downstream transects. The person at the upstream cross section placed a level against the surveyor's rod and backsighted to the downstream rod, recording the elevation of the level on the upstream rod and the corresponding elevation on the downstream rod. These readings were then used to calculate the water surface slope between the transects. If it was not possible to see from one transect to the next due to the stream curvature, streamside vegetation or low light levels, supplementary slope measurements were taken between the transects.

Substrate Size/Channel Dimensions

At the transect, a surveyor's rod was extended across the channel perpendicular to the flow, with the "zero" end at the left bank. The wetted channel width was divided into four equal segments to locate substrate measurement points on the cross-section. The distances corresponding to 0% (Left), 25% (LCtr), 50% (Ctr), 75% (RCtr), and 100% (Right) of the measured wetted width were recorded in the "DistLB" fields of the form. The distance recorded for the right bank was the same as the wetted channel width. At each measurement point on the cross section, (Left, LCtr, Ctr, RCtr, Right), the depth of the water was recorded. Because the left and right measurement points were at the limits of the wetted width of the stream, the water depth at these points was recorded as "0".

Substrate size and embeddedness were evaluated at each of the 11 cross-section transects. A substrate particle was picked up at each measuring point (unless the substrate was bedrock or consolidated hardpan material), and the size of the particle was visually estimated, according to the table on the Channel/Riparian Cross-section Form. The substrate embeddedness was also evaluated according to the guidelines on the form and in the EMAP-SW protocol and the value was recorded on the data form. By definition, sand and fine-grained sediments were considered 100 percent embedded; bedrock and hardpan were considered 0 percent embedded.

Bank Characteristics

Bank angle and bank undercut distance were determined on the left and right banks at each cross section transect. To measure bank angle, the surveyor's rod was laid against the bank, with one end at the water's edge. A clinometer was placed on the rod, and the bank angle in degrees was read from the external scale on the clinometer. The angle was recorded in the field for the left bank in the "Bank Measurement" section of the Channel/ Riparian Cross-section Form. If the bank was undercut, the horizontal distance of the undercutting (defined as the distance from the water's edge out to the point where a vertical plumb line from the bank would hit the water's surface) was measured to the nearest 0.01 m, and the distance was recorded on the field data form.

The incised height of the stream was measured by holding the surveyor's rod vertically, with its base at the water's edge. Using the surveyor's rod as a guide while examining both banks, the channel incision as the height up from the water surface to elevation of the first terrace of the valley floodplain was visually estimated, and the value was recorded in the "Incised Height" field of the bank measurement section on the field data form.

At each transect, both banks were examined to estimate and record the height of bankfull flow above the thalweg elevation. The EMAP-SW protocol calls for bankfull height to be measured relative to the water surface elevation at the time of sampling; however, recording bankfull height relative to the thalweg elevation allows for comparison from year to year without the need to account for differing flow conditions. Potential bankfull indicators looked for included the following:

- An obvious slope break that differentiates the channel from a relatively flat floodplain terrace higher than the channel;
- A transition from exposed stream sediments to terrestrial vegetation;
- Moss growth on the banks;
- Presence of drift material caught on overhanging vegetation; and/or
- Transition from flood- and scour-tolerant vegetation to that which is relatively intolerant of these conditions.

The procedure for obtaining bank and channel dimension measurements is presented in more detail in Table 7-8 of the EMAP-SW protocol.

Canopy Cover

Canopy cover over the stream was determined at each of the 11 cross-section transects using a Convex Spherical Densiometer taped as shown in the procedures outlined in the EMAP-SW protocol. The EMAP-SW protocol recommends obtaining six measurements at each cross-section transect (four measurements in four directions at mid-channel and one at each bank). The mid-channel measurements are used to estimate canopy cover over the channel. The two bank measurements complement your visual estimates of vegetation structure and cover within the riparian zone itself, and are particularly important in wide streams, where riparian canopy may not be detected by the densiometer when standing midstream. Because the stream channels within the project area are very narrow, only the four mid-channel measurements were collected for this project.

Facing upstream at mid-channel at each cross-section transect and with the densitometer held level at 0.3 m (1 ft) above the surface of the stream the number of grid intersection points covered by either a tree, a leaf, or a high branch were counted. The value (0 to 17) was recorded in the “CenUp” field of the canopy cover measurement section of the Channel/Riparian Cross-section and Thalweg Profile Form. Canopy cover values were then determined for the left bank, downstream, and right bank and recorded in the appropriate spaces of the field data form.

Riparian Vegetation Structure

Riparian vegetation observations were made for the riparian area for a distance of 5 meters upstream and downstream of each of the 11 cross-section transects. The riparian vegetation observations were made for the visible area from the stream back a distance of 10m (30 ft) shoreward from both the left and right banks, creating a 10 m × 10 m riparian plot on each side of the stream. The riparian plot dimensions were estimated and not measured.

Standing mid-channel at a cross-section transect, a 5-meter distance upstream and downstream was estimated for the purpose of assessing riparian vegetation cover. For one bank and then the other, a distance of 10 meters back into the riparian vegetation was estimated. Within this 10 m × 10 m area, the riparian vegetation was conceptually divided into three layers: a CANOPY LAYER (>5m high), an UNDERSTORY (0.5 to 5 m high), and a GROUND COVER layer (<0.5 m high), and the dominant vegetation type for the CANOPY LAYER (vegetation > 5 m high) was determined to be either Deciduous, Coniferous, broadleaf Evergreen, Mixed, or None.

The areal cover class of large trees (> 0.3 m [1 ft] diameter at breast height [DBH]) and small trees (< 0.3 m DBH) within the canopy layer was determined separately, and the appropriate cover class was recorded on the field data form ("0"=absent: zero cover, "1"=sparse: <10%, "2"=moderate: 10-40%, "3"=heavy: 40-75%, or "4"=very heavy: >75%). Next, the dominant vegetation type for the understory layer was determined as described above for the canopy layer. The areal cover class for woody shrubs and saplings was determined separately from non-woody vegetation within the understory. Similarly, the areal cover class for woody shrubs and seedlings, non-woody vegetation, and the amount of bare ground present in the ground cover layer was determined as described above.

Instream Fish Cover, Algae, and Aquatic Macrophytes

The areal cover of all of the fish cover and other listed features that are in the water and on the banks 5 meters upstream and downstream of the cross-section were recorded in the “Fish Cover/Other” section of the Channel /Riparian Cross-section Form.

Standing mid-channel at a cross-section transect, a 5-meter distance upstream and downstream (10 m total length) was estimated for the purpose of evaluating fish cover. The water and the banks within the 10-m segment of stream were examined for the following features and types of fish cover:

- filamentous algae - long streaming algae that often occur in slow moving waters;
- aquatic macrophytes - are water-loving plants, including mosses, in the stream that could provide cover for fish or macroinvertebrates;
- large woody debris – the larger pieces of wood that can influence cover and stream morphology (i.e., those pieces that would be included in the large woody debris tally);
- brush and small woody debris – smaller wood pieces that primarily affect cover but not morphology;
- in-channel live trees or roots - living trees that are within the channel -- estimate the areal cover provided by the parts of these trees or roots that are inundated;
- overhanging vegetation - includes tree branches, brush, twigs, or other small debris that is not in the water but is close to the stream (within 1 m of the surface) and provides potential cover;
- undercut banks;
- boulders - typically basketball- to car-sized particles; and
- artificial structures - include those designed for fish habitat enhancement, as well as in-channel structures discarded (e.g., cars or tires) or purposefully placed for diversion, impoundment, channel stabilization, or other purposes.

For each cover type, the areal cover was estimated as follows and recorded in the “FISH COVER/OTHER” section of the Channel/Riparian Cross-section Form. According to the EMAP-SW protocol the cover classes of instream fish cover features were estimated as follows:

"0"=absent: zero cover,
"1"=sparse: <10%,
"2"=moderate: 10-40%,
"3"=heavy: 40-75%, or
"4"=very heavy: >75%.

Human Influence

For the left and right banks at each of the 11 detailed Channel and Riparian Cross-Sections, the presence/absence and the proximity of 11 categories of human influences were evaluated.

Standing mid-channel at each cross-section transect, a 5-meter distance was estimated upstream and downstream (10 m total length), and a distance of 10 meters back into the riparian zone from each bank was estimated to define a riparian plot area. The channel, bank and riparian plot area adjacent to the defined stream segment were examined for the following human influences:

(1) walls, dikes, revetments, riprap, and dams;
(2) buildings;
(3) pavement/cleared lot (e.g., paved, gravelled, dirt parking lot, foundation);
(4) roads or railroads,
(5) inlet or outlet pipes;
(6) landfills or trash (e.g., cans, bottles, trash heaps);
(7) parks or maintained lawns;
(8) row crops;
(9) pastures, rangeland, hay fields, or evidence of livestock;
(10) logging; and
(11) mining (including gravel mining).

For each type of influence, its presence or absence and its proximity to the stream and riparian plot area was determined. The human disturbance items were considered to be present if they were visible from the cross-section transect. For each type of influence, the appropriate proximity class was recorded in the “Human Influence” part of the “Visual Riparian Estimates” section of the Channel/Riparian Cross-section Form. The proximity classes are defined by the EMAP-SW protocol as follows:

B ("Bank”) - Present within the defined 10 m stream segment and located in the stream or on the stream bank.
C (“Close”) - Present within the 10 × 10 m riparian plot area, but away from the bank.
P (“Present”) - Present, but outside the riparian plot area.
O ("Absent”) - Not present within or adjacent to the 10 m stream segment or the riparian plot area at the transect

A particular influence may be observed outside of more than one riparian observation plot (e.g., at both transects "D" and "E"). In such situations, the influence was recorded as present at every transect from which it was observed without having to site through another transect or its 10 m × 10 m riparian plot.

Riparian "Legacy" Trees and Invasive Alien Plants

One tree was identified as a "legacy" tree at each transect, and at transect K, the legacy tree was identified as the largest tree within 4 channel widths upstream of the transect location. For each legacy tree, which was defined as the largest tree within sight of the transect, the following information was recorded:

- type of tree, and, the taxonomic group, as defined on the field data form and Table 7-13 of the EMAP-SW protocol;
- estimated height,
- diameter at breast height (dbh), and
- distance from the wetted margin of the stream.

At each transect, the presence of listed invasive plant species within the 10 m x 10 m riparian plots on either bank was recorded on the Riparian "Legacy" Trees and Invasive Alien Plants field form. In accordance with the EMAP-SW protocol, only the presence of plants which are targets in the state (as identified in the EMAP-SW protocol) were recorded, even though other invasive species may be present.

4.0 RESULTS AND DISCUSSION

4.1 Benthic Macroinvertebrate Sampling

Benthic macroinvertebrate sampling was conducted on September 29, 2011, and the benthic macroinvertebrate samples were processed by Aquatic Biology Associates, Inc. (ABA) in Corvallis, Oregon. Each sample was scored according to the Benthic Index of Biological Integrity (BIBI), modified from Kerr 1998, which is a quantitative method for determining and comparing the biological condition of streams. The BIBI scoring system is composed of the 10 metrics:

- Total number of taxa;
- Number of Ephemeroptera taxa;
- Number of Plecoptera taxa;
- Number of Trichoptera taxa;
- Number of long-lived taxa;
- Number of intolerant taxa;
- Percent tolerant taxa;
- Percent predators;
- Number of clinger taxa; and
- Percent dominant taxa.

Each individual metric is given a score of 1 through 5, with higher numbers given to conditions representative of streams unaltered by anthropogenic influence and exhibiting higher biological integrity. These metrics are then added together for the single, integrated overall BIBI score.

Data and results from ABA's analysis are provided in Appendix B. The results of the BIBI scoring for each of the sample reaches are summarized in Table 1 and summarized below. The descriptions of metrics that follow are summarized from The Puget Sound Stream Benthos website (www.pugetsoundstreambenthos.org).

Table 1. Benthic Invertebrate Index of Biological Integrity – BIBI (modified Karr 1998)

Metric	**Battle Creek 1**		**Battle Creek 2**		**Waln Creek 1**		**Waln Creek 2**	
	Value	**Score**[a]	**Value**	**Score**[a]	**Value**	**Score**[a]	**Value**	**Score**[a]
Total Number of Taxa[b]	31	3	26	3	33	3	34	3
Number of Ephemeroptera Taxa[b]	1	1	0	1	1	1	1	1
Number of Plecoptera Taxa[b]	1	1	1	1	0	1	0	1
Number of Trichoptera Taxa[b]	1	1	1	1	1	1	1	1
Number of Long-lived Taxa[b]	4	3	3	3	3	3	3	3
Number of Intolerant Taxa[b]	3	3	2	1	2	1	3	3
Percent Tolerant Taxa[c]	30.88	3	38.04	3	34.96	3	43.48	3
Percent Predators[b]	13.33	3	9.35	1	19.81	3	20.86	5
Number of Clinger Taxa[b]	8	1	7	1	8	1	9	1
Percent Dominance (3 Taxa)[c]	45.97	5	45.67	5	34.03	5	38.78	5
Total BIBI Score[d]:	**n/a**	**24**	**n/a**	**20**	**n/a**	**22**	**n/a**	**26**
Biological Condition:	**Low**		**Low**		**Low**		**Moderate**	

Notes:
a. Each metric scored: 1 = Low; 3 = Moderate; 5 = High
b. Metric value generally decreases with declining biological integrity
c. Metric value general increases with declining biological integrity
d. Key to Total BIBI Scores:
  BIBI scores 0 – 24 = Low biological integrity
  BIBI scores 25 – 39 = Moderate biological integrity
  BIBI scores 39 – 50 = High biological integrity

Total Number of Taxa

The total number of taxa, or total taxa richness, is the total number of unique taxa identified within the sample. All types of invertebrates (mayflies, caddisflies, stoneflies, true flies, midges, clams, snails, and worms) collected from the sampling reach are included in this metric. The biodiversity of a stream declines as flow regimes are altered, habitat is lost, chemicals are introduced, energy cycles are disrupted, and alien taxa invade. The moderate scores given for total number of taxa in each of the sampling reaches indicates some level of disturbance within the assessment reaches.

Number of Ephemeroptera Taxa

The number of Ephemeroptera taxa, or Ephemeroptera taxa richness, is the total number of unique mayfly (Family Ephemeroptera) taxa identified within the sample. Typically, the diversity of mayflies declines in response to most types of human influence. The very low numbers of mayfly taxa recorded within the assessment reaches are indicative of disturbed systems.

Number of Plecoptera Taxa

The number of Plecoptera taxa, or Plecoptera taxa richness, is the total number of unique stonefly (Family Plecoptera) taxa identified within the sample. In general, stoneflies are among the most sensitive benthic macroinvertebrates, and they are among the first macroinvertebrates to disappear from a stream as human disturbance increases. Many stoneflies are predators that stalk their prey and hide around and between rocks, and these hiding places are lost as sediment washes into a stream and the stream substrates become embedded. Like salmonids, most stoneflies require cool, well-oxygenated water, and increased stream temperatures adversely affect the stream's ability to support stoneflies. The very low numbers of stonefly taxa recorded within the assessment reaches are indicative of disturbed systems.

Number of Trichoptera Taxa

The number of Trichoptera taxa, or Trichoptera taxa richness, is the total number of unique caddisfly (Family Trichoptera) taxa identified within the sample. Caddisflies are a diverse family of insect. Various caddisfly taxa feed in a variety of ways: some spin nets to trap food, others collect or scrape food from the tops of exposed rocks. Many caddisflies build gravel or wood cases to protect them from predators, and others are predators themselves. Although caddisflies are a diverse family, taxa richness of caddisflies declines steadily as the variety and complexity of stream habitats decline. The very low numbers of caddisfly taxa recorded within the assessment reaches are indicative of disturbed systems.

Number of Long-Lived Taxa

The number of long-lived taxa is the total number of unique taxa that require more than one year to complete their life cycles. Because of their longer life cycles, these taxa are exposed to cumulatively more stream disturbances than taxa with shorter life cycles. If the stream is dry part of the year or subject to flooding, taxa with longer life cycles may disappear from the stream. Loss of long-lived taxa from a system may indicate an on-going problem that repeatedly interrupts their life cycles. The moderate scores given for total number of long-lived taxa in each of the sampling reaches indicates some level of disturbance within the assessment reaches.

Number of Intolerant Taxa

The number of intolerant taxa is the total number of unique taxa that are intolerant of stream pollution. Chironomids are not included in this metric. Benthic macroinvertebrates identified as intolerant are the most sensitive taxa and represent approximately five to ten percent of the taxa present in the region. These taxa are the first to disappear as stream degradation increases. The moderate scores given for the number of intolerant taxa in each of the sampling reaches indicate some level of disturbance within the assessment reaches.

Percent Tolerant Taxa

The percent tolerant taxa is the total number of individuals belonging to taxa tolerant to stream degradation, divided by the total number of individuals within the sample, multiplied by 100. Chironomids are not included in this metric. Tolerant taxa are present within most streams, but as disturbance increases, tolerant taxa represent an increasingly large percentage of the total macroinvertebrate community. The moderate scores given for the percent tolerant taxa in each of the sampling reaches indicate some level of disturbance within the assessment reaches.

Percent Predators

The percent predators metric is the total number of predator individuals identified within the sample, divided by the total number of individuals within the sample, multiplied by 100. Predator taxa represent the peak of the food web and depend on a reliable source of other invertebrates that they can eat. The percentage of animals that are obligate predators provides a measure of the trophic complexity supported by a site. Less disturbed sites generally support a greater diversity of prey items and, therefore, a larger diversity of predators to feed on them.

Number of Clinger Taxa

This metric is the total number of unique clinger taxa within the sample. “Clingers” have physical adaptations that allow them to hold onto smooth substrates in fast water. These macroinvertebrates typically occupy the open areas between rocks and cobbles along the bottom of the stream; thus, they are particularly sensitive to fine sediments that fill these spaces and eliminate the variety and complexity of these small habitats. Sediment also prevents clingers from accessing the hyporheic zone of the stream bed. The very low numbers of clinger taxa recorded within the assessment reaches are indicative of disturbed systems.

Percent Dominance

Percent dominance is the sum of the individuals of the three most abundant taxa in the sample, divided by the total number of individuals in the sample, multiplied by 100. In general, as diversity declines, a fewer number of taxa make up a larger percentage of the total macroinvertebrate community. In contrast to the other metrics examined, the scores for percent dominance within all of the sample reaches were within the “high” category.

Total BIBI Score

Scores for all ten metrics are added together to arrive at a total BIBI score. The stream’s total BIBI score is a measure of the stream’s biological condition. Because there are ten metrics and each metric is scored 1 to 5, the total BIBI score can range from 10 to 50. A score closer to 50 indicates a high biotic condition similar to that found in a “natural” reference stream, which in the Willamette Valley Region is a relatively undisturbed Pacific Northwest montane stream. A score closer to 10 indicates a severely degraded stream with poor biological integrity. Total BIBI scores for the project area sampling reaches ranged from 20 to 26, in the upper low to moderate range for biological integrity.

4.1.1 Other Stream Assessment Metrics

ABA provided scores for fourteen other metrics that may be useful in assessing the biological integrity of the project area streams. Values and biological integrity scores for each of these metrics are provided in Table 2. For the first six metrics listed in Table 2 (total abundance, EPT taxa richness, predator richness, scraper richness, shredder richness, and percent intolerant taxa), the metric value generally decreases as biological integrity decreases. For the project-area sampling reaches, these metrics generally scored low overall, indicating low biological integrity for project area streams.

For the last eight metrics listed in Table 2 (Hilsenhoff biotic index, percent *Baetis tricaudatus*, percent collector, percent parasite, percent Oligochaeta, number of tolerant taxa, percent Simuliidae, and percent Chironomidae), the metric value generally increases as biological integrity decreases. Though scores for these metrics were variable for the project-area sampling reaches, many of the scores were in the moderate to high range, indicating impaired biological integrity for project-area streams.

Table 2. Other Community Composition Metrics that are Indicative of Biological Condition

Metric	Battle Creek 1		Battle Creek 2		Waln Creek 1		Waln Creek 2	
	Value	Score[a]	Value	Score[a]	Value	Score[a]	Value	Score[a]
Total Abundance[b]	285	L	589	M	429	L	1150	H
EPT Taxa Richness[b]	3	L	2	L	2	L	2	L
Predator Richness[b]	8	L	6	L	7	L	9	L
Scraper Richness[b]	4	L	4	L	4	L	5	L
Shredder Richness[b]	3	L	3	L	3	L	3	L
Percent Intolerant Taxa[b]	7.02	M	7.81	M	8.15	M	3.65	L
Hilsenhoff Biotic Index[c]	6.06	L	6.14	L	6.68	L	6.81	L
Percent *Baetis tricaudatus*[c]	0	H	0	H	0	H	0	H
Percent Collector[c]	42.81	M	35.83	M	52.21	M	42.78	M
Percent Parasite[c]	12.63	L	11.55	L	3.97	M	6.60	L
Percent Oligochaeta[c]	5.61	M	2.04	H	4.66	M	1.22	H
Number of Tolerant taxa[c]	11	L	8	M	11	L	14	L
Percent Simuliidae[c]	0	H	0	H	0.93	H	0	H
Percent Choronomidae[c]	51.93	L	37.86	L	70.40	L	37.57	L

Notes:
a. Low (L), moderate (M), and high (H) scores compared with a Pacific Northwest montane stream with high biological integrity.
b. Metric value generally decreases with declining biological integrity
c. Metric value generally increases with declining biological integrity

4.2 Fish Sampling

Table 3 summarizes the results of the fish sampling efforts within the project-sampling reaches. As noted above, the purpose of this sampling was to document the types of fish inhabiting the project-area streams. The sampling effort was not designed to document the number of fish within the project-area reaches. Six fish taxa were identified across all four sampling reaches. One cutthroat trout within Reach BC1 was notable. As noted above, portions of Reaches BC1, BC2, and BC3 could not be sampled with the backpack electrofisher because of dense, tangled vegetation hanging low over the water surface. A large portion of Reach WC1 was not accessible for sampling, and therefore, only five sculpin were caught during the fish sampling effort. Additionally, a large school of shiners was observed within Reach WC1 during the benthic macroinvertebrate sampling effort.

Table 3. Results of Fish Sampling for Project Area Sampling Reaches

Fish Species	**Sampling Reach**			
	Battle Creek 1[a]	**Battle Creek 2[a]**	**Waln Creek 1[a]**	**Waln Creek 2**
Sculpin	4	7	5	11
Shiner	45	14	X[b]	90
Largescale sucker	3	1	0	0
Cutthroat trout	1	0	0	0
Dace	0	0	0	7
Lamprey	0	0	0	3
Total	**53**	**22**	**5+**	**111**

Notes: a. Unable to sample reach completely with electrofishing equipment due to low, dense, overhanging vegetation.
b. Shiners observed within reach but not collected with the electrofishing equipment.

4.3 Physical Habitat Characterization

Physical habitat data was collected to provide baseline information that could be compared with future data following completion of restoration efforts at Battle and Waln Creeks—particularly Waln Creek immediately upstream of its confluence with Battle Creek. Data related to thalweg profile, presence of large woody debris, for each of the sampling reaches are provided on data forms derived from those provided in the EMAP-SW protocol. Data forms for each of the sampling reaches are in Appendices C, D, E, and F, respectively.

Because of the shallow slope of the project area streams, PHS determined the water surface slope using a level and surveyor's rods rather than a clinometer, as described in the methodology section above. Therefore, the EMAP-SW data sheet for slope measurement was not used. Slope data for the four sampling reaches are presented in Table 4, below.

Table 4. Water Surface Slopes for the Four Project-Area Sampling Reaches

Transect	Water Surface Slope			
	BC1	BC2	WC1	WC2
A to B	*	0.83	0.16	0.20
B to C	*	0.75	0.69	0.65
C to D	0.37	0.73	0.83	1.02
D to E	0.98	1.67	0.61	0.14
E to F	2.13	1.22	1.52	0.12
F to G	0.37	1.08	0.81	2.11
G to H	0.43	0.51	0.71	0.33
H to I	1.20	0.57	0.83	1.34
I to J	0.51	0.51	1.00	0.60
J to K	0.24	1.46	0.57	1.00
Reach Average	**0.78**	**0.93**	**0.77**	**0.75**

Notes: Slope data was not collected between transects A and C due to the presence of yellow jacket nests on the stream banks in this area.

The slope of the stream reach may be useful in three different ways. First, the overall stream gradient gives an indication of potential water velocities and stream power, which are in turn important controls on aquatic habitat and sediment transport within the reach. Second, the spatial variability of stream gradient is a measure of habitat complexity, as reflected in the diversity of water velocities and sediment sizes within the stream reach. Lastly, the water surface slope allows computation of residual pool depths and volumes from the multiple depth and width measurements taken in the thalweg profile.

The EMAP-SW protocol for physical habitat characterization is useful for longitudinal studies of changes in channel morphology due to urban changes in the stream hydrograph. Water depths at one-meter intervals along the thalweg are provided on the “Thalweg Profile & Woody Debris Form” for each of the sampled reaches. With the assumption of linear water surface slope between the 11 sample transects within the reach, a detailed longitudinal profile of the stream bed thalweg can be drawn from the assessment data. Such a profile could be compared to profiles drawn from subsequent year’s data to assess changes in the stream profile over time. Downstream discharge can be correlated with mean water depths over the sample reach to yield an average relative rating curve for the reach.

Changes in the flow regime are likely to alter the longitudinal relations of bedforms within a sampled reach, so that repeated monitoring will record the changes in bed geometry as the stream bed is altered. Fourier analysis of the inferred relative bed elevations will reveal changes in the distribution of streambed features resulting from changes in the hydrograph.

Wetted width data are listed on the “Thalweg Profile & Woody Debris Form” and on the “Channel/Riparian Cross-Section Form” for each of the sampled reaches. Changes in the low-flow wetted width can be expected to result from hydrograph changes resulting from changes in surface properties of the watershed. While not so detailed as the bedform data, these data can be expected to show channel changes resulting from altered flow regimes. Comparison of the baseline data contained in this report to data obtained in subsequent monitoring efforts can document changes in the stream over time.

Substrate size is one of the most important determinants of habitat character for fish and macroinvertebrates in streams. Substrate data for each transect within the sampled reaches are provided on the “Channel/Riparian Cross-Section Form”. Along with bedform (e.g., riffles and pools), substrate influences the hydraulic roughness and consequently the range of water velocities in the channel. It also influences the size range of interstices that provide living space and cover for macroinvertebrates, salamanders, and sculpins. Substrate characteristics are often sensitive indicators of the effects of human activities on streams. Decreases in the mean substrate size and increases in the percentage of fine sediments, for example, may destabilize channels and indicate changes in the rates of upland erosion and sediment supply. Within the sampled reaches, substrates were quite variable, but generally showed evidence of disturbance, as would be expected for urban streams. Throughout large sections of the sampled reaches, substrates were dominated by silt and other fine-grained sediments. In large sections of the Battle Creek reaches, substrates were dominated by hardpan consisting of consolidated clay layers, with fine silt dominating the substrate composition in deeper, slower-moving portions of the stream.

Other channel morphology data, including bank angles, undercut measurements, bankfull heights, and incision heights are provided on the “Channel/Riparian Cross-Section Form” for each of the sampled reaches. The recorded bank angles from the edge of the low-flow wetted channel will show changes to the banks resulting from flows at or in excess of the bankfull discharge. If the channel is not greatly incised, bankfull channel height and incision height will be the same. However, if the channel is incised greatly, the bankfull level will be below the level of the first terrace of the valley floodplain, making bankfull channel height smaller than incision height. Throughout most of the sampled reaches, particularly on Battle Creek, the channels are relatively deeply incised under current conditions.

Qualitative assessments of riparian vegetation and land use characteristics along each of the sampled reaches are provided on the “Channel/Riparian Cross-Section Form” and the “Riparian ‘Legacy’ Trees and Invasive Alien Plants” forms. While these data cannot be used to directly describe hydromodification of the stream, the visual estimations of riparian condition are useful for evaluating the health and level of disturbance of the stream corridor. They also provide an indication of the present and future potential for various types of organic inputs and shading, which are important contributors to water quality and the aquatic ecosystem. Riparian canopy cover over a stream is important not only in its role in moderating stream temperatures through shading, but also as an indicator of conditions that control bank stability and the potential for inputs of coarse and fine particulate organic material. Organic inputs from riparian vegetation become food for stream organisms and structure to create and maintain complex channel habitat. The field evaluation of the presence and proximity of various important types of human land use activities in the stream riparian area may be used in combination with mapped watershed land use information to assess the potential degree of disturbance of the sample stream reaches.

4.4 Future Sampling Efforts

This report presents the results of benthic macroinvertebrate sampling, fish sampling, and physical habitat characterization conducted within four sampled reaches in the vicinity of proposed restoration activities on Waln Creek. This data is intended as baseline data against which the results of future monitoring efforts can be compared to assess the success and effects of the proposed restoration on Waln Creek.

The Waln Creek relocation and restoration activities are scheduled to occur in the 2012 construction work season with work in the stream occurring during the June 1 to October 15 in-water work period. To document changes in Waln Creek and Battle Creek that might be the result of the restoration efforts on Waln Creek, subsequent sampling will need to be conducted following completion of the restoration activities. It's recommended that initial post-construction monitoring be completed in late summer or early fall 2013, after benthic macroinvertebrates and fish have had time to colonize the relocated stream channel. After that, monitoring may be conducted yearly for a period of a minimum of five years, or as required by project permits, to document the success of the stream restoration and potential effects to Battle Creek downstream of the project site.

5.0 REFERENCES

Oregon Department of Environmental Quality. June 30, 2010. *Water Monitoring and Assessment Mode of Operations Manual* (*MOMs*), Version 3.3, DEQ03-LAB-0036-SOP, Laboratory and Environmental Assessment Division, Hillsboro, Oregon.

Peck, D.V., J.M. Lazorchak, and D.J. Klemm (editors). Unpublished draft. *Environmental Monitoring and Assessment Program -Surface Waters: Western Pilot Study Field Operations Manual for Wadeable Streams.* EPA/XXX/X-XX/XXXX. U.S. Environmental Protection Agency, Washington, D.C.

Puget Sound Stream Benthos Website. www.pugetsoundstreambenthos.org. Accessed February 2012.

Appendix A

Figures

3/23/12
PHS #4891

Location of Sampling Reaches along Wain Creek and Battle Creek, Salem, Oregon.

I FIG1UREI

Pacific Habitat Services, Inc.

......1

3/23/12

PHS #4891

Transect Layout along Sampling Reach BC1, Battle Creek, Salem, Oregon.

I FIG2UREI

Pacific Habitat Services, Inc.

......1

Appendix B

Benthic Macroinvertebrate Sampling Data

Battle Creek, Site 1, September 29, 2011

OR: City of Salem. For Pacific Habitat Services,Inc., Wilsonville, OR.
Benthic invertebrates, D-net, 11 square foot composite, 500 micron.
Abundance for full I & m2. BY ABA, Inc., FILE: 11PHS01

IDENTIFICATION CODE	[illegible]
CORRECTION FACTOR	1

Taxon	Abundance	%
Nemata	1	0.35
Oligochaeta	16	5.61
Pisidium	12	4.21
Ferrissia	1	0.35
Fluminicola	3	1.05
Juga	43	15.09
Caecidotea	5	1.75
Acari	35	12.28
TOTAL: NON INSECTS	116	40.70
Coenagrion/Enallagma	1	0.35
TOTAL: ODONATA	1	0.35
Paraleptophlebia	1	0.35
TOTAL: EPHEMEROPTERA	1	0.35
Sweltsa	1	0.35
TOTAL: PLECOPTERA	1	0.35
Sialis	1	0.35
TOTAL: MEGALOPTERA	1	0.35
Lepidostoma-panel case larvae	12	4.21
TOTAL: TRICHOPTERA	12	4.21
Lara avara	2	0.70
Optioservus	1	0.35
TOTAL: COLEOPTERA	3	1.05
Ceratopogoninae	2	0.70
TOTAL: DIPTERA	2	0.70
Chironomidae-pupae	5	1.75
Cryptochironomus	9	3.16
Heterotrissocladius	18	6.32
Micropsectra	2	0.70
Paramerina	9	3.16
Paratendipes	1	0.35
Polypedilum	17	5.96
Procladius	7	2.46
Prodiamesa	1	0.35
Rheocricotopus	1	0.35
Stempellinella	4	1.40
Tanytarsus	6	2.11
Thienemannimyia Complex	4	1.40
Tribelos	53	18.60
Zavrelimyia	11	3.86
TOTAL: CHIRONOMIDAE	148	51.93
GRAND TOTAL	285	100.00

Battle Creek, Site 1, September 29, 2011
OR: City of Salem. For Pacific Habitat Services,Inc., Wilsonville, OR.
Benthic invertebrates, D-net, 11 square foot composite, 500 micron.
Abundance for full sample & m2. BY ABA, Inc., FILE: llPHSOl

Total **invertebrate abundance=** 285.0 EPT **abundance** = 14.0
Total number of taxa = 31 Number EPT **taxa** = 3
Hilsenhoff Biotic Index = 6.06 **Brillouin H** = 2.59

TAXONOMIC GROUP	#TAXA	ABUNDANCE	PERCENT
Non-insects	8	116.0	40.69
Odonata	1	1.0	0.35
Ephemeroptera	1	1.0	0.35
Plecoptera	1	1.0	0.35
Hemiptera	0	0.0	0.00
Megaloptera	1	1.0	0.35
Trichoptera	1	12.0	4.21
Lepidoptera	0	0.0	0.00
Coleoptera	2	3.0	1.05
Misc. Diptera	1	2.0	0.70
Chironomidae	15	148.0	51.93

FEEDING GROUP	#TAXA	ABUNDANCE	PERCENT
Predator	8	38.0	13.33
Parasite	2	36.0	12.63
Collector-gatherer	9	104.0	36.49
Collector-filterer	2	18.0	6.32
Macrophyte-herbivore	0	0.0	0.00
Fiercer-herbivore	0	0.0	0.00
Scraper	4	48.0	16.84
Shredder	2	14.0	4.91
Xylophage	0	0.0	0.00
Omnivore	2	18.0	6.31
Unknown	2	9.0	3.15

DOMINANT TAXON	ABUNDANCE	PERCENT
Tribelos	53.0	18.60
Juga	43.0	15.09
Acari	35.0	12.28
Heterotrissocladius	18.0	6.32
Polypedilum	17.0	5.96
SUBTOTAL 5 DOMINANTS	166.0	58.25
Oligochaeta	16.0	5.61
Pisidium	12.0	4.21
Lepidostoma-panel case lar	12.0	4.21
Zavrelimyia	11.0	3.86
Cryptochironomus	9.0	3.16
TOTAL 10 DOMINANTS	226.0	79.30

INDICATOR ASSEMBLAGE	#TAXA	ABUNDANCE	PERCENT
A Tolerant taxa	11	88.0	30.88
B InTolerant taxa	3	20.0	7.02

```
Battle  Creek,  Site  1, September  29,  2011
OR: City  of  Salem. For Pacific  Habitat  Services,Inc.,  Wilsonville,  OR.
Benthic  invertebrates,  D-net, 11 square  foot composite,  500 micron.
Abundance  for full sample & m2. BY ABA, Inc., FILE: 11PHS01

RATIOS OF TAX. GROUP ABUNDANCES
EPT/Chironomidae                          0.09
Hydropsychidae/Total Trichoptera          0.00
Baetidae/Total  Ephemeroptera           = 0.00

RATIOS OF FFG ABUNDANCES
Scraper/Collector-filter                             = 2.67
Scraper/(Scraper + C.-filterer)                      = 0.73
Shredder/Total  organisms                            = 0.0S

Biotic  Condition  Index
   Community  Tolerance  Quotient  (a) = 97.93
   Community  Tolerance  Quotient  (d) = 102.91

DIVERSITY MEASURES
Shannon H  (loge) = 2.75
Shannon H  (log2)   3.97
Evenness            0.80
Simpson  D        = 0.09

COMMUNITY VOLTINISM ANALYSIS
TYPE           ABUNDANCE   PERCENT
Multivoltine   147.0       51.58
Univoltine     75.0        26.32
Semivoltine    63.0        22.11
```

Battle Creek, Site 2, September 29, 2011

OR: City of Salem. For Pacific Habitat Services,Inc., Wilsonville, OR.
Benthic invertebrates, D-net, 11 square foot composite, 500 micron.
Abundance for full . & m2. BY Inc., FILE: 11PHS02

IDENTIFICATION CODE	11PHS02
CORRECTION FACTOR	1

Taxon	Abundance	%
Nemata	6	1.02
Oligochaeta	12	2.04
Pisidium	67	11.38
Sphaerium	1	0.17
Ferrissia	1	0.17
Fluminicola	65	11.04
Juga	119	20.20
Acari	62	10.53
TOTAL: NON INSECTS	333	56.54
Sweltsa	16	2.72
TOTAL: PLECOPTERA	16	2.72
Lepidostoma-panel case larvae	6	1.02
TOTAL: TRICHOPTERA	6	1.02
Lara avara	2	0.34
Optioservus	5	0.85
TOTAL: COLEOPTERA	7	1.19
Chelifera/Metachela	2	0.34
Muscidae	2	0.34
TOTAL: DIPTERA	4	0.68
Chironomidae-pupae	11	1.87
Corynoneura	1	0.17
Cryptochironomus	20	3.40
Heterotrissocladius	43	7.30
Paracladopelma	1	0.17
Paramerina	4	0.68
Polypedilum	42	7.13
Procladius	1	0.17
Prodiamesa	3	0.51
Stempellinella	3	0.51
Tribelos	83	14.09
Zavrelimyia	11	1.87
TOTAL: CHIRONOMIDAE	223	37.86
GRAND TOTAL	589	100.00

Battle Creek, Site 2, September 29, 2011
OR: City of Salem. For Pacific Habitat Services,Inc., Wilsonville, OR.
Benthic invertebrates, D-net, 11 square foot composite, 500 micron.
Abundance for full sample & m2. BY ABA, Inc., FILE: 11PHS02

Total invertebrate abundance = 589.0
Total number of taxa = 26
Hilsenhoff Biotic Index 6.14

EPT abundance = **22.0**
Number EPT taxa = 2
Brillouin H 2.40

TAXONOMIC GROUP	#TAXA	ABUNDANCE	PERCENT
Non-insects	8	333.0	56.55
Odonata	0	0.0	0.00
Ephemeroptera	0	0.0	0.00
Plecoptera	1	16.0	2.72
Hemiptera	0	0.0	0.00
Megaloptera	0	0.0	0.00
Trichoptera	1	6.0	1.02
Lepidoptera	0	0.0	0.00
Coleoptera	2	7.0	1.19
Misc. Diptera	2	4.0	0.68
Chironomidae	12	223.0	37.87

FEEDING GROUP	#TAXA	ABUNDANCE	PERCENT
Predator	6	55.0	9.35
Parasite	2	68.0	11.55
Collector-gatherer	6	143.0	24.28
Collector-filterer	2	68.0	11.55
Macrophyte-herbivore	0	0.0	0.00
Piercer-herbivore	0	0.0	0.00
Scraper	4	190.0	32.26
Shredder	2	8.0	1.36
Xylophage	0	0.0	0.00
Omnivore	1	42.0	7.13
Unknown	3	15.0	2.55

DOMINANT TAXON	ABUNDANCE	PERCENT
Juga	119.0	20.20
Tribelos	83.0	H.09
Pisidium	67.0	11.38
Fluminicola	65.0	11.04
Acari	62.0	10.53
SUBTOTAL 5 DOMINANTS	396.0	67.24
Heterotrissocladius	43.0	7.30
Polypedilum	42.0	7.13
Cryptochironomus	20.0	3.40
Sweltsa	16.0	2.72
Oligochaeta	12.0	2.04
TOTAL 10 DOMINANTS	529.0	89.83

INDICATOR ASSEMBLAGE	#TAXA	ABUNDANCE	PERCENT
A Tolerant taxa	8	224.0	38.04
B InTolerant taxa	2	46.0	7.81

Battle Creek, Site 2, September 29, 2011
OR: City of Salem. For Pacific Habitat Services,Inc., Wilsonville, OR.
Benthic invertebrates, D-net, 11 square foot composite, 500 micron.
Abundance for full sample & m2. BY ABA, Inc., FILE: 11PHS02

RATIOS OF TAX. GROUP ABUNDANCES
EPT/Chironomidae = 0.10
Hydropsychidae/Total Trichoptera = 0.00
Baetidae/Total Ephem. undefined. Total Ephem.=O

RATIOS OF FFG ABUNDANCES
Scraper/Collector-filter = 2.79
Scraper/(Scraper + C.-filterer) = **0.74**
Shredder/Total organisms = 0.01

Biotic Condition Index
Community Tolerance Quotient (a) = 100.50
Community Tolerance Quotient (d) = 100.24

DIVERSITY MEASURES
Shannon H (loge) = 2.48
Shannon H (log2) = 3.58
Evenness = 0.76
Simpson D 0.11

COMMUNITY VOLTINISM ANALYSIS

TYPE	ABUNDANCE	PERCENT
Multivoltine	235.2	39.94
Univoltine	122.8	20.84
Semivoltine	231.0	*39.22*

Wain Creek, Site 1, September 29, 2011

OR: City of Salem. For Pacific Habitat Services,Inc., Wilsonville, OR.
Benthic invertebrates, D-net, 11 square foot composite, 500 micron.
Abundance for full sam & m2. BY Inc., FILE: 11PHS03

IDENTIFICATION CODE	11PHS03
CORRECTION FACTOR	1

Taxon	Abundance	%
Nemata	2	0.47
Oligochaeta	20	4.66
Pisidium	13	3.03
Ferrissia	27	6.29
Fluminicola	3	0.70
Menetus	13	3.03
Juga	13	3.03
Caecidotea	2	0.47
Acari	15	3.50
TOTAL: NON INSECTS	108	25.17
Coenagrion/Enallagma	6	1.40
TOTAL: ODONATA	6	1.40
Paraleptophlebia	2	0.47
TOTAL: EPHEMEROPTERA	2	0.47
Lepidostoma-panel case larvae	2	0.47
TOTAL: TRICHOPTERA	2	0.47
Lara avara	2	0.47
TOTAL: COLEOPTERA	2	0.47
Dixella	1	0.23
Empididae	1	0.23
Ephydridae	1	0.23
Simulium	4	0.93
TOTAL: DIPTERA	7	1.63
Chironomidae-pupae	5	1.17
Alotanypus	6	1.40
Corynoneura	6	1.40
Cryptochironomus	27	6.29
Heterotrissocladius	27	6.29
Micropsectra	74	17.25
Nanocladius	2	0.47
Paramerina	10	2.33
Parametriocnemus	2	0.47
Paratanytarsus	21	4.90
Polypedilum	17	3.96
Procladius	45	10.49
Prodiamesa	8	1.86
Thienemannimyia Complex	23	5.36
Tribelos	17	3.96
Zavrelimyia	12	2.80
TOTAL: CHIRONOMIDAE	302	70.40
GRAND TOTAL	429	100.00

Waln Creek, Site 1, September 29, 2011
OR: City of Salem. For Pacific Habitat Services,Inc., Wilsonville, OR.
Benthic invertebrates, D-net, 11 square foot composite, 500 micron.
Abundance for full sample & m2. BY ABA, Inc., FILE: 11PHS03

Total invertebrate abundance= 429.0 **EPT abundance = 4.0**
Total number of taxa = 33 Number EPT taxa = 2
Hilsenhoff Biotic Index = 6.68 **Brillouin H = 2.85**

TAXONOMIC GROUP	#TAXA	ABUNDANCE	PERCENT
Non-insects	9	108.0	25.18
Odonata	1	6.0	1.40
Ephemeroptera	1	2.0	0.47
Plecoptera	0	0.0	0.00
Hemiptera	0	0.0	0.00
Megaloptera	0	0.0	0.00
Trichoptera	1	2.0	0.47
Lepidoptera	0	0.0	0.00
Coleoptera	1	2.0	0.47
Misc. Diptera	4	7.0	1.62
Chironomidae	16	302.0	70.40

FEEDING GROUP	#TAXA	ABUNDANCE	PERCENT
Predator	7	85.0	19.81
Parasite	2	17.0	3.97
Collector-gatherer	13	207.0	48.25
Collector-filterer	2	17.0	3.96
Macrophyte-herbivore	0	0.0	0.00
Fiercer-herbivore	0	0.0	0.00
Scraper	4	56.0	13.05
Shredder	2	4.0	0.94
Xylophage	0	0.0	0.00
Omnivore	1	17.0	3.96
Unknown	2	26.0	6.07

DOMINANT TAXON	ABUNDANCE	PERCENT
Micropsectra	74.0	17.25
Procladius	45.0	10.49
Ferrissia	27.0	6.29
Cryptochironomus	27.0	6.29
Heterotrissocladius	27.0	6.29
SUBTOTAL 5 DOMINANTS	200.0	46.61
Thienemannimyia Complex	23.0	5.36
Paratanytarsus	21.0	4.90
Oligochaeta	20.0	4.66
Polypedilum	17.0	3.96
Tribelos	17.0	3.96
TOTAL 10 DOMINANTS	298.0	69.45

INDICATOR ASSEMBLAGE	#TAXA	ABUNDANCE	PERCENT
A Tolerant taxa	11	150.0	34.96
B InTolerant taxa	2	35.0	8.15

Waln Creek, Site 1, September 29, 2011
OR: City of Salem. For Pacific Habitat Services,Inc., Wilsonville, OR.
Benthic invertebrates, D-net, 11 square foot composite, 500 micron.
Abundance for full sample & m2. BY ABA, Inc., FILE: 11PHS03

RATIOS OF TAX. GROUP ABUNDANCES
EPT/Chironomidae = **0.01**
Hydropsychidae/Total Trichoptera = **0.00**
Baetidae/Total Ephemeroptera = **0.00**

RATIOS OF FFG ABUNDANCES
Scraper/Collector-filter 3.29
Scraper/(Scraper + C.-filterer) 0.77
Shredder/Total organisms = **0.01**

Biotic Condition Index
Community Tolerance Quotient (a) = 101.12
Community Tolerance Quotient (d) = 105.08

DIVERSITY MEASURES
Shannon H (loge) = 2.99
Shannon H (log2) = 4.31
Evenness = **0.86**
Simpson D = **0.07**

COMMUNITY VOLTINISM ANALYSIS

TYPE	ABUNDANCE	PERCENT
Multivoltine	243.5	56.76
Univoltine	151.0	35.20
Semivoltine	34.5	8.04

Wain Creek, Site 2, September 29, 2011

OR: City of Salem. For Pacific Habitat Services,Inc., Wilsonville, OR.
Benthic invertebrates, D-net, 11 square foot composite, 500 micron.
Abundance for full sam & m2. BY Inc., FILE: 11PHS04

IDENTIFICATION CODE	11PHS04
CORRECTION FACTOR	2

Taxon	Abundance	%
Nemata	2	0.17
Oligochaeta	14	1.22
Helobdella stagnalis	2	0.17
Pisidium	154	13.39
Ferrissia	8	0.70
Fluminicola	108	9.39
Physa	94	8.17
Menetus	162	14.09
Juga	16	1.39
Crangonyx	6	0.52
Caecidotea	4	0.35
Acari	74	6.43
TOTAL: NON INSECTS	644	56.00
Baetis tricaudatus	20	1.74
TOTAL: EPHEMEROPTERA	20	1.74
Sialis	10	0.87
TOTAL: MEGALOPTERA	10	0.87
Lepidostoma-panel case larvae	18	1.57
TOTAL: TRICHOPTERA	18	1.57
Dixella	18	1.57
Muscidae	8	0.70
TOTAL: DIPTERA	26	2.26
Chironomidae-pupae	10	0.87
Alotanypus	130	11.30
Brillia	2	0.17
Cryptochironomus	2	0.17
Heterotrissocladius	26	2.26
Macropelopia	6	0.52
Micropsectra	34	2.96
Orthocladius Complex	2	0.17
Paramerina	8	0.70
Polypedilum	16	1.39
Procladius	58	5.04
Prodiamesa	6	0.52
Rheocricotopus	2	0.17
Tanytarsus	8	0.70
Thienemannimyia Complex	68	5.91
Tribelos	48	4.17
Zavrelimyia	6	0.52
TOTAL: CHIRONOMIDAE	432	37.57
GRAND TOTAL	1150	100.00

Waln Creek, Site *2,* September 29, 2011
OR: City of Salem. For Pacific Habitat Services,Inc., Wilsonville, OR.
Benthic invertebrates, D-net, 11 square foot composite, 500 micron.
Abundance for full sample & m2. BY ABA, Inc., FILE: 11PHS04

Total invertebrate abundance= 1150.0 **EPT abundance** = **38.0**
Total number of taxa = 34 Number EPT taxa = 2
Hilsenhoff Biotic Index = 6.81 **Brillouin H** = **2.76**

TAXONOMIC GROUP	#TAXA	ABUNDANCE	PERCENT
Non-insects	12	644.0	55.99
Odonata	0	0.0	0.00
Ephemeroptera	1	20.0	1.74
Plecoptera	0	0.0	0.00
Hemiptera	0	0.0	0.00
Megaloptera	1	10.0	0.87
Trichoptera	1	18.0	1.57
Lepidoptera	0	0.0	0.00
Coleoptera	0	0.0	0.00
Misc. Diptera	2	26.0	2.27
Chironomidae	17	432.0	37.54

FEEDING GROUP	#TAXA	ABUNDANCE	PERCENT
Predator	9	240.0	20.86
Parasite	2	76.0	6.60
Collector-gatherer	12	330.0	28.69
Collector-filterer	2	162.0	14.09
Macrophyte-herbivore	0	0.0	0.00
Fiercer-herbivore	0	0.0	0.00
Scraper	4	294.0	25.57
Shredder	2	20.0	1.74
Xylophage	0	0.0	0.00
Onmivore	2	18.0	1.56
Unknown	1	10.0	0.87

DOMINANT TAXON	ABUNDANCE	PERCENT
Menetus	162.0	14.09
Pisidium	154.0	13.39
Alotanypus	130.0	11.30
Fluminicola	108.0	9.39
Physa	94.0	8.17
SUBTOTAL 5 DOMINANTS	648.0	56.34
Acari	74.0	6.43
Thienemannimyia Complex	68.0	5.91
Procladius	58.0	5.04
Tribelos	48.0	4.17
Micropsectra	34.0	2.96
TOTAL 10 DOMINANTS	930.0	80.85

INDICATOR ASSEMBLAGE	#TAXA	ABUNDANCE	PERCENT
A Tolerant taxa	14	500.0	43.48
B InTolerant taxa	3	42.0	3.65

Waln Creek, Site 2, September 29, 2011
OR: City of Salem. For Pacific Habitat Services,Inc., Wilsonville, OR.
Benthic invertebrates, D-net, 11 square foot composite, 500 micron.
Abundance for full sample & m2. BY ABA, Inc., FILE: 11PHS04

RATIOS OF TAX. GROUP ABUNDANCES
EPT/Chironomidae = **0.09**
Hydropsychidae/Total Trichoptera = **0.00**
Baetidae/Total Ephemeroptera = 1.00

RATIOS OF FFG ABUNDANCES
Scraper/Collector-filter = **1.81**
Scraper/(Scraper + C.-filterer) = **0.64**
Shredder/Total organisms = **0.02**

Biotic Condition Index
Community Tolerance Quotient (a) 104.18
Community Tolerance Quotient (d) = 103.81

DIVERSITY MEASURES
Shannon H (loge) = 2.82
Shannon H (log2) = 4.07
Evenness = **0.80**
Simpson D = **0.08**

COMMUNITY VOLTINISM ANALYSIS

TYPE	ABUNDANCE	PERCENT
Multivoltine	421.0	36.61
Univoltine	521.0	45.30
Semivoltine	208.0	18.09

Benthic Invertebrate Index of Biological Integrity-8181 (modified Karr 1998)

OR: City of Salem. For Pacific Habitat Services, Inc., Wilsonville, OR. By Aquatic Biology Associates, Inc.

Sampling method: D-frame net, composite sample, 11 points, 1 m^2 total area , 500 micron mesh.

Subsampling: 500 organism minimum or entire sample. Level 3 PNW standard taxonomic effort.

Abundances adjusted to a full sample and square meter basis.

Site	Battle Creek 1		Battle Creek 2		Wain Creek 1		Wain Creek 2	
Date	9/29/2011		9/29/2011		9/29/2011		9/29/2011	
METRIC	Value	Score	Value	Score	Value	Score	Value	Score
D Total number of taxa	31	3	26	3	33	3	34	3
D Number Ephemeroptera taxa	1	1	0	1	1	1	1	1
D Number Plecoptera taxa D	1	1	1	1	0	1	0	1
Number Trichoptera taxa D	1	1	1	1	1	1	1	1
Number of long-lived taxa D	4	3	3	3	3	3	3	3
Number of intolerant taxa	3	3	2	1	2	1	3	3
% Tolerant taxa	30.88	3	38.04	3	34.96	3	43.48	3
D % Predator	13.33	3	9.35	1	19.81	3	20.86	5
D Number of clinger taxa	8	1	7	1	8	1	9	1
% Dominance (3 taxa)	45.97	5	45.67	5	34.03	5	38.78	5
TOTAL SCORE					🟥	22		
BIOLOGICAL CONDITION CATEGORY								

Maximum score of 50.

Each metric scored: 1=low, 3=moderate, 5=high

OTHER COMMUNITY COMPOSITION METRICS THAT ARE INDICATIVE OF BIOLOGICAL CONDITION

Total abundance (m2)	285	🟥	589	🟨	429	🟥	1150	🟩
D EPT taxa richness	3	🟥	2	🟥	2	🟥	2	🟥
D Predator richness	8	🟥	6	🟥	7	🟥	9	🟥
D Scraper richness	4	🟥	4	🟥	4	🟥	5	🟥
D Shredder richness	3	🟥	3	🟥	3	🟥	3	🟥
D %Intolerant taxa	7.02	🟨	7.81	🟨	8.15	🟨	3.65	🟥
Hilsenhoff Biotic Index	6.06	🟥	6.14	🟥	6.68	🟥	6.81	🟥
% *Baetis tricaudatus*	0	🟩	0	🟩	0	🟩	1.74	🟩
%Collector	42.81	🟨	35.83	🟨	52.21	🟨	42.78	🟨
%Parasite	12.63	🟥	11.55	🟥	3.97	🟨	6.6	🟥
%Oligochaeta	5.61	🟨	2.04	🟩	4.66	🟨	1.22	🟩
Number tolerant taxa	11	🟥	8	🟨	11	🟥	14	🟥
%Simuliidae	0	🟩	0	🟩	0.93	🟩	0	🟩
%Chironomidae	51.93	🟥	37.86	🟥	70.4	🟥	37.57	🟥

L,M & H comparisons with a Pacific Northwest montane stream with high biological integrity.

I= Metric value generally increases with declining biological integrity.

D= Metric value generally decreases with declining biological integrity.

L= Low biological integrity.		8181 scores between 0-24.
M= Moderate biological integrity.	🟫	8181 scores between 25-39.
H= High biological integrity.	🟫	8181 scores >40.

Appendix C

Physical Habitat Data

Battle Creek, Reach 1

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: BC-1	DATE: 10/26/11	**TRANSECT:**	☒ **A-B** ☐ **B-C** ☐ **C-D** ☐ **D-E** ☐ **E-F** ☐ **F-G** ☐ **G-H** ☐ **H-I** ☐ **I-J** ☐ **J-K**

THALWEG PROFILE

For Transect A-B ONLY

Increment (m)x.x:	1.0	Total Reach Length (m)	150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[1] Present (Y/ N)	BAR WIDTH[1] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	36.8	1.3	N		N	GL	N	N	N		
1	59.1		N		N	GL	N	N	N		
2	66.5		N		N	GL	N	N	N		
3	60.9		N		N	GL	N	N	N		
4	58.4		N		N	GL	N	N	N		
5	58.3		N		N	GL	N	N	N		
6	63.6		N		N	GL	N	N	N		
7	62.7	1.6	N		N	GL	N	N	N		
8	56.7		N		N	GL	N	N	N		
9	56.2		N		N	GL	N	N	N		
10	53.8		N		N	GL	N	N	N		
11	45.7		N		N	GL	N	N	N		
12	52.8		N		N	GL	N	N	N		
13	57.8		N		N	GL	N	N	N		
14	K		N		N	GL	N	N	N		Yellow jacket nest at transect B in dense vegetation.

SUBSTRATE	**Station (5 or 7)**	**LFT**	**LCTR**	**CTR**	**RCTR**	**RGT**	**FLAG**
	7	HP	HP	FN	FN	HP	

FLAG	**COMMENTS**

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length) | **CHECK IF ALL UNMARKED BOXES ARE ZERO** X | **FLAG**

Diameter Large End	**Pieces All/Part in Bankfull Channel** Length 1.5-5 m	**Pieces All/Part in Bankfull Channel** 5-15 m	**Pieces All/Part in Bankfull Channel** >15 m	**Pieces Bridge Above Bankfull Channel** Length 1.5-5 m	**Pieces Bridge Above Bankfull Channel** 5-15 m	**Pieces Bridge Above Bankfull Channel** >15 m
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

SUBSTRATE SIZE CLASS CODES

RS = BEDROCK (SMOOTH)–(Larger than a car)
RR = BEDROCK (ROUGH)-(Larger than a car)
BL = BOULDER (250 to 400 mm)-(Basketball to car)
CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball)
GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball)
GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble)
SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size)
FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

POOL FORM CODES

N= Not a pool
W= Large Woody Debris
R = Rootwad
B = Boulder or Bedrock
F = Unknown, fluvial

COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES

PP = Pool, Plunge
PT = Pool, Trench
PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: BC-1	DATE: 10/26/11	**TRANSECT:**	☐ **A-B** ☒ **B-C** ☐ **C-D** ☐ **D-E** ☐ **E-F** ☐ **F-G** ☐ **G-H** ☐ **H-I** ☐ **I-J** ☐ **J-K**

THALWEG PROFILE

For Transect A-B ONLY

Increment (m)x.x:	1.0	Total Reach Length (m)	150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH^2		SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
			Present (Y/ N)	XX.X							
0	K	K	N	N/A	K	GL	N	N	N		Yellow jacket nest at transect
1	K		N		K	GL	N	N	N		Yellow jacket nest at transect
2	42.2		N		Y	RI	N	N	N		
3	25.8		N		Y	RI	N	N	N		
4	37.3		N		Y	GL	N	N	N		
5	36.9	N/A	N		Y	GL	N	N	N		
6	47.1		N		Y	GL	N	N	N		
7	55.9	2.8	N		N	GL	N	N	N		
8	57.1		N		Y	GL	N	N	N		
9	55.8		N		Y	GL	N	N	N		
10	51.8		N		Y	GL	N	N	N		
11	49.9		N		Y	GL	N	N	N		
12	61.9		N		Y	RF	N	N	N		
13	28.8		N		Y	RI	N	N	N		
14	59.6		N		Y	GL	N	N	N		

SUBSTRATE	**Station (5 or 7)**	**LFT**	**LCTR**	**CTR**	**RCTR**	**RGT**	**FLAG**
	7	HP	FN	FN	FN	HP	

FLAG	**COMMENTS**

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GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball)
GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble)
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FN = SILT/CLAY/MUCK-(Not gritty)
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WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

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Eg. WR, BR, WRB

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PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)			**CHECK IF ALL UNMARKED BOXES ARE ZERO**		X	**FLAG**	
	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**			
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**	
0.1-<0.3 m	☐	☐	☐	☐	☐	☐	
0.3-0.5 m	☐	☐	☐	☐	☐	☐	
0.5-0.8 m	☐	☐	☐	☐	☐	☐	
>0.8 m	☐	☐	☐	☐	☐	☐	

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: BC-1 DATE: 10/26/11

TRANSECT: ☐ **A-B** ☐ **B-C** ☒ **C-D** ☐ **D-E** ☐ **E-F**
☐ **F-G** ☐ **G-H** ☐ **H-I** ☐ **I-J** ☐ **J-K**

THALWEG PROFILE

For Transect A-B ONLY | Increment (m)x.x: 1.0 | Total Reach Length (m) 150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH^3		SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
			Present (Y/ N)	XX.X							
0	47.6	1.8	N	N/A	Y	GL	N	N	N		
1	37.2		N		Y	GL	N	N	N		
2	37.7		N		Y	GL	N	N	N		
3	39.2		N		Y	GL	N	N	N		
4	33.9		N		Y	GL	N	N	N		
5	26.7	N/A	N	N/A	Y	GL	N	N	N		
6	20.5		N		Y	GL	N	N	N		
7	18.8	2.3	N	N/A	Y	GL	N	N	N		
8	19.6		N		Y	GL	N	N	N		
9	18.4		N		Y	GL	N	N	N		
10	18.4		N		Y	GL	N	N	N		
11	19.7		N		Y	GL	N	N	N		
12	19.2		N		Y	GL	N	N	N		
13	18.1		N		Y	GL	N	N	N		
14	17.4		N		Y	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	HP	FN	FN	FN	HP	

FLAG	COMMENTS

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)				CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	
	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel			
Diameter Large End	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m	
0.1-<0.3 m	☐	☐	☐	☐	☐	☐	
0.3-0.5 m	☐	☐	☐	☐	☐	☐	
0.5-0.8 m	☐	☐	☐	☐	☐	☐	
>0.8 m	☐	☐	☐	☐	☐	☐	

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Eg. WR, BR, WRB

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= Riffle RA =
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PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: BC-1	DATE: 10/26/11	**TRANSECT:**	☐ **A-B** ☐ **B-C** ☐ **C-D** ☒ **D-E** ☐ **E-F** ☐ **F-G** ☐ **G-H** ☐ **H-I** ☐ **I-J** ☐ **J-K**

THALWEG PROFILE

For Transect A-B ONLY

Increment (m)x.x:	1.0	Total Reach Length (m)	150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[4] Present (Y/ N)	BAR WIDTH[4] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	19.0	2.2	N	N/A	Y	GL	N	N	N		
1	21.8		N		Y	GL	N	N	N		
2	25.2		N		Y	GL	N	N	N		
3	23.6		N		Y	GL	N	N	N		
4	25.8		N		Y	GL	N	N	N		
5	25.6	N/A	N	N/A	Y	GL	N	N	N		
6	23.2		N		Y	GL	N	N	N		
7	36.1	2.0	N	N/A	Y	GL	N	N	N		
8	38.8		N		Y	GL	N	N	N		
9	24.2		N		Y	GL	N	N	N		
10	22.3		N		Y	GL	N	N	N		
11	19.2		N		Y	GL	N	N	N		
12	20.6		N		Y	GL	N	N	N		
13	22.9		N		Y	GL	N	N	N		
14	23.4		N		Y	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	FN	FN	FN	FN	FN	

FLAG	COMMENTS

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= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)				CHECK IF ALL UNMARKED BOXES ARE ZERO		X	FLAG
	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**			
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**	
0.1-<0.3 m	☐	☐	☐	☐	☐	☐	
0.3-0.5 m	☐	☐	☐	☐	☐	☐	
0.5-0.8 m	☐	☐	☐	☐	☐	☐	
>0.8 m	☐	☐	☐	☐	☐	☐	

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: BC-1	DATE: 10/26/11	**TRANSECT:**	☐ **A-B**	☐ **B-C**	☐ **C-D**	☐ **D-E**	☒ **E-F**				
			☐ **F-G**	☐ **G-H**	☐ **H-I**	☐ **I-J**	☐ **J-K**				

THALWEG PROFILE

For Transect A-B ONLY

Increment (m) x.x: 1.0 | Total Reach Length (m) 150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH^5		SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
			Present (Y/ N)	XX.X							
0	28.7	1.8	N	N/A	Y	GL	N	N	N		
1	23.1		N		Y	GL	N	N	N		
2	22.2		N		Y	GL	N	N	N		
3	20.7		N		Y	GL	N	N	N		
4	20.2		N		Y	GL	N	N	N		
5	22.1	N/A	N	N/A	Y	GL	N	N	N		
6	21.9		N		Y	GL	N	N	N		
7	18.1	2.1	N	N/A	Y	GL	N	N	N		
8	29.1		N		Y	GL	N	N	N		
9	17.6		N		Y	RI	N	N	N		
10	38.2		N		Y	GL	N	N	N		
11	43.9		N		Y	GL	N	N	N		
12	38.1		N		Y	GL	N	N	N		
13	39.6		N		Y	GL	N	N	N		
14	37.4		N		Y	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	FN	FN	FN	FN	FN	

FLAG	COMMENTS

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)				CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG
	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

SUBSTRATE SIZE CLASS CODES

RS = BEDROCK (SMOOTH)–(Larger than a car)
RR = BEDROCK (ROUGH)-(Larger than a car)
BL = BOULDER (250 to 400 mm)-(Basketball to car)
CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball)
GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball)
GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble)
SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size)
FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

POOL FORM CODES

N= Not a pool
W= Large Woody Debris
R = Rootwad
B = Boulder or Bedrock
F = Unknown, fluvial

COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES

PP = Pool, Plunge
PT = Pool, Trench
PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: BC-1	DATE: 10/26/11	**TRANSECT:**	☐ **A-B**	☐ **B-C**	☐ **C-D**	☐ **D-E**	☐ **E-F**				
			☒ **F-G**	☐ **G-H**	☐ **H-I**	☐ **I-J**	☐ **J-K**				

THALWEG PROFILE

For Transect A-B ONLY | Increment (m) x.x: 1.0 | Total Reach Length (m) 150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[6] Present (Y/ N)	BAR WIDTH[6] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	37.1	2.2	N/A	N	Y	GL	N	N	N		
1	36.2		N		Y	GL	N	N	N		
2	30.9		N		Y	GL	N	N	N		
3	26.2		N		N	RI	N	N	N		
4	25.4		N		N	RI	N	N	N		
5	33.3	N/A	N	N/A	N	RI	N	N	N		
6	26.1		N		N	RI	N	N	N		
7	33.6	2.7	N	N/A	N	RI	N	N	N		
8	40.3		N		N	RI	N	N	N		
9	31.7		N		N	RI	N	N	N		
10	34.8		N		N	RI	N	N	N		
11	18.1		N		N	GL	N	N	N		
12	26.6		N		N	GL	N	N	N		
13	26.2		N		N	GL	N	N	N		
14	24.3		N		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	HP	HP	HP	HP	HP	

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES
RS = BEDROCK (SMOOTH)–(Larger than a car)
RR = BEDROCK (ROUGH)-(Larger than a car)
BL = BOULDER (250 to 400 mm)-(Basketball to car)
CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball)
GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball)
GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble)
SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size)
FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

POOL FORM CODES
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COMBINATIONS:
Eg. WR, BR, WRB

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PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)				CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	
	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel			
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**	
0.1-<0.3 m	☐	☐	☐	☐	☐	☐	
0.3-0.5 m	☐	☐	☐	☐	☐	☐	
0.5-0.8 m	☐	☐	☐	☐	☐	☐	
>0.8 m	☐	☐	☐	☐	☐	☐	

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: BC-1

DATE: 10/26/11

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F
☐ F-G ☒ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE

For Transect A-B ONLY

Increment (m) x.x: 1.0

Total Reach Length (m): 150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[7]		SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
			Present (Y/ N)	XX.X							
0	23.4	2.3	N	N/A	Y	GL	N	N	N		
1	21.8		N		Y	GL	N	N	N		
2	20.2		N		Y	GL	N	N	N		
3	26.6		N		Y	GL	N	N	N		
4	27.7		N		Y	GL	N	N	N		
5	28.8	N/A	N	N/A	Y	GL	N	N	N		
6	26.3		N		Y	GL	N	N	N		
7	26.6	2.5	N	N/A	Y	GL	N	N	N		
8	2.21		N		Y	GL	N	N	N		
9	2.46		N		Y	GL	N	N	N		
10	2.42		N		Y	GL	N	N	N		
11	2.48		N		Y	GL	N	N	N		
12	2.76		N		Y	GL	N	N	N		
13	1.95		N		Y	GL	N	N	N		
14	1.99		N		Y	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	HP	FN	FN	FN	HP	

FLAG	COMMENTS

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RS = BEDROCK (SMOOTH)–(Larger than a car)
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GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)

CHECK IF ALL UNMARKED BOXES ARE ZERO: X

FLAG:

Diameter Large End	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: BC-1 DATE: 10/26/11

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F
☐ F-G ☐ G-H ☒ H-I ☐ I-J ☐ J-K

THALWEG PROFILE

For Transect A-B ONLY

Increment (m) x.x:	1.0	Total Reach Length (m)	150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH^8		SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
			Present (Y/ N)	XX.X							
0	27.3	2.7	N	N/A	Y	GL	N	N	N		
1	25.8		N		N	RI	N	N	N		
2	20.4		N		Y	GL	N	N	N		
3	34.6		N		Y	GL	N	N	N		
4	36.6		N		Y	GL	N	N	N		
5	36.4	N/A	N	N/A	Y	GL	N	N	N		
6	33.9		N		Y	GL	N	N	N		
7	30.9	2.4	N	N/A	Y	GL	N	N	N		
8	26.8		N		Y	GL	N	N	N		
9	26.6		N		Y	GL	N	N	N		
10	27.7		N		Y	GL	N	N	N		
11	26.4		N		Y	GL	N	N	N		
12	29.6		N		Y	GL	N	N	N		
13	29.2		N		Y	GL	N	N	N		
14	23.1		N		Y	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	FN	FN	FN	FN	HP	

FLAG	COMMENTS

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

SUBSTRATE SIZE CLASS CODES

RS = BEDROCK (SMOOTH)–(Larger than a car)
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Eg. WR, BR, WRB

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GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
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PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: BC-1	DATE: 10/26/11	**TRANSECT:**	☐ **A-B** ☐ **B-C** ☐ **C-D** ☐ **D-E** ☐ **E-F** ☐ **F-G** ☐ **G-H** ☐ **H-I** ☒ **I-J** ☐ **J-K**

THALWEG PROFILE

For Transect A-B ONLY

Increment (m) x.x: 1.0

Total Reach Length (m) 150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[9]		SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
			Present (Y/ N)	XX.X							
0	32.0	2.5	N	N/A	Y	GL	N	N	N		
1	32.2		N		Y	GL	N	N	N		
2	26.4		N		Y	GL	N	N	N		
3	27.8		N		Y	GL	N	N	N		
4	31.7		N		Y	GL	N	N	N		
5	30.4	N/A	N	N/A	Y	GL	N	N	N		
6	25.7				Y	GL	N	N	N		
7	24.7	2.7	N	N/A	Y	GL	N	N	N		
8	27.4		N		Y	GL	N	N	N		
9	32.8		N		Y	GL	N	N	N		
10	31.7		N		Y	GL	N	N	N		
11	31.9		N		Y	GL	N	N	N		
12	33.6		N		Y	GL	N	N	N		
13	27.0		N		Y	GL	N	N	N		
14	24.3		N		Y	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	FN	FN	FN	FN	HP	

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES

RS = BEDROCK (SMOOTH)–(Larger than a car)
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Eg. WR, BR, WRB

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= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG			
	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: BC-1	DATE: 10/26/11	**TRANSECT:**	☐ **A-B** ☐ **B-C** ☐ **C-D** ☐ **D-E** ☐ **E-F** ☐ **F-G** ☐ **G-H** ☐ **H-I** ☐ **I-J** ☒ **J-K**

THALWEG PROFILE	For Transect A-B ONLY	Increment (m)x.x:	1.0	Total Reach Length (m)	150

STATION	**THALWEG DEPTH (cm) (xx.x)**	**WETTED WIDTH (m) (XXX.X)**	**BAR WIDTH[10]**		**SOFT/ SMALL SEDIMENT (Y/N)**	**CHANNEL UNIT CODE**	**POOL FORM CODE**	**SIDE CHANNEL (Y/N)**	**BACK WATER (Y/N)**	**FLAG**	**COMMENTS**
			Present (Y/ N)	**XX.X**							
0	31.8	2.5	N	N/A	Y	GL	N	N	N		
1	27.3		N		Y	GL	N	N	N		
2	24.9		N		Y	GL	N	N	N		
3	28.7		N		Y	GL	N	N	N		
4	318		N		Y	GL	N	N	N		
5	37.3	N/A	N	N/A	Y	GL	N	N	N		
6	30.6		N		Y	GL	N	N	N		
7	31.2	2.8	N	N/A	Y	GL	N	N	N		Waln Creek Intersection
8	41.9		N		N	GL	N	N	N		
9	40.7		N		N	GL	N	N	N		
10	39.1		N		N	GL	N	N	N		
11	37.4		N		N	GL	N	N	N		
12	21.1		N		N	RI	N	N	N		
13	25.9		N		Y	GL	N	N	N		
14	39.6		N		Y	GL	N	N	N		

SUBSTRATE	**Station (5 or 7)**	**LFT**	**LCTR**	**CTR**	**RCTR**	**RGT**	**FLAG**
	7	FN	FN	FN	FN	HP	

FLAG	**COMMENTS**

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)				**CHECK IF ALL UNMARKED BOXES ARE ZERO**		X
	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

FLAG

SUBSTRATE SIZE CLASS CODES

RS = BEDROCK (SMOOTH)–(Larger than a car)
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Cascade FA =
Falls
DR = Dry Channel

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: BC-1

DATE: 11/10/11

TRANSECT: ☒ A ☐ B ☐ C ☐ D ☐ E ☐ F ☐ G ☐ H ☐ I ☐ J ☐ K

X-tra Side Channel ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	HP	0	
LCtr	0.31	33.4	GC	40	
Ctr	0.62	29.0	GF	60	
RCtr	0.93	17.0	HP	0	
Right	1.25	0	HP	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)
(circle one)

FISH COVER/OTHER		FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	[✓ 0] 1 2 3 4	F1
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	F1

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
Canopy (>5 m high)			
Vegetation Type	D [✓ C] E M N	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	0 1 [✓ 2] 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Understory (0.5 to 5 m high)			
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 2 3 [✓ 4]	0 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	0 1 2 3 [✓ 4]	
Ground Cover (<0.5 m high)			
Woody Shrubs and Saplings	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	0 1 2 [✓ 3] 4	
Barren, Bare Dirt or Duff	0 1 2 [✓ 3] 4	0 1 2 [✓ 3] 4	

HUMAN INFLUENCE: 0= Not Present P= >10 m C= Within 10 m B= On Bank

HUMAN INFLUENCE	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	0 P [✓ C] B	0 P [✓ C] B	F2
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	83	0	
Right	67	0	
Welted Width xxx.x m		1.3	
Bar Width xx.x m		0	
Bankfull Width xxx.x m		1.8	
Bankfull Height xx.x m		0.9	
Incised Height xx.x m		1.4	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	13		CenR	17	
CenL	14		Left	K	
CenDwn	12		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments
F1	Bridge immediately downstream; overhanging vegetation immediately upstream of transect
F2	Bridge abutments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: BC-1 DATE: 10/26/11

TRANSECT: ☐ **A** ☒ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐
☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K**

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	HP	0	
LCtr	0.38	46.1	HP	0	
Ctr	0.76	57.9	HP	0	
RCtr	1.14	46.8	HP	0	
Right	1.51	0	HP	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 [✓ 1] 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 2 3 [✓ 4]	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 3 [✓ 4]	0 1 2 3 [✓ 4]	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 3 [✓ 4]	0 1 2 3 [✓ 4]	
Barren, Bare Dirt or Duff	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	90	0	
Right	90	0	
Welted Width xxx.x m		1.5	
Bar Width xx.x m		N/A	
Bankfull Width xxx.x m		1.7	
Bankfull Height xx.x m		1.3	
Incised Height xx.x m		1.8	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	17	
CenL	17		Left	K	
CenDwn	17		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments
	2x4s, bottles, trash on surface

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: BC-1

DATE: 11/10/11

TRANSECT: ☐ A ☐ B ☒ C ☐ D ☐ E ☐ F ☐ G ☐ H ☐ I ☐ J ☐ K

X-tra Side Channel ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	HP	0	
LCtr	0.49	35.2	HP	0	
Ctr	0.98	56.1	FN	100	
RCtr	1.47	54.4	FN	100	
Right	1.97	0	HP	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 1 2 [✓ 3] 4	
Live Trees or Roots	0 1 [✓ 2] 3 4	
Overhanging Veg. = <1 m of Surface	0 1 2 [✓ 3] 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 2 3 [✓ 4]	0 [✓ 1] 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Barren, Bare Dirt or Duff	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	77	0	
Right	64	0	
Welted Width xxx.x m		2.0	
Bar Width xx.x m		0	
Bankfull Width xxx.x m		2.8	
Bankfull Height xx.x m		1.3	
Incised Height xx.x m		1.7	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	17	
CenL	17		Left	K	
CenDwn	17		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments
	Measurements made on upstream side of debris/willow jam.

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: BC-1	DATE: 11/10/11	**TRANSECT:**	☐ **A** ☐ **B** ☐ **C** ☒ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	HP	0	
LCtr	0.70	24.2	SA	100	
Ctr	1.40	28.3	SA	100	
RCtr	2.10	20.8	FN	100	
Right	2.78	0	HP	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 [✓ 2] 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	0 [✓ 1] 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 3 [✓ 4]	0 1 2 3 [✓ 4]	
Barren, Bare Dirt or Duff	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	0 P C B	
Park/Lawn	0 P [✓ C] B	0 P C B	
Row Crops	[✓ 0] P C B	0 P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	0 P C B	
Logging Operations	[✓ 0] P C B	0 P C B	
Mining Activity	[✓ 0] P C B	0 P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	66	0	
Right	78	0	
Welted Width xxx.x m		2.8	
Bar Width xx.x m		0	
Bankfull Width xxx.x m		3.1	
Bankfull Height xx.x m		0.9	
Incised Height xx.x m		1.4	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	3		CenR	3	
CenL	4		Left	K	
CenDwn	4		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	**Comments**

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: BC-1	DATE: 11/10/11	**TRANSECT:**	☐ **A** ☐ **B** ☐ **C** ☐ **D** ☒ **E** ☐ **F** **X-tra Side Channel** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	HP	0	
LCtr	0.59	33.3	GF	90	
Ctr	1.18	19.6	FN	100	
RCtr	1.77	13.9	FN	100	
Right	2.36	0	HP	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 1 [✓ 2] 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 [✓ 1] 2 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	[✓ 0] 1 2 3 4	0 1 2 [✓ 3] 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	[✓ 0] 1 2 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 3 [✓ 4]	0 1 [✓ 2] 3 4	
Barren, Bare Dirt or Duff	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	88	0	
Right	86	0	
Welted Width xxx.x m		2.4	
Bar Width xx.x m		0	
Bankfull Width xxx.x m		3.6	
Bankfull Height xx.x m		0.9	
Incised Height xx.x m		1.7	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	0		CenR	6	
CenL	3		Left	K	
CenDwn	5		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: BC-1	DATE: 11/10/11	**TRANSECT:**	☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☒ **F** **X-tra Side Channel** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	HP	0	
LCtr	0.65	32.8	FN	100	
Ctr	1.30	40.7	SA	50	
RCtr	1.95	25.6	SA	50	
Right	2.58	0	HP	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 [✓ 2] 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Barren, Bare Dirt or Duff	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	67	0	
Right	71	0	
Welted Width xxx.x m		2.6	
Bar Width xx.x m		0	
Bankfull Width xxx.x m		3.1	
Bankfull Height xx.x m		0.8	
Incised Height xx.x m		1.1	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	13		CenR	14	
CenL	17		Left	K	
CenDwn	15		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	**Comments**

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: BC-1

DATE: 11/10/11

TRANSECT: ☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐
☒ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K**

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	HP	0	
LCtr	0.56	24.8	GF	90	
Ctr	1.11	22.8	HP	0	
RCtr	1.67	17.8	FN	100	
Right	2.23	0	HP	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 [✓ 2] 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	0 1 [✓ 2] 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 2 3 [✓ 4]	0 1 2 3 [✓ 4]	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	0 [✓ 1] 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	79	0	
Right	82	0	
Welted Width xxx.x m		2.2	
Bar Width xx.x m		0	
Bankfull Width xxx.x m		2.6	
Bankfull Height xx.x m		0.8	
Incised Height xx.x m		1.2	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	17	
CenL	17		Left	K	
CenDwn	17		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: bc-1

DATE: 11/10/11

TRANSECT: ☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐
☐ **G** ☒ **H** ☐ **I** ☐ **J** ☐ **K**

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	HP	0	
LCtr	0.64	27.6	GF	10	
Ctr	1.28	24.6	GF	20	
RCtr	1.92	15.6	GF	30	
Right	2.57	0	HP	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)
(circle one)

FISH COVER/OTHER		FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 1 [✓ 2] 3 4	
Live Trees or Roots	0 [✓ 1] 2 3 4	
Overhanging Veg. = <1 m of Surface	0 [✓ 1] 2 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	0 1 2 [✓ 3] 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	0 1 [✓ 2] 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 2 [✓ 3] 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
Barren, Bare Dirt or Duff	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	

0= Not Present P= >10 m C= Within 10 m B= On Bank

HUMAN INFLUENCE	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	67	0	
Right	70	0.1	
Welted Width xxx.x m		2.6	
Bar Width xx.x m		0	
Bankfull Width xxx.x m		3.4	
Bankfull Height xx.x m		0.9	
Incised Height xx.x m		1.6	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	14		CenR	17	
CenL	15		Left	K	
CenDwn	17		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: BC-1 DATE: 11/10/11

TRANSECT: ☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel**
☐ **G** ☐ **H** ☒ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	HP	0	
LCtr	0.66	24.8	FN	100	
Ctr	1.32	30.2	FN	100	
RCtr	1.98	27.8	FN	100	
Right	2.63	0	WD	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	0 [✓ 1] 2 3 4	
Overhanging Veg. = <1 m of Surface	0 [✓ 1] 2 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	0 1 [✓ 2] 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	0 [✓ 1] 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 2 [✓ 3] 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Barren, Bare Dirt or Duff	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	

HUMAN INFLUENCE: 0= Not Present P= >10 m C= Within 10 m B= On Bank

HUMAN INFLUENCE	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	54	0	
Right	67	0	
Welted Width xxx.x m		2.6	
Bar Width xx.x m		0	
Bankfull Width xxx.x m		3.7	
Bankfull Height xx.x m		1.0	
Incised Height xx.x m		1.6	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	17	
CenL	17		Left	K	
CenDwn	17		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: BC-1 DATE: 11/10/11

TRANSECT: ☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel**
☐ **G** ☐ **H** ☐ **I** ☒ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	HP	0	
LCtr	0.65	30.4	FN	100	
Ctr	1.30	31.8	FN	100	
RCtr	1.95	27.6	FN	100	
Right	2.59	0	WD	50	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	0 1 [✓ 2] 3 4	
Overhanging Veg. = <1 m of Surface	0 [✓ 1] 2 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
Canopy (>5 m high)			
Vegetation Type	D [✓ C] E M N	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	0 1 [✓ 2] 3 4	0 1 2 [✓ 3] 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	0 [✓ 1] 2 3 4	
Understory (0.5 to 5 m high)			
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 2 [✓ 3] 4	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	0 [✓ 1] 2 3 4	
Ground Cover (<0.5 m high)			
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 [✓ 1] 2 3 4	
Barren, Bare Dirt or Duff	0 1 [✓ 2] 3 4	0 [✓ 1] 2 3 4	

HUMAN INFLUENCE: 0= Not Present P= >10 m C= Within 10 m B= On Bank

HUMAN INFLUENCE	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	0 P C B	
Pavement/Cleared Lot	[✓ 0] P C B	0 P C B	
Road/Railroad	[✓ 0] P C B	0 P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	0 P C B	
Landfill/Trash	[✓ 0] P C B	0 P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	0 P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	0 P C B	
Logging Operations	[✓ 0] P C B	0 P C B	
Mining Activity	[✓ 0] P C B	0 P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	64	0	
Right	74	0	
Welted Width xxx.x m		2.6	
Bar Width xx.x m		0	
Bankfull Width xxx.x m		3.4	
Bankfull Height xx.x m		0.9	
Incised Height xx.x m		1.7	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	17	
CenL	17		Left	K	
CenDwn	17		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: BC-1	DATE: 11/10/11	TRANSECT:	☐ A ☐ B ☐ C ☐ D ☐ E ☐ F X-tra Side Channel ☐ G ☐ H ☐ I ☐ J ☒ K ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	HP	0	
LCtr	0.62	6.9	FN	100	
Ctr	1.24	36.9	HP	0	
RCtr	1.86	23.8	HP	0	
Right	2.46	0	HP	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 2 [✓ 3] 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 [✓ 1] 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 2 [✓ 3] 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	73	0	
Right	84	0	
Welted Width xxx.x m		2.5	
Bar Width xx.x m		0	
Bankfull Width xxx.x m		3.0	
Bankfull Height xx.x m		1.0	
Incised Height xx.x m		1.3	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	8		CenR	6	
CenL	3		Left	K	
CenDwn	6		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

RIPARIAN “LEGACY” TREES AND INVASIVE ALIEN PLANTS

SITE ID: BC-1 DATE: 11/10/11

TRAN	LARGEST LEGACY TREE VISIBLE FROM THIS STATION						ALIEN PLANT SPECIES PRESENT IN LEFT AND RIGHT RIPARIAN PLOTS	
	Trees not Visible	DBH (m)	Height (m)	Dist. from wetted margin (m)	Type	Taxonomic Category	Check all that are present	
A	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒.3-.75	☐<5 ☐5-15 ☒15-30 ☐>30	K	☐Deciduous ☒Coniferous ☐Broadleaf Evergreen	Pine	☐ None	☒RC Grass ☐Salt Ced ☐Hblack ☐G Reed ☐Engl Ivy ☐CanThis ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
B	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒.3-.75	☐<5 ☐5-15 ☐15-30 ☐>30	K	☐Deciduous ☐Coniferous ☐Broadleaf Evergreen	Pine	☐ None	☒RC Grass ☐Salt CEd ☐Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
C	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☐<5 ☐5-15 ☒15-30 ☐>30	>30m	☐Deciduous ☒Coniferous ☐Broadleaf Evergreen	Pine	☐ None	☒RC Grass ☐Salt Ced ☐Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol

INSTRUCTIONS

Legacy trees are defined as the largest tree within your search area, which is as far as you can see, but within maximum limits as follows:

Wadeable Streams: Confine search to no more than 50 m from left and right bank and extending upstream to next transect (for ‘K’ look upstream 4 channel widths)

Non-wadeable Rivers: Confine search to no more than 100 m from left and right bank and extending both upstream and downstream as far as you can see confidently.

Alien Plants: Confine search to riparian plots on left and right bank

Wadeable Streams: 10 m x 10 m
Non-wadeable Rivers: 10 m x 20 m

Not all aliens are to be identified in all states. See Field Manual and Plant Identification Guide.

TAXONOMIC CATEGORIES
Acacia/Mesquite Alder/Birch Ash Maple/Box elder Oak Poplar/Cottonwood Sycamore Willow Unknown or Other Deciduous
Cedar/Cypress/Sequoia Fir (including Douglas Fir and Hemlock) Juniper Pine Spruce Unknown or Other Deciduous
Unknown or Other Broadleaf Evergreen
Snag (Dead tree of any species)

ALIEN SPECIES		
RC Grass	Reed Canarygrass	*Phalaris arundinacea*
Engl Ivy	English Ivy	*Hedera Helix*
ChGrass	Cheat Grass	*Bromus tectorum*
Salt Ced	Salt Cedar	*Tamarix spp.*
Can This	Canada thistle	*Cirsium arvense*
M This	Musk thistle	*Carduus nutans*
Hblack	Himalayan blackberry	*Rubus discolor*
Teasel	Teasel	*Dipsacus fullonum*
Spurge	Leafy spurge	*Euphorbia esula*
G Reed	Giant Reed	*Arundo donax*
C Burd	Common burdock	*Arctium minus*
Rus Ol	Russian-olive	*Elaeagnus angustifolia*

COMMENTS

Transects D to K continued on next page

RIPARIAN “LEGACY” TREES AND INVASIVE ALIEN PLANTS

SITE ID: BC-1 DATE: 11/10/11

TRAN	LARGEST LEGACY TREE VISIBLE FROM THIS STATION						ALIEN PLANT SPECIES PRESENT IN LEFT AND RIGHT RIPARIAN PLOTS				
	Trees not Visible	DBH (m)	Height (m)	Dist. from wetted margin (m)	Type	Taxonomic Category	Check all that are present				
D	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒.3-.75	☐<5 ☐5-15 ☒15-30 ☐>30	0	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Cottonwood	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☐CanThis ☐M This	☐Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
E	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒.3-.75	☐<5 ☐5-15 ☐15-30 ☐>30	K	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Cottonwood, same as last	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt CEd ☐Can This ☐M This	☐Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
F	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒.3-.75	☐<5 ☐5-15 ☒15-30 ☐>30	>30m	☐Deciduous ☒Coniferous ☐Broadleaf Evergreen	Pine	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☐Can This ☐M This	☒Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
G	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒.3-.75	☐<5 ☒5-15 ☐15-30 ☐>30	0.5	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Alder	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☐Can This ☐M This	☒Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
H	☐	☐0-0.1 ☐.75-2 ☒.1-.3 ☐>2 ☐.3-.75	☐<5 ☒5-15 ☐15-30 ☐>30	0.5	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Alder	☐ None	☐RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☐Can This ☐M This	☒Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
I	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒.3-.75	☐<5 ☒5-15 ☐15-30 ☐>30	0.5	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Alder	☐ None	☐RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☐Can This ☐M This	☒Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
J	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒.3-.75	☐<5 ☒5-15 ☐15-30 ☐>30	5m	☐Deciduous ☒Coniferous ☐Broadleaf Evergreen	Pine	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☐Can This ☐M This	☒Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
K	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☐<5 ☐5-15 ☐15-30 ☐>30	>50m	☐Deciduous ☐Coniferous ☐Broadleaf Evergreen	Pine, same as last	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☐Can This ☐M This	☒Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol

Appendix D

Physical Habitat Data

Battle Creek, Reach 2

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: BC-2	DATE: 12/7/11	TRANSECT:	☒ A-B	☐ B-C	☐ C-D	☐ D-E	☐ E-F
			☐ F-G	☐ G-H	☐ H-I	☐ I-J	☐ J-K

THALWEG PROFILE	For Transect A-B ONLY	Increment (m) x.x:	1.0	Total Reach Length (m)	150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[1] Present (Y/ N)	BAR WIDTH[1] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	49.6	2.1	N		Y	GL	N	N	N		
1	53.6		N		N	GL	N	N	N		
2	59.5		N		N	GL	N	N	N		
3	61.4		N		N	GL	N	N	N		
4	59.6		N		N	GL	N	N	N		
5	36.2	N/A	N	N/A	Y	GL	N	N	N		
6	65.0		N		Y	GL	N	N	N		
7	62.8	1.9	N	N/A	Y	GL	N	N	N		
8	65.9		N		Y	GL	N	N	N		
9	63.8		N		Y	GL	N	N	N		
10	65.1		N		Y	GL	N	N	N		
11	59.8		N		Y	GL	N	N	N		
12	68.1		N		Y	GL	N	N	N		
13	73.9		N		N	GL	N	N	N		
14	K		N		K	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	FN	FN	FN	FN	HP	

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)			CHECK IF ALL UNMARKED BOXES ARE ZERO		X	FLAG
	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: BC-2	DATE: 12/7/11	**TRANSECT:**	☐ **A-B**	☒ **B-C**	☐ **C-D**	☐ **D-E**	☐ **E-F**
			☐ **F-G**	☐ **G-H**	☐ **H-I**	☐ **I-J**	☐ **J-K**

THALWEG PROFILE	For Transect A-B ONLY	Increment (m) x.x:	1.0	Total Reach Length (m)	150

STATION	**THALWEG DEPTH (cm) (xx.x)**	**WETTED WIDTH (m) (XXX.X)**	**BAR WIDTH^2**		**SOFT/ SMALL SEDIMENT (Y/N)**	**CHANNEL UNIT CODE**	**POOL FORM CODE**	**SIDE CHANNEL (Y/N)**	**BACK WATER (Y/N)**	**FLAG**	**COMMENTS**
			Present (Y/ N)	**XX.X**							
0	68.3	1.8	N	N/A	N	GL	N	N	N		
1	61.8		N		N	GL	N	N	N		
2	60.3		N		Y	GL	N	N	N		
3	58.5		N		Y	GL	N	N	N		
4	55.7		N		Y	GL	N	N	N		
5	54.6	N/A	N	N/A	Y	GL	N	N	N		
6	45.4		N		N	GL	N	N	N		
7	43.8	2.2	N	N/A	N	GL	N	N	N		
8	49.4		N		N	GL	N	N	N		
9	61.7		N		N	GL	N	N	N		
10	67.9		N		N	GL	N	N	N		
11	66.4		N		Y	GL	N	N	N		
12	60.9		N		Y	GL	N	N	N		
13	42.3		N		Y	GL	N	N	N		
14	39.8		N		N	GL	N	N	N		

SUBSTRATE	**Station (5 or 7)**	**LFT**	**LCTR**	**CTR**	**RCTR**	**RGT**		**FLAG**
	7	FN	GF	GF	FN	FN		

FLAG	**COMMENTS**

SUBSTRATE SIZE CLASS CODES

RS = BEDROCK (SMOOTH)–(Larger than a car)
RR = BEDROCK (ROUGH)-(Larger than a car)
BL = BOULDER (250 to 400 mm)-(Basketball to car)
CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball)
GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball)
GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble)
SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size)
FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

POOL FORM CODES

N= Not a pool
W= Large Woody Debris
R = Rootwad
B = Boulder or Bedrock
F = Unknown, fluvial

COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES

PP = Pool, Plunge
PT = Pool, Trench
PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)				CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	
	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**			
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**	
0.1-<0.3 m	☐	☐	☐	☐	☐	☐	
0.3-0.5 m	☐	☐	☐	☐	☐	☐	
0.5-0.8 m	☐	☐	☐	☐	☐	☐	
>0.8 m	☐	☐	☐	☐	☐	☐	

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: BC-2	DATE: 12/7/11	**TRANSECT:**	☐ **A-B** ☐ **B-C** ☒ **C-D** ☐ **D-E** ☐ **E-F** ☐ **F-G** ☐ **G-H** ☐ **H-I** ☐ **I-J** ☐ **J-K**

THALWEG PROFILE

For Transect A-B ONLY

Increment (m) x.x:	1.0	Total Reach Length (m)	150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH^3 Present (Y/ N)	BAR WIDTH^3 XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	36.8	2.1	N	N/A	N	GL	N	N	N		
1	36.9		N		N	GL	N	N	N		
2	31.5		N		N	GL	N	N	N		Under wooden golf cart bridge
3	32.1		N		N	GL	N	N	N		Under wooden golf cart bridge
4	40.8		N		N	GL	N	N	N		
5	55.2	N/A	N	N/A	N	GL	N	N	N		
6	56.3		N		Y	GL	N	N	N		
7	58.1	1.8	N	N/A	Y	GL	N	N	N		
8	59.7		N		Y	GL	N	N	N		
9	51.3		N		Y	GL	N	N	N		
10	49.6		N		Y	GL	N	N	N		
11	43.9		N		Y	GL	N	N	N		
12	51.9		N		Y	GL	N	N	N		
13	52.4		N		Y	GL	N	N	N		
14	44.8		N		Y	GL	N	N	N		

SUBSTRATE	**Station (5 or 7)**	**LFT**	**LCTR**	**CTR**	**RCTR**	**RGT**	**FLAG**
	7	hp	hp	fn	fn	hp	

FLAG	**COMMENTS**

SUBSTRATE SIZE CLASS CODES

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RR = BEDROCK (ROUGH)-(Larger than a car)
BL = BOULDER (250 to 400 mm)-(Basketball to car)
CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball)
GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball)
GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble)
SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size)
FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

POOL FORM CODES

N= Not a pool
W= Large Woody Debris
R = Rootwad
B = Boulder or Bedrock
F = Unknown, fluvial

COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES

PP = Pool, Plunge
PT = Pool, Trench
PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)			CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	
	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: BC-2 DATE: 12/7/11

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☒ D-E ☐ E-F
☐ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

For Transect A-B ONLY

Increment (m) x.x: 1.0 Total Reach Length (m) 150

THALWEG PROFILE

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[4] Present (Y/ N)	BAR WIDTH[4] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	55.1	2.2	N	N/A	Y	GL	N	N	N		
1	55.4		N		Y	GL	N	N	N		
2	57.1		N		Y	GL	N	N	N		
3	57.7		N		Y	GL	N	N	N		
4	56.5		N		Y	GL	N	N	N		
5	60.2	N/A	N	N/A	Y	GL	N	N	N		
6	49.5		N		Y	GL	N	N	N		
7	47.6	2.2	N	N/A	Y	GL	N	N	N		
8	45.2		N		N	GL	N	N	N		
9	41.8		N		N	GL	N	N	N		
10	57.0		N		N	GL	N	N	N		
11	51.6		N		N	GL	N	N	N		
12	59.6		N		N	GL	N	N	N		
13	58.6		N		N	GL	N	N	N		
14	59.7		N		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	FN	FN	FN	HP	HP	

FLAG	COMMENTS

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Falls
DR = Dry Channel

LARGE WOODY DEBRIS
(⟨10 cm small end diameter; ⟨1.5 m length)

CHECK IF ALL UNMARKED BOXES ARE ZERO X **FLAG**

Diameter Large End	Pieces All/Part in Bankfull Channel: Length 1.5-5 m	Pieces All/Part in Bankfull Channel: 5-15 m	Pieces All/Part in Bankfull Channel: >15 m	Pieces Bridge Above Bankfull Channel: Length 1.5-5 m	Pieces Bridge Above Bankfull Channel: 5-15 m	Pieces Bridge Above Bankfull Channel: >15 m
0.1-<0.3 m	1					
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: BC-2	DATE: 12/7/11	**TRANSECT:**	☐ **A-B**	☐ **B-C**	☐ **C-D**	☐ **D-E**	☒ **E-F**
			☐ **F-G**	☐ **G-H**	☐ **H-I**	☐ **I-J**	☐ **J-K**

THALWEG PROFILE

For Transect A-B ONLY

Increment (m) x.x: 1.0 | Total Reach Length (m) 150

STATION	**THALWEG DEPTH (cm) (xx.x)**	**WETTED WIDTH (m) (XXX.X)**	**BAR WIDTH[5] Present (Y/ N)**	**BAR WIDTH[5] XX.X**	**SOFT/ SMALL SEDIMENT (Y/N)**	**CHANNEL UNIT CODE**	**POOL FORM CODE**	**SIDE CHANNEL (Y/N)**	**BACK WATER (Y/N)**	**FLAG**	**COMMENTS**
0	43.1	2.7	N	N/A	Y	GL	N	N	N		
1	51.8		N		Y	GL	N	N	N		
2	63.9		N		Y	GL	N	N	N		
3	60.4		N		N	GL	N	N	N		
4	56.0		N		Y	GL	N	N	N		
5	50.1	N/A	N	N/A	Y	GL	N	N	N		
6	51.3		N		N	GL	N	N	N		
7	55.6	2.6	N	N/A	Y	GL	N	N	N		
8	62.9		N		Y	GL	N	N	N		
9	64.7		N		Y	GL	N	N	N		
10	66.8		N		Y	GL	N	N	N		
11	70.7		N		Y	GL	N	N	N		
12	69.7		N		Y	GL	N	N	N		
13	74.1		N		Y	GL	N	N	N		
14	61.1		N		Y	GL	N	N	N		

SUBSTRATE	**Station (5 or 7)**	**LFT**	**LCTR**	**CTR**	**RCTR**	**RGT**	**FLAG**
	7	FN	FN	FN	FN	HP	

FLAG	**COMMENTS**

SUBSTRATE SIZE CLASS CODES

RS = BEDROCK (SMOOTH)–(Larger than a car)
RR = BEDROCK (ROUGH)-(Larger than a car)
BL = BOULDER (250 to 400 mm)-(Basketball to car)
CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball)
GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball)
GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble)
SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size)
FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

POOL FORM CODES

N= Not a pool
W= Large Woody Debris
R = Rootwad
B = Boulder or Bedrock
F = Unknown, fluvial

COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES

PP = Pool, Plunge
PT = Pool, Trench
PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls
DR = Dry Channel

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)				**CHECK IF ALL UNMARKED BOXES ARE ZERO**		X	**FLAG**
	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**			
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**	
0.1-<0.3 m	1						
0.3-0.5 m							
0.5-0.8 m							
>0.8 m							

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: BC-2	DATE: 12/7/11	**TRANSECT:**	☐	**A-B**	☐	**B-C**	☐	**C-D**	☐	**D-E**
			☒	**F-G**	☐	**G-H**	☐	**H-I**	☐	**I-J**

☐	**E-F**	☐	**J-K**		

THALWEG PROFILE								For Transect A-B ONLY			Increment (m) x.x: 1.0 Total Reach Length (m) 150
STATION	**THALWEG DEPTH (cm) (xx.x)**	**WETTED WIDTH (m) (XXX.X)**	**BAR WIDTH[6] Present (Y/ N)**	**BAR WIDTH[6] XX.X**	**SOFT/ SMALL SEDIMENT (Y/N)**	**CHANNEL UNIT CODE**	**POOL FORM CODE**	**SIDE CHANNEL (Y/N)**	**BACK WATER (Y/N)**	**FLAG**	**COMMENTS**
0	59.9	3.3	N	N/A	Y	GL	N	N	N		
1	53.9		N		Y	GL	N	N	N		
2	44.9		N		Y	GL	N	N	N		
3	52.6		N		Y	GL	N	N	N		
4	62.4		N		Y	GL	N	N	N		
5	62.9	N/A	N	N/A	Y	GL	N	N	N		
6	62.1		N		Y	GL	N	N	N		
7	63.6	1.4	N	N/A	Y	GL	N	N	N		
8	64.9		N		Y	GL	N	N	N		
9	64.8		N		Y	GL	N	N	N		
10	53.1		N		Y	GL	N	N	N		
11	67.1		N		Y	GL	N	N	N		
12	67.7		N		Y	GL	N	N	N		
13	67.1		N		Y	GL	N	N	N		
14	69.2		N		Y	GL	N	N	N		

SUBSTRATE	**Station (5 or 7)**	**LFT**	**LCTR**	**CTR**	**RCTR**	**RGT**	**FLAG**
	7	FN	FN	FN	FN	HP	

FLAG	**COMMENTS**

SUBSTRATE SIZE CLASS CODES

RS = BEDROCK (SMOOTH)–(Larger than a car)
RR = BEDROCK (ROUGH)-(Larger than a car)
BL = BOULDER (250 to 400 mm)-(Basketball to car)
CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball)
GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball)
GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble)
SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size)
FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

POOL FORM CODES

N= Not a pool
W= Large Woody Debris
R = Rootwad
B = Boulder or Bedrock
F = Unknown, fluvial

COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES

PP = Pool, Plunge
PT = Pool, Trench
PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)			**CHECK IF ALL UNMARKED BOXES ARE ZERO**		X	**FLAG**
	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: BC-2 DATE: 12/7/11

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F
☐ F-G ☒ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE

For Transect A-B ONLY

Increment (m) x.x: 1.0 Total Reach Length (m) 150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[7] Present (Y/ N)	BAR WIDTH[7] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	72.0	1.5	N	N/A	Y	GL	N	N	N		
1	49.3		N		N	GL	N	N	N		
2	55.0		N		N	GL	N	N	N		
3	55.7		N		Y	GL	N	N	N		
4	52.0		N		Y	GL	N	N	N		
5	65.5	N/A	N	N/A	Y	GL	N	N	N		
6	73.7		N		Y	GL	N	N	N		
7	70.8	2.9	N	N/A	Y	GL	N	N	N		
8	60.4		N		Y	GL	N	N	N		
9	48.5		N		Y	GL	N	N	N		
10	46.8		N		Y	GL	N	N	N		
11	53.9		N		Y	GL	N	N	N		
12	62.1		N		Y	GL	N	N	N		
13	60.6		N		Y	GL	N	N	N		
14	39.9		N		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	FN	FN	FN	HP	HP	

FLAG	COMMENTS

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	

Diameter Large End	Pieces All/Part in Bankfull Channel: Length 1.5-5 m	Pieces All/Part in Bankfull Channel: 5-15 m	Pieces All/Part in Bankfull Channel: >15 m	Pieces Bridge Above Bankfull Channel: Length 1.5-5 m	Pieces Bridge Above Bankfull Channel: 5-15 m	Pieces Bridge Above Bankfull Channel: >15 m
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

SUBSTRATE SIZE CLASS CODES
RS = BEDROCK (SMOOTH)–(Larger than a car)
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FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

POOL FORM CODES
N= Not a pool
W= Large Woody Debris
R = Rootwad
B = Boulder or Bedrock
F = Unknown, fluvial

COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES
PP = Pool, Plunge
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PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: BC-2   DATE: 12/7/11

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F ☐ F-G ☐ G-H ☒ H-I ☐ I-J ☐ J-K

THALWEG PROFILE

For Transect A-B ONLY

Increment (m) x.x: 1.0   Total Reach Length (m) 150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[8]		SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
			Present (Y/ N)	XX.X							
0	51.4	2.4	N	N/A	N	GL	N	N	N		
1	64.4		N		Y	GL	N	N	N		
2	63.0		N		Y	GL	N	N	N		
3	58.4		N		Y	GL	N	N	N		
4	56.6		N		Y	GL	N	N	N		
5	56.6	N/A	N	N/A	Y	GL	N	N	N		
6	67.8		N		Y	GL	N	N	N		
7	63.5	2.8	N	N/A	Y	GL	N	N	N		
8	61.6		N		Y	GL	N	N	N		
9	64.0		N		Y	GL	N	N	N		
10	45.2		N		Y	GL	N	N	N		
11	41.9		N		Y	GL	N	N	N		
12	45.3		N		Y	GL	N	N	N		
13	45.6		N		Y	GL	N	N	N		
14	46.6		N		Y	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	FN	FN	FN	FN	FN	

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES

RS = BEDROCK (SMOOTH)–(Larger than a car)
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SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size)
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COMBINATIONS:
Eg. WR, BR, WRB

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PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (⟨10 cm small end diameter; ⟨1.5 m length)			CHECK IF ALL UNMARKED BOXES ARE ZERO		X	FLAG	
	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel			
Diameter Large End	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m	
0.1-<0.3 m							
0.3-0.5 m							
0.5-0.8 m							
>0.8 m							

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: BC-2	DATE: 12/7/11	TRANSECT:	☐ A-B	☐ B-C	☐ C-D	☐ D-E	☐ E-F
			☐ F-G	☐ G-H	☐ H-I	☒ I-J	☐ J-K

THALWEG PROFILE

For Transect A-B ONLY

Increment (m) x.x: 1.0 | Total Reach Length (m) 150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[9]		SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
			Present (Y/ N)	XX.X							
0	49.6	1.9	N	N/A	N	GL	N	N	N		
1	60.2		N		N	GL	N	N	N		
2	64.6		N		N	GL	N	N	N		
3	64.9		N		N	GL	N	N	N		
4	64.7		N		N	GL	N	N	N		
5	57.3	N/A	N	N/A	N	GL	N	N	N		
6	46.1		N		Y	GL	N	N	N		
7	44.9	2.2	N	N/A	Y	GL	N	N	N		
8	47.6		N		Y	GL	N	N	N		
9	55.4		N		Y	GL	N	N	N		
10	54.5		N		Y	GL	N	N	N		
11	57.0		N		Y	GL	N	N	N		
12	57.5		N		Y	GL	N	N	N		
13	51.9		N		N	GL	N	N	N		
14	43.6		N		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	FN	FN	GF	FN	FN	

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES

RS = BEDROCK (SMOOTH)–(Larger than a car)
RR = BEDROCK (ROUGH)-(Larger than a car)
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CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball)
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SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size)
FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

POOL FORM CODES

N= Not a pool
W= Large Woody Debris
R = Rootwad
B = Boulder or Bedrock
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COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES

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PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)				CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	
	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel			
Diameter Large End	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m	
0.1-<0.3 m							
0.3-0.5 m							
0.5-0.8 m							
>0.8 m							

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: BC-2	DATE: 12/7/11	**TRANSECT:**	☐	**A-B**	☐	**B-C**	☐	**C-D**	☐	**D-E**	☐	**E-F**
			☐	**F-G**	☐	**G-H**	☐	**H-I**	☐	**I-J**	☒	**J-K**

THALWEG PROFILE

For Transect A-B ONLY

Increment (m) x.x:	1.0	Total Reach Length (m)	150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[10]		SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
			Present (Y/ N)	XX.X							
0	45.1	2.8	N	N/A	N	GL	N	N	N		
1	51.0		N		N	GL	N	N	N		
2	69.5		N		Y	GL	N	N	N		
3	67.0		N		Y	GL	N	N	N		
4	60.6		N		Y	GL	N	N	N		
5	59.4	N/A	N	N/A	Y	GL	N	N	N		
6	59.4		N		Y	GL	N	N	N		
7	74.4	2.4	N	N/A	Y	GL	N	N	N		
8	78.4		N		Y	GL	N	N	N		
9	72.8		N		Y	GL	N	N	N		
10	54.5		N		Y	GL	N	N	N		
11	51.0		N		N	GL	N	N	N		
12	57.5		N		N	GL	N	N	N		
13	72.2		N		N	GL	N	N	N		
14	80.8		N		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	FN	FN	FN	FN	HP	

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)			CHECK IF ALL UNMARKED BOXES ARE ZERO		X	FLAG
	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: BC-2	DATE: 12/9/11	**TRANSECT:**	☒ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	HP	0	
LCtr	0.53	25.8	FN	100	
Ctr	1.06	48.7	GF	50	
RCtr	1.59	31.9	HP	0	
Right	2.11	0	HP	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 [✓ 2] 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	0 1 2 3 4	0 1 [✓ 2] 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	0 1 [✓ 2] 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	0 1 [✓ 2] 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	77	N/A	
Right	73	N/A	
Welted Width xxx.x m		2.1	
Bar Width xx.x m		N/A	
Bankfull Width xxx.x m		2.7	
Bankfull Height xx.x m		0.9	
Incised Height xx.x m		2.1	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	5		CenR	14	
CenL	12		Left	K	
CenDwn	17		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: BC-2	DATE: 12/9/11	**TRANSECT:**	☐ **A** ☒ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.45	35.8	HP	0	
Ctr	0.90	62.9	FN	100	
RCtr	1.35	54.7	FN	100	
Right	1.80	0	HP	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 1 [✓ 2] 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 2 [✓ 3] 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
Canopy (>5 m high)			
Vegetation Type	D C E M [✓ N]	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Understory (0.5 to 5 m high)			
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	[✓ 0] 1 2 3 4	0 1 2 [✓ 3] 4	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Ground Cover (<0.5 m high)			
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	[✓ 0] 1 2 3 4	
Barren, Bare Dirt or Duff	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	70	N/A	
Right	90	N/A	
Welted Width xxx.x m		1.8	
Bar Width xx.x m		N/A	
Bankfull Width xxx.x m		2.4	
Bankfull Height xx.x m		1.1	
Incised Height xx.x m		2.1	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	17	
CenL	12		Left	K	
CenDwn	17		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: BC-2 DATE: 12/9/11 **TRANSECT:** ☐ **A** ☐ **B** ☒ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	HP	0	
LCtr	0.54	32.6	HP	100	
Ctr	1.08	33.4	GF	30	
RCtr	1.62	32.6	GF	20	
Right	2.14	0	HP		

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 [✓ 1] 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 [✓ 2] 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	0 1 2 [✓ 3] 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	68	N/A	
Right	69	N/A	
Welted Width xxx.x m		2.1	
Bar Width xx.x m		N/A	
Bankfull Width xxx.x m		2.8	
Bankfull Height xx.x m		2.5	U
Incised Height xx.x m		2.1	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	13		CenR	17	
CenL	5		Left	K	
CenDwn	15		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments
U	Wooden golf cart bridge immediately upstream of transect

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: BC-2
DATE: 12/9/11
TRANSCECT:

TRANSECT: ☐ **A** ☐ **B** ☐ **C** ☒ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐
☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K**

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.55	42.0	HP	0	
Ctr	1.10	50.8	FN	100	
RCtr	1.65	30.9	HP	0	
Right	2.20	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 1 [✓ 2] 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 2 [✓ 3] 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	0 1 [✓ 2] 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 [✓ 1] 2 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	

0= Not Present P= >10 m C= Within 10 m B= On Bank

HUMAN INFLUENCE	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	74	N/A	
Right	90	N/A	U
Welted Width xxx.x m		2.2	
Bar Width xx.x m		N/A	
Bankfull Width xxx.x m		1.8	
Bankfull Height xx.x m		1.0	
Incised Height xx.x m		2.1	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	17	
CenL	13		Left	K	
CenDwn	11		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments
	New discharge pipe immediately upstream from transect

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: BC-2 DATE: 12/9/11

TRANSECT: ☐ **A** ☐ **B** ☐ **C** ☐ **D** ☒ **E** ☐ **F** **X-tra Side Channel** ☐
☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K**

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	HP	0	
LCtr	0.67	37.7	HP	0	
Ctr	1.34	33.1	GF	80	
RCtr	2.01	39.0	FN	100	
Right	2.68	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	0 [✓ 1] 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 1 [✓ 2] 3 4	
Live Trees or Roots	0 1 [✓ 2] 3 4	
Overhanging Veg. = <1 m of Surface	0 1 [✓ 2] 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	0 1 2 3 4	0 [✓ 1] 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 2 [✓ 3] 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	0 1 [✓ 2] 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	0 [✓ 1] 2 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	55	N/A	
Right	69	N/A	
Welted Width xxx.x m		2.7	
Bar Width xx.x m		N/A	
Bankfull Width xxx.x m		3.5	
Bankfull Height xx.x m		0.8	
Incised Height xx.x m		2.1	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	17	
CenL	12		Left	K	
CenDwn	5		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments
	Log in stream downstream of transect

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: BC-2	DATE: 12/9/11	TRANSCRIPT:	☐ A ☐ B ☐ C ☐ D ☐ E ☒ F X-tra Side Channel ☐ G ☐ H ☐ I ☐ J ☐ K ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	HP	0	
LCtr	0.83	50.3	HP	0	
Ctr	1.67	55.1	FN	100	
RCtr	2.49	30.1	FN	100	
Right	3.30	0	HP	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 [✓ 1] 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 [✓ 2] 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D [✓ C] E M N	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	0 [✓ 1] 2 3 4	0 1 [✓ 2] 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 2 [✓ 3] 4	0 1 2 [✓ 3] 4	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	K	N/A	
Right	86	N/A	
Welted Width xxx.x m		3.3	
Bar Width xx.x m		N/A	
Bankfull Width xxx.x m		3.5	
Bankfull Height xx.x m		1.0	
Incised Height xx.x m		2.0	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	17	
CenL	17		Left	K	
CenDwn	14		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: BC-2

DATE: 12/9/11

TRANSECT: ☐ A ☐ B ☐ C ☐ D ☐ E ☐ F X-tra Side Channel ☐
☒ G ☐ H ☐ I ☐ J ☐ K

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.39	71.4	HP	0	
Ctr	0.78	58.9	HP	0	
RCtr	1.17	57.4	HP	0	
Right	1.54	0	HP	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 1 [✓ 2] 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 [✓ 2] 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)	D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None	
RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	D C E M N	
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 2 [✓ 3] 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	[✓ 0] 1 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	[✓ 0] 1 2 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	K	N/A	
Right	K	N/A	
Welted Width xxx.x m		1.5	
Bar Width xx.x m		N/A	
Bankfull Width xxx.x m		2.1	
Bankfull Height xx.x m		1.3	
Incised Height xx.x m		2.0	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	15		CenR	17	
CenL	6		Left	K	
CenDwn	13		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments
	Banks nearly vertical, densely covered with briars

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: BC-2   DATE: 12/9/11   **TRANSECT:** ☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐
☐ **G** ☒ **H** ☐ **I** ☐ **J** ☐ **K**

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	HP	0	
LCtr	0.59	0.33	HP	0	
Ctr	1.18	47.8	FN	100	
RCtr	1.77	40.9	FN	100	
Right	2.36	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 [✓ 1] 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 [✓ 2] 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
Canopy (>5 m high)			
Vegetation Type	D C E M [✓ N]	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Understory (0.5 to 5 m high)			
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 1 2 [✓ 3] 4	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
Ground Cover (<0.5 m high)			
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	0 [✓ 1] 2 3 4	
Barren, Bare Dirt or Duff	0 1 [✓ 2] 3 4	[✓ 0] 1 2 3 4	

0= Not Present P= >10 m C= Within 10 m B= On Bank

HUMAN INFLUENCE	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	52	N/A	
Right	K	N/A	F1
Welted Width xxx.x m		2.4	
Bar Width xx.x m		N/A	
Bankfull Width xxx.x m		2.7	
Bankfull Height xx.x m		1.0	
Incised Height xx.x m		1.9	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	17	
CenL	17		Left	K	
CenDwn	17		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments
F1	Right bank nearly vertical-dense vegetation on bank

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: BC-2
DATE: 12/9/11
TRANSECT: ☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel**
☐ **G** ☐ **H** ☒ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.49	29.6	FN	100	
Ctr	0.98	42.2	GF	50	
RCtr	1.47	44.8	HP	0	
Right	1.94	0	HP	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)
(circle one)

FISH COVER/OTHER		FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 1 [✓ 2] 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 [✓ 1] 2 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 2 [✓ 3] 4	[✓ 0] 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	0 [✓ 1] 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	0 1 [✓ 2] 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	0 [✓ 1] 2 3 4	

0= Not Present P= >10 m C= Within 10 m B= On Bank

HUMAN INFLUENCE	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	77	N/A	F1
Right	53	N/A	
Welted Width xxx.x m		1.9	
Bar Width xx.x m		N/A	
Bankfull Width xxx.x m		3.2	
Bankfull Height xx.x m		0.9	
Incised Height xx.x m		2.0	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	6		CenR	2	
CenL	1		Left	K	
CenDwn	0		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments
F1	Left bank densely covered by Rubus discolor

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: BC-2 DATE: 12/9/11

TRANSECT: ☐ A ☐ B ☐ C ☐ D ☐ E ☐ F **X-tra Side Channel**
☐ G ☐ H ☐ I ☒ J ☐ K ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.69	30.8	FN	100	
Ctr	1.38	44.6	GF	60	
RCtr	2.07	36.8	FN	100	
Right	2.76	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 [✓ 1] 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 [✓ 2] 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	0 1 [✓ 2] 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	0 1 [✓ 2] 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	0 1 [✓ 2] 3 4	

HUMAN INFLUENCE: 0= Not Present P= >10 m C= Within 10 m B= On Bank

HUMAN INFLUENCE	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	K	N/A	F1
Right	71	N/A	
Welted Width xxx.x m		2.8	
Bar Width xx.x m		N/A	
Bankfull Width xxx.x m		3.7	
Bankfull Height xx.x m		1.0	
Incised Height xx.x m		2.1	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	17	
CenL	17		Left	K	
CenDwn	17		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments
F1	Tree hanging over stream, exposed tree roots

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: BC-2
DATE: 12/9/11
TRANSECT: ☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐
☐ **G** ☐ **H** ☐ **I** ☐ **J** ☒ **K**

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	K	49.1	FN	100	
Ctr	K	81.6	FN	100	
RCtr	K	70.9	HP	0	
Right	K	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 1 [✓ 2] 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 2 3 [✓ 4]	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 2 3 [✓ 4]	0 1 2 3 [✓ 4]	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	

0= Not Present P= >10 m C= Within 10 m B= On Bank

HUMAN INFLUENCE	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	K	N/A	F1
Right	K	N/A	F1
Welted Width xxx.x m		K	
Bar Width xx.x m		N/A	
Bankfull Width xxx.x m		2.6	
Bankfull Height xx.x m		1.2	
Incised Height xx.x m		2.3	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	15		CenR	17	
CenL	17		Left	K	
CenDwn	17		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments
F1	Both banks densely vegetated with Rubus discolor

RIPARIAN “LEGACY” TREES AND INVASIVE ALIEN PLANTS

SITE ID: BC-2 DATE: 12/9/11

TRAN	LARGEST LEGACY TREE VISIBLE FROM THIS STATION						ALIEN PLANT SPECIES PRESENT IN LEFT AND RIGHT RIPARIAN PLOTS	
	Trees not Visible	DBH (m)	Height (m)	Dist. from wetted margin (m)	Type	Taxonomic Category	Check all that are present	
A	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒.3-.75	☐<5 ☐5-15 ☒15-30 ☐>30	0	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Alder	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐CanThis ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
B	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☐<5 ☐5-15 ☐15-30 ☐>30	K	☐Deciduous ☐Coniferous ☐Broadleaf Evergreen	Same tree as last transect	☐ None	☒RC Grass ☐Salt CEd ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
C	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒.3-.75	☐<5 ☐5-15 ☐15-30 ☐>30	10	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Ash	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol

INSTRUCTIONS

Legacy trees are defined as the largest tree within your search area, which is as far as you can see, but within maximum limits as follows:

Wadeable Streams: Confine search to no more than 50 m from left and right bank and extending upstream to next transect (for ‘K’ look upstream 4 channel widths)

Non-wadeable Rivers: Confine search to no more than 100 m from left and right bank and extending both upstream and downstream as far as you can see confidently.

Alien Plants: Confine search to riparian plots on left and right bank

Wadeable Streams: 10 m x 10 m
Non-wadeable Rivers: 10 m x 20 m

Not all aliens are to be identified in all states. See Field Manual and Plant Identification Guide.

TAXONOMIC CATEGORIES
Acacia/Mesquite Alder/Birch Ash Maple/Box elder Oak Poplar/Cottonwood Sycamore Willow Unknown or Other Deciduous
Cedar/Cypress/Sequoia Fir (including Douglas Fir and Hemlock) Juniper Pine Spruce Unknown or Other Deciduous
Unknown or Other Broadleaf Evergreen
Snag (Dead tree of any species)

ALIEN SPECIES		
RC Grass	Reed Canarygrass	*Phalaris arundinacea*
Engl Ivy	English Ivy	*Hedera Helix*
ChGrass	Cheat Grass	*Bromus tectorum*
Salt Ced	Salt Cedar	*Tamarix spp.*
Can This	Canada thistle	*Cirsium arvense*
M This	Musk thistle	*Carduus nutans*
Hblack	Himalayan blackberry	*Rubus discolor*
Teasel	Teasel	*Dipsacus fullonum*
Spurge	Leafy spurge	*Euphorbia esula*
G Reed	Giant Reed	*Arundo donax*
C Burd	Common burdock	*Arctium minus*
Rus Ol	Russian-olive	*Elaeagnus angustifolia*

COMMENTS

Transects D to K continued on next page

RIPARIAN “LEGACY” TREES AND INVASIVE ALIEN PLANTS

SITE ID: BC-2 DATE: 12/9/11

TRAN	LARGEST LEGACY TREE VISIBLE FROM THIS STATION						ALIEN PLANT SPECIES PRESENT IN LEFT AND RIGHT RIPARIAN PLOTS				
	Trees not Visible	DBH (m)	Height (m)	Dist. from wetted margin (m)	Type	Taxonomic Category	Check all that are present				
D	☐	☐0-0.1 ☒.75-2 ☐.1-.3 ☐>2 ☐ .3-.75	☐<5 ☒5-15 ☐15-30 ☐>30	10	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Ash	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☐CanThis ☐M This	☒Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
E	☐	☐0-0.1 ☒.75-2 ☐.1-.3 ☐>2 ☐ .3-.75	☐<5 ☐5-15 ☒15-30 ☐>30	15	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Ash	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt CEd ☐Can This ☐M This	☒Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
F	☐	☐0-0.1 ☒.75-2 ☐.1-.3 ☐>2 ☐ .3-.75	☐<5 ☐5-15 ☐15-30 ☐>30	5	☐Deciduous ☐Coniferous ☐Broadleaf Evergreen	Ash	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☐Can This ☐M This	☒Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
G	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒ .3-.75	☐<5 ☐5-15 ☒15-30 ☐>30	20	☐Deciduous ☒Coniferous ☐Broadleaf Evergreen	Pine	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☐Can This ☐M This	☒Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
H	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒ .3-.75	☐<5 ☐5-15 ☒15-30 ☐>30	25	☐Deciduous ☒Coniferous ☐Broadleaf Evergreen	Pine	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☐Can This ☐M This	☒Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
I	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒ .3-.75	☐<5 ☒5-15 ☐15-30 ☐>30	20	☐Deciduous ☒Coniferous ☐Broadleaf Evergreen	Cedar	☐ None	☐RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☐Can This ☐M This	☒Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
J	☐	☐0-0.1 ☒.75-2 ☐.1-.3 ☐>2 ☐ .3-.75	☐<5 ☐5-15 ☒15-30 ☐>30	0	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Ash	☐ None	☐RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☐Can This ☐M This	☒Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
K	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒ .3-.75	☐<5 ☐5-15 ☒15-30 ☐>30	0	☐Deciduous ☐Coniferous ☐Broadleaf Evergreen	Ash on bank upstream from transect	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☐Can This ☐M This	☒Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol

Appendix E

Physical Habitat Data

Waln Creek, Reach 1

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: WC-1	DATE: 12/1/11	**TRANSECT:**	☒ **A-B** ☐ **B-C** ☐ **C-D** ☐ **D-E** ☐ **E-F** ☐ **F-G** ☐ **G-H** ☐ **H-I** ☐ **I-J** ☐ **J-K**

THALWEG PROFILE	For Transect A-B ONLY	Increment (m) x.x:	1.0	Total Reach Length (m)	150

STATION	**THALWEG DEPTH (cm) (xx.x)**	**WETTED WIDTH (m) (XXX.X)**	**BAR WIDTH[1]**		**SOFT/ SMALL SEDIMENT (Y/N)**	**CHANNEL UNIT CODE**	**POOL FORM CODE**	**SIDE CHANNEL (Y/N)**	**BACK WATER (Y/N)**	**FLAG**	**COMMENTS**
			Present (Y/ N)	**XX.X**							
0	47.6	1.4	N	N/A	Y	GL	N	N	N		
1	49.4		N		Y	GL	N	N	N		
2	48.2		N		Y	GL	N	N	N		
3	54.4		N		Y	GL	N	N	N		
4	55.1		N		N	GL	N	N	N		
5	56.5	N/A	N	N/A	N	GL	N	N	N		
6	61.3		N		N	GL	N	N	N		
7	62.6	2.0	N	N/A	N	GL	N	N	N		
8	62.3		N		N	GL	N	N	N		
9	66.8		N		N	GL	N	N	N		
10	69.9		N		N	GL	N	N	N		
11	62.8		N		N	GL	N	N	N		
12	60.9		N		N	GL	N	N	N		
13	65.9		N		N	GL	N	N	N		
14	65.2		N		N	GL	N	N	N		

SUBSTRATE	**Station (5 or 7)**	**LFT**	**LCTR**	**CTR**	**RCTR**	**RGT**	**FLAG**
	7	HP	HP	HP	HP	HP	

FLAG	**COMMENTS**

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)	**CHECK IF ALL UNMARKED BOXES ARE ZERO**		X	**FLAG**		
	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

SUBSTRATE SIZE CLASS CODES

RS = BEDROCK (SMOOTH)–(Larger than a car)
RR = BEDROCK (ROUGH)-(Larger than a car)
BL = BOULDER (250 to 400 mm)-(Basketball to car)
CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball)
GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball)
GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble)
SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size)
FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

POOL FORM CODES

N= Not a pool
W= Large Woody Debris
R = Rootwad
B = Boulder or Bedrock
F = Unknown, fluvial

COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES

PP = Pool, Plunge
PT = Pool, Trench
PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: WC-1 DATE: 12/1/11

TRANSECT: ☐ **A-B** ☒ **B-C** ☐ **C-D** ☐ **D-E** ☐ **E-F**
☐ **F-G** ☐ **G-H** ☐ **H-I** ☐ **I-J** ☐ **J-K**

THALWEG PROFILE

For Transect A-B ONLY

Increment (m) x.x:	1.0	Total Reach Length (m)	150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH^2 Present (Y/ N)	BAR WIDTH^2 XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	67.7	1.4	N	N/A	Y	GL	N	N	N		
1	70.6		N		Y	GL	N	N	N		
2	71.2		N		Y	GL	N	N	N		
3	67.1		N		Y	GL	N	N	N		
4	64.1		N		Y	GL	N	N	N		
5	63.7	N/A	N	N/A	Y	GL	N	N	N		
6	63.7		N		Y	GL	N	N	N		
7	55.8	1.6	N	N/A	Y	GL	N	N	N		
8	59.5		N		Y	GL	N	N	N		
9	60.3		N		Y	GL	N	N	N		
10	59.0		N		Y	GL	N	N	N		
11	58.5		N		Y	GL	N	N	N		
12	57.2		N		Y	GL	N	N	N		
13	K		N		Y	GL	N	N	N		
14	K		N		Y	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	HP	HP	HP	FN	FN	

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES
RS = BEDROCK (SMOOTH)–(Larger than a car)
RR = BEDROCK (ROUGH)-(Larger than a car)
BL = BOULDER (250 to 400 mm)-(Basketball to car)
CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball)
GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball)
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SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size)
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WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

POOL FORM CODES
N= Not a pool
W= Large Woody Debris
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B = Boulder or Bedrock
F = Unknown, fluvial

COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES
PP = Pool, Plunge
PT = Pool, Trench
PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)	**CHECK IF ALL UNMARKED BOXES ARE ZERO**	X	**FLAG**			
	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: WC-1 DATE: 12/1/11

TRANSECT: ☐ **A-B** ☐ **B-C** ☒ **C-D** ☐ **D-E** ☐ **E-F**
☐ **F-G** ☐ **G-H** ☐ **H-I** ☐ **I-J** ☐ **J-K**

THALWEG PROFILE

For Transect A-B ONLY

Increment (m) x.x: 1.0 | Total Reach Length (m) 150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[3]		SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
			Present (Y/ N)	XX.X							
0	59.6	1.5	N	N/A	Y	GL	N	N	N		
1	57.6		N		Y	GL	N	N	N		
2	53.3		N		Y	GL	N	N	N		
3	50.4		N		Y	GL	N	N	N		
4	46.8		N		Y	GL	N	N	N		
5	37.4	N/A	N	N/A	Y	GL	N	N	N		
6	45.9		N		N	GL	N	N	N		
7	55.0	1.4	N	N/A	Y	GL	N	N	N		
8	64.9		N		Y	GL	N	N	N		
9	64.2		N		Y	GL	N	N	N		
10	64.0		N		Y	GL	N	N	N		
11	50.7		N		Y	GL	N	N	N		
12	66.9		N		Y	GL	N	N	N		
13	64.4		N		Y	GL	N	N	N		
14	65.6		N		Y	GL	N	N	N		

SUBSTRATE	**Station (5 or 7)**	**LFT**	**LCTR**	**CTR**	**RCTR**	**RGT**	**FLAG**
	7	HP	FN	FN	FN	HP	

FLAG	**COMMENTS**

SUBSTRATE SIZE CLASS CODES
RS = BEDROCK (SMOOTH)–(Larger than a car)
RR = BEDROCK (ROUGH)-(Larger than a car)
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GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)			**CHECK IF ALL UNMARKED BOXES ARE ZERO**		X	**FLAG**
	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: WC-1	DATE: 12/1/11	**TRANSECT:**	☐ **A-B** ☐ **B-C** ☐ **C-D** ☒ **D-E** ☐ **E-F** ☐ **F-G** ☐ **G-H** ☐ **H-I** ☐ **I-J** ☐ **J-K**

THALWEG PROFILE

For Transect A-B ONLY

Increment (m) x.x:	1.0	Total Reach Length (m)	150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[4]		SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
			Present (Y/ N)	XX.X							
0	56.7	1.5	N	N/A	N	GL	N	N	N		
1	57.2		N		N	GL	N	N	N		
2	58.1		N		N	GL	N	N	N		
3	57.8		N		N	GL	N	N	N		
4	59.4		N		N	GL	N	N	N		
5	62.2	N/A	N	N/A	N	GL	N	N	N		
6	66.1		N		N	GL	N	N	N		
7	64.2	1.3	N	N/A	N	GL	N	N	N		
8	63.8		N		N	GL	N	N	N		
9	59.4		N		N	GL	N	N	N		
10	52.8		N		N	GL	N	N	N		
11	53.3		N		N	GL	N	N	N		
12	35.0		N		Y	GL	N	N	N		
13	51.4		N		Y	GL	N	N	N		
14	56.1		N		Y	GL	N	N	N		

SUBSTRATE	**Station (5 or 7)**	**LFT**	**LCTR**	**CTR**	**RCTR**	**RGT**	**FLAG**
	7	HP	HP	HP	HP	HP	

FLAG	**COMMENTS**

SUBSTRATE SIZE CLASS CODES
RS = BEDROCK (SMOOTH)–(Larger than a car)
RR = BEDROCK (ROUGH)-(Larger than a car)
BL = BOULDER (250 to 400 mm)-(Basketball to car)
CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball)
GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball)
GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble)
SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size)
FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

POOL FORM CODES
N= Not a pool
W= Large Woody Debris
R = Rootwad
B = Boulder or Bedrock
F = Unknown, fluvial

COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES
PP = Pool, Plunge
PT = Pool, Trench
PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)			CHECK IF ALL UNMARKED BOXES ARE ZERO		X	FLAG
	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: WC-1 DATE: 12/1/11

TRANSECT:
☐ A-B ☐ B-C ☐ C-D ☐ D-E ☒ E-F
☐ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE

For Transect A-B ONLY

Increment (m) x.x: 1.0

Total Reach Length (m) 150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[5]		SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
			Present (Y/ N)	XX.X							
0	54.9	2.0	N	N/A	N	GL	N	N	N		
1	55.8		N		N	GL	N	N	N		
2	58.3		N		N	GL	N	N	N		
3	56.9		N		N	GL	N	N	N		
4	52.0		N		N	GL	N	N	N		
5	52.1	N/A	N	N/A	N	GL	N	N	N		
6	55.8		N		N	GL	N	N	N		
7	56.9	1.7	N	N/A	N	GL	N	N	N		
8	58.0		N		N	GL	N	N	N		
9	58.4		N		N	GL	N	N	N		
10	56.3		N		N	GL	N	N	N		
11	51.7		N		N	GL	N	N	N		
12	38.6		N		Y	GL	N	N	N		
13	44.2		N		Y	GL	N	N	N		
14	52.0		N		Y	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	HP	HP	HP	HP	HP	

FLAG	COMMENTS

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)				CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	
	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel			
Diameter Large End	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m	
0.1-<0.3 m	1 1						
0.3-0.5 m							
0.5-0.8 m							
>0.8 m							

SUBSTRATE SIZE CLASS CODES
RS = BEDROCK (SMOOTH)–(Larger than a car)
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GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble)
SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size)
FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

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COMBINATIONS:
Eg. WR, BR, WRB

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PB = Pool, Backwater
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GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: WC-1 DATE: 12/1/11

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F
☒ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE

For Transect A-B ONLY

Increment (m)x.x: 1.0 Total Reach Length (m) 150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[6] Present (Y/ N)	BAR WIDTH[6] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	55.1	2.1	N	N/A	Y	GL	N	N	N		
1	45.0		N		Y	GL	N	N	N		
2	59.6		N		Y	GL	N	N	N		
3	59.2		N		Y	GL	N	N	N		
4	51.4		N		Y	GL	N	N	N		
5	47.1	N/A	N	N/A	Y	GL	N	N	N		
6	50.4		N		Y	GL	N	N	N		
7	52.9	1.6	N	N/A	Y	GL	N	N	N		
8	59.7		N		Y	GL	N	N	N		
9	59.2		N		Y	GL	N	N	N		
10	59.4		N		Y	GL	N	N	N		
11	56.9		N		Y	GL	N	N	N		
12	57.7		N		Y	GL	N	N	N		
13	60.0		N		Y	GL	N	N	N		
14	39.6		N		Y	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	HP	FN	FN	FN	HP	

FLAG	COMMENTS

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FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

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COMBINATIONS:
Eg. WR, BR, WRB

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GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)

CHECK IF ALL UNMARKED BOXES ARE ZERO: X

FLAG:

	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m	11 2					
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: WC-1 DATE: 12/1/11

TRANSECT: ☐ **A-B** ☐ **B-C** ☐ **C-D** ☐ **D-E** ☐ **E-F**
☐ **F-G** ☒ **G-H** ☐ **H-I** ☐ **I-J** ☐ **J-K**

THALWEG PROFILE

For Transect A-B ONLY

Increment (m) x.x:	1.0	Total Reach Length (m)	150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[7] Present (Y/ N)	BAR WIDTH[7] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	61.6	2.2	N	N/A	Y	GL	N	N	N		
1	60.1		N		Y	GL	N	N	N		
2	59.3		N		Y	GL	N	N	N		
3	57.6		N		Y	GL	N	N	N		
4	63.9		N		Y	GL	N	N	N		
5	62.8	N/A	N	N/A	Y	GL	N	N	N		
6	62.4		N		Y	GL	N	N	N		
7	48.1	2.4	N	N/A	Y	GL	N	N	N		
8	48.1		N		Y	GL	N	N	N		
9	47.7		N		Y	GL	N	N	N		
10	45.5		N		Y	GL	N	N	N		
11	63.8		N		Y	GL	N	N	N		
12	64.4		N		Y	GL	N	N	N		
13	63.5		N		Y	GL	N	N	N		
14	65.5		N		Y	GL	N	N	N		

SUBSTRATE	**Station (5 or 7)**	**LFT**	**LCTR**	**CTR**	**RCTR**	**RGT**		**FLAG**
	7	HP	FN	FN	FN	HP		

FLAG	**COMMENTS**

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)			**CHECK IF ALL UNMARKED BOXES ARE ZERO**		X	**FLAG**
	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

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PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: WC-1	DATE: 12/1/11	**TRANSECT:**	☐ **A-B** ☐ **B-C** ☐ **C-D** ☐ **D-E** ☐ **E-F** ☐ **F-G** ☐ **G-H** ☒ **H-I** ☐ **I-J** ☐ **J-K**

THALWEG PROFILE	For Transect A-B ONLY	Increment (m)x.x:	1.0	Total Reach Length (m)	150

STATION	**THALWEG DEPTH (cm) (xx.x)**	**WETTED WIDTH (m) (XXX.X)**	**BAR WIDTH[8]**		**SOFT/ SMALL SEDIMENT (Y/N)**	**CHANNEL UNIT CODE**	**POOL FORM CODE**	**SIDE CHANNEL (Y/N)**	**BACK WATER (Y/N)**	**FLAG**	**COMMENTS**
			Present (Y/ N)	**XX.X**							
0	62.5	1.4	N	N/A	Y	GL	N	N	N		
1	62.9		N		Y	GL	N	N	N		
2	57.6		N		Y	GL	N	N	N		
3	48.1		N		N	GL	N	N	N		
4	56.5		N		Y	GL	N	N	N		
5	64.4	N/A	N	N/A	Y	GL	N	N	N		
6	66.0		N		Y	GL	N	N	N		
7	61.5	1.6	N	N/A	N	GL	N	N	N		
8	63.2		N		N	GL	N	N	N		
9	56.8		N		N	GL	N	N	N		
10	41.6		N		Y	GL	N	N	N		
11	44.8		N		Y	GL	N	N	N		
12	55.9		N		Y	GL	N	N	N		
13	56.4		N		Y	GL	N	N	N		
14	57.1		N		Y	GL	N	N	N		

SUBSTRATE	**Station (5 or 7)**	**LFT**	**LCTR**	**CTR**	**RCTR**	**RGT**	**FLAG**
	7	HP	HP	HP	HP	HP	

FLAG	**COMMENTS**

SUBSTRATE SIZE CLASS CODES
RS = BEDROCK (SMOOTH)–(Larger than a car)
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Eg. WR, BR, WRB

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= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)			**CHECK IF ALL UNMARKED BOXES ARE ZERO**		X	**FLAG**
	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: WC-1 DATE: 12/1/11

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F
☐ F-G ☐ G-H ☐ H-I ☒ I-J ☐ J-K

For Transect A-B ONLY | Increment (m)x.x: 1.0 | Total Reach Length (m) 150

THALWEG PROFILE

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[9] Present (Y/ N)	BAR WIDTH[9] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	58.5	1.9	N	N/A	Y	GL	N	N	N		
1	62.6		N		Y	GL	N	N	N		
2	59.9		N		Y	GL	N	N	N		
3	52.8		N		Y	GL	N	N	N		
4	52.4		N		Y	GL	N	N	N		
5	56.9	N/A	N	N/A	Y	GL	N	N	N		
6	57.7		N		Y	GL	N	N	N		
7	58.5	2.3	N	N/A	Y	GL	N	N	N		
8	63.6		N		Y	GL	N	N	N		
9	64.3		N		Y	GL	N	N	N		
10	64.8		N		Y	GL	N	N	N		
11	59.6		N		Y	GL	N	N	N		
12	58.5		N		Y	GL	N	N	N		
13	56.4		N		Y	GL	N	N	N		
14	50.6		N		Y	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	HP	FN	FN	FN	HP	

FLAG	COMMENTS

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Cascade FA =
Falls
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LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)			CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	
	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: WC-1	DATE: 12/1/11	TRANSECT:	☐ A-B ☐ F-G	☐ B-C ☐ G-H	☐ C-D ☐ H-I	☐ D-E ☐ I-J	☐ E-F ☒ J-K

THALWEG PROFILE

For Transect A-B ONLY

Increment (m)x.x:	1.0	Total Reach Length (m)	150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[10]		SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
			Present (Y/ N)	XX.X							
0	55.5	2.5	N	N/A	Y	GL	N	N	N		
1	60.1		N		Y	GL	N	N	N		
2	57.8		N		Y	GL	N	N	N		
3	48.7		N		Y	GL	N	N	N		
4	46.9		N		Y	GL	N	N	N		
5	45.8	N/A	N	N/A	Y	GL	N	N	N		
6	41.9		N		Y	GL	N	N	N		
7	46.5	1.9	N	N/A	Y	GL	N	N	N		
8	42.9		N		Y	GL	N	N	N		
9	51.9		N		Y	GL	N	N	N		
10	47.8		N		Y	GL	N	N	N		
11	43.5		N		Y	GL	N	N	N		
12	42.6		N		Y	GL	N	N	N		
13	40.2		N		N	GL	N	N	N		
14	42.5		N		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	FN	FN	FN	FN	FN	

FLAG	COMMENTS

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)			CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	
	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

SUBSTRATE SIZE CLASS CODES

RS = BEDROCK (SMOOTH)–(Larger than a car)
RR = BEDROCK (ROUGH)-(Larger than a car)
BL = BOULDER (250 to 400 mm)-(Basketball to car)
CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball)
GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball)
GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble)
SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size)
FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

POOL FORM CODES

N= Not a pool
W= Large Woody Debris
R = Rootwad
B = Boulder or Bedrock
F = Unknown, fluvial

COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES

PP = Pool, Plunge
PT = Pool, Trench
PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: WC-1	DATE: 12/1/11	**TRANSECT:**	☒ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	HP	0	
LCtr	0.35	40.6	FN	100	
Ctr	0.70	49.7	FN	100	
RCtr	1.05	49.5	FN	100	
Right	1.40	0	HP	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 [✓ 1] 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 [✓ 1] 2 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)	D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None	
RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Small Trees (Trunk <0.3 m DBH)	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
Barren, Bare Dirt or Duff	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	66	0	
Right	64	0	
Welted Width xxx.x m		1.4	
Bar Width xx.x m		N/A	
Bankfull Width xxx.x m		1.8	
Bankfull Height xx.x m		0.9	
Incised Height xx.x m		2.0	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	14		CenR	17	
CenL	17		Left	K	
CenDwn	17		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	**Comments**

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: WC-1
DATE: 12/1/11
TRANSECT: ☐ **A** ☒ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐
☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K**

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	HP	0	
LCtr	0.35	45.9	FN	100	
Ctr	0.70	63.0	FN	100	
RCtr	1.05	44.1	HP	0	
Right	1.40	0	HP	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	80	0	
Right	74	0	
Welted Width xxx.x m		1.4	
Bar Width xx.x m		N/A	
Bankfull Width xxx.x m		2.5	
Bankfull Height xx.x m		1.1	
Incised Height xx.x m		1.7	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 2 3 [✓ 4]	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	17	
CenL	14		Left	K	
CenDwn	13		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	D C E M N	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 2 3 [✓ 4]	0 1 2 3 [✓ 4]	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: WC-1	DATE: 12/1/11	**TRANSECT:**	☐ **A** ☐ **B** ☒ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	HP	0	
LCtr	039	49.7	HP	0	
Ctr	0.78	48.2	FN	100	
RCtr	1.17	46.6	HP	0	
Right	1.54	0	HP	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 2 [✓ 3] 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)	D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None	
RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 2 3 [✓ 4]	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	[✓ 0] 1 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	[✓ 0] 1 2 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	53	0	
Right	90	0	
Welted Width xxx.x m		1.5	
Bar Width xx.x m		N/A	
Bankfull Width xxx.x m		2.6	
Bankfull Height xx.x m		1.0	
Incised Height xx.x m		1.7	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	17	
CenL	13		Left	K	
CenDwn	17		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: WC-1 DATE: 12/1/11

TRANSECT: ☐ **A** ☐ **B** ☐ **C** ☒ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐
☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K**

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	HP	0	
LCtr	0.39	47.5	HP	0	
Ctr	0.78	58.0	HP	0	
RCtr	1.17	51.0	HP	0	
Right	1.54	0	HP	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 [✓ 1] 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 [✓ 2] 3 4	
Undercut Banks	0 [✓ 1] 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D [✓ C] E M N	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	0 1 [✓ 2] 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 2 3 [✓ 4]	0 1 2 3 [✓ 4]	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	71	0	
Right	79	0	
Welted Width xxx.x m		1.5	
Bar Width xx.x m		N/A	
Bankfull Width xxx.x m		1.7	
Bankfull Height xx.x m		1.2	
Incised Height xx.x m		1.7	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	16		CenR	17	
CenL	17		Left	K	
CenDwn	13		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: WC-1	DATE: 12/1/11	TRANSECT:	☐ A ☐ B ☐ C ☐ D ☒ E ☐ F X-tra Side Channel ☐ G ☐ H ☐ I ☐ J ☐ K ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	HP	0	
LCtr	0.49	42.8	HP	0	
Ctr	0.98	52.1	HP	0	
RCtr	1.48	43.7	HP	0	
Right	1.98	0	HP	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 2 3 [✓ 4]	
Undercut Banks	0 [✓ 1] 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 2 3 [✓ 4]	0 1 2 3 [✓ 4]	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	[✓ 0] 1 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	

HUMAN INFLUENCE
0= Not Present P= >10 m C= Within 10 m B= On Bank

	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	0 P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	88	0	
Right	82	0	
Welted Width xxx.x m		1.98	
Bar Width xx.x m		N/A	
Bankfull Width xxx.x m		2.13	
Bankfull Height xx.x m		1.10	
Incised Height xx.x m		2.01	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	12	
CenL	17		Left	K	
CenDwn	13		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: WC-1 DATE: 12/1/11

TRANSECT: ☐ A ☐ B ☐ C ☐ D ☐ E ☒ F **X-tra Side Channel** ☐
☐ G ☐ H ☐ I ☐ J ☐ K

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.52	45.4	FN	100	
Ctr	1.04	54.8	FN	100	
RCtr	1.56	44.4	FN	100	
Right	2.06	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 1 [✓ 2] 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 [✓ 2] 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	[✓ D] C E M N	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	0 1 [✓ 2] 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 2 3 [✓ 4]	0 1 2 3 [✓ 4]	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	0 [✓ 1] 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	70	0	
Right	90	0	
Welted Width xxx.x m		2.1	
Bar Width xx.x m		N/A	
Bankfull Width xxx.x m		2.23	
Bankfull Height xx.x m		1.0	
Incised Height xx.x m		1.7	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	12	
CenL	17		Left	K	
CenDwn	11		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: WC-1 DATE: 12/1/11

TRANSECT: ☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel**
☒ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.55	52.1	HP	0	
Ctr	1.10	58.9	GF	50	
RCtr	1.65	43.0	FN	100	
Right	2.20	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 1 [✓ 2] 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 2 [✓ 3] 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	[✓ D] C E M N	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	0 [✓ 1] 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 2 3 [✓ 4]	0 1 2 3 [✓ 4]	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	84	0	
Right	61	0	
Welted Width xxx.x m		2.2	
Bar Width xx.x m		N/A	
Bankfull Width xxx.x m		2.1	
Bankfull Height xx.x m		1.1	
Incised Height xx.x m		2.0	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	16		CenR	17	
CenL	17		Left	K	
CenDwn	13		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: WC-1	DATE: 12/1/11	**TRANSCECT:**	☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐ **G** ☒ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.36	50.5	FN	100	
Ctr	0.72	60.4	FN	100	
RCtr	1.08	44.0	HP	0	
Right	1.44	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 1 [✓ 2] 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 [✓ 2] 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 2 3 [✓ 4]	0 1 2 3 [✓ 4]	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	[✓ 0] 1 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	53	0	
Right	90	0	
Welted Width xxx.x m		1.4	
Bar Width xx.x m		N/A	
Bankfull Width xxx.x m		1.7	
Bankfull Height xx.x m		1.1	
Incised Height xx.x m		1.9	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	13		CenR	17	
CenL	11		Left	K	
CenDwn	11		Right	*	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: WC-1	DATE: 12/1/11	TRANSECT:	☐ A	☐ B	☐ C	☐ D	☐ E	☐ F	X-tra Side Channel
			☐ G	☐ H	☒ I	☐ J	☐ K		☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	0.47	38.4	HP	0	
Ctr	0.94	52.9	FN	100	
RCtr	1.41	35.3	FN	100	
Right	1.88	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 [✓ 1] 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 [✓ 2] 3 4	
Undercut Banks	0 [✓ 1] 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 2 3 [✓ 4]	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	[✓ 0] 1 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	[✓ 0] 1 2 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	

HUMAN INFLUENCE
0= Not Present P= >10 m C= Within 10 m B= On Bank

HUMAN INFLUENCE	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	72	0	
Right	61	0	
Welted Width xxx.x m		1.9	
Bar Width xx.x m		N/A	
Bankfull Width xxx.x m		2.2	
Bankfull Height xx.x m		1.1	
Incised Height xx.x m		1.8	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	0		CenR	0	
CenL	0		Left	K	
CenDwn	0		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: WC-1	DATE: 12/1/11	**TRANSECT:**	☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐ **G** ☐ **H** ☐ **I** ☒ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	HP	0	
LCtr	0.63	42.8	HP	0	
Ctr	1.26	57.8	GF	80	
RCtr	1.89	41.6	FN	100	
Right	2.50	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)
(circle one)

FISH COVER/OTHER		FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 [✓ 1] 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 [✓ 2] 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 2 3 [✓ 4]	0 1 2 3 [✓ 4]	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	

0= Not Present P= >10 m C= Within 10 m B= On Bank

HUMAN INFLUENCE	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	84	0	
Right	87	0	
Welted Width xxx.x m		2.5	
Bar Width xx.x m		N/A	
Bankfull Width xxx.x m		3.1	
Bankfull Height xx.x m		1.2	
Incised Height xx.x m		1.8	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	11		CenR	13	
CenL	17		Left	K	
CenDwn	10		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: WC-1	DATE: 12/1/11	**TRANSECT:**	☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☒ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0	0	FN	100	
LCtr	K	26.0	FN	100	
Ctr	K	46.6	GF	30	
RCtr	K	39.7	HP	0	
Right	K	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 1 [✓ 2] 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 [✓ 2] 3 4	
Undercut Banks	0 [✓ 1] 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)	D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None	
RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 2 [✓ 3] 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	0 P [✓ C] B	0 P [✓ C] B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	74	0	
Right	90	0	
Welted Width xxx.x m		K	
Bar Width xx.x m		N/A	
Bankfull Width xxx.x m		2.0	
Bankfull Height xx.x m		1.0	
Incised Height xx.x m		5.6	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	11		CenR	10	
CenL	4		Left	K	
CenDwn	0		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	**Comments**

RIPARIAN “LEGACY” TREES AND INVASIVE ALIEN PLANTS

SITE ID: WC-1 DATE: 12/1/11

TRAN	LARGEST LEGACY TREE VISIBLE FROM THIS STATION						ALIEN PLANT SPECIES PRESENT IN LEFT AND RIGHT RIPARIAN PLOTS				
	Trees not Visible	DBH (m)	Height (m)	Dist. from wetted margin (m)	Type	Taxonomic Category	Check all that are present				
A	☒	☐0-0.1 ☐.75-2 ☒.1-.3 ☐>2 ☐.3-.75	☐<5 ☐5-15 ☐15-30 ☐>30	5	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Cherry	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☐CanThis ☐M This	☐Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
B	☒	☐0-0.1 ☐.75-2 ☒.1-.3 ☐>2 ☐.3-.75	☐<5 ☐5-15 ☐15-30 ☐>30	20	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Same tree	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt CEd ☐Can This ☐M This	☐Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
C	☒	☐0-0.1 ☐.75-2 ☒.1-.3 ☐>2 ☐.3-.75	☐<5 ☐5-15 ☐15-30 ☐>30	30	☐Deciduous ☒Coniferous ☐Broadleaf Evergreen	Pine	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☐Can This ☐M This	☐Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol

INSTRUCTIONS

Legacy trees are defined as the largest tree within your search area, which is as far as you can see, but within maximum limits as follows:

Wadeable Streams: Confine search to no more than 50 m from left and right bank and extending upstream to next transect (for ‘K’ look upstream 4 channel widths)

Non-wadeable Rivers: Confine search to no more than 100 m from left and right bank and extending both upstream and downstream as far as you can see confidently.

Alien Plants: Confine search to riparian plots on left and right bank

Wadeable Streams: 10 m x 10 m
Non-wadeable Rivers: 10 m x 20 m

Not all aliens are to be identified in all states. See Field Manual and Plant Identification Guide.

Transects D to K continued on next page

TAXONOMIC CATEGORIES

- Acacia/Mesquite
- Alder/Birch
- Ash
- Maple/Box elder
- Oak
- Poplar/Cottonwood
- Sycamore
- Willow
- Unknown or Other Deciduous

- Cedar/Cypress/Sequoia
- Fir (including Douglas Fir and Hemlock)
- Juniper
- Pine
- Spruce
- Unknown or Other Deciduous

- Unknown or Other Broadleaf Evergreen

- Snag (Dead tree of any species)

ALIEN SPECIES

RC Grass	Reed Canarygrass	*Phalaris arundinacea*
Engl Ivy	English Ivy	*Hedera Helix*
ChGrass	Cheat Grass	*Bromus tectorum*
Salt Ced	Salt Cedar	*Tamarix spp.*
Can This	Canada thistle	*Cirsium arvense*
M This	Musk thistle	*Carduus nutans*
Hblack	Himalayan blackberry	*Rubus discolor*
Teasel	Teasel	*Dipsacus fullonum*
Spurge	Leafy spurge	*Euphorbia esula*
G Reed	Giant Reed	*Arundo donax*
C Burd	Common burdock	*Arctium minus*
Rus Ol	Russian-olive	*Elaeagnus angustifolia*

COMMENTS

RIPARIAN “LEGACY” TREES AND INVASIVE ALIEN PLANTS

SITE ID: WC-1 DATE: 12/1/11

TRAN	LARGEST LEGACY TREE VISIBLE FROM THIS STATION						ALIEN PLANT SPECIES PRESENT IN LEFT AND RIGHT RIPARIAN PLOTS				
	Trees not Visible	DBH (m)	Height (m)	Dist. from wetted margin (m)	Type	Taxonomic Category	Check all that are present				
D	☐	☐0-0.1 ☐.75-2 ☒.1-.3 ☐>2 ☐ .3-.75	☐<5 ☒5-15 ☐15-30 ☐>30	5	☐Deciduous ☒Coniferous ☐Broadleaf Evergreen	Pine	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☐CanThis ☐M This	☐Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
E	☐	☐0-0.1 ☐.75-2 ☒.1-.3 ☐>2 ☐ .3-.75	☐<5 ☒5-15 ☐15-30 ☐>30	30	☐Deciduous ☐Coniferous ☐Broadleaf Evergreen	Same tree	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt CEd ☐Can This ☐M This	☐Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
F	☐	☒0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐ .3-.75	☐<5 ☒5-15 ☐15-30 ☐>30	0	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Ash	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☐Can This ☐M This	☐Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
G	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒ .3-.75	☐<5 ☐5-15 ☒15-30 ☐>30	40	☐Deciduous ☐Coniferous ☐Broadleaf Evergreen	Pine	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☐Can This ☐M This	☐Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
H	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐ .3-.75	☐<5 ☐5-15 ☐15-30 ☐>30	30	☐Deciduous ☐Coniferous ☐Broadleaf Evergreen	Pine	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☐Can This ☐M This	☐Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
I	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐ .3-.75	☐<5 ☐5-15 ☐15-30 ☐>30	40	☐Deciduous ☐Coniferous ☐Broadleaf Evergreen	Pine	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☐Can This ☐M This	☐Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
J	☐	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☒ .3-.75	☐<5 ☐5-15 ☐15-30 ☐>30	40	☐Deciduous ☐Coniferous ☐Broadleaf Evergreen	Pine	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☐Can This ☐M This	☒Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
K	☐	☐0-0.1 ☐.75-2 ☒.1-.3 ☐>2 ☐ .3-.75	☐<5 ☐5-15 ☐15-30 ☐>30	40	☐Deciduous ☐Coniferous ☐Broadleaf Evergreen	Pine	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☐Can This ☐M This	☒Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol

Appendix F

Physical Habitat Data

Waln Creek, Reach 2

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: WC-2 DATE: 10/6/11

TRANSECT:
☒ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F
☐ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE

For Transect A-B ONLY

Increment (m) x.x: 1.0 Total Reach Length (m) 150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[1]		SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
			Present (Y/ N)	XX.X							
0	11.6	1.7	N	N/A	N	RI	N	N	N		Rip rap
1	14.0		N		N	RI	N	N	N		
2	18.9		N		N	PB	N	N	Y		
3	18.8		N		N	PB	N	N	Y		
4	15.2		N		N	PB	N	N	Y		
5	19.4	N/A	N	N/A	N	PB	N	N	Y		
6	28.5		N		N	PB	N	N	Y		
7	26.9	2.8	N	N/A	Y	PB	N	N	Y		
8	28.8		N		Y	PB	N	N	Y		
9	36.9		N		Y	PB	N	N	Y		
10	38.8		N		Y	PB	N	N	Y		
11	41.7		N		Y	PB	N	N	Y		
12	43.2		N		Y	PB	N	N	Y		
13	42.4		N		Y	PB	N	N	Y		
14	29.1		N		Y	PB	N	N	Y		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	7	FN	FN	FN	FN	FN		

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES
RS = BEDROCK (SMOOTH)–(Larger than a car)
RR = BEDROCK (ROUGH)-(Larger than a car)
BL = BOULDER (250 to 400 mm)-(Basketball to car)
CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball)
GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball)
GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble)
SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size)
FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

POOL FORM CODES
N= Not a pool
W= Large Woody Debris
R = Rootwad
B = Boulder or Bedrock
F = Unknown, fluvial

COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES
PP = Pool, Plunge
PT = Pool, Trench
PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG			
	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: WC-2	DATE: 10/6/11	**TRANSECT:**	☐	**A-B**	☒	**B-C**	☐	**C-D**	☐	**D-E**	☐ **E-F**
			☐	**F-G**	☐	**G-H**	☐	**H-I**	☐	**I-J**	☐ **J-K**

THALWEG PROFILE

For Transect A-B ONLY

Increment (m)x.x:	1.0	Total Reach Length (m)	150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[2] Present (Y/ N)	BAR WIDTH[2] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	25.8	2.7	N	N/A	Y	PB	N	N	Y		
1	27.1		N		Y	PB	N	N	Y		
2	31.3		N		Y	PB	N	N	Y		
3	26.8		N		Y	PB	N	N	Y		
4	18.8		N		Y	GL	N	N	N		
5	20.9	N/A	N	N/A	Y	GL	N	N	N		
6	19.4		N		Y	GL	N	N	N		
7	19.2	2.9	N	N/A	Y	GL	N	N	N		
8	25.8		N		Y	GL	N	N	N		
9	32.8		N		Y	GL	N	N	N		
10	29.2		N		Y	GL	N	N	N		
11	33.7		N		Y	GL	N	N	N		
12	34.8		N		Y	GL	N	N	N		
13	39.9		N		Y	GL	N	N	N		
14	38.8		N		Y	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	FN	FN	FN	FN	FN	

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES
RS = BEDROCK (SMOOTH)–(Larger than a car)
RR = BEDROCK (ROUGH)-(Larger than a car)
BL = BOULDER (250 to 400 mm)-(Basketball to car)
CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball)
GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball)
GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble)
SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size)
FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

POOL FORM CODES
N= Not a pool
W= Large Woody Debris
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COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES
PP = Pool, Plunge
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PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

Flag Codes: K = no measurement made, U= suspect measurement F1, F2, etc. – flags assigned by each field crew. Explain all flags in comments. 1 = Measure Bar Width at Station 0 and mid-station (5 or 7)

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)	**CHECK IF ALL UNMARKED BOXES ARE ZERO**	X	**FLAG**			
	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: WC-2	DATE: 10/6/11	TRANSECT:	☐ A-B	☐ B-C	☒ C-D	☐ D-E	☐ E-F				
			☐ F-G	☐ G-H	☐ H-I	☐ I-J	☐ J-K				

THALWEG PROFILE								For Transect A-B ONLY		Increment (m)x.x:	1.0 Total Reach Length (m) 150
STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH^3 Present (Y/ N)	BAR WIDTH^3 XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	32.0	2.8	N	N/A	Y	GL	N	N	N		
1	28.7		N		Y	GL	N	N	N		
2	30.1		N		Y	GL	N	N	N		
3	21.8		N		Y	GL	N	N	N		
4	17.9		N		Y	GL	N	N	N		
5	16.8	N/A	N	N/A	Y	GL	N	N	N		
6	14.9		N		Y	GL	N	N	N		
7	13.1	2.6	N	N/A	Y	GL	N	N	N		
8	10.1		N		Y	GL	N	N	N		
9	9.7		N		Y	GL	N	N	N		
10	17.2		N		Y	GL	N	N	N		
11	20.8		N		Y	GL	N	N	N		
12	22.8		N		Y	GL	N	N	N		
13	25.3		N		Y	GL	N	N	N		
14	20.7		N		Y	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	FN	SA	GF	GF	FN	

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES

RS = BEDROCK (SMOOTH)–(Larger than a car)
RR = BEDROCK (ROUGH)-(Larger than a car)
BL = BOULDER (250 to 400 mm)-(Basketball to car)
CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball)
GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball)
GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble)
SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size)
FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

POOL FORM CODES

N= Not a pool
W= Large Woody Debris
R = Rootwad
B = Boulder or Bedrock
F = Unknown, fluvial

COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES

PP = Pool, Plunge
PT = Pool, Trench
PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)			CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	
	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: WC-2 DATE: 10/6/11

TRANSECT: ☐ **A-B** ☐ **B-C** ☐ **C-D** ☒ **D-E** ☐ **E-F**
☐ **F-G** ☐ **G-H** ☐ **H-I** ☐ **I-J** ☐ **J-K**

THALWEG PROFILE

For Transect A-B ONLY — Increment (m)x.x: 1.0 — Total Reach Length (m) 150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[4] Present (Y/ N)	BAR WIDTH[4] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	19.6	2.4	N	N/A	Y	GL	N	N	N		
1	21.3		N		Y	GL	N	N	N		
2	24.2		N		Y	GL	N	N	N		
3	20.2		N		Y	GL	N	N	N		
4	25.6		N		Y	GL	N	N	N		
5	29.2	N/A	N	N/A	Y	GL	N	N	N		
6	28.8		N		Y	GL	N	N	N		
7	24.8	2.4	N	N/A	Y	GL	N	N	N		
8	20.8		N		Y	GL	N	N	N		
9	19.7		N		Y	GL	N	N	N		
10	22.8		N		Y	GL	N	N	N		
11	23.1		N		Y	GL	N	N	N		
12	19.4		N		Y	GL	N	N	N		
13	24.3		N		Y	GL	N	N	N		
14	31.4		N		Y	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	FN	FN	GF	FN	FN	

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)	**CHECK IF ALL UNMARKED BOXES ARE ZERO**		X	**FLAG**		
	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: WC-2	DATE: 10/6/11	**TRANSECT:**	☐ **A-B** ☐ **B-C** ☐ **C-D** ☐ **D-E** ☒ **E-F** ☐ **F-G** ☐ **G-H** ☐ **H-I** ☐ **I-J** ☐ **J-K**

THALWEG PROFILE

For Transect A-B ONLY	Increment (m) x.x:	1.0	Total Reach Length (m)	150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[5]		SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
			Present (Y/ N)	XX.X							
0	29.5	2.6	N	N/A	Y	GL	N	N	N		
1	27.0		N		Y	GL	N	N	N		
2	33.1		N		Y	GL	N	N	N		
3	37.7		N		Y	GL	N	N	N		
4	40.8		N		Y	GL	N	N	N		
5	36.9	N/A	N	N/A	Y	GL	N	N	N		
6	33.6		N		Y	GL	N	N	N		
7	35.8	2.6	N	N/A	Y	GL	N	N	N		
8	33.1		N		Y	GL	N	N	N		
9	35.1		N		Y	GL	N	N	N		
10	24.0		N		Y	GL	N	N	N		
11	35.1		N		Y	GL	N	N	N		
12	33.1		N		Y	GL	N	N	N		
13	32.6		N		Y	GL	N	N	N		
14	29.3		N		Y	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	FN	FN	FN	FN	HP	

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES
RS = BEDROCK (SMOOTH)–(Larger than a car)
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FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

POOL FORM CODES
N= Not a pool
W= Large Woody Debris
R = Rootwad
B = Boulder or Bedrock
F = Unknown, fluvial

COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES
PP = Pool, Plunge
PT = Pool, Trench
PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)			**CHECK IF ALL UNMARKED BOXES ARE ZERO**		X	**FLAG**	

	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: WC-2

DATE: 10/6/11

TRANSECT:

☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F

☒ F-G ☐ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE

For Transect A-B ONLY

Increment (m) x.x: 1.0

Total Reach Length (m): 150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[6]		SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
			Present (Y/ N)	XX.X							
0	29.4	1.6	N	N/A	Y	GL	N	N	N		
1	30.7		N		Y	GL	N	N	N		
2	29.6		N		Y	GL	N	N	N		
3	23.1		N		N	GL	N	N	N		
4	15.7		N		N	GL	N	N	N		
5	13.7	N/A	N	N/A	N	GL	N	N	N		
6	16.1		N		N	GL	N	N	N		
7	18.2	1.5	N	N/A	N	GL	N	N	N		
8	20.0		N		N	GL	N	N	N		
9	21.7		N		N	GL	N	N	N		
10	23.1		N		N	GL	N	N	N		
11	13.9		N		N	GL	N	N	N		
12	12.3		N		N	GL	N	N	N		
13	13.8		N		N	GL	N	N	N		
14	14.6		N		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	HP	HP	HP	GF	GF	

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES	POOL FORM CODES	CHANNEL UNIT CODES
RS = BEDROCK (SMOOTH)–(Larger than a car) RR = BEDROCK (ROUGH)-(Larger than a car) BL = BOULDER (250 to 400 mm)-(Basketball to car) CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball) GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball) GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble) SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size) FN = SILT/CLAY/MUCK-(Not gritty) HP = HARDPAN-(Firm, Consolidated, Fine Substrate) WD = WOOD-(Any Size) OT = OTHER (Write comment on back of form)	N= Not a pool W= Large Woody Debris R = Rootwad B = Boulder or Bedrock F = Unknown, fluvial COMBINATIONS: Eg. WR, BR, WRB	PP = Pool, Plunge PT = Pool, Trench PL = Pool, Lateral Scour PB = Pool, Backwater PD = Pool, Impoundment GL = Glide RI = Riffle RA = Rapid CA = Cascade FA = Falls DR = Dry Channel

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)			CHECK IF ALL UNMARKED BOXES ARE ZERO		X	FLAG
	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: WC-2 DATE: 10/6/11

TRANSECT: ☐ A-B ☐ B-C ☐ C-D ☐ D-E ☐ E-F
☐ F-G ☒ G-H ☐ H-I ☐ I-J ☐ J-K

THALWEG PROFILE

For Transect A-B ONLY	Increment (m) x.x:	1.0	Total Reach Length (m)	150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[7]		SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
			Present (Y/ N)	XX.X							
0	13.9	2.0	N	N/A	N	GL	N	N	N		
1	11.5		N		N	GL	N	N	N		
2	9.2		N		N	GL	N	N	N		
3	11.1		N		N	GL	N	N	N		
4	10.9		N		N	GL	N	N	N		
5	9.2	N/A	N	N/A	N	GL	N	N	N		
6	9.8		N		N	GL	N	N	N		
7	6.6	2.6	N	N/A	N	RI	N	N	N		
8	4.9		N		N	RI	N	N	N		
9	4.9		N		N	RI	N	N	N		
10	7.4		N		N	GL	N	N	N		
11	10.2		N		N	GL	N	N	N		
12	10.9		N		N	GL	N	N	N		
13	14.7		N		N	GL	N	N	N		
14	11.4		N		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT	FLAG
	7	FN	SA	GF	GF	FN	

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES
RS = BEDROCK (SMOOTH)–(Larger than a car)
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HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
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OT = OTHER (Write comment on back of form)

POOL FORM CODES
N= Not a pool
W= Large Woody Debris
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B = Boulder or Bedrock
F = Unknown, fluvial

COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES
PP = Pool, Plunge
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PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG	

Diameter Large End	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
	Length 1.5-5 m	5-15 m	>15 m	Length 1.5-5 m	5-15 m	>15 m
0.1-<0.3 m						
0.3-0.5 m						
0.5-0.8 m						
>0.8 m						

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: WC-2	DATE: 10/6/11	**TRANSECT:**	☐ **A-B** ☐ **B-C** ☐ **C-D** ☐ **D-E** ☐ **E-F** ☐ **F-G** ☐ **G-H** ☒ **H-I** ☐ **I-J** ☐ **J-K**

THALWEG PROFILE	For Transect A-B ONLY	Increment (m) x.x:	1.0	Total Reach Length (m)	150

STATION	**THALWEG DEPTH (cm) (xx.x)**	**WETTED WIDTH (m) (XXX.X)**	**BAR WIDTH[8]**		**SOFT/ SMALL SEDIMENT (Y/N)**	**CHANNEL UNIT CODE**	**POOL FORM CODE**	**SIDE CHANNEL (Y/N)**	**BACK WATER (Y/N)**	**FLAG**	**COMMENTS**
			Present (Y/ N)	**XX.X**							
0	15.5	2.3	N	N/A	Y	GL	N	N	N		
1	12.3		N		Y	GL	N	N	N		
2	12.0		N		Y	GL	N	N	N		
3	12.1		N		Y	GL	N	N	N		
4	13.3		N		Y	GL	N	N	N		
5	11.8	N/A	N	N/A	Y	GL	N	N	N		
6	12.5		N		Y	GL	N	N	N		
7	11.3	1.7	N	N/A	N	GL	N	N	N		
8	10.2		N		N	GL	N	N	N		
9	15.1		N		N	GL	N	N	N		
10	13.8		N		N	GL	N	N	N		
11	8.9		N		N	RI	N	N	N		
12	7.3		N		N	RI	N	N	N		
13	10.8		N		N	RI	N	N	N		
14			N		N	RI	N	N	N		

SUBSTRATE	**Station (5 or 7)**	**LFT**	**LCTR**	**CTR**	**RCTR**	**RGT**	**FLAG**
	7	HP	GF	GF	HP	HP	

FLAG	**COMMENTS**

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COMBINATIONS:
Eg. WR, BR, WRB

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GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)				**CHECK IF ALL UNMARKED BOXES ARE ZERO**		X	**FLAG**
	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**			
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**	
0.1-<0.3 m	☐	☐	☐	☐	☐	☐	
0.3-0.5 m	☐	☐	☐	☐	☐	☐	
0.5-0.8 m	☐	☐	☐	☐	☐	☐	
>0.8 m	☐	☐	☐	☐	☐	☐	

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: WC-2	DATE: 10/6/11	TRANSECT:	☐ A-B	☐ B-C	☐ C-D	☐ D-E	☐ E-F
			☐ F-G	☐ G-H	☐ H-I	☒ I-J	☐ J-K

THALWEG PROFILE	For Transect A-B ONLY	Increment (m)x.x:	1.0	Total Reach Length (m)	150

STATION	THALWEG DEPTH (cm) (xx.x)	WETTED WIDTH (m) (XXX.X)	BAR WIDTH[9] Present (Y/ N)	BAR WIDTH[9] XX.X	SOFT/ SMALL SEDIMENT (Y/N)	CHANNEL UNIT CODE	POOL FORM CODE	SIDE CHANNEL (Y/N)	BACK WATER (Y/N)	FLAG	COMMENTS
0	15.0	2.2	N		N	GL	N	N	N		
1	16.7		N		N	GL	N	N	N		
2	14.8		N		N	GL	N	N	N		
3	12.8		N		N	GL	N	N	N		
4	13.1		N		N	GL	N	N	N		
5	14.3	N/A	N		N	GL	N	N	N		
6	11.8		N		N	GL	N	N	N		
7	13.4	2.3	N		N	GL	N	N	N		
8	21.8		N		N	GL	N	N	N		
9	31.2		N		N	GL	N	N	N		
10	15.6		N		N	GL	N	N	N		
11	19.2		N		N	GL	N	N	N		
12	20.8		N		N	GL	N	N	N		
13	24.9		N		N	GL	N	N	N		
14	23.7		N		N	GL	N	N	N		

SUBSTRATE	Station (5 or 7)	LFT	LCTR	CTR	RCTR	RGT		FLAG
	7	HP	HP	BL	GF	FN		

FLAG	COMMENTS

SUBSTRATE SIZE CLASS CODES

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COMBINATIONS:
Eg. WR, BR, WRB

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= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)	CHECK IF ALL UNMARKED BOXES ARE ZERO	X	FLAG			
	Pieces All/Part in Bankfull Channel			Pieces Bridge Above Bankfull Channel		
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**
0.1-<0.3 m	☐	☐	☐	☐	☐	☐
0.3-0.5 m	☐	☐	☐	☐	☐	☐
0.5-0.8 m	☐	☐	☐	☐	☐	☐
>0.8 m	☐	☐	☐	☐	☐	☐

PHAB: THALWEG PROFILE & WOODY DEBRIS FORM STREAMS

SITE ID: WC-2	DATE: 10/6/11	**TRANSECT:**	☐	**A-B**	☐	**B-C**	☐	**C-D**	☐	**D-E**	☐ **E-F**
			☐	**F-G**	☐	**G-H**	☐	**H-I**	☐	**I-J**	☒ **J-K**

THALWEG PROFILE	For Transect A-B ONLY	Increment (m) x.x:	1.0	Total Reach Length (m)	150

STATION	**THALWEG DEPTH (cm) (xx.x)**	**WETTED WIDTH (m) (XXX.X)**	**BAR WIDTH[10]**		**SOFT/ SMALL SEDIMENT (Y/N)**	**CHANNEL UNIT CODE**	**POOL FORM CODE**	**SIDE CHANNEL (Y/N)**	**BACK WATER (Y/N)**	**FLAG**	**COMMENTS**
			Present (Y/ N)	**XX.X**							
0	24.2	1.7	N	N/A	N	GL	N	N	N		
1	18.8		N		N	GL	N	N	N		
2	13.6		N		N	GL	N	N	N		
3	12.9		N		N	GL	N	N	N		
4	15.1		N		N	GL	N	N	N		
5	19.9	N/A	N	N/A	N	GL	N	N	N		
6	23.8		N		N	GL	N	N	N		
7	27.7	1.8	N	N/A	Y	GL	N	N	N		
8	18.8		N		Y	GL	N	N	N		
9	15.3		N		N	GL	N	N	N		
10	21.2		N		N	GL	N	N	N		
11	23.1		N		N	GL	N	N	N		
12	21.8		N		N	GL	N	N	N		
13	22.8		N		N	GL	N	N	N		
14	25.1		N		N	GL	N	N	N		

SUBSTRATE	**Station (5 or 7)**	**LFT**	**LCTR**	**CTR**	**RCTR**	**RGT**	**FLAG**
	7	HP	FN	FN	FN	FN	

FLAG	**COMMENTS**

LARGE WOODY DEBRIS (〈10 cm small end diameter; 〈1.5 m length)				**CHECK IF ALL UNMARKED BOXES ARE ZERO**		X	**FLAG**
	Pieces All/Part in Bankfull Channel			**Pieces Bridge Above Bankfull Channel**			
Diameter Large End	**Length 1.5-5 m**	**5-15 m**	**>15 m**	**Length 1.5-5 m**	**5-15 m**	**>15 m**	
0.1-<0.3 m							
0.3-0.5 m							
0.5-0.8 m							
>0.8 m							

SUBSTRATE SIZE CLASS CODES
RS = BEDROCK (SMOOTH)–(Larger than a car)
RR = BEDROCK (ROUGH)-(Larger than a car)
BL = BOULDER (250 to 400 mm)-(Basketball to car)
CB = COBBLE (64 to 250 mm)-(Tennis ball to basketball)
GC = COARSE GRAVEL (16 to 64mm)-(Marble to Tennis ball)
GF = FINE GRAVEL (2 to 16mm)-(Ladybug to marble)
SA = SAND (0.06 to 2mm)-(Gritty up to ladybug size)
FN = SILT/CLAY/MUCK-(Not gritty)
HP = HARDPAN-(Firm, Consolidated, Fine Substrate)
WD = WOOD-(Any Size)
OT = OTHER (Write comment on back of form)

POOL FORM CODES
N= Not a pool
W= Large Woody Debris
R = Rootwad
B = Boulder or Bedrock
F = Unknown, fluvial

COMBINATIONS:
Eg. WR, BR, WRB

CHANNEL UNIT CODES
PP = Pool, Plunge
PT = Pool, Trench
PL = Pool, Lateral Scour
PB = Pool, Backwater
PD = Pool, Impoundment
GL = Glide RI
= Riffle RA =
Rapid CA =
Cascade FA =
Falls
DR = Dry Channel

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: WC-2	DATE: 10/6/11	**TRANSECT:**	☒ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0.00	0	BL	0	
LCtr	0.50	8.1	GF	0	
Ctr	1.00	9.4	CB	0	
RCtr	1.40	6.5	CB	0	
Right	1.80	0	OT	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	0 [✓ 1] 2 3 4	
Overhanging Veg. = <1 m of Surface	[✓ 0] 1 2 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	0 1 [✓ 2] 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	0 1 2 3 [✓ 4]	0 1 2 [✓ B] 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 2 [✓ 3] 4	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	0 1 [✓ 2] 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
Barren, Bare Dirt or Duff	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/Riprap/Dam	0 [✓ P] C B	0 P C [✓ B]	
Buildings	[✓ 0] P C B	[✓ 0] P C B	
Pavement/Cleared Lot	[✓ 0] P C B	[✓ 0] P C B	
Road/Railroad	[✓ 0] P C B	0 P [✓ C] B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	[✓ 0] P C B	[✓ 0] P C B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	79	0.0	
Right	68	0.0	
Wetted Width xxx.x m		1.8	
Bar Width xx.x m		0.0	
Bankfull Width xxx.x m		6.7	
Bankfull Height xx.x m		0.6	
Incised Height xx.x m		K	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	13		CenR	17	
CenL	16		Left	K	
CenDwn	17		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: WC-2	DATE: 10/6/11	**TRANSECT:**	☐ **A** ☒ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0.00	0	FN	100	
LCtr	0.68	22.7	FN	100	
Ctr	1.36	26.3	FN	100	
RCtr	2.04	34.3	FN	100	
Right	2.70	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	[✓ 0] 1 2 3 4	
Undercut Banks	0 [✓ 1] 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	0 1 2 [✓ 3] 4	0 1 [✓ 2] 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 2 3 [✓ 4]	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Barren, Bare Dirt or Duff	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	

0= Not Present P= >10 m C= Within 10 m B= On Bank

HUMAN INFLUENCE	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	0 [✓ P] C B	
Pavement/Cleared Lot	[✓ 0] P C B	0 [✓ P] C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	[✓ 0] P C B	[✓ 0] P C B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	139	0.17	
Right	90	0.42	
Wetted Width xxx.x m		2.7	
Bar Width xx.x m		0.0	
Bankfull Width xxx.x m		3.8	
Bankfull Height xx.x m		0.6	
Incised Height xx.x m		K	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	14		CenR	15	
CenL	13		Left	K	
CenDwn	16		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	**Comments**

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: WC-2	DATE: 10/6/11	**TRANSECT:**	☐ **A** ☐ **B** ☒ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0.00	0	FN	100	
LCtr	0.70	20.8	FN	100	
Ctr	1.40	32.7	FN	100	
RCtr	2.10	27.2	FN	100	
Right	2.80	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)
(circle one)

FISH COVER/OTHER		FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	0 [✓ 1] 2 3 4	
Overhanging Veg. = <1 m of Surface	0 [✓ 1] 2 3 4	
Undercut Banks	0 1 [✓ 2] 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
Canopy (>5 m high)			
Vegetation Type	[✓ D] C E M N	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	0 1 [✓ 2] 3 4	[✓ 0] 1 2 3 4	
Understory (0.5 to 5 m high)			
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	[✓ 0] 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	0 1 [✓ 2] 3 4	
Ground Cover (<0.5 m high)			
Woody Shrubs and Saplings	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	0 1 2 3 [✓ 4]	
Barren, Bare Dirt or Duff	0 [✓ 1] 2 3 4	[✓ 0] 1 2 3 4	

HUMAN INFLUENCE: 0= Not Present P= >10 m C= Within 10 m B= On Bank

HUMAN INFLUENCE	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	0 [✓ P] C B	
Pavement/Cleared Lot	[✓ 0] P C B	0 [✓ P] C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	[✓ 0] P C B	[✓ 0] P C B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	138	0.18	
Right	107	0.19	
Wetted Width xxx.x m		2.8	
Bar Width xx.x m		0.0	
Bankfull Width xxx.x m		3.5	
Bankfull Height xx.x m		0.9	
Incised Height xx.x m		K	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	10		CenR	11	
CenL	16		Left	K	
CenDwn	12		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: WC-2 DATE: 10/6/11

TRANSECT: ☐ **A** ☐ **B** ☐ **C** ☒ **D** ☐ **E** ☐ **F** **X-tra Side Channel**
☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0.00	0	HP	0	
LCtr	0.60	19.6	GF	100	
Ctr	1.20	20.0	SA	100	
RCtr	1.80	19.1	FN	100	
Right	2.40	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 [✓ 2] 3 4	
Undercut Banks	0 [✓ 1] 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%) D=Deciduous
1=Sparse (<10%) C=Coniferous
2=Moderate (10-40%) E=Broadleaf Evergreen
3=Heavy (40-75%) M=Mixed
4=Very Heavy (>75%) N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	[✓ D] C E M N	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	0 [✓ 1] 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 2 3 [✓ 4]	0 1 2 3 [✓ 4]	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 2 [✓ 3] 4	0 1 2 [✓ 3] 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	0 [✓ P] C B	
Pavement/Cleared Lot	[✓ 0] P C B	0 [✓ P] C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	[✓ 0] P C B	[✓ 0] P C B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	43	0	
Right	120	0.07	
Wetted Width xxx.x m		2.4	
Bar Width xx.x m		0.0	
Bankfull Width xxx.x m		2.8	
Bankfull Height xx.x m		0.8	
Incised Height xx.x m		K	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	3		CenR	3	
CenL	4		Left	K	
CenDwn	1		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: WC-2 DATE: 10/6/11

TRANSECT: ☐ **A** ☐ **B** ☐ **C** ☐ **D** ☒ **E** ☐ **F** **X-tra Side Channel** ☐
☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K**

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0.00	0	FN	100	
LCtr	0.65	33.4	FN	100	
Ctr	1.30	33.3	FN	100	
RCtr	1.95	28.7	FN	100	
Right	2.60	0	HP	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	[✓ 0] 1 2 3 4	
Undercut Banks	0 1 [✓ 2] 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
Canopy (>5 m high)			
Vegetation Type	[✓ D] C E M N	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	0 1 2 [✓ 3] 4	[✓ 0] 1 2 3 4	
Understory (0.5 to 5 m high)			
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 2 [✓ 3] 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Ground Cover (<0.5 m high)			
Woody Shrubs and Saplings	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	

0= Not Present P= >10 m C= Within 10 m B= On Bank

HUMAN INFLUENCE	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	0 [✓ P] C B	
Pavement/Cleared Lot	[✓ 0] P C B	0 [✓ P] C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	[✓ 0] P C B	[✓ 0] P C B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	140	0.25	
Right	88	0.0	
Wetted Width xxx.x m		2.6	
Bar Width xx.x m		0.0	
Bankfull Width xxx.x m		2.9	
Bankfull Height xx.x m		0.8	
Incised Height xx.x m		K	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	8		CenR	1	
CenL	0		Left	K	
CenDwn	0		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: WC-2 DATE: 10/6/11

TRANSECT: ☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☒ **F** **X-tra Side Channel**
☐ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0.00	0	HP	0	
LCtr	0.40	25.3	FN	100	
Ctr	0.80	31.3	GF	50	
RCtr	1.20	23.1	HP	50	
Right	1.60	0	HP		

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 [✓ 1] 2 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)	D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None	
RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	0 1 [✓ 2] 3 4	
Small Trees (Trunk <0.3 m DBH)	0 [✓ 1] 2 3 4	0 1 [✓ 2] 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 2 [✓ 3] 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Barren, Bare Dirt or Duff	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	0 [✓ P] C B	
Pavement/Cleared Lot	[✓ 0] P C B	0 [✓ P] C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	[✓ 0] P C B	[✓ 0] P C B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	50	0	
Right	73	0	
Wetted Width xxx.x m		1.6	
Bar Width xx.x m		0.0	
Bankfull Width xxx.x m		2.5	
Bankfull Height xx.x m		0.9	
Incised Height xx.x m		K	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	14	
CenL	15		Left	K	
CenDwn	11		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: WC-2	DATE: 10/6/11	**TRANSECT:**	☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☒ **G** ☐ **H** ☐ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0.00	0	HP	0	
LCtr	0.50	5.3	HP	30	
Ctr	1.00	13.1	GF	30	
RCtr	1.50	3.9	HP	25	
Right	2.00	0	HP	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 [✓ 1] 2 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)	D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None	
RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	0 1 2 [✓ 3] 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	0 1 [✓ 2] 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 2 3 [✓ 4]	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	0 1 [✓ 2] 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	[✓ 0] 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	0 1 [✓ 2] 3 4	
Barren, Bare Dirt or Duff	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	0 [✓ P] C B	
Pavement/Cleared Lot	[✓ 0] P C B	0 [✓ P] C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	[✓ 0] P C B	[✓ 0] P C B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	49	0	
Right	73	0	
Wetted Width xxx.x m		2.0	
Bar Width xx.x m		0.0	
Bankfull Width xxx.x m		3.1	
Bankfull Height xx.x m		0.7	
Incised Height xx.x m		K	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	14		CenR	15	
CenL	5		Left	K	
CenDwn	8		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	**Comments**

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: WC-2

DATE: 10/6/11

TRANSECT: ☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐
☐ **G** ☒ **H** ☐ **I** ☐ **J** ☐ **K**

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0.00	0	HP	0	
LCtr	0.56	8.1	GF	20	
Ctr	1.12	9.6	GF	20	
RCtr	1.68	11.9	HP	0	
Right	2.25	0	FN	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	[✓ 0] 1 2 3 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	0 [✓ 1] 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	0 1 2 [✓ 3] 4	0 1 2 [✓ 3] 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 2 [✓ 3] 4	0 1 [✓ 2] 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 [✓ 1] 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 1 [✓ 2] 3 4	
Barren, Bare Dirt or Duff	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	

HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	0 [✓ P] C B	
Pavement/Cleared Lot	[✓ 0] P C B	0 [✓ P] C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	[✓ 0] P C B	[✓ 0] P C B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	51	0	
Right	59	0	
Wetted Width xxx.x m		2.3	
Bar Width xx.x m		0.0	
Bankfull Width xxx.x m		3.4	
Bankfull Height xx.x m		0.7	
Incised Height xx.x m		K	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	17		CenR	17	
CenL	16		Left	K	
CenDwn	17		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: WC-2	DATE: 10/6/11	**TRANSECT:**	☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐ **G** ☐ **H** ☒ **I** ☐ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0.00	0	HP	0	
LCtr	0.55	12.7	GF	60	
Ctr	1.10	15.1	GF	10	
RCtr	1.65	10.3	HP	0	
Right	2.20	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 1 2 [✓ 3] 4	
Undercut Banks	[✓ 0] 1 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	44	0	
Right	90	0	
Wetted Width xxx.x m		2.2	
Bar Width xx.x m		0.0	
Bankfull Width xxx.x m		3.1	
Bankfull Height xx.x m		0.6	
Incised Height xx.x m		K	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	16		CenR	17	
CenL	15		Left	K	
CenDwn	17		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

VISUAL RIPARIAN ESTIMATES	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)	D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None	
RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	[✓ D] C E M N	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	0 [✓ 1] 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	0 [✓ 1] 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 2 [✓ 3] 4	0 1 2 3 [✓ 4]	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	0 [✓ 1] 2 3 4	0 [✓ 1] 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 1 [✓ 2] 3 4	0 [✓ 1] 2 3 4	
Barren, Bare Dirt or Duff	0 1 [✓ 2] 3 4	0 [✓ 1] 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	0 [✓ P] C B	
Pavement/Cleared Lot	[✓ 0] P C B	0 [✓ P] C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	[✓ 0] P C B	[✓ 0] P C B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: WC-2	DATE: 10/6/11	**TRANSECT:**	☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel** ☐ **G** ☐ **H** ☐ **I** ☒ **J** ☐ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0.00	0	HP	0	
LCtr	0.43	24.8	HP	0	
Ctr	0.86	23.7	HP	0	
RCtr	1.28	21.2	HP	0	
Right	1.70	0	FN	100	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	0 [✓ 1] 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 [✓ 1] 2 3 4	
Undercut Banks	0 [✓ 1] 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%)	D=Deciduous C=Coniferous E=Broadleaf Evergreen M=Mixed N=None	
RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 2 3 [✓ 4]	0 1 2 3 [✓ 4]	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Barren, Bare Dirt or Duff	0 1 [✓ 2] 3 4	[✓ 0] 1 2 3 4	
HUMAN INFLUENCE	0= Not Present P= >10 m C= Within 10 m B= On Bank		
	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	0 [✓ P] C B	
Pavement/Cleared Lot	[✓ 0] P C B	0 [✓ P] C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	[✓ 0] P C B	[✓ 0] P C B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	82	0	
Right	99	0.1	
Wetted Width xxx.x m		1.7	
Bar Width xx.x m		0.0	
Bankfull Width xxx.x m		2.8	
Bankfull Height xx.x m		0.8	
Incised Height xx.x m		K	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	16		CenR	17	
CenL	16		Left	K	
CenDwn	17		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	**Comments**

PHAB: CHANNEL/RIPARIAN CROSS-SECTION FORM – STREAMS

SITE ID: WC-2

DATE: 10/6/11

TRANSECT: ☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F** **X-tra Side Channel**
☐ **G** ☐ **H** ☐ **I** ☐ **J** ☒ **K** ☐

SUBSTRATE CROSS-SECTIONAL INFORMATION

	Dist LB xx.xx m	Depth xxx cm	Size Class Code	Embed. 0-100%	Flag
Left	0.00	0	FN	100	
LCtr	0.67	17.0	FN	100	
Ctr	1.34	20.2	GF	20	
RCtr	2.01	18.2	GF	20	
Right	2.66	0	HP	0	

SUBSTRATE SIZE CLASS CODES	Embed. (%)
RS = Bedrock(Smooth)-(Larger than a car)	0
RR = Bedrock (Rough)-(Larger than a car)	0
BL = Boulder (250 to 400 mm)-(Basketball to car)	
CB = Cobble (64 to 250 mm)-(Tennis ball to basketball)	
GC = Coarse Gravel (16 to 64mm)-(Marble to Tennis ball)	
GF = Fine Gravel (2 to 16mm)-(Ladybug to marble)	
SA = Sand (0.06 to 2mm)-(Gritty up to ladybug size)	100
FN = Silt/Clay/Muck-(Not gritty)	100
HP = Hardpan-(Firm, Consolidated, Fine Substrate)	0
WD = Wood-(Any Size)	
OT = Other (Write comment below)	

FISH COVER/OTHER

FISH COVER/OTHER	0=Absent (0%) 1=Sparse (<10%) 2=Moderate (10-40%) 3=Heavy (40-75%) 4=Very Heavy (>75%) (circle one)	FLAG
Filamentous Algae	[✓ 0] 1 2 3 4	
Macrophytes	[✓ 0] 1 2 3 4	
Woody Debris >0.3 m (Big)	[✓ 0] 1 2 3 4	
Brush/Woody Debris <0.3 (Small)	[✓ 0] 1 2 3 4	
Live Trees or Roots	[✓ 0] 1 2 3 4	
Overhanging Veg. = <1 m of Surface	0 [✓ 1] 2 3 4	
Undercut Banks	0 [✓ 1] 2 3 4	
Boulders	[✓ 0] 1 2 3 4	
Artificial Structures	[✓ 0] 1 2 3 4	

VISUAL RIPARIAN ESTIMATES

0=Absent (0%)
1=Sparse (<10%)
2=Moderate (10-40%)
3=Heavy (40-75%)
4=Very Heavy (>75%)

D=Deciduous
C=Coniferous
E=Broadleaf Evergreen
M=Mixed
N=None

RIPARIAN VEGETATION COVER	Left Bank	Right Bank	Flag
	Canopy (>5 m high)		
Vegetation Type	D C E M [✓ N]	D C E M [✓ N]	
Big Trees (Trunk >0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Small Trees (Trunk <0.3 m DBH)	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
	Understory (0.5 to 5 m high)		
Vegetation Type	[✓ D] C E M N	[✓ D] C E M N	
Woody Shrubs and Saplings	0 1 2 [✓ 3] 4	0 1 2 3 [✓ 4]	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	[✓ 0] 1 2 3 4	
	Ground Cover (<0.5 m high)		
Woody Shrubs and Saplings	[✓ 0] 1 2 3 4	[✓ 0] 1 2 3 4	
Non-Woody Herbs, Grasses, Forbs	0 [✓ 1] 2 3 4	0 1 [✓ 2] 3 4	
Barren, Bare Dirt or Duff	0 [✓ 1] 2 3 4	0 1 [✓ 2] 3 4	

HUMAN INFLUENCE — 0= Not Present P= >10 m C= Within 10 m B= On Bank

HUMAN INFLUENCE	Left Bank	Right Bank	Flag
Wall/Dike/Revetment/ Riprap/Dam	[✓ 0] P C B	[✓ 0] P C B	
Buildings	[✓ 0] P C B	0 [✓ P] C B	
Pavement/Cleared Lot	[✓ 0] P C B	0 [✓ P] C B	
Road/Railroad	[✓ 0] P C B	[✓ 0] P C B	
Pipes (Inlet/Outlet)	[✓ 0] P C B	[✓ 0] P C B	
Landfill/Trash	[✓ 0] P C B	[✓ 0] P C B	
Park/Lawn	[✓ 0] P C B	[✓ 0] P C B	
Row Crops	[✓ 0] P C B	[✓ 0] P C B	
Pasture/Range/Hay Field	[✓ 0] P C B	[✓ 0] P C B	
Logging Operations	[✓ 0] P C B	[✓ 0] P C B	
Mining Activity	[✓ 0] P C B	[✓ 0] P C B	

BANK MEASUREMENTS

	Bank Angle 0-360	Undercut Dist. (m)	Flag
Left	120	0.1	
Right	87	0.0	
Wetted Width xxx.x m		2.7	
Bar Width xx.x m		0.0	
Bankfull Width xxx.x m		3.2	
Bankfull Height xx.x m		0.7	
Incised Height xx.x m		K	

CANOPY COVER MEASUREMENTS

DENSIOMETER (0-17 Max)

		Flag			Flag
CenUp	16		CenR	11	
CenL	14		Left	K	
CenDwn	9		Right	K	

Flag Codes: K= Sample not collected; U= Suspect sample; F1, F2, etc.= misc. flag assigned by field crew. Explain all flags in comment sections.

Flag	Comments

RIPARIAN “LEGACY” TREES AND INVASIVE ALIEN PLANTS

SITE ID: WC-2 DATE: 10/6/11

TRAN	LARGEST LEGACY TREE VISIBLE FROM THIS STATION						ALIEN PLANT SPECIES PRESENT IN LEFT AND RIGHT RIPARIAN PLOTS				
	Trees not Visible	DBH (m)	Height (m)	Dist. from wetted margin (m)	Type	Taxonomic Category	Check all that are present				
A	☐	☐0-0.1 ☐.75-2 ☒.1-.3 ☐>2 ☐.3-.75	☐<5 ☒5-15 ☐15-30 ☐>30	0	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Willow	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☐CanThis ☐M This	☒Hblack ☐Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
B	☐	☒0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☐<5 ☒5-15 ☐15-30 ☐>30	1.0	☐Deciduous ☐Coniferous ☐Broadleaf Evergreen	Willow	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt CEd ☐Can This ☐M This	☒Hblack ☒Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol
C	☐	☐0-0.1 ☐.75-2 ☒.1-.3 ☐>2 ☐.3-.75	☐<5 ☒5-15 ☐15-30 ☐>30	1.0	☐Deciduous ☐Coniferous ☐Broadleaf Evergreen	Willow	☐ None	☒RC Grass ☐Engl Ivy ☐Ch Grass	☐Salt Ced ☒Can This ☐M This	☒Hblack ☒Teasel ☐Spurge	☐G Reed ☐C Burd ☐Rus Ol

INSTRUCTIONS

Legacy trees are defined as the largest tree within your search area, which is as far as you can see, but within maximum limits as follows:

Wadeable Streams: Confine search to no more than 50 m from left and right bank and extending upstream to next transect (for ‘K’ look upstream 4 channel widths)

Non-wadeable Rivers: Confine search to no more than 100 m from left and right bank and extending both upstream and downstream as far as you can see confidently.

Alien Plants: Confine search to riparian plots on left and right bank

Wadeable Streams: 10 m x 10 m
Non-wadeable Rivers: 10 m x 20 m

Not all aliens are to be identified in all states. See Field Manual and Plant Identification Guide.

TAXONOMIC CATEGORIES
Acacia/Mesquite Alder/Birch Ash Maple/Box elder Oak Poplar/Cottonwood Sycamore Willow Unknown or Other Deciduous
Cedar/Cypress/Sequoia Fir (including Douglas Fir and Hemlock) Juniper Pine Spruce Unknown or Other Deciduous
Unknown or Other Broadleaf Evergreen
Snag (Dead tree of any species)

ALIEN SPECIES		
RC Grass	Reed Canarygrass	*Phalaris arundinacea*
Engl Ivy	English Ivy	*Hedera Helix*
ChGrass	Cheat Grass	*Bromus tectorum*
Salt Ced	Salt Cedar	*Tamarix spp.*
Can This	Canada thistle	*Cirsium arvense*
M This	Musk thistle	*Carduus nutans*
Hblack	Himalayan blackberry	*Rubus discolor*
Teasel	Teasel	*Dipsacus fullonum*
Spurge	Leafy spurge	*Euphorbia esula*
G Reed	Giant Reed	*Arundo donax*
C Burd	Common burdock	*Arctium minus*
Rus Ol	Russian-olive	*Elaeagnus angustifolia*

COMMENTS

Transects D to K continued on next page

RIPARIAN “LEGACY” TREES AND INVASIVE ALIEN PLANTS

SITE ID: WC-2

DATE: 10/6/11

TRAN	LARGEST LEGACY TREE VISIBLE FROM THIS STATION						ALIEN PLANT SPECIES PRESENT IN LEFT AND RIGHT RIPARIAN PLOTS	
	Trees not Visible	DBH (m)	Height (m)	Dist. from wetted margin (m)	Type	Taxonomic Category	Check all that are present	
D	☒	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☐<5 ☐5-15 ☐15-30 ☐>30		☐Deciduous ☐Coniferous ☐Broadleaf Evergreen		☐ None	☐RC Grass ☐Salt Ced ☐Hblack ☐G Reed ☐Engl Ivy ☐CanThis ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
E	☒	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☐<5 ☐5-15 ☐15-30 ☐>30		☐Deciduous ☐Coniferous ☐Broadleaf Evergreen		☐ None	☐RC Grass ☐Salt CEd ☐Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
F	☒	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☐<5 ☐5-15 ☐15-30 ☐>30		☐Deciduous ☐Coniferous ☐Broadleaf Evergreen		☐ None	☐RC Grass ☐Salt Ced ☐Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
G	☐	☐0-0.1 ☒.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☐<5 ☐5-15 ☒15-30 ☐>30	K	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Cottonwood	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☒Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
H	☐	☐0-0.1 ☐.75-2 ☒.1-.3 ☐>2 ☐.3-.75	☐<5 ☐5-15 ☒15-30 ☐>30	K	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Alder	☐ None	☐RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☒Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
I	☐	☐0-0.1 ☐.75-2 ☒.1-.3 ☐>2 ☐.3-.75	☐<5 ☐5-15 ☒15-30 ☐>30	K	☒Deciduous ☐Coniferous ☐Broadleaf Evergreen	Alder	☐ None	☒RC Grass ☐Salt Ced ☒Hblack ☐G Reed ☐Engl Ivy ☐Can This ☒Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
J	☒	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☐<5 ☐5-15 ☐15-30 ☐>30		☐Deciduous ☐Coniferous ☐Broadleaf Evergreen		☐ None	☐RC Grass ☐Salt Ced ☐Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol
K	☒	☐0-0.1 ☐.75-2 ☐.1-.3 ☐>2 ☐.3-.75	☐<5 ☐5-15 ☐15-30 ☐>30		☐Deciduous ☐Coniferous ☐Broadleaf Evergreen		☐ None	☐RC Grass ☐Salt Ced ☐Hblack ☐G Reed ☐Engl Ivy ☐Can This ☐Teasel ☐C Burd ☐Ch Grass ☐M This ☐Spurge ☐Rus Ol

ATTACHMENT D. City of Salem Comments on EPA Proposed Additions to 2010 303(d) Integrated Report (April 27, 2012).

CITY OF Salem
AT YOUR SERVICE
PUBLIC WORKS DEPARTMENT
1410 20"' Street SE, Bldg #2 • Salem, OR 97302-1200 • Phone 503-588-6063 • Fax 503-588-6480

April27, 2012

Jill Gable
Watershed Unit
U.S. Environmental Protection Agency, Region 10
1200 Sixth Avenue Suite 900 (OWW-134)
Seattle WA 98101-3140

SUBJECT: **City of Salem Comments to Proposed Revisions to Oregon's 2010 Impaired Waters List**

Dear Ms. Gable:

City of Salem Public Works Depmiment staff have reviewed the Environmental Protection Agency's (EPA) proposed revisions to the 2010 list of impaired waters that was developed by the Oregon Department of Environmental Quality (ODEQ) as pmi of its 2010 Integrated Report. The purpose of this letter is to provide the EPA with comments about the proposed revisions.

Stream segments for which the comments petiain are within the jurisdictional boundaries of the City of Salem. Fmihetmore, each stream is also a receiving water body for the City's Municipal Separate Storm Sewer System.

Comments that follow are organized by the proposed listing parameter and applicable stream name(s), and are based on information provided by EPA at the following website: http://yosemite.epa.gov/R10/water.nsf/Public+Notices/oregon303d.

I. Dissolved Oxygen-Glenn Creek (LLID No. 1230650449903)

a. *Proposed Listing:* Glerm Creek, dissolved oxygen: River miles 4.1 to 7, non-spawning cold water criteria: not less than 8.0 mg/L.

b. *Comment:* The EPA has already approved a dissolved oxygen 303(d) listing, necessitating a Total Maximum Daily Load (TMDL) for Glerm Creek, river miles 0 to 7. The previous approval was for non-spawning **cool** water criteria (not less than 6.5 mg/L). The City questions if this new listing is in error because the EPA has already approved a cool water criteria that encompasses river miles 4.1 to 7.

2. Dissolved Oxygen-Clark Creek (LLID No. 1230332449270)

a. *Proposed Listing:* Clark Creek, dissolved oxygen.

b. *Comment:* A stream segment discrepancy was identified between EPA documents Enclosure 3: "Proposed Additions to Oregon's 2010 303(d) List" (PDF) and the supporting Excel data spreadsheet, "Dissolved Oxygen (Microsoft Excel Spreadsheet)." The PDF file shows the resident trout spawning criteria applicable stream segment identified as river mile 0 to 3.2, while the Excel spreadsheet shows the resident trout spawning criteria segment identified as river mile 0 to 1.9. The City questions if the PDF is in error because the PDF is based on data in the spreadsheet. The City requests that the EPA correct this mistake prior to final approval.

3. Dissolved Oxygen-Mill Creek (LLID No. 1230393449519)

   a. *Proposed Listing:* Mill Creek, dissolved oxygen: River miles 0 to 19, resident trout spawning criteria: not less than 11.0 mg/L between January 1-May 15.

   b. *Comment:* The City requests clarification as to why the "resident trout dissolved oxygen spawning criteria" is proposed for listing, but the "salmonlsteelhead spawning criteria" is not being proposed for listing for this stream segment. The ODEQ has identified that both trout and salmonlsteelhead spawning dissolved oxygen criteria to be not less than 11.0 mg/L. The identified season for salmonlsteelhead spawning for Mill Creek is October15-May15; however the listing is for January 1-May 15. It seems appropriate for the date range of the proposed listing to correspond with the date range of the sahnonlsteelhead spawning criteria.

4. Biological Criteria-Claggett Creek (LLID No. 1230310450293), Clark Creek (LLID No.1230332449270), Croisan Creek (LLID No. 1230550449257), Glenn Creek (LLID No. 1230650449903), and Pringle Creek Tributary (LLID No. 1230217449092)

   a. *Proposed Listings:*

      1. Claggett Creek, biological criteria, river miles 0 to 5.2.

      11. Clark Creek, biological criteria, river miles 0 to 1.9.

      111. Croisan Creek, biological criteria, river miles 0 to 6.5.

      1v. Glenn Creek, biological criteria, river miles 0 to 7.

      v. Pringle Creek Tributary, biological criteria, river miles 0 to 2.8.

   b. *Comment:* The ODEQ identified the streams listed above as Category 3C, being that a pollutant causing the impairment is unknown and a TMDL cannot be developed. The City requests clarification as to how biological criteria 303(d) listings are justified, particularly if the pollutant causing the impairment is unknown and a TMDL cannot be developed.

The City of Salem thanks the EPA for providing an opportunity to submit comments on the proposed listings. If you have any questions, please contact me at jboyington@cityofsalem.net or 503-588-6063, extension 7730.

Sincerely,

Justin Boyington
Stmmwater Flow Monitoring Analyst

VLS/DM:O:\Group\Filcs\CHRON0\2012\JB <»2412 salem comment 303d adds.doc

By Email
cc: File: Chrono