Clearwater Creek In-stream Habitat Restoration Project Closeout Report

Project Title: Clearwater Creek in-stream Habitat Restoration

Agency: US Forest Service
Gifford Pinchot National Forest
Mount St. Helens National Volcanic Monument

Project Manager: Bryce Michaelis, (360) 449-7847
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Project Approved By: Aquatic Coordination Committee (April 12, 2012)

Project Funding:

ACC funding	$128,000
FS funding	$155,000
Ecotrust funding	$ 23,000
RAC Funding	$ 7,500
MSHI	$ 3,000
Project Total	**$316,500**

Project Description (work completed): The Gifford Pinchot National Forest used PacifiCorp, Ecotrust and Title II (RAC) funding to supply equipment, operators and labor for construction of habitat restoration structures in the Clearwater Creek. Work included placing approximately 900 logs to create 62 complex structures to restore fish habitat and stabilize streambanks.

The main objectives of this project were to create rearing pools for juvenile Chinook, coho and steelhead, increase the amount and quality of spawning habitat and spawning opportunities for adult fish, and increase the overall habitat complexity in the lower 1.7 miles of the lower Clearwater Creek watershed.

A 46 acre logging unit was developed as a source of instream wood for USFS restoration activities and provided most of the wood used. Wood was extracted by logging standing green trees and salvaging blown down trees with rootwads. The unit was thinned using chainsaws, rubber tire skidders and excavators. Trees were transported via log trucks to a staging area adjacent to Clearwater Creek. Multiple rubber tire skidders transported logs from the staging areas to each structure location.

Approximately 15 to 30 pieces of large woody material (LWM) were used at each structure location to form complex habitat. Structures were placed along margins protruding no more than 25 percent into the stream channel to minimize excessive water shear stress and create a meandering thalweg. Key pieces of wood at each location were anchored into the streambanks using an excavator to dig trenches up to 25 feet long, and bury the wood. Other pieces of LWM were interwoven into these key pieces and riparian vegetation.

Structures were built to address specific needs and improve the conditions at each location. They were built to create pools, capture spawning gravels, reduce pressure on eroding banks, and prevent down-cutting of streambed. Structures were also placed in side-channels.

Partners	**Mount St. Helens Institute (MSHI) Youth Stream Team:** consisted of students from diverse backgrounds, some are at risk youth and others are from urban environments, but are all interested in the aquatic environment. This is part of the overall goal of the USFS "Kids Back in the Woods" program. MSHI Stream Team youth implemented the monitoring with USFS oversight. They used survey equipment including flow meters, gravel-o-meters, and studied macro-invertebrates in Lower Clearwater Creek. A pre-longitudinal survey was completed with photographs. Pre monitoring for 2014 is now complete and post monitoring will occur in 2015. **PacifiCorp** **Swift Community Action Team** **Ecotrust**
Workforce	Bryce Michaelis, USFS Fisheries Technician
Contractors:	Twin Peaks Construction Inc. Carson, WA
Problems Encountered:	Stream substrate was soft and machinery had to be careful when moving and excavating in the creek so they did not get stuck in the ash/sand.

Map of Clearwater Creek Restoration Project 1.7 miles


Logging standing green trees for restoration project

Stand after being thinned

Logs getting ready to be unloaded at staging area

Logs at staging area

Logs getting ready to cross Muddy River on their 2.4 miles venture to Clearwater Creek

Rubber tired skitter getting ready to skid logs

Staging logs to begin the project

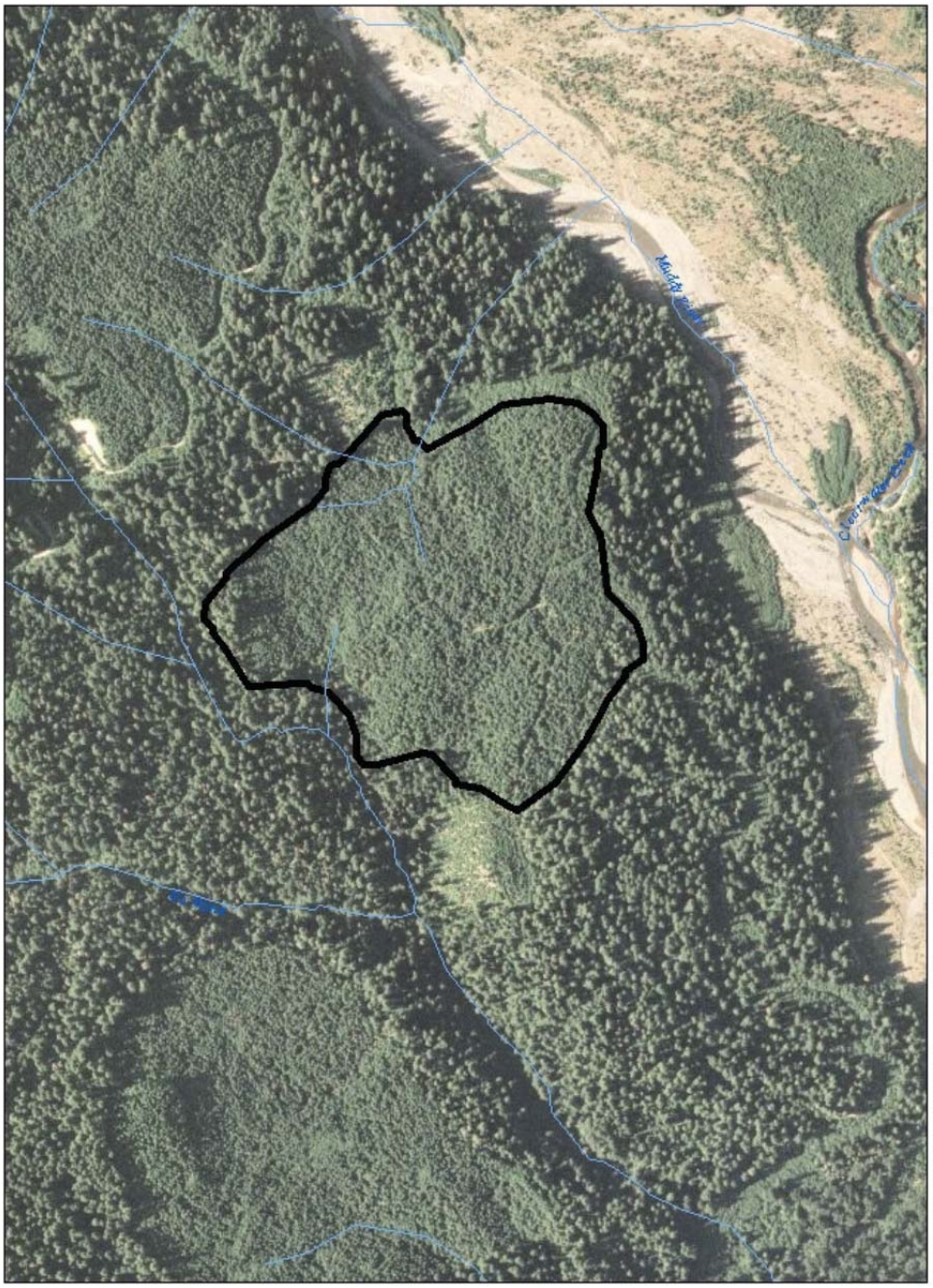
Structure 62 before construction

Structure 62 during construction 18 logs (fish cover structure)

Structure 22 bank stabilization structure 22 logs

Structure 46 is designed to keep holding pool scoured out and deep

Timber Stand 100735



0.1 0.05 0 0.1 Miles

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W E
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Post-implementation Status Report
Clearwater Creek Fish Habitat Restoration

Partnership between Mount St. Helens Institute and USFS Region 6, MSHNVM

Prepared by: Abigail Groskopf, MSHI Science Education Director and Jacob Sleasman, MSHI Fisheries Lead

October 2014

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Project Summary

The Clearwater Creek Fish Habitat Restoration project resulted in the construction of 64 complex Large Woody Material (LWM) structures over 1.7 miles of the lower reach of Clearwater Creek. These LWM structures are designed to create pools for summer rearing and overwintering habitat for juvenile coho salmon and steelhead trout. In addition some structures are designed for bank stabilization and to capture sediment to increase spawning areas. Reconnaissance surveys conducted for this project occurred on October 14 2011 reported minimal instream LWM and long glides and riffles with few suitable rearing pools.

The lack of large woody material in this section of Clearwater Creek appears to be the result of several factors including the residual effects from the 1980 eruption of Mt. St. Helens, past timber harvest, effects of the 1996 floods and landslides caused by the floods in the headwaters of the creek, and a lahar flow in the confluence area. The Muddy River Watershed Analysis (GPNF 1997) identified high sediment issues and need of instream large woody debris.

This project is funded by PacifiCorp Aquatic Coordination Committee, Title II, and Ecotrust.

Site Location and Description

Clearwater Creek is a major tributary to the Muddy River. The restoration area, located in the Gifford Pinchot National Forest is 1.7 miles long between RM 0.0 and RM 1.7. Access to the site is from FR 8322 and crossing the Muddy River to the confluence.

Figure 1: Map of project area

Goals and Objectives

Project goals include:

1. Over 50 structures using 900 pieces of Large Woody Material.
2. Formation of 50 stable quality pools over 3 feet in depth with cover elements associated with each structure.
3. Spawning gravel bed formed at structures.

Community Outreach

The Mount St. Helens Institute provides community outreach in a number of different ways. The Youth Stream program engages underserved youth, ages 8-18 in watershed education and introduces youth to restoration and monitoring in the Gifford Pinchot National Forest. Through engaging hands-on lessons, youth learn about water quality, fish biology, watershed dynamics and the effects of the1980 eruption n the riverine ecosystems.
The Mount St. Helens Institute provides internships for undergraduate students. Interns gain surveying, monitoring and education skills that equip them for an active career in science and/or education and have an opportunity to make a visible difference on their public lands.

Table 1: 2014 Community Engagement

Community Type	Individuals	Actual Hours Served
Youth Stream Team	10	50
Adult (undergraduate) Volunteer	-	0
MSHI Interns	2	60
Total	12	110

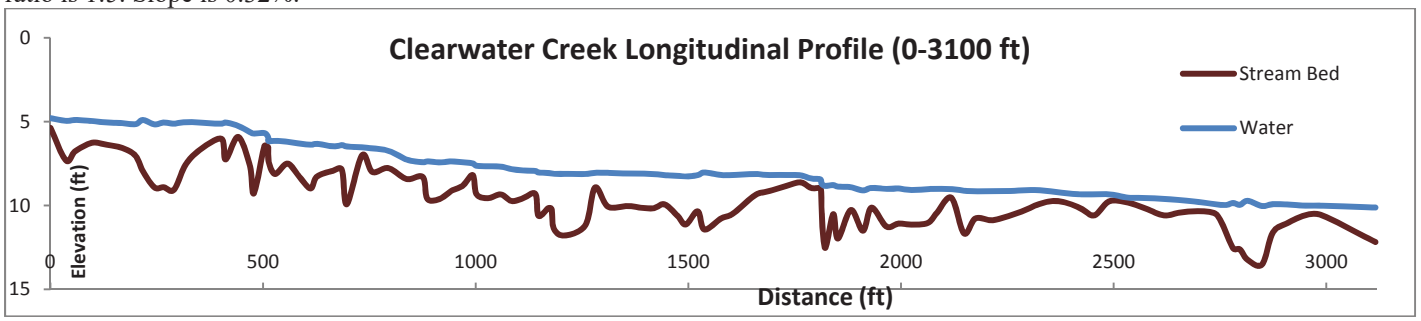
Monitoring Methodology

To capture the effects of the complex structures one cross-section was established at a key point near the structure. Only structures that were designed to alter geomorphology (pools, gravel-beds) were surveyed. Two benchmarks were placed in live trees so they will last for many years. Throughout the reach there are seven structures that are on opposite banks and in close proximity, which warranted a single cross-section going through both structures. All cross-sections have an accompanying Wolman Pebble Count. A longitudinal profile was determined from an established benchmark at the upper extent of the project area. A longitudinal profile measures the elevation changes following the thalweg (the deepest continuing line in the stream channel). It is important to note that due to stream/ thalweg meandering the longitudinal profile is not only a measure of distance and elevation, but also of sinuosity. From the longitudinal profile pool depths and pool:riffle counts can be assessed. Surveyors used *Stream Channel Reference Sites* (Harrelson et. al., 1994) as the standard surveying protocol. Photos were taken at all structures (including bank stabilization structures) above the structure looking downstream, opposite the structure, and below the structure looking upstream.

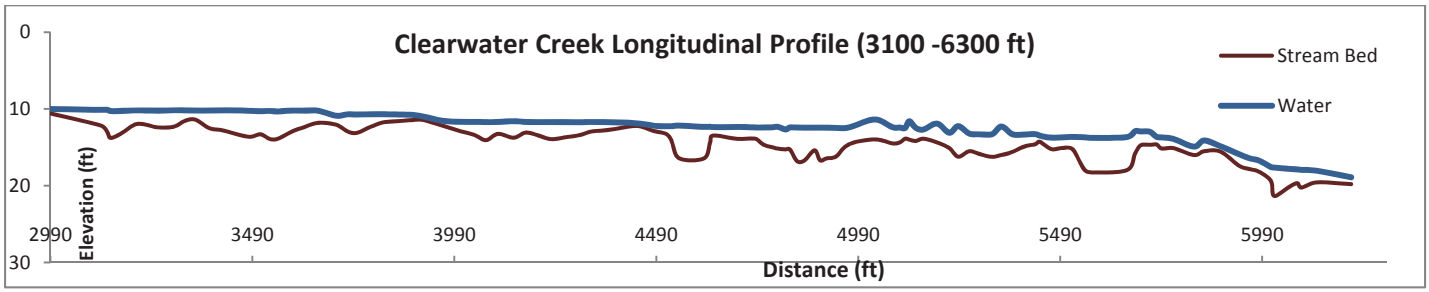
Results and Analysis

A baseline longitudinal survey was conducted prior to the restoration installations. Immediately following the installations, baseline cross-sectional surveys and pebble counts were conducted. Due to project delays and project extension amendments, it is not within the scope of the project to conduct 1-year post implementation surveys and analysis.

The baseline longitudinal project is shown in Figure 2 and Figure 3. Within the project reach there are 16 distinct pools with a baseflow water depth of 3 feet or deeper, and a residual pool depth of at least 1.0 feet. The pool:riffle ratio is 1:5. Slope is 0.32%.

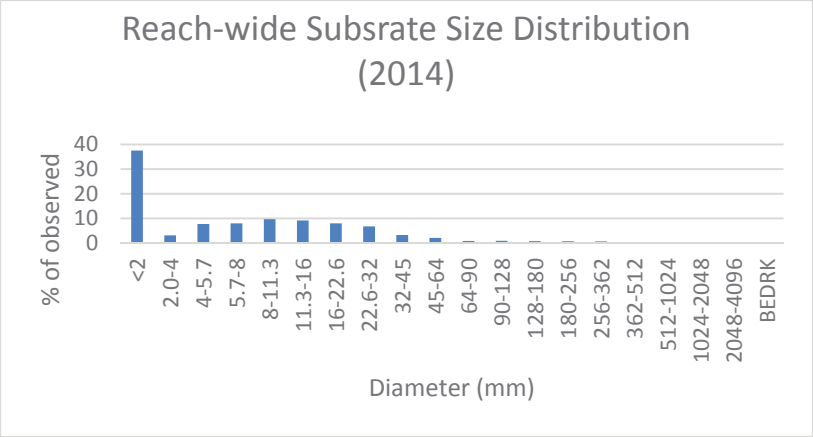


2: Clearwater 2014 Longitudinal Profile (0-3100 ft)



3: Clearwater Creek Longitudinal Profile (3100 - 6300 ft)

Baseline post-installation survey of substrate size distribution confirms previous data and reconnaissance reports. Throughout the Clearwater Creek restoration reach substrate size is small, with an average median substrate size of 7.2 mm and a D84 of 27.4 mm.



4: Clearwater Creek Reach-wide Substrate Size Distribution

ST #	D50	D84
1	34.8	119.1
2	1.2	8.0
4	Fines	7.5
5	160.7	371
6	Fines	6.4
7	Fines	13.8
9	5.1	15.3
12&13	2.7	15
15	Fines	13.3
16	11.8	24
19	7.5	21
21&22	Fines	4.7
23&24	9.3	21.6
26	6.9	16.9
28	11	19.9
31	7.4	21.9
32&33	8	33.1
34	7.4	22.5
35&36	3.4	19.1
37&38	7	18.1
40	4.9	12.2
41&42	Fines	6.7
43	3.3	13
45	5.8	18.8
48&49	5.5	13.6
59	Fines	12.2
64	6.6	26.2

5: Table showing median and 84 percentile substrate sizes for each restoration structure.

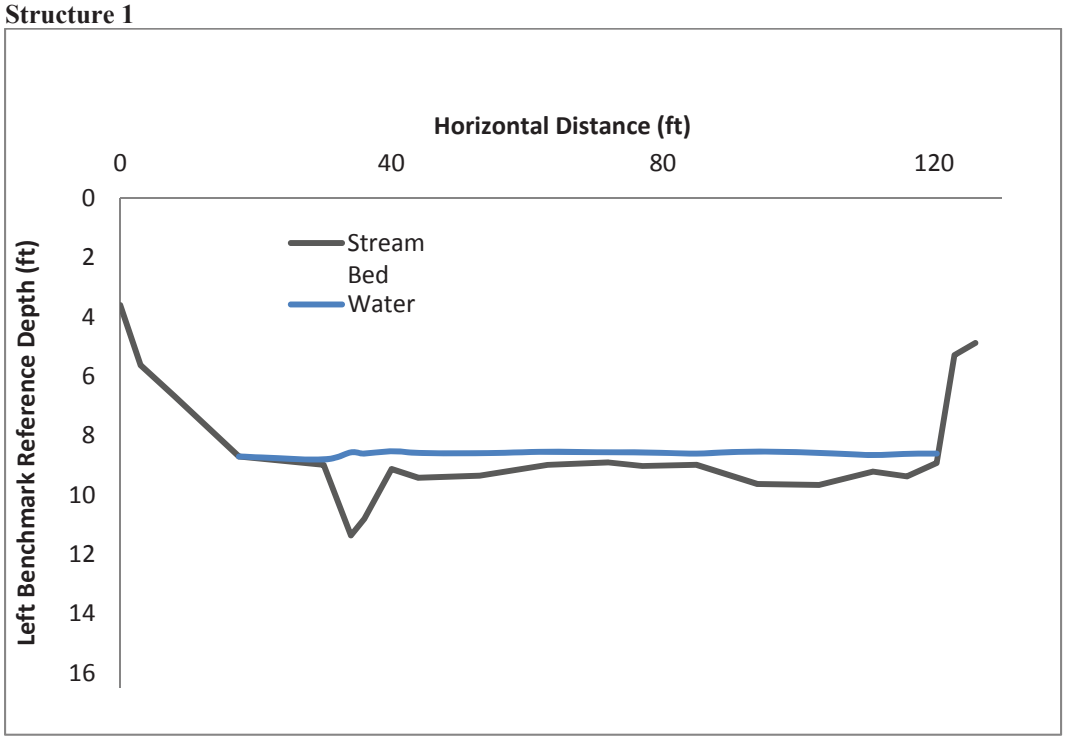
Conclusions

Overall the project was successfully implemented. Sixty-four complex structures were constructed, including structures designed to provide rearing habitat and spawning beds and bank stabilization. Due to time constraints there is no 1-year post implementation report and therefore it is imperative to continue monitoring the structures with cross-sections, pebble counts, longitudinal profiles and photographs. By engaging both underserved youth and undergraduate students in on-the-ground data collection, the Mount St. Helens Institute not only more efficiently collects data but students of all ages gain invaluable job-training skills necessary in today highly competitive market.

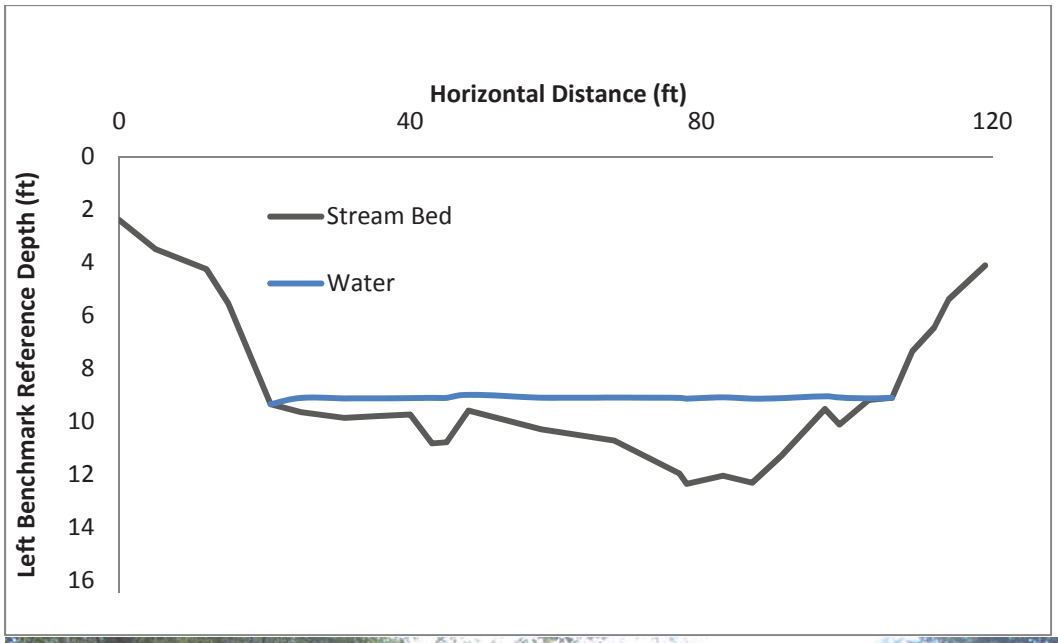
Appendix A: Site level cross-sections and photo-documentation

Included for each complex structure are baseline cross-sectional graphs and well as post-installation photographs. Substrate graphs and additional site photos are available upon request. Photos of bank stabilization structures are available on request.

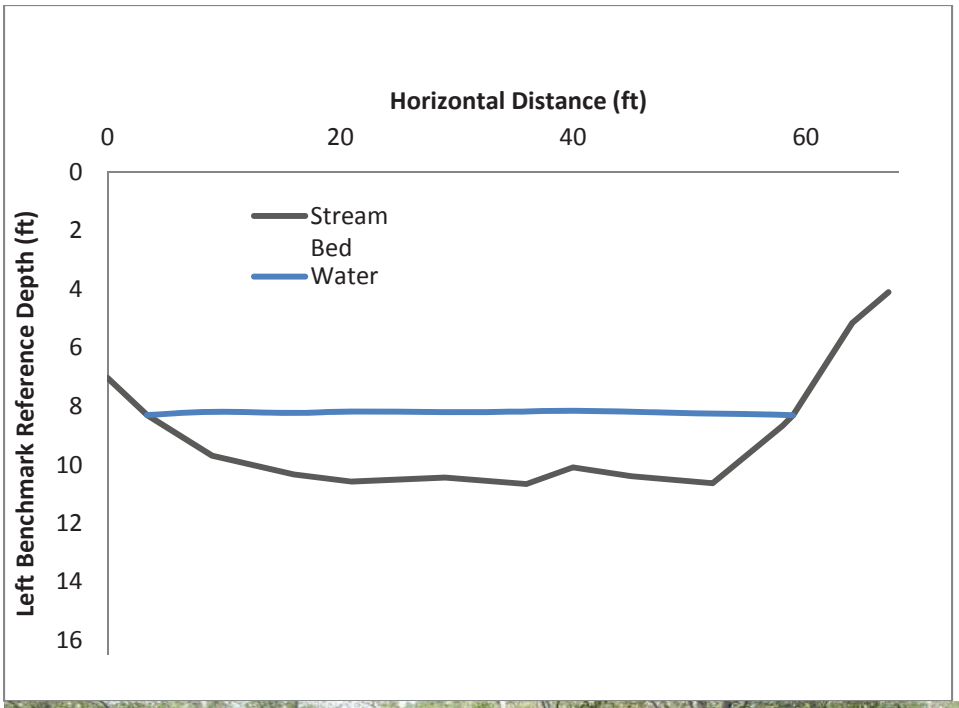
Structure 1



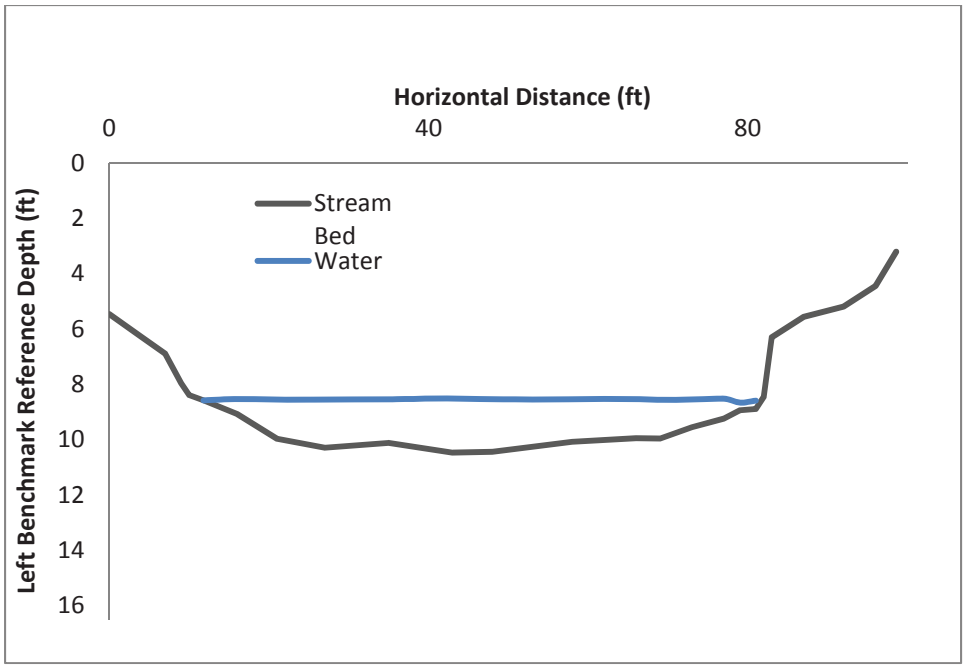
Structure 2


Horizontal Distance (ft)
0
40
80
120
Left Benchmark Reference Depth (ft)
0
2
4
6
8
10
12
14
16
Stream Bed
Water

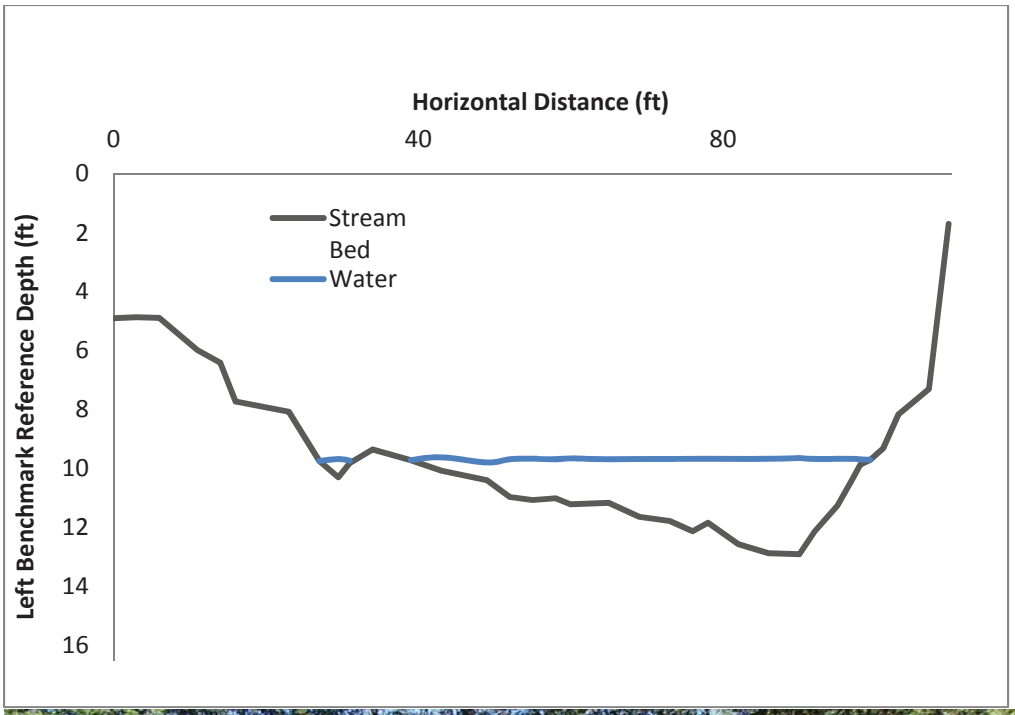
Structure 4


Horizontal Distance (ft)
0
20
40
60
0
2
4
6
8
10
12
14
16
Left Benchmark Reference Depth (ft)
Stream Bed
Water

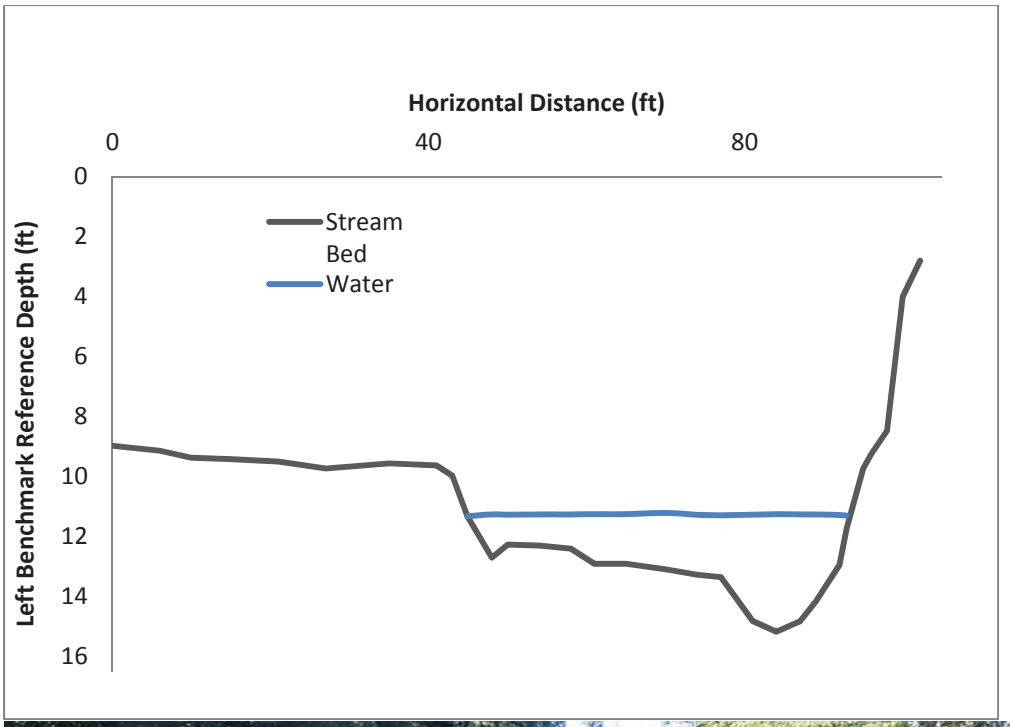
Structure 6


Horizontal Distance (ft)
0
40
80
Left Benchmark Reference Depth (ft)
0
2
4
6
8
10
12
14
16
Stream Bed
Water

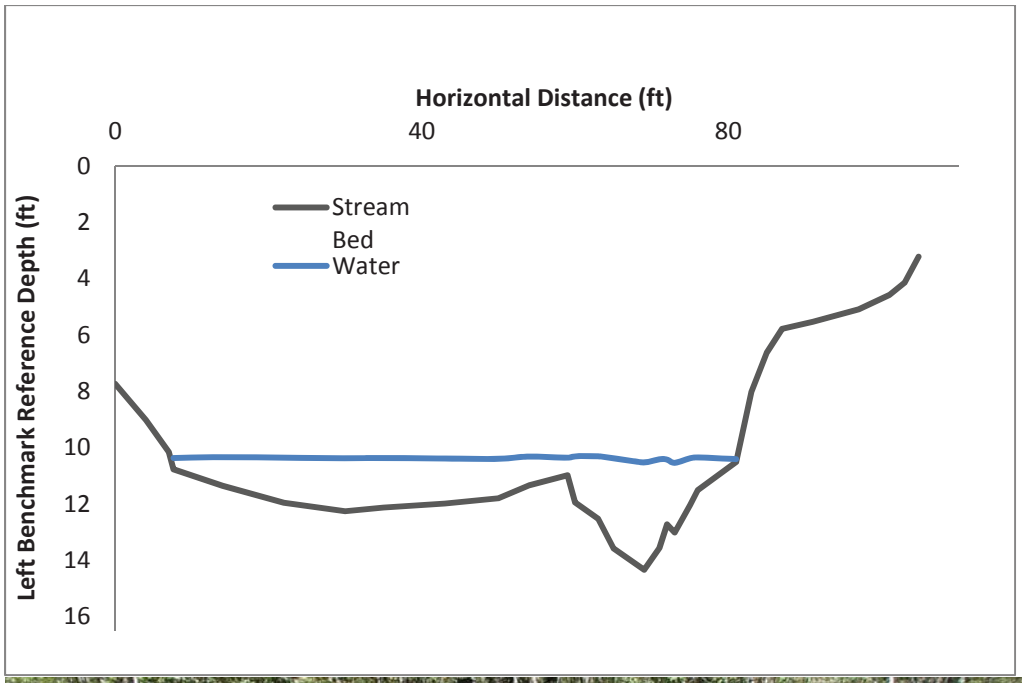
Structure 7


Horizontal Distance (ft)
0
40
80
Left Benchmark Reference Depth (ft)
0
2
4
6
8
10
12
14
16
Stream
Bed
Water

Structure 9



Structure 12&13



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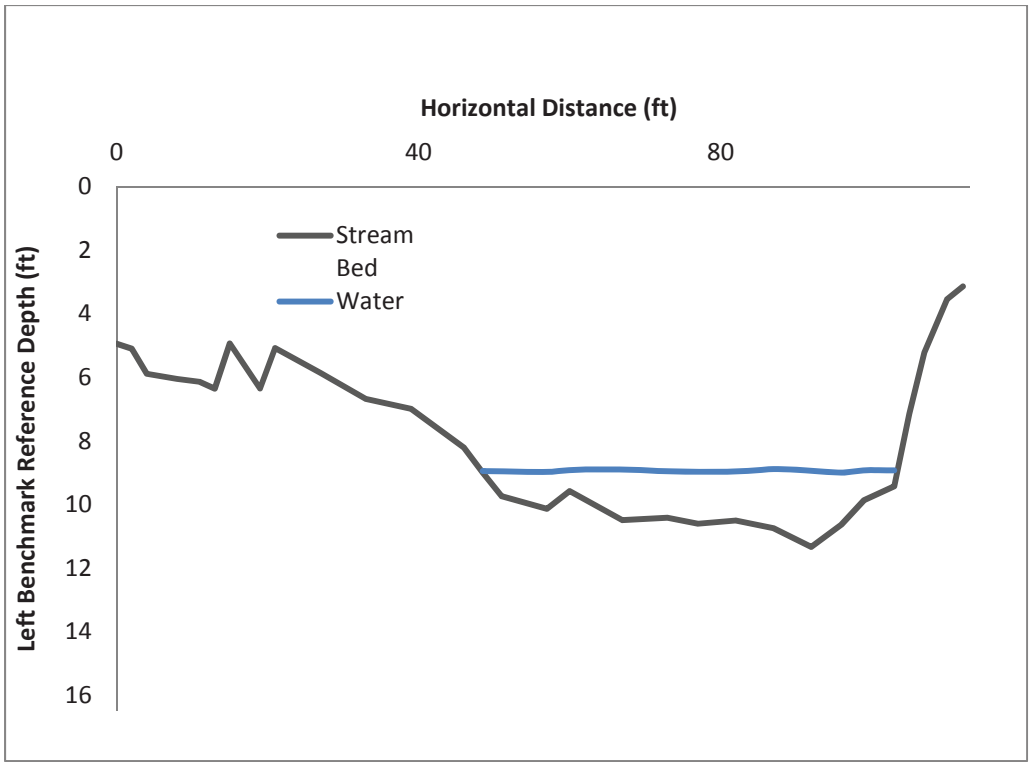

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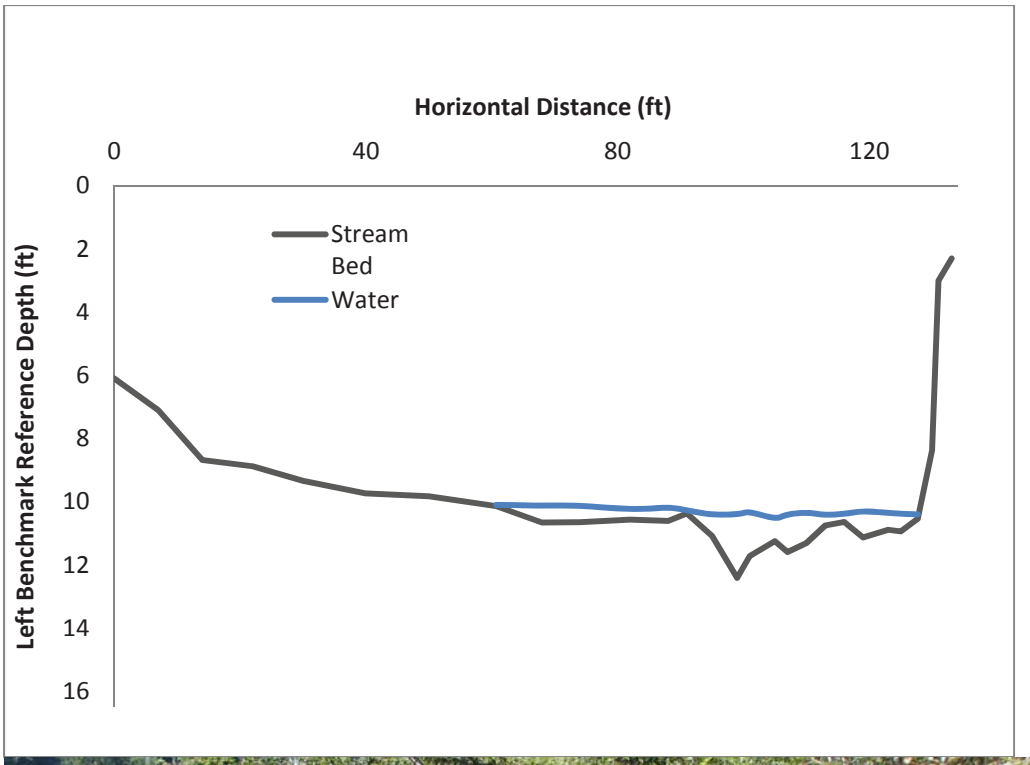

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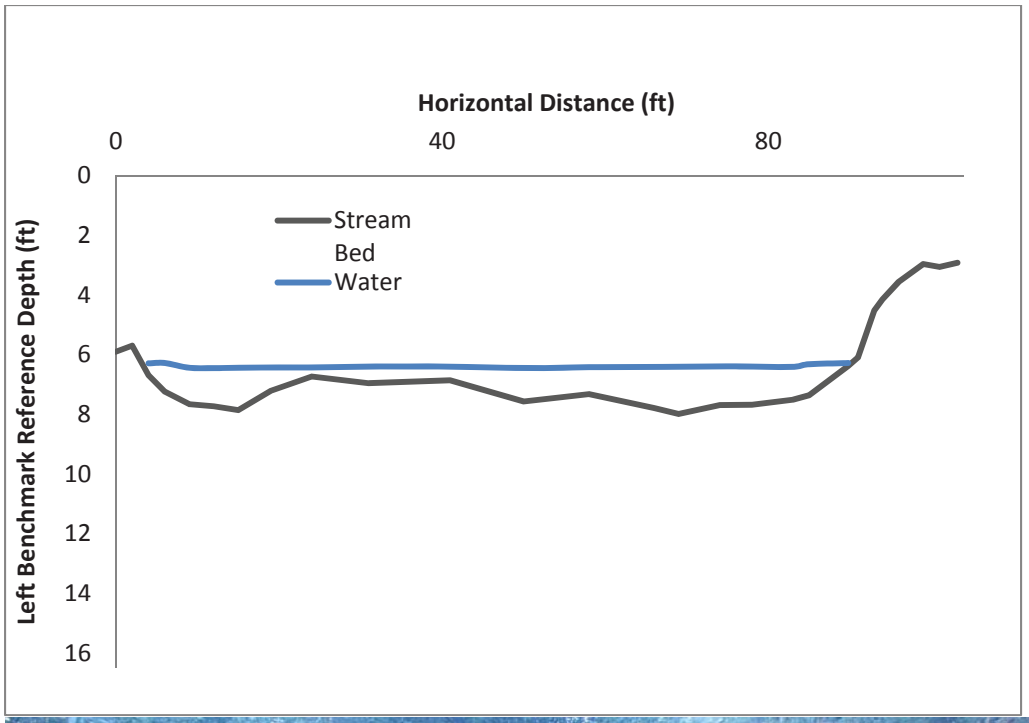

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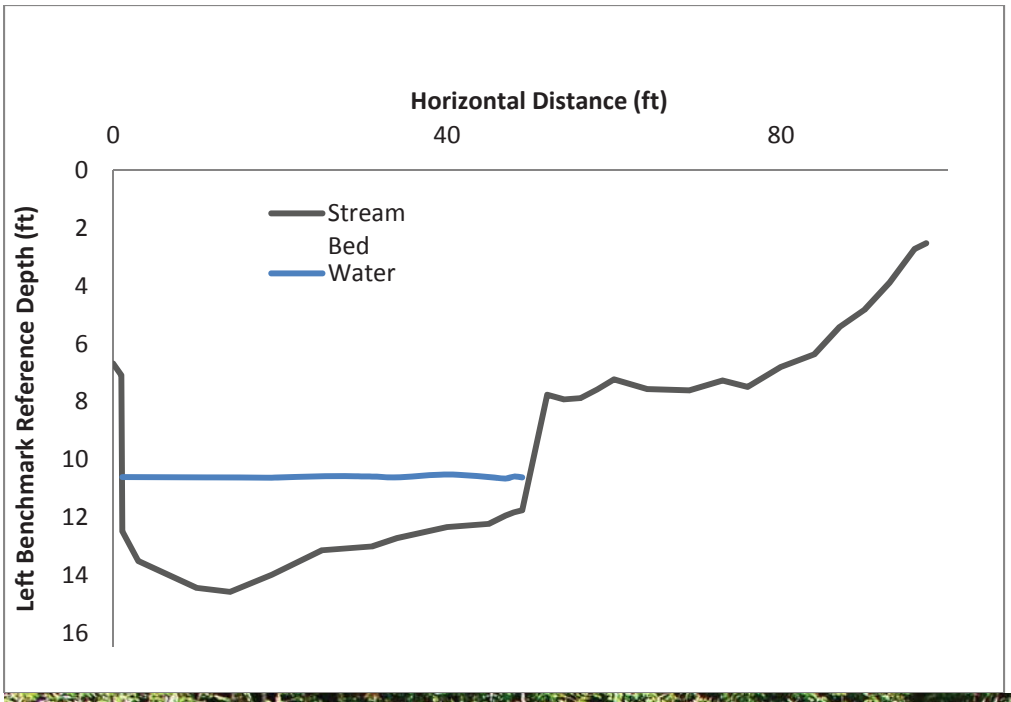

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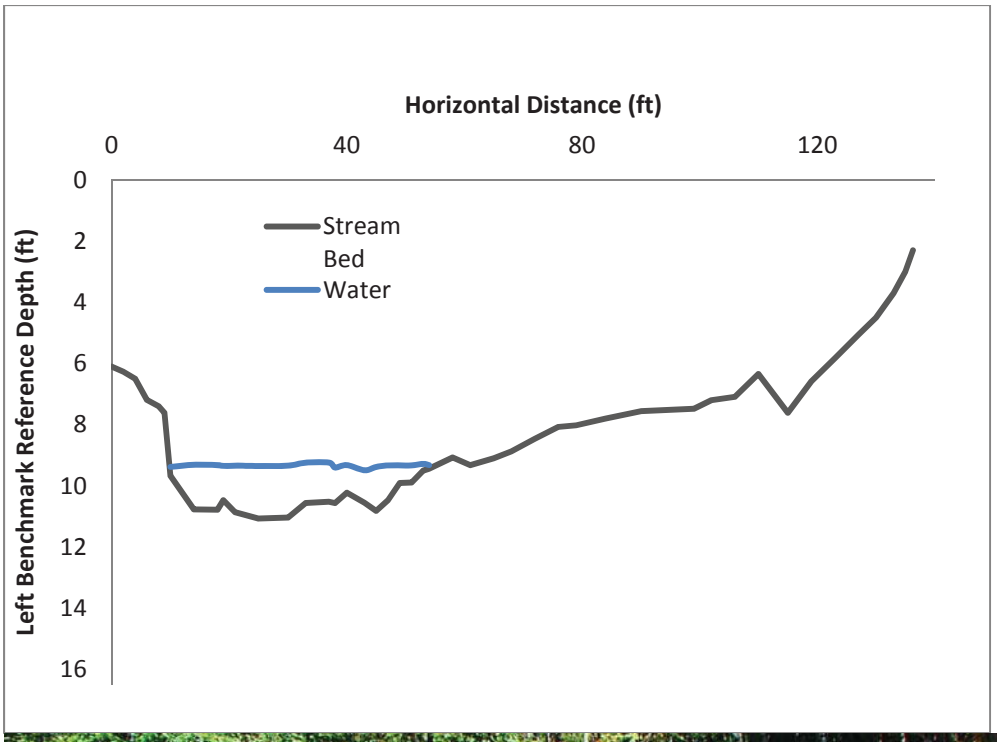

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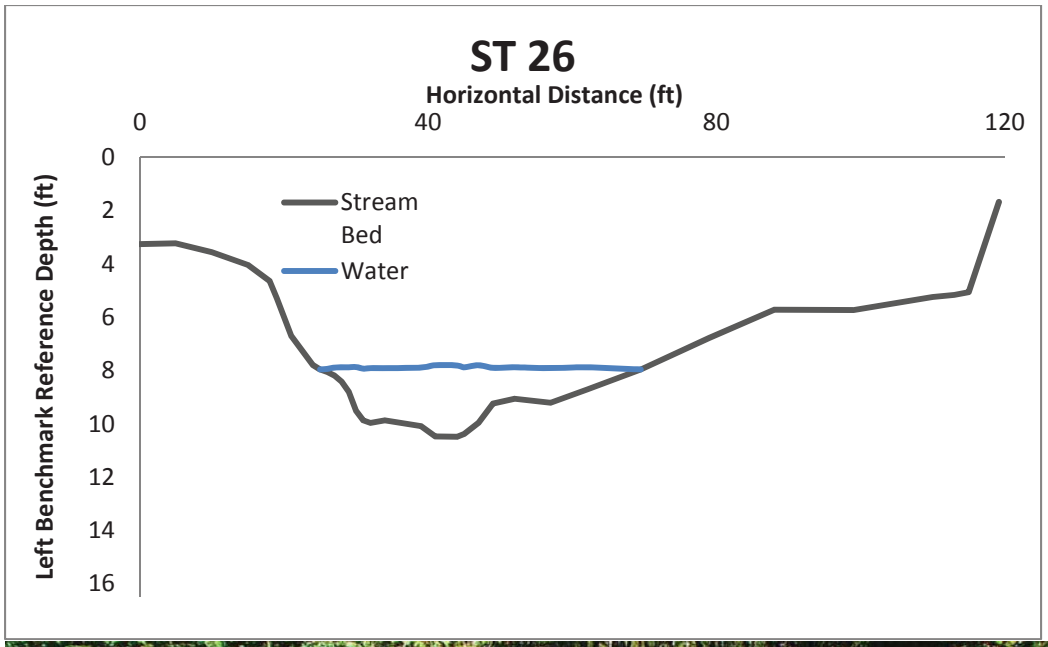

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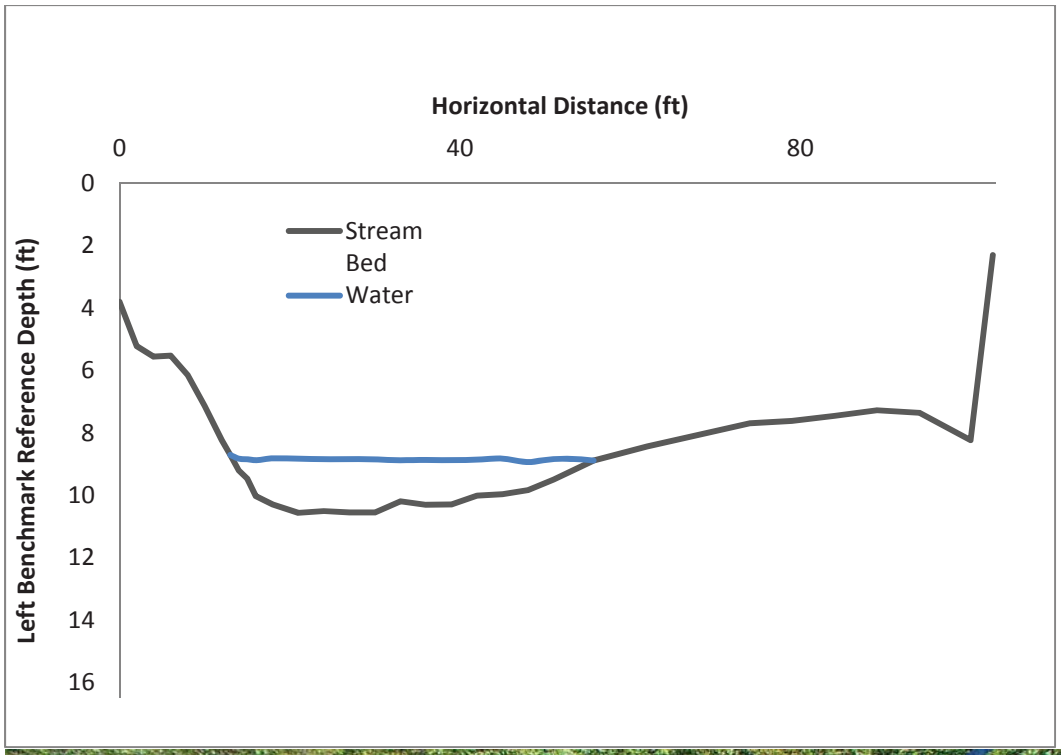

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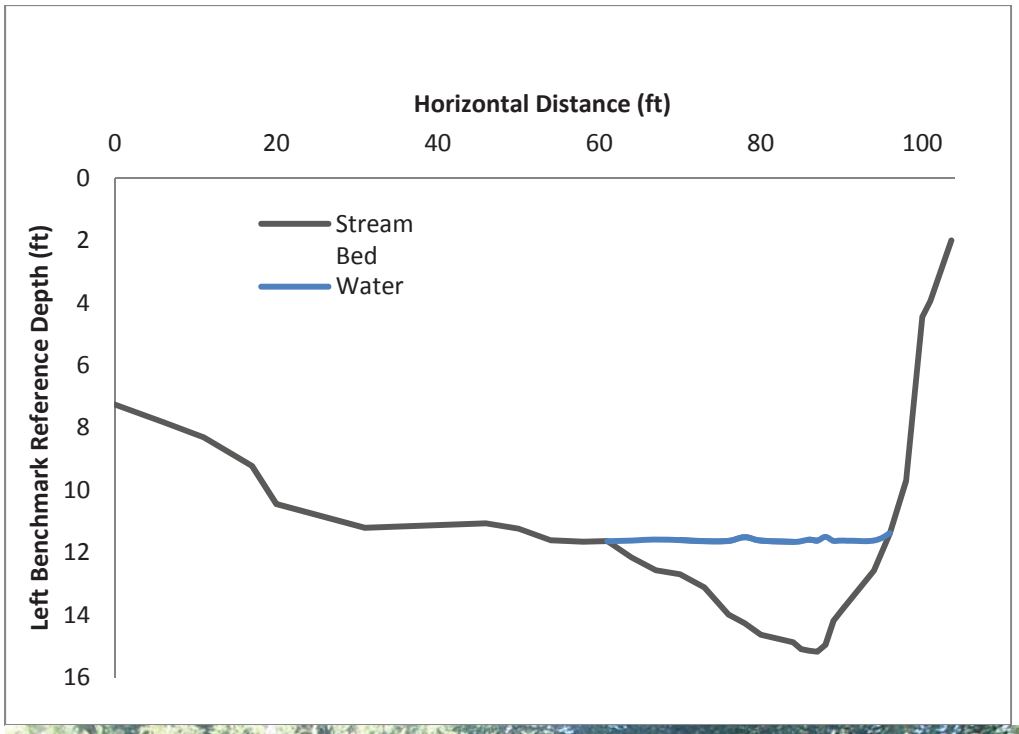

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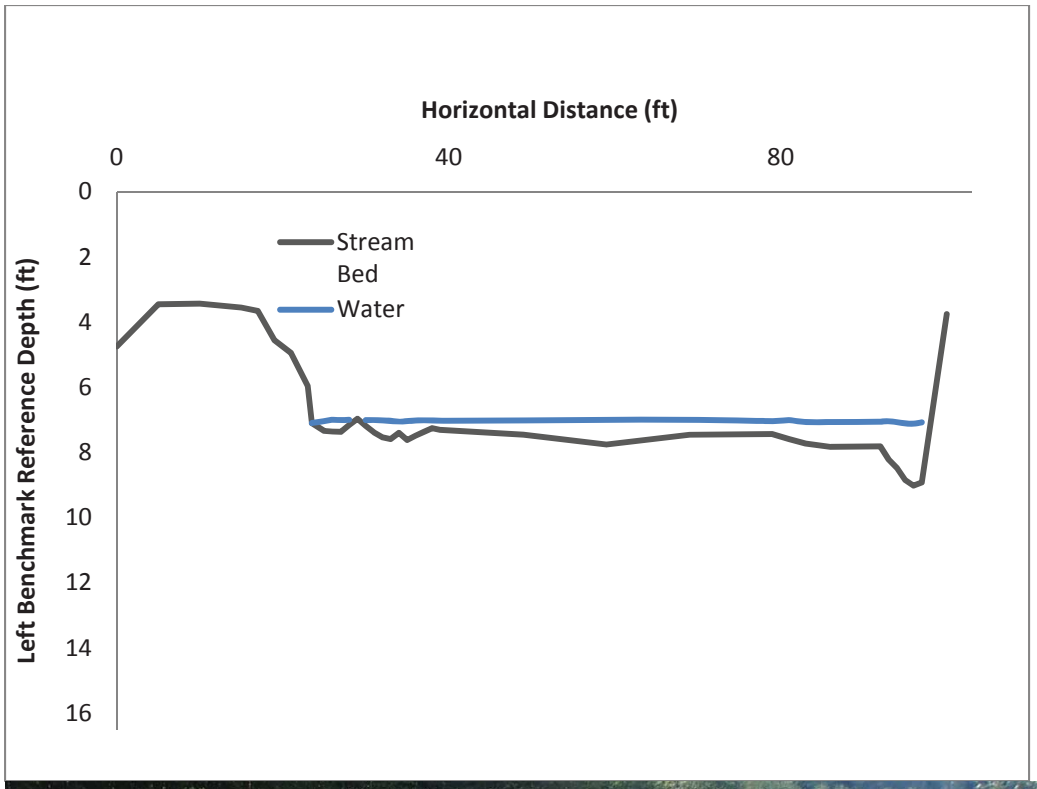

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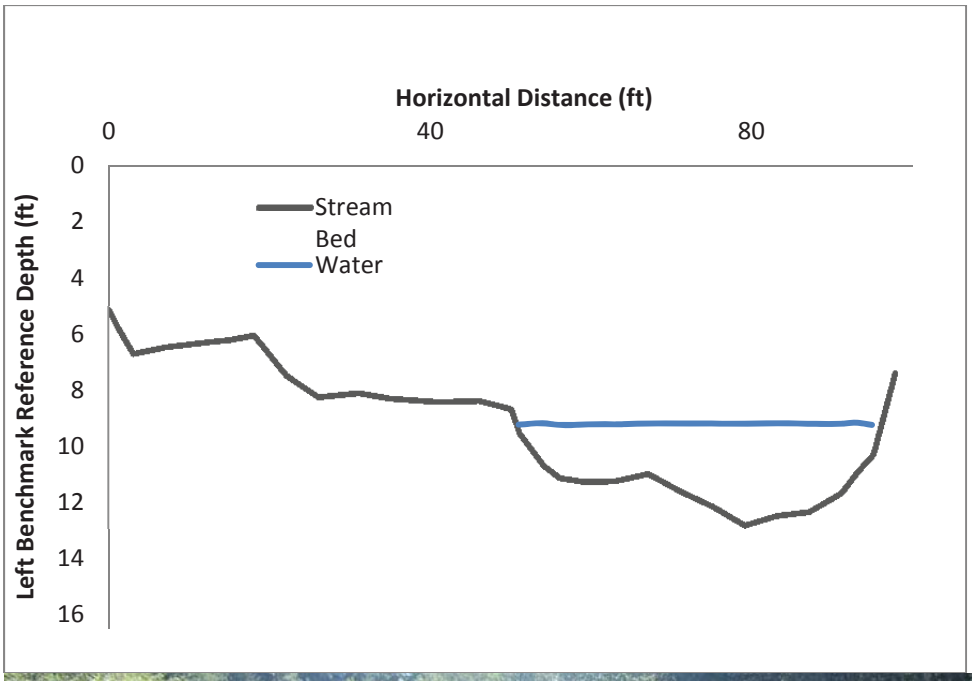

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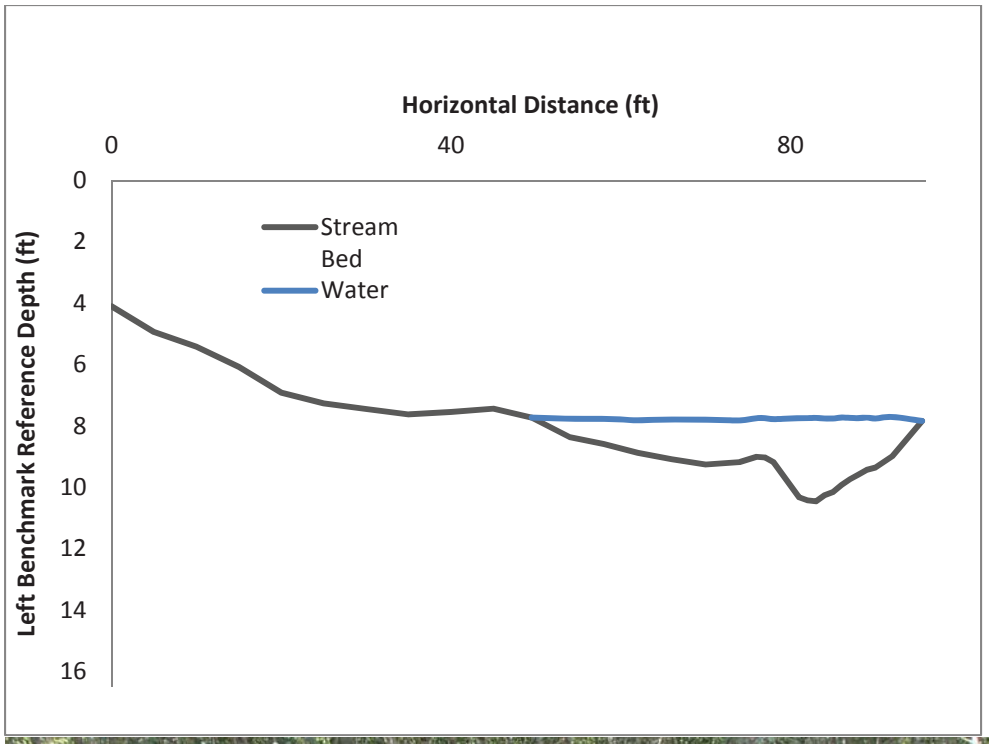

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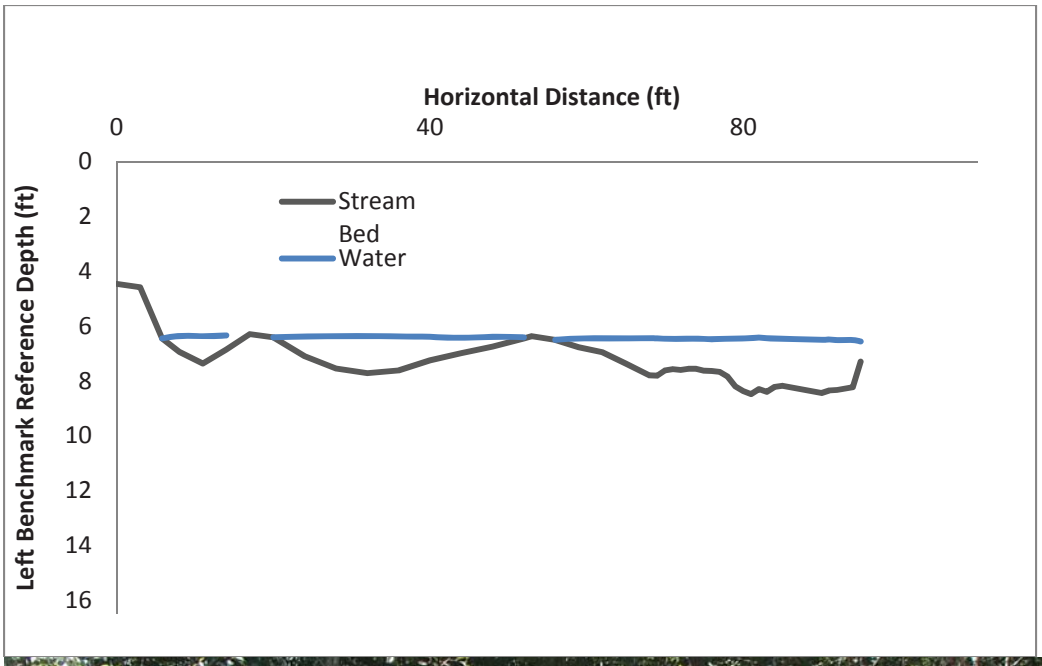

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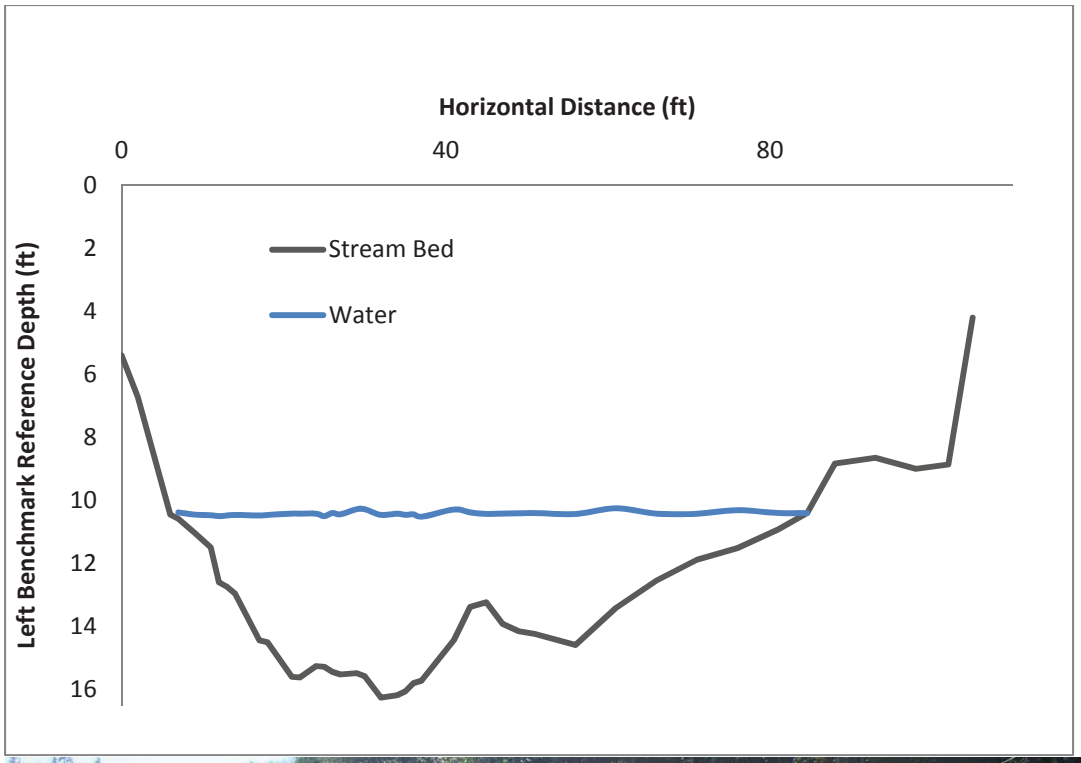

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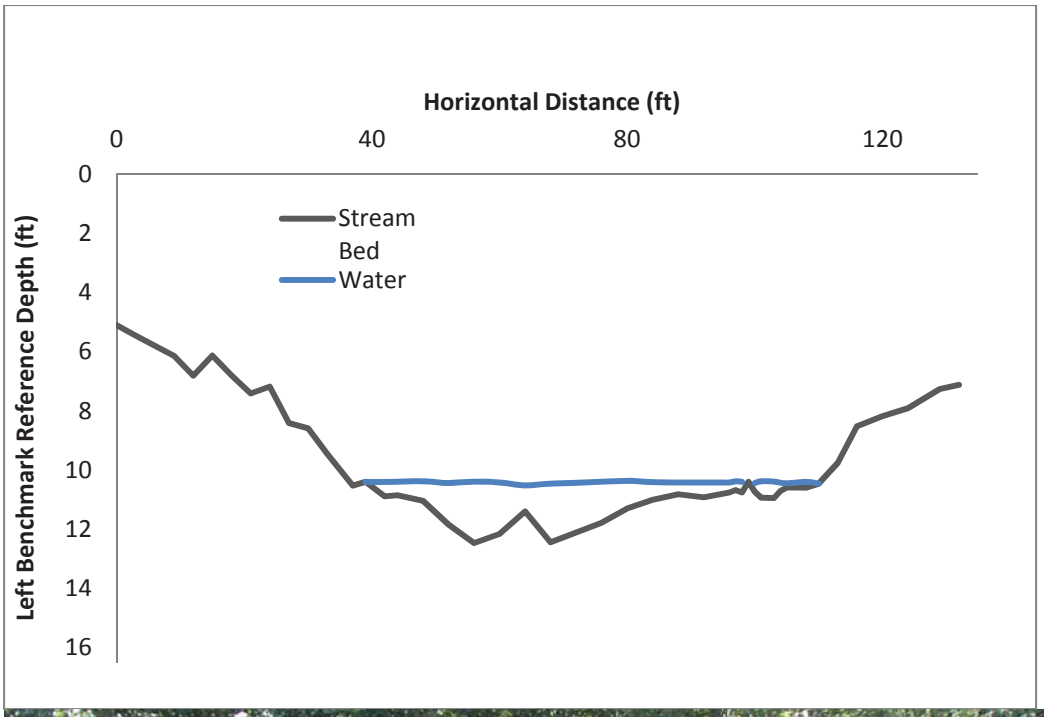

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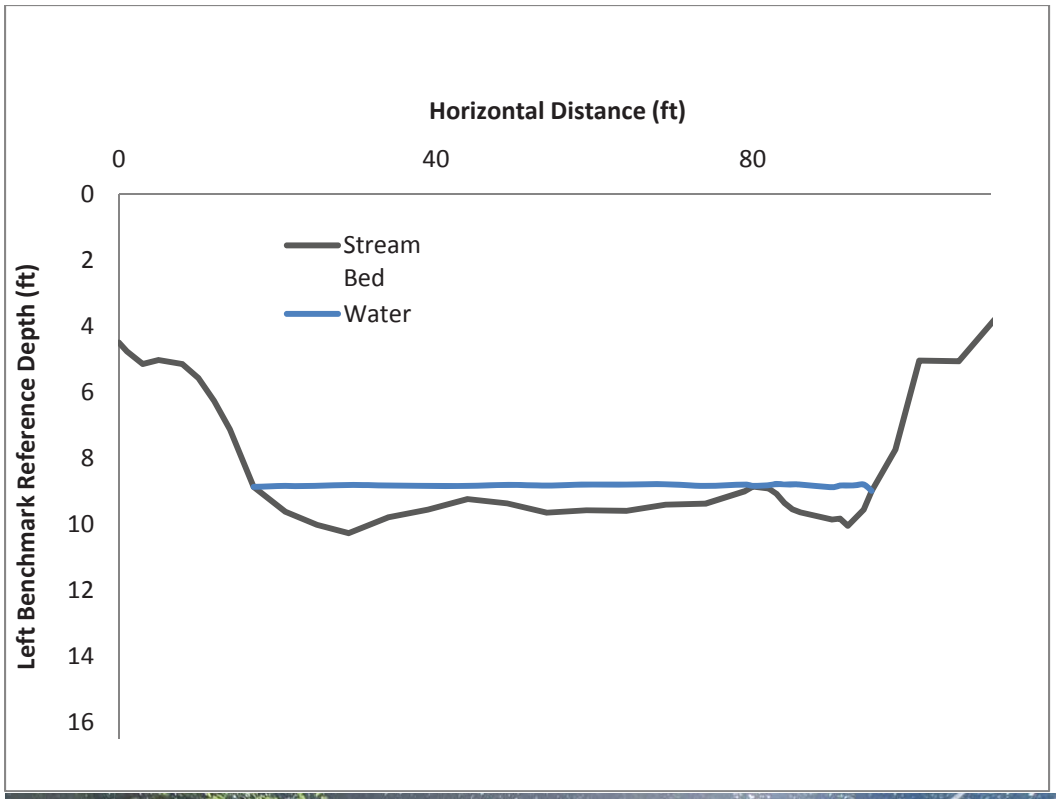

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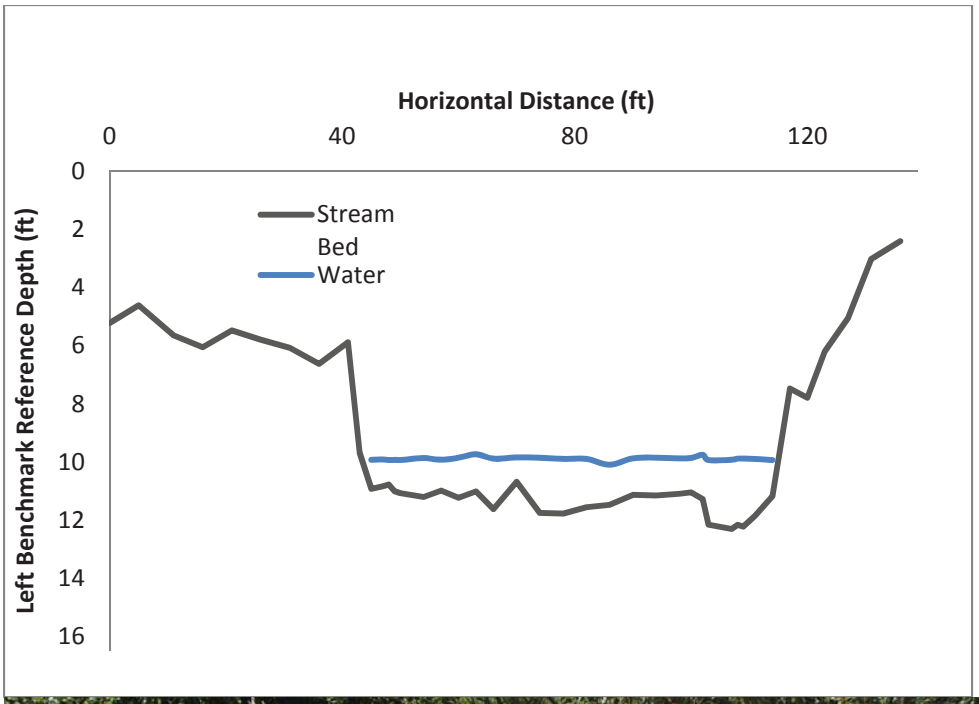

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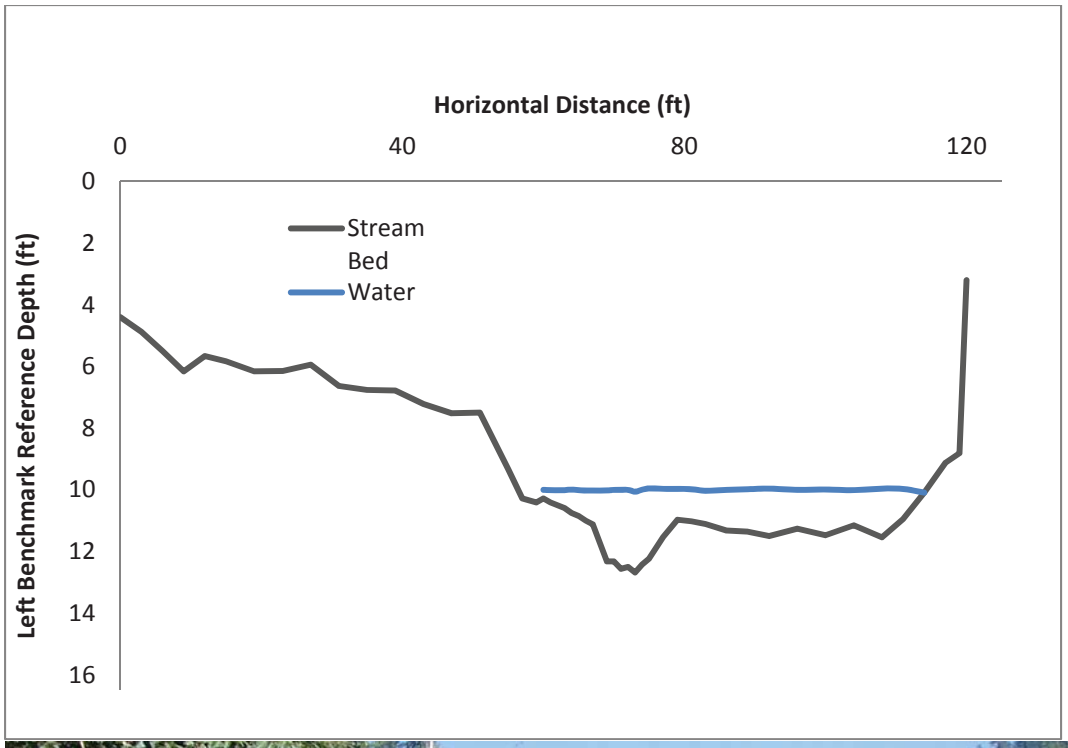

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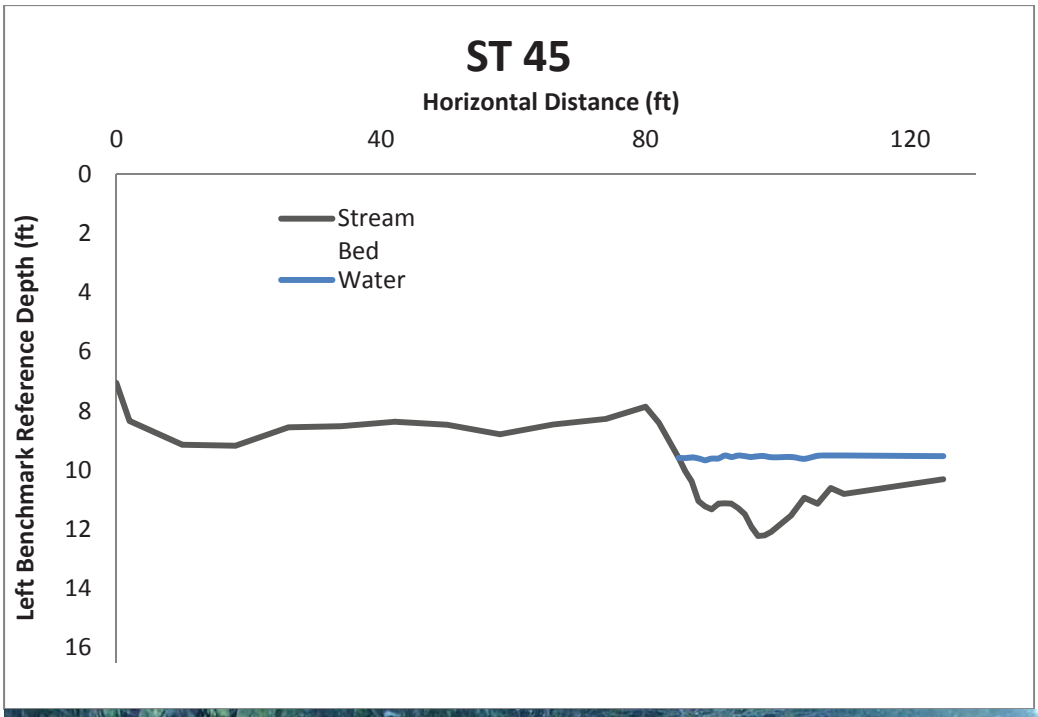

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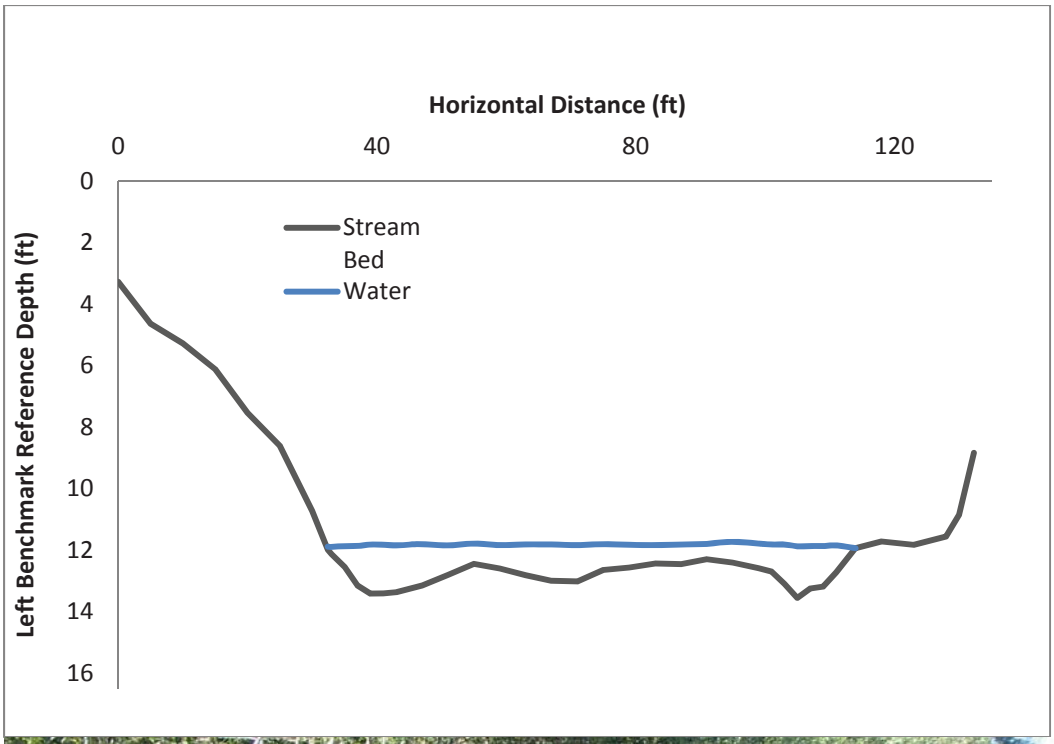

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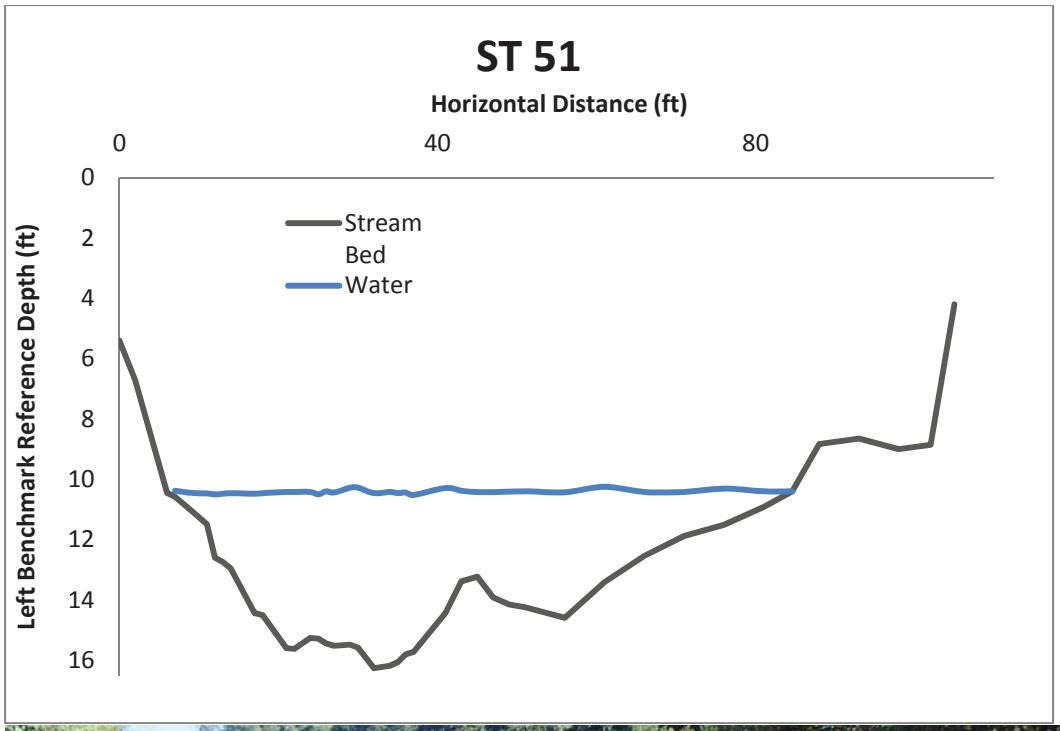

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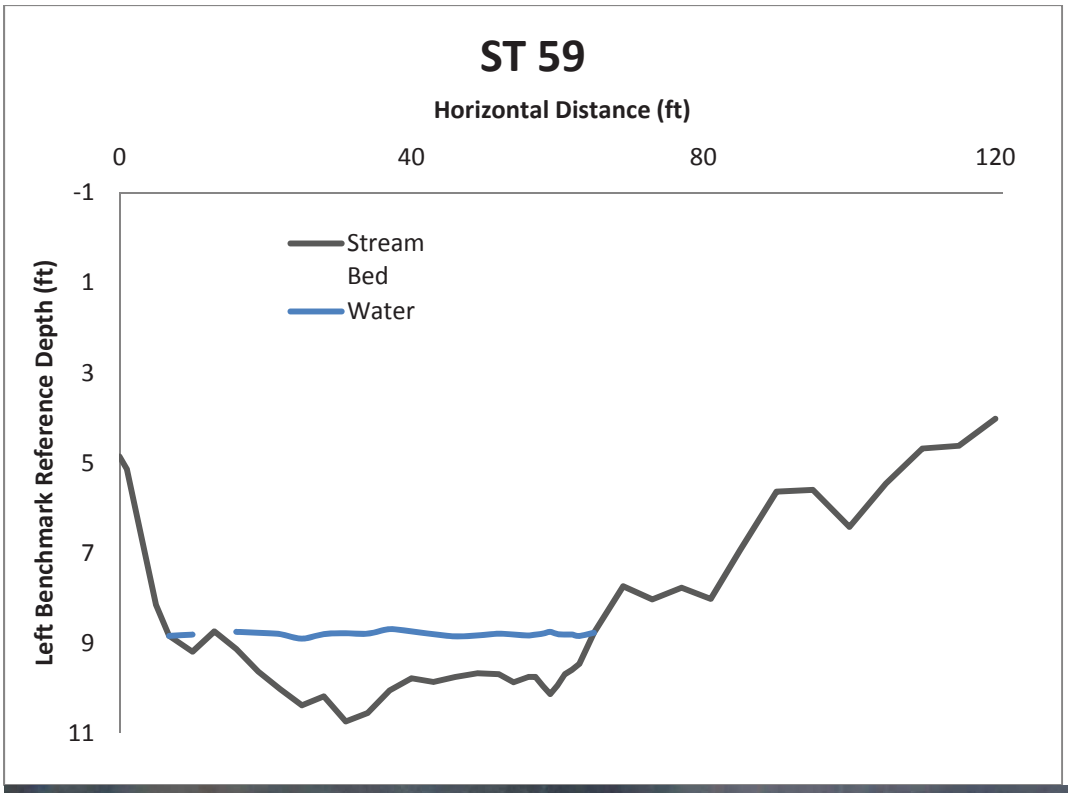

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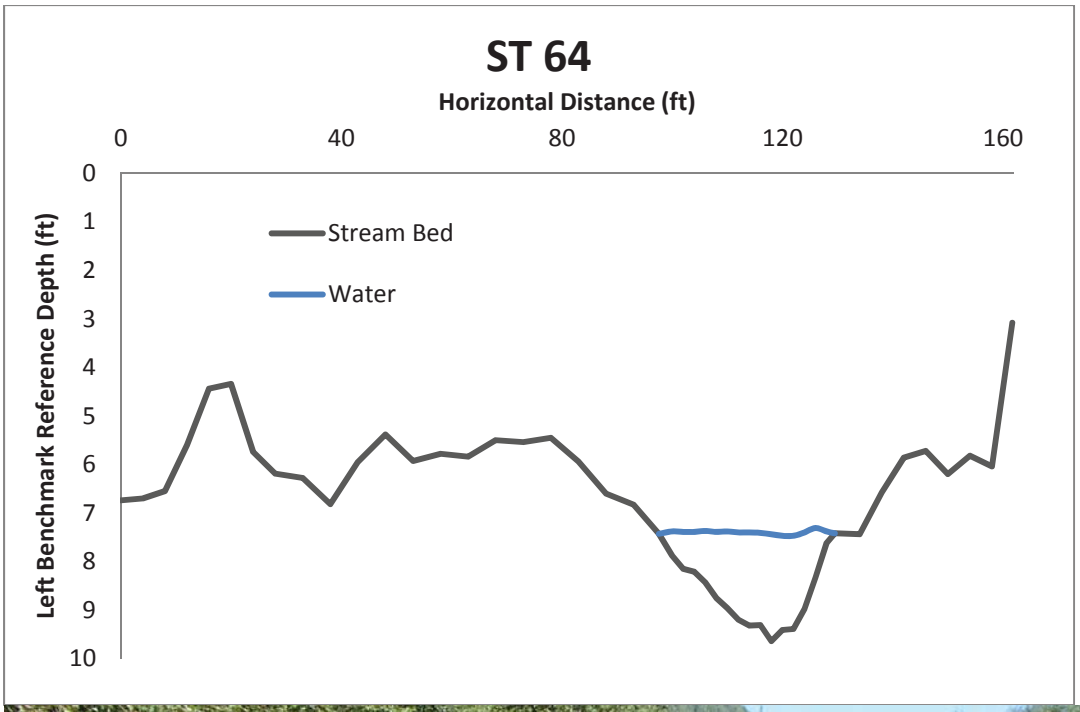
ST 64
Horizontal Distance (ft)
0
40
80
120
160
Left Benchmark Reference Depth (ft)
0
1
2
3
4
5
6
7
8
9
10
Stream Bed
Water