USFS, Gifford Pinchot National Forest

Mount St. Helens Ranger District. 2011

Project Title	Pepper Lewis Side Channel Restoration
Agency	US Forest Service Gifford Pinchot National Forest Mount St. Helens Ranger District
Project Manager	Adam Haspiel (360) 449-7833 ahaspiel@fs.fed.us
Project Approved By	Aquatic Coordination Committee
Project Funding	ACC Funding $41,300 USFS Funding $43,100 Partner Funding $ 2,000 **Project Total $86,400**
Project Description (work completed)	In 2011 the Gifford Pinchot National Forest used funds from PacifiCorp and Cowlitz PUD to furnish equipment, operators, and labor for construction of habitat restoration in a side channel of the Lewis River associated with Pepper Creek. Work included placing approximately 170 logs, most with rootwads attached, to create 16 complex structures to restore fish habitat. The structures were designed to alter stream flows and modify stream morphology, including pool depth, overhanging banks, and by slowing water to drop and capture mobile sediment. Work also included removing creosote timbers from a failed bridge located approximately 10 miles upstream, that were lodged in a log jam near the side channel. The project objectives were to: • Improve habitat complexity • Improve holding pools for juvenile salmonids • Improve overwintering habitat for resident species • Collect gravel and improve spawning habitat • Remove creosote timbers from a logjam

A 35 acre logging unit was developed as part of the Peppercat timber sale for instream restoration activities. The unit was thinned for the project using standard logging techniques such as chainsaws for cutting trees down, and pushing trees over with a logging shovel to keep the tree bole intact with rootwad. Trees were transported via log trucks to a staging areas at the end of a spur road about ¼ mile downstream of the project area. Trees were transported to the project site from the staging area with a rubber tired skidder that followed the banks of the Lewis River.

Approximately 8 to 12 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 30 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 40 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, such as pool creation or collection of spawning gravels.

Partners

Mount St. Helens Institute. The Mount St. Helens Institute monitored the reach for thalweg changes, and established baseline data for sediment and cross-sectional morphology in 2012, using two undergraduate interns and the Youth Stream Team.

Surveyors used Stream Channel Reference Sites (Harrelson et. al., 1994) as the standard surveying protocol. Cross-sectional benchmarks were established above margin structures to capture the effect of pool formation or gravel capture depending on the

	structure intent. The Mount St. Helens Institute utilized two undergraduate interns to assist with surveying. Interns not only provide needed assistance with data collection, but also provide necessary hands-on experience with environmental surveying. **PacifiCorp and Cowlitz PUD.** The utilities funding for the project.
Workforce	Adam Haspiel, USFS Fisheries Biologist Bryce Michaelis, USFS Fisheries Technician
Contractors	O'Malley Brothers Corporation Gresham Oregon
Problems Encountered	Some equipment used for logging was old and thus broke down more often than desired.

Figure 1. Picture of some of the creosote timbers removed from the logjam. Timbers were disposed of properly at a hazardous waste facility

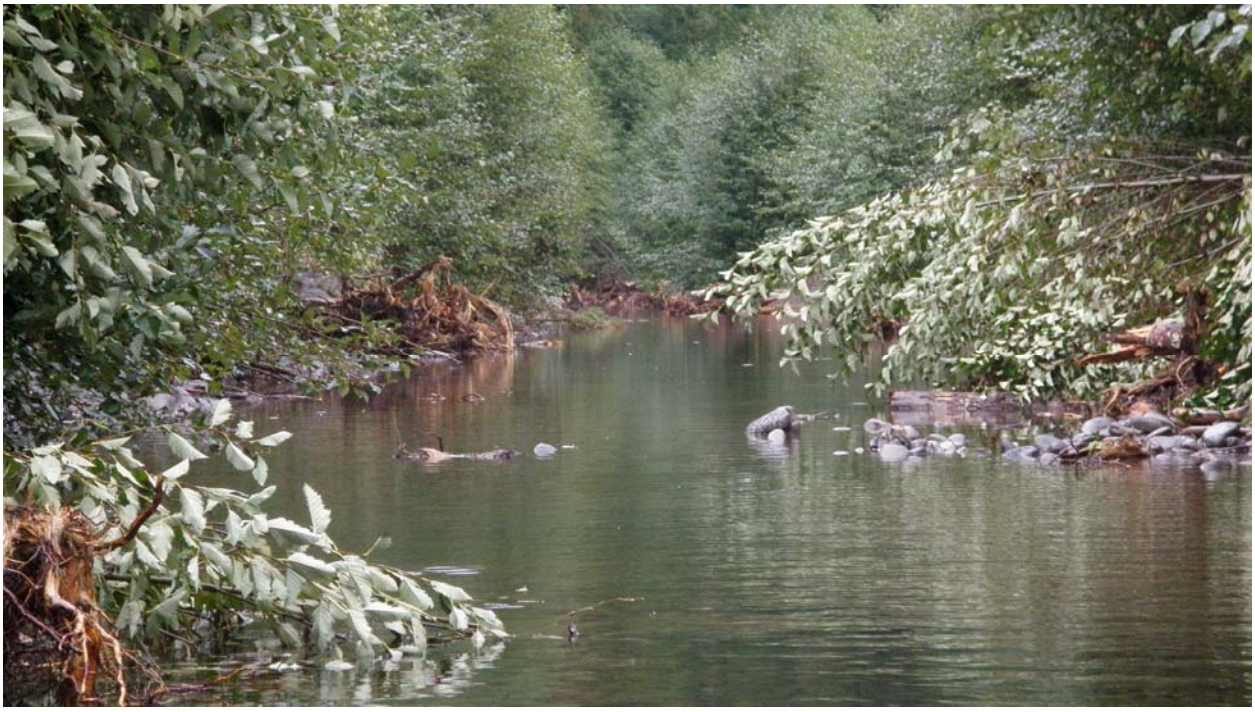

Figure 2. Section of Side Channel with installed structures.

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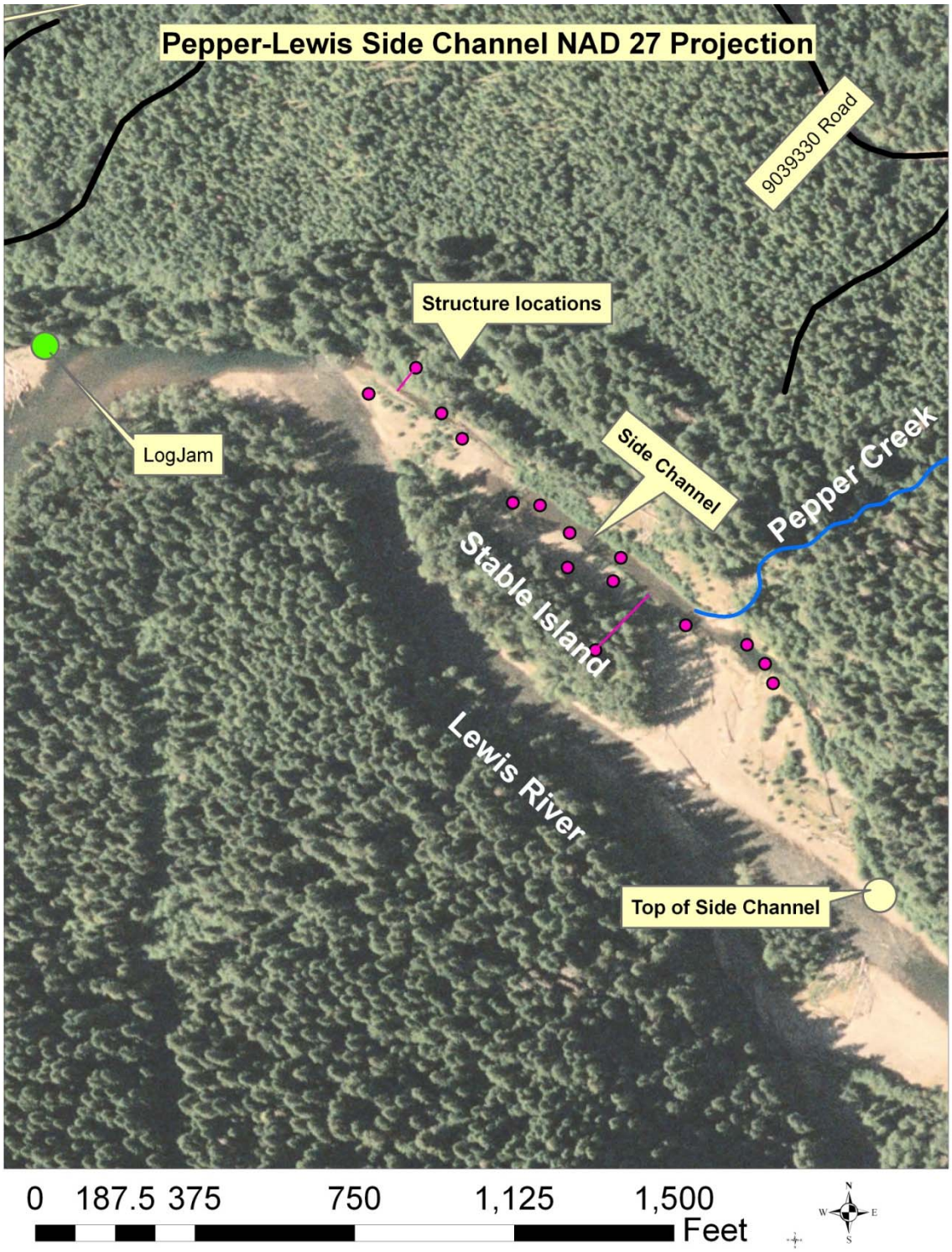

Pepper Lewis Side Channel Instream Habitat Restoration

Monitoring Report December 2012

Prepared by Abigail Groskopf
Mount St. Helens Institute
For the Mount St. Helens National Volcanic Monument
Gifford Pinchot National Forest

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Executive Summary

The object of the 2011 instream restoration on the Pepper-Lewis side channel was to improve habitat and holding pools for juvenile salmonids (coho, spring Chinook, and steelhead trout) and to improve overwintering habitat of resident species. In addition, restoration efforts were intended to collect gravel, create rearing pools, provide habitat complexity and create spawning opportunities. Over 170 pieces of Large Woody Material (logs and logs with rootwads) were installed on stream margins throughout the 1/3 mile side channel. The stream reach was surveyed longitudinally prior to installations; however, due to insufficient time cross-sections and pebble counts were not assessed. During the 2012 field season, Mount St. Helens Institute staff re-surveyed the reach longitudinally, installed 16 benchmarked cross-sections and assessed substrate at each cross-section. All 16 structures are still in place and there has been no significant movement of large woody material. A longitudinal survey from prior to the installation compared with a longitudinal survey one year after (2012) shows very little stream bed change; however, it typically takes at least 3 to 4 years for morphological change to take place (Gerstein, 2005). Approximately 700 feet of the upper side channel was dry during summer base flows; here isolated pools contained juvenile coho. Monitoring should continue on a 3 to 5 year rotation to identify on-going morphological change.

This report was designed to present background information and baseline data. PacifiCorp and Cowlitz PUD provided funding for the instream work. Monitoring was done using grant funds and in-kind contributions.

Site Description

Habitat restoration efforts occurred on a side channel of the Lewis River about two miles upstream from Eagles Cliff Bridge on Swift Reservoir. The side channel occurs at the confluence of Pepper Creek and the Lewis River. The site is accessed from USFS Rd 9039.

The site was selected based on previous snorkel surveys that identified coho at the mouth of Pepper Creek and coho redds in the side channel.

This side channel is approximately 1/3 of a mile long. During summer base flows, the upper end of the side channel is disconnected from the mainstem. With the exception of isolated pools (5 pools in 2012), the first 740 feet were dry during summer months in 2011 and 2012; during low flows the upper end of the side channel is disconnected from the mainstem, however Pepper Creek provides flows below its confluence with the side channel. Deep pools with margin structures occur for approximately 500 feet upstream from the Pepper Creek confluence. Overall the side channel is characterized by pools, runs and toward the mouth, by riffles.

Project Description

The project objectives are to:

- Improve habitat complexity
- Improve holding pools for juvenile salmonids
- Improve overwintering habitat for resident species
- Collect gravel and improve spawning habitat

In 2011, 16 large woody material structures were installed on stream margins in order to meet these objectives. The structures were designed to alter stream flows and modify stream morphology, including pool depth, overhanging banks, and by slowing water to drop and capture mobile sediment.

The Mount St. Helens Institute monitored the reach for thalweg changes, and established baseline data for sediment and cross-sectional morphology in 2012, using two undergraduate interns. Surveyors used Stream Channel Reference Sites (Harrelson et. al., 1994) as the standard surveying protocol. Cross-sectional benchmarks were established above margin structures to capture the effect of pool formation or gravel capture depending on the structure intent.

The Mount St. Helens Institute utilized two undergraduate interns to assist with surveying in 2012. Internships not only provide needed assistance with data collection, but also provide necessary hands-on experience with environmental surveying.

2012 Monitoring Results

Longitudinal Profile

Due to a changing thalweg, the longitudinal profiles between 2011 and 2012 were not perfectly aligned; however, this shows morphological change, especially below Structure #3. Note the long run between Structure #8 and Structure #3 in Figure 1. This run may be in part due to the mouth of Pepper Creek. Also note the riffle-pool profile near the Lewis River confluence.

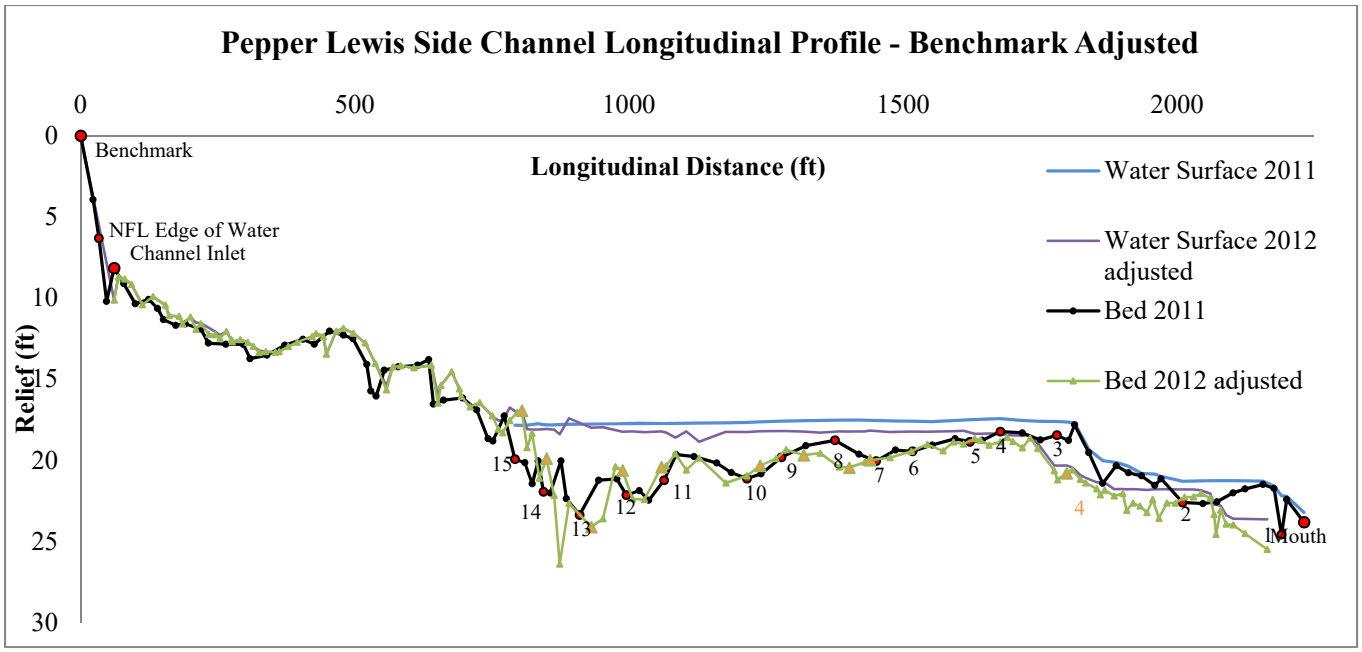


Figure 3: Pepper Lewis Longitudinal Profile for 2011 and 2012

Overall, there is a pool to riffle ratio of 69% pools to 31% riffle, with 949 feet of pool habitat, comprised of 21 pools, and 410 feet of riffle length. This includes the long run as a pool or slow water habitat unit. There is little noticeable change in the profile but it may take multiple years for structures to influence stream dynamics in a side channel.

Figure 4 Above Structure #4 looking downstream to cobble riffle unit

Figure 5 Above Structure 10 looking downstream at long run

Substrate

Overall, sediment median particle size is within the range of use by salmonids, with a D50 of 54.55 mm. However 20% of observed particles are fine (<2mm). In addition, observed particle sizes display bimodal distribution of fines and cobbles at 9 of 15 cross-sections surveyed. This high level of fines and bimodal distribution of sediment sizes could result in the filling of interstitial spaces potentially decreasing redd success and marcoinvertebrate populations.

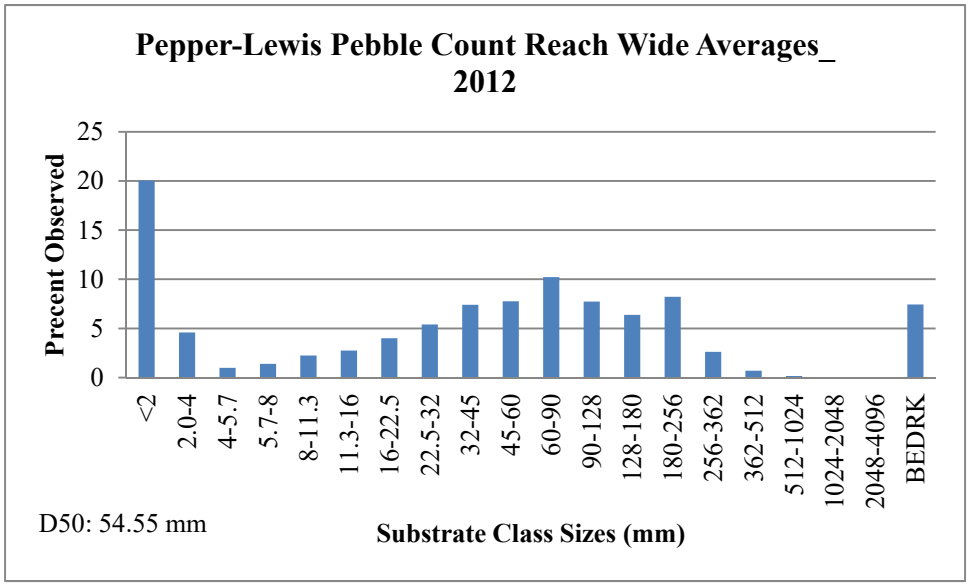


Figure 6 Substrate size percentages observed

Cross-sections

Permanent benchmarked cross-sections were established above each margin structure. See figure 5 for how these are flagged, identified and benchmarked. Data from monitoring in subsequent years can be overlaid on the 2012 cross-sectional graphs to identify and quantify changes in bedform. Analysis of other cross-sectional matrices (wetted width etc.) were not accomplished in 2012 but could be accomplished in other years. Graphs and raw data in Excel is available through the Mount St. Helens Institute and the Mount St. Helens National Volcanic Monument Aquatics staff.

Figure 7 An example of cross-section benchmarks, flagging and rod placement

Table 1: Channel characteristics at each structure's cross-section survey

ST	BKF_W (ft)	BKF_D (ft)	Wetted_W (ft)	Wetted_D (ft)
1	35.4	1.67	11.6	0.44
2	35	2.78	17.5	0.94
3	21	1.43	9.7	0.34
4	31.5	1.07	17	0.3
5	52.3	2.57	31.3	0.89
6	56.8	2.5	32.7	1.14
6.5	51.9	3.55	35.4	1.83
7	45.5	3.32	28.6	1.82
8	38.1	2.55	24.8	1.47
9	41.7	3.02	30.3	1.54
10	40.5	3.38	34	2.6
11	42.6	4.2	27.2	3.08
11.5	39.1	4.18	24.6	3.21
12	28.5	4	27.5	2.48
13	27.5	7.86	22.8	6
14	42.5	5.81	39.7	3.07
15	32.4	1.71	4	0.04

Conclusions

USFS installed 16 margin structures designed to improve rearing habitat for juvenile salmonids, particularly coho in a side channel of the Lewis River, at the confluence of Pepper Creek. The project was completed in 2011 and monitored the following season, in 2012.

Overall, all LWM stayed within the reach and within each designed structure. There was very little change in bedform and particle sizes exhibit bimodality. The results from future monitoring – in 2013 or again in 2015 – will better show the effectiveness of the project in obtaining the desired objectives.

References

Gerstein, J.M. 2005. *Monitoring the Effectiveness of Instream Habitat Restoration.* University of California, Center for Forestry, Berkeley, CA. 45 pp.

Harrelson, Cheryl C; Rawlins, C. L.; Potyondy, John P. 1994. Stream channel reference sites: an illustrated guide to field technique. Gen. Tech. Rep. RM-245. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 61 p.

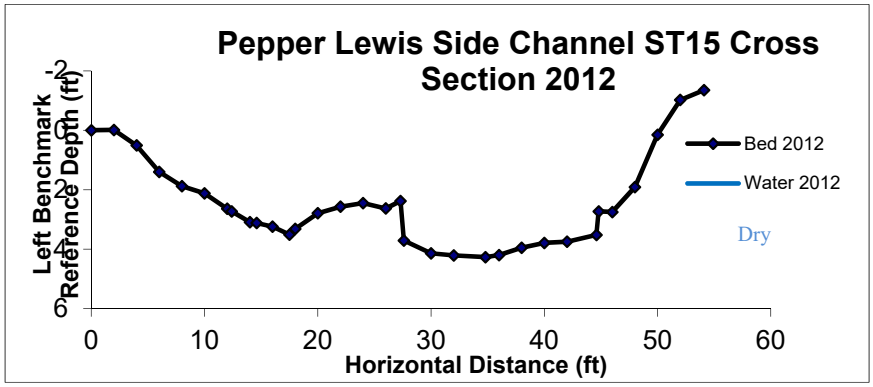
Appendix A: Structure Photographs and Graphs

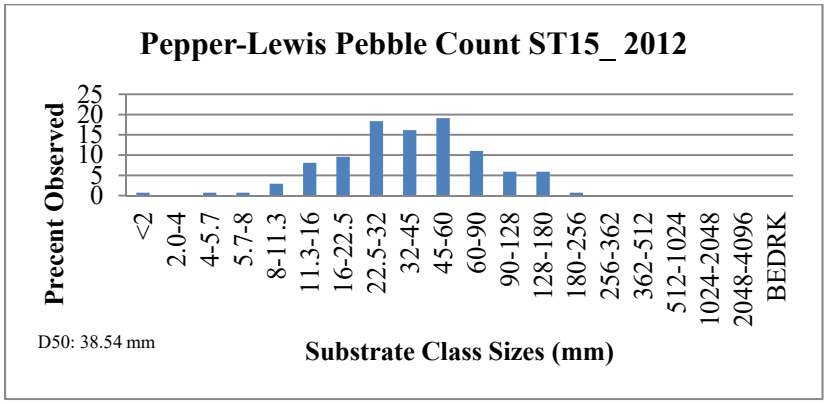
Figure 8 Longitudinal Profile benchmark (BM) on right bank (RB)

Figure 9 Upper end of side channel; note dry and disconnected from North Fork Lewis River mainstem

Structure 15

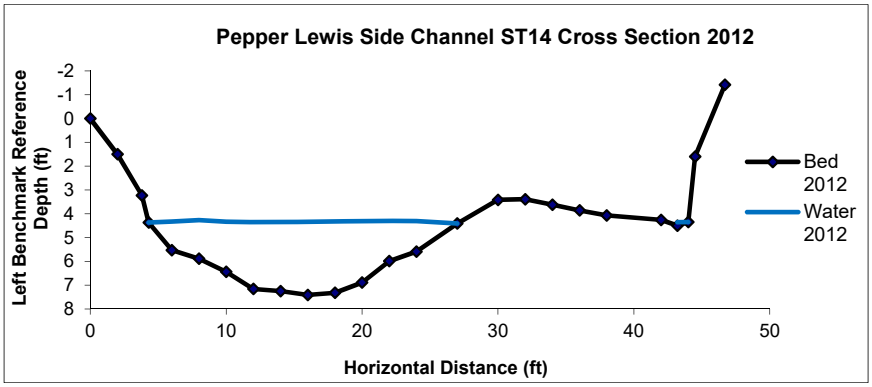
Figure 10 : Structure (ST) 15 on RB looking to left bank (LB)

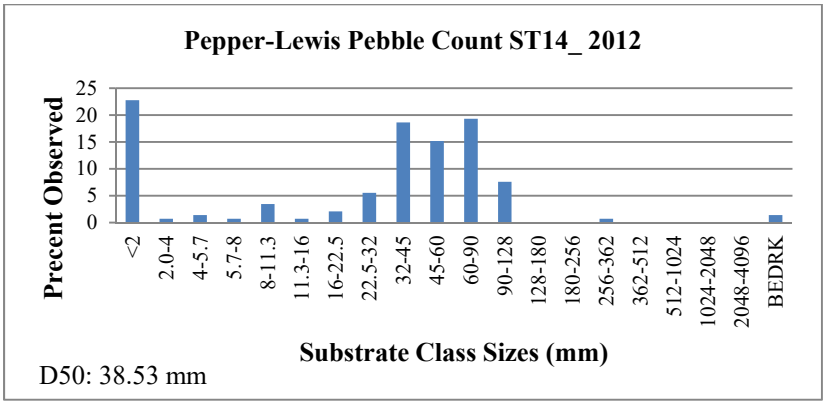




Structure 14

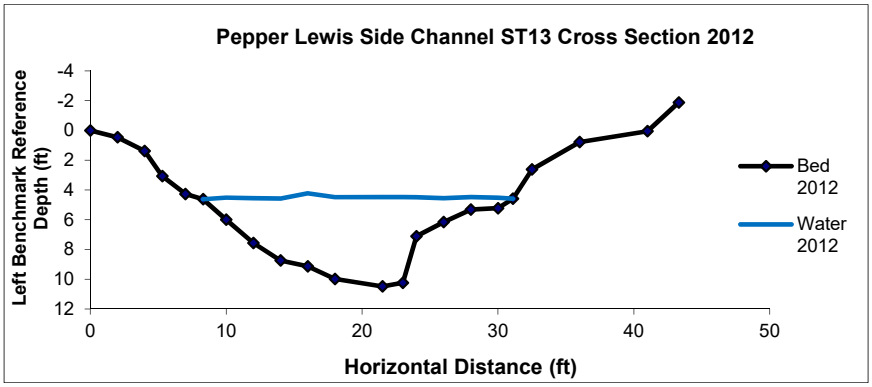
Figure 11 ST 14, above ST looking downstream; note deep pool





Structure 13

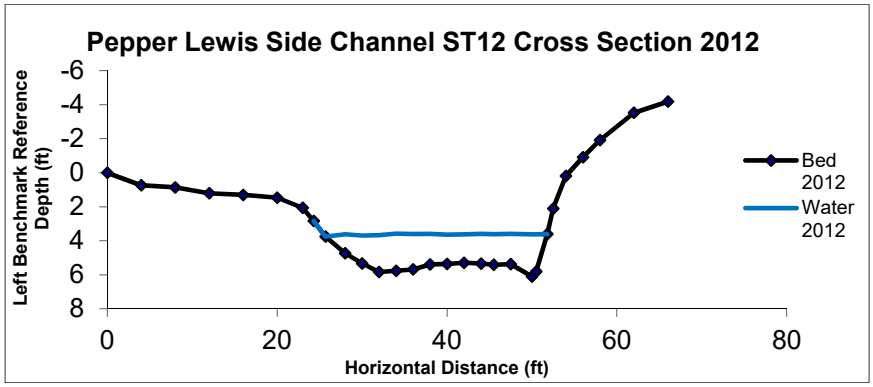
Figure 12 ST 13 on LB to RB

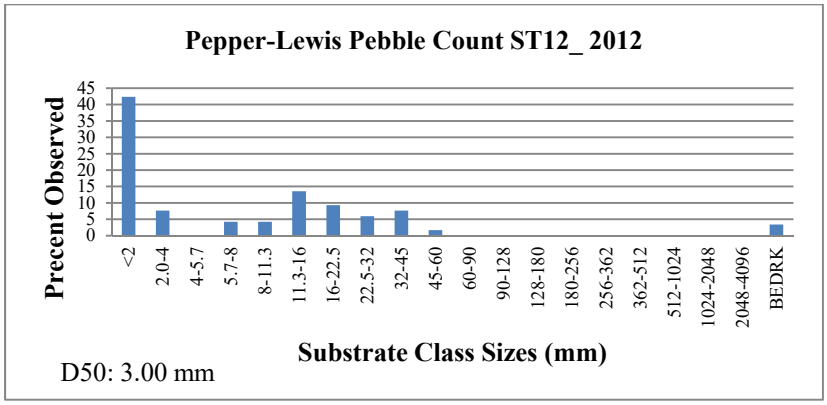


*No pebble count because of water depth

Structure 12

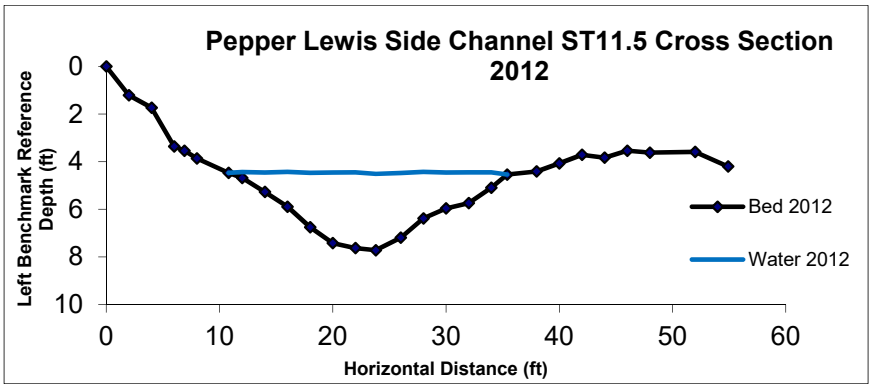
Figure 13 ST 12 on LB looking to RB

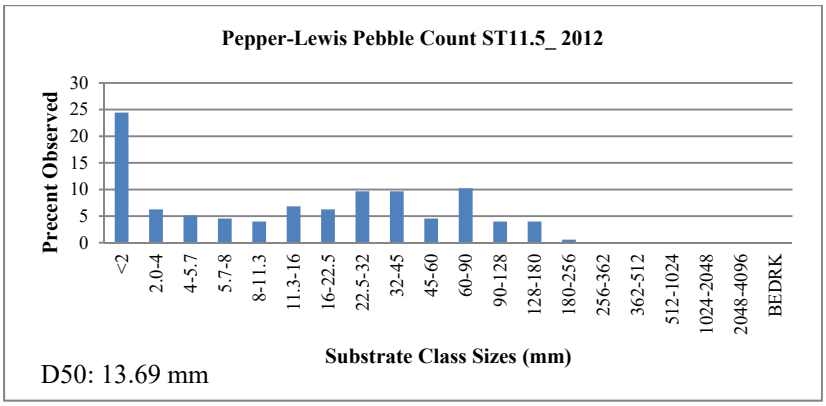




Structure 11.5

Figure 14 ST 11.5, on RB looking to LB, just above Pepper Creek confluence

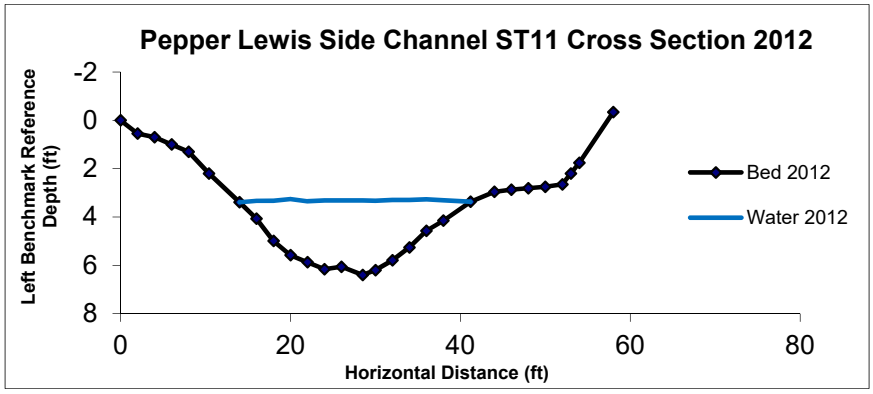


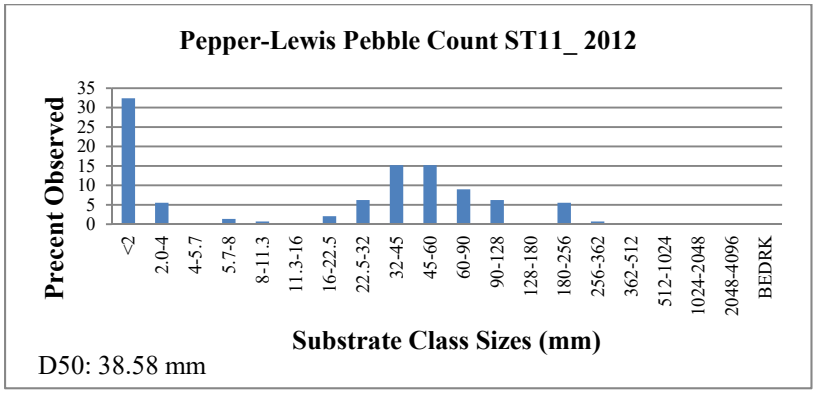


D50: 13.69 mm

Structure 11

Figure 15 ST 11 above structure looking downstream

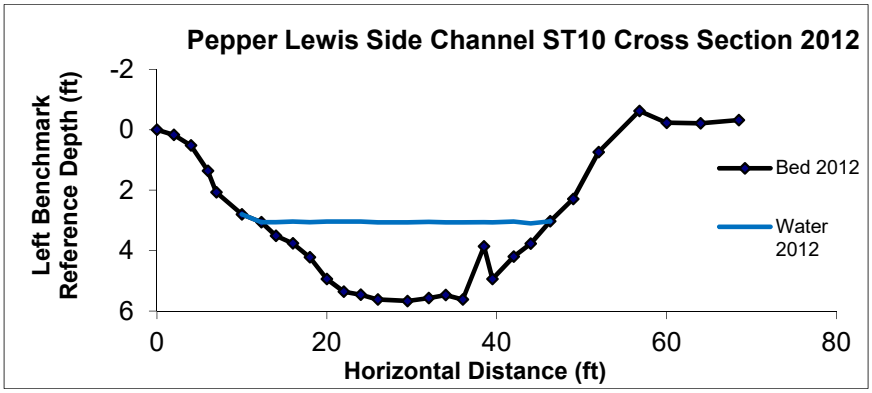


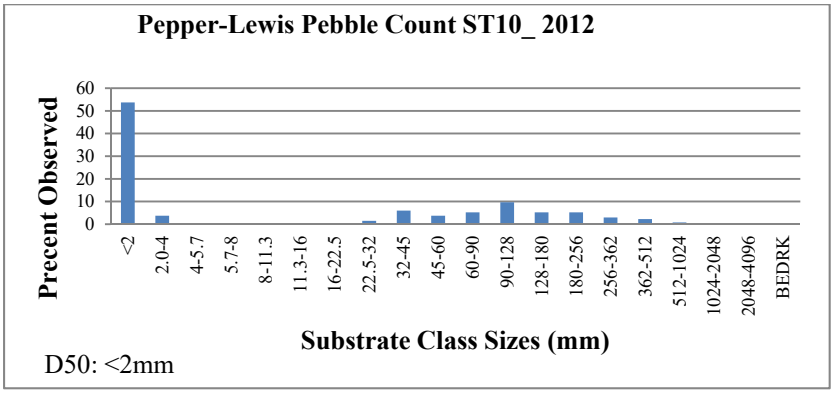


D50: 38.58 mm

Structure 10

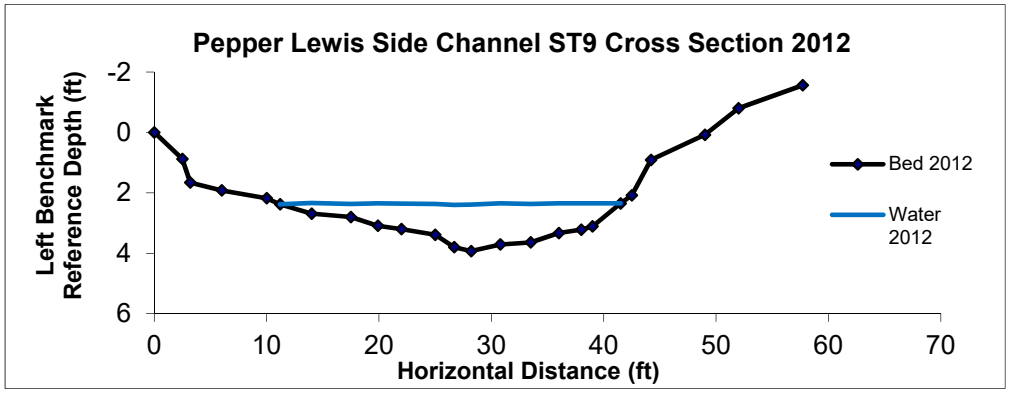
Figure 16 ST 10 below structure looking upstream; ST 10 on left

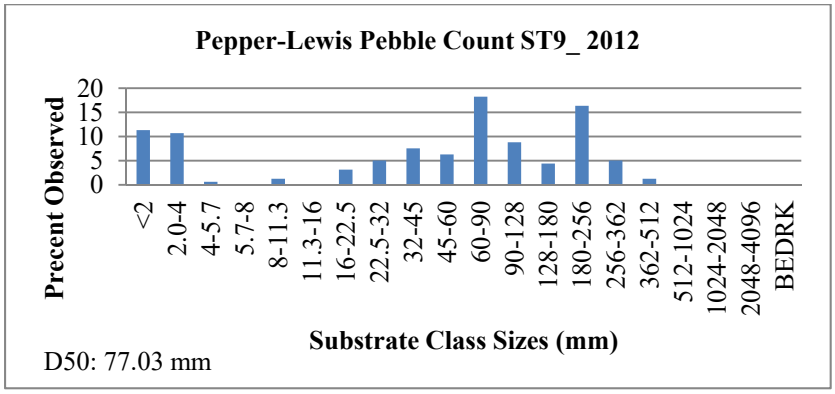




Structure 9

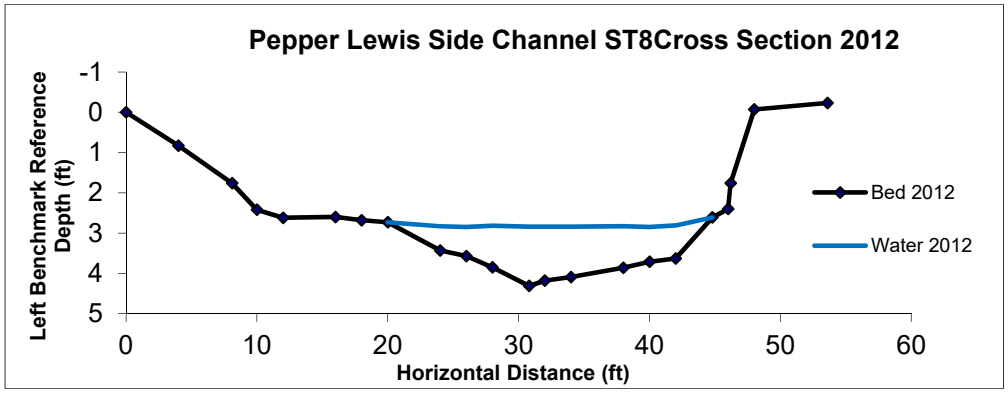
Figure 17 ST 9 from RB looking to structure on LB

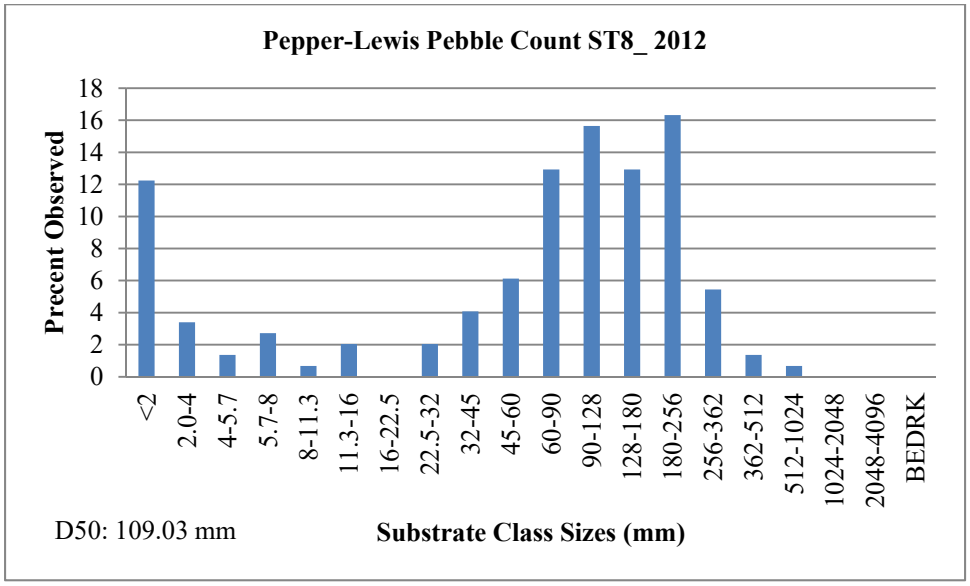




Structure 8

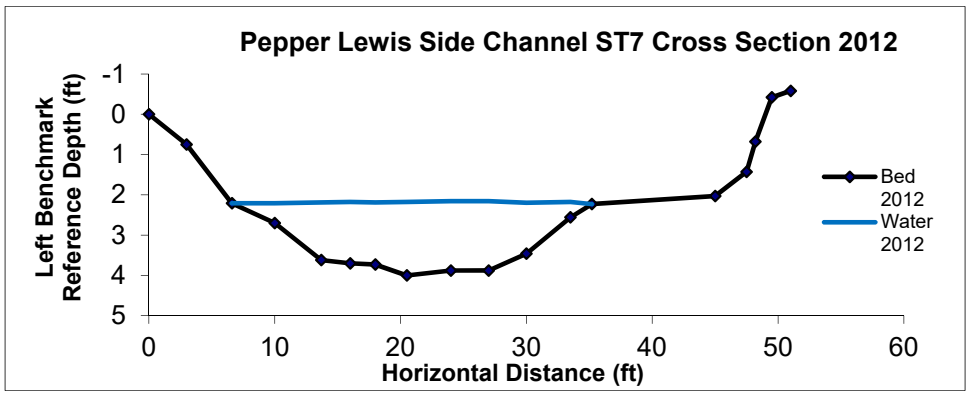
Figure 18 ST 8 on LB looking to RB

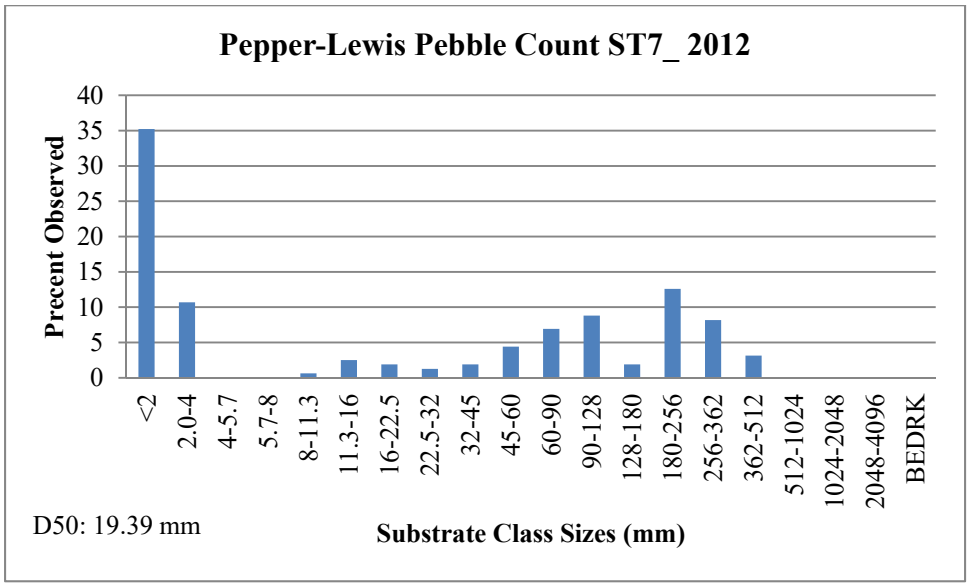




Structure 7

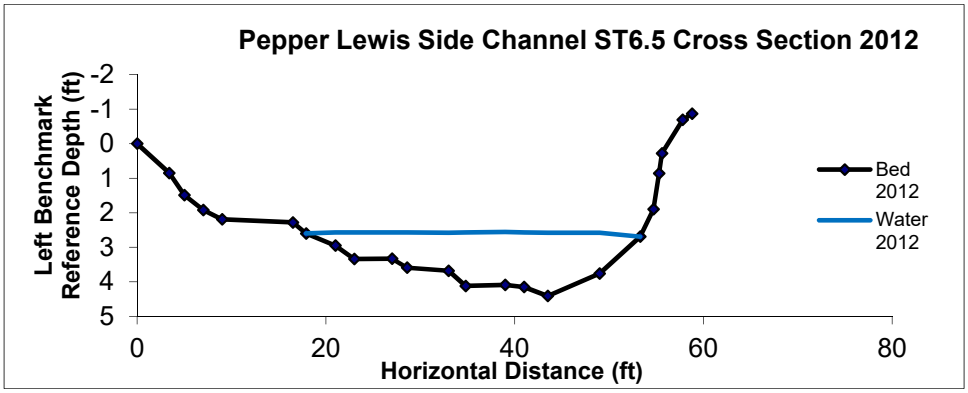
Figure 19 ST 7 above structure looking downstream

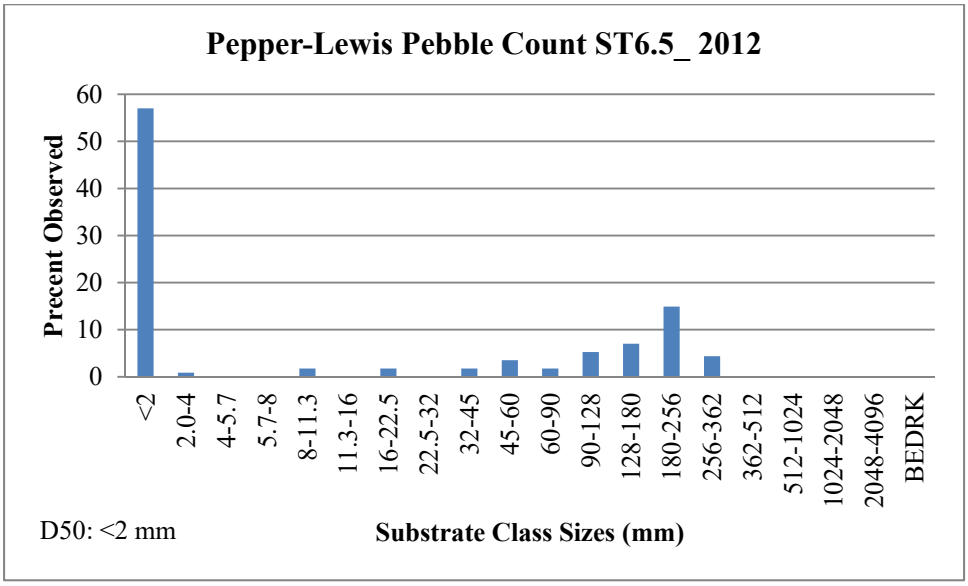




Structure 6.5

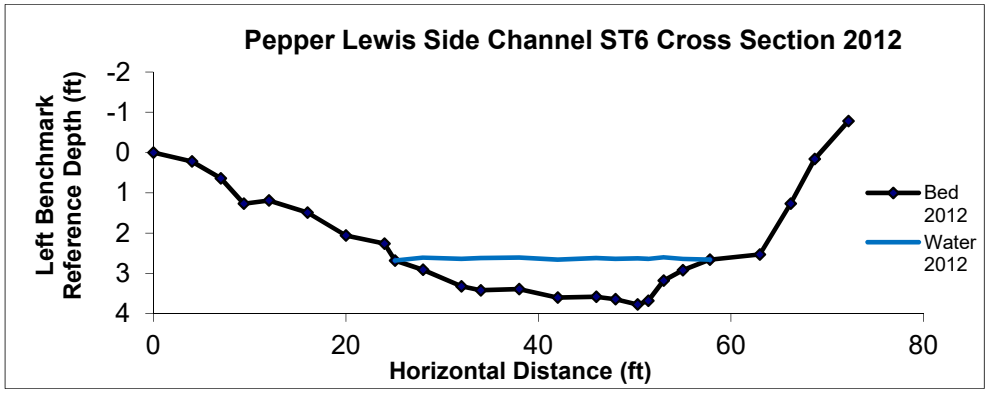
Figure 20 ST 6.5 on LB looking to RB

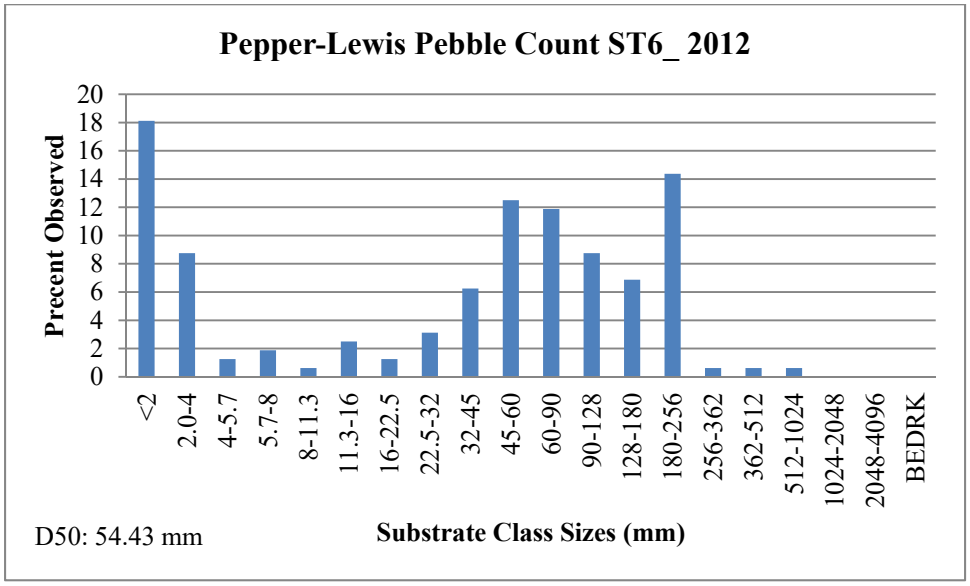




Structure 6

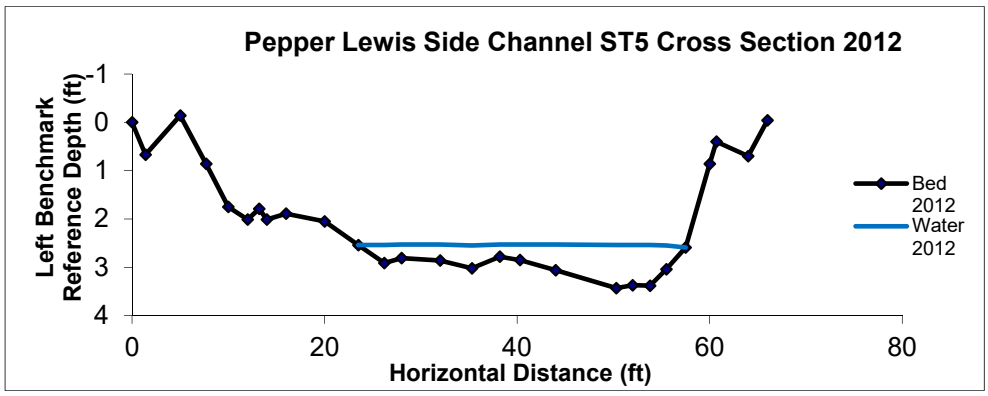
Figure 21 ST 6 above structure looking downstream

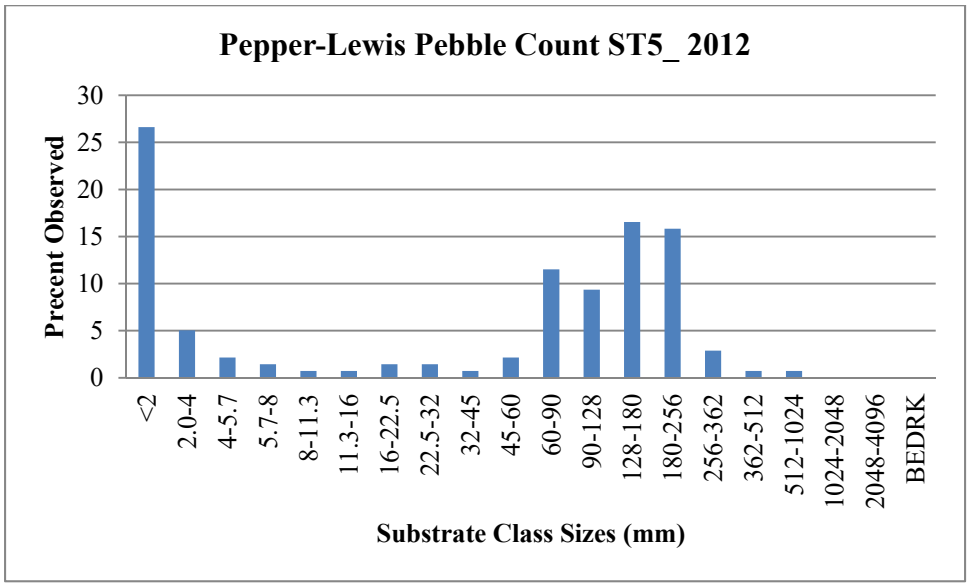




Structure 5

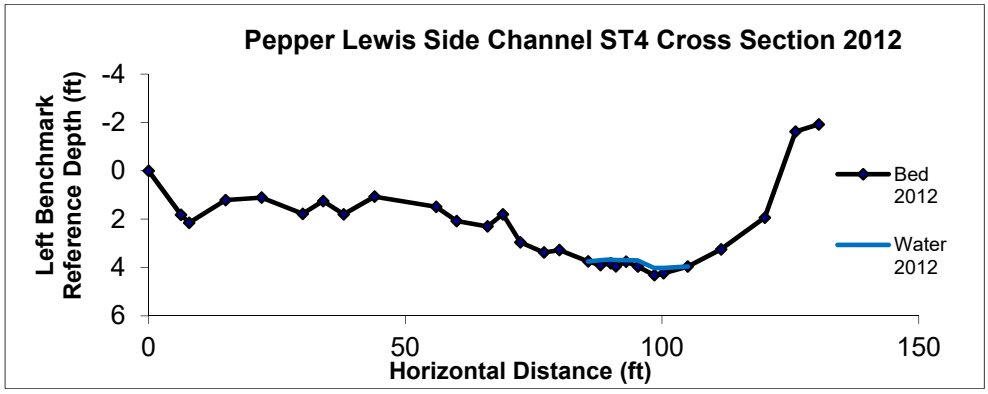
Figure 22: ST 5, on RB looking to ST on LB

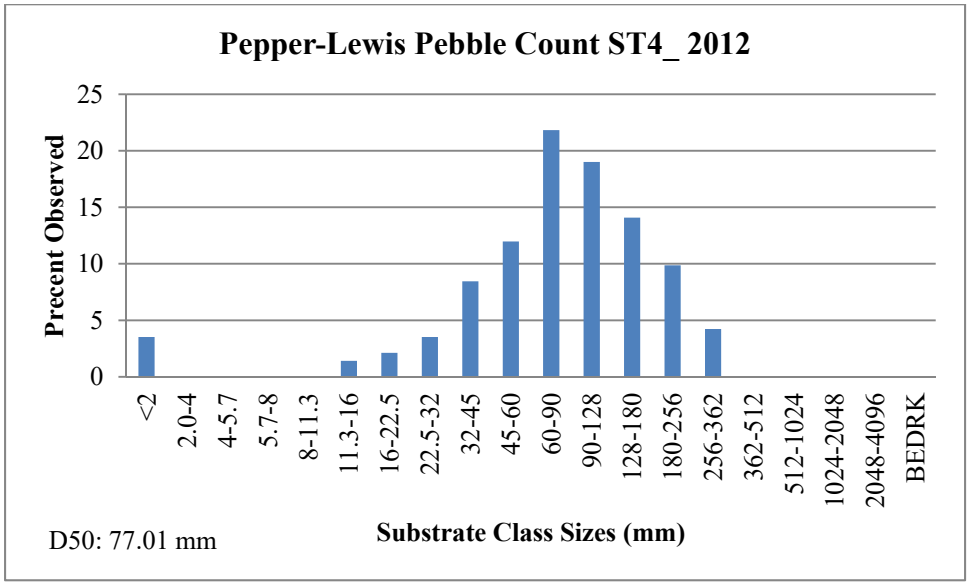




Structure 4

Figure 23 ST 4, above ST looking downstream





Structure 3

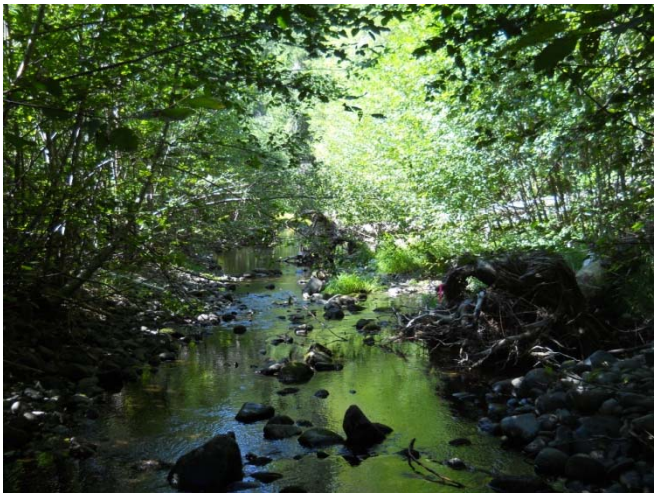
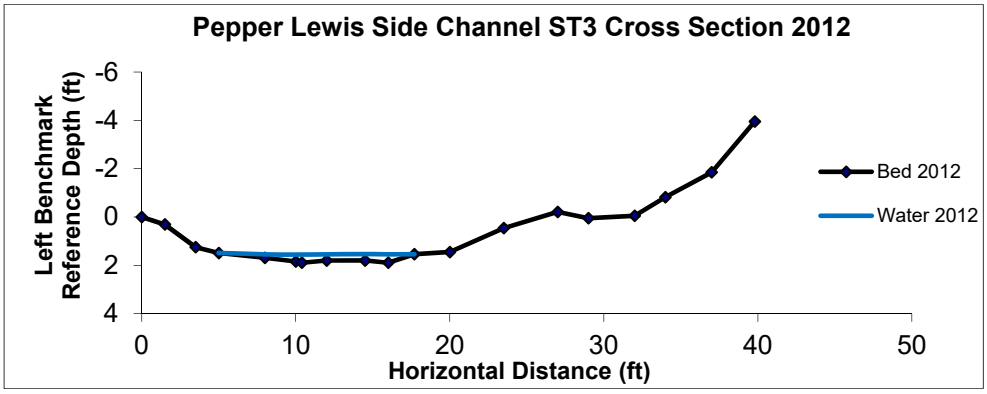
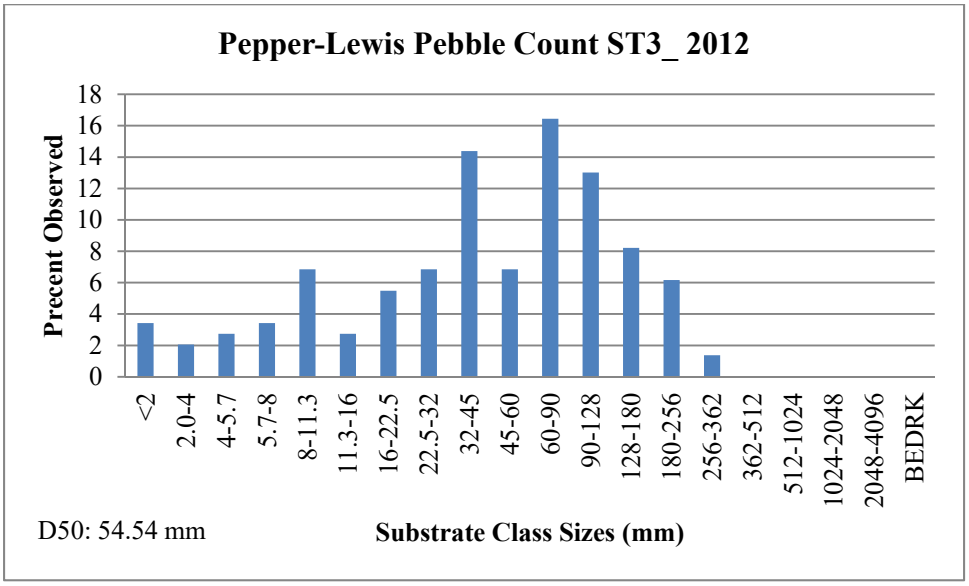


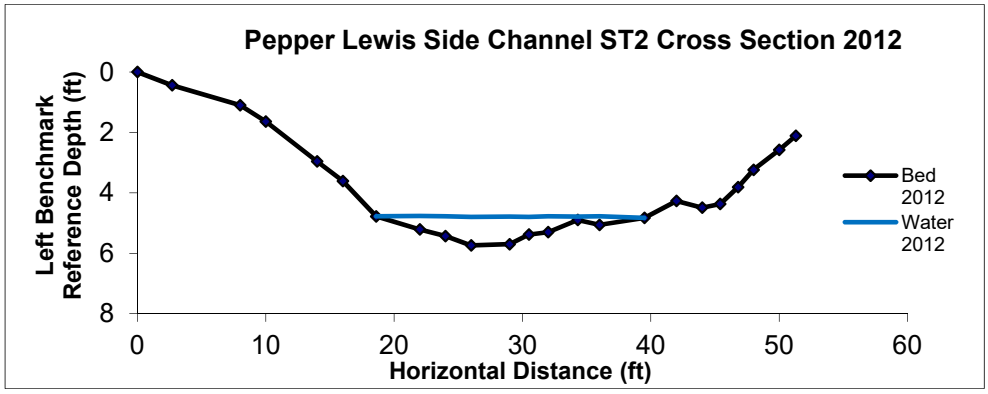
Figure 24: ST 3, above ST looking downstream; ST on RB

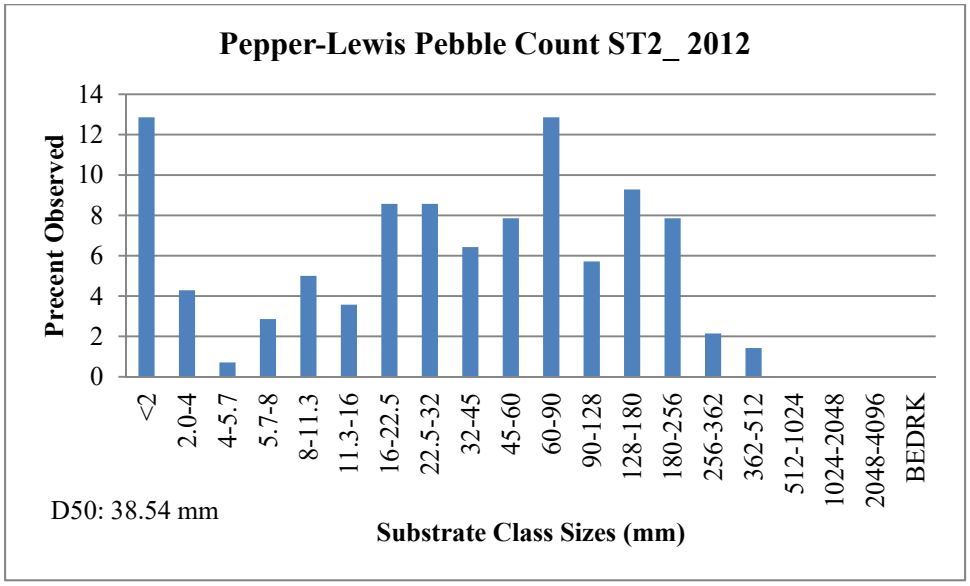




Structure 2

Figure 25 ST 2, on LB looking to RB





Structure 1

Figure 26 ST 1, below ST looking upstream