

Lewis River Aquatic Fund Projects (SA 7.5.3.2)

Project Closeout Report

Project Title:	Lewis River Hydroelectric Project 2013 Bull Trout Habitat Restoration Project ID Assessment
Project Approved By:	Aquatic Coordination Committee March 26, 2013
Original Project Sponsor:	Adam Haspiel (US Forest Service) Abigail Groskopf (Mount St. Helens Institute)
Project Funding	<ul style="list-style-type: none">• \$59,226.00
Project Description (work completed):	<ul style="list-style-type: none">• Collected and synthesized existing bull trout data. (2013)• Deployed temperature data loggers in cold water streams. (2013 & 2014)• Conducted habitat survey data in Pine Creek• Conducted spawning surveys (2013 & 2014)• Develop study design for data collection (2014)• Conduct habitat parameter surveys (2014 known use & 2015 scoping).• Completed data summarization (2016) and Reporting• Developed conceptual project scoping designs (2017)
Workforce:	<ul style="list-style-type: none">• US Forest Service• US Fish and Wildlife Service• WA Department of Fish and Wildlife• PacifiCorp• Cowlitz Indian Tribe• Lower Columbia Fish Recovery Board• Mount St. Helens Institute
Schedule Summary:	Planned Completion Date: Spring 2015 Actual Completion Date: Fall 2017
Problems Encountered:	<ul style="list-style-type: none">• In October 2013 the US government shutdown delayed 2013 spawning surveys because of a lack of transportation for the field crew. As a result, all project activities were delayed one year.• Additionally, the project saw significant personnel changes between 2013 and 2017 resulting in minor delays and new personnel became acquainted with the project.

Things that went well:

- Diverse partners provided collaborative approach throughout the project.
- Habitat surveys identified unique habitat characteristics specific to Lewis River Bull Trout.
- Project allowed for additional partnership to conduct eDNA sampling throughout the basin.
- Completed detailed habitat surveys in previously under-surveyed reaches.
- Model of key habitat characteristics in the basin.

Work Not Completed:

- All work identified in the project proposal has been completed.

Lessons Learned:

- In addition to cold water, bull trout spawning occurs with increased channel complexity and at stream margins with appropriate depths (15-20 cm).
- While there is no quick fix to improve habitat conditions for bull trout there are restoration options to improve connectivity to cold-water habitats.

*** Attachments (Photo Documentation):**

- 2015 BT MSHI 6. CL 24. Clear Creek HabID 24
- 2015 BT MSHI 20. CW. 96. Clearwater HabID 96
- 2015 BT MSHI 28. D 26. Drift Creek HabID 26
- 2015 BT MSHI 37. SM 1. Smith Creek HabID 1

*(Per National Marine Fisheries Service's Biological Opinion for Relicensing of the Lewis River Hydroelectric Projects):

Identify process or methodology the project will include and provide photo documentation of habitat conditions at the project site **before, during, and after** project completion.

- a. Include general views and close-ups showing details of the project and project area, including pre- and post-construction.
- b. Label each photo with date, time, project name, photographer's name, and documentation of the subject activity.



Photo 1. Clear Creek HabID 24



Photo 2. Clearwater HabID 96



Photo 3. Drift Creek HabID 26



Photo 4. Smith Creek HabID 1

Lewis River Aquatic Fund Projects (SA 7.5.3.2)

Project Closeout Report

Project Title: Lewis River Hydroelectric Project
Lewis River Side Channel 5

Project Approved By: Aquatic Coordination Committee
March 26, 2013

Original Project Sponsor: U.S. Forest Service

Project Funding • \$88,000

Project Description (work completed):

- NEPA completed.
- Project designs completed.
- Materials secured from the 35-acre Peppercat timber sale unit
- Equipment and logging contracts completed.
- Contract administered/implementation. Two complex Large Woody Material structures and side channel large wood installed using 260 trees.
- Monitoring (cross-sections, longitudinal profiles, pebble counts and photos documentation) conducted before implementation, immediately following implementation and one-year after implementation (2018)
- Snorkel surveys
- Monitoring report written in 2017 and again 2018.

Workforce:

- **Personnel (by craft)**
- **Contractors:**

- Greg Robertson, USFS Fisheries Biologist
- Bryce Michaelis, USFS South Zone Aquatic Technician
- Abigail Groskopf, MSHI, Program Director (supervisor for field staff)
- Two seasonal fisheries technicians, MSHI (for monitoring)
- Twin Peaks Construction

Schedule Summary: Planned Completion Date: December 31, 2017
Actual Completion Date: December 31, 2017

Problems Encountered:

- There were no real problems that were encountered. However, higher than anticipated flows for the season changed the anticipated work schedule and was a very minor disruption in that the logs for the north side of the river were stockpiled until the water dropped (1 week).

Things that went well:

- The contractor performance was exceptional and there were no equipment breakdowns.

Work Not Completed:

- All work was completed as planned.

Lessons Learned:

- Each water year is different and contingency plans should be available to mitigate unforeseen site conditions.

*** Attachments (Photo Documentation):**

- See Monitoring Report for complete photos.
- See accompanying photos per the request below.
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*(Per National Marine Fisheries Service's Biological Opinion for Relicensing of the Lewis River Hydroelectric Projects):

Identify process or methodology the project will include and provide photo documentation of habitat conditions at the project site **before, during, and after** project completion.

- a. Include general views and close-ups showing details of the project and project area, including pre- and post-construction.
- b. Label each photo with date, time, project name, photographer's name, and documentation of the subject activity.



Photo 1. Lewis River side channel 5 project pre-implementation conditions on 8/2016 (Photo B. Michaelis).



Photo 2. Lewis River side channel 5 project post implementation on 8/15/2017 (Photo B. Michaelis).



Photo 3. Lewis River side channel 5 project unloading large wood obtained from PacifiCorp forebay cleaning operations

Post-implementation Status Report

Lewis River Mainstem Fish Habitat Restoration 2016



**Partnership between Mount St. Helens Institute and
USFS Gifford Pinchot National Forest**

**Prepared by: Kevin Wells, MSHI Fisheries Lead and Abigail Groskopf, MSHI Science
Education Director**

**Reviewed by: Bryce Michaelis, South Zone Aquatic Technician,
Gifford Pinchot National Forest**

December 2016

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Project Summary

The Lewis River Mainstem Fish Habitat Restoration Project resulted in the construction of 8 complex Large Woody Material (LWM) structures in a 1000-foot stretch of river previously lacking in LWM. These LWM structures are designed to improve salmonid habitat in the North Fork Lewis River by increasing habitat complexity and diversity, providing winter refugia, improving summer rearing opportunities for juveniles and increasing spawning opportunities for adults.

Construction of the structures occurred during the summer of 2016. Approximately 200 trees 60+ feet long with root wads were harvested from Forest Service land and trucked to a clearing adjacent to the access road and near the Lewis River. Trees were moved into place near the structure locations using a skidder. Seven (7) structures were located on river-left and one island apex jam was located on a rocky island in the middle of the channel. The excavator was used to dig trenches in the bank and place 12-20 trees per structure in the trenches. 30-50 feet of the trees were buried, leaving 10-30 feet including the root wads protruding into the channel. The trenches were then backfilled. The excavator was also used to dig pools where the root wads would be placed in order to accelerate the process of pool creation. Additional trees were strategically placed on the bank and interwoven through and between the structures. On the rocky island, a large hole approximately 20 feet wide and 10 feet deep was dug with the excavator. Approximately 25 trees were strategically placed to maximize complexity, durability, and overall habitat quality. Rocks and soil were backfilled onto the trees for ballast. USFS protocol to avoid the introduction of non-native species was implemented, including pressure washing machinery and mulching exposed areas.



LWM being hauled into place on the North Fork Lewis River

This report summarizes the baseline data collected in monitoring efforts before and after structure installations in 2016. Follow up monitoring will occur in 2017, after which point analysis of stream channel modifications will be used to determine if the project goals outlined in the Lewis River Aquatic Coordination Committee (ACC) Project Proposal have been accomplished.

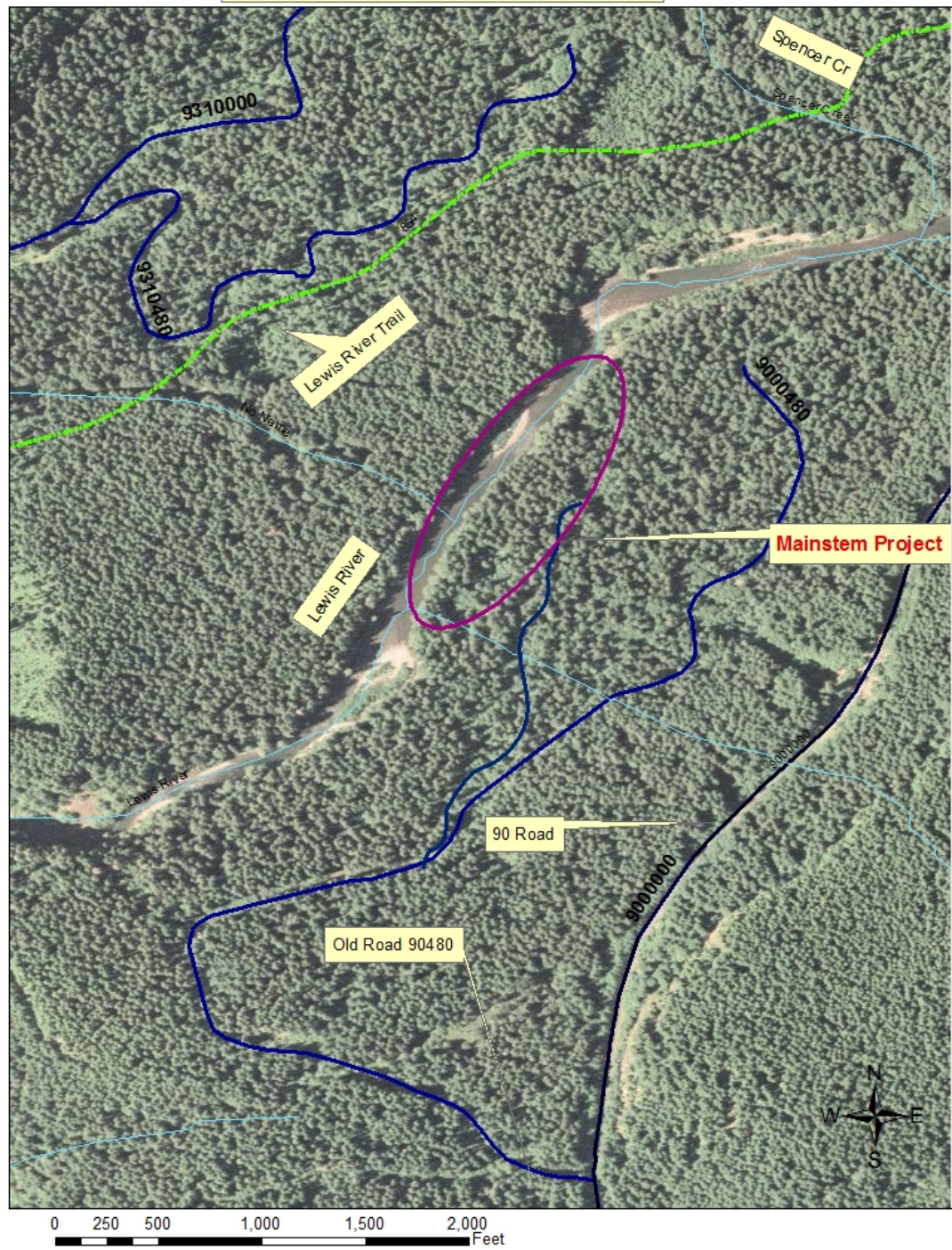
Site Location and Description

This section of the North Fork Lewis River, located in the Gifford Pinchot National Forest, WA, is approximately 10 miles upstream from Swift Reservoir. The project site begins 500 feet downstream of Spencer Creek and approximately 4000 feet downstream of the future Crab Creek acclimation pond.

Access to the site is by FR 90 and spur road 9000480 which was reopened for this project. Access to the river was accomplished by creating a skid trail between the end of road 9000480 and the Lewis River. The skid trail and road 9000480 were closed at the end of the project was by re-establishing drainage and blocking vehicular access.

Water flows year round in this section of the North Fork Lewis River. The channel width at this location varies between 100 and 150 feet, does not braid, and the velocity is slow. The banks on both sides are stable. The surrounding forest is dominated by douglas-fir and western redcedar with occasional western hemlock. Alders are found near the water especially on the river-right bank.

Lewis River Mainstem Project



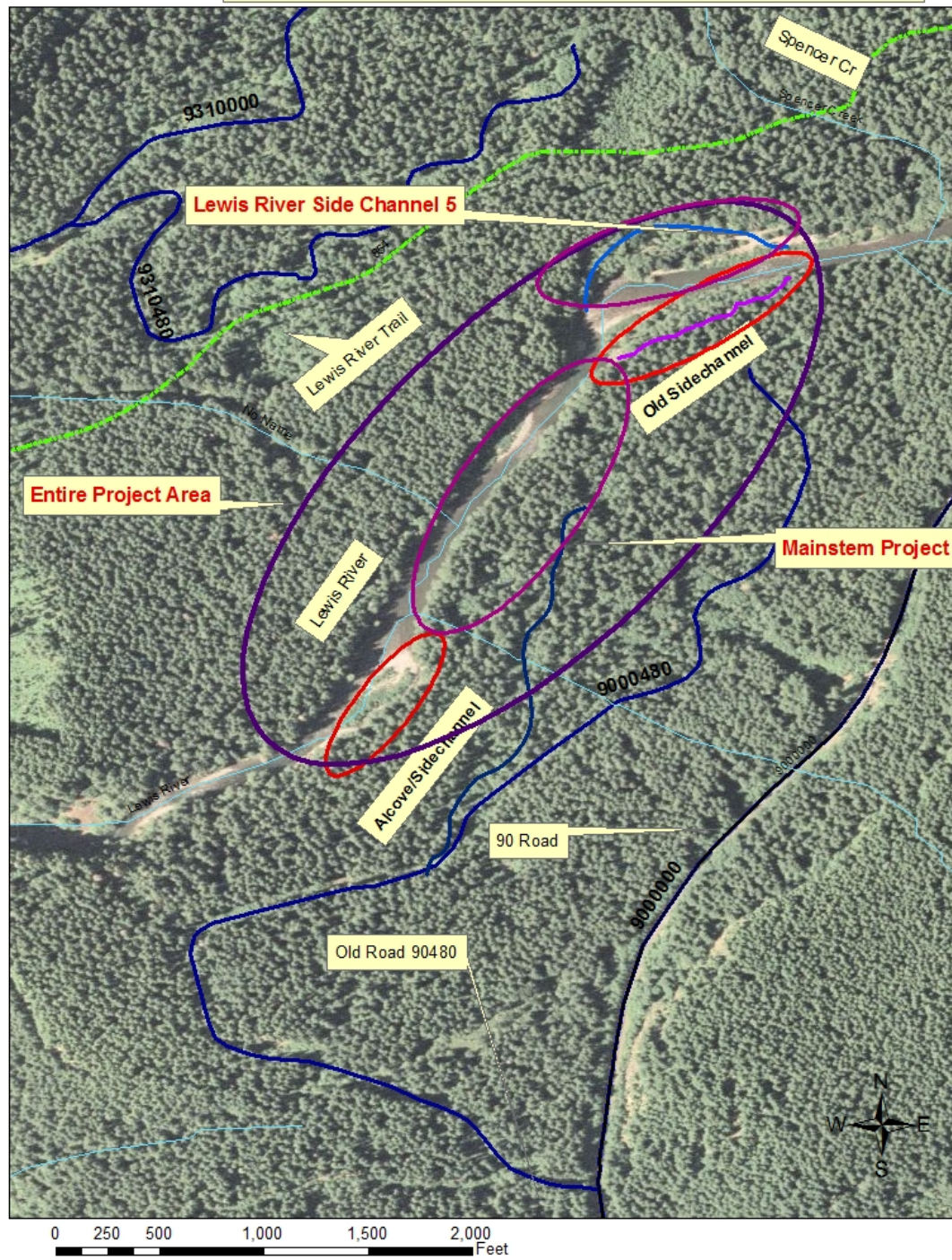
Map of Lewis River Mainstem and road used to access the project

Lewis River Mainstem Project



Enlarged view of the Lewis River Mainstem Project

Lewis River side channel and mainstem project



Lewis River Mainstem Project in relation to other projects proposed or already funded in the area

Priorities and Goals

The Aquatic Coordination Committee gives three priorities for restoration projects in the Lewis River Basin:

1. Benefit fish recovery throughout the North Fork Lewis River, with priority to federal ESA-listed species.
2. Support the reintroduction of anadromous fish throughout the basin.
3. Enhance fish habitat in the Lewis River Basin, with priority given to the North Fork Lewis River.

This project lists four goals to address these priorities:

1. Improve habitat complexity and diversity using LWM
2. Provide refugia during winter flows for juvenile salmonids.
3. Provide rearing opportunities for juvenile salmonids during summer months.
4. Provide increased spawning opportunities for adult salmonids.

The target species of anadromous fish expected to benefit from these structures are coho salmon, steelhead trout, and possibly Chinook salmon and bull trout.

It was expected that the modifications to the channel caused by the introduction of LWM structures would accomplish all four goals. The Mount St. Helens Institute monitored the structures in 2016 with support from the Forest Service after the installations and will conduct monitoring again in 2017 in order to determine if these goals have been met.

Community Outreach

The Mount St. Helens Institute provides internships for undergraduate students studying fisheries science. Interns gain experience surveying and monitoring restoration projects. This experience is a stepping stone for a career in fisheries and watershed management. In addition, the Mount St. Helens Institute trains school age youth in watershed dynamics, monitoring and water quality analysis. In the 2016 field work season, one intern from Clark College was employed to assist in the monitoring of the Lewis River Mainstem.

Monitoring Methodology

In 2016 a series of monitoring surveys were conducted to quantify baseline in the stream channel conditions. A baseline longitudinal profile was conducted prior to project implementation. Immediately following structure installation a second longitudinal profile was conducted and baseline cross section profiles were created using methodology adapted from Harrelson et al (1994). Photographs were also taken to document in further detail the changes to the stream channel.

Cross Section Profiles

To monitor the effects of each LWM structure, cross section profiles were obtained immediately downstream of each structure. The methods for measuring these cross sections were adapted from methods described by Harrelson et al (1994). A long-lasting benchmark in the form of a nail hammered into a tree was installed on each side of the channel such that the cross section was directly perpendicular to the angle of water flow. The benchmarks ensure that all surveys, present and future, would be conducted at precisely the same spot. Labeled flagging tape identifies each structure and improves visibility. Due to measuring tape limitations, two measuring tapes were tied together, stretched tightly across the channel and attached to each benchmark. A laser level and was used to map the topography of the bank and stream bed along the measuring tape. Measurements were taken as frequently as needed to capture all significant topographical features. The height from the ground to the nail was recorded in the notes so that the nail could be used as the fixed reference point. In addition to mapping the topography of the stream bed, the survey also recorded the water level, locations of water edges (shown on the profiles), and bankfull locations (not shown on the profiles).

Longitudinal Profile

A longitudinal profile was created using methods closely adapted from Harrelson et al (1994). The longitudinal profile measures the elevation changes of the thalweg - the deepest continuing line in the stream channel. The longitudinal profile is not only a measure of distance and elevation, but also of sinuosity; however, this section is relatively straight. From the longitudinal profile, one can assess stream type, pool depth, and pool:riffle ratio.

The upper benchmark for the longitudinal profile is a nail in an alder tree situated in a group of 3 trees on river-left at the start (upstream part) of the project area. The group of 3 trees hangs over a sheltered inlet/pool to the side of the main channel. UTM coordinates for the upper benchmark are E 0584135, N 5109959, ±13 ft., map datum WGS 84. The upper benchmark is accessed via a trail paralleling the east side of the North Fork Lewis River which connects to the decommissioned 9000480 road. The height from the ground to the nail was recorded in order to use the nail as the fixed reference point. The lower benchmark is a nail in a large douglas-fir on river-left just above where a side channel splits off the mainstem on river-left and flows into an alcove. In fact, the same benchmark serves as the upper benchmark for the alcove restoration area, and is labeled with both names. The douglas-fir has a yellow boundary marker permanently attached to it which faces the river. UTM coordinates for the lower benchmark are E 0583955, N 5109529, ±10 ft., map datum WGS 84. Access to the lower benchmark is via faint trails coming from the decommissioned 9000480 road.

A laser level was used to measure changes in elevation. The distances covered between the measuring points varied depending on changes in the thalweg. Sections of frequent topographical changes were measured more densely while sections with little change were measured less densely. Generally, as many measurements as needed were taken to record all significant changes in elevation of the thalweg. A range finder was used to measure the distance between the points. When the laser was no longer in sight, it was moved to a new location and a reading was taken before and after the relocation in order to account for the change. In addition to measuring changes in elevation, the water level and habitat unit (fast water or slow water) was recorded at each point.

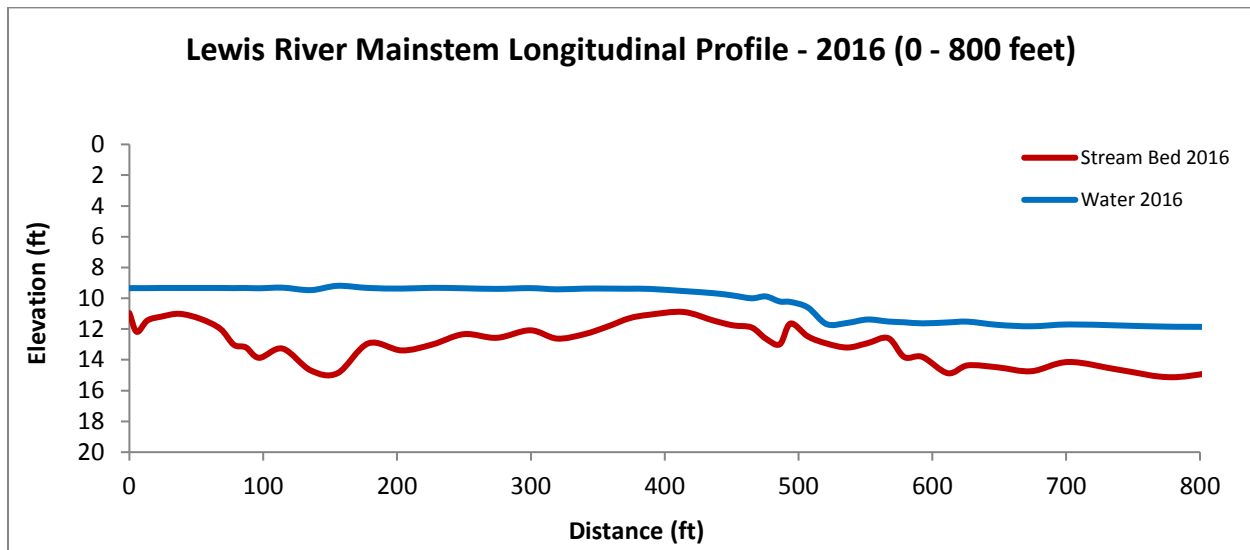
Photos

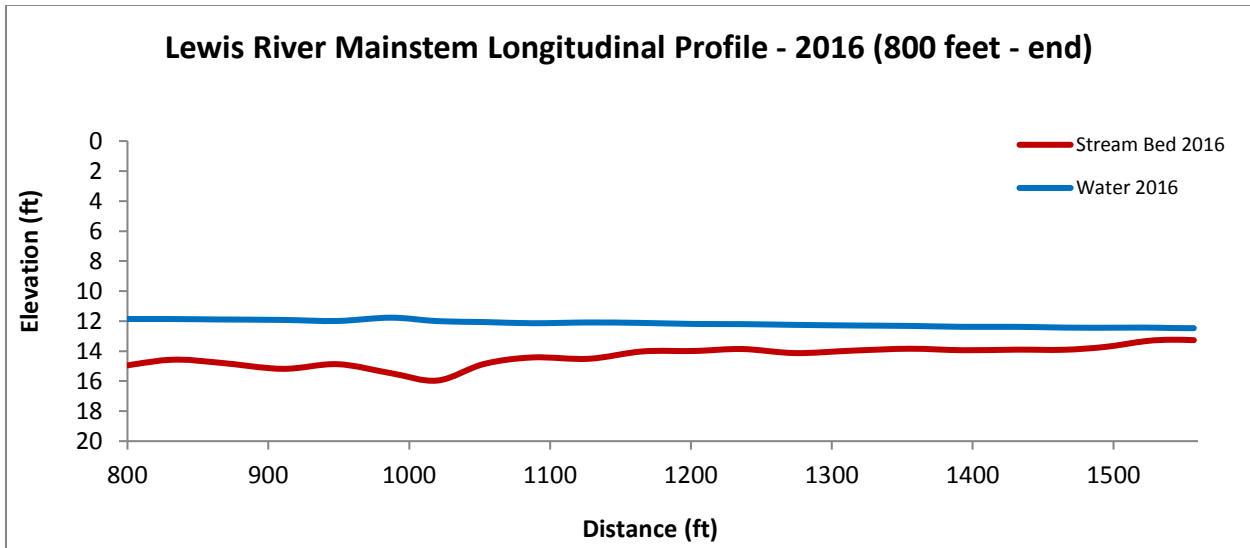
Photos were taken of the upper and lower longitudinal profile benchmarks and at each structure from above the structure looking downstream, from below the structure looking upstream, from right bank looking to left bank, and from left bank looking to right bank. Select photos are included in this report but all photos are available on request.

Results

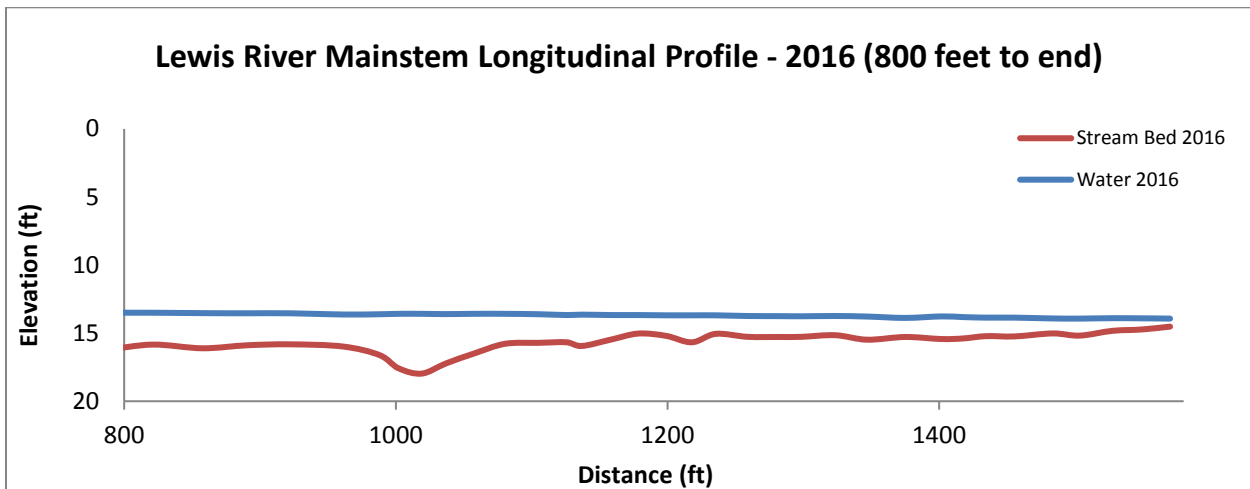
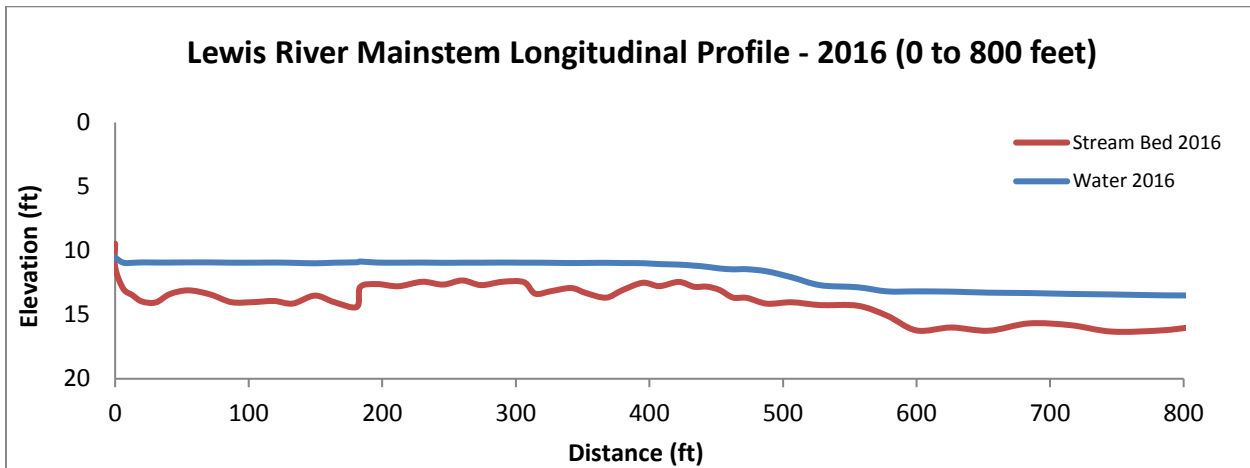
In addition to the results given in this report, all raw data is available on request.

Longitudinal Profile - Before Installations



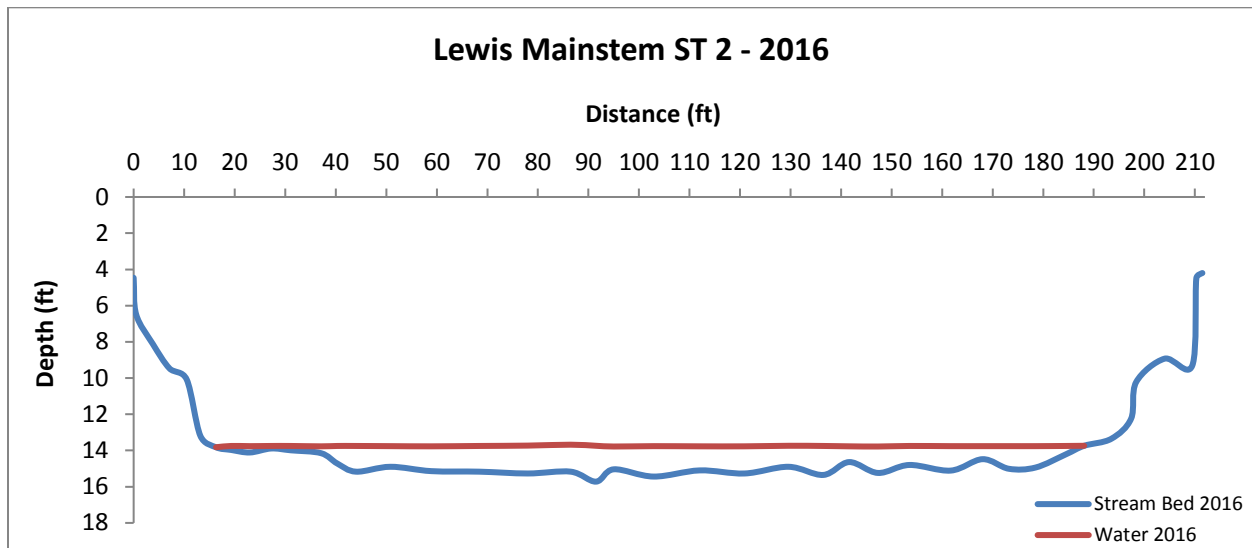
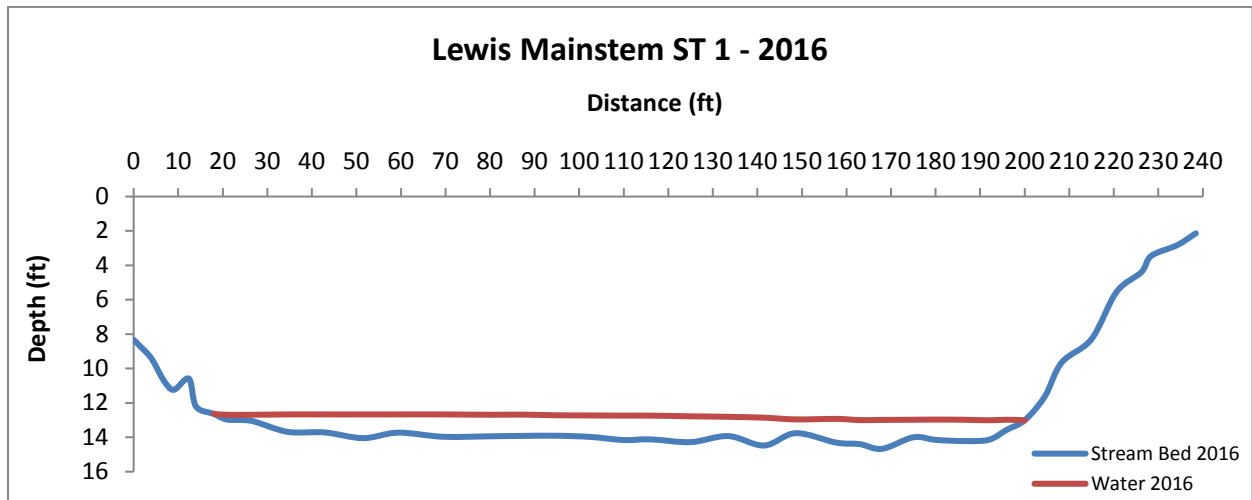


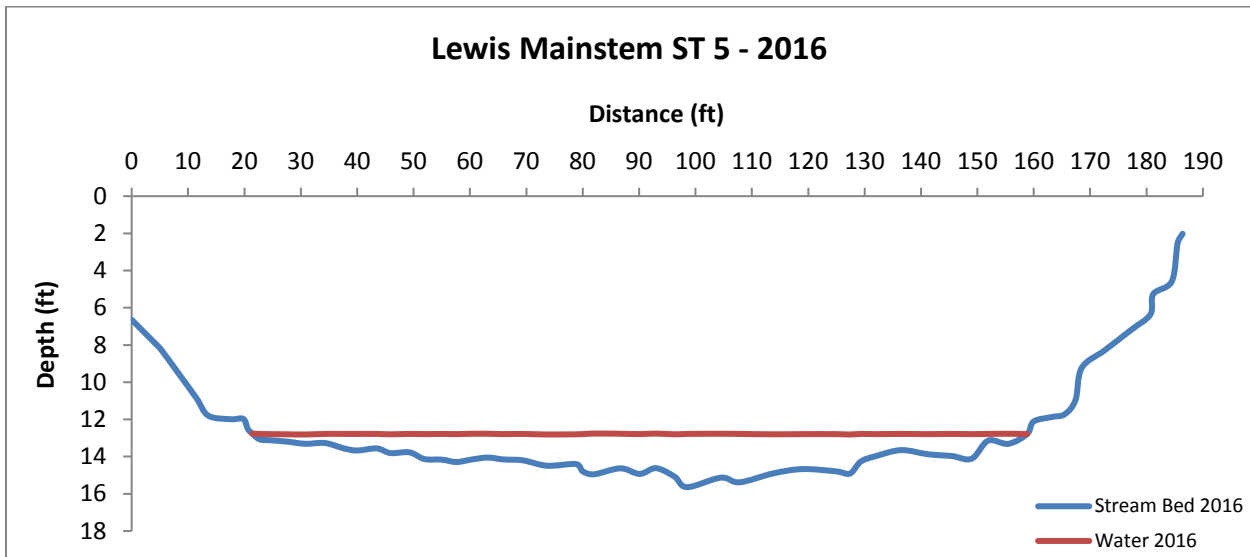
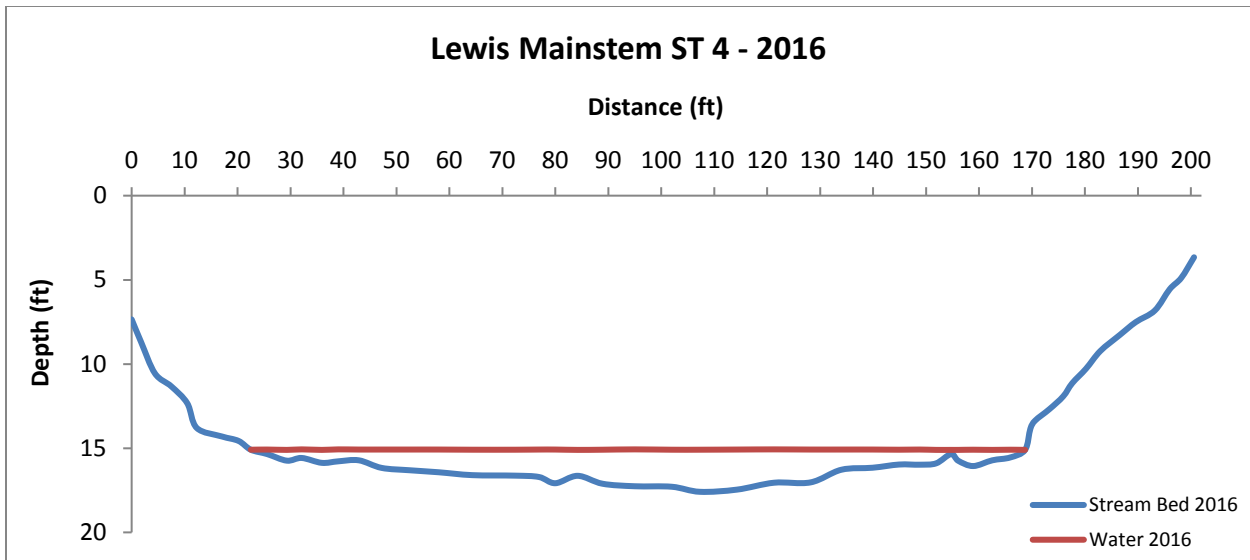
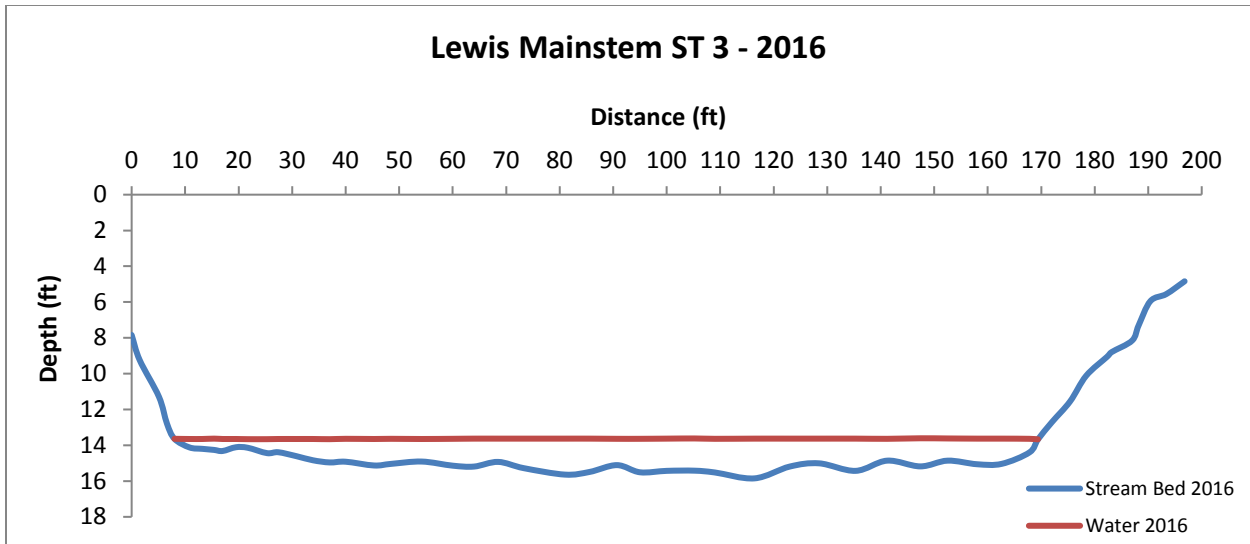
Longitudinal Profile - After Installations

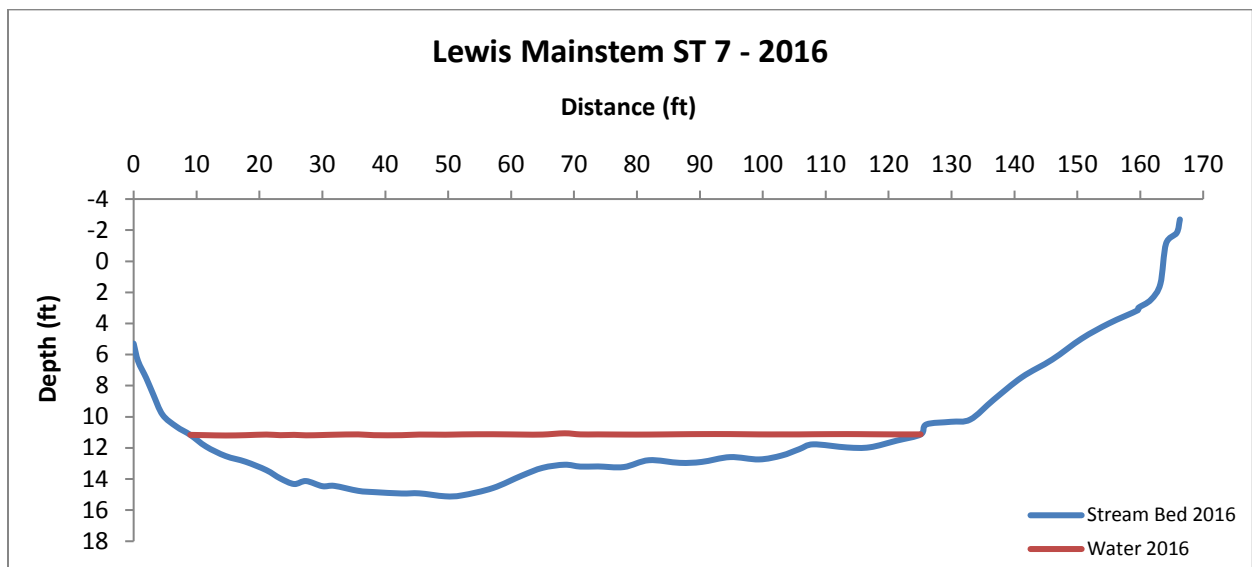
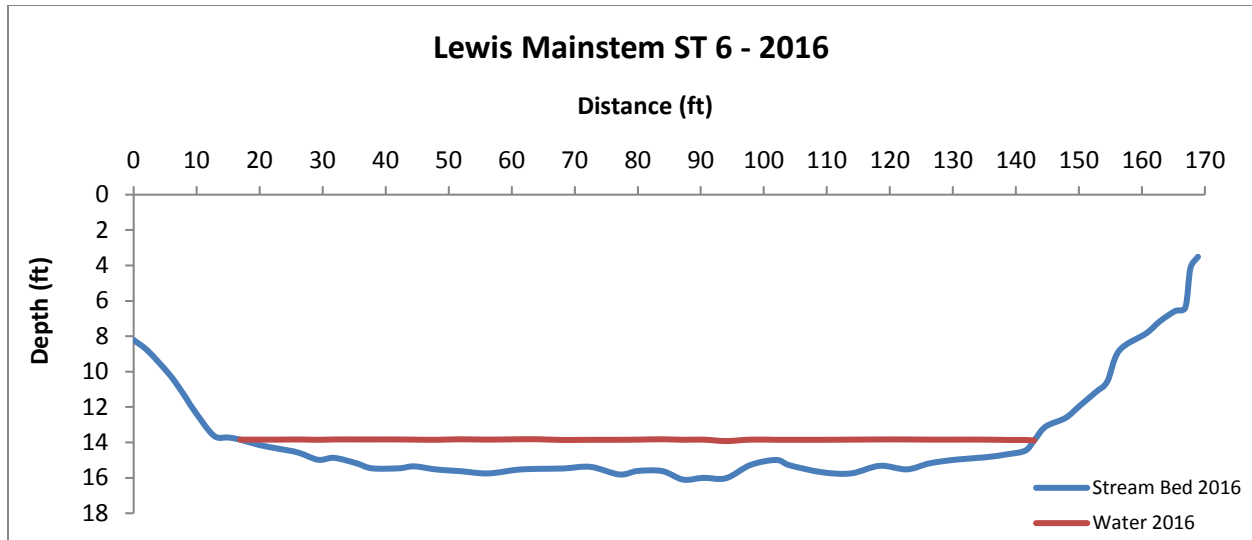


It is important to note that the longitudinal profile from after the installations surveyed further from the shore than the longitudinal profile from before the installations due to surveying variability, possibly accounting for the differences in certain statistics such as the decrease in number of pools over 1.00 feet and the stream bed depth.

Cross Section Profiles







Conclusions

Following monitoring in 2017, conclusions on the project's impact and success will be included in the 2017 final report.

Appendix A: Photo Documentation



Lower benchmark of longitudinal profile



Lower benchmark of longitudinal profile



Upper benchmark of longitudinal profile



Upper benchmark of longitudinal profile



Structure 1 - Looking right bank to left bank



Structure 1 - Looking left bank to right bank



Structure 2 - Looking right bank to left bank



Structure 2 - Looking left bank to right bank



Structure 3 - Looking right bank to left bank



Structure 3 - Looking left bank to right bank



Structure 4 - Looking right bank to left bank



Structure 4 - Looking left bank to right bank



Structure 5 - Looking right bank to left bank



Structure 5 - Looking left bank to right bank



Structure 6 - Looking right bank to left bank



Structure 6 - Looking left bank to right bank



Structure 7 - Looking right bank to left bank



Structure 7 - Looking left bank to right bank



Structure 7 - Looking upstream to downstream along the left bank



Non-numbered structure apex log jam on rocky island in center of channel, below other structures



Excavator creating apex log jam



Storage area for logs and machinery at the end of spur road 9000480



End of spur road 9000480 and beginning of skid trail to North Fork Lewis River



Skid trail accessing the North Fork Lewis River



Logs placed into piles in the river before installation



Logs placed into piles in the river before installation



Skidder placing logs, excavator building apex log jam



Top of river bank after installation of structures, trenches have been backfilled to maintain level ground



Panorama from right bank showing all 8 structures