Final Design and As-built Report

Increasing Wood Densities in Asotin Creek Intensively Monitored Watershed

Grant 19-1499

South Fork Asotin Creek Rebuilt Structure #42

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EXECUTIVE SUMMARY

The Asotin Creek Intensively Monitored Watershed project (Asotin IMW) has been running since 2008 with the goal to test the effectiveness of low-tech process-based restoration structures at improving riverscape health and summer steelhead productivity. The project is coordinated by the Snake River Salmon Recovery Board and funded by the Pacific States Marine Fisheries Commission. This report summarizes the final design and as-built increasing of wood densities in the Asotin Creek Intensively Monitored Watershed project funded by RCO Grant 19-1499. We installed 654 post-assisted log structures between 2012-2016 and have seen some positive geomorphic and fish population responses. As part of our adaptive management plan have conducted annual structure surveys and have thresholds that trigger the addition of more wood if the density in treatment sections does not remain high. We have increased wood density in 2016 and 201 based on the annual surveys. We increase wood density by adding more wood to structures that lost wood and rebuilding structures that were washed downstream since the installation of all the IMW treatments. We have also used other low-tech restoration approaches like harvesting trees on site and adding them to treatment areas. Surveys in spring 2020 identified 156 sites that could be enhanced with more wood – in this report we document enhancing 116 structures with the addition of 794 pieces of wood. The majority of the wood was added to the South Fork Asotin Creek using wood harvested from the Umatilla National Forest and donated by the USFS. We were unable to secure permits and a cultural survey to work in the North Fork or build BDAs due to delays in WDFW cultural review process and therefore focused all our efforts on South Fork and Charley Creeks (which we had existing permits and cultural surveys). This report includes the final restoration design and as-built descriptions of the methods, structure locations, and quantities of wood added.

ACKNOWLEDGMENTS

The Asotin Intensively Monitored Watershed (IMW) is a collaborative multi-agency initiative sponsored by the Snake River Salmon Recovery Board (SRSRB). The SRSRB provides oversight and technical review of all the Asotin Creek IMW activities through support from the Regional Technical Team (RTT) and National Oceanic and Atmospheric Administration (NOAA) staff. The majority of the IMW takes place on the Asotin Wildlife Area managed by the Clarkston office of the Washington Department of Fish and Wildlife (WDFW) with portions of monitoring also occurring on the Pomeroy Ranger District, Umatilla National Forest, managed by the US Forest Service (USFS). Both the WDFW and USFS have supported the development and implementation of the Asotin IMW since its inception. Steve Martin (former director) and John Foltz (current director) of the Snake River Salmon Recovery Board have been supporters of the IMW and worked continually to help secure monitoring and restoration funds and coordinate between all the stakeholders – the IMW could not have been implemented without their commitment to the project. Keith Dublanica of the Washington State Recreation and Conservation Office (RCO) made sure contracts and funds were always secured to continue this long-term and complex project. Funding for the primary monitoring and reporting components of the IMW are provided and managed by Stephen Phillips, Pacific States Marine Fisheries Commission (PSMFC) and Greg Sieglitz, National Marine Fisheries Service (NMFS). Funding for restoration activities comes from PCSRF through the State of Washington's Salmon Recovery Funding Board (SRFB), BPA, Conservation Commission, USFS, and WDFW.

We are also grateful for support we receive from Ethan Crawford and Mike Herr of WDFW in the form of field staff and data from fish-in fish-out monitoring conducted by the Clarkston office, and Bonneville Power Administration (BPA) which supports WDFW's efforts to collect fish-in fish-out data in Asotin Creek. Bob Dice, the manager of the Clarkston Wildlife Office, has also provided the IMW with accommodation, transportation, and access since the start of the project. Megan Stewart of the Asotin County Conservation District, Brad Johnson of the Palouse Conservation District, and Dave Karl of the WDFW have also been an indispensable part of the IMW team, working with the local landowners and agencies to help secure access, operating permits, local support, and acting as sponsors for IMW funding. The Asotin County Public Utility Department has provided us with office space and storage for field gear. Del Groat (now retired) and Bill Dowdy of the USFS have provided generous donations of time and large wood for the restoration treatments and Billy Bowles, also with USFS, has helped with safety training for field crews. We also wish to thank the Koch and Thornton families for graciously providing us access to private property along Charley Creek (properties now owned by WDFW). Bruce Heiner, WDFW Habitat Engineer and Barry Sutherland, USDA Natural Resources Conservation Service (NRCS) Fluvial Geomorphologist (retired) provided comments on the earlier versions of the restoration plan. The following groups have provided direct support to the IMW in either goods or services: Avista Power, Clearwater Power, Collier Electric, Inland Metals Electric, TDS Telecom, WDFW, and USFS.

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1 INTRODUCTION AND SETTING

1.1 Background

The Asotin Intensively Monitored Watershed (IMW) Project is a long-term experiment to test the effectiveness of large wood additions at improving freshwater habitat and ultimately increasing freshwater production of ESA listed steelhead (Bennett et al. 2016). The Asotin IMW is part of a group of IMWs in the Pacific Northwest funded by federal and state agencies to provide critical information on stream restoration effectiveness and how restoration actions can be improved to maximize benefits to ESA listed salmon and steelhead. The Asotin IMW was initiated in 2008 in three tributaries of Asotin Creek: Charley Creek, North Fork, and South Fork Asotin Creeks (Figure 1). Pre-restoration monitoring of habitat and juvenile steelhead was conducted from 2008-2012 (Bennett and Bouwes 2009). From 2012-2016 restoration treatments were implemented on 14 km of stream where 654 post-assisted log structures (PALS) were installed in three different streams: Charley Creek (207 PALS), North Fork Asotin Creek (135 PALS), and South Fork Asotin Creek (312 PALS; Wheaton et al. 2012 ; Figure 2). Under funding from Project 19-1499 we added large woody debris to existing PALS, felled trees, and rebuilt some PALS in Charley and South Fork Asotin Creek at locations where existing PALS lost wood or where existing PALS had moved from their original location.

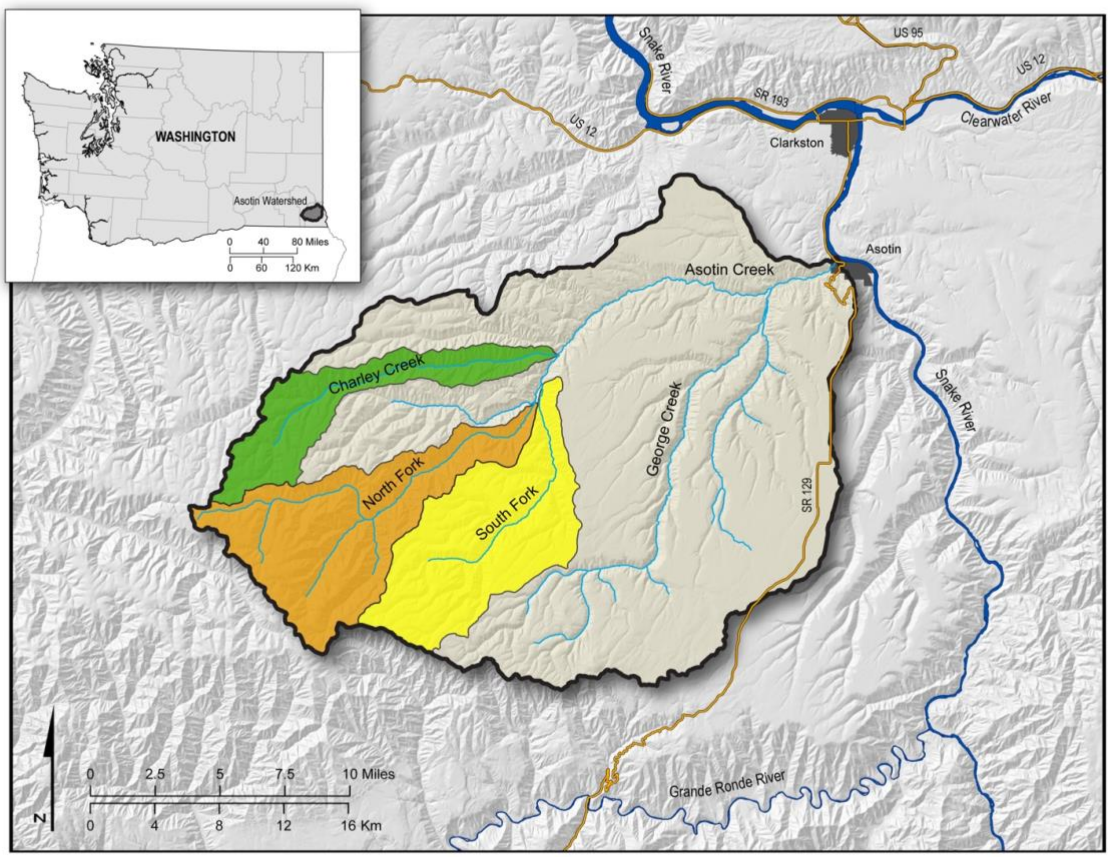

Figure 1. Asotin Creek watershed and Intensively Monitored Watershed area: Charley Creek (green), North Fork Asotin Creek (orange), and South Fork Asotin Creek (yellow). See Figure 2 for the experimental design (treatment and control areas) and fish and habitat monitoring layout.

1.2 Adaptive Management and Project Goals & Objectives

We developed the Asotin IMW using an adaptive management framework that explicitly called for the addition of more LWD if structures lose wood, move, or are not producing the desired results (Wheaton et al. 2012, Bouwes et al. 2016). Our annual surveys of PALS across the entire IMW study area suggest that more LWD will help continue to improve habitat conditions, potentially increase the fish response, and may lead to sustainable geomorphic processes and healthy riverscapes (Bennett et al. 2020). The goal of Project 19-1499 was to improve geomorphic condition, function, and habitat quality for rearing and spawning steelhead. Other species such as Chinook, bull trout and lamprey may benefit as well. The specific objectives were to increase

- large wood density in treatment sections of the IMW by 2-3 times the density of control reaches,
- occurrence of overbank flow by 25% across Asotin IMW project footprint by the year 2023 (i.e., increase the area of active floodplain),
- channel sinuosity by 0.1-0.3 (depending on the reach type) on average over the IMW project treatment footprint to reduce water velocities and support sediment aggradation to provide improved juvenile steelhead rearing habitat,
- total active channel length to valley length (measured as a ratio) across IMW project treatment footprint by 0.3-0.5 by 2023 year, and
- reconnect 1-4 side channels across in each treatment area of the IMW project treatment footprint by the year 2023.

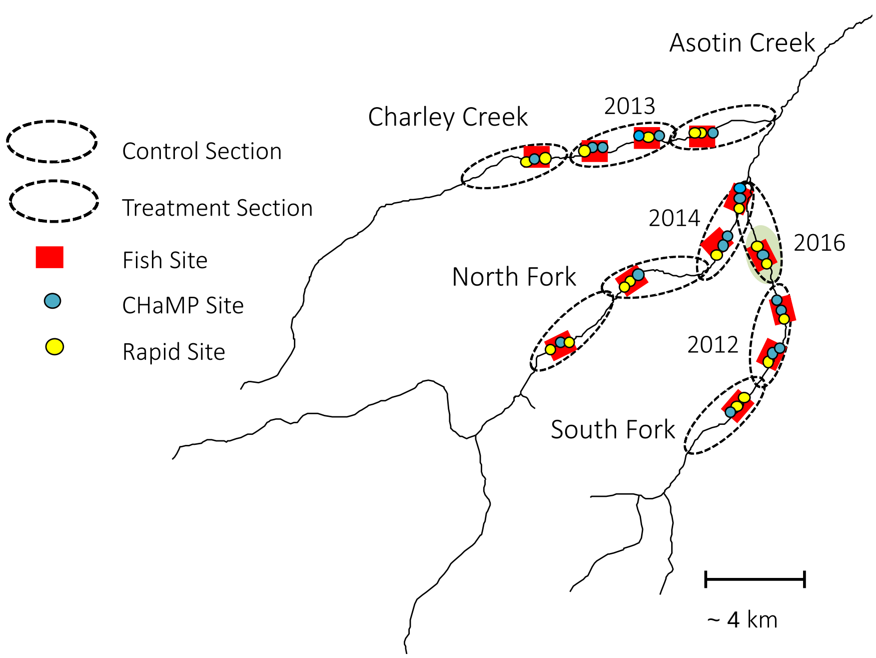

Figure 2. Experimental design and sample sites for juvenile steelhead PIT tagging and habitat surveys for the Asotin Creek IMW. Each study stream has three 4 km long sections. One section in each stream has been restored using post-assisted log structures (shaded green): South Fork (2012), Charley Creek (2013), and North Fork (2014). Additional section was restored in South Fork (lower section) in 2016 at part of the adaptive management plan. All other sections not colored are controls. Fish sites and habitat survey sites are nested within each section. CHaMP = Columbia Habitat Monitoring Protocol, Rapid = custom rapid habitat survey.

2 EXISTING CONDITIONS

Implementation of the Asotin Creek Model Watershed Plan starting in 1995 improved conditions in the uplands and led to extensive protection of much of the riparian areas in the watershed (ACCD 1995, 2004). The Model Watershed restoration actions lead to improved stream conditions by limiting sediment inputs from upland farming and initiated recovery of riparian areas. However, by the time the Asotin IMW was initiated in 2008 stream channels still lacked large woody debris, had low habitat complexity, were dominated by planar habitat, and were disconnected from their floodplains (SRSRB 2011).

The study streams differ in size, valley conditions, gradient, and flow characteristics. Charley Creek is steep and confined by numerous tributary fans and is dominated by spring flows and relatively stable flows (Table 1). North Fork is less confined and has the most potential floodplain, highest spring runoff and base flows, and is dominated by snow-melt. South Fork tends to have large but unpredictable spring flows and very low base flows. All three streams are in moderate geomorphic condition and are dominated by planar habitat, low LWD and pool frequencies, single thread channels, and had limited floodplain connection (Bennett et al. 2018). Since the implementation of PALS, habitat complexity has increased and we have documented increases in LWD, bar, and pool frequencies in treatment compared to control areas (Bennett et al. 2020). This has led to increases in fish abundance in treatment areas in all three study streams ranging from 128-745 juvenile steelhead/km compared to control areas. There is also evidence that self-sustaining geomorphic processes are being initiated by the PALS such as tree recruitment, erosion, and deposition. However, the channels in each of the study streams are still predominately single thread and there is limited overbank flow and floodplain connection. The addition of more LWD to the treatment areas is expected to promote more overbank flow and floodplain connection and potentially increase the positive fish responses already documented.

Table 1. Basic watershed characteristics for the three Asotin Creek IMW study creeks.

Stream	Basin area (km^2)	Bankfull width (m)	Gradient (%)	Average annual discharge (cfs)	2 Year return interval* (cfs)
Charley	58	4.8	3.0	9.5	292
North Fork	165	9.8	1.7	60.0	674
South Fork	104	6.3	2.6	11.5	448

* data from USGS Stream Stats

3 PRELIMINARY DESIGN ALTERNATIVES

We developed PALS[1] specifically to test the low-tech process-based restoration approach within the Asotin IMW as an alternative to traditional restoration actions (Wheaton et al. 2019). PALS are installed

[1] Note: Post-assisted log structures were originally referred to as Dynamic Woody Structures (Wheaton et al. 2012).

by hand and all the wood is carried into the stream to limit the disturbance to recovering riparian habitat (Appendix A & B). We did not explore other engineering-based alternatives because the IMW is designed to test low-tech process-based restoration approaches. However, we did use other low-tech methods to increase wood densities in the treatment areas including adding wood to existing PALS, rebuilding PALS that have moved, and falling subdominant trees on site and adding them to the treatment areas (Carah et al. 2014). We had proposed to build beaver dam analogs (BDAs) as part of the project but we were unable to secure permits in time due to issues related to WDFW initiating a cultural resources review required as the IMW is implemented on WDFW property.

4 PREFERRED ALTERNATIVES

We describe the preferred alternatives for increasing wood and dam frequencies here. See the Appendix B for Design Drawings for more details on the preferred alternatives.

***Adding wood to existing PALS*:** Some PALS were present but lost wood. This happened when wood floats off the structure or when part of the structure was washed away (Figure 3). We added LWD to increase the size of some PALS, interlocking the wood into remaining posts or live trees. Wood was harvested from the Umatilla National Forest with permission and coordination with the USFS. We thinned forest stands to reduce fire risk and transported the wood to the treatment sites. Some wood was also collected on site by harvesting subdominant trees and trimming branches from near the ground when available.

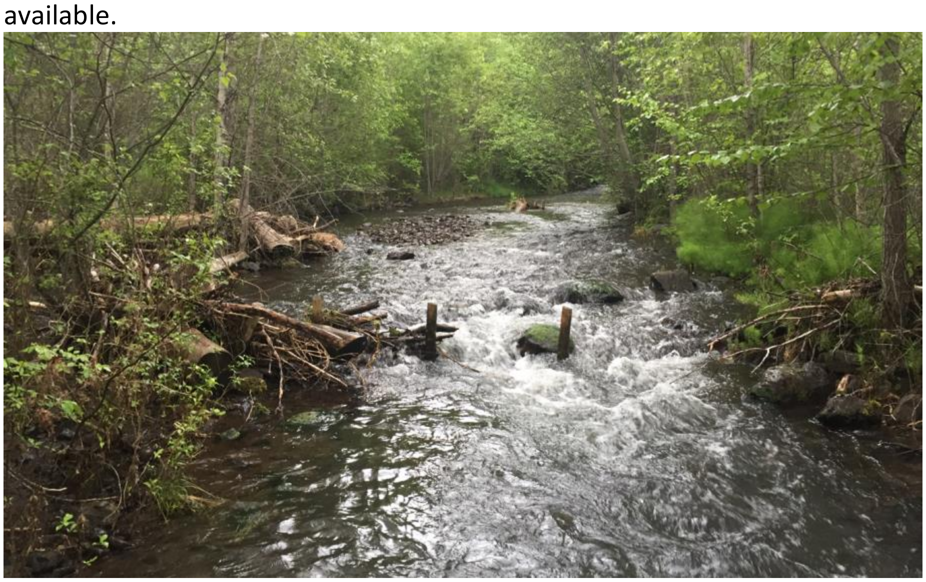

Figure 3. Example of a partly intact post-assisted log structure that were enhanced with the addition of more large woody debris.

***Rebuilding PALS*:** Some PALS have completely moved leaving areas within the treatment where there is limited wood. Where it was logistically feasible to move the hydraulic post-driver to these locations, we rebuilt the PALS (Figure 4). Wood will be harvested from the USFS and transported to the treatment sites.

Figure 4. Example of a post-assisted log structure that has washed downstream that could be rebuilt.

Cutting subdominant trees: The most efficient way to increase wood densities is to harvest wood on site along the riparian area (Figure 5). We have permission from the WDFW manager and forestry to cut subdominant conifers and alder in areas where the densities of trees are high. We have observed that alder in particular are locking the stream in a single channel and harvesting some trees may help to allow the stream to begin to meander and interact with the floodplain more frequently.

Figure 5. Example of a falling alders along North Fork Asotin Creek to increase wood density.

5 DESIGN CONSIDERATIONS AND PRELIMINARY ANALYSES

The original post-assisted log structures were designed in four basic configurations: bank-attached, mid-channel, channel spanning, and seeding. Each of these designs were developed to promote specific hydraulic and geomorphic responses. We have observed these responses during our annual IMW monitoring (Figure 6; Wheaton et al. 2012, Camp 2015, Wheaton et al. 2019, Bennett et al. 2020). Therefore, we decided to generally add wood or rebuild structures to their original configuration although we have noted larger responses from channel spanning structures and some bank-attached or mid-channel PALS were altered to create channel spanning PALS. When we were adding wood, the wood was placed to interlock with remaining posts or live trees at the site to secure the wood. When cutting trees, the trees were also interlocked with other trees or where possible felled on existing structures to provide stability. We have noted from our extensive surveys of PALS that the high density of PALS tends to trap mobile wood causing other PALS to get large and, in some cases, create new log jams (Figure 7).

Figure 6. Example of hydraulic and geomorphic diversity created by a channel spanning PALS on South Fork Asotin Creek. A large dam pool was created upstream, a plunge pool and gravel bar formed downstream, and overbank flow is being forced, connecting a portion of floodplain.

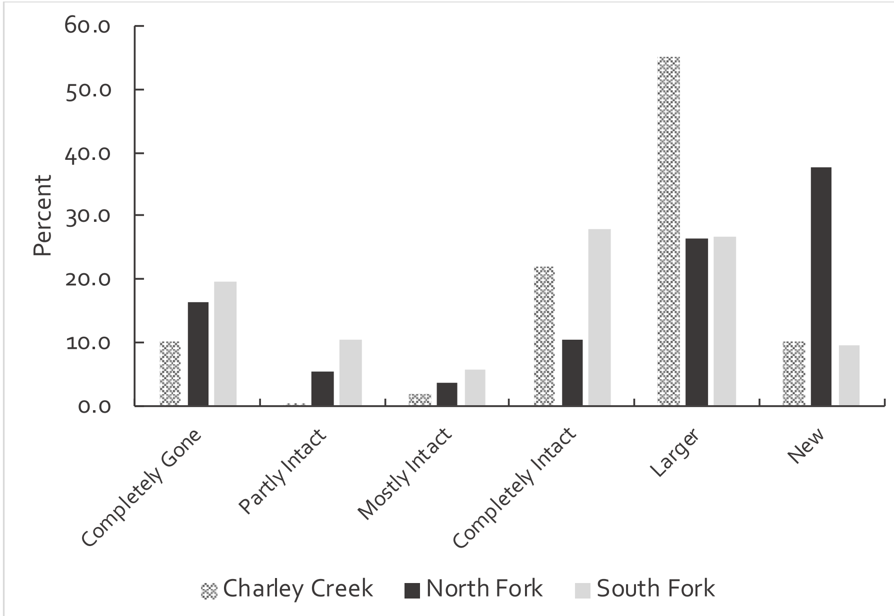

Figure 7. Percent of structures by category describing their integrity based on 2019 survey. Larger refers to structures that have increased 25% in volume due to wood accumulation and New refers to wood accumulations that have developed since the original restoration treatment from IMW wood, natural recruitment or both (Total number of wood accumulations now = 750 in 14 km treatment area).

A spring flow in May 2020 of ~ 600 cfs was recorded in Asotin Creek just below the confluence of North Fork and South Fork that likely washed some PALS downstream. A survey in June of 2020 was conducted to determine potential locations for adding wood or rebuilding some PALS. We identified 156 PALS sites and ranked the sites as high priority for wood enhancement/rebuilding if they were near our fish and habitat sampling sites.

Table 2. Potential number of structures that could be rebuilt or enhanced with the addition of more large woody debris by stream.

		Structure Type					
Stream	**Enhancement Priority**	**Bank Attached Left**	**Bank Attached Right**	**Channel Span**	**Mid Channel**	**BDA**	**Total**
Charley	High	2	2	-	-	18	22
	Moderate	-	-	1	-	6	7
North Fork	High	-	-	6	11	-	17
	Moderate	-	-	-	-	-	0
South Fork	High	4	11	5	1	29	50
	Moderate	13	15	27	5	-	60
Total		19	28	39	17	53	156

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6 PERMITTING AND STAKEHOLDER CONSULTATION

We secured the required HPA to conduct addition of wood to PALS or constructions of new PALS (attached to PRISM), we have cultural surveys completed on Charley and South Fork Creeks (attached to PRISM); however, we are still waiting for WDFW to initiate a cultural resource consultation which held up BDA permits that were applied for in March 2002 with the US Army Corp of Engineers. As a result, we were not able to work in the North Fork Asotin Creek, or build any BDAs in the IMW project area. Therefore, we focused on increasing wood density in Charley and South Fork Asotin Creeks.

7 FINAL DESIGN DRAWINGS AND INFRASTRUCTURE

See Figure 1 & 2 for project locations and experimental design for the Asotin Creek IMW. Figure 8 shows the property boundaries of the IMW study area which is entirely owned by WDFW and USFS, the monitoring sites for fish and habitat, locations of existing and intact PALS, and structures that were enhanced with more wood. There is no infrastructure other than primitive roads, wood was staged along the stream and carried by hand to the enhancement locations, and no fill that was used. See Appendix B for structure design drawings.

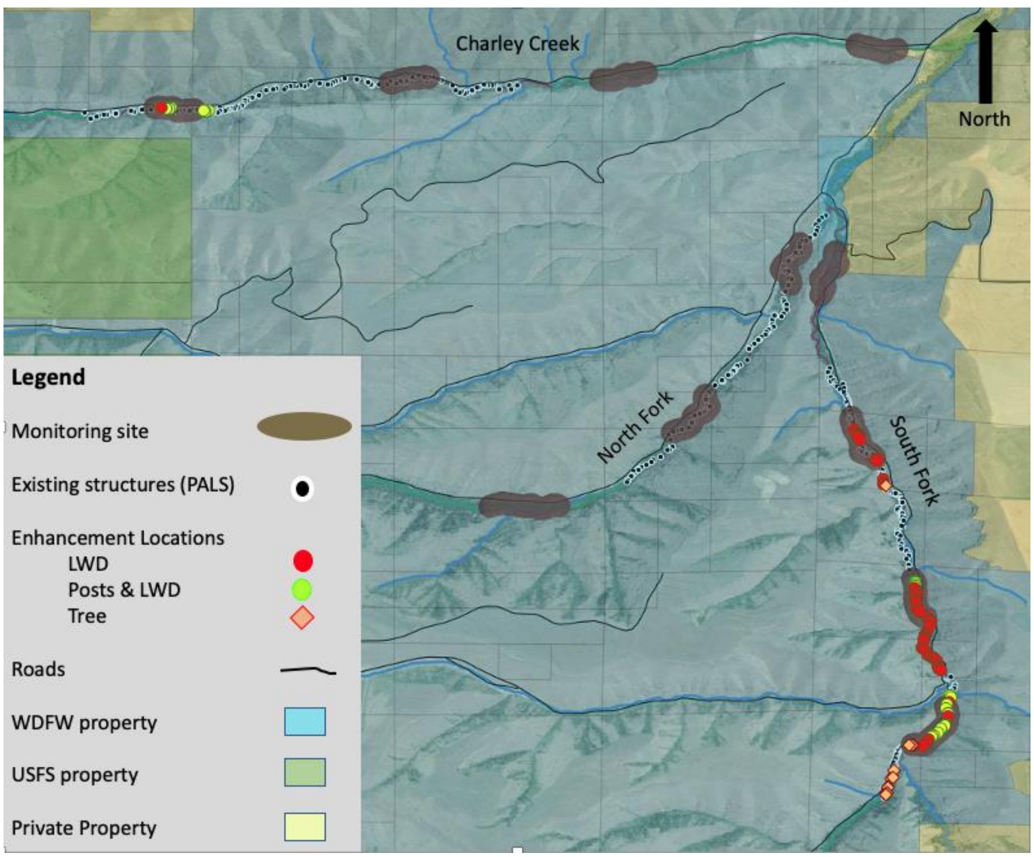

Figure 8. Final design plan for increasing wood density showing existing fish and habitat monitoring sites, existing post-assisted log structures (PALS), 116 structures enhanced with additional wood, roads, and property boundaries. The type of enhancement included large wood added to existing structures (LWD), existing structures being rebuilt (post & wood), and live trees felled into the stream (Tree). See Appendix C for list of all structures enhanced with wood and their GPS location.

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8 AS-BUILT CONSTRUCTION QUANTITIES AND CONSTRUCTION COSTS

We identified 156 sites where enhancement could be implemented in the preliminary design report. Due to WDFW being unable to complete a cultural resource consultation, we were not able to proceed with restoration in the North Fork Asotin Creek. Therefore, we selected additional sites on South Fork Asotin Creek for enhancement. We increased the LWD density in three treatment sections and were able to enhance 116 structures using a combination of falling trees, adding wood collected from the USFS, and rebuilding structures with post and wood (i.e., using hydraulic post driver to add more posts and wood; Figure 9-11, Table 3). The majority of structures (58%) were enhanced by adding LWD (collected mostly from the USFS; Figure 9), rebuilding structures with posts and LWD (29%; Figure 10), and falling trees (13%; Figure 11). Most of the structures that were enhanced were in South Fork Asotin Creek (Table 3 & 4). We added almost 800 pieces of wood to 116 structures (6.8 LWD/structure; Table 4). Most of the pieces of wood were ponderosa pine, small diameter (2-4”), and relatively long (12-15’). The budget for this project was $32,500.

Table 3. Summary of the location (stream and treatment section) and type of structures enhanced with the addition of more large woody debris (LWD). See Figure # for location of enhancement. PALS = post-assisted log structure.

			PALS TYPE			
Stream	Section	Action	Bank Attached	Channel Spanning	Mid Channel	Total
South Fork	SFS1	Add LWD	11	4		15
		Tree Fall		1		1
	SFS2	Add LWD	44	6	1	51
		Posts & LWD	6	16	1	23
		Tree Fall	7	5	1	13
Charley	CCS2	Add LWD		1	1	2
		Posts & LWD	8	3		11
North Fork	NFS1	-	-	-	-	0
Total			**76**	**36**	**4**	**116**

Table 4. Summary of the location (stream and treatment section), type of structure, and amount of large woody debris (LWD) added. See Figure # for location of enhancement.

			LWD Added			
Stream	Section	Action	Bank Attached	Channel Spanning	Mid Channel	Total
South Fork	SFS1	Add LWD	49	21		70
		Tree Fall		8		8
	SFS2	Add LWD	301	46	8	355
		Posts & LWD	47	146	8	201
		Tree Fall	36	39	4	79
Charley	CCS2	Add LWD		3	4	7
		Posts & LWD	52	22		74
North Fork	NFS1	-	-	-	-	0
Total			**485**	**285**	**24**	**794**

Figure 9. Example of structures enhanced with the addition of large woody debris (left – South Fork structure #124 , right – South Fork # 672). Most of the wood was collected on the Umatilla Forest and donated by the USFS but occasionally we collected trees cut down along the road by road maintenance crews.

Figure 10. Example of structures enhanced with the addition of posts and large woody debris (left – South Fork structure #42, right - Charley #61) . A hydraulic post driver was used to drive posts into streambed and secure wood. Most of the wood was collected on the Umatilla Forest and donated by the USFS.

Figure 11. Example of structures enhanced with the addition tree falling (left - South Fork structure #679, right - #157). We felled mostly subdominant Douglas-fir and alder along the stream channel to maintain shading and cover.

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APPENDIX A. PHOTOS OF TYPICAL POST-ASSISTED LOG STRUCTURE

Figure 12. Post-restoration conditions in South Fork Asotin Creek – channel spanning post-assisted log structure forcing overbank flow (during receding high flow) and ponding water upstream of the structure.

Figure 13. Post -restoration conditions in Charley Creek – bank attached post-assisted log structure forcing flow against river left bank, creating eddy pool downstream, and forcing overbank flow and forming upstream and downstream bars on river right.

Figure 14. Post -restoration conditions in North Fork Asotin Creek – mid-channel post assisted log structure splitting flow and creating downstream mid-channel bar.

APPENDIX B. DRAWINGS OF TYPICAL STRUCTURE TYPES

Bank Attached Post-assisted log structure (PALS) – for widening the channel

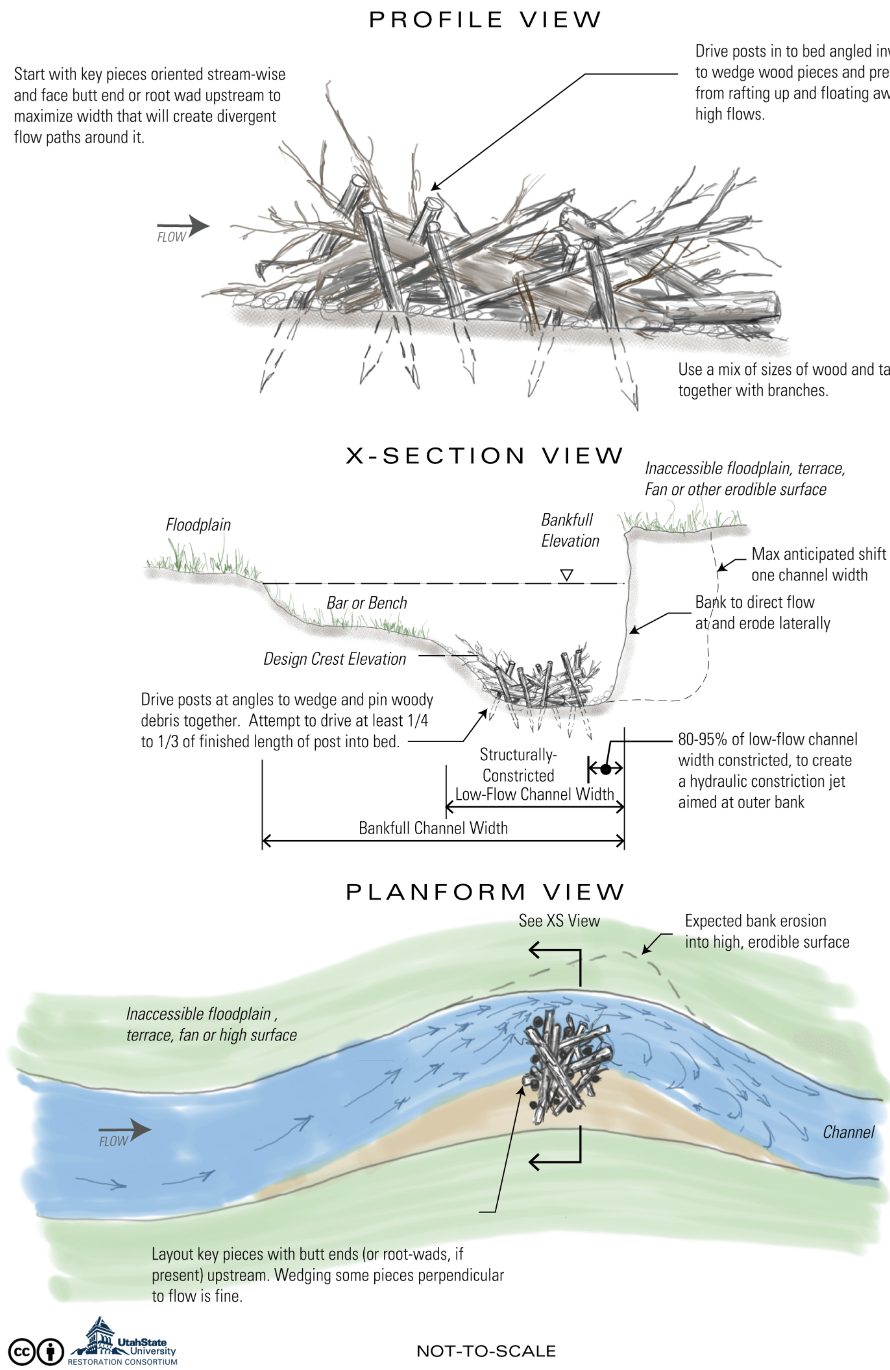

Figure 15. Typical drawing sketches of a bank-attached PALS intended to cause lateral channel migration through deposition of material on point and diagonal bars and erosion of high bank features.

Bank Attached Post-assisted log structure (PALS) – for scouring pools

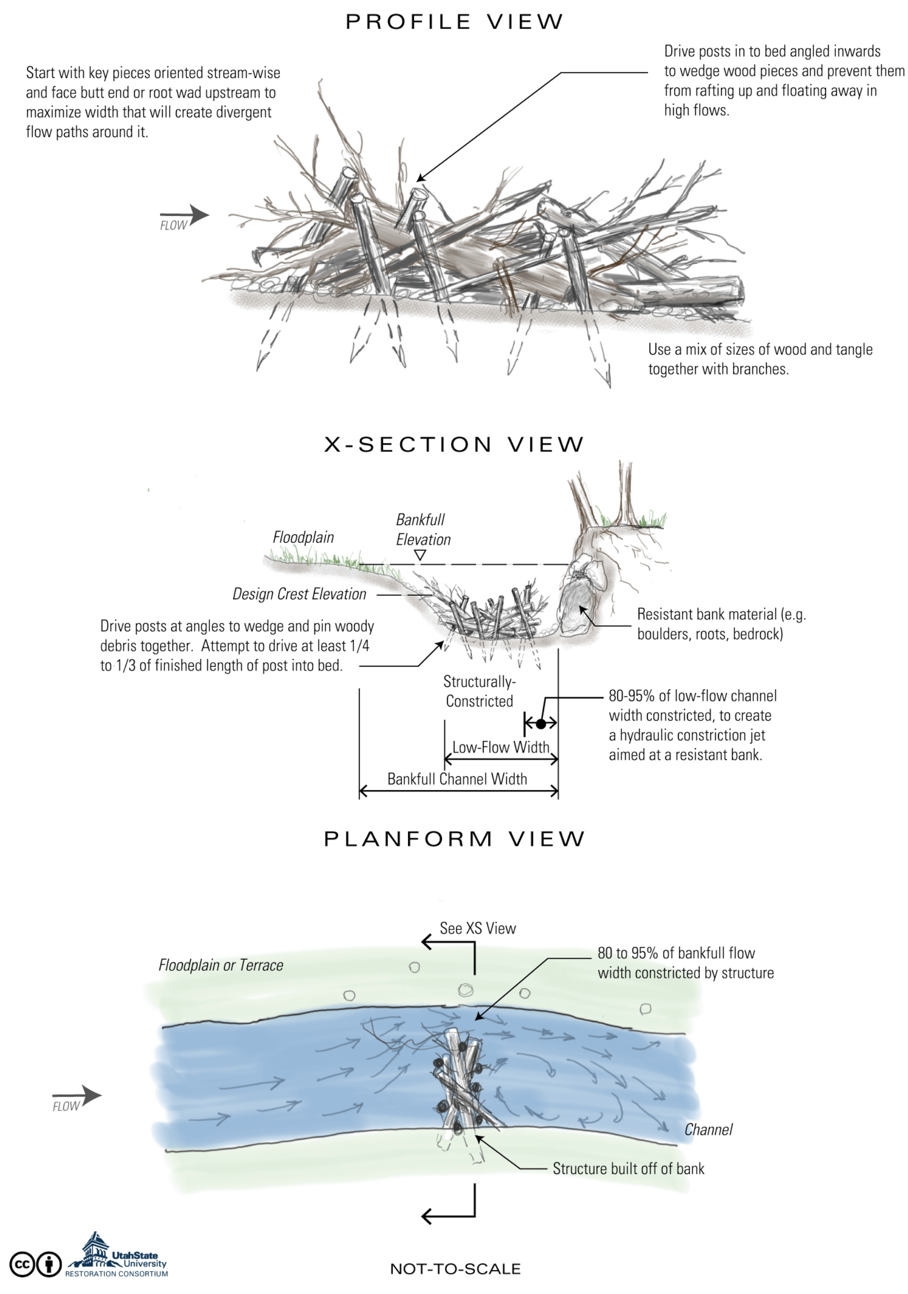

Figure 16. Typical drawings of a mid-channel PALS designed to induce channel complexity, encourage mid-channel deposition, and encourage channel avulsion.

Mid-channel Post-assisted log structure (PALS) – for splitting flow

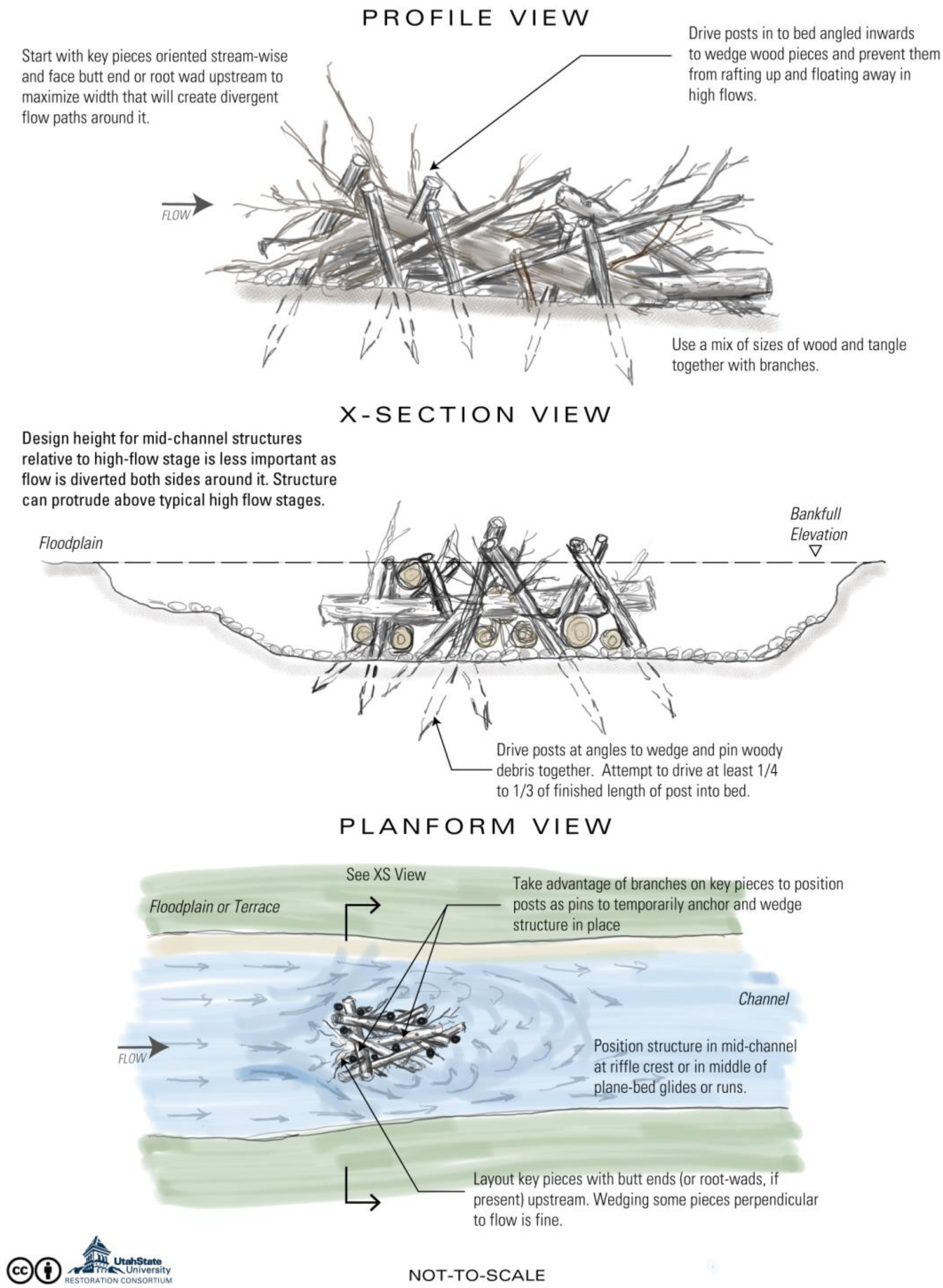

Figure 17. Typical drawings of a mid-channel PALS designed to split flow, increase channel complexity, encourage mid-channel deposition, and encourage overbank flow.

Channel Spanning Post-assisted log structure (PALS) – for aggrading channel, creating plunge pool, and forcing overbank flow

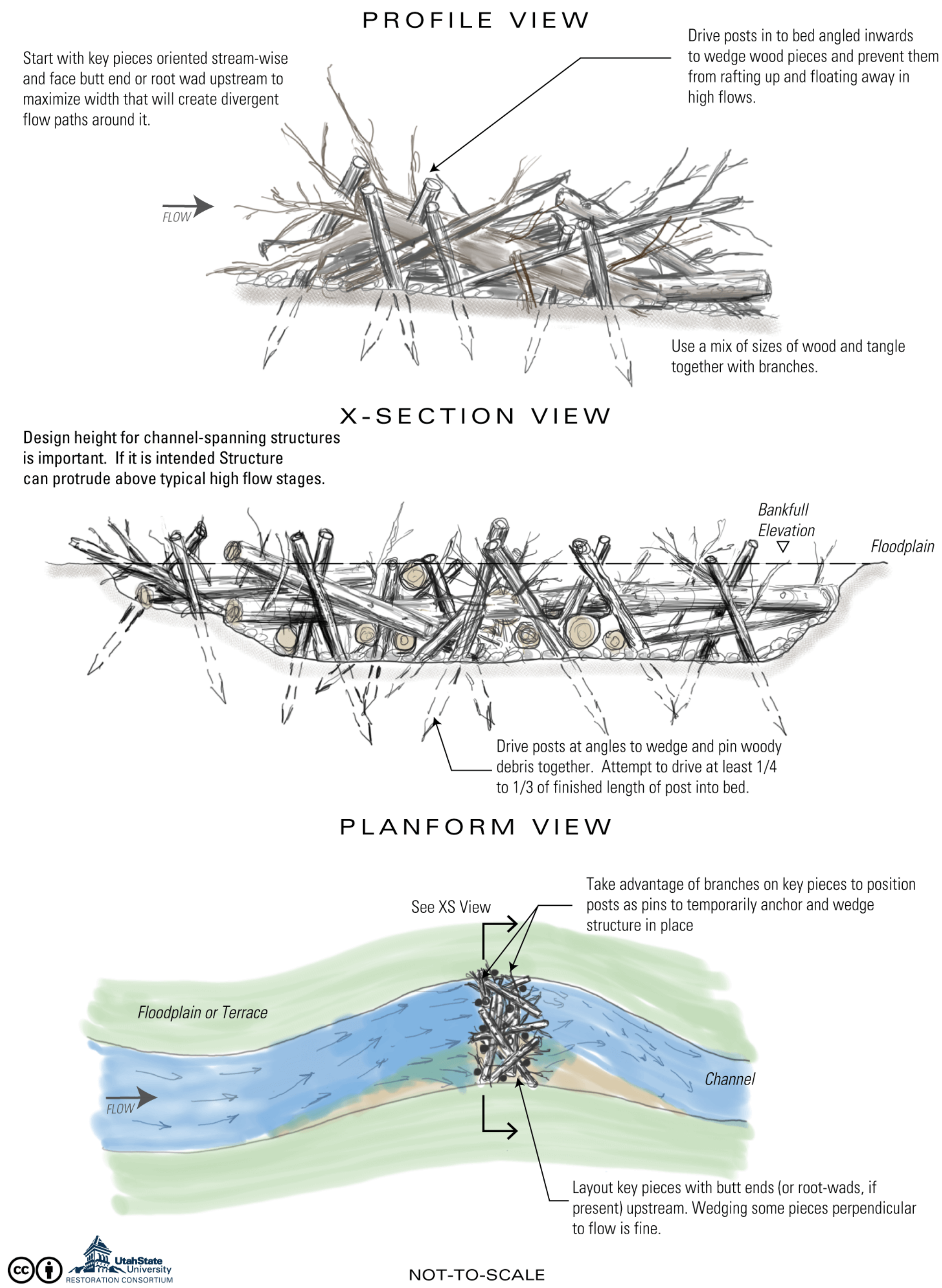

Figure 18. Typical drawings of a channel spanning PALS designed to trap sediment, increase channel complexity, force overbank flow, plunge pools, and induce avulsions.

APPENDIX C. DESIGN SUMMARY FOR EACH STRUCTURE DESCRIBING HOW MUCH WOOD WAS ADDED, ENHANCEMENT TYPE, TYPE OF WOOD ADDED, TOTAL WOOD ADDED, AND GPS LOCATION. ENHANCEMENT TYPES ARE: POSTS AND WOOD – STRUCTRE REBUILT WITH POST-DRIVER AND MORE LWD; LWD – WOOD ADDED TO EXISITNG STRUCTURE; TREE – LIVE TREE FELLED IN PLACE IN STREAM. DECID = DECIDUOUS TREE (ALDER, WATER BIRCH OR COTTONWOOD); CONIFER = CONIFER TREE (DOUGLAS-FIR OR PONDEROSA PINE). PALS TYPE – SPAN = CHANNEL SPANNING, BANK = BANK ATTACHED, MID = MID CHANNEL.

Stream	Section	Enhancement Type	Decid Added	Confir Added	Total LWD Added	PALS Type	Structure No	Latitude	Longitude
Charley	CCS2	Posts & LWD	2	6	8	Span	331	46.282163	-117.355042
Charley	CCS2	Posts & LWD	2	6	8	Bank	332	46.28208	-117.355294
Charley	CCS2	Posts & LWD	2	6	8	Bank	333	46.282105	-117.355572
Charley	CCS2	LWD		3	3	Span	350.1	46.282399	-117.359953
Charley	CCS2	Posts & LWD	2	6	8	Bank	354	46.282399	-117.359953
Charley	CCS2	Posts & LWD	2	3	5	Bank	355	46.282426	-117.358808
Charley	CCS2	Posts & LWD	3	3	6	Bank	356	46.282341	-117.358998
Charley	CCS2	Posts & LWD	1	4	5	Bank	356.1	46.282341	-117.358998
Charley	CCS2	Posts & LWD	2	4	6	Span	357	46.282373	-117.359316
Charley	CCS2	Posts & LWD	3	4	7	Bank	358	46.282399	-117.359953
Charley	CCS2	Posts & LWD	3	2	5	Bank	360	46.28247	-117.359797
Charley	CCS2	Posts & LWD	4	4	8	Span	361	46.28247	-117.359797
Charley	CCS2	LWD		4	4	Mid	362	46.28247	-117.359797
Charley	SFS2	Tree	4	5	9	Span	194	46.212988	-117.286544
South Fork	SFS1	LWD		3	3	Bank	623	46.249903	-117.289723
South Fork	SFS1	LWD		3	3	Bank	624	46.249602	-117.289539
South Fork	SFS1	LWD		6	6	Span	625	46.24945	-117.28938
South Fork	SFS1	LWD		4	4	Bank	626	46.249376	-117.289366

South Fork	SFS1	LWD		4	4	Bank	627	46.249279	-117.289338
South Fork	SFS1	LWD		5	5	Bank	628	46.249313	-117.2894
South Fork	SFS1	LWD		3	3	Bank	629	46.249144	-117.289304
South Fork	SFS1	LWD		5	5	Bank	630	46.249189	-117.289447
South Fork	SFS1	LWD	3	1	4	Span	631	46.246915	-117.287334
South Fork	SFS1	LWD		4	4	Bank	632	46.248846	-117.289174
South Fork	SFS1	LWD	5		5	Span	656	46.246896	-117.287601
South Fork	SFS1	LWD	6		6	Bank	657	46.246746	-117.28741
South Fork	SFS1	LWD	6		6	Span	672	46.244906	-117.286754
South Fork	SFS1	LWD	6		6	Bank	675	46.244544	-117.286822
South Fork	SFS1	LWD	6		6	Bank	676	46.244394	-117.28674
South Fork	SFS1	Tree		8	8	Span	679	46.244249	-117.286577
South Fork	SFS2	Posts & LWD	6	6	12	Span	40	46.234589	-117.283652
South Fork	SFS2	Posts & LWD		10	10	Span	40.1	46.234527	-117.283605
South Fork	SFS2	Posts & LWD	2	9	11	Span	41	46.234482	-117.283554
South Fork	SFS2	Posts & LWD	2	10	12	Span	42	46.234335	-117.283478
South Fork	SFS2	Posts & LWD	6		6	Span	43	46.234099	-117.28354
South Fork	SFS2	LWD		5	5	Bank	44	46.233932	-117.283582
South Fork	SFS2	LWD		6	6	Bank	45	46.233873	-117.283601
South Fork	SFS2	LWD		8	8	Bank	47	46.233534	-117.283472
South Fork	SFS2	LWD		8	8	Bank	47.1	46.233243	-117.283466
South Fork	SFS2	LWD		8	8	Bank	48	46.233376	-117.283417
South Fork	SFS2	LWD		8	8	Bank	52	46.232855	-117.283603
South Fork	SFS2	LWD		9	9	Bank	53	46.232681	-117.283539
South Fork	SFS2	LWD		8	8	Bank	54	46.232462	-117.283473
South Fork	SFS2	LWD		8	8	Bank	55	46.232446	-117.283484
South Fork	SFS2	LWD		8	8	Bank	56	46.232384	-117.283438
South Fork	SFS2	LWD		8	8	Bank	61	46.231893	-117.283417

South Fork	SFS2	LWD		10	10	Bank	63	46.231623	-117.283207
South Fork	SFS2	LWD		8	8	Bank	65	46.231529	-117.283153
South Fork	SFS2	LWD		10	10	Bank	73	46.230921	-117.28233
South Fork	SFS2	LWD		8	8	Bank	74	46.230737	-117.282161
South Fork	SFS2	LWD		8	8	Bank	75	46.230607	-117.28203
South Fork	SFS2	LWD		8	8	Bank	76	46.230504	-117.281986
South Fork	SFS2	LWD		8	8	Bank	77	46.230294	-117.281967
South Fork	SFS2	LWD		8	8	Bank	79	46.230082	-117.282044
South Fork	SFS2	LWD		6	6	Bank	80	46.230015	-117.282082
South Fork	SFS2	LWD		6	6	Bank	83	46.229437	-117.282374
South Fork	SFS2	LWD		6	6	Bank	86	46.22922	-117.282606
South Fork	SFS2	LWD		6	6	Bank	87	46.229084	-117.282609
South Fork	SFS2	LWD		6	6	Bank	88	46.228869	-117.282616
South Fork	SFS2	LWD		6	6	Bank	89	46.228772	-117.282669
South Fork	SFS2	LWD		6	6	Bank	90	46.228654	-117.282673
South Fork	SFS2	LWD		6	6	Bank	91	46.228497	-117.282733
South Fork	SFS2	LWD		6	6	Bank	94	46.227918	-117.282859
South Fork	SFS2	LWD		6	6	Bank	95	46.227729	-117.282713
South Fork	SFS2	LWD		6	6	Bank	96	46.227653	-117.282637
South Fork	SFS2	LWD		6	6	Bank	99	46.227135	-117.282253
South Fork	SFS2	LWD		6	6	Bank	100	46.227029	-117.282064
South Fork	SFS2	LWD		6	6	Bank	101	46.226903	-117.281788
South Fork	SFS2	LWD		6	6	Bank	102	46.226873	-117.281702
South Fork	SFS2	LWD		6	6	Bank	103	46.226739	-117.28156
South Fork	SFS2	LWD		6	6	Bank	104	46.226532	-117.281389
South Fork	SFS2	LWD		6	6	Span	105	46.226243	-117.281282
South Fork	SFS2	LWD		8	8	Span	106	46.226003	-117.281242
South Fork	SFS2	LWD	3	3	6	Span	107	46.225899	-117.281266

South Fork	SFS2	LWD	3	3	6	Bank	108	46.225735	-117.281196
South Fork	SFS2	LWD	3	3	6	Bank	109	46.2256	-117.280986
South Fork	SFS2	LWD	4	1	5	Bank	110	46.2256	-117.280986
South Fork	SFS2	Posts & LWD		10	10	Span	122	46.223092	-117.280101
South Fork	SFS2	Posts & LWD		10	10	Span	123	46.222882	-117.279987
South Fork	SFS2	LWD		10	10	Span	124	46.222385	-117.280106
South Fork	SFS2	Posts & LWD		8	8	Mid	125	46.222208	-117.280374
South Fork	SFS2	Posts & LWD		6	6	Bank	126	46.221746	-117.280425
South Fork	SFS2	Posts & LWD	2	4	6	Span	128.5	46.221217	-117.280278
South Fork	SFS2	Posts & LWD	3	5	8	Span	129	46.221217	-117.280278
South Fork	SFS2	Posts & LWD		9	9	Span	131	46.221217	-117.280278
South Fork	SFS2	Posts & LWD		9	9	Bank	133	46.221217	-117.280278
South Fork	SFS2	LWD		10	10	Span	134	46.220956	-117.280279
South Fork	SFS2	Posts & LWD		9	9	Bank	135	46.220137	-117.280436
South Fork	SFS2	LWD		6	6	Bank	137	46.220048	-117.280505
South Fork	SFS2	Posts & LWD		6	6	Bank	138	46.22	-117.280544
South Fork	SFS2	Posts & LWD		9	9	Bank	140	46.219875	-117.280753
South Fork	SFS2	Posts & LWD		6	6	Span	141	46.219677	-117.280992
South Fork	SFS2	Posts & LWD		8	8	Bank	142	46.21954	-117.281062
South Fork	SFS2	Posts & LWD		12	12	Span	143	46.219333	-117.281287
South Fork	SFS2	Posts & LWD		8	8	Span	144	46.219231	-117.281416
South Fork	SFS2	Posts & LWD		10	10	Span	145	46.219134	-117.281548
South Fork	SFS2	Posts & LWD		8	8	Span	146	46.218986	-117.281696
South Fork	SFS2	Posts & LWD		8	8	Span	147	46.218879	-117.281867
South Fork	SFS2	LWD		5	5	Bank	148	46.2186	-117.282169
South Fork	SFS2	LWD		6	6	Span	149	46.218382	-117.282351
South Fork	SFS2	LWD		8	8	Mid	150	46.218012	-117.282795
South Fork	SFS2	LWD		8	8	Bank	151	46.218012	-117.282795

South Fork	SFS2	LWD		5	5	Bank	152	46.218012	-117.282795
South Fork	SFS2	LWD		6	6	Bank	153	46.218012	-117.282795
South Fork	SFS2	Tree	2	2	4	Mid	156	46.218073	-117.283669
South Fork	SFS2	Tree	3	7	10	Span	157	46.218066	-117.283868
South Fork	SFS2	Tree	5	3	8	Span	157.5	46.218066	-117.283868
South Fork	SFS2	Tree	3	5	8	Span	158	46.217987	-117.28414
South Fork	SFS2	Tree	2	2	4	Bank	178	46.215518	-117.28569
South Fork	SFS2	Tree	3	1	4	Span	181	46.214655	-117.286029
South Fork	SFS2	Tree	4	-	4	Bank	182	46.214806	-117.285764
South Fork	SFS2	Tree	2	1	3	Bank	185	46.213837	-117.286307
South Fork	SFS2	Tree	4	-	4	Bank	186	46.213755	-117.286332
South Fork	SFS2	Tree	3	3	6	Bank	188	46.213283	-117.286392
South Fork	SFS2	Tree	3	4	7	Bank	190	46.213193	-117.286446
South Fork	SFS2	Tree	4	4	8	Bank	193	46.213081	-117.286489