Preliminary Design Report

Increasing Wood Densities in Asotin Creek Intensively Monitored Watershed

Grant 19-1499

North Fork Asotin Creek Partly Intact PALS

South Fork Asotin Creek Fully Intact PALS

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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 proposed enhancement 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. However, as part of our adaptive management plan we wish to add more wood to structures that may have lost wood or been washed downstream. We may also use other low-tech restoration approaches like harvesting trees on site and add them to restoration areas or building beave dam analogs to force overbank flows during low flow periods to enhance floodplain connection. Surveys in spring 2020 identified 156 sites that could be enhanced with more wood – we likely do not have the budget to enhance all these sites, but we have prioritized sites that are in and around our annual monitoring sites to enhance first. The report includes maps of the enhancement sites and typical design drawings of PALS and BDAs.

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.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

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). Project 19-1499 seeks to add large woody debris, rebuild some PALS, and construct a small number of beaver dam analogs (BDAs) in locations where some of the original PALS have lost some wood or have moved and accumulated on other PALS or natural log jams.

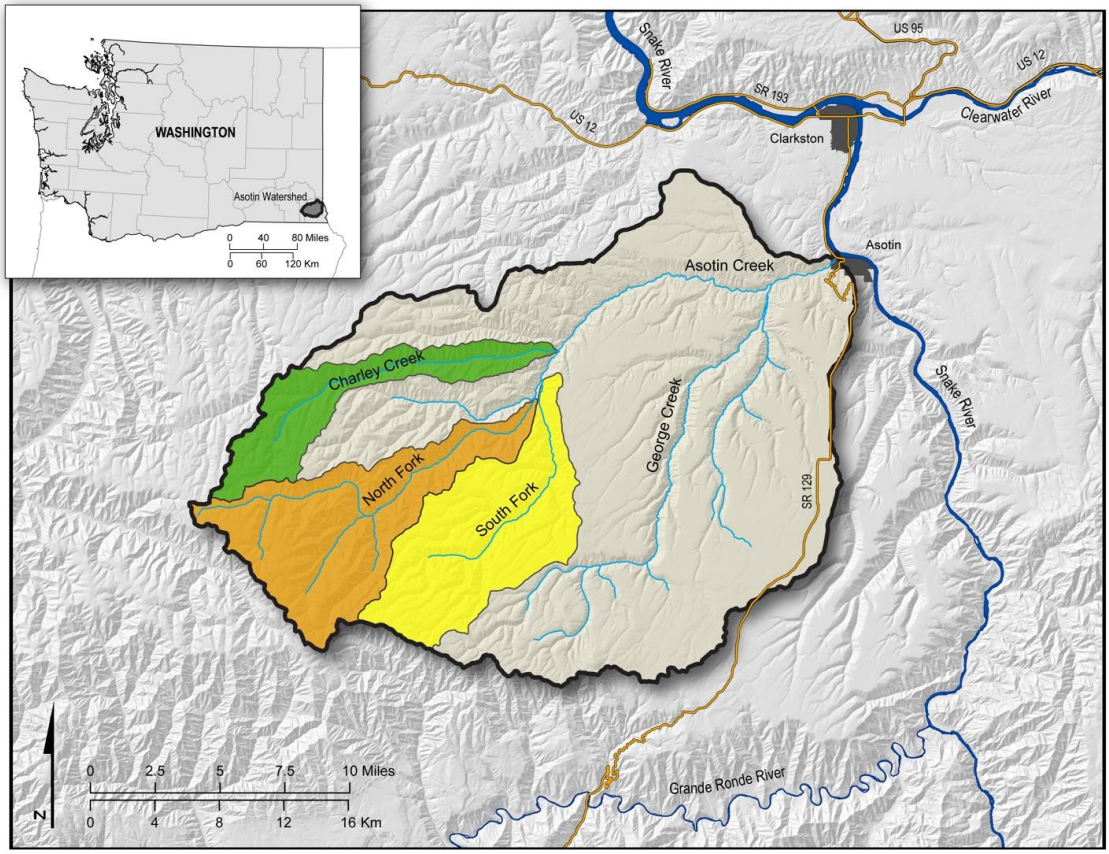

Figure 1. Asotin Creek watershed and Intensively Monitored Watershed area: Charley Creek (green), North Fork Asotin Creek (orange), and South Fork Asotin Creek (yellow). See Figure 2 for the experimental design (treatment and control areas) and fish and habitat monitoring layout.

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 (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 is 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 are 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.

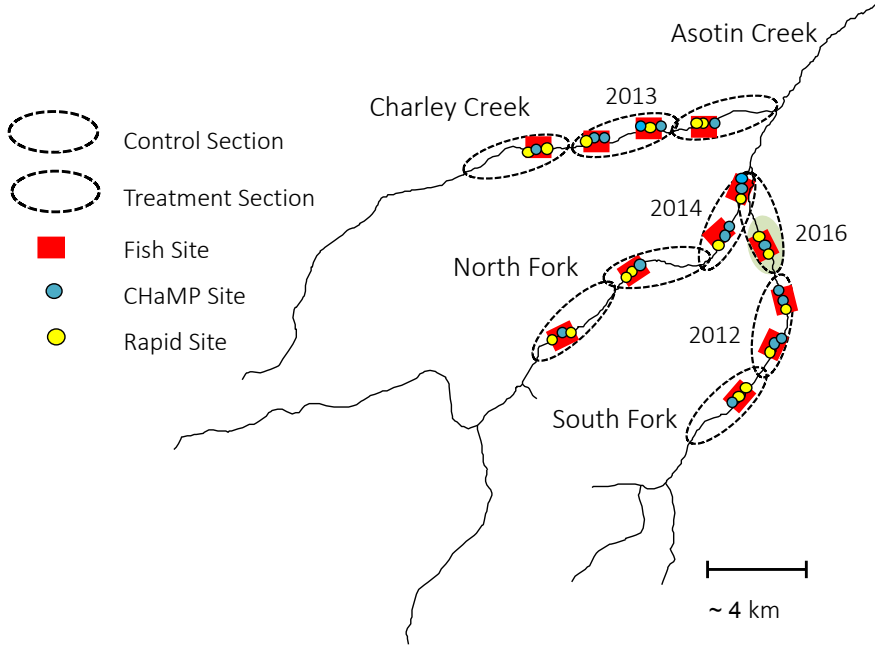

Figure 2. Experimental design and sample sites for juvenile steelhead PIT tagging and habitat surveys for the Asotin Creek IMW. Each study stream has three 4 km long sections. One section in each stream has been restored using post-assisted log structures (shaded green): South Fork (2012), Charley Creek (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 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 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 by hand and all the wood is carried into the stream to limit the disturbance to recovering riparian

habitat (Appendix A). We have not explored other engineering-based alternatives because the IMW is designed to test low-tech process-based restoration approaches. However, we are proposing to use other low-tech methods to increase wood densities in the treatment areas including adding wood to existing PALS, rebuilding PALS that have moved, cutting subdominant trees on site and adding them to the treatment areas, and building beaver dam analogs (BDAs).

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 are still present but have lost wood. This happens when wood floats off the structure or when part of the structure is washed away (Figure 3). We will add LWD to increase the size of the PALS, interlocking the wood into remaining posts or live trees. Wood will be harvested from the USFS and transported to the treatment sites or collected on site when available.

Figure 3. Example of a partly intact post-assisted log structure that could be 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 is logistically feasible to move the hydraulic post-driver to these locations, we will rebuild 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.

Beaver dam analogs: BDAs will be used in the two smaller study streams (Charley and South Fork) to promote overbank flow during base flow conditions. PALS are increasing complexity within the existing channel but do not force overbank flows at base flow (Figure 6). We wish to test if BDAs can help reconnect the floodplain at low flows in combination with the existing PALS.

Figure 6. Example of treatment section along Charley Creek where beaver-dam analogs may be used to force floodplain connection during low flows. Post-assisted log structures are increasing hydraulic and geomorphic diversity in Charley Creek but have not forced floodplain connection.

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 7; Wheaton et al. 2012, Camp 2015, Wheaton et al. 2019, Bennett et al. 2020). Therefore, we plan to generally add wood or rebuild structures to their original configuration although we have noted larger responses from channel spanning structures and may alter some bank-attached or mid-channel PALS to create channel spanning PALS. If adding wood, the wood will be placed to interlock with remaining posts or live trees at the site to secure the wood. If cutting trees, the trees will also be interlocked and 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 8).

Figure 7. 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.

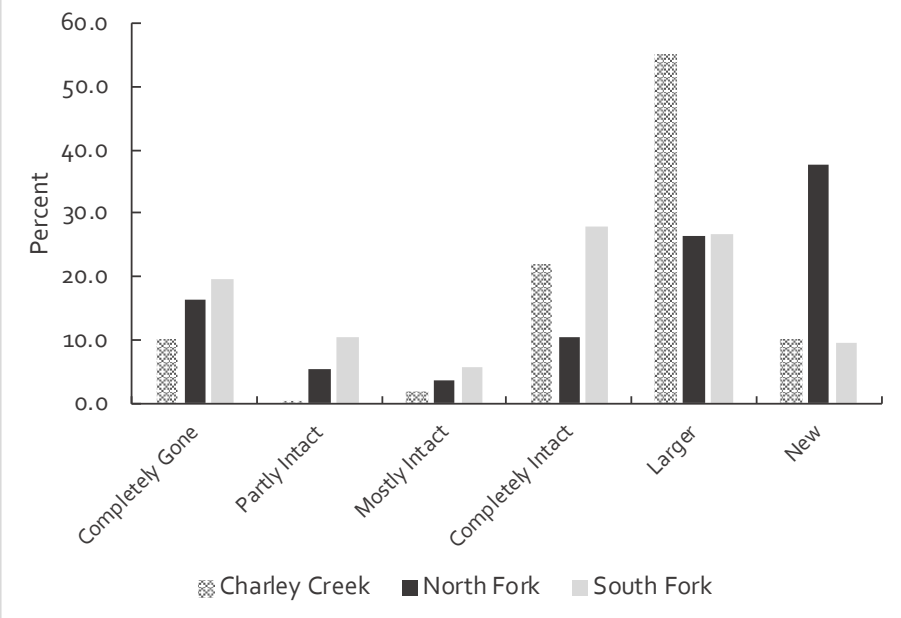

Figure 8. Percent of structures by category describing their integrity based on 2019 survey. Larger refers to structures that have increased 25% in volume due to wood accumulation and New refers to wood accumulations that have developed since the original restoration treatment from IMW wood, natural 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 (Appendices D).

Table 2. Proposed number of structures that will be rebuilt or enhanced with the addition of more large woody debris by stream. See Appendices for maps and data sheets for GPS locations and further descriptions of each structure location.

		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

6 PERMITTING AND STAKEHOLDER CONSULTATION

We have secured the required HPA to conduct this work (attached to PRISM), we have cultural surveys completed on Charley and South Fork Creeks (attached to PRISM), and we are in the process of applying for a final cultural consultation and USACE permit to build BDAs in the project area.

7 PRELIMINARY DESIGN DRAWINGS

See Figure 1 & 2 for project locations and experimental design for the Asotin Creek IMW. Figure 9 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 sites where we will enhance structures. There is no infrastructure other than primitive roads, wood will be staged along the stream and carried by hand to the enhancement locations, and the only fill that will be used is for BDA construction and it will be sourced from the banks and bed upstream of the structures (~ 0.5 yd^3/structure). See Appendices for structure design drawings.

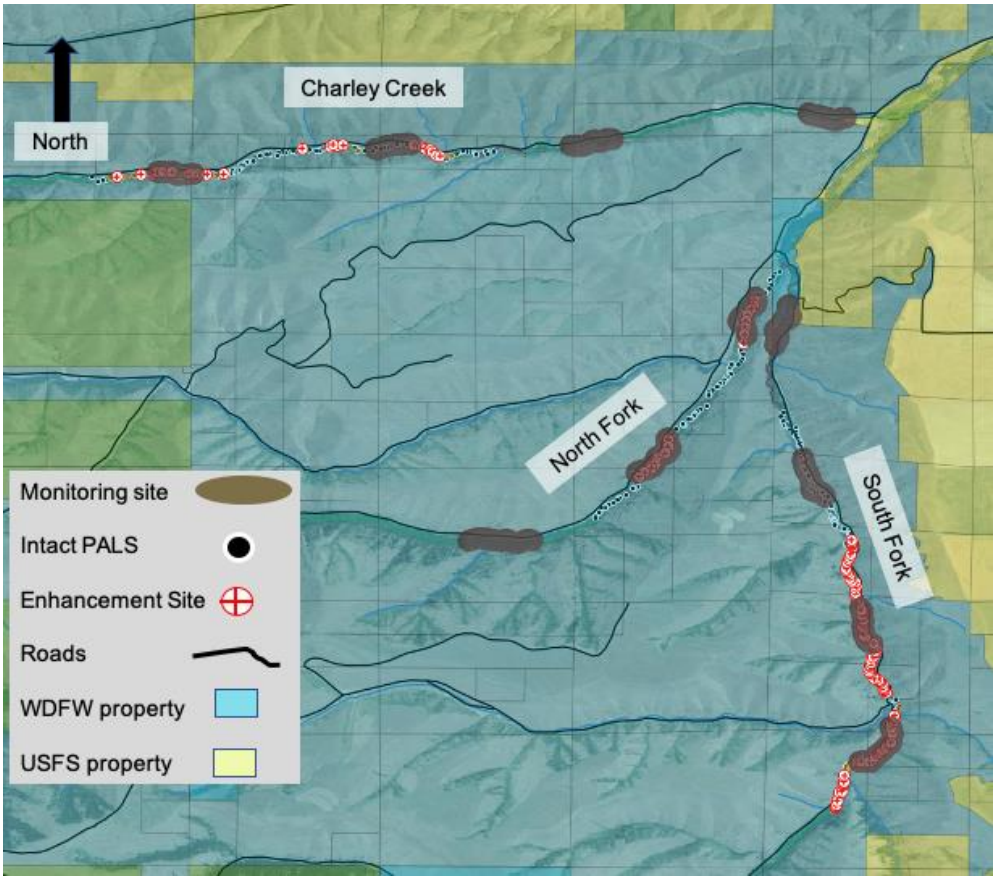

Figure 9. Site plan for increasing wood density showing existing fish and habitat monitoring sites, intact PALS, sites to enhance with additional wood, roads, and property boundaries.

8 CONSTRUCTION QUANTITIES AND PRELIMINARY CONSTRUCTION COST ESTIMATE

We identified 156 sites where enhancement could be implemented (Table 2, Figure 9, Appendix C). We prioritized the sites based on their proximity to monitoring sites for fish and habitat. The budget for this project is $32,500. We do not expect to be able to complete all the enhancement that was identified in the design surveys because North Fork Asotin Creek. Requires a cultural assessment and likely survey that could use up considerable budget (estimate $4,000-7,000). We estimate we can enhance 40-60 sites with the available funds.

APPENDIX A. PHOTOS OF TYPICAL STRUCTURE TYPES

Figure 10. 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 11. 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 12. Post -restoration conditions in North Fork Asotin Creek – mid-channel post assisted log structure splitting flow and creating downstream mid-channel bar.

Figure 13. Beaver dam analog on South Fork Crooked River, Oregon forcing overbank flow during low flow.

APPENDIX B. DRAWINGS OF TYPICAL STRUCTURE TYPES

Beaver Dam Analog (BDA)

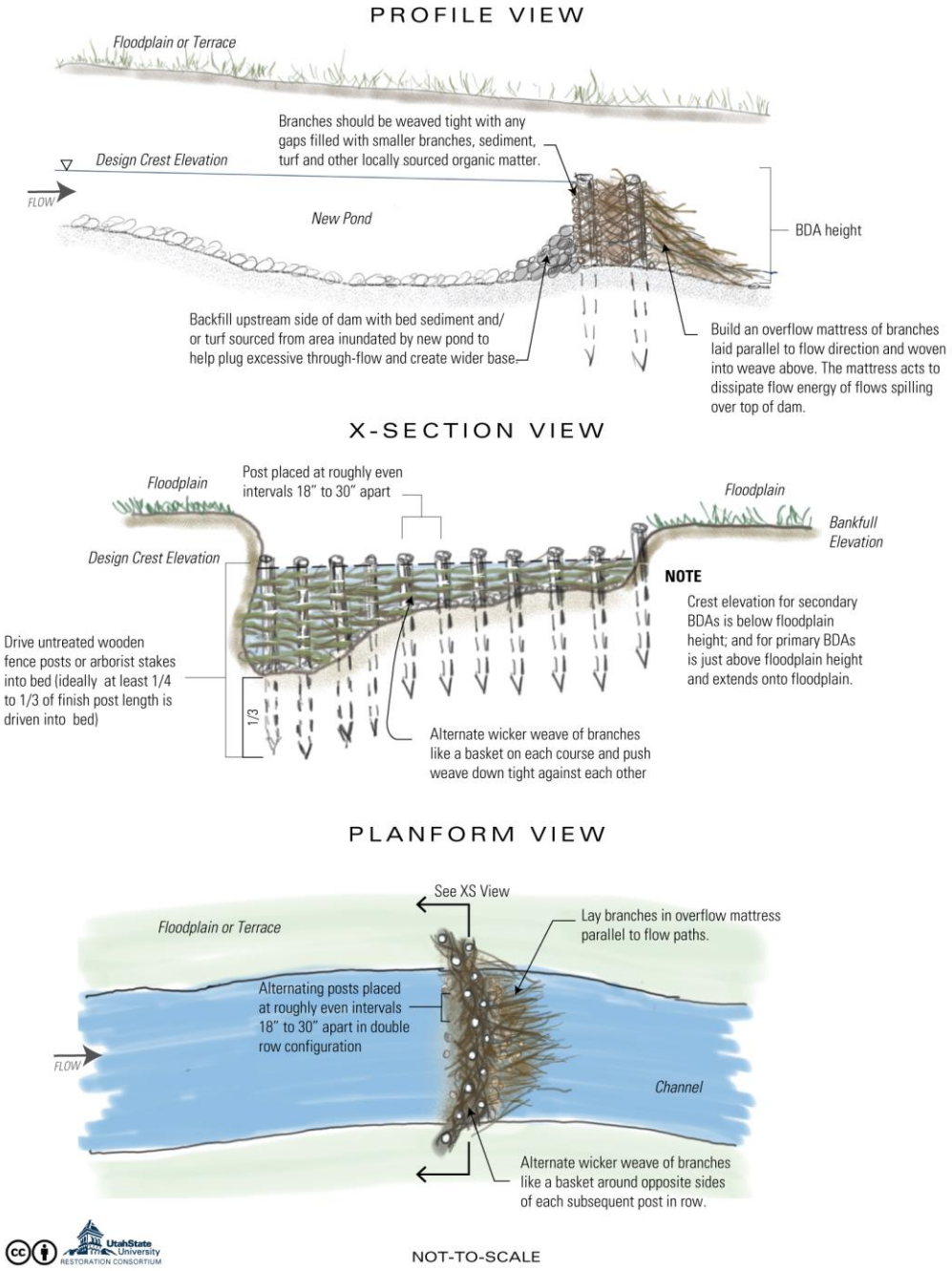

Figure 14. Drawing sketches of typical Beaver Dam Analog (BDA) structures including a profile, cross-section, and planform view.

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

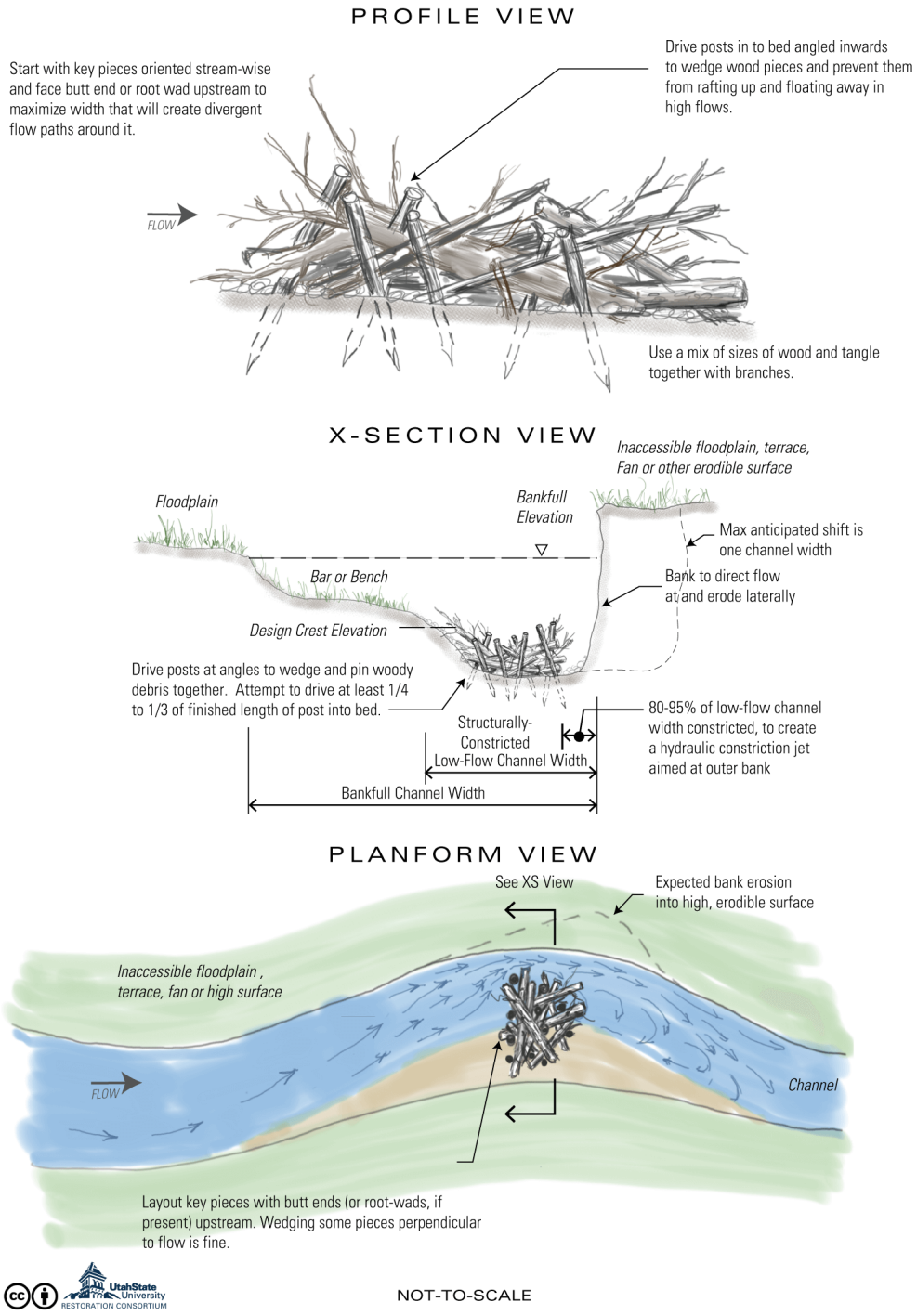

Figure 15. Typical drawing sketches of a bank-attached PALS intended to cause lateral channel migration through deposition of material on point and diagonal bars and erosion of high bank features.

Bank Attached Post-assisted log structure (PALS) – for widening scouring a pool

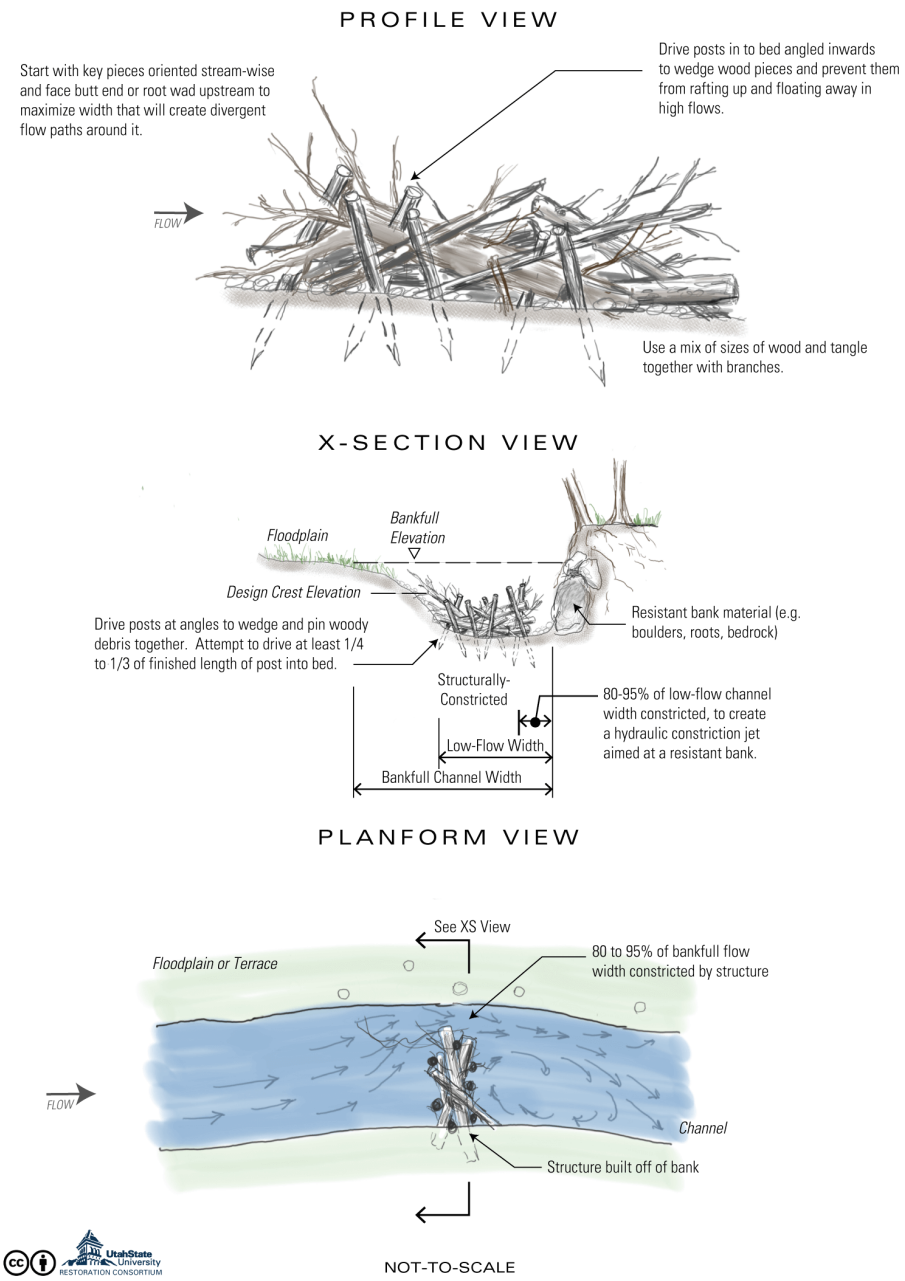

Figure 16. Typical drawings of a mid-channel PALS designed to induce channel complexity, encourage mid-channel deposition, and encourage channel avulsion.

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

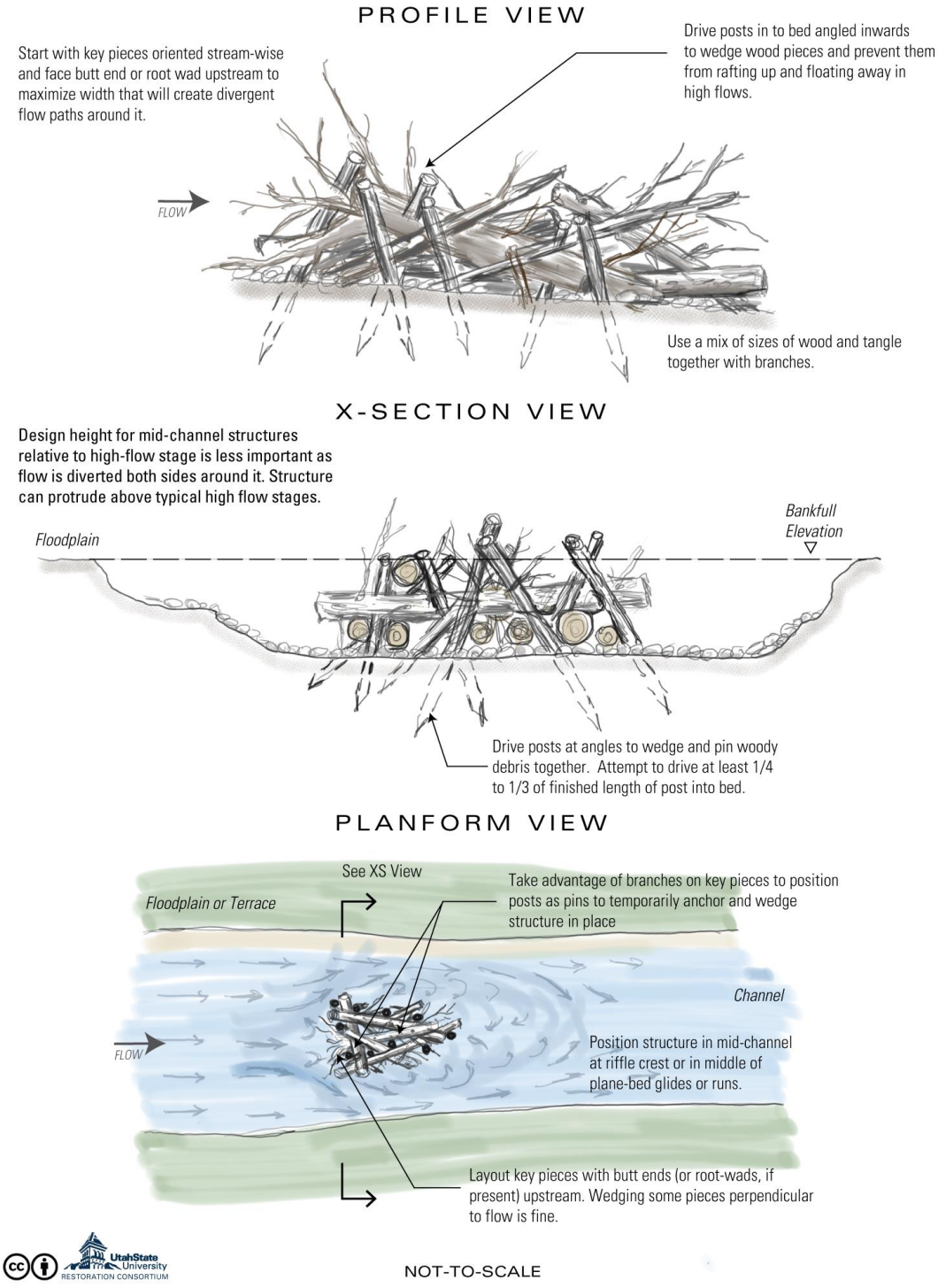

Figure 17. Typical drawings of a mid-channel PALS designed to split flow, increase channel complexity, encourage mid-channel deposition, and encourage overbank flow.

Channel Spanning Post-assisted log structure (PALS) – for widening scouring a pool

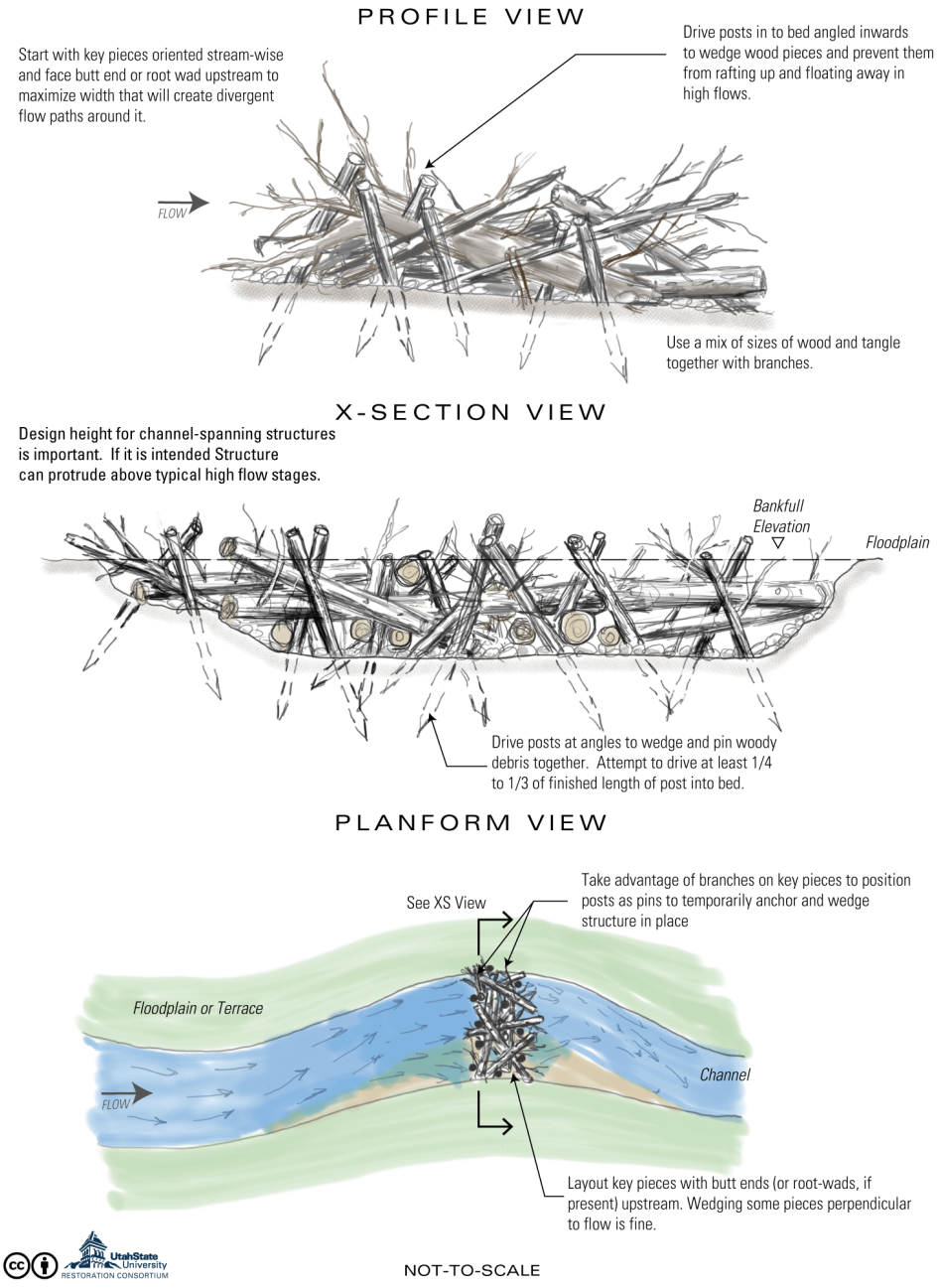

Figure 18. Typical drawings of a channel spanning PALS designed to trap sediment, increase channel complexity, force overbank flow, plunge pools, and induce avulsions.

APPPENDIX C. REFERENCES

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APPENDIX D. DESIGN SUMMARY FOR EACH SITE DESCRIBING WHAT STRUCTURE TO BUILD, WHAT TYPE AND HOW MUCH WOOD TO ADD, AND OTHER DESIGN PARTICULARS.

Stream	Priority	Name	Latitude	Longitude	WoodSource	Alder Count	Birch Count	Cottonwood Count	Conifer Count	Other Count	Total Wood	Wood Location	Add To Structure #	Potential Build Type	Post Pounder
South Fork	Moderate	Maintenance 1	46.212988	-117.286544	Cut Tree(s)	3	0	0	1	0	4	Both	0	Channel Span	No
South Fork	Moderate	Maintenance 2	46.213081	-117.286489	Cut Tree(s)	2	0	0	0	0	2	River Left	193	Bank Left	No
South Fork	Moderate	Maintenance 3	46.213147	-117.286464	Cut Tree(s)	0	0	0	4	0	4	River Left	0	Mid Channel	No
South Fork	Moderate	Maintenance 4	46.213193	-117.286446	Cut Tree(s)	0	0	0	6	0	6	River Left	190	Bank Left	No
South Fork	Moderate	Maintenance 5	46.213283	-117.286392	Cut Tree(s)	2	0	0	2	0	4	Both	188	Bank Left	No
South Fork	Moderate	Maintenance 6	46.213837	-117.286307	Cut Tree(s)	1	0	0	3	0	4	Both	185	Bank Left	No
South Fork	Moderate	Maintenance 7	46.213755	-117.286332	Cut Tree(s)	4	0	0	0	0	4	River Right	186	Channel Span	No
South Fork	Moderate	Maintenance 8	46.214655	-117.286029	Cut Tree(s)	3	0	0	1	0	4	River Right	181	Channel Span	No
South Fork	Moderate	Maintenance 9	46.214806	-117.285764	Cut Tree(s)	14	0	0	1	0	15	River Right	181	Channel Span	No
South Fork	Moderate	Maintenance 10	46.215518	-117.28569	Cut Tree(s)	4	0	0	1	0	5	River Left	178	Channel Span	No
South Fork	Moderate	Maintenance 11	46.215643	-117.285606	Cut Tree(s)	5	0	2	0	0	7	River Left	177	Bank Left	No
South Fork	Moderate	Maintenance 12	46.21569	-117.285583	Cut Tree(s)	3	1	0	0	0	4	River Right	175	Channel Span	No
South Fork	Moderate	Maintenance 13	46.215869	-117.285552	Cut Tree(s)	4	1	0	0	0	5	River Left	174	Bank Right	No
South Fork	Moderate	Maintenance 14	46.216525	-117.285519	Cut Tree(s)	4	1	0	0	0	5	Both	171	Channel Span	No
South Fork	High	Maintenance 15	46.217987	-117.28414	Cut Tree(s)	3	2	0	3	0	8	River Right	158	BDA	No
South Fork	High	Maintenance 16	46.218066	-117.283868	Cut Tree(s)	6	0	0	0	0	6	River Right	157	BDA	No
South Fork	High	Maintenance 17	46.218073	-117.283669	Cut Tree(s)	0	1	0	0	0	1	Both	156	BDA	No
South Fork	High	Maintenance 18	46.218012	-117.282795	Cut Tree(s)	3	1	0	0	0	4	Both	151	BDA	No
South Fork	High	Maintenance 19	46.218382	-117.282351	Stage Trailer Wood	0	0	0	8	0	8	Stage	149	BDA	Yes
South Fork	High	Maintenance 20	46.2186	-117.282169	Stage Trailer Wood	0	0	0	6	0	6	River Right	148	BDA	Yes
South Fork	High	Maintenance 21	46.218879	-117.281867	Stage Trailer Wood	0	0	0	8	0	8	Stage	147	BDA	Yes
South Fork	High	Maintenance 22	46.218986	-117.281696	Stage Trailer Wood	0	0	0	12	0	12	Stage	146	BDA	Yes
South Fork	High	Maintenance 23	46.219134	-117.281548	Stage Trailer Wood	0	0	0	15	0	15	Stage	0	BDA	Yes
South Fork	High	Maintenance 24	46.219231	-117.281416	Stage Trailer Wood	0	0	0	0	0	0	Stage	0	BDA	Yes
South Fork	High	Maintenance 25	46.219333	-117.281287	Stage Trailer Wood	0	0	0	13	0	13	Stage	143	BDA	Yes
South Fork	High	Maintenance 26	46.21954	-117.281062	Stage Trailer Wood	0	0	0	12	0	12	Stage	0	BDA	Yes
South Fork	High	Maintenance 27	46.219677	-117.280992	Stage Trailer Wood	0	0	0	8	0	8	Stage	141	BDA	Yes
South Fork	High	Maintenance 28	46.219875	-117.280753	Stage Trailer Wood	0	0	0	5	0	5	Stage	0	BDA	Yes
South Fork	High	Maintenance 29	46.22	-117.280544	Stage Trailer Wood	0	0	0	8	0	8	Stage	138	BDA	Yes
South Fork	High	Maintenance 30	46.220048	-117.280505	Stage Trailer Wood	0	0	0	15	0	15	Stage	137	BDA	Yes
South Fork	High	Maintenance 31	46.220137	-117.280436	Stage Trailer Wood	0	0	0	8	0	8	Stage	135	BDA	Yes
South Fork	High	Maintenance 32	46.220956	-117.280279	Stage Trailer Wood	0	0	0	10	0	10	Stage	0	BDA	Yes
South Fork	High	Maintenance 33	46.221217	-117.280278	Stage Trailer Wood	0	0	0	8	0	8	Stage	0	BDA	Yes
South Fork	High	Maintenance 34	46.221746	-117.280425	Stage Trailer Wood	0	0	0	10	0	10	Stage	127.1	BDA	Yes
South Fork	High	Maintenance 35	46.222208	-117.280374	Stage Trailer Wood	0	0	0	6	0	6	Stage	125	BDA	Yes
South Fork	High	Maintenance 36	46.222385	-117.280106	Stage Trailer Wood	0	0	0	15	0	15	Stage	0	BDA	Yes
South Fork	High	Maintenance 37	46.222882	-117.279987	Stage Trailer Wood	0	0	0	6	0	6	Stage	0	BDA	Yes
South Fork	High	Maintenance 38	46.223092	-117.280101	Stage Trailer Wood	0	0	0	8	0	8	Stage	0	BDA	Yes
South Fork	Moderate	Maintenance 39	46.2256	-117.280986	Stage Trailer Wood	0	0	4	0	0	4	River Right	110	Channel Span	No
South Fork	Moderate	Maintenance 40	46.225735	-117.281196	Stage Trailer Wood	0	0	0	8	0	8	Stage	108	Bank Right	No
South Fork	Moderate	Maintenance 41	46.225899	-117.281266	Stage Trailer Wood	0	0	3	6	0	9	Stage	107	Channel Span	No
South Fork	Moderate	Maintenance 42	46.226003	-117.281242	Cut Tree(s)	3	0	0	8	0	11	Stage	106	Channel Span	No
South Fork	Moderate	Maintenance 43	46.226243	-117.281282	Cut Tree(s)	1	0	0	0	1	2	Both	105	Channel Span	No
South Fork	Moderate	Maintenance 44	46.226532	-117.281389	Stage Trailer Wood	0	0	0	10	0	10	Stage	0	Channel Span	No
South Fork	Moderate	Maintenance 45	46.226739	-117.28156	Stage Trailer Wood	0	0	0	8	0	8	Stage	103	Channel Span	No
South Fork	Moderate	Maintenance 46	46.226873	-117.281702	Cut Tree(s)	0	0	0	10	0	10	Stage	102	Mid Channel	Yes
South Fork	Moderate	Maintenance 47	46.226903	-117.281788	Stage Trailer Wood	0	0	0	7	0	7	Stage	101	Mid Channel	Yes
South Fork	Moderate	Maintenance 48	46.227029	-117.282064	Stage Trailer Wood	0	0	0	8	0	8	Stage	100	Bank Right	No
South Fork	Moderate	Maintenance 49	46.227135	-117.282253	Cut Tree(s)	2	0	0	2	0	4	Both	99	Bank Right	No
South Fork	Moderate	Maintenance 50	46.227653	-117.282637	Stage Trailer Wood	3	0	0	6	0	9	Stage	96	Mid Channel	Yes
South Fork	Moderate	Maintenance 51	46.227729	-117.282713	Cut Tree(s)	2	0	0	1	0	3	Both	95	Bank Right	No
South Fork	Moderate	Maintenance 52	46.227918	-117.282859	Cut Tree(s)	0	0	0	8	0	8	River Left	94	Channel Span	No
South Fork	Moderate	Maintenance 53	46.228185	-117.28287	Cut Tree(s)	0	3	0	3	0	6	River Left	92	Channel Span	No
South Fork	Moderate	Maintenance 54	46.228497	-117.282733	Cut Tree(s)	2	0	0	0	0	2	River Left	91	Bank Left	No
South Fork	Moderate	Maintenance 55	46.228654	-117.282673	Stage Trailer Wood	0	0	0	6	0	6	Stage	90	Channel Span	Yes
South Fork	Moderate	Maintenance 56	46.228772	-117.282669	Stage Trailer Wood	0	0	0	6	0	6	Stage	89	Channel Span	Yes
South Fork	Moderate	Maintenance 59	46.22922	-117.282606	Stage Trailer Wood	3	0	0	8	0	11	Stage	86	Channel Span	Yes

South Fork	Moderate	Maintenance 57	46.228869	-117.282616	Stage Trailer Wood	0	0	0	6	0	6	Stage	88	Channel Span	Yes
South Fork	Moderate	Maintenance 58	46.229084	-117.282609	Stage Trailer Wood	0	0	0	6	0	6	Stage	87	Channel Span	Yes
South Fork	Moderate	Maintenance 60	46.229437	-117.282374	Cut Tree(s)	0	2	0	6	0	8	River Right	83	Channel Span	No
South Fork	High	Maintenance 61	46.230015	-117.282082	Cut Tree(s)	1	0	3	0	0	4	River Right	80	Bank Left	No
South Fork	High	Maintenance 62	46.230082	-117.282044	Stage Local Wood	0	0	5	0	0	5	River Right	79	Bank Left	No
South Fork	High	Maintenance 63	46.230294	-117.281967	Stage Trailer Wood	0	0	0	8	0	8	Stage	0	Bank Right	No
South Fork	High	Maintenance 64	46.230504	-117.281986	Stage Trailer Wood	0	0	0	6	0	6	Stage	76	Bank Left	No
South Fork	High	Maintenance 65	46.230607	-117.28203	Stage Trailer Wood	0	0	0	5	0	5	Stage	75	Bank Right	No
South Fork	High	Maintenance 66	46.230737	-117.282161	Stage Trailer Wood	0	0	0	8	0	8	Stage	74	Channel Span	No
South Fork	High	Maintenance 67	46.230921	-117.28233	Stage Trailer Wood	0	0	0	7	0	7	Stage	73	Bank Right	No
South Fork	High	Maintenance 68	46.231529	-117.283153	Cut Tree(s)	0	0	0	0	0	0	River Right	65	Channel Span	No
South Fork	High	Maintenance 69	46.231623	-117.283207	Cut Tree(s)	0	0	0	2	0	2	River Right	63	Mid Channel	No
South Fork	High	Maintenance 70	46.231893	-117.283417	Cut Tree(s)	1	1	0	1	0	3	River Left	61	Bank Left	No
South Fork	High	Maintenance 71	46.232384	-117.283438	Stage Local Wood	0	0	0	1	0	1	River Right	56	Bank Right	No
South Fork	High	Maintenance 72	46.232446	-117.283484	Stage Trailer Wood	0	0	0	8	0	8	Stage	55	Bank Right	No
South Fork	High	Maintenance 73	46.232462	-117.283473	Stage Trailer Wood	0	0	0	6	0	6	Stage	54	Bank Right	No
South Fork	High	Maintenance 74	46.232681	-117.283539	Stage Trailer Wood	0	0	0	8	0	8	Stage	53	Bank Right	No
South Fork	High	Maintenance 75	46.232855	-117.283603	Cut Tree(s)	2	0	0	1	0	3	Both	52	Channel Span	No
South Fork	High	Maintenance 76	46.233243	-117.283466	Stage Trailer Wood	0	0	0	6	0	6	Stage	47.1	Bank Right	No
South Fork	High	Maintenance 77	46.233376	-117.283417	Stage Trailer Wood	0	0	0	7	0	7	Stage	48	Bank Right	No
South Fork	High	Maintenance 78	46.233534	-117.283472	Stage Trailer Wood	0	0	0	6	0	6	Stage	47	Bank Right	No
South Fork	High	Maintenance 79	46.233873	-117.283601	Cut Tree(s)	0	0	0	4	0	4	River Right	45	Bank Right	No
South Fork	High	Maintenance 80	46.233932	-117.283582	Cut Tree(s)	0	0	0	2	0	2	River Left	44	Channel Span	No
South Fork	High	Maintenance 81	46.234099	-117.28354	Stage Trailer Wood	1	0	0	5	0	6	River Left	43	Channel Span	No
South Fork	High	Maintenance 82	46.234335	-117.283478	Stage Trailer Wood	0	0	0	15	0	15	Stage	42	BDA	Yes
South Fork	High	Maintenance 83	46.234482	-117.283554	Stage Trailer Wood	0	0	0	10	0	10	Stage	41	BDA	Yes
South Fork	High	Maintenance 84	46.234527	-117.283605	Stage Trailer Wood	0	0	0	10	0	10	Stage	40.1	BDA	Yes
South Fork	High	Maintenance 85	46.234589	-117.283652	Stage Trailer Wood	0	0	0	8	0	8	Stage	40	BDA	Yes
South Fork	High	Maintenance 86	46.234615	-117.283689	Cut Tree(s)	1	0	0	0	0	1	River Left	39.1	BDA	No
South Fork	Moderate	Maintenance 87	46.235369	-117.283909	Cut Tree(s)	2	0	0	0	0	2	River Right	38	Bank Right	No
South Fork	Moderate	Maintenance 88	46.235597	-117.284163	Cut Tree(s)	0	0	0	1	1	2	Both	0	Channel Span	No
South Fork	Moderate	Maintenance 89	46.235826	-117.284204	Cut Tree(s)	3	0	0	0	0	3	River Left	36	Channel Span	No
South Fork	Moderate	Maintenance 90	46.236204	-117.284261	Stage Local Wood	1	0	0	1	0	2	River Left	35	Bank Left	No
South Fork	Moderate	Maintenance 91	46.236504	-117.284338	Cut Tree(s)	2	0	0	0	0	2	Both	34	Bank Right	No
South Fork	Moderate	Maintenance 92	46.236859	-117.284288	Cut Tree(s)	3	0	0	2	0	5	Both	33	Channel Span	No
South Fork	Moderate	Maintenance 93	46.237156	-117.284165	Cut Tree(s)	0	0	0	4	2	6	River Left	32	Channel Span	No
South Fork	Moderate	Maintenance 94	46.237604	-117.284293	Cut Tree(s)	1	3	0	7	0	11	River Left	30	Bank Right	Yes
South Fork	Moderate	Maintenance 95	46.23776	-117.284666	Cut Tree(s)	4	1	0	0	0	5	River Right	29	Bank Left	No
South Fork	Moderate	Maintenance 96	46.238062	-117.284944	Cut Tree(s)	0	4	0	0	6	10	River Right	27	Bank Right	No
South Fork	Moderate	Maintenance 97	46.238473	-117.284967	Stage Trailer Wood	0	0	0	10	0	10	River Left	26	Bank Left	Yes
South Fork	Moderate	Maintenance 98	46.238711	-117.285179	Stage Trailer Wood	0	0	0	10	0	10	Stage	24	Channel Span	Yes
South Fork	Moderate	Maintenance 99	46.238872	-117.285305	Cut Tree(s)	0	0	0	4	0	4	River Left	23	Channel Span	Yes
South Fork	Moderate	Maintenance 100	46.239086	-117.285322	Cut Tree(s)	0	0	0	4	0	4	River Left	4	Mid Channel	Yes
South Fork	Moderate	Maintenance 101	46.239767	-117.285225	Stage Local Wood	3	0	0	1	0	4	River Right	17	Bank Right	Yes
South Fork	Moderate	Maintenance 102	46.240118	-117.285025	Stage Trailer Wood	0	0	0	8	0	8	Stage	16	Bank Left	No
South Fork	Moderate	Maintenance 103	46.240293	-117.284876	Stage Trailer Wood	0	0	0	8	0	8	Stage	15	Bank Left	Yes
South Fork	Moderate	Maintenance 104	46.240696	-117.284839	Cut Tree(s)	0	0	0	2	0	2	River Left	9	Bank Left	No
South Fork	Moderate	Maintenance 105	46.241456	-117.284583	Cut Tree(s)	4	0	0	0	0	4	Both	8	Bank Right	No
South Fork	Moderate	Maintenance 106	46.24165	-117.284725	Stage Trailer Wood	0	0	0	8	0	8	River Right	7	Bank Right	No
South Fork	Moderate	Maintenance 107	46.241829	-117.284755	Stage Trailer Wood	0	0	0	7	0	7	Stage	6	Bank Right	No
South Fork	Moderate	Maintenance 108	46.241933	-117.284729	Stage Trailer Wood	0	0	0	6	0	6	Stage	5	Bank Left	No
South Fork	Moderate	Maintenance 109	46.241982	-117.284671	Stage Trailer Wood	0	0	0	4	0	4	Stage	4	Bank Right	No
South Fork	Moderate	Maintenance 110	46.242249	-117.28473	Stage Trailer Wood	0	0	0	4	0	4	Stage	2	Bank Right	No
Charley	High	Maintenance 111	46.281913	-117.364843	Cut Tree(s)	3	1	0	1	0	5	River Right	387.1	Bank Left	No
Charley	High	Maintenance 112	46.282172	-117.362218	Cut Tree(s)	0	2	0	0	0	2	River Right	372	Bank Right	No
Charley	High	Maintenance 113	46.282161	-117.361038	Cut Tree(s)	3	3	0	0	0	6	Both	367	BDA	No
Charley	High	Maintenance 114	46.282338	-117.360593	Cut Tree(s)	2	1	0	0	0	3	River Left	365	BDA	No
Charley	High	Maintenance 115	46.282409	-117.360464	Cut Tree(s)	3	0	0	0	0	3	River Right	364	BDA	No
Charley	High	Maintenance 116	46.28247	-117.359797	Stage Trailer Wood	3	0	0	0	6	9	Stage	360	Bank Right	Yes

Charley	High	Maintenance 117	46.282373	-117.359316	Stage Trailer Wood	0	1	0	0	10	11	Stage	357	BDA	Yes
Charley	High	Maintenance 118	46.282341	-117.358998	Stage Trailer Wood	0	1	0	0	10	11	Stage	356	BDA	Yes
Charley	High	Maintenance 119	46.282426	-117.358808	Stage Trailer Wood	0	0	0	0	20	20	Stage	355	Bank Left	Yes
Charley	High	Maintenance 120	46.282182	-117.356953	Stage Trailer Wood	0	0	0	0	8	8	Stage	340	BDA	Yes
Charley	High	Maintenance 121	46.282222	-117.35681	Stage Trailer Wood	0	0	0	0	0	0	Stage	0	BDA	Yes
Charley	High	Maintenance 122	46.282183	-117.35623	Stage Trailer Wood	0	0	0	0	10	10	Stage	336	BDA	Yes
Charley	High	Maintenance 123	46.282176	-117.355975	Stage Trailer Wood	0	0	0	0	10	10	Stage	334	BDA	Yes
Charley	High	Maintenance 124	46.282105	-117.355572	Stage Trailer Wood	0	0	0	0	10	10	Stage	333	BDA	Yes
Charley	Moderate	Maintenance 125	46.28208	-117.355294	Stage Trailer Wood	0	0	0	0	15	15	Stage	332	BDA	Yes
Charley	Moderate	Maintenance 126	46.282163	-117.355042	Stage Trailer Wood	0	0	0	0	20	20	Stage	331	BDA	Yes
Charley	Moderate	Maintenance 127	46.282204	-117.353249	Stage Trailer Wood	0	0	0	0	10	10	Stage	320	BDA	No
Charley	Moderate	Maintenance 128	46.28499	-117.344661	Stage Trailer Wood	0	0	0	0	10	10	Stage	280	Channel Span	No
Charley	Moderate	Maintenance 129	46.285314	-117.340874	Cut Tree(s)	0	0	0	0	0	0	Both	267	BDA	Yes
Charley	High	Maintenance 130	46.285174	-117.341627	Cut Tree(s)	0	0	0	0	10	10	Both	269	BDA	Yes
Charley	High	Maintenance 131	46.285394	-117.341299	Cut Tree(s)	0	0	0	0	10	10	Both	268	BDA	Yes
Charley	High	Maintenance 132	46.285328	-117.340217	Cut Tree(s)	0	0	0	0	10	10	Both	266	BDA	No
Charley	High	Maintenance 133	46.285422	-117.332459	Cut Tree(s)	3	0	0	0	0	3	River Right	234	BDA	Yes
Charley	High	Maintenance 134	46.28519	-117.331498	Cut Tree(s)	0	0	0	0	15	15	Both	234	BDA	Yes
Charley	High	Maintenance 135	46.284959	-117.331259	Cut Tree(s)	0	0	0	0	10	10	Stage	230	BDA	Yes
Charley	High	Maintenance 136	46.284853	-117.330693	Cut Tree(s)	0	0	0	0	15	15	Both	229	BDA	Yes
Charley	High	Maintenance 137	46.284679	-117.330441	Cut Tree(s)	0	0	0	0	10	10	Both	228	BDA	Yes
Charley	Moderate	Maintenance 138	46.284195	-117.33005	Cut Tree(s)	2	0	0	0	0	2	River Left	0	BDA	Yes
Charley	Moderate	Maintenance 139	46.284119	-117.329628	Stage Local Wood	0	0	3	0	0	3	River Left	226	BDA	No
North Fork	High	Maintenance 140	46.268422	-117.295313	Cut Tree(s)	3	0	0	1	0	0	Both	0	Mid Channel	4
North Fork	High	Maintenance 141	46.267908	-117.295414	Cut Tree(s)	1	0	0	2	0	0	Both	0	Mid Channel	4
North Fork	High	Maintenance 142	46.267497	-117.295709	Cut Tree(s)	2	0	0	0	4	0	Stage	0	Mid Channel	6
North Fork	High	Maintenance 143	46.266832	-117.296092	Stage Trailer Wood	2	1	0	0	6	0	Both	0	Mid Channel	9
North Fork	High	Maintenance 144	46.266183	-117.296269	Stage Trailer Wood	0	0	0	0	6	0	Stage	0	Channel Span	6
North Fork	High	Maintenance 145	46.265518	-117.296369	Cut Tree(s)	3	0	0	0	0	0	Both	0	Mid Channel	0
North Fork	High	Maintenance 146	46.264731	-117.296405	Cut Tree(s)	4	0	0	0	0	0	Both	0	Channel Span	0
North Fork	High	Maintenance 147	46.263724	-117.29654	Cut Tree(s)	3	0	0	0	0	0	Both	0	Channel Span	0
North Fork	High	Maintenance 148	46.25325	-117.304718	Stage Trailer Wood	0	0	0	0	10	0	Stage	0	Mid Channel	0
North Fork	High	Maintenance 149	46.25246	-117.304743	Stage Trailer Wood	0	0	0	0	12	0	Stage	0	Mid Channel	0
North Fork	High	Maintenance 150	46.251737	-117.305076	Stage Trailer Wood	0	0	0	0	15	0	Stage	0	Channel Span	0
North Fork	High	Maintenance 151	46.251237	-117.305832	Stage Trailer Wood	0	0	0	0	0	0	Stage	0	Channel Span	0
North Fork	High	Maintenance 152	46.250824	-117.306114	Stage Trailer Wood	0	0	0	0	12	0	Stage	0	Channel Span	0
North Fork	High	Maintenance 153	46.250509	-117.306186	Cut Tree(s)	3	0	0	1	0	0	Both	0	Mid Channel	0
North Fork	High	Maintenance 154	46.250087	-117.30655	Cut Tree(s)	2	0	0	1	0	0	Both	0	Mid Channel	0
North Fork	High	Maintenance 155	46.249627	-117.307297	Cut Tree(s)	2	2	0	1	0	0	Both	0	Mid Channel	0
North Fork	High	Maintenance 156	46.249177	-117.307908	Cut Tree(s)	2	2	0	2	0	0	Both	0	Mid Channel	0