Basis of Design 80%

Kelly Creek PA-45

Prepared for the Bonneville Power Administration

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Asotin County Conservation District
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SECTION 1: Property Characteristics and Management Objectives

Landowner: Washington Department of Fish & Wildlife
Asotin Creek Wildlife Area: George Creek Unit
Property Address/Directions: Kelly Creek, at the end of Dwight Halsey Road. From Asotin, take WA-129 south approximately 13.5 miles. Turn right on Onstot Road for approximately .5 miles. Turn right on Dwight Halsey road and travel approximately 3 miles to the end of the road.

Property description

County	Asotin
PLSS	T09N, R45E, R46E, S11: SE ¼; S13: SW ¼; S14: NE ¼ SE ¼; S24: NE ¼ SE ¼ NW ¼; S19; NW ¼.
Lat./Long.	46°15'14.70"N, 117° 7'26.77"W
Area	~1.4 stream miles
HUC8	Lower-Snake Asotin (1760103)
HUC12	Pintler Creek (170601030207)
WRIA	35 Middle Snake
Land use	Public Access: Wildlife Habitat, Hunting, Camping
ESA Listings	Snake River Summer Steelhead, Threatened
VSP Critical areas	Wildlife Habitat: Mule Deer, Upland Game Birds, Cliff-nesting Birds, Snake River Steelhead. Severe water erosion potential (NRCS), Moderate to low wind erosion potential (NRCS).
Project Area	PA-45, Kelly Creek. RM 0.0 - RM 1.4, (Kelly Creek confluence with Pintler Creek at RM 3.6 and ~3,700 ft. upstream, spring-fed tributary of Pintler Creek.)

Introduction

The Asotin County Conservation District (ACCD) is sponsoring the Kelly Creek (aka: "Project Area-45, or PA-45") instream habitat restoration project to improve habitat conditions for ESA listed Snake River Summer Steelhead migration, spawning, rearing. Kelly Creek is a spring-fed tributary to Pintler Creek, located within the George Creek Major Spawning Area (MSA). This stream has the potential to support summer base flows for Pintler Creek, a priority restoration reach identified in the Snake River Salmon Recovery Plan for SE Washington (SRSRB, 2011).

Recommended treatments for improving limiting factors include adding Large Woody Debris (LWD) to improve geomorphic conditions and increase the rearing capacity for juvenile steelhead by improving the primary limiting factors of channel stability, flow restrictions, habitat diversity, water temperature and key habitat quantity (Bennett et al. 2018).

Low-Tech Process Based Restoration (LTPBR) strategies will be implemented to address the Steelhead recovery objectives identified in the Asotin County Conceptual Restoration Plan for Kelly Creek project area 45 (Bennett et. al., 2018). Hand-built Post-Assisted Log Structures (PALS) and Beaver Dam Analogue structures (BDA's) install strategically placed woody-debris into structures within the stream channel that reinitiate natural stream processes including overbank flow, increased complexity, floodplain connectivity, and sediment and water retention (Wheaton et. al., 2019). Construction of LTPBR structures will follow generally standardized steps of LTPBR, and individual structures will be installed based on site-specific conditions to achieve project goals and objectives (Wheaton, et. al., 2019). LTPBR is designed to have minimal adverse impacts on streams by limiting the amount of disturbance and mimicking natural stream processes to achieve habitat restoration goals (Bennett et al. 2018).

This project is being implemented with permission and support of the landowner on public land owned by the Washington Department of Fish and Wildlife (WDFW).

Goals

The Asotin County Conceptual Restoration Plan for Kelly Creek (PA-45) identifies the need for additional large woody debris throughout the project area to increase geomorphic complexity, promote overbank flows, and increase sediment and water retention as priorities for this project area (Bennett et. al., 2018). The addition of large woody debris in strategic locations throughout the creek will provide structural elements that will kick-start natural processes that will continue improving riparian and geomorphic stream function into the future (Wheaton, et. al, 2019), and increase the quantity and quality of habitat available for ESA listed Summer Steelhead.

Adding structural elements (PALS/BDAs) to the channel will:

- Increase hydraulic and geomorphic complexity to provide flow-refuge and cover for fish
- Increase habitat diversity by forcing new pools, eddy bars, riffles, plunge pools, side channels and undercuts
- Improve sediment sorting, and reduce woody-debris transport time to reduce negative impacts of sediment erosion from upland wildfire area
- Improve water temperature regulation as riparian vegetation is recruited to shade the stream

- Increase the amount of available key habitat features such as pools, riffles, flow-refuge and cover for fish

The Asotin County Conservation District completed a Geomorphic Assessment for Asotin, George, Alpowa, Tenmile, and Couse Creeks in 2018 with funding from BPA and SRSRFB. Based on the information in the assessment there was a Conceptual Restoration Plan completed for (83) project areas including Kelly Creek ("Project Area 45"), and recommendations for restoration actions were included in the plan. In 2020, ACCD collaborated with BPA to develop a project on lower Pintler Creek, which is a tributary to George Creek. After exploring the project location and conditions, BPA recommended the ACCD focus restoration actions on the upper reaches of George Creek and Pintler Creek due to the degraded conditions in the lower reaches (Bennett et. al., 2018). This direction has resulted in ACCD working to develop additional prioritizations and long-term restoration strategy for the Pintler and George Creek watersheds. This project is being proposed as part of that larger strategy as it is an important tributary of Pintler Creek. The restoration actions taken on Kelly Creek will be the first of many phases in the upper Pintler watershed and was prioritized for early action due to its current conditions.

Objectives:

This project will result in the implementation of (80-100) PALS and BDA structures across approximately 3700 feet of channel in Kelly Creek to facilitate instream habitat rehabilitation for Summer Steelhead. Geomorphic improvements will increase the rearing capacity for juvenile steelhead by improving the primary limiting factors of channel stability, flow restrictions, habitat diversity, water temperature and key habitat quantity (Bennett et al. 2018). Structures will provide instream channel complexity, improve sediment retention, increase water holding and access to floodplain, and promote overbank flows. Project activities are expected to create roughly 60 new pools in Kelly Creek within 2 to 3 flow cycles. The instream habitat construction sequence is planned in phases and will begin the "Maintenance and Adaptive Management Phase 2". Phase 2 will include monitoring, adaptive management activities, and riparian planting.

Site history

The project area is owned by the Washington Department of Fish & Wildlife and part of the George Creek Wildlife Area. The parcels making up this area were purchased between 1991-2012 and the property was acquired to protect high quality shrub-steppe habitats (WDFW Website, 2022). Prior to the purchase, this property was used for rangeland livestock grazing.

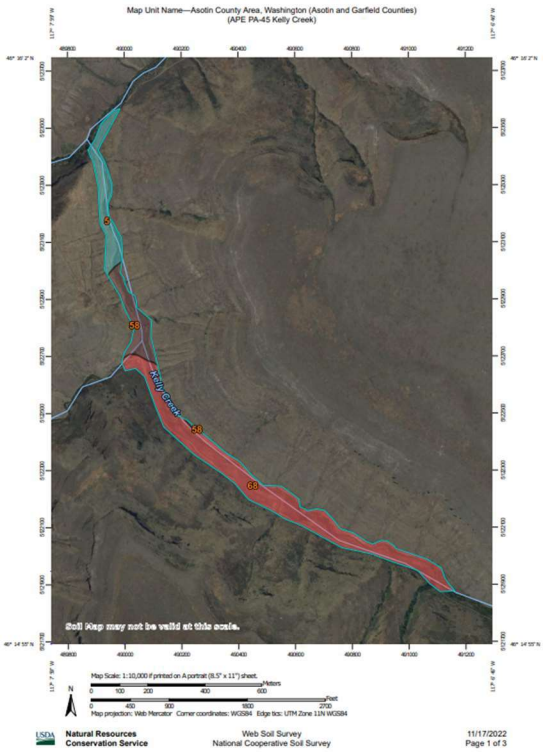
SECTION 2: Resource Inventory

Inventory of current conditions and relevant baseline information.

Soils

Information describing the following soils was gathered from the USDA-NRCS Web Soil Survey.
(https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
5	Bolicker-Asotin silt loams, 40 to 90 percent slopes	Bolicker-Asotin silt loams, 40 to 90 percent slopes	5.9	17.8%
58	Lickskillet-Schuelke-Rock outcrop complex, 40 to 90 percent slopes	Lickskillet-Schuelke-Rock outcrop complex, 40 to 90 percent slopes	5.0	15.1%
68	Matheny-Linville-Laufer complex, 40 to 90 percent slopes	Matheny-Linville-Laufer complex, 40 to 90 percent slopes	22.3	67.1%
Totals for Area of Interest			**33.2**	**100.0%**



Water

**The following information is copied directly from the Asotin County Conceptual Restoration Plan (Bennett, 2018):*

Kelly Creek

Site Description

Project Area **45 (PA-45)** is located along Kelly Creek, which is a tributary to Pintler Creek. Kelly Creek enters Pintler Creek at RM 3.7 and the headwaters of Kelly Creek are in loess uplands, which are dominated by dryland farming. There is a defined channel, the substrate is coarse cobble and boulder, with deciduous dominated riparian vegetation along the lower mile and a half of Kelly Creek. The geomorphic function is moderate and the flow goes subsurface annually after spring floods.

Basic descriptors of Project Area 45.

RM Start	RM End	RM Length	Reach Type	Geomorphic Function	Landownership
0.0	1.4	1.4	Confined with Occasional Floodplain Pockets	Moderate	State

Initial Hydraulic and Hydrologic Conditions:

The current geomorphic function is moderate due to limited geomorphic or structural element diversity. The channel is relatively simple with few side channels and overbank flow opportunities. (Bennett et. al, 2018) Kelly Creek's hydrologic regime is snow-rain dominated, however it is anticipated to shift to a rain-dominated regime. This will likely decrease summer base flows and increase summer water temperatures. Healthy stream and riparian areas conditions are essential during climate change shifts since they provide a critical location in the ecosystem for habitat for both fish and wildlife. The restoration work proposed will improve the resiliency of the project area and overall watershed. No stream gauges or water-quality monitoring stations are present in Kelly Creek.

- Estimated average bank full width and depth: 8' feet wide, up to 6" depth, Average less than 4" depth.
- Estimated average alluvial valley width: 200 ft.
- Slope: ≈ 40-90%

Kelly Creek elevation-relief maps, Google Earth Web.

StreamStats Report:
(https://streamstats.usgs.gov/ss/)
Region ID: WA
Workspace ID: WA20221122192229080000
Clicked Point (Latitude, Longitude): 46.26401, -117.13059
Time: 2022-11-22 11:22:53 -0800
Drainage Area: 14.45 Sq. Mi.
Mean average precipitation: PRISM 1981-2012: 16.5 Inches.
Minimum Elevation: 2900 ft.
Maximum Elevation: 3570 ft.

Peak-Flow Statistics Parameters [Peak Region 1 2016 5118]					
Parameter Code	**Parameter Name**	**Value**	**Units**	**Min Limit**	**Max Limit**
DRNAREA	Drainage Area	14.45	square miles	0.25	3310
PRECPRIS10	Mean Annual Precip PRISM 1981 2010	16.5	inches	9.82	52.5
CANOPY_PCT	Percent Area Under Canopy	0.11	percent	0	77.4

Peak-Flow Statistics Flow Report [Peak Region 1 2016 5118]					
PIl: Prediction Interval-Lower, Plu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)					
Statistic	**Value**	**Unit**	**PIl**	**Plu**	**ASEp**
50-percent AEP flood	94.7	ft^3/s	25.3	354	95
20-percent AEP flood	235	ft^3/s	81.4	679	71.9
10-percent AEP flood	378	ft^3/s	132	1080	70.7
4-percent AEP flood	633	ft^3/s	205	1960	77.4
2-percent AEP flood	891	ft^3/s	266	2980	84.8
1-percent AEP flood	1200	ft^3/s	326	4410	93.6
0.5-percent AEP flood	1570	ft^3/s	385	6390	104
0.2-percent AEP flood	2180	ft^3/s	467	10200	119

Air
Air quality
There is no long term, management caused, air quality issue or concern in the planning area.

Plants

This project area has limited riparian establishment and is primarily deciduous trees and shrubs. The riparian vegetation has matured but overall, the site still lacks large woody debris needed to encourage natural stream processes and provide salmonid habitat. The stream reach has deciduous tree and shrub dominated riparian vegetation and defined channel with limited floodplain opportunities. Small pockets of moderate riparian vegetation exist, heavily dominated by mock orange, and noxious weeds (reed canary grass and poison hemlock).

Vegetation observed (Site Notes, 4/6/2022):

Mock orange (Syringa)
Golden currant
Gray's biscuitroot
Arrowleaf balsamroot
Smooth sumac
Ponderosa pine
Water birch
Cattails
Black cottonwood
Alder
Prairie star
Blue bunch wheat grass
Idaho fescue

Noxious weeds:

Poison hemlock
Reed canary grass (*very dense in some pockets)
Teasle

1: Kelly Creek site photo, 4/6/22

Animals

Wildlife

The property contains priority habitat for Mule Deer, Gamebirds, Cliff-nesting birds, and Snake River Steelhead.

ESA Listed Species and Habitat Present:

Snake River Summer Steelhead (an ESA listed fish) use Kelly Creek for migration, spawning, and rearing life stages.

Fish species presence and use by life history stage in Project Area 45:

**The following information is copied from the Asotin County Conceptual Restoration Plan (Bennett, 2018):*

Fish species presence and use by life history stage in Project Area 45.

Spring Chinook				Fall Chinook				Steelhead				Bull Trout			
Migratio	Spawnin	Rearing	Holding	Migratio	Spawnin	Rearing	Holding	Migratio	Spawnin	Rearing	Holding	Migratio	Spawnin	Rearing	Holding

- no activity
- low to moderate activity
- peak activity

Primary limiting factors in Project Area 45:

Channel Stability	Flow	Habitat Diversity	Sediment Load	Temperature	Key Habitat Quantity	Obstructions
	X	X			X	

Humans

The planning area is owned by the Washington Department of Fish and Wildlife managed for public use, and is a moderately popular hunting, hiking, and camping area. Recreational opportunities including hunting, hiking, and wildlife viewing are an important use of the property. Surrounding uplands are dominated by dry-land farming and livestock rangeland use.

Landowners were engaged throughout the Assessment and Conceptual Restoration Plan development through public meetings and onsite visits. There has been no opposition to the conceptual restoration plan that was developed for PA-45. This project is being proposed on public property and the landowner, WDFW, is willing to proceed with the development of a complete site plan and implementation of the project. There are no identified public safety concerns identified at this time. In the event there is a safety concern identified, ACCD will address the concerns while completing the site plan and designs.

Cultural Resources

The Asotin County Conservation District will complete a cultural resources survey for the area of potential effect (APE) of this project to ensure cultural compliance with GEO 21-02 and Section 106 requirements. Any culturally sensitive sites identified within the APE will be excluded from all future construction activities to protect the integrity of the sites. A detailed archaeological survey will be made available for authorized project personnel, but general exclusion areas will be mapped for construction crews and will be flagged for easy recognition during construction activities.

Environmental Compliance

All permitting to be secured by the Asotin County Conservation District prior to beginning construction and will adhere to the Bonneville Power Administration's habitat improvement program environmental compliance requirements.

Energy/Facilities

Roads and Site-Access:

The project is located south of the city of Asotin, WA, accessible by Dwight Halsey Road, and an ATV trail which runs from a large parking area near the headwaters of Kelly Creek to its confluence with Pintler Creek. The project begins at Kelly Creek RM 0.0 and ends at RM 1.4. From Asotin, take WA-129 south approximately 13.5 miles. Turn right on Onstot Road for approximately 0.5 miles. Turn right on Dwight Halsey Road and travel approximately 3 miles to the end of the road, where the large gravel parking lot ends at a Washington Department of Fish and Wildlife (WDFW) access gate. Motorized vehicles are not allowed beyond this point without prior approval from WDFW. The access trail is an old farming access road large enough for ATV/UTV access and a few turn-around locations along the trail. Full-sized trucks with trailers will not fit. The access trail is covered in grasses, and (3) water-ford locations exist within the project area, but only (2) are within the APE of PA-45. Water-ford locations are notated on the site map. The nearest bridge is ~4.5 miles downstream on George Creek.

Recreational Areas

Kelly Creek is located within the George Creek Wildlife Area Unit, within the Asotin Creek Wildlife Area which is managed by the Washington State Department of Fish and Wildlife for recreation and public access. The unit is approximately 12,822 acres and ranges in elevation between 1162 ft. to 2909 ft. WDFW releases pheasants on this unit (Game Management Unit 181) to support upland game hunting. This unit has pockets of high-quality shrub steppe and steep rocky canyons with riparian areas, offering opportunities to view a variety of wildlife, including deer, turkeys, and songbirds. Trails offer opportunities for horseback riding and hiking (wdfw.wa.gov, 2022).

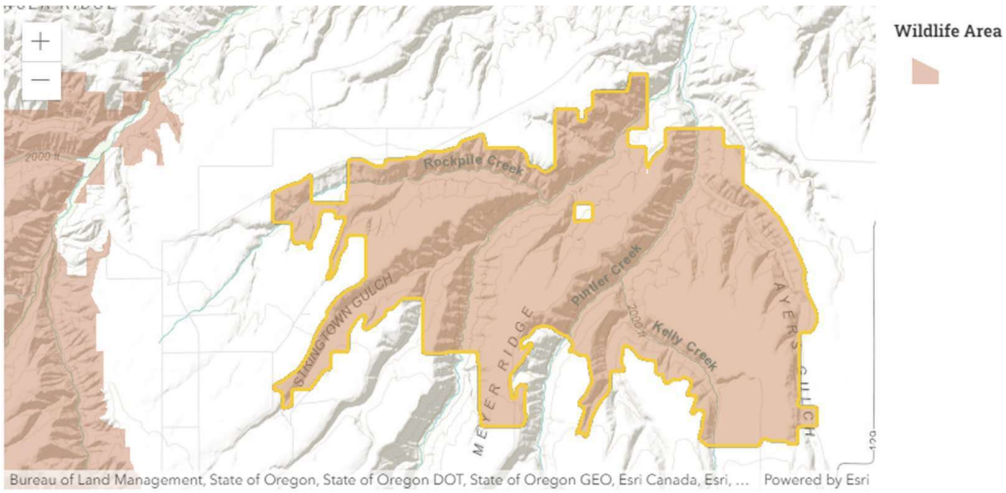
**The following information is copied directly from the WDFW Website (www.wdfw.wa.gov):*

"The George Creek Unit is comprised of steep rocky canyons with riparian habitat in the canyon bottoms. George Creek forms the largest sub-basin within the Asotin Creek watershed, but this creek, along with its tributaries Pintler and Rockpile creeks, has no surface flow for the majority of the lower reaches. The George Creek Unit is located about 6 miles southwest of Asotin in Asotin County. The unit can be accessed from both Cloverland Grade Road and Meyers Ridge Road off of Asotin Creek Road." (WDFW George Creek Wildlife Area Unit Description, 2021.)

The George Creek Unit is located in the Snake River Watershed, within the Columbia River Basin. Surrounding land use consists of rural agriculture. The unit is mostly surrounded by private lands, and in the northeast corner of the unit Department of Natural Resources land.

- *No motorized travel is allowed off county roads.*
- *This unit includes areas of very steep terrain.*
- *Visitors should avoid use of county roads during wet or wintery conditions. Roads include steep grades and can become slick."*

Figure 2 WDFW: Map of George Creek Unit, (www.wdfw.wa.gov).



SECTION 3: Resource Concerns and Recommended Actions

The following information was guided by the Asotin County Conceptual Restoration Plan (2018), and by the NRCS Resource Concerns Checklist. When appropriate, NRCS technical notes and tools were used to assess resource concerns.

Identified Resource Concerns

- Degraded Plant Condition: *Inadequate structure and composition*
- Inadequate Habitat for Fish and Wildlife: *Habitat Degradation*

Recommended Actions

**The following guidance is copied from the Asotin Conceptual Restoration Plan (Bennett et. al., 2018):*

GEORGE, PINTLER, TENMILE, COUSE, PAGE, POW WAH KEE, KELLY, PAGE, AND SMALL TRIBUTARIES

6.1 Primary Issue

- Excessive sediment (very active sediment deposition); natural, but likely exacerbated by anthropogenic impacts
- Low floodplain roughness and little to no riparian vegetation
- Often poorly sorted sediment
- Low summer base flows (or completely subsurface)
- Low geomorphic and hydraulic diversity

6.2 Recommended Actions

- Long-term processes – Riparian and Upland Management
  - Planting in portions of George, Pintler, Couse, Tenmile, and tributaries that do not have perennial flow is very challenging. Future planting efforts should follow efforts to mitigate flow and sediment issues
- Short-term processes – Adding Structural Elements
  - Flow improvements should be the primary goal throughout, especially in upper reaches and upstream Project Areas. Slow the spring runoff and recharge the groundwater to increase summer base flows downstream
  - Addressing excessive sediment is likely impractical; however, the lack of structural elements leaves these reaches in a static state where high flow events are not effective at altering the channel in a way that produces quality salmon habitat. These reaches are highly dynamic and transport a lot of sediment, so there would likely be a quick geomorphic response to LWD additions
  - Floodplain often lacks the structure to facilitate the creation of beneficial floodplain features. These reaches often have the flows to access the floodplain every 1-5 years, but water and sediment is not being stored, leaving an unsorted, poorly defined channel dominated by cobble and boulders. Structural elements on the floodplain would encourage fine sediment deposition, increase water storage, and promote riparian health.

Restoration recommendations for Project Area 45:

Restoration Strategy	Recommended Restoration Actions
Protect and Maintain Natural Processes	Continue best management practices in the loess dominated farmlands of upper Ayers Creek to limit excess fine sediment and protect recovering riparian habitat.
Remove Barriers and Reconnect Disconnected Habitats	Promote overbank flow. Add structural elements throughout to improve hydraulic and geomorphic complexity, increase fish cover and flow refuge, improve sediment sorting, and reduce sediment and LWD transport time.
Long-term Processes	Riparian planting in reconnected floodplain habitat and invasive vegetation control throughout.
Short-term Processes	Add LWD throughout to improve hydraulic and geomorphic complexity, increase fish cover and flow refuge, improve sediment sorting, and reduce sediment and LWD transport time.
Alternative Strategies	N/A

9.1.1 *Recommended Restoration Actions*

Recommendations for PA-45 include promoting overbank flow, adding structural elements to improve geomorphic function, riparian planting, and control of non-native vegetation.

9.1.2 *Geomorphic Implications*

Adding structural elements will increase geomorphic and hydraulic complexity, improve sediment sorting, and reduce sediment and LWD transport time. Riparian planting in areas with reconnected floodplain and controlling invasive weeds will improve riparian function and provide a source of LWD.

9.1.3 *Biological Benefits*

Adding structural elements will increase high flow and predator refuge for fish and create more suitable rearing and spawning habitat. Restoration of a large portion of Kelly Creek may provide some benefits to downstream flow.

9.1.4 *Potential Challenges*

There do not appear to be any significant challenges in this PA, other than ease of access to the site.

Alternative Treatments:

In the past, heavy equipment was used for instream restoration projects. Since the Asotin Creek IMW introduced the use of low-tech process-based restoration (LTPBR) strategies such as Post Assisted Log Structures (PALS) and Beaver Dam Analogs (BDA) the implementation of restoration projects in small streams shifted to utilizing techniques that have less disturbance to the stream and riparian vegetation. An alternative treatment to LTPBR treatment of Kelly Creek would be to use heavy equipment to install large, engineered projects, but the potential for disturbance of critical resources is much greater when using heavy equipment.

Project Plan

Materials Staging:

Due to the access and terrain restrictions in Kelly Creek and the presence of (3) water ford crossings, a helicopter is recommended to drop large bundles of woody-materials for restoration activities directly into predetermined staging areas close to construction sites. Use of a helicopter would increase efficiency of materials transport, reduce the number of crossings needed through water-fords, and reduce the disturbance potential from extra vehicles on the WDFW access trail. The woody materials needed for the PALS and BDA structures will be sourced from forest-thinning projects within Asotin County whenever possible, or otherwise purchased materials will be sourced from the region. Untreated posts will be sourced from the region as well. Access lanes and staging areas may be cleared of dry/dead standing weeds or vegetation using mowers or brush cutters to mitigate fire risks. No soil disturbance or scalping will occur during vegetation management.

Post-Assisted Log Structures (PALS):

Woody material of various sizes will be pinned together with untreated wooden posts (<4" diameter) driven into the substrate to mimic natural wood accumulations. PALS installation will occur in the stream channel within the 100-year floodplain. Untreated wooden posts will be pounded 2-3 feet into the stream bed using a hand-held pneumatic post-pounder. Tops of the posts will be trimmed to the desired crest elevation and so that a minimum of 1/3rd of the post is driven into the subsurface **OR** the post will be lashed to another post with natural fiber rope to increase stability. Posts will be cut at <18" above the channel invert or at <1' drops, all posts will be cut horizontally to the same elevation. Approximately 4-15 posts per structure (depending on the width of the stream at installation location), plus the addition of woody debris (small trees and branches, <4' diameter) will be woven between posts by hand.

Variations of PALS structures include bank-attached PALS on the river-right bank (RR), bank-attached PALS on the river-left bank (RL), mid-channel PALS which are shaped like a triangle, and centered in the channel between RR and RL banks (Mid), and mid-channel debris jams which are centered in the channel between RR and RL banks but are not shaped uniformly. Channel spanning PALS structures shall be less than 10% of all structures within a given project area, and shall never exceed 18" in total height, or exceed the bank-full height of the channel. Structures will be designed and built according to the Low-Tech Process-Based Restoration of Riverscapes Design Manual[3]. Equipment to be used includes a hand-held pneumatic post-pounder and a generator to power it, chainsaw, handsaws, sledgehammers, shovels, and rock bars. An ATV will be used for staging additional materials and equipment near the stream channel, with access provided by a WDFW access trail adjacent to the stream. Woody materials will be dropped into designated

Disturbance of banks and channel shall be limited to that necessary to construct PALS structures. No structure shall create a barrier to fish passage.

Beaver Dam Analogues (BDAs):

A permeable, channel-spanning structure with a constant crest elevation constructed with a mixture of woody debris and fill material to mimic a natural beaver dam and create ponding of water. BDA'S will be installed in the stream bed by scouring the channel using hand-tools and buckets to build subsequent layers of substrate between 6"-12" into the BDA formation. Fine woody debris and additional sediment will be woven by hand between and on top of layers. BDA installations are "post-assisted," and 4-25 treated wooden posts will be inserted into the stream bed using a hand-held pneumatic post-pounder. Depth of disturbance will be variable depending on location of structure, design, and woody materials characteristics, usually less than 2 feet of sediment will be moved to form layers of BDA. Post-assisted BDA structures will cause ground disturbance of 2-3 feet (posts into stream bed). Posts will be cut at <18" above the channel invert or at <1' drops, all posts will be cut horizontally to the same elevation. Equipment to be used includes chainsaws, hand-held pneumatic post-pounder, sledgehammers, handsaws, shovels, drills, and buckets. An ATV will be used for staging materials, equipment, and crew on site with access provided by a WDFW access trail adjacent to the stream.

Material for BDA structures will consist of assorted cobbles and sediments, will be sourced from the streambed and floodplain within 10 yards of the BDA location, will be excavated using hand tools, and placed by hand in the stream in a way which promotes ponding within low-flow channels in the floodplain. The structures will be varied in size based on their locations and beneficial effects, but the amount of fill used in all BDA structures will be less than 0.25 cubic yards per structure, (less than 2.5 cubic yards total for all structures), of woody debris, rocks, gravel and sediments, and will directly impact less than 1,500 sq. ft of the waterbody.

(7) Beaver Dam Analogue (BDA) structures will be installed at the following GPS locations:

(1) 117.1309914°W 46.2641817°N <10 ft. length, 2 ft. height, <3 ft. width. (<0.25 CY fill material)
(2) 117.1305863°W 46.2627647°N <15 ft. length, 2 ft. height, <3 ft. width. (<0.25 CY fill material)
(3) 117.1301028°W 46.2616991°N <10 ft. length, 2 ft. height, <3 ft. width. (<0.25 CY fill material)
(4) 117.1289602°W 46.2590996°N <12 ft. length, 2 ft. height, <3 ft. width. (<0.25 CY fill material)
(5) 117.1289020°W 46.2584507°N <15 ft. length, 2 ft. height, <3 ft. width. (<0.25 CY fill material)
(6) 117.1212617°W 46.2528027°N <10 ft. length, 2 ft. height, <3 ft. width. (<0.25 CY fill material)
(7) 117.1156132°W 46.2510876°N <10 ft. length, 2 ft. height, <3 ft. width. (<0.25 CY fill material)

Post Vanes

Post vanes are similar to PALS, but do not incorporate woody materials other than untreated posts. They are not meant to explicitly mimic a natural feature, rather they create roughness along the streambed to increase variability in the channel cross section. Most often, these are used to induce meandering in structurally starved streams. A line of non-treated wood fence posts is driven into the stream bed at an acute angle of approximately 18 degrees from the stream bank. The height of the post closest to the bank will be cut/trimmed to the bankfull elevation that is expected following bank erosion and channel widening (no post >18" height). Each subsequent post is cut/trimmed linearly down to the most upstream post which should remain a few inches above the streambed. Cobble is placed at the apex (near the most downstream post) to increase stability and help capture bedload. During flood events, bedload is trapped within the triangle created between the posts and the bank. This increase in the streambed elevation forces flows towards the opposite bank. If the bank is erodible, the channel will widen near the structure, forcing a meander bend and pool. Post vanes should be built in sequence with structures on alternating banks to create a meander pattern (Camp, 2022).

Boulder Reconfiguration

Boulder reconfiguration is a simple, but labor intensive method to increase instream channel complexity in high-gradient streams with large substrate. Large boulders in small streams are usually mobilized and naturally configured during large, rare, episodic flood events. Because these types of events are rare, boulders are often left in a random configuration that does not provide optimal hydraulic and geomorphic effects. As more large flood events occur, boulders continue to roll downstream and eventually form predictable configurations that have a greater impact on local hydraulics which lead to positive geomorphic changes. Rather than waiting for large flood events, the boulder reconfiguration method aims to move existing boulders a short distance to form configurations that are commonly observed in intact streams (e.g., ribs, clusters, gardens, berms). Boulders can be moved using a pry bar, come along, grip hoist, winch, or heavy machinery (Camp, 2022).

Small boulders and rocks from the stream and immediately adjacent floodplain will be manipulated by hand and using basic hand tools to reincorporate them into the stream channel in a natural configuration and in accordance with project designs to increase complexity within the stream and promote recovery of fish habitat. The amount of rocks manipulated in each boulder structure will vary, but the overall amount of rock will be less than 2.4 cubic yards for all 3 boulder structures, and will directly impact less than 1,000 sq. ft. of the waterbody.

Boulder Reconfiguration structures will be installed at the following GPS locations (Upstream, beginning at Pintler Creek Confluence):

(1) 117.1309162°W 46.2640393°N
(2) 117.1305889°W 46.2627181°N
(3) 117.1300007°W 46.2610140°N

Riparian Planting:

Riparian planting of native and/or site adapted vegetation will occur in and around the stream channel. Equipment used will be shovels, planting bar, and brush cutters. Disturbance will be limited to 12 inches or less. An ATV will be used for staging materials on site with access provided by a county road adjacent to the stream.

Equipment and Tools:

Due to the restricted access to the site, a helicopter is recommended for staging bulk materials within the Kelly Creek basin. Materials will be packaged/staged for helicopter lifting at the designated staging area near the WDFW Parking area at the headwaters of Kelly Creek, and will be delivered into designated drop-zones which correlate with PALS activities in the canyon below. All transportation equipment (cables, pallets, ropes, etc.) shall be removed from the site at the end of construction activities. No landing or take-off of the helicopter will occur within the Kelly Creek basin or at the materials staging area.

Equipment to be used for installation includes a hand-held pneumatic post-pounder and a generator to power it, chainsaw, handsaws, sledgehammers, shovels, and rock bars. An ATV will be used for staging materials on site with access provided by a county road adjacent to the stream. Disturbance of banks and channel shall be limited to that necessary to construct PALS and BDA structures. ACCD will require all equipment used by the contractor/crew to be cleaned and inspected prior to accessing the project site to reduce the chances of importing or exporting noxious weeds from the site. There will be a dip station available for everyone

to treat boots and waders prior to accessing the site. If there are any areas disturbed during construction, they will be seeded with a native grass mix.

Timeline:

Sept. 2022 – April 2023	**Develop Site Plan** – Plan will identify structure locations and type including material and quantities needed. It will also include generic designs for PALS and BDAs and location specific designs. The site plans will be reviewed by funding sources before finalized.
April 2023 – Dec. 2023	**Secure Permits** – Cultural Resources Survey, Utilize JARPA to secure HPA, Shoreline and other required permits for project, helicopter materials transport logistics and flight plans.
Oct. 2023 – April 2024	**Staging** – Pile materials at project site and prep for helicopter drops.
April 2024 – June 2024	**Helicopter Drops** – Hire a helicopter to carry materials from the top of the ridge down to the bottom of the canyon near the stream constructions sites.
July 2024 – Sept. 2024	**Install structures** – Install 80-100 structures. PALS, BDAs, boulder arrangements, and post vanes. In water work window July 15th to September 30.
October 2024 - 2025	**Assess & Monitor Structures** – Complete as-built design, GPS all structures and establish photo/video monitoring points will be completed by ACCD. Site visits during and after high flow periods to assess and document effectiveness.
2025	**Close Out** – Complete documentation and final reporting for project closeout Spring/Summer 2025
2025 - 2030	**Monitoring and Adaptive Management** – Follow monitoring and adaptive management plan, including maintenance to structures as needed.

Adaptive Management Plan

This project will utilize the adaptive management plan developed by ACCD and BPA, attached in Appendix C. The adaptive management plan will be implemented after the structures have been installed which includes periodic visual monitoring and observation of the structures, especially after high-flow events. The Adaptive Management mitigation plan is designed to monitor the structures to ensure they are not having adverse impacts on the stream and flood plain and to allow for removal and/or modification of problematic structures. The areas up and down stream of the project area will be monitored frequently to assess the impacts of the installed PALS and BDA's, with particular attention paid to timing and volume of flow and water temperature. Additionally, the Adaptive Management plan includes the ability to add and/or remove any structures that are having adverse effects. Some structures are anticipated to be damaged or breached during high flow events, and not all structures will be repaired or replaced as ecological processes are reinitiated the system begins to create more channel complexities and habitat components (Wheaton et. al, 2019).

While we do not anticipate significant maintenance, we do plan on providing wood supplements to the PALS and BDAs over the 10- year project life. ACCD will conduct site evaluations annually to determine the function of the structures and what maintenance is needed.

References

1. Bennett, S., Camp, R., Hill, A., Wheaton, J.M., Bouwes, N., O'Brien, G., Floyd, B., and Drury, T. 2018. Asotin County Conceptual Restoration Plan: Technical Document and Appendices. Prepared for Asotin County Conservation District, Clarkston, Washington.

2. Camp, R., Biggs M., 2022. Pintler Creek Watershed Assessment: Technical document. Prepared for the Asotin County Conservation District, Clarkston, Washington.

3. NRCS National Biology Handbook, Subpart B – Conservation Planning. Part 614 – Stream Visual Assessment Protocol Version 2.

4. Snake River Salmon Recovery Board (SRSRB). 2021. Snake River Salmon Recovery Region Provisional 3-5 Year Work Plan 2016-2021. Accessed online 11/17/2022 at: https://snakeriverboard.org/wp-content/uploads/2021/01/3-5-Year-Provisional-Habitat-Restoration-Plan-2021.pdf

5. Snake River Salmon Recovery Board (SRSRB). 2006.Technical document, Snake River Salmon Recovery Plan for SE Washington. Prepared for the Washington Governor's Salmon Recovery Office, 2011 version.

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7. Washington Department of Wildlife website, 2022. WDFW George Creek Wildlife Area Unit Description, Accessed 11/17/2022 from: https://wdfw.wa.gov/places-to-go/wildlife-areas/george-creek-wildlife-area-unit.

8. Mastin, M.C., Konrad, C.P., Veilleux, A.G., and Tecca, A.E., 2016, Magnitude, frequency, and trends of floods at gaged and ungaged sites in Washington, based on data through water year 2014 (ver 1.2, November 2017), StreamStats Peak-flow statistics citation. U.S. Geological Survey Scientific Investigations Report 2016–5118, 70 p.,

Appendix A: Adaptive Management Plan

ACCD Monitoring and Adaptive Management Plan

1. & 2. Introduction & Responsible Parties Involved

The following monitoring plan will be used by ACCD to assess the effectiveness of low-tech process-based restoration projects. Monitoring will take place for 5 years. Adaptive Management Plan is good for 5 years or until cultural survey has expired (whichever is sooner).

3. Assessment Protocols

	Element	Performance	Monitoring Method	Responsible
1	**Complex function**	Is the Complex achieving the predicted responses?	Annual assessment of complex function.	ACCD
2	**Structure Integrity & Function**	Is the structure intact and achieving the predicted responses?	Annual assessment of structure.	ACCD
3	**Harm to Infrastructure**	Structures should not cause harm to infrastructure.	Annual assessment of damage or potential damage to infrastructure.	ACCD
4	**Harm to riverscape function**	Mimic or promote desired processes.	Annual assessment of damage to riverscape processes.	ACCD
5	**Harm to fish passage**	Structures should maintain fish passage.	Annual assessment of structure function.	ACCD
6	**Increased benefits**	Structure working as intended, modifications will maintain or increase benefit.	Annual assessment of structure function.	ACCD

4. Adaptive Management Triggers

	Element	Triggers	Adaptive Management*
1	**Complex function**	Is the Complex contributing to improving watershed processes? (e.g., sediment sorting and transport, channel development, water routing, vegetation establishment/growth, etc.) If no, the adaptive management is triggered.	Improve existing structures (e.g., add wood, add posts) or build new structures to achieve desired response*.
2	**Structure Integrity & Function**	Is the structure intact and achieving the desired objective OR promoting another desired process? If no, adaptive management is triggered	Improve structure (add wood), relocate structure, or modify function by installing adjacent structures to produce a beneficial function.
3	**Harm to Infrastructure**	Is the structure causing harm to or at risk of causing harm to infrastructure? If yes, adaptive management is triggered.	Remove or modify structure to stop or avoid damage to infrastructure.
4	**Harm to riverscape function**	Is the structure causing harm to riverscape processes? If yes, adaptive management is triggered.	Remove or modify the structure to mimic or promote desired process. (add posts and/or woody debris to achieve desired function.)
5	**Harm to fish passage**	Do structures prevent the passage of fish during spawning season? If yes, adaptive management is triggered. This time frame may be extended as structures allow for year-round flow in streams that typically run dry in the summer.	Remove or modify the structure to allow for passage.
6	**Increased Benefits**	Is this structure functioning as intended? Would modifications to this structure increase or maintain process-based benefits?	Modify the structure to maintain or increase process-based benefits from existing structure (add posts and/or woody debris to achieve desired function.)

***The number of new structures per year will be limited to less than 15% of original design specifications; Modification to existing structures not to exceed 50% of original materials quantities per structure. Adaptive management plan addresses environmental compliance and depends on funding availability.**

5. Assessment Frequency, Timing, and Duration

ACCD will monitor the project annually for 5 years. Results and adaptive measures will be submitted to HIP review team (EC Lead, COR, and Tech Lead) to ensure proposed actions are compliant with original consultation. A PNF shall be submitted annually if any in-water work is to occur.

a. Refer to design report for current site conditions.

b. The as-built survey will be completed by the project consultant to determine that the design objectives were met. Any deviations from the final plan set will be recorded, rationale provided and circulated to the project stakeholders.

c. Photos of the site and structures look up and downstream for documentation during visual inspection post install.

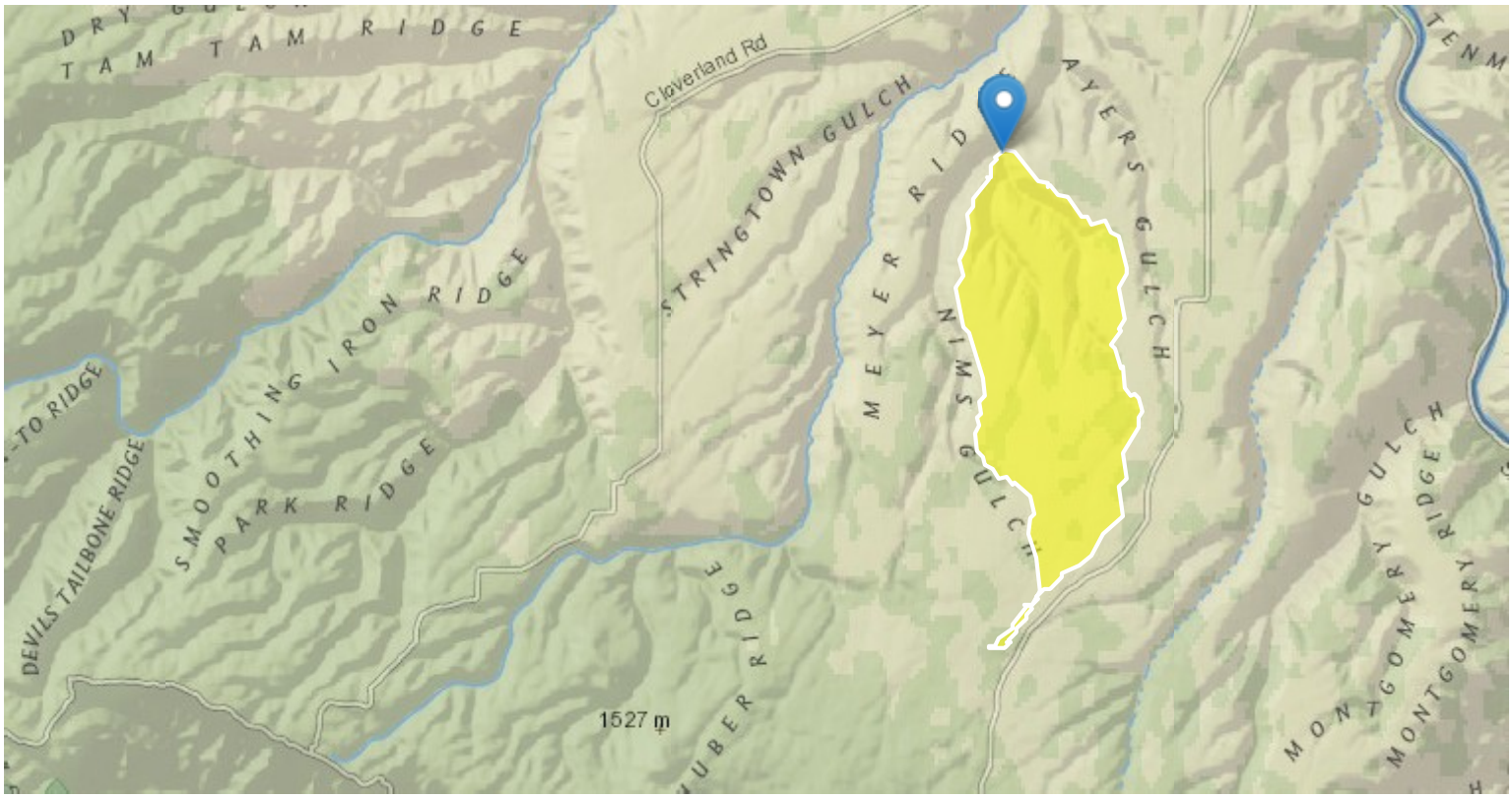
d. Project site will be monitored to ensure that project actions do not negatively impact fish passage.

6 & 7. Data Storage and Quality Assurance Plan

All photos, field and survey data collected will be stored by ACCD or their contractor. ACCD will be responsible for ensuring that the monitoring plan is followed and that the field observer is adequately trained.

StreamStats Report

Region ID: WA
Workspace ID: WA20221122192229080000
Clicked Point (Latitude, Longitude): 46.26401, -117.13059
Time: 2022-11-22 11:22:53 -0800



Kelly Creek, PA-45. Asotin County, WA.

Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BSLDEM30M	Mean basin slope computed from 30 m DEM	9.15	percent
CANOPY_PCT	Percentage of drainage area covered by canopy as described in OK SIR 2009_5267	0.11	percent
DRNAREA	Area that drains to a point on a stream	14.45	square miles
ELEV	Mean Basin Elevation	2900	feet
ELEVMAX	Maximum basin elevation	3570	feet

Parameter Code	Parameter Description	Value	Unit
MINBELEV	Minimum basin elevation	1650	feet
NFSL30	North-Facing Slopes Greater Than 30 Percent	2.23	percent
PRECIP	Mean Annual Precipitation	19.5	inches
PRECPRIS10	Basin average mean annual precipitation for 1981 to 2010 from PRISM	16.5	inches
RELIEF	Maximum - minimum elevation	1920	feet
SLOP30_30M	Percent area with slopes greater than 30 percent from 30-meter DEM.	9.96	percent

Peak-Flow Statistics

Peak-Flow Statistics Parameters [Peak Region 1 20165118]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	14.45	square miles	0.25	3310
PRECPRIS10	Mean Annual Precip PRISM 1981 2010	16.5	inches	9.82	52.5
CANOPY_PCT	Percent Area Under Canopy	0.11	percent	0	77.4

Peak-Flow Statistics Flow Report [Peak Region 1 20165118]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIl	PIu	ASEp
50-percent AEP flood	94.7	ft^3/s	25.3	354	95
20-percent AEP flood	235	ft^3/s	81.4	679	71.9
10-percent AEP flood	378	ft^3/s	132	1080	70.7
4-percent AEP flood	633	ft^3/s	205	1960	77.4
2-percent AEP flood	891	ft^3/s	266	2980	84.8
1-percent AEP flood	1200	ft^3/s	326	4410	93.6
0.5-percent AEP flood	1570	ft^3/s	385	6390	104
0.2-percent AEP flood	2180	ft^3/s	467	10200	119

Peak-Flow Statistics Citations

Mastin, M.C., Konrad, C.P., Veilleux, A.G., and Tecca, A.E.,2016, Magnitude, frequency, and trends of floods at gaged and ungaged sites in Washington, based on data through water year 2014 (ver 1.1, October 2016): U.S. Geological Survey Scientific Investigations Report 2016–5118, 70 p. (http://dx.doi.org/10.3133/sir20165118)

Bankfull Statistics

Bankfull Statistics Parameters [Intermontane Plateau D Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	14.45	square miles	3.62934	7579.9152

Bankfull Statistics Parameters [Columbia Plateau P Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	14.45	square miles	17.698824	7579.957671

Bankfull Statistics Parameters [USA Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	14.45	square miles	0.07722	59927.7393

Bankfull Statistics Parameters [West Int Basin Range CastroJackson 2001]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	14.45	square miles	17.7	8080

Bankfull Statistics Flow Report [Intermontane Plateau D Bieger 2015]

Statistic	Value	Unit
Bieger_D_channel_width	16.4	ft
Bieger_D_channel_depth	0.756	ft
Bieger_D_channel_cross_sectional_area	11.4	ft^2

Bankfull Statistics Disclaimers [Columbia Plateau P Bieger 2015]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Bankfull Statistics Flow Report [Columbia Plateau P Bieger 2015]

Statistic	Value	Unit

Statistic	Value	Unit
Bieger_P_channel_width	12.3	ft
Bieger_P_channel_depth	1.61	ft
Bieger_P_channel_cross_sectional_area	10.5	ft^2

Bankfull Statistics Flow Report [USA Bieger 2015]

Statistic	Value	Unit
Bieger_USA_channel_width	31.7	ft
Bieger_USA_channel_depth	2.13	ft
Bieger_USA_channel_cross_sectional_area	72.3	ft^2

Bankfull Statistics Disclaimers [West Int Basin Range CastroJackson 2001]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Bankfull Statistics Flow Report [West Int Basin Range CastroJackson 2001]

Statistic	Value	Unit
Bankfull Width	12.8	ft
Bankfull Depth	1.5	ft
Bankfull Area	15.5	ft^2
Bankfull Streamflow	102	ft^3/s

Bankfull Statistics Flow Report [Area-Averaged]

Statistic	Value	Unit
Bieger_D_channel_width	16.4	ft
Bieger_D_channel_depth	0.756	ft
Bieger_D_channel_cross_sectional_area	11.4	ft^2
Bieger_P_channel_width	12.3	ft
Bieger_P_channel_depth	1.61	ft
Bieger_P_channel_cross_sectional_area	10.5	ft^2
Bieger_USA_channel_width	31.7	ft
Bieger_USA_channel_depth	2.13	ft
Bieger_USA_channel_cross_sectional_area	72.3	ft^2
Bankfull Width	12.8	ft

Statistic	Value	Unit
Bankfull Depth	1.5	ft
Bankfull Area	15.5	ft^2
Bankfull Streamflow	102	ft^3/s

Bankfull Statistics Citations

Bieger, Katrin; Rathjens, Hendrik; Allen, Peter M.; and Arnold, Jeffrey G.,2015, Development and Evaluation of Bankfull Hydraulic Geometry Relationships for the Physiographic Regions of the United States, Publications from USDA-ARS / UNL Faculty, 17p. (https://digitalcommons.unl.edu/usdaarsfacpub/1515?utm_source=digitalcommons.unl.edu%2Fusdaarsfacpub%2F1515&utm_medium=PDF&utm_campaign

Castro, J.M, and Jackson, P.L.Castro, J.M, and Jackson, P.L., 2001, Bankfull Discharge Recurrence Intervals and Regional Hydraulic Geometery Relationships: Patterns in the Pacific Northwest, USA, Journal of the American Water Resources Association, Volume 37, No. 5, 14 p. (https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1752-1688.2001.tb03636.x)

Application Version: 4.11.1
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1

Appendix C: Construction Spill Mat Policy

Low Tech Process Based Restoration Construction: Asotin County Conservation District Policy

Generator Refueling Standard Operating Procedures:

1. Fill generator with gas, oil, and hydraulic fluid at primary authorized staging/refueling locations at beginning of every workday. Always use caution and use spill mat when refueling outside of the authorized staging/refueling location to prevent environmental effects from splashes and spills.

2. While installing habitat structures in flood plain, the generator will inevitably run out of gas. When generator runs out of gas during construction, or needs additional fluids, remove equipment from stream channel and let machine cool for 10 minutes AWAY from any flammable vegetation or materials. Keep fire prevention equipment always prepared and near generator, and one crew member must remain on "fire watch" while equipment is cooling down if weather conditions require it.

3. If authorized staging/refueling location is determined to be >10 minute walk with generator, proceed to closest authorized "spill mat" location to refuel generator.

4. Install spill mat according to manufacturer instructions, be sure spill mat booms/sides are inflated, check for holes, and ensure that it is on flat ground, and not placed on a slope. Refuel generator or add fluids on top of spill mat according to manufacturer instructions. A 2.5 gallon fuel can is the ONLY authorized fuel canister for refueling outside of primary authorized staging/refueling areas, and MUST be used in conjunction with spill mat, and in an authorized spill mat location. Inspect fuel canister regularly to ensure integrity.

5. Carefully remove spill mat at the end of each workday, and store according to manufacturer instructions.

- **Under NO circumstances should the generator be refueled or have fluids added within the ordinary high water of the stream channel, within 20 feet of the ordinary high water, or outside of any authorized spill mat location or authorized staging/refueling location.**

- **Under NO circumstances should any fuel canister larger than 2.5 gallons be used to refuel equipment outside of designated staging/refueling locations.**

- **If spill mat is unavailable for any reason, proceed to primary authorized staging/refueling locations.**

- **Any accidental spills or splashing of fuel or fluids during refueling shall be reported to ACCD staff immediately, even if contained to the spill mat.**

Appendix D:

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

612 Tree / Shrub Establishment Implementation Requirements

Owner/Operator: *Washington Dept. of Fish & Wildlife* **Contract**: *PA-45, Kelly Creek* CIN: _

Farm & Tract Number: _____ **Field Number/Location:** *Kelly Creek*

Practice Location Map:

See Project Map for specific planting locations.

Provide documentation of permits (federal, state, tribal, local, etc.),

Safety

Utility Safety / One-Call System Information: 811

Wear appropriate personal protective equipment.

Follow safety instructions for tools and equipment used.

https://www.osha.gov/Publications/ Search for: Working Safely with Chainsaws.

Benchmark Condition:

Site is a:

- ☐ Forest Land
- ☐ Pasture
- ☐ Crop
- ☒ Range
- ☒ Other (Describe below)

This plan is the planting component for a large-scale riparian habitat restoration project on Kelly Creek (PA-45). Planting area is located within a 1.4 mile stretch in the flood plain of Kelly Creek between RM 0.0 and 1.4. Streambed and floodplain are primarily composed of exposed cobble substrate and streamflow goes subsurface in summer months, limiting surface water to small pools and short sections of perennial surface flow. Canopy-cover over the stream is limited to small pockets, and species diversity is limited. Degraded plant condition (inadequate structure and composition) and inadequate habitat for fish and wildlife (habitat degradation) are major resource concerns identified onsite.

In 2024, post assisted log structures (PALS) will be installed to reconnect flood channels, improve flood plain function, enhance fish habitat, create pools, and collect fine sediments needed for establishing riparian vegetation. Planting locations will be selected to capitalize on positive ecological effects facilitated by PALS structures within 2-3 flow cycles (newly deposited sediments, pools, etc.).

Practice Purpose(s):

- ☒ Maintain or improve desirable plant diversity, productivity, and health by establishing woody plants.
- ☒ Create or improve habitat for desired wildlife species compatible with ecological characteristics of the site.
- ☒ Control erosion.
- ☒ Improve water quality. Reduce excess nutrients and other pollutants in runoff and groundwater.
- ☒ Sequester and store carbon.
- ☒ Restore or maintain native plant communities.
- ☐ Develop renewable energy systems.

☐ Conserve energy.

☐ Provide for beneficial organisms and pollinators

Desired Condition (Goals and Objectives):

Increasing diversity of native vegetation in the riparian buffer will aid ecosystem function and resiliency by restoring adequate structure and composition of vegetation and restoring degraded habitat for fish and wildlife. Establishing riparian vegetation in the restoration site will help enable PALS structures to create additional stream complexity, slow water in the floodplain, prevent soil erosion, protect water quality, improve habitat diversity, and create refuge habitat for steelhead and other wildlife.

A combination of peachleaf and coyote willows planted in sediments collected by the PALS will establish quickly and develop extensive root systems, create shade over surface water, and improve quality and quantity of fish habitat in the stream. Elderberry and Doug fir will be planted in moist areas under existing riparian vegetation canopy to provide diversity and food for wildlife. Drought tolerant conifer species of Ponderosa pine and golden currant will establish in micro sites and areas of deep soil to expand the riparian buffer and provide shade and soil stability on steep hillsides.

Planting trees at a dense spacings in multiple planting phases will accommodate for expected mortality in dry arid conditions.

SPECIFICATIONS:

Establishment Acres : 2.5 acres

Timing of Initial Practice Installation:

Dry arid conditions in summer months make seedling trees difficult to establish without supplemental water, reducing estimated survival rates to less than 50% after the first growing season. Dense stocking rates at a 6 X 6 foot maximum spacing of will allow for anticipated mortality. Planting should take place in 2-3 planting phases replacing trees that did not survive the previous planting. Trees should be planted in the fall, winter, or early spring as soon as soil-moisture conditions are favorable, and ground is free of frost.

All planting should be completed no later than April 15th. Willow cuttings should be planted along the stream in late fall or early winter when plants are in a dormant state.

Site Preparation Requirements:

No preliminary site prep is required. The planting site is in a cobble flood plain with minimal existing vegetation. Avoid ground surface disturbance when planting pine trees by keeping sod layer intact to help with moisture retention and reduce weed germination. When planting Doug fir and elderberry, scalp or remove the top layer of vegetation down to mineral soil in 1 X 1 foot area prior to placing seedling in the ground. Organic mulch material such as decomposing grasses and leaves found on site may be placed around the base of the tree to aid with moisture retention.

General Treatment Method: *(Check all that apply)*

☒ Planting Seedlings & Cuttings by- ☒ Hand ☐ Machine

☐ Direct Seeding by- ☐ Drill ☐ Broadcast ☐ Hand ☐ Machine

☐ Natural Regeneration through-

☐ Single tree/small group removal ☐ Patch cuts ☐ Seed Tree

☐ Shelterwood ☐Coppice ☐ Advanced Regeneration protection & enhancement

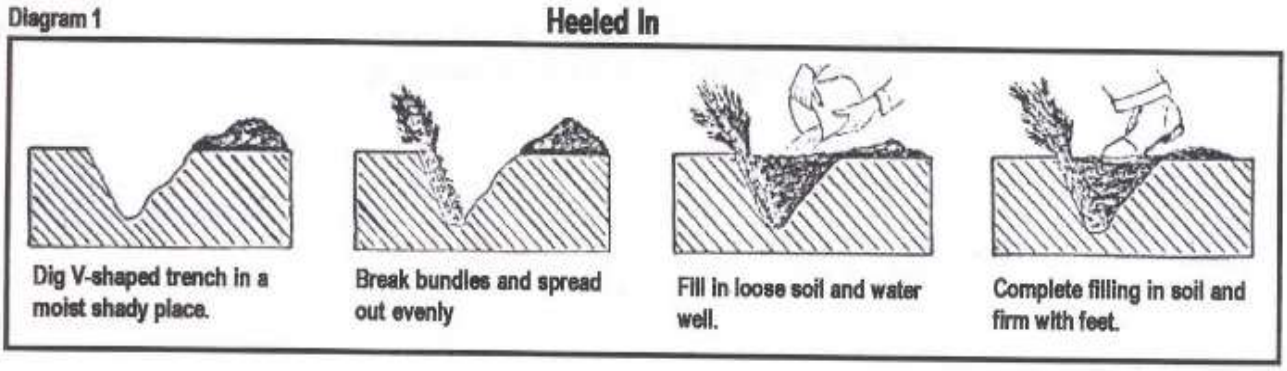
Notes:

Planting Specifications for Seedlings and Cuttings:

Species Field:	Stock type	Seedling Height	Seedling Caliper	Planting Rate (Trees / Acre) or Spacing	Acres to Plant	Total Number of Trees to Plant
Coyote Willow	18" cuttings			2 X 2 ft	2.5 ac	500
Peachleaf Willow	18" cuttings			2 X 2 ft	2.5 ac	500
Ponderosa Pine	Plugs < 10"			6 X 6 ft	3.5 ac	1,000
Golden Currant	Plugs < 10"			6 X 6 ft	3.5 ac	250
Douglas Fir	Plugs < 10"			6 X 6 ft	3.5 ac	100
Blue Elderberry	Plugs < 10"			10 X 10 ft	3.5 ac	50
					Total Number of Trees & Shrubs Established:	**2400**

Temporary Storage Instructions: Bareroot seedlings and cuttings may be stored for up to 7 - 10 days at temperatures from 36 to 45 degrees F. If snow is available storage can be provided by constructing a cavity for the packaged seedlings (on a north facing slope or under shade if possible).

If planting has to be delayed or cold storage is not available, unpack bareroot seedlings and "heel in":
1) Dig a V-shaped trench in a moist, shady place;
2) Break bundles and spread seedlings out evenly, 3 or 4 thick, in an upright position to a depth equal to the root collar;
3) Fill in with loose soil, and water;
4) Complete filling in soil and pack firmly (See diagram below). Store container plants in a cool area.



Seedling Handling Guidance: In the field on the day of planting, store seedlings in the shade or under a reflective space blanket. Do not use canvas to protect seedlings from solar heating.

Use suitable container (bucket, planting bag, or planting tray) for carrying the trees during the planting operation. Do not carry more seedlings than can be planted in 1 hour (warm, windy, dry day) to 2 hours (calm, humid day). Keep wet material around roots to prevent their damage through exposure. Never carry a handful of trees exposed to the sun and wind. Take one tree at a time from the container and plant it immediately. Trim excessively long roots with a sharp hatchet, machete, shears, or scissors. Do not tear or rip roots.

Avoid planting on hot, windy days. Planting site must be free of snow and the soil frost-free. To provide shade for new seedlings, plant them on the north side of stumps, logs, rocks, or debris wherever possible.

Tools to use and Spacing Requirements:

A mixture of peachleaf and coyote willow cuttings will be placed at approximately 2 X 2-foot spacings in areas of moist soils and near PALS where sediments have accumulated. 18" cuttings should be placed in locations where highest water table is expected in summer months, or be placed around pools that hold surface water in summer months. A pounding bar will be used to make a hole for placing cuttings into the cobble. Two cuttings should be placed in each hole to maximize efforts. Stakes shall be placed deep in the ground to allow for rooting with ¾ of the stake placed under the surface. Cuttings should be placed with nodes facing up. Holes should be filled with a mud slurry to seal the cuttings into the ground.

Pines, elderberry, currant, and Douglas fir trees to be planted at 6- to 8 foot spacing + or – 50% variation in spacing due to existing vegetation, rock outcrops, obstacles, unplantable rocky areas or selecting quality microsites. Planting locations should be as close to stream channel as possible where soil deposits will support establishment. Pounding bars can be used to plant conifer seedling plugs, while shovels and basic hand tools will be used to plant larger seedlings. Hodads or shovels will be used to scalp 1 x 1 of existing vegetation without disturbing mineral soil layer when planting elderberry, currant and Douglas fir seedlings.

Additional Criteria Based on Purpose:

Establishment of native trees in planning area is intended to address identified resource concerns within the stream channel and immediate riparian buffer by stabilizing water control structures in the floodplain, restoring the diversity of the native plant community, reducing nutrients and pollutants entering surface water, providing shade to stream to reduce water temperature, protection of stream banks from erosion, resulting in improved habitat for ESA listed Steelhead, and other fish & wildlife. Selection of exact planting locations, species mixes, and density should be aligned with these intended effects and focus on ideal microsites to improve survival rate and efficacy of planting.

Considerations and Mitigations:

Cuttings need to be placed deep into the ground to ensure roots will reach the water table in late summer months when streamflow is subsurface. Cuttings should be placed in low water conditions at the lowest point in the streambed around the PALS.

Do not plant trees and shrubs in established trails or paths used for maintenance or recreation access.

Tree locations may be marked by flags making them easy to identify when assessing survival and controlling weeds to prevent herbicide damage.

When planting pines, avoid ground disturbance to the soil-surface keeping sod layer intact to help with moisture retention and reduce weed germination.

Avoid travel and planting throughout entire cultural resources exclusion area, area will be clearly flagged prior to implementation of restoration activities.

Associated Practices:

(List associated practices that are part of the conservation system)

☐ 314 Brush Management
☐ 315 Herbaceous Weed Control
☐ 384 Woody Residue Treatment
☐ 441 Irrigation System, Micro-irrigation
☐ 472 Access Control
☐ 490 Tree and Shrub Site Preparation
☐ 660 Tree and Shrub Pruning
☐ 666 Forest Stand Improvement
☐ Other:

Wildlife Practices:

☐ 643 Restoration and Management of Rare and Declining Habitats
☐ 644 Wetland Wildlife Habitat Management
☐ 645 Upland Wildlife Habitat Management
☐ 647 Early Successional Wildlife Habitat Mgmt
☐ 649 Structures for Wildlife

Operation and Maintenance: *Practice Life is 15 Years*

The following actions shall be carried out to ensure this practice functions as intended throughout its lifespan. These actions include normal repetitive activities in the application and use of the practice (operation), plus repair and upkeep of the practice (maintenance).

- Control undesirable vegetation in the area periodically, if needed to maintain the health of the plant community.
- Avoid conducting maintenance practices activities such as weed treatment by mowing or burning during primary nesting season (April 1st to July 1st).
- Control access by vehicles and/or equipment during or after tree/shrub establishment to protect new plants and minimize erosion, compaction and other site impacts.
- Inspect the site at an appropriate time following planting, seeding, and/or natural regeneration to determine whether the survival rate for tree and shrubs meets practice and client objectives.
- Replant or provide supplemental planting when survival is not adequate.
- Inspect the trees and shrubs periodically, and protect them from adverse impacts of insects, diseases, competing vegetation, fire, livestock, wildlife, non-functioning tree shelters and/or weed barriers, etc.
- If needed, control competing vegetation until the desired trees/shrubs are established. Control plant species on the Federal or State invasive species and noxious weed lists.
- If needed, apply nutrients to maintain vigor of desirable trees/shrubs.

District will monitor tree mortality annually. Mortality replacement of trees dependent upon funding availability and will occur as needed to achieve intended instream habitat restoration effects. No supplemental watering required on this project due to restricted access.