YAKIMA BASIN SIDE CHANNELS

FY 2016 ANNUAL REPORT

MARCH 1, 2016 – FEBRUARY 28, 2018

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Prepared by

Yakama Nation

Yakima/Klickitat Fisheries Project (YKFP)

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Contents

I. Introduction:

The project serves as the overarching habitat stewardship program for YKFP in the Yakima Subbasin, for off-reservation activities. Examples of work that is performed under this project includes all aspects of stream restoration including revegetation, weed control, fencing, removal of fish passage barriers, installation of NOAA-compliant fish screens, placement of woody material in streams at strategic locations, levee removal and road relocation. Other activities include collaboration with other resource management entities, review and input on restoration plans and programs, review and comment on land use plans and development projects. The project has a strong history of collaboration with many entities. Over 50 miles of habitat has been reopened to anadromous fish through this program, dozens of screens have been installed and over 80 restoration and protection projects have been implemented.

II. Restoration Projects:

a. Oak Creek Wood Replenishment Phase II:

YKFP completed a Phase II floodplain restoration project along approximately 1 mile of Oak Creek, a left bank tributary to the Tieton River in the Yakima River Basin (Figure 1). Project partners include Washington Department of Fish and Wildlife (WDFW), The Nature Conservancy (TNC), and BPA.

The project reach is located within WDFW's Oak Creek Wildlife Area. Oak Creek is a fish-bearing tributary, approximately 1 mile from its confluence with the Tieton River. Oak Creek supports Middle Columbia River steelhead and is within the potential/historic range of bull trout, which are listed "threatened" under the Endangered Species Act.

The goals of the project are to enhance instream habitat complexity and groundwater storage along Oak Creek. This project will provide additional benefits to fish and wildlife by increasing minimum stream flows, restoring the density and species composition of riparian vegetation, increasing the availability of pool habitat and cool water refugia during periods of high temperature, and providing suitable habitat for beaver re-colonization. The project installed wood structures to restore in-channel complexity, reverse channel incision and reengage Oak Creek with its floodplain. Log structures can be cost-effective applications that reduce stream velocities at high flows, thereby trapping sediment to help reverse channel incision. The project is consistent with WDFW's Stream Habitat Restoration Guidelines for large wood replenishment. Wood for the project was harvested in the Oak Creek drainage, under the Tapash Sustainable Forest Collaborative - Oak Creek Restoration Project.

The Oak Creek harvest units were collectively 13 acres in size. The harvest units were thinned using a silviculturist prescription for forest health and hiding cover for elk. Approximately 660 trees were harvested and transported to the treatment reaches. No rootwads were harvested.

Adaptive management necessitates implementation over multiple phases. "Restore, monitor, and respond to changes, opportunities, and unforeseen outcomes" will guide this project toward

maximum benefit for water resources. Improving groundwater storage in floodplains is a common goal of many of these types of projects because the intended result is lower peak flow runoff and an increased base flow water surface. In addition, other project effectiveness monitoring includes aerial photography, photo points, vegetation characterization, and stream morphology characterization.

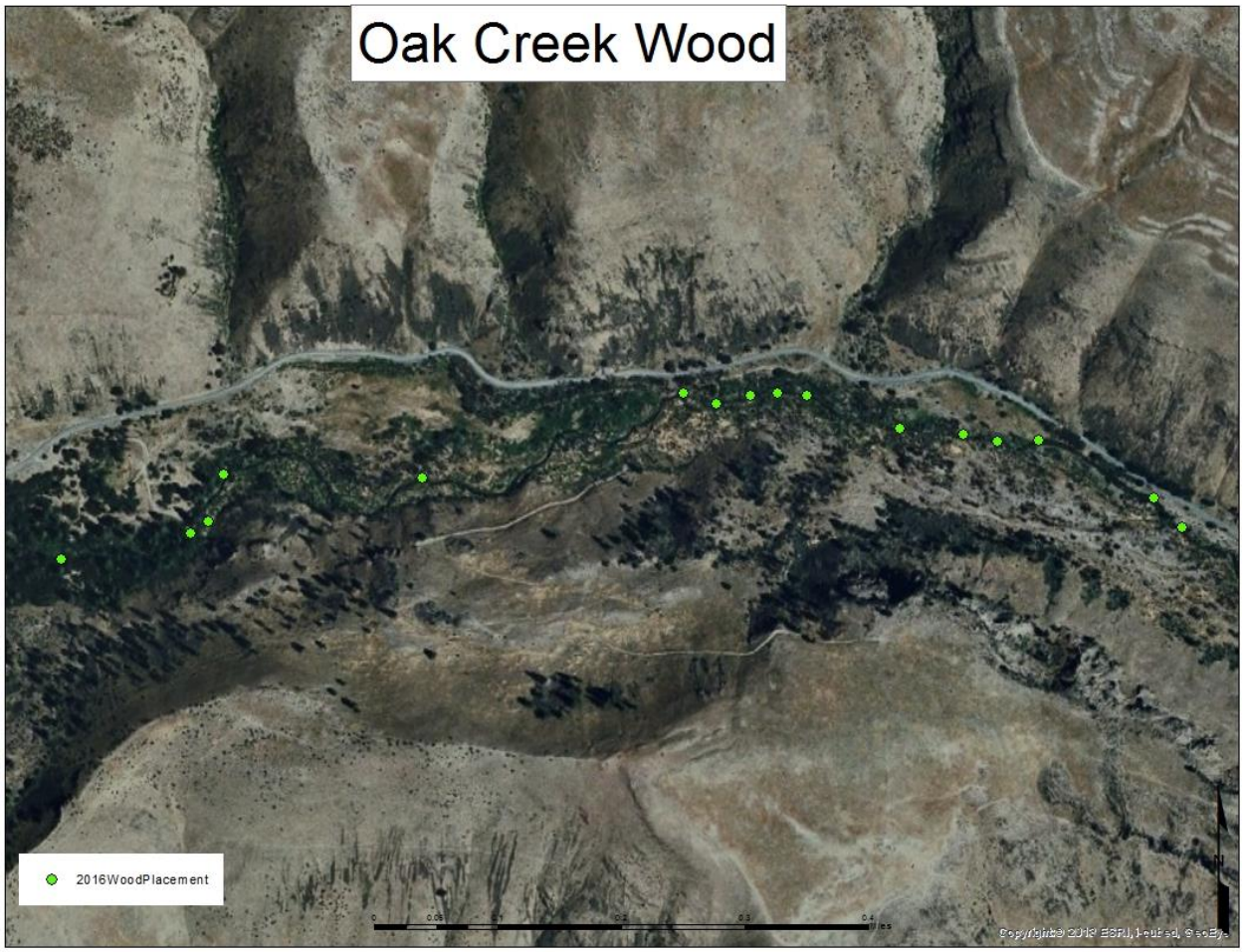


Figure 1 – 2016 Oak Creek wood replenishment sites

The proposal for Oak Creek identified 3 stream reaches for wood replenishment and riparian enhancement. Reach 1 spans approximately one mile upstream from SR 12. Reach 1 has been impacted by fire and exhibits significant down cutting and bank erosion. Reach 2 is a floodplain reach directly upstream of Reach 1. Oak Creek in Reach 2 is disconnected from its floodplain due to down-cutting and the riparian area has been negatively impacted by dispersed recreation. Reach 3 is approximately 1 mile upstream from Reach 2, where Hoover Canyon converges with Oak Creek. Oak Creek in Reach 3 is also disconnected from its floodplain due to down-cutting and the riparian area has been negatively impacted by dispersed recreation. Phase I of the project was completed in December of 2014 in Reach 3. Phase II of the project was completed in December of 2016 in Reaches 1 and 2.

The YKFP, in collaboration with WDFW and TNC, identified numerous areas of source wood within the Oak Creek watershed for wood replenishment in the 3 identified reaches. The off-site areas upstream were identified by WDFW/TNC as part of the larger forest health component. The off-site areas are road adjacent and were selectively logged and trailered down to the treatment reaches.

Phase II of the project began on 11/08/2016 with the Washington Conservation Corps (WCC) thinning and staging the logs. WCC thinned 13 acres, with approximately 660 trees. WCC thinning and staging continued till 12/14/2016. Approximately 1/3 of the trees had been felled in 2015, before being snowed out in December of 2015. The contractor with the self-loading log truck began hauling logs on 12/14/2016 through 12/21/2016.

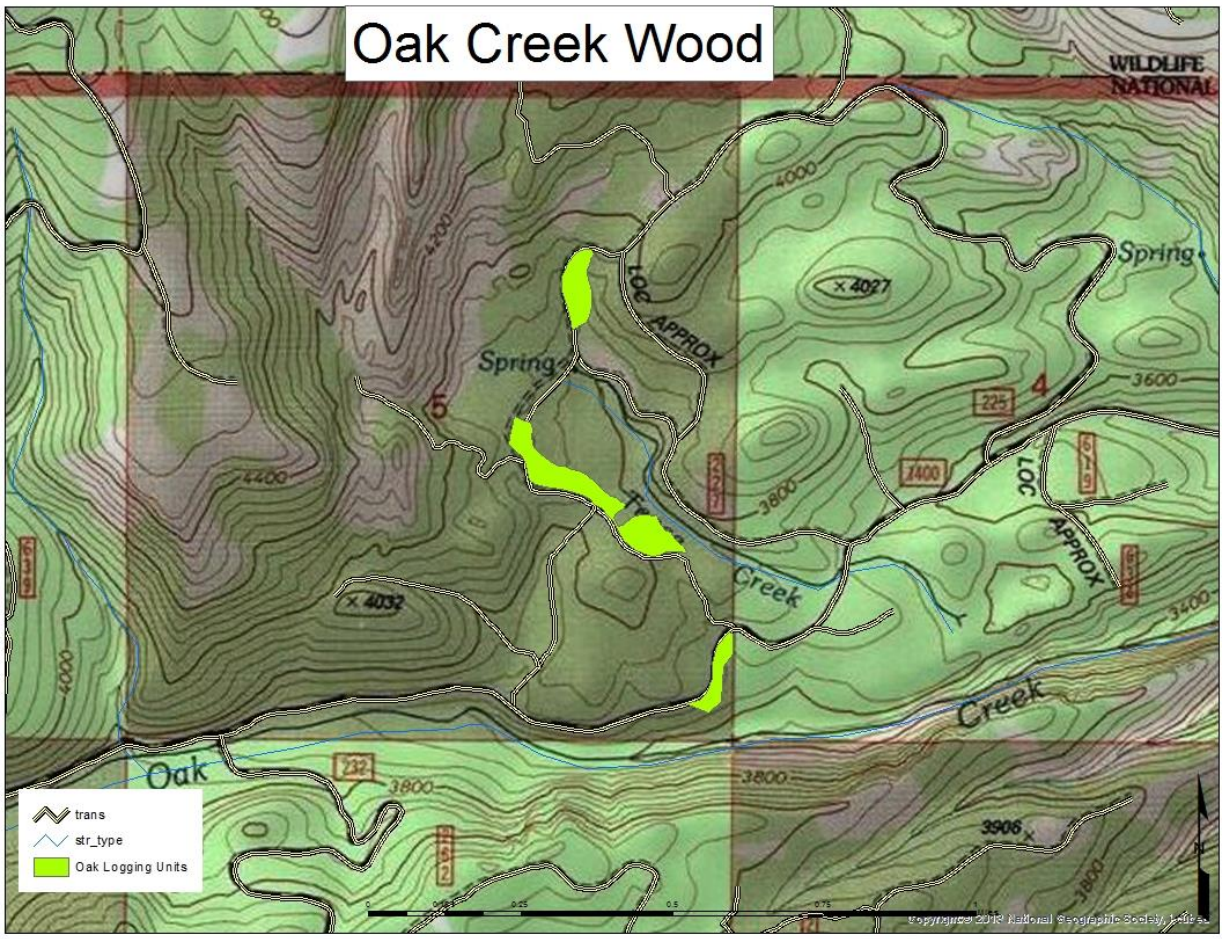


Figure 2 – Upland harvest units

Figure 3 – WCC thinning operations and wood delivery to aquatic treatment reaches November 2016.

The contractor graded the road on 12/15/2016 and 12/16/2016. Snow removal from the road was required on 12/19/2016. The contractor with the excavator began placing instream wood on 12/15/2016 and continued till 12/19/2016. All excavator work to place the wood was on snow, so soil disturbance was minimal. Water quality was maintained. The contractor placed wood at 16 sites, shown in Figure 1, utilizing all of the wood. Two of the dispersed camping sites were excluded from vehicle access with the installation of large boulders in order to allow for the riparian vegetation to recover.

Figure 4 – Site 1 before and after wood placement. Boulders placed to exclude vehicular access December 2016

Figure 5 – Site 2 before and after wood placement. Boulders place to exclude vehicular access December 2016.

Conclusion

Approximately 660 logs were placed in the channel along 1 mile (Reaches 1 and 2) of Oak Creek. Revegetation will depend heavily on hydrologic response, sediment transport, side channel development and migration. The current vegetation will be monitored for its response to an elevated water table and species will be planted based on high flows distributed across the floodplain. Re-vegetation of native plant species and planned weed control will encourage a healthy riparian corridor to develop in subsequent years. This will cause temperatures to be more stable, provide cover for fish, and increase wood recruitment, while providing wildlife habitat.

Status: Completed

Targeted Populations: Middle Columbia River Steelhead

Location Area (Basin, sub-basin): Yakima River, Naches River, Tieton River, Oak Creek

In partnership with: BPA

Limiting Factors: Floodplain connectivity, elevated temperatures, low streamflows

Project Manager: John Marvin

b. South Fork Cowiche Creek Wood Replenishment

YKFP completed a floodplain restoration project along 2 miles of South Fork Cowiche Creek, a right bank tributary to the Naches River in the Yakima River Basin February 2017 (Figure 1). Project partners include BPA, Washington Department of Fish and Wildlife (WDFW), Mid-Columbia Fisheries Enhancement Group (MCFEG), and the Salmon Recovery Funding Board (SRFB).

The project reach is located on the Cowiche unit of WDFW's Oak Creek Wildlife Area. South Fork Cowiche Creek is a fish-bearing tributary, approximately 12 miles from its confluence with the Naches River. Cowiche Creek supports Middle Columbia River Steelhead Trout and is the potential/historic range of Bull Trout, which are listed "threatened" under the Endangered Species Act now that downstream barriers have been removed. Aerial photographs suggest South Fork Cowiche Creek was braided and likely supported multiple side channels, beaver dams, backwater ponds, and other off-channel habitat features. Much of this off-channel complexity has been lost as the valley has been converted for agricultural production. WDFW purchased the property in the 1970's, after historic agricultural use. Historic aerial photos and field reconnaissance indicate that the stream was likely pushed to the south end of the valley, with a majority of the riparian/floodplain vegetation removed to make way for agriculture. Within the project reach, Cowiche Creek has degraded/down-cut and is isolated from its floodplain, with areas of severe bank erosion. The creek flows through a large floodplain area almost devoid of any instream wood.

Figure 1. Orthorectified overlay of SF Cowiche Creek "pre-project" drone flights October 11, 2016

The goals of the project are to enhance instream habitat complexity and groundwater storage along 2 miles of South Fork Cowiche Creek. This project will provide additional benefits to fish and wildlife by increasing minimum stream flows, restoring the density and species composition of riparian vegetation, increasing the availability of pool habitat and cool water refugia during periods of high temperature, and providing suitable habitat for beaver re-colonization. The project installed wood structures to restore in-channel complexity, reverse channel incision and reengage Cowiche Creek with its floodplain. Log structures can be cost-effective applications that reduce stream velocities at high flows, thereby trapping sediment to help reverse channel incision. Wood was also placed on the floodplain to promote roughness during floods. Fine material will be trapped which will promote seed germination, and provide microclimate heterogeneity for riparian re-vegetation. Floodplain roughness also helps avoid rapid channel avulsions that would otherwise hamper floodplain restoration. The project is consistent with WDFW's Stream Habitat Restoration Guidelines (2012) for large wood replenishment. Restoration includes construction of log jams, each including 20-80 Douglas fir trees with a minimum 40 feet in length (more than 1.5 times the average bankfull width of 22 feet), and greater than 8 inches in diameter at the butt end. No less than 50% of trees are greater than 15 inches diameter and no less than 5% are greater than 20 inches diameter. Approximately 10% of trees contain root wads. Wood for the project was harvested in the Oak Creek drainage, under the Tapash Sustainable Forest Collaborative - Oak Creek Restoration Project (Figure 2).

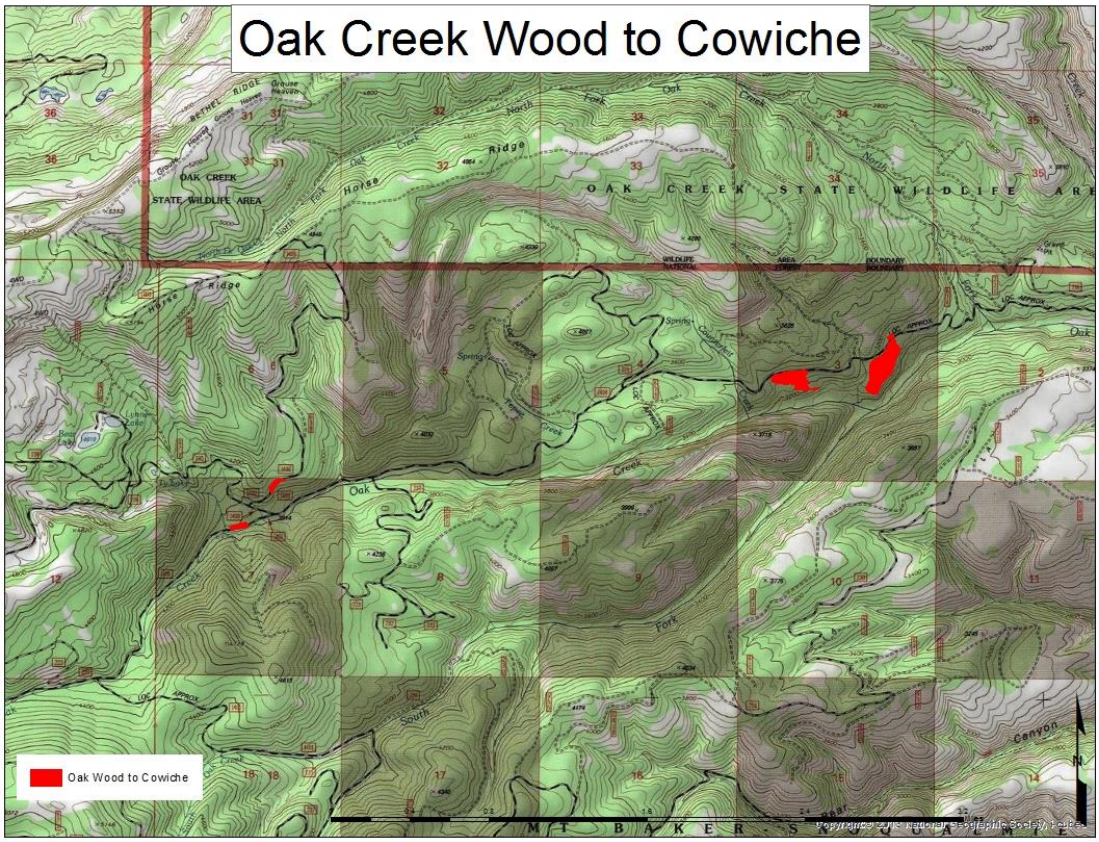


Figure 2. Harvest units in Oak Creek drainage for SF Cowiche Creek wood replenishment

The Oak Creek harvest units identified for South Fork Cowiche Creek were collectively 22 acres in size. The harvest units were thinned using a siviculturist prescription for forest health and hiding cover for elk. Approximately 380 trees were harvested and transported to South Fork Cowiche Creek. No rootwads were harvested from Oak Creek. Large diameter trees and rootwads were supplemented from a privately owned parcel in the Shinando drainage on Satus Creek. Trees were placed using a 1993 Link Belt 4300 log loader with grappling hook (Figure 3).

Figure 3. 1993 Link Belt 4300 log loader at site #1 October 5, 2016

Strategic placement will promote trapping bedload gravel to raise the streambed elevation. Logs may be positioned individually or in small groupings in the stream channel and adjacent floodplain (Figures 4 and 5). Small diameter woody material was placed by laborers as racking material upstream of and within each jam. The downstream end of the project area has an expansive riparian zone with robust, dense woody vegetation that will function to trap floating debris at high flow. The topography of the valley bottom in this area creates a constriction that ensures that all flood flows will be routed through this riparian zone.

Figure 4. Before (October 3, 2016) and after (October 6, 2016) photos of wood placement at site #1

Figure 5. Completed log jam at site #1 October 8, 2016

Adaptive management necessitates implementation over multiple phases. “Restore, monitor and respond to changes, opportunities and unforeseen outcomes” will guide this project toward maximum benefit for water resources. Improving groundwater storage in floodplains is a common goal of many of these types of projects because the intended result is lower peak flow runoff and increased base flow water surface. In addition to other project effectiveness monitoring including; aerial photography, photo points, vegetation, stream morphology and temperature – change in groundwater storage as a result of the project will also be monitored. YKFP procured data loggers and equipment to install 11 shallow groundwater wells with pressure transducer data loggers (Figures 6-8). Monitoring shallow groundwater in floodplains pre and post floodplain restoration project implementation is a method for quantitatively describing the magnitude of groundwater storage change as a result of restoration.

Figure 6. Groundwater well installation October 26, 2016

Figure 7. Pressure transducer data logger

Figure 8. Bentonite clay to stabilize well

Conclusion

Approximately 1400 trees were placed in the channel and adjacent floodplain along 2 miles of South Fork Cowiche Creek. Revegetation will depend heavily on hydrologic response, sediment transport, wood influences, side channel development and migration. The current vegetation will be monitored for response to an elevated water table and species will be planted based on high flows distributed across the floodplain. Extensive re-vegetation of native plant species and planned weed control by laborers will allow for a healthy riparian corridor to develop in subsequent years. This will cause temperatures to be more stable, provide cover for fish, and increase wood recruitment, while providing wildlife habitat.

Figure 9. Native grass seed and straw placed following construction

Status: Completed

Targeted Populations: Middle Columbia River Steelhead

Location Area (Basin, sub-basin): Yakima River, Naches River, South Fork Cowiche Creek

In partnership with: BPA, Salmon Recovery Funding Board

Limiting Factors: Floodplain connectivity, elevated temperatures, low streamflows

Project Manager: Kelly Clayton

c. Soda Springs Wood Replenishment

YKFP, in partnership with the United States Forest Service (USFS), Okanogan-Wenatchee National Forest, Naches Ranger District, recently completed (08/14/2017) a project to enhance aquatic habitat within approximately 6.2 miles of the Bumping River (Figure 1). This was accomplished by placing 140 pieces of large wood at five identified sites (Figure 2). Site 2 was dropped from the project at implementation due to lack of accessibility to large equipment. The Bumping River is within the Yakima River basin and is a tributary to the Little Naches River in northwest Yakima County, Washington. The project occurred between Township 17, Range 13, Section 14 to Township 16, Range 13, Section 07.

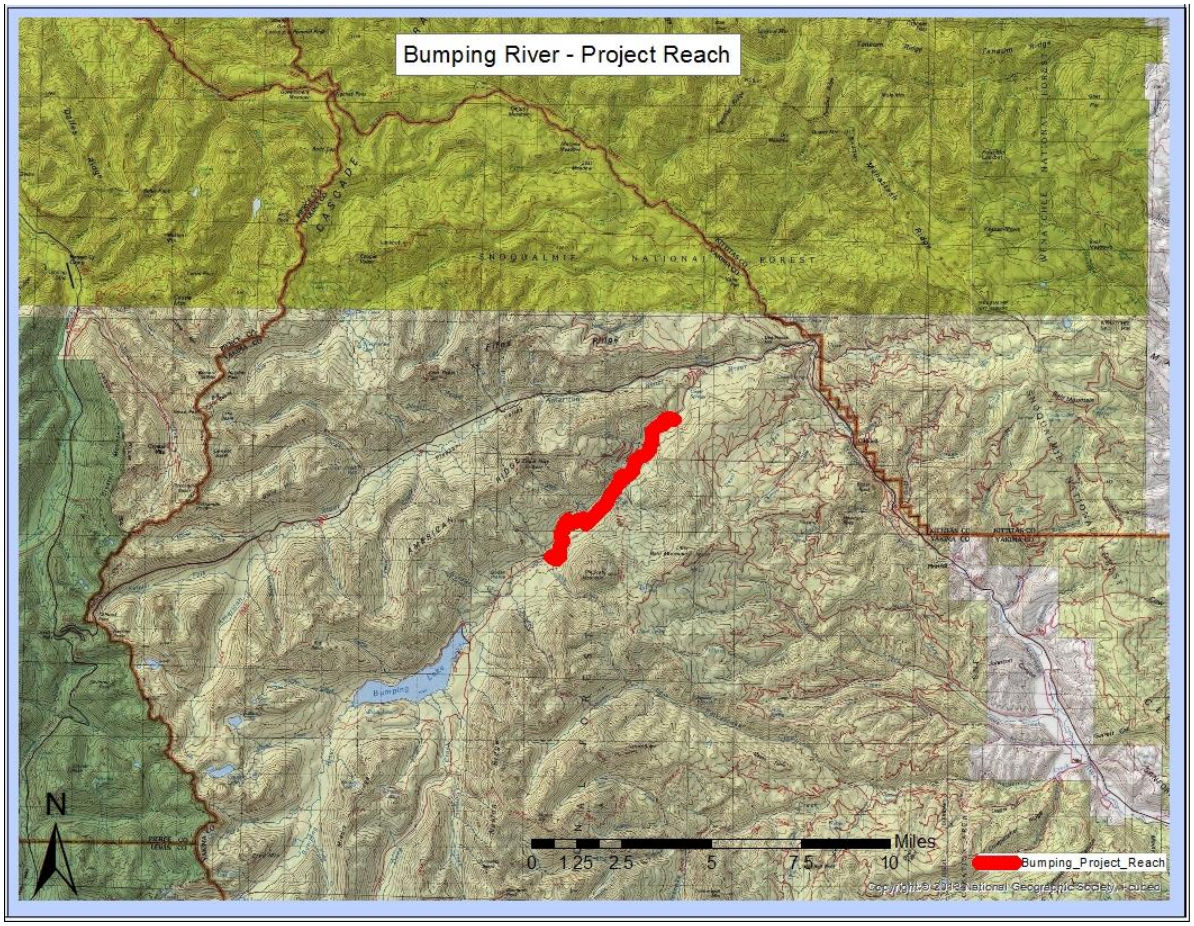


Figure 1: Location of the proposed project, downstream of Bumping Lake.

Background

There were approximately 200 trees in the USFS Soda Springs campground (Figure 2) that were naturally felled during a November 2015 storm with sustained strong winds. The YKFP and the Naches Ranger District completed Phase I of the project in the summer of 2016, by loading the trees out of the campground with heavy equipment and storing them in a quarry 0.7 mile down the paved Bumping River Road (Road 1800). Phase II was completed in the summer of 2017, and it entailed re-loading the trees, delivering them to the five identified large wood placement sites, and placing them in-stream to restore and enhance aquatic habitat.

Risk Assessment

The six placement sites were selected based on accessibility to large equipment, and the low level of risk to infrastructure and development. The closest bridge is 4.6 miles downstream at the Old River Road on the American river, and the next bridge 4.2 miles downstream on the Naches River . The placement sites were selected so that floodwaters could access adjacent, undeveloped floodplains. The right bank is the William O. Douglas Wilderness, and the left

bank is the Wenatchee National Forest. None of the sites were directly adjacent to the Bumping River Road (Road 1800). The furthest downstream site (site #1) included the largest base logs with root balls to act as a catch for any loose wood. The trees were kept as long as possible, with the largest logs in excess of 60 feet. Base logs of the jams were aligned with root balls upstream and the log shaft downstream to increase stability and catch loose wood. The largest log at site #1 was estimated to weigh approximately 10,000 pounds, and the jam itself was estimated to weigh approximately 100,000 pounds.

Purpose and Need

Aquatic habitat surveys performed by the Naches Ranger District in 2005 found that the reach of the Bumping River, in which this project is proposed, is deficient of instream LWD. The survey data shows that this reach of the Bumping River only had 27 key pieces of wood per mile, and 64 total pieces wood per mile overall. Compared to reference data from the American River, which had 130 key pieces/mile, 324 total wood pieces/mile. This data highlights the necessity of large wood replenishment in the Bumping River. Large wood has been shown to improve hydrologic and habitat functions, including channel complexity, spawning habitat, pool creation, recharge of shallow groundwater (base flows), reduction of peak flows, refugia, and stream temperatures. The purpose of this project is to improve the hydrology and aquatic habitat of the Bumping River through the placement of large wood. These improvements will directly benefit Yakama Nation treaty reserved fish species, including the Middle Columbia River steelhead (*Oncorhynchus mykiss)* and Bull trout (*Salvelinus confluentus*), both of which are listed as threatened by the Endangered Species Act (ESA). This project directly addressed limiting factors of the recovery of these treaty reserved fish species including diminished habitat complexity, a lack of large wood, elevated temperatures, and reduced stream flows. Part of the USFS Aquatic Conservation Strategy (NWFP 1994) is to restore watershed condition and function. The emplacement of LWD in this reach is a direct benefit to watershed condition and function.

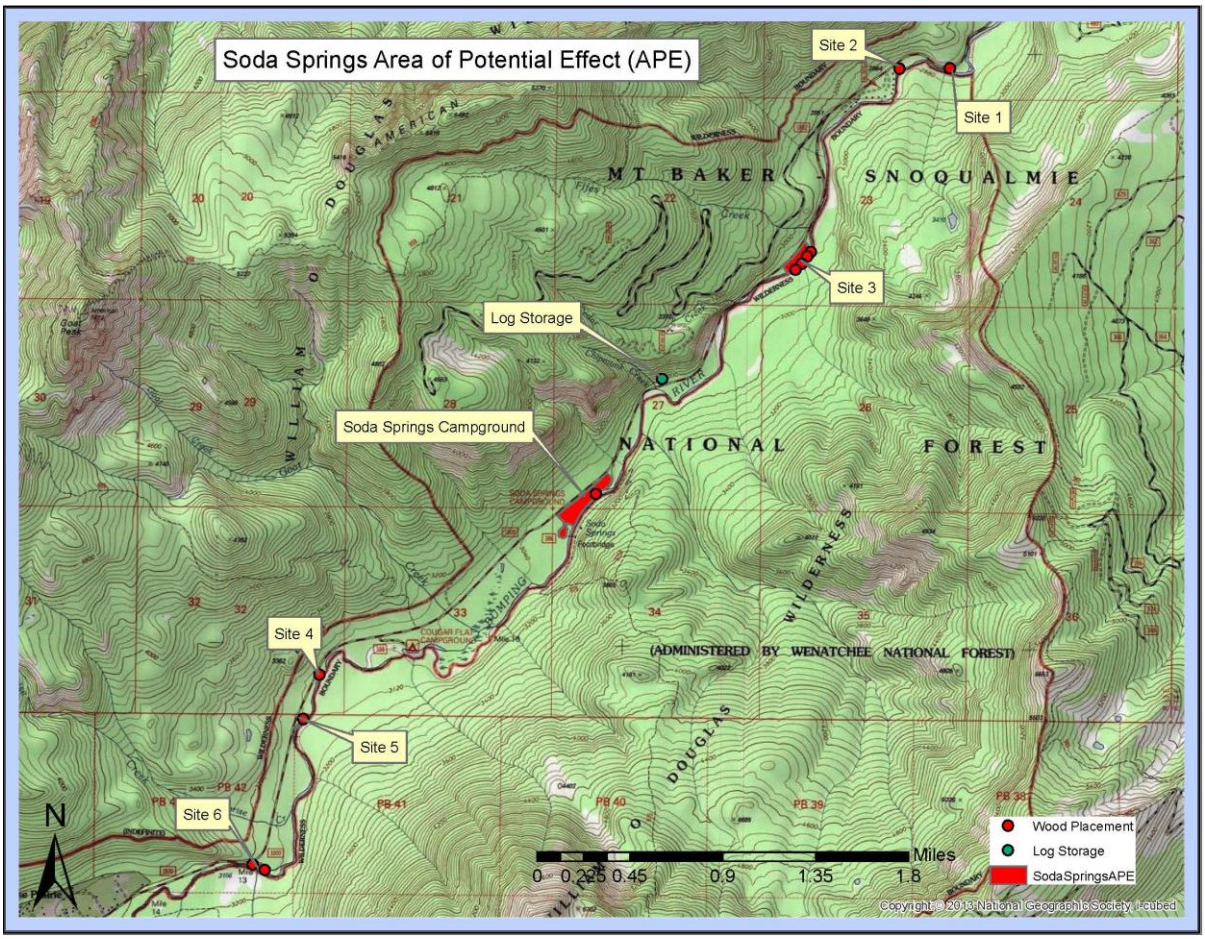


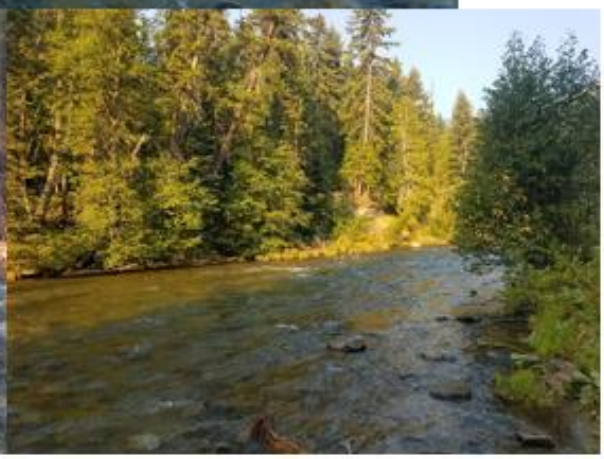
Figure 2: Location of Soda Springs Campground and large wood emplacement sites.

The project will enhance aquatic habitat by placing up to 140 pieces of large wood (75% of which is classified by Forest Service standards as Medium sized large wood) within the active channel of the Bumping River at five identified sites (Figure 2), between river mile 5 and river mile 13. The majority of the logs still have their root balls attached. The logs will be loaded by a log loader/excavator onto log trucks and transported to the six identified placement site. All of the placement sites are within 3.3 miles of the storage area. The logs were placed within the active channel with a cable crane. Cable cranes have extend reach, and can place logs up to the opposite bank without entering into the water. All of the six identified placement sites are currently utilized for dispersed recreation, so access will be by established routes to minimize new disturbance of native vegetation. All disturbed sites were treated with a weed free grass mix.

This project was implemented in the summer of 2017, between August 8th and August 14th.

Site #1 – Before

Site #1 – After



Site #6 – Before

Site #6 – After

Status: Completed

Targeted Populations: Spring Chinook Salmon

Location Area (Basin, sub-basin): Yakima River, Naches River, Bumping River

In partnership with: BPA

Limiting Factors: floodplain loss, altered flows, lack of complexity, deficient in LWD

Project Manager: John Marvin

d. Teanaway Community Forest Aquatic Restoration Phase I

Overview:

YKFP made efficient use of in-water work periods 2017/2018 implementing aquatic restoration within tributary watersheds of the Teanaway Community Forest amidst a number of unanticipated challenges and constraints to project implementation. At the direction and observation of YKFP staff, contractors placed approximately 1,987 logs and logs with root wads in-stream and approximately 3,550 logs on stream adjacent floodplains within three tributaries of the North Fork Teanaway River. In addition, 60 acres of overstocked, state owned forests were thinned to promote healthier, more fire resilient forests, while also producing the materials needed for stream and floodplain restorative activities. Half of those materials were placed in stream and the other half is decked and will be hauled and used for TCF restoration activities next summer/fall/winter. Approximately 2.5 miles of stream channel and 60 acres of floodplain were treated with woody materials in Indian, Jungle, and Middle Creeks during this effort (appendix 1).

Timeline Summary:

- Indian Creek Phase II: , 7/18/2017 -10/18/2017 (intermittent closers during this period)
    - Staged wood from Morrison Canyon thinning unit, Cle Elum Ranger District, and Belsaas and Smith.
    - Placed wood in Lower Indian Creek (Section 16 downstream to bottom of project site) and on adjacent floodplain surfaces
- Middle Creek: 8/4/2017 – 10/16/2017 (intermittent closers during this period)
    - Staged wood from Morrison Canyon thinning unit and Belsaas and Smith
    - Placed wood in Middle Creek and on adjacent floodplain surfaces (10/6/2017-10/18/2017)
- Jungle Creek: 10/6/2017 – 2/15/2018
    - Staged wood from Morrison Canyon thinning unit
    - Placed wood in Jungle Creek and on adjacent floodplain surfaces

- First Creek: 6/2017
    - Staged wood from Cle Elum Ranger District source using a self-loading log truck

Discussion:

As mentioned in the overview of this document, a number of unanticipated constraints to implementation occurred during the implementation period impacting the amount of time available to construct the project. Access with equipment, a 40,000 acre wildfire, and inadvertent cultural discoveries are examples of the dominant constraints to restoration experienced. Although we persevered through these adverse scenarios, much more work could have been accomplished barring their occurrences. However, YKFP staff and our partners are pleased with the quantity and quality of work performed and the positive effects of the work on stream morphology following an unseasonably warm winter season.

Access proved to be an exceptional challenge. It was determined that it was not feasible for loaded log trucks to traverse the two mile stretch of road from the Lower Indian Creek staging area to the Upper Indian Creek site. To move the materials from Lower to Upper Indian Creek, materials needed to be offloaded at the Lower Indian Creek staging area, re-loaded on off road dump trucks, and transported to the Upper Indian Creek staging areas which proved to be a significant time sink (appendices 2 & 3). Ultimately however, all of the materials prescribed in the proposal for Upper Indian Creek have been staged on site or placed in stream. Wood placements were completed for the reach of Indian Creek upstream of the bridge (omitted from appendix 1).

On, 8/30/2017, the Kittitas County Sheriff forced all work to cease and recommended evacuating the area due to risks associated with the Jolly Mountain Fire which had burned approximately 40,000 acres once contained (appendix 2). Re-entry and commencement of project implementation occurred on 10/5/2017, causing a loss of over a month of work during ideal implementation conditions. Upon re-entry, spot fires were observed within the Jungle Creek project site and standing, dead trees persist.

In an effort to avoid a cultural resources site buffer on Lower Indian Creek and avoid disturbance to stream adjacent resources, the route for transporting materials to the stream and floodplain was changed to the heavily over grazed terrace to the North of the project site, adjacent to Henry's Field. As was later discovered, the changed transportation route was through another cultural site buffer. DNR archaeologists made this discovery in addition to the discovery that some of the staged wood on Jungle Creek was within cultural sites. Apparently, the flagging that was used to demarcate the site boundaries had been removed either by animals or humans so it was not apparent to YKFP staff that the wood was staged within these sensitive regions. For these reasons, the project went into an inadvertent discovery protocol which led to work being stopped from 10/18/2017 – 1/16/2018. Fortunately, an alternate work plan was approved by the cultural resources committee consisting of DAHP, BPA, Colville, DNR, WDFW, ACHP, and Yakama Nation allowing YKFP Habitat staff to nearly complete implementation within Jungle Creek close to how the site was originally proposed to be constructed.

In total, not including access constraints, a total of nearly four months of work was lost due to unforeseen reasons. Hydrophobic soils and diminished floodplain and upslope roughness due to

the Jolly Mountain Fire, made it imperative to construct the log jams and roughen the floodplain at Jungle Creek. If implementation had not occurred, a huge opportunity would have been missed including the capture of bed load materials, and the risk of further channel incision would have increased precipitously. Approximately 100 logs are in a deck that still need to be placed (warm temperatures forced a stop work toward mid-February due to ground conditions) in Upper Jungle Creek.

Equipment used for implementation included a log loader/shovel loader, skidder, off road dump truck, an excavator, self-loading log truck, and hand tools used by AmeriCorps crews. The log loader proved to be an efficient tool for this type of work. Further, a highly experienced operator developed a synergy with YKFP staff and did a top notch job not only building the project to the specifications, but respecting the sensitivity of resources that could be impacted. Appendices 5-8 display the log loader constructing the project.

Per the WDFW Hydraulic Permit, "catcher's mitt" log jam configurations were installed at locations to serve as infrastructure protection from mobile, placed wood. Large root wad logs were used as ballast, core log jam members were tied into existing hardwood riparian vegetation and core members were lashed with chain to provide further stability (appendix 9 and 10). Three jams of this type were installed on Indian Creek, one on Jungle Creek, and one on Middle Creek. Large volumes of slash derived from stewardship activities were incorporated into in stream log placements to expedite sediment deposition/channel aggradation. Appendix 10 demonstrates the backwater effect slash can create.

Appendices 11 through 14 are photos of Jungle Creek following wood installations and the first high water which occurred early February 2018. Materials seem to be staying in place thus far and forcing overbank flows into previously inactive/disconnected floodplains. Opportunities to use the woody materials to force floodplain reconnection were sought after throughout the entire implementation period in each of the watersheds. Appendix 14 is a prime example at Upper Jungle Creek. Abundant quantities of wood was placed randomly within the geomorphic floodplain to prevent treated channels to end run around in stream wood and to decrease overbank velocities (appendix 15). In floodplain areas inaccessible via the log loader, Americorp crewmen/crew women dispersed wood with hand tools/gas powered winches that was staged by the log loader over those floodplain surfaces. This proved to be a slow process, but was successful in roughening inaccessible floodplains.

Outreach:

As this project was partially funded by Yakima Basin Integrated Plan funding, a number of legislative tours of the project were held in fall 2017 to show how the funding has been successfully spent. In addition, a group from the Washington Water Infrastructure, a group advocating for investing in floodplain restoration, composed of water resource managers from across the state, held a tour of the site at Lower Indian Creek to kick-off the group's first meeting. Other partners, including Trout Unlimited are working with volunteers and community members to create a citizen science group that monitors stream temperature and collects photo points related to project activities. YKFP staff have established four photo monitoring sites on Indian Creek using trail cameras to monitor change every hour during daylight.

Lessons Learned:

- When archaeologists are marking site boundaries prior to construction, accompany them so that it is clear where sites are located.
- Cultural site boundaries need to be marked with a more permanent material than flagging.
- A log loader with an exceptional operator is an efficient tool for conducting wood replenishment work.
- Working over snow is a viable method for eliminating impacts to soil, even if the temperatures are above freezing.
- If grading snow is a possibility as part of a restoration project, be sure that the road to be graded is not a part of a groomed snowmobile route and if it is allow time to make the appropriate arrangements with appropriate agencies.
- This work is incredibly mentally and physically draining
- Work through and adapt to adversity and don't let it get you down.
- Racking material can be produced by breaking logs to bits with the log loader, and it produces a more natural appearing log jam.
- Slash is analogous to glue, for a log jam and a 60 cubic yard load of slash can get used super-fast.
- Having a machine to unload log trucks and an additional machine to place wood on floodplains and in stream is optimal for overall efficiency if there is work for the log unloading machine to do in between truck loads.
- A method for preserving wood stocks is to build frequent jams opposed to continuous wood longitudinally. This method may contribute to a relatively higher amount of sinuosity once natural processes re-work placed wood.
- Take lots and lots of notes

Status: Active

Targeted Populations: Middle Columbia River Steelhead

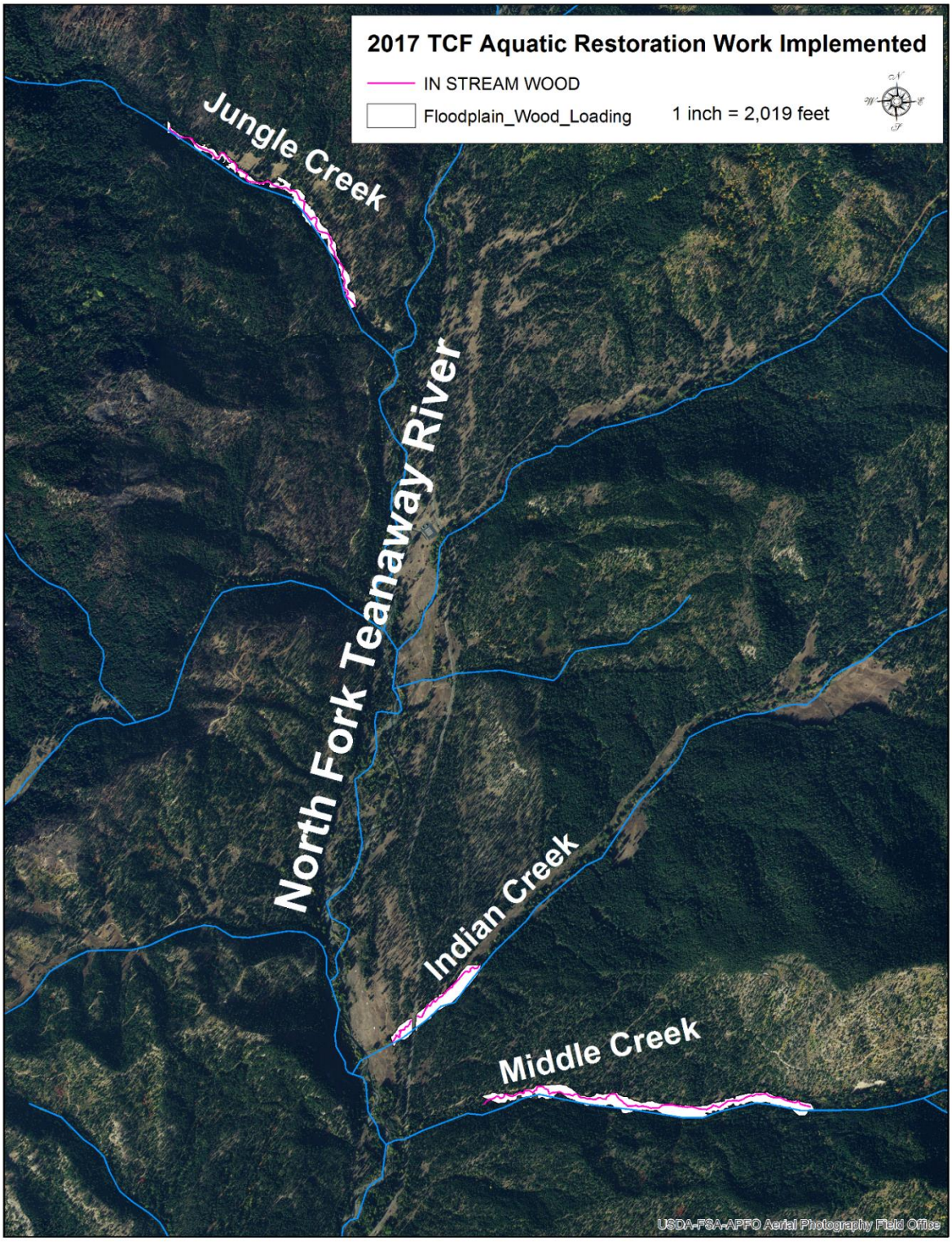
Location Area (Basin, sub-basin): Upper Yakima River, North Fork Teanaway River

In partnership with: BPA

Limiting Factors: Floodplain connectivity, elevated temperatures, low streamflows

Project Manager: Ryan DeKnikker

Appendices:



APPENDIX 1 Completed work 2017/2018 in stream work period

APPENDIX 2 Re-loading materials for transport to Upper Indian Creek Staging Areas

APPENDIX 3 Re-loaded off road dump truck in route to Upper Indian Creek staging areas

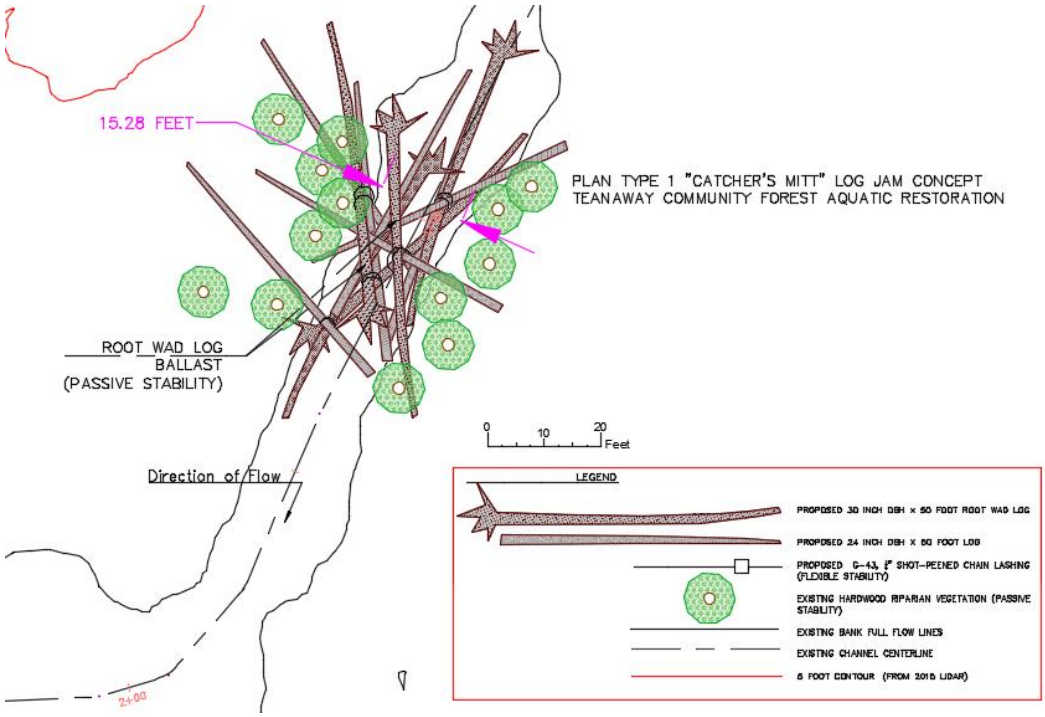
APPENDIX 4 Jolly Mountain Fire as viewed from the YKFP, Jack Creek Acclimation Site (photo by Tracy Rooney)

APPENDIX 5 Lower Indian Creek-Log Loader

APPENDIX 6 Indian Creek-Log Loader

APPENDIX 7 Middle Creek-Log Loader

APPENDIX 8 Jungle Creek-Log Loader



APPENDIX 9 Plan view of proposed type 1 catcher's mitt design

APPENDIX 10 Catcher's Mitt installed on Lower Jungle Creek 10-18-2017

APPENDIX 11 Jungle Creek-Early February 2018

APPENDIX 12 Jungle Creek-Early February 2018

APPENDIX 13 Jungle Creek-Early February 2018

APPENDIX 14 Jungle Creek-Early February 2018

APPENDIX 15 Floodplain wood-mid Middle Creek reach