Nason Creek Upper White Pine Floodplain Reconnection
June 19, 2015

Chelan County Natural Resources Department
411 Washington Street Suite 201
Jennifer.hadersberger@co.chelan.wa.us
15-1210

Anticipated Request - SRFB:	$750,000
Anticipated Request - Tributary Committee:	$400,000
Anticipated Request for Proposal:	**$1,150,000**
Other Funding/Contributions/Matches:	$750,000 (Department of Ecology - secured)
Anticipated Other Funding/Contributions/Matches:	$945,107 (Pending)
TOTAL Construction Budget:	**$2,845,107**

Upper Columbia Region Supplemental Application/Resource

✓	Questions	Answers (Delete examples as needed)	Information Resource
REGIONAL INFORMATION			
1	What Upper Columbia subbasin is the project in?	Wenatchee	
2	What project category is your project?	☐ Restoration ☐	
3	What Assessment Unit is the project in?	Nason Creek	
4	What restoration and/or protection priority is the assessment unit the project is located in?	Nason Creek has been identified as the sub-watershed, or assessment unit, with the highest priority for restoration actions in the Wenatchee watershed This project will reconnect a floodplain wetland to provide peripheral and transitional habitat in Nason Creek which addresses the highest priority ecological concern within the Nason Creek watershed (UCRTT 2013). Levee removal has been identified as the Tier 1 strategy to address this ecological concern.	
5	What is the primary species the project will target?	(Choose one) ☐ Spring Chinook	
6	What secondary species will the project will target?	(Choose one or more if applicable.) ☐ Steelhead ☐ Bull trout	
7	What PCSRF Metrics will be implemented with this project?	Remove 0.5 mile or 2,500 linear feet of levee including rip-rap removal Increase floodplain connectivity and improve juvenile rearing habitat. o At the 2 year event, 4.69 acres o At the 100 year event, 26.9 acres Restore the 30 acre channel migration zone Increase instream complexity by adding large woody material (332 logs, 129 w/rootwads), increase pools from 1 to 7, and increase sinuosity from 1 to 1.1 Improve bed substrate and spawning habitat in 1,500 linear feet of re-located channel	
8	What Primary Ecological Concern does the Project Address? (not required for protection projects)	#1EC for Nason Creek - Reconnection of Transitional and Peripheral Habitats (side channel and wetland connections) – remove levee	
9	What other Ecological Concerns does the Project Address	#2 EC for Nason Creek Channel Structure and Form (Bed and Channel form)– remove levee #4 EC for Nason Creek Channel Structure and Form (Instream Structural Complexity) – install large wood	

Upper Columbia Region Supplemental Application/Resource

✓	Questions	Answers (Delete examples as needed)	Information Resource
10	What is the priority of the primary ecological concern this project addresses in the assessment unit it occurs (not required for protection projects)	#1, 2, and 4 – see above	

Regional Technical Team Scoring Criteria Summary Information

Add summary information in boxes below Please be succinct (For complete RTT scoring criteria see UCSRB/Resources/RRT Scoring Criteria)

1	In one sentence, what is the purpose of your project?	To re-establish hydrogeomorphic connectivity between Nason Creek and its floodplain and restore and enhance stream channel functions to increase productivity and survival of ESA-listed salmonids
2	Location of the Restoration Project	The project is located near RM 13.3 to 13.9 in the Upper White Pine reach of Nason Creek which is just upstream of the town of Merritt and near USFS White Pine Road in Chelan County.
3	In one sentence, identify your restoration methods	Remove 0.5 mile (2500 linear feet) of levee and re-location 1,500 feet of straightened mainstem to restore sinuosity, complexity, and spring Chinook spawning habitat in Nason Creek.
4	How long will it take for the benefits of the project to be realized and how long are they estimated to persist?	Project metrics quantify the immediate post-construction benefits, however, once the levee is removed, this restores natural stream channel processes. Additional floodplain connection and channel migration benefits are anticipated into the future.
5	Benefits to Freshwater Survival or Capacity	This project will provide additional spawning habitat to increase capacity and rearing habitat to increase survival. See proposal for more details.

Upper Columbia Region Supplemental Application

Citizens Ranking Criteria

Please be succinct (For complete CAC ranking criteria see UCSRB/Resources/RRT Scoring Criteria)

CRITERIA	RESPONSES
Criterion 1: Benefits to Fish and Certainty of Success (60 pts. as a weighted percentage based upon RTT score)	
Is the project consistent with the Recovery Plan Implementation Strategy?	This project is located in the highest priority area (Nason Creek), is the highest priority action (reconnection of peripheral and transitional habitat) and directly benefits priority species (steelhead and spring Chinook).
Is the project/assessment based on proven scientific methods that will meet objectives?	Project design has followed the BOR design guidelines and has been designed by a licensed PE. That said, the project engineer has been given guidance to select restoration methods that are not "overly engineered". The goal is for short term bank stability while vegetation establishes and long term deformability. For example, there is no ferrous anchoring or any metal incorporated to anchor large wood. All wood will be ballasted (buried) in bank materials and wood piles. In addition, we have selected bioengineered bank treatments (FESL) which are expensive, however, they are more natural than the alternative choices (gabion, rip rap, concrete) given the velocity and shear forces anticipated. The channel meander was designed based upon analysis of reference areas, historic channel meander scars, and to minimize impacts to adjacent vegetation and wetlands.
Are there any obstacles that could delay the implementation of this project or study (e.g. permitting, design)?	Yes, we need to secure restoration funds now in order to use the DOE funds towards powerline re-location in 2016. The deliverable for the DOE grant is the levee removal and floodplain connectivity. If we don't secure restoration funds now, then we cannot use the DOE funds to re-locate the powerlines.
Criterion 2: Project Longevity (30 points)	
Who has the responsibility to manage and maintain the project? What is the responsibility of current or future landowners?	USFS is the landowner and will provide the long term site stewardship. BOR will fund project implementation monitoring to meet permitting requirements. The current monitoring plan calls for 10 years of post-construction monitoring, however, not all parameters are sampled every year post construction.
Has the sponsor successfully implemented projects in the past?	CCNRD has demonstrated the ability to implement floodplain re-connection projects while working with nearby infrastructure in Nason Creek. For example, the two oxbow re-connections under SR 207 and the BNSF bridge that re-connects the Coulter and Roaring drainages.
Are the benefits associated with the project in perpetuity? *Will the project last only a few years?	The project is designed to restore natural stream channel processes in longevity.
Is there a high risk of failure associated with this project?	No. However, there could be some mainstem channel migration within the floodplain area and large wood movement. These changes would be considered part of the natural channel processes being restored to this site.
Criterion 3: Project Scope (15 points)	
How much habitat is being protected or gained?	The project benefit metrics include 0.5 mile of levee removal, improved instream habitat in 1500 feet of mainstem, and reconnection of a 25 acre floodplain wetland. There is also restoration of natural stream channel process by re-connecting a 30 acre channel migration zone.

Are threats imminent?	This section of Nason Creek has been channelized and function has been lost for over 50 years. The only imminent threat is losing the grant funding to pay for infrastructure re-location. Funding to support that project element is not likely to be secured again in the future if it's not utilized now.
Is the scale of the proposed action appropriate?	Design alternatives considered levee removal only, however, that does not reconnect floodplain areas during low frequency flood return intervals (less than 50 year event). In addition, we considered a smaller scale project with only one channel re-location meander and we were told by BPA, NOAA, and WDFW to "go bigger" with this project. Thus, the proposed design provides the highest biological benefit possible at this site.
Criterion 4: Community Support (25 points)	
*Has there been public outreach about this project to assess the level of community support? *Does the project build community support for salmon recovery efforts? *Is there any community outreach planned during and/or after implementation?	A postcard mailer was sent to nearby residents at project kick-off in 2010. Since then, the project has been discussed at two Nason Creek community meetings (2011 and 2014). USFS sent a public scoping letter for the project in summer 2013 and the only public comment received was from Chelan PUD. CCNRD has been working closely with USFS and CPUD. CCNRD has met with private landowners on White Pine road and they do not have any issues with the proposed project. USFS is currently circulating the Environmental Assessment for a 30 day public review period. CCNRD will continue to conduct pre-construction outreach with the Merritt community to address any concerns and minimize construction related impacts.
Has the project sponsor secured landowner participation or acceptance?	USFS staff have participated as members of the design team and they are supportive of the proposed project. They just finished drafting the Environmental Assessment and NEPA is anticipated to be completed in September 2015. CCNRD has had design review by BNSF at the 30 and 60% plans and they do not have any issues with the proposed project. CCNRD will secure a temporary occupancy permit from BNSF for project construction.
Will there be public access?	Yes, access will be through USFS land via White Pine road.
Will the project create benefits or raise concerns for particular groups or the community at large?	The project is designed to provide stream habitat benefits for fish and increase flood storage which could reduce flooding impacts to downstream landowners and infrastructure. We do not anticipate concerns or issues with particular groups or the community at large.
What is the breadth and strength of the partnership supporting the project (technical support, financial, and in-kind contributions, labor)?	This project has broad landowner, technical, and financial support. Landowners and utilities (USFS, CPUD, and BNSF) are supportive of this project. BOR has provided financial support for the engineering (technical) project design and project management (CCNRD staff time). DOE has contributed $750,000 towards project construction through the Floodplains by Design program. RCO partially funded the alternatives analysis.
Criterion 5: Economics (20 points)	
Does the project represent an opportunity for economic benefit?	Restoration construction (~ 1.5 million), powerline re-location construction (~250,000), and powerline corridor clearing (tree salvage ~250,000) will provide ~ 2 million in construction dollars and jobs.
Will this project help the region move closer to delisting or reduce regulatory intervention?	This project is designed to increase productivity (spawning habitat) and survival (rearing habitat) for steelhead and spring Chinook. Increased survival and productivity will help the region move closer to de-listing.
Is the project budget clearly defined and reasonable?	This project is expensive and we have never funded a mainstem re-location in the Upper Columbia region. The bed and bank treatments are necessary because of the site conditions (silty-sandy soils and stream velocity). The costs per unit are comparable to those in other recent projects. We have also incorporated cost savings in that the trees removed from the powerline re-location and levee clearing will be

	available to the project for free (there is still the cost of removal and placement). In addition, this project will re-use material that YN excavates this summer immediately downstream as imported material to save costs. That said, this project has a high biological benefit and represents a unique opportunity to re-locate infrastructure and fully re-connect a large floodplain wetland area to restore natural processes to Nason Creek. Project costs are within the range of channel reconstruction project costs according to 2004 WDFW Stream Restoration Guidelines which indicate that channel relocation costs range from $20- >1000/linear foot ($30,000 - >1.5 million).
How much benefit does the project create for the dollars invested?	The project benefit metrics include 0.5 mile of levee removal, improved instream habitat in 1500 feet of mainstem, and reconnection of a 25 acre floodplain wetland. Restoration of natural channel process = PRICELESS. Sorry, I couldn't resist that one ☺

Restoration, Acquisition, and Combination Project Proposal

Project Number	15-1210
Project Name	Nason Creek Upper White Pine Floodplain Reconnection
Sponsor	Jennifer Hadersberger, CCNRD

List all related projects previously funded or reviewed by RCO:

Project # or Name	Status	Status of Prior Phase Deliverables and Relationship to Current Proposal?
09-1466 Nason Creek Upper White Pine Reconnection	Completed	This RCO grant partially funded the development of the Restoration Plan (Alternatives Analysis) for the Upper White Pine reach (RM 12-14)

1. Project Location.

The project is located near RM 13.3 to 13.9 in the Upper White Pine reach of Nason Creek which is just upstream of the town of Merritt and near USFS White Pine Road in Chelan County.

2. Brief Project Summary.

The Upper White Pine Floodplain Reconnection Project will restore floodplain connectivity, channel migration processes, and improve in-stream aquatic habitat in Nason Creek (between RM 13.3 – 13.85). Within the project area, Nason Creek is artificially confined by two rip-rap lined levees that protect the CPUD powerlines on river left and the BNSF railroad on river right. Channelization has created an entrenched, incised channel which results in habitat simplification and disruption of natural stream channel processes such as floodplain inundation rate, channel migration, sediment deposition patterns, and large wood recruitment. These impacts have reduced the quantity, quality, and access to stream and off-channel habitats within the project area. This project proposes to remove approximately 0.5 mile of the river left levee to increase the flood prone area by 7 -15 acres (2 year to 100 year event, respectively). This project will also restore stream channel meanders to increase sinuosity and add large woody material to increase pool quality and quantity. Increasing access to floodplain area will increase the off-channel habitat for rearing and flood refugia. This will provide productive foraging opportunities and refuge from predators to increase the rearing potential for juvenile steelhead and spring Chinook. In order to accommodate restoration actions, six Chelan PUD power poles will be removed and that section of transmission line will be re-located to White Pine road.

3. Problems Statement.

A. Describe the problem including the source and scale.

Figure 1 (all Figures are included in Appendix A) depicts the location of the historic Nason Creek channel and current conditions to document the channelization, loss of stream sinuosity, and disconnection from floodplain habitat that has occurred on site. From RM 14.1 to 13.3, Nason Creek is artificially confined by two rip-rap lined levees that protect the CPUD powerlines on river left and the BNSF railroad on river right. Channelization has created an entrenched, incised channel (Figure 2) which results in habitat simplification as well as disruption of natural stream channel processes such as floodplain inundation rate, channel

migration, sediment deposition patterns, and large wood recruitment. These impacts have reduced the quantity, quality, and access to stream and off-channel habitats. At low flows, only about 1 percent of the habitat area in Nason Creek consists of side channels and off-channel habitat (USFS 2008). At the reach scale (RM 12-14), infrastructure has disconnected >30% (42 acres) of the floodplain area (USBR 2009). In the lower 14 miles, infrastructure has also disconnected about 30% (300 acres) of floodplain habitat from Nason Creek (USBR 2009). Steelhead fry emerging from nearby redds and spring Chinook yearlings have limited rearing and refugia in this reach under current conditions. Infrastructure constraints that limit floodplain connectivity are visible in an aerial photograph (Figure 3). Existing beaver dams also limit fish passage into the floodplain wetland area (Figure 4). It is believed that some juveniles, perhaps the better swimmers, pass through or over the beaver dams at higher flow events.

B. List the fish resources present at the site and targeted by your project.

Species	Life History Present	Current Population Trend	ESA (Y/N)
steelhead	Egg, juvenile, adult	rising	Y
spring Chinook	Egg, juvenile, adult	declining	Y
Bull trout	Adult (migratory corridor)	unknown	Y
coho	Adult, juvenile	Stable-increasing	N

Nason Creek is Major Spawning Area for spring Chinook salmon and steelhead (UCRTT 2013 Table 3). Nason Creek is also a stronghold for coho and it is a feeding and migration corridor for bull trout with limited bull trout spawning in the upper reaches. Steelhead, spring Chinook, coho, and bull trout use the project area for holding, migration, and rearing. Tables 1-5 (Appendix B) present the results of 2013-2014 fish monitoring data in the project area. In summary, there are currently spring Chinook and steelhead juveniles utilizing the floodplain wetland area (UWP North), however, numbers are limited because the levee and a series of beaver dams limit connectivity between Nason Creek from the floodplain wetland.

Spring Chinook and steelhead spawning occurs near the downstream limits of the project area near RM 13.3-13.4, however, not within the straightened section of mainstem from RM 13.45-14 (Figures 4 and 5). Approximately 38% of spring Chinook and 57% of steelhead spawning is located in the reach immediately below the project area (~RM 8 to 14). .

C. Describe the limiting factors, and life stages that your project addresses.

This project has been designed to reconnect peripheral and transitional (floodplain) habitat for spring Chinook and steelhead juveniles. Improved access to the floodplain wetland will provide rearing habitat as well as thermal and high flow refugia for spring Chinook and steelhead juveniles. Providing rearing habitat during high flow conditions is important so that juvenile fry that emerge from redds are not prematurely flushed downstream.

Since Nason Creek has been disconnected from large areas of floodplain and side channel habitat, rearing habitat is limited during high flow and winter conditions. Photos 1 and 2 depict conditions in the existing floodplain. Access to this habitat would be improved under proposed conditions. This area has submerged and overhanging vegetation and structure to provide cover for juvenile fry rearing while providing refuge from high flows in the mainstem.

Levee removal and channel re-location will improve fish access to the floodplain area in two ways. First, the project will increase the connection and access to the floodplain during high water events (Figure 8); high water from Nason Creek will overtop the banks providing access to the floodplain. Second, the increased frequency of activation in the lower meander will increase the frequency and duration of the high water events that provide fish access over the beaver dams. Project construction will not remove the beaver dams at the downstream portion of the project area, however, once the levee is removed, the lower meander will have flow through conditions during the annual event (currently, this meander has flow-through activation at the 10 year event and greater). Improved floodplain access will provide productive foraging opportunities and refuge from predators to increase the rearing potential for juvenile steelhead and spring Chinook.

Improvements to aquatic habitat, such as creation of pools, riffles, increased sinuosity, and addition of large wood and spawning material, addresses the second and fourth ecological concerns (or limiting factors) in Nason Creek, namely, channel structure and form. This project will improve in-stream aquatic habitat by increasing the channel length, sinuosity, pools, and large woody material. The project will add 332 pieces of large wood instream (129 with rootwads) plus over 200 pieces of wood will be placed as floodplain roughness wood. Stream channel re-location and levee removal will also facilitate future channel migration and sediment transport processes capable of further increasing and maintaining those habitat features over the long term.

4. Project Goals and Objectives.

A. What are your project's goals?

The overall project goal is to re-establish hydrogeomorphic connectivity between Nason Creek and its floodplain and restore and enhance stream channel, riparian, and wetland habitat functions for ESA-listed salmonids. More specifically:

Goal 1: Restore natural stream channel and floodplain structure and function to increase floodplain connectivity and promote habitat formation. Reconnect the stream channel to its historic floodplain and channel migration zone to allow for more frequent floodplain inundation, natural rates of channel migration and bank stability, and natural lateral channel dynamics to restore and support habitat-forming processes.

Goal 2: Rehabilitate and restore aquatic habitat to allow for the opportunity and capacity to support diverse life history strategies and increased growth and survival of fish. Restore the structure and function of Nason Creek in order to support and create high quality, complex, and diverse fish habitat that can support productive fish populations.

B. What are your project's objectives?

- Remove 0.5 mile or 2,500 linear feet of levee including rip-rap removal
- Increase floodplain connectivity and improve juvenile rearing habitat.
    - At the 2 year event, Nason Creek will activate 4.69 acres of floodplain providing fish access to that area plus the inundated floodplain (Figure 8).

  - At the 100 year event, Nason Creek will activate an additional 16.5 acres of floodplain making the total activated floodplain area 26.9 acres (Figure 9).
- Restore the 30 acre channel migration zone (Figure 10).
- Increase instream complexity by adding large woody material (332 logs, 129 w/rootwads), increase pools from 1 to 7, and increase sinuosity from 1 to 1.1
- Improve bed substrate and spawning habitat in 1,500 linear feet of re-located channel

C. What are the assumptions and constraints that could impact whether you achieve your objectives?

CCNRD secured $780,000 from Department of Ecology towards construction. These funds can be used for powerline re-location, however, the grant deliverables are levee removal and floodplain re-connection. Therefore, project construction in 2016 cannot commence until stream restoration funding is secured. In order to re-locate powerlines in 2016, the materials need to be ordered 9-10 months in advance. So restoration funds need to be secured now in order to order construction materials this fall/winter.

5. Project Details.

A. Provide a narrative description of your proposed project.

Levee removal and stream channel re-alignment involves several interrelated actions including: 1) re-routing the existing Chelan PUD powerlines to a location out of the existing floodplain, 2) realigning the straightened mainstem channel into a new meandering alignment (RM 13.45 to 13.7), and 3) removing 0.5 mile of the left-bank levee. Figure 11 provides an overview of the proposed project.

A segment of the existing CPUD powerlines will be relocated out of the project area. This includes the portion of the powerlines between approximately RM 13.25 and 13.95 and includes 6 towers. The powerlines will be relocated up to White Pine Road and will reconnect downstream near RM 13.25. Removal of these powerlines will allow for channel realignment, levee and riprap removal, and will enhance long-term channel migration and floodplain processes. Assessment of powerline relocation alternatives has been conducted by Chelan County and summarized in a technical memorandum (HDR 2012) that should be consulted for additional information. The powerline re-location design is at the 100% design plan stage and bid documents for materials procurement will be prepared upon completion of NEPA.

Approximately 1,500 feet of Nason Creek will be re-aligned north of the existing channel between RM 13.7 and 13.45. The channel will have pool-riffle habitat and large wood placements. Excavated material from the new alignment will be placed in the existing channel segment to be abandoned. The re-alignment also includes creating a new backwater alcove within the abandoned channel segment and creating a connector channel to ensure fish and hydrologic connectivity to the existing culvert under the railroad.

The channel re-alignment will involve excavation of existing ground to proposed channel dimensions and grade. The channel re-alignment takes advantage of floodplain depressions and

channel scars, while also minimizing impacts to existing perched wetland habitats. The channel re-alignment will involve levee removal along river-left at the upstream and downstream connection points; near RM 13.7 and RM 13.45, respectively. The inlet bed elevation of the proposed channel will be raised approximately 4 feet to achieve desired gradient and to increase floodplain connectivity. This will create a pool in the main channel upstream of RM 13.7. Over time, this pool will naturally fill with bedload transported from upstream, at which point a more uniform profile will develop through the upstream connection point. The channel profile matches existing grade in the channel at the outlet connection point. The average gradient of the proposed channel bed is 0.44%.

The proposed channel planform, profile, and cross-section geometry is based on numerous data sources and is further described in the 60% Design Report (Interfluve 2015). In summary, the channel planform, cross-section, and profile geometry is based on reference to numerous sources including: 1) geometry of the historical channel, 2) geometry of the upstream reference reach, 3) geometry of adjacent upstream and downstream channel segments, 4) the geometry needed to achieve floodplain connection objectives, 5) the geometry needed to achieve sediment competency through the site, and 6) the geometry needed to address erosion and flood risks to nearby infrastructure. The design geometry was achieved through multiple iterations of channel geometry and modeling using 1-D and 2-D models. As designed, the proposed channel provides continuity of stream width, depth, flow velocity, and shear stress from upstream segments, through the project reach, and into downstream reaches.

The proposed design includes lining the bed of the new channel with a layer of coarse bedload (primarily gravels and cobbles with some small boulders) and construction of fabric encapsulated soil (FES) lifts and large wood placements along the banks in order to achieve desired channel stability. This is based on the presence of highly erodible soils that were found during the soils test pits. Providing initial stability is especially important over the short-term, when sediment equilibrium processes will favor erosion of the channel due to the sediment trapping that will initially occur in the mainstem pool upstream of RM 13.7. Once the upstream pool fills, equilibrium sediment processes are expected to become established within the restored reach. The new channel, which by that time would be expected to have mature streambank vegetation, will then be able to naturally adjust in response to dynamic sediment erosion and deposition processes.

The need to line the bed of the new channel was determined through sediment mobility analysis based on the soil types found in the test pits and the hydraulic model output. A bed size gradation for the imported material was selected to achieve bed stability over a range of potential flood volumes. It is assumed that a portion (nearly half) of the in situ bed material that is over-excavated for placement of the liner material can be sorted and re-used in the bed. The placed streambed material will extend beneath the lowest FES lift to provide vertical stability for some degree of lateral channel migration.

FES lifts are proposed for select locations where stream energy would result in significant erosion of channel banks over the short-term. This primarily occurs along the outside of the bends and in straight segments of the new channel. The inside of bends, which are expected to be deposition zones (bars), are not included for FES lift treatment. In general, based on bank heights, it is anticipated that 3 tiers of 1 foot tall lifts would be required, but this could be

adjusted based on site conditions and will be further determined as part of final design. The FES lifts will be filled with a mix of salvaged or imported cobble, gravel, and topsoil. The lower tiers will have a greater amount of cobble and gravel than the top lift, which will have a greater percentage of topsoil in the mix in order to support riparian plantings.

Large wood will be incorporated into the banks as partially-buried toe logs beneath the FES lifts and as placements along the surface of the banks. Wood placements will provide immediate habitat cover and complexity, and will also help provide initial stability within the newly constructed channel, which will be prone to erosion following construction. The intent of the bank treatments that use FES lifts combined with large wood is to provide for initial stability following construction but to allow for long-term deformation (including channel migration at natural rates) once riparian vegetation becomes established. These treatments avoid the use of boulders or ferrous anchoring that could potentially affect the rates of long-term channel deformation.

At the inlet of the channel re-alignment, a ballasted log jam will be constructed within the upstream end of the existing channel fill. This log jam will be used to stabilize the fill and to divert water into the new channel alignment. The log jam will also provide habitat complexity and cover for salmonids in the newly created pool upstream of the channel inlet. The log jam will be anchored via the partial burial of key log members into the channel fill. Boulders salvaged from the existing riprap bank along the river-left (north) side of the existing channel will be used as ballast within the backfill of the jam. This channel boundary is designed to be stable over the long term in order to prevent the encroachment or reoccupation of the existing channel by Nason Creek.

At the outlet of the channel re-alignment, where the new channel enters back into the existing channel, a log jam will be constructed on river-right to protect the downstream portion of the fill between the culvert connector channel and the existing riprap bank along the railroad prism. This jam will be constructed to provide for long-term stability at this location, and will be configured similar to the log jam at the inlet.

The upstream end of the existing channel backfill will have a sloped grade that diverts flood waters away from the railroad corridor and back towards the new channel. Fill along the railroad is designed to be above the 100 year flood elevation, which transitions down to a lower grade closer to the new channel. Fill material placed in the existing mainstem is expected to be primarily the sandy loam observed in the soils pits and will require moisture control, restrictions on thickness of lifts, and controlled compaction. Two buried boulder obstructions are proposed to be constructed within the channel fill. One is located at the upstream end of the fill, adjacent to the log jam, and one is located approximately midway through the fill where the new meander channel extends/bends to the south. These are designed to resist the potential for lateral erosion of the new channel to the south, back into the existing alignment along the railroad embankment. These will be constructed using salvaged boulders from the existing riprap bank along the river-left (north) side of the existing channel. The surface of the fill material will be treated with erosion control and/or floodplain roughness measures to reduce the risk of erosion of the placed material (details to be determined).

Removal of the lowest portion of the left-bank levee near RM 13.37 will increase activation of a relic channel meander. The project construction will not modify the existing beaver dams. The proposed depth of excavation of the inlet berm matches the extrapolation of the relic meander thalweg profile. Currently, the channel receives surface flow from the upstream end only above the 10-year event. Removal of the levee will provide for activation of the channel at the annual event. A log jam proposed near the apex of the split flow channel entrance will help stabilize the bank following excavation of the levee plug and will also encourage scour at the channel inlet to help maintain flow into the high flow channel. Wood placements will be secured using partial burial into banks and bracing against vertical wood pilings.

A small backwater alcove (~100' long) will be constructed along river-right of the re-aligned channel to add structural complexity. In the mainstem of Nason Creek, an access channel will maintain the hydrologic connection to the historic channel through the existing culvert under the railroad tracks near RM 13.46. Wood will be placed in both the backwater alcove and access channels to provide habitat complexity and cover. Wood will consist of single pieces and small accumulations of wood. Wood placements will be secured using partial burial into banks and bracing against vertical wood pilings. FES lifts will be placed along the margins of the backwater alcove and access channels to provide temporary soil stability until planted riparian vegetation can establish.

Approximately 2,500 feet of the existing left-bank (north) levee will be removed. The levee removal extends from approximately RM 13.33 to RM 13.8. This accounts for the portions of the levee that impact floodplain inundation rates up to the 100-year flood event. Levee removal will include removing the levee prism down to existing floodplain elevation, except at the connection points for the new channel and the reconnected high flow channel, where additional material will be removed to activate these channels. The levee is currently forested, however, trees are less than 50 years old dating back to the construction of the levee in the late 1950s/early 1960s. These trees will be removed as necessary to facilitate levee removal. Trees greater than 12" dbh will be removed with rootwads attached and incorporated into the project area as floodplain roughness wood.

Riprap will be removed along the river-left (north) bank through the project area. The primary anticipated benefits of riprap removal are to enhance channel margin habitat and to restore longterm geomorphic function (e.g. lateral channel dynamics and migration). The riprap removal encompasses approximately 2,500 feet of channel. This action extends from approximately RM 13.33 to RM 13.8 although the riprap is discontinuous in the downstream portion. The riprap downstream of the new channel outlet (RM 13.33 to 13.44) will be fully removed. Within the channel fill (RM 13.44 to 13.68), the riprap will be salvaged as required for construction of the buried obstructions or will otherwise be buried in place. Riprap at the channel inlet will be removed down to the elevation of the new constructed bed elevation. Upstream of the inlet (RM 13.69), riprap on the upper bank will be removed down to the elevation of the 2-year flood event.

All areas disturbed for construction (~ 5 acres) plus the existing CPUD powerline corridor (> 5 acres) will be re-vegetated with native species. The 60% plan set contains a draft re-vegetation plan which will be revised in the final plan set with additional input from USFS. In addition to re-vegetation, small woody debris salvaged from onsite will be used to increase floodplain

roughness. The wood will consist of brush, slash, and small trees up to 15 inches diameter. This material is intended to mimic the downed wood and organic matter that naturally occurs in floodplains. The floodplain roughness wood treatment will include dispersal of brush, slash, and wood chips to facilitate re-vegetation efforts by decreasing invasive plant establishment and improving soil moisture content.

B. Provide a scope of work. See Table 6 in Appendix B

C. **Explain how you determined your cost estimates**.

A copy of the Engineer's cost estimate that was prepared with the 60% design plans is included in Appendix B. Last fall we received comments from Tributary Committee and PRCC in support of the proposed design and biological benefit, however, there were concerns about project cost. It was suggested that we obtain a contractor cost estimate for construction. CCNRD contacted 2 contractors to secure cost estimates based upon 60% design. The contractor cost estimates will be available in the next few weeks. As soon as it is available, that additional cost information will be uploaded into PRISM and handed out at the May field tour.

D. Describe the design or acquisition alternatives that you considered to achieve your project's objectives.

USBR identified floodplain (DIZ-1) and off-channel (DOZ-1) habitat connection as potential restoration actions on site (USBR 2009 Figure 12). After evaluation of all potential projects in the lower 14 miles of Nason Creek, reconnection of the Upper White Pine DOZ-1 floodplain wetland ranked moderate (3) for biological benefit, however, it ranked as the highest priority for reconnection of isolated habitat subreach units when biological benefit, social feasibility, construction feasibility and cost were considered (ICF 2009). The Upper White Pine DIZ-1 reconnection of the historic channel ranked high (5) for biological benefit (ICF 2009).

USFS TEAMS, Interfluve, USBR, CCNRD, and US Forest Service staff worked together to draft a Restoration Plan (USFS TEAMS and Interfluve 2012) that identified restoration opportunities through an evaluation of geomorphic, hydraulic, and ecological processes. Table 7 provides a short, succinct summary of the alternatives evaluated. For more information about alternatives evaluated, please see the Restoration Plan (TEAMS and Interfluve 2013).

E. **How have lessons learned from completed projects or monitoring studies informed your project**?

F. **Describe the long-term stewardship and maintenance obligations for the project or acquired land**.

A post-construction monitoring plan will be developed as part of the final design. The project is currently being evaluated by Tetra Tech and BPA as a possible Action Effectiveness Monitoring (AEM) site. If this site does not become an AEM site, USBR will likely fund CCNRD for post-construction implementation monitoring. The land is owned by US Forest Service so they will be the long term site stewards.

6. **Context within the Local Recovery Plan.**

A. **Discuss how this project fits within your regional recovery plan and/or local lead entity's strategy to restore or protect salmonid habitat**

The Upper Columbia spring Chinook salmon and steelhead Recovery Plan (UCSRB 2007) references the Biological Strategy (UCRTT 2013) as the framework for prioritizing assessment units and actions within the region. This project targets priority fish species; it is located within a priority area; and it addresses a priority action as described below.

Priority fish species

This project targets spring Chinook and steelhead which are both listed for protection under the Endangered Species Act. This project will also provide potential habitat for bull trout, coho, and other fish species present in Nason Creek, however, project goals and objectives are targeted for spring Chinook and steelhead juvenile use.

Priority area

Nason Creek has been identified as the sub-watershed, or assessment unit, with the highest priority for restoration actions in the Wenatchee watershed (UCRTT 2013).

Priority Action

This project will reconnect a floodplain wetland to provide peripheral and transitional habitat in Nason Creek which addresses the highest priority ecological concern within the Nason Creek watershed (UCRTT 2013). Levee removal has been identified as the Tier 1 strategy to address this ecological concern.

B. **Explain why it is important to do this project now instead of later.**

It has taken significant effort to build stakeholder support for this project. It would be difficult to re-build that support in the future if the project is not implemented now because partners would lose faith that it would really happen. Since this project has partial funding and support from CPUD and USFS, now is the time to secure remaining construction funds and implement.

C. **If your project is a part of a larger overall project or strategy, describe the goal of the overall strategy, explain individual sequencing steps, and which of these steps is included in this application for funding.**

There has been significant effort to restore habitat in Nason Creek. Figure 13 documents restoration and monitoring efforts completed and in progress in Nason Creek.

7. **Project Proponents and Partners.**

A. **Describe your experience managing this type of project**.

CCNRD has been the project sponsor for several restoration projects in Nason Creek that have involved coordination with infrastructure and USFS. For example, the nearby Lower White Pine floodplain reconnection project re-connected 152 acres of floodplain habitat in Nason Creek including installation of a bridge under the BNSF railroad. CCNRD also installed culverts under SR 207 for the 2007 and 2009 oxbow reconnection projects and both of those projects were located on USFS land with WSDOT ROW and CPUD utilities in the corridor. CCNRD also removed 0.64 acres of floodplain fill in Lower Nason Creek in 2014 which required coordination with WSDOT, USFS, and Weyerhaeuser. These projects demonstrate CCNRD

ability to manage, develop, and implement large scale projects that involve negotiations with nearby utilities and infrastructure.

B. **List all landowner names**.

USFS and BNSF own land within the project area; see attached signed forms.

C. **List project partners and their role and contribution to the project**. *N/A*

D. **Stakeholder Outreach**.

CCNRD mailed a postcard notification to adjacent residents to notify them of the proposed project in 2010. Since then, CCNRD staff presented project overviews at community meetings in Nason Creek (2011 and 2014). USFS initiated NEPA in summer 2013 with a public notice describing the proposed project. The only comment of record from the NEPA scoping was from CPUD re-iterating their role in this project. USFS will circulate the Environmental Assessment for public review and comment this summer, however, we do not anticipate any issues to arise.

A. **Will you complete, or have you already completed, a preliminary design, final design, and design report (per Appendix D) before construction?**
Yes

The project is currently at the 60% design phase and plans and design report have been uploaded to PRISM. The 60% design plans meet Appendix D guidelines for preliminary design. Compiled stakeholder comments on 30 and 60% design are also available upon request.

B. **Will your project be designed by a licensed professional engineer?**

The project has been designed by a licensed professional engineer, Dan Miller at Interfluve.

C. **If this project includes measures to stabilize an eroding stream bank, explain why bank stabilization there is necessary to accomplish habitat recovery.** *N/A*

D. **Describe the steps you will take to minimize the introduction and spread of invasive species during construction and restoration.**

Measures to minimize the introduction and spread of invasive species will be incorporated into the final contractor specifications per the requirements of USFS design standards.

References:

HDR Engineering. 2012. Chelan PUD Transmission Line Relocation Detailed Alternative Analysis due to Nason Creek Reconnection. Available in PRISM and online at http://hwsconnect.ekosystem.us/project.aspx?sid=290&id=14463&stat=on

ICF. 2009. Nason Creek Subreach Unit Prioritization.

Interfluve. 2014. 60% Engineering Plans and Design Report. Loaded into PRISM and online http://hwsconnect.ekosystem.us/project.aspx?sid=290&id=14463&stat=on

UCRTT. 2013. A Biological Strategy to protect and restore salmonid habitat in Upper Columbia Region.

USBR. 2009. Nason Creek Upper White Pine Reach Assessment, Chelan County, Washington.

UCSRB. 2007. Upper Columbia spring Chinook salmon, steelhead, and bull trout recovery plan.

USFS 2008. Nason Creek Habitat Assessment.

USFS TEAMS and Interfluve. 2013. Upper White Pine Reach Restoration Plan. On PRISM and online at http://hwsconnect.ekosystem.us/project.aspx?sid=290&id=14463&stat=on

Appendix A: Figures

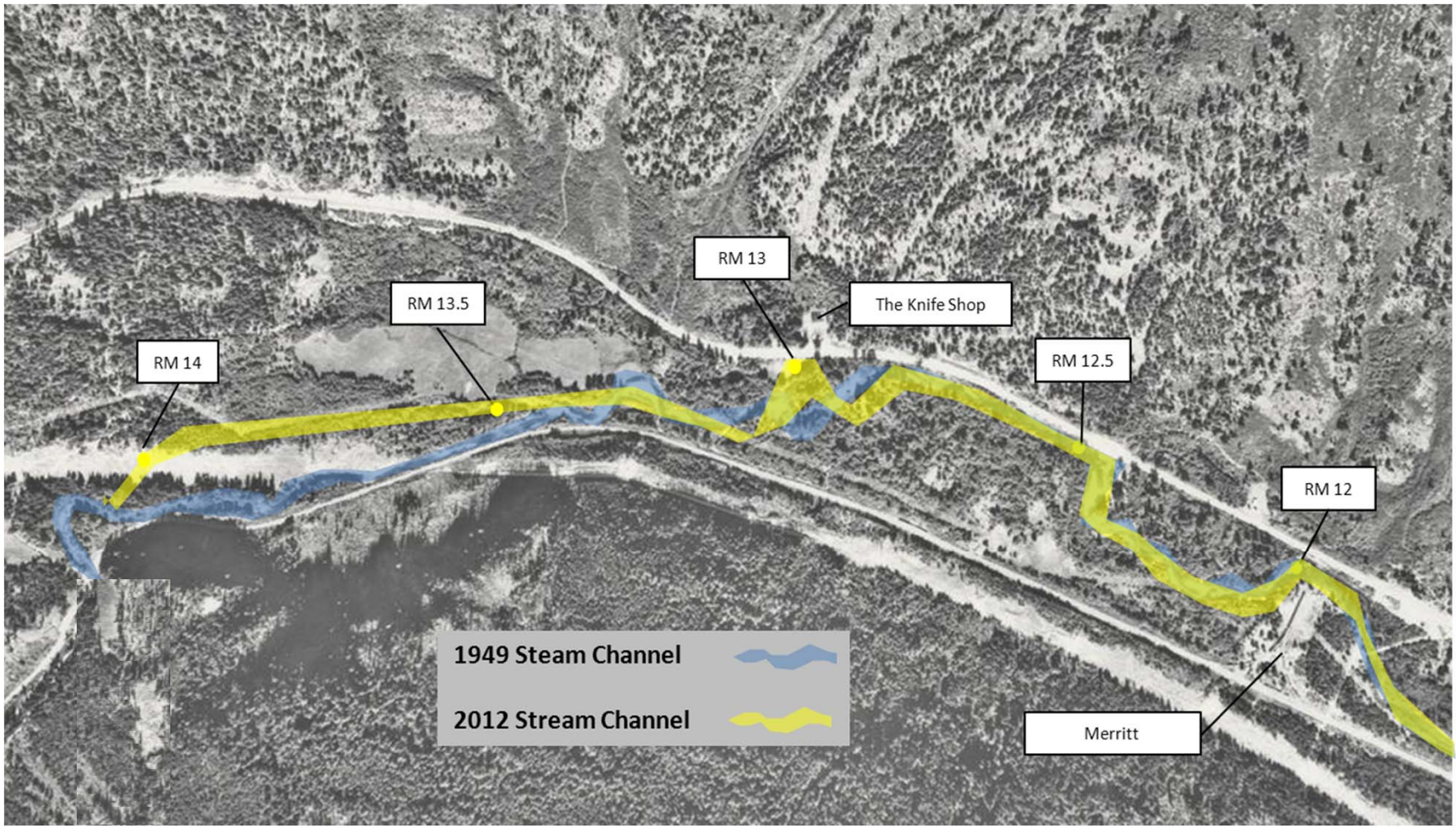


Figure 1. Aerial photo (1949) of the Upper White Pine Reach showing the approximate locations of the 1949 and 2012 (present day) stream channel alignments. The Burlington Northern Railroad is in its original alignment at the upper end of the reach. The floodplain near RM 13.5 appears to be in agricultural use. The CPUD powerline corridor is in a different alignment at the upper end of the reach.

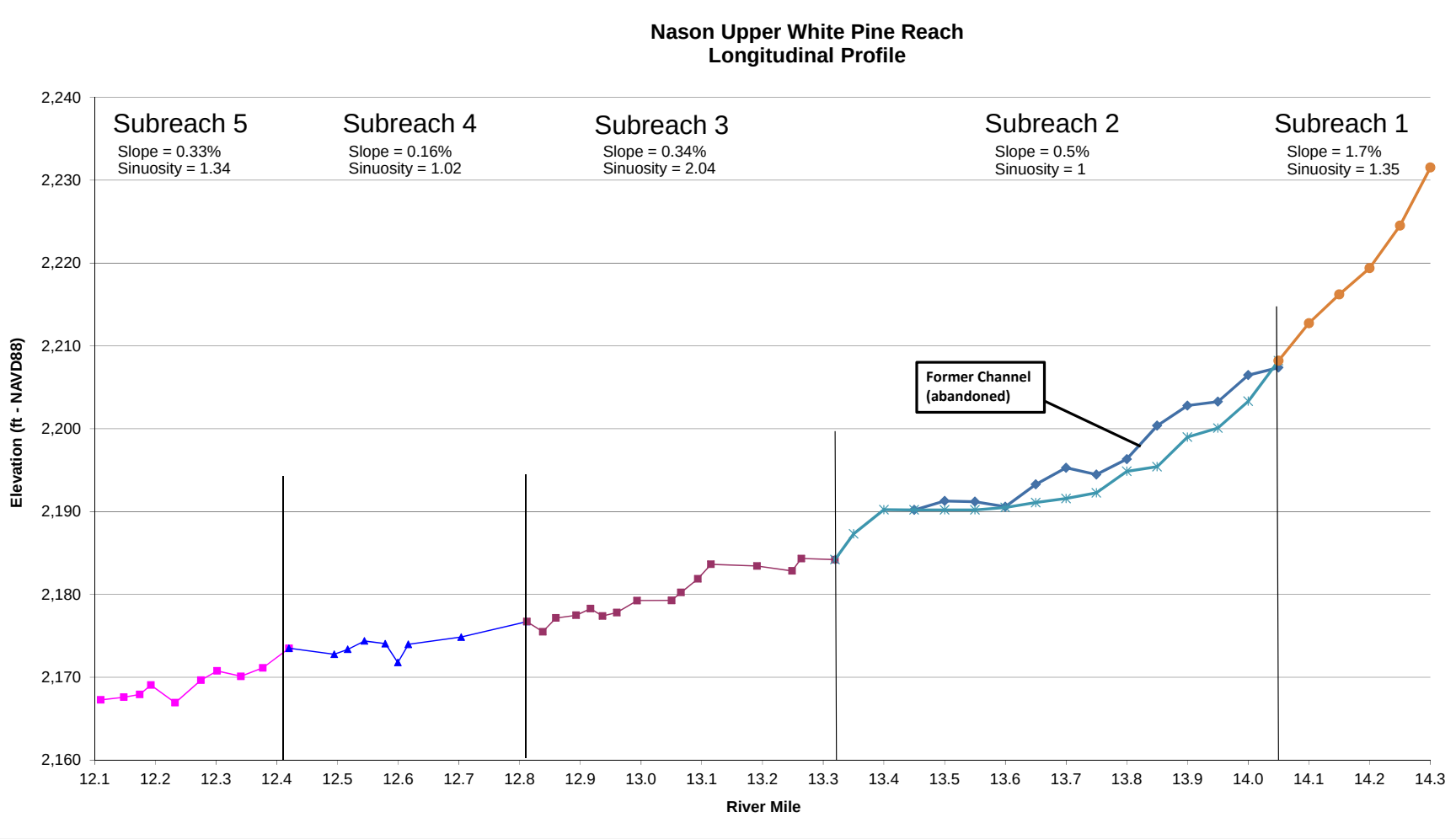


Figure 2. Longitudinal profile of the Upper White Pine Reach. Data for subreaches 1 and 2 was obtained from LiDAR and therefore represents water surface at the time of the LiDAR flight. Data for subreaches 3-5 is from bathymetric survey data and represents the channel thalweg. Note the incision in the current bed profile in reach 2 compared to the historic channel bed.

Figure 3: Google earth imagery of the project area. Note the infrastructure constraints (BNSF railroad, BPA powerlines, CPUD powerlines, Hwy 2) to floodplain connectivity and channel migration processes. Note the long straightened mainstem channel of Nason Creek in this area. This project presents a unique opportunity to move infrastructure out of the floodplain to restore natural channel processes.

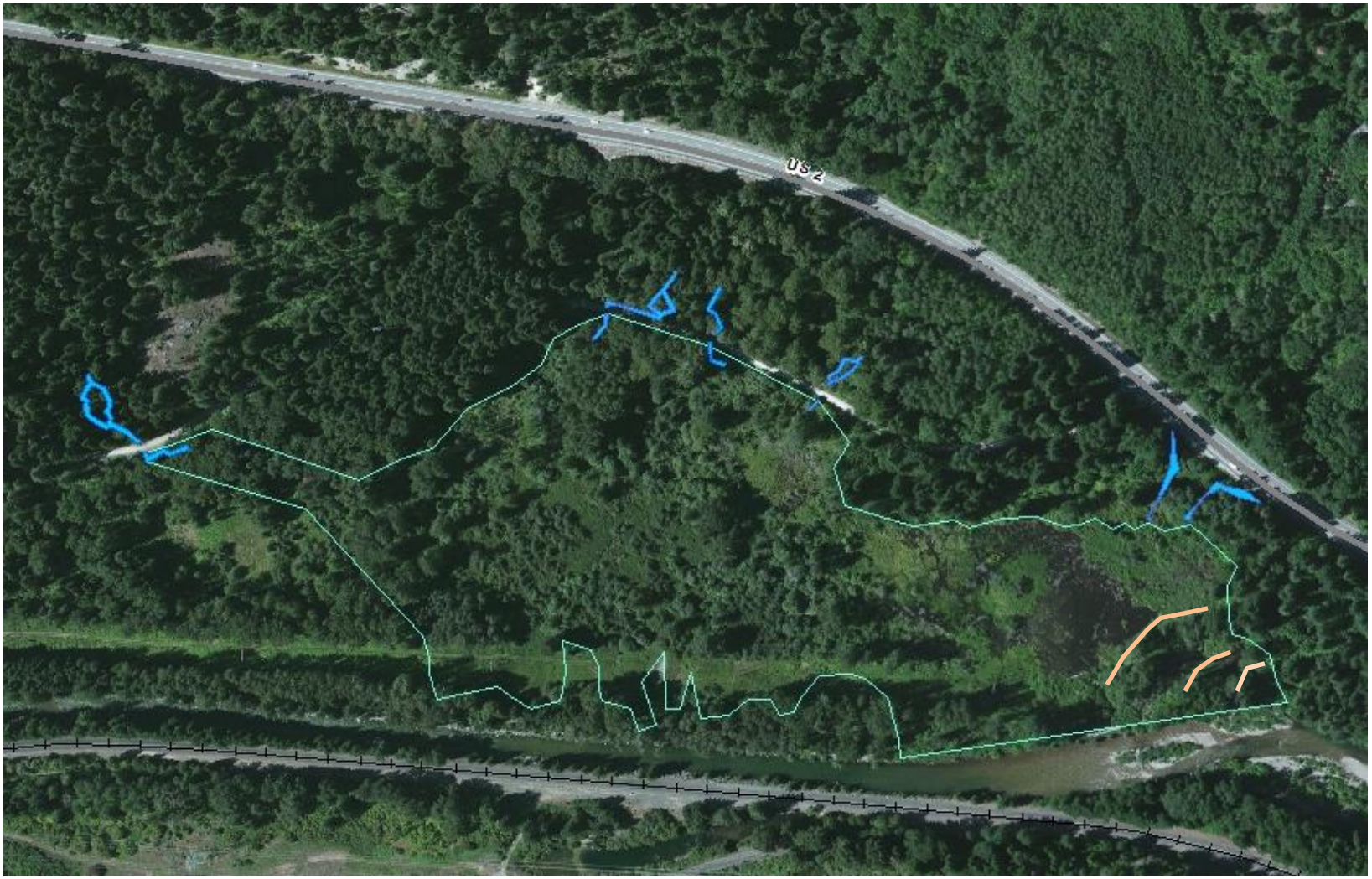


Figure 4: Wetland Boundary, six Rayrock Springs Tributaries (as mapped within 100' of White Pine road), and approximate location of beaver dams (orange)

Figure 5: Spring Chinook spawning (2004-2012). Note the abundance of redds upstream and downstream of the project area but lack of redds between RM 13.4 – 14.1

Legend:

- Spring Chinook Redds
- River Miles

0 500 1,000 2,000 Feet

Figure 5: Steelhead spawning (2004-2009). Note the abundance of redds upstream and downstream of the project area but lack of redds between RM 13.4 – 14.1

Legend:

- Steelhead Redds
- River Miles

0 500 1,000 2,000 Feet

Photo 1 – this is the ponded area that will become the lowermost reconnected meander near RM 13.3-13.4.

Photo 2 – this is the larger floodplain wetland. This photo is taken above the uppermost beaver dam. Fish surveys have documented fish use in this area, however, it is limited to juveniles who can pass over the existing beaver dams.

Figure 7: Photos 1 and 2 of the floodplain wetland north of the levee. Fish access to this wetland will be improved to provide rearing and thermal and high flow refuge.

Figure 8: Floodplain connectivity from the 2 year model depicts overbank flows from Nason Creek in shades of green. The modeling results are overlaid on existing ponded areas in the floodplain (grayish-green color).

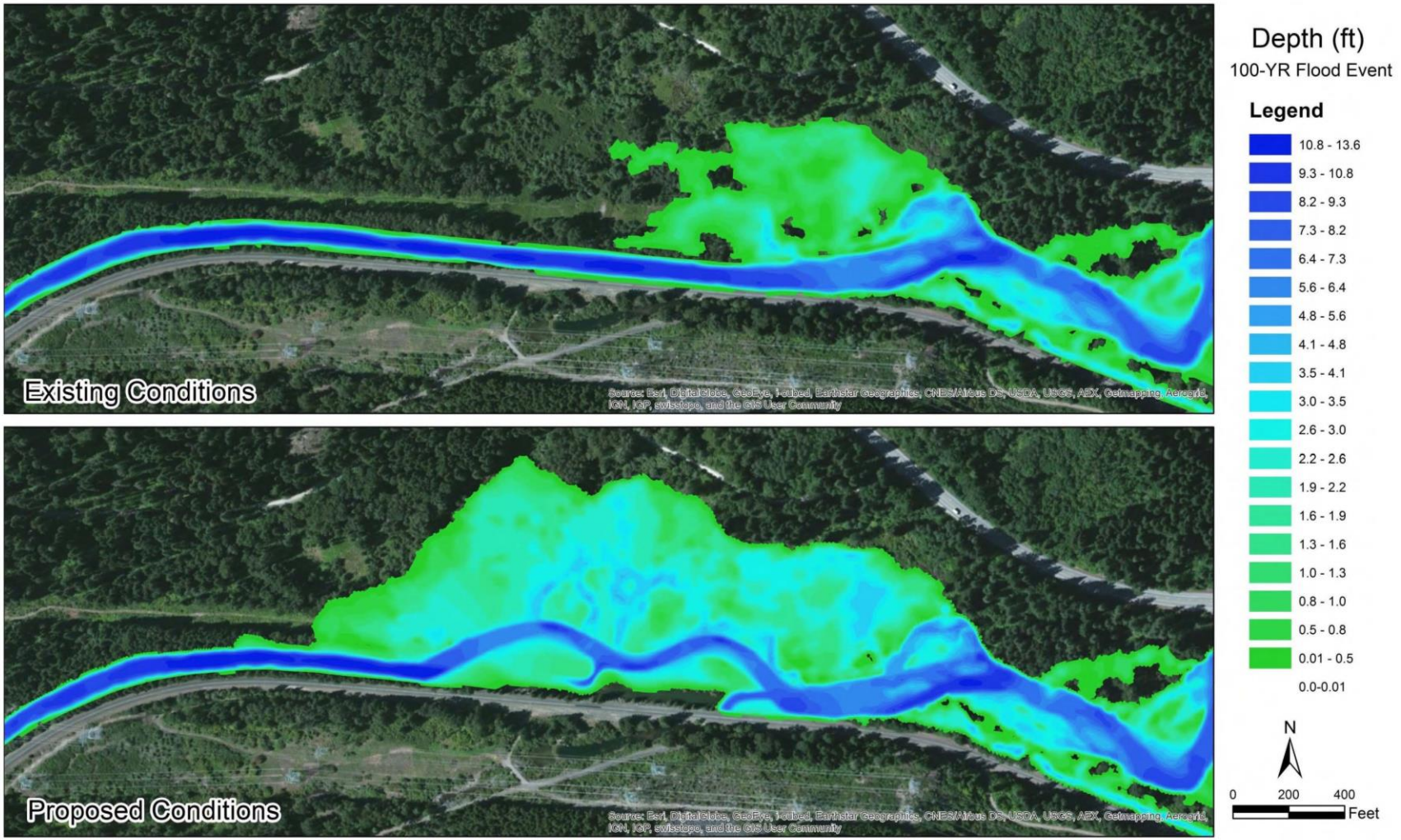


Figure 9: Existing and proposed conditions at the 100 year event. Proposed conditions provide 26.9 acres of floodplain connectivity.

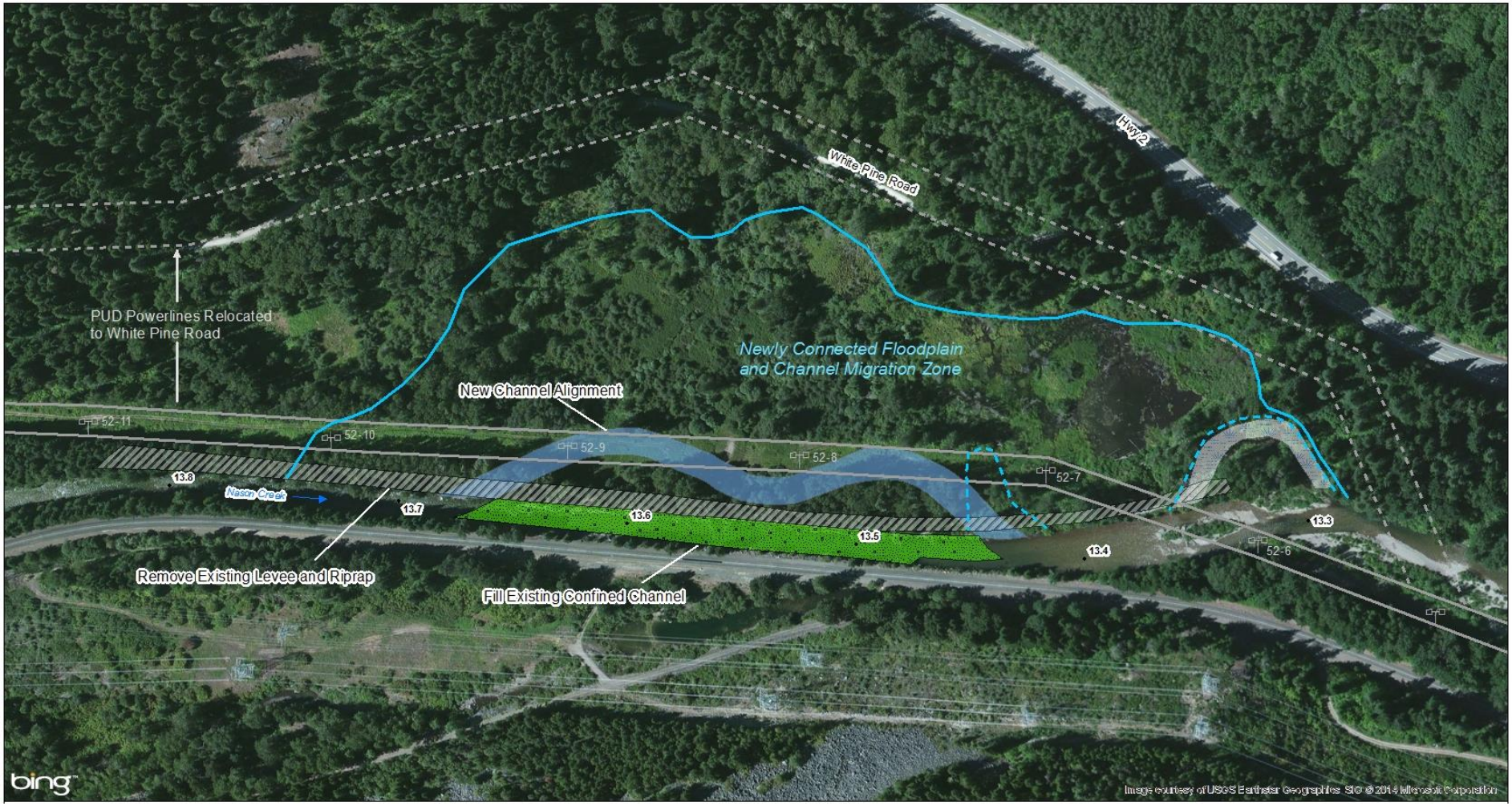
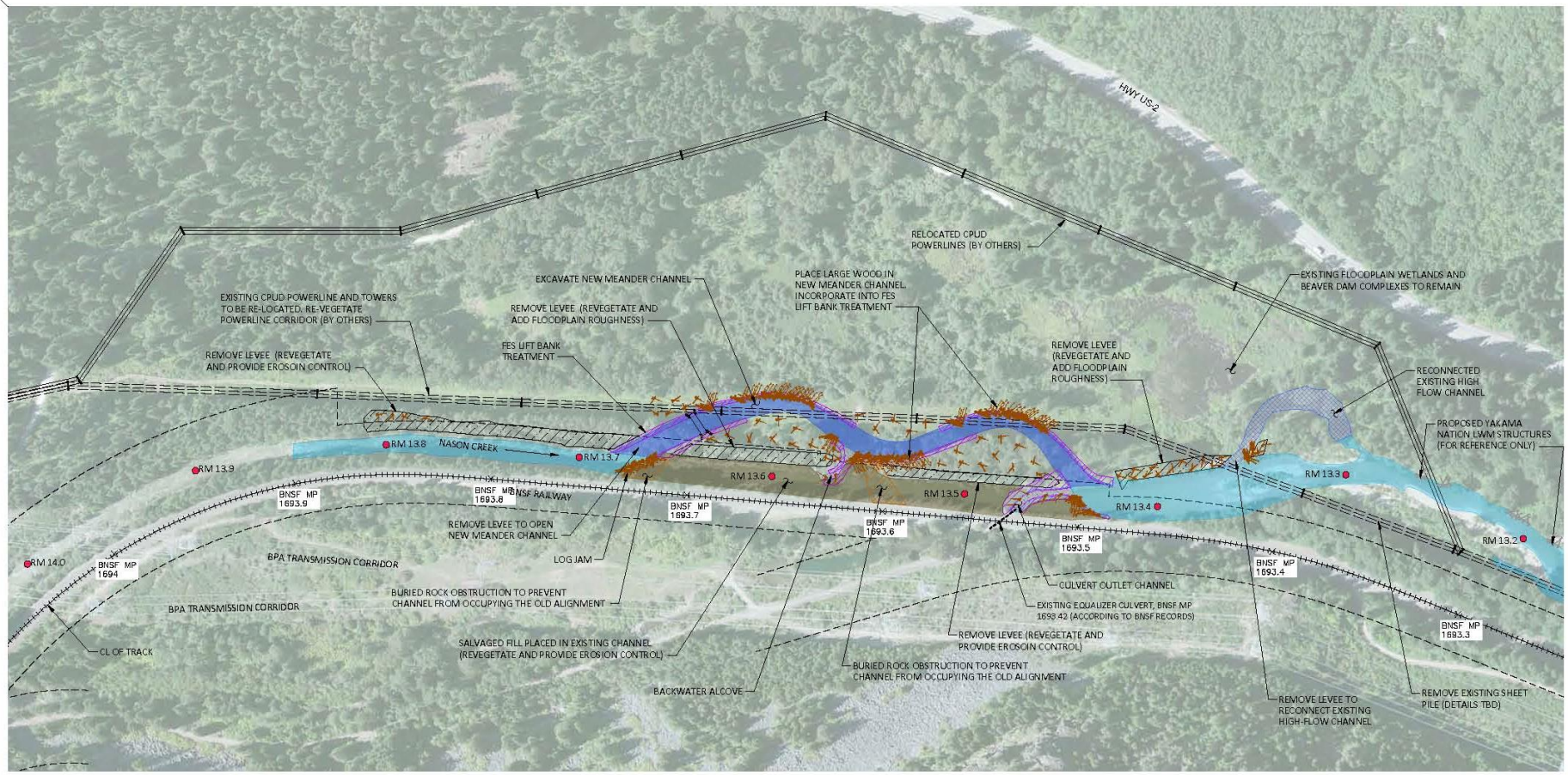


Figure 10: Proposed Project depicting the current channel migration zone in a blue dashed line and the future channel migration zone in a blue solid line.



SITE PLAN

LEGEND

EXISTING FEATURES

- EXISTING MAINSTEM CHANNEL
- RM 13.4 RIVER MILE
- EXISTING OVERHEAD POWERLINE AND TOWERS
- EXISTING BNSF ROW (FOR REFERENCE ONLY)
- CENTER LINE OF BNSF TRACKS

PROPOSED FEATURES

- CONSTRUCTED MAINSTEM CHANNEL MEANDER BEND
- CONSTRUCTED BURIED MAINSTEM CHANNEL OBSTRUCTION
- CONSTRUCTED FLOODPLAIN (FILLED EXISTING CHANNEL)
- NEW BACKWATER ALCOVE
- LEVEE REMOVAL
- FES LIFT BANK TREATMENT
- EXISTING HIGH-FLOW CHANNEL TO BE RE-CONNECTED
- PROPOSED OVERHEAD POWERLINE (RELOCATED BY OTHERS)
- LARGE WOODY MATERIAL

0 150 300
SCALE IN FEET

Preliminary

Figure 11: Proposed Project –Sheet 4 of the 60% plan set.
The 60% plan set (43 pages) is available on PRISM and HWS
http://hwsconnect.ekosystem.us/project.aspx?sid=290&id=14463&stat=on

Figure 12: The USBR Reach Assessment for Nason Creek identified the proposed project as an opportunity to reconnect floodplain (UWP DOZ-1 purple polygon).

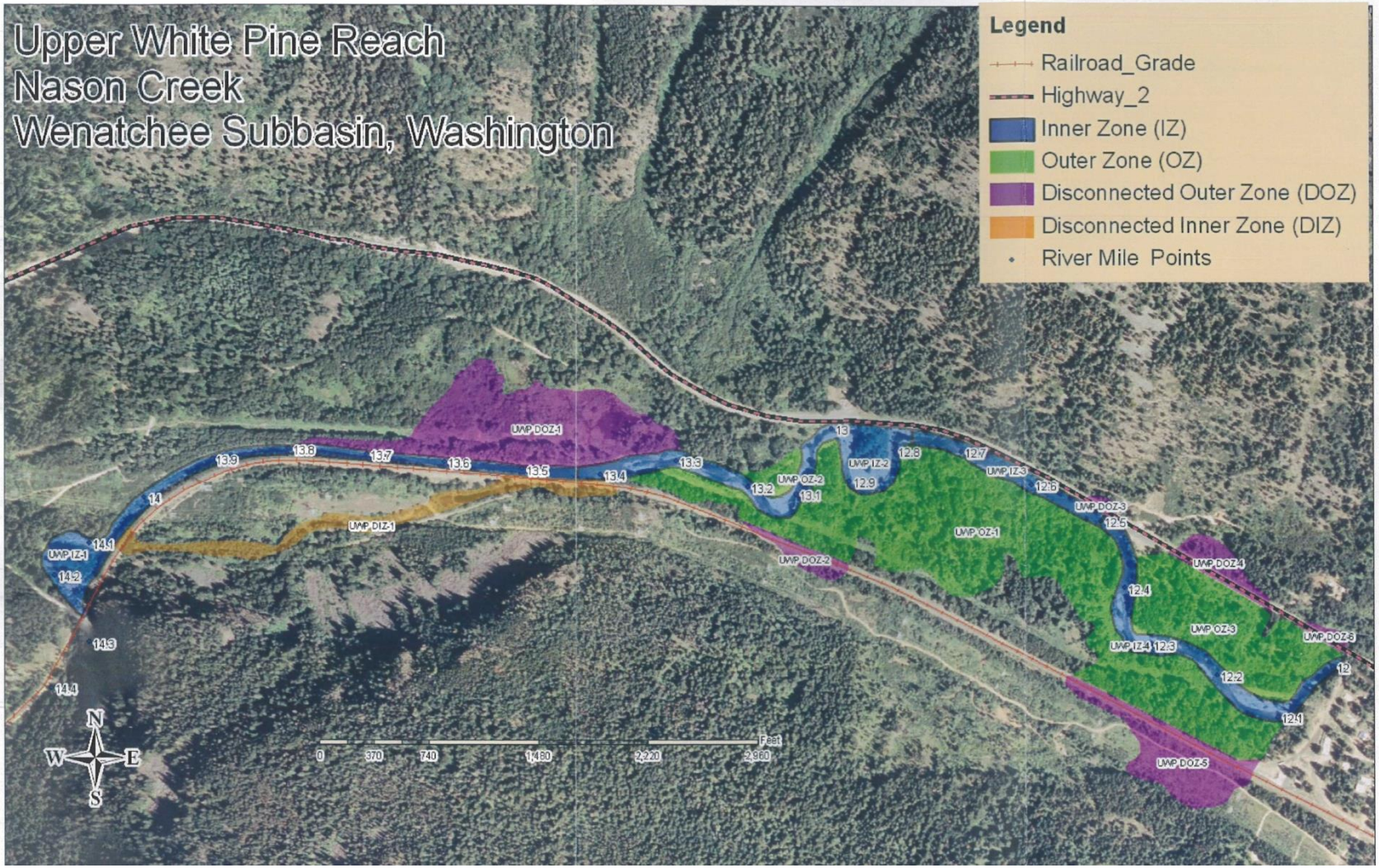
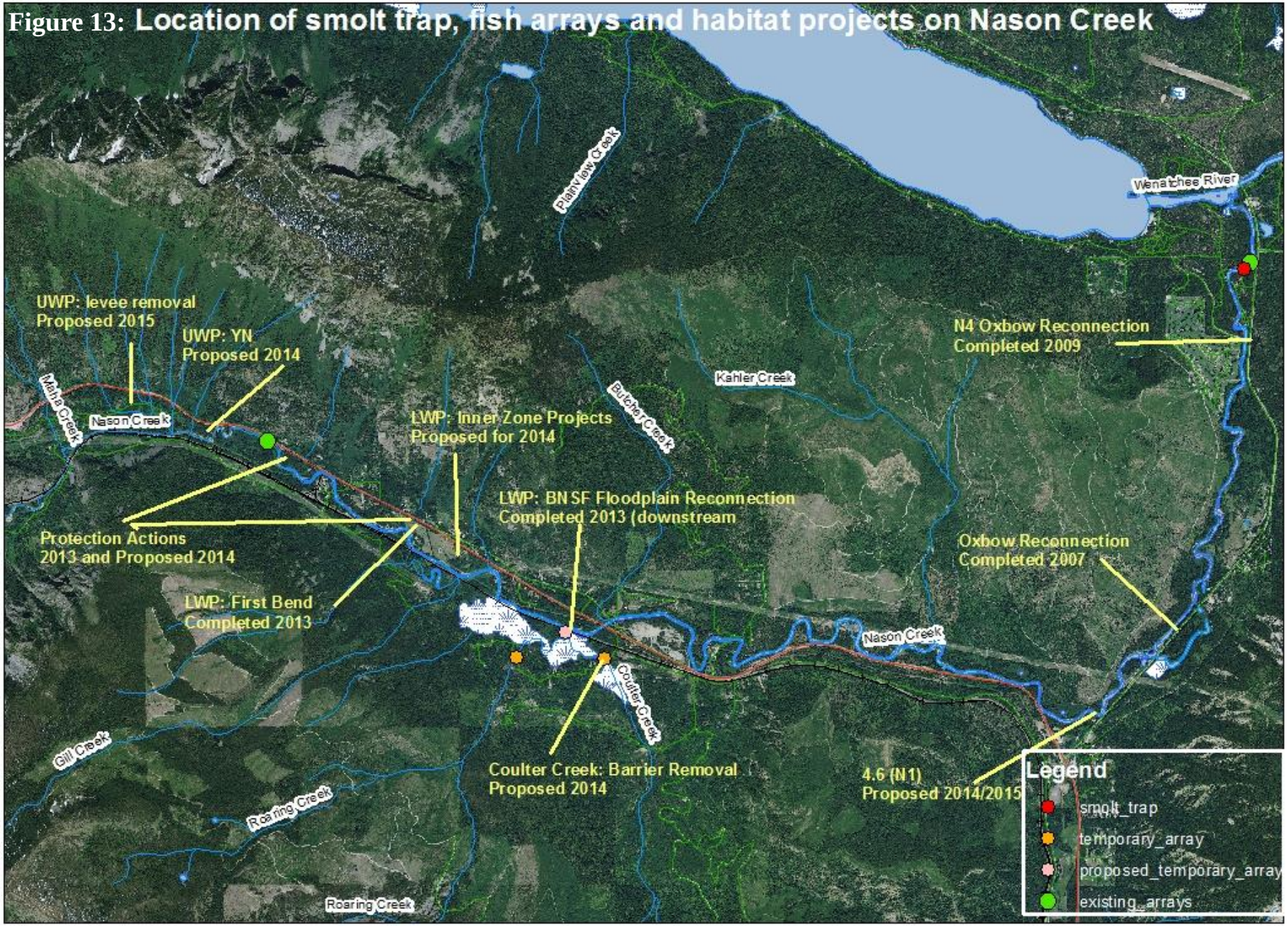


Figure 13: Location of smolt trap, fish arrays and habitat projects on Nason Creek



Appendix B: Tables, Cost Estimate, and Landowner Acknowledgement

Tables 1-5: Fish data

Table 6: Scope of Work

Table 7: Summary of Alternatives Analysis

Cost Estimate

Landowner Acknowledgement Form

Snorkel survey data collected by Yakama Nation. See site descriptions at the bottom of the page.

Table 1. Fish counts by species observed during the June 2013 UWP snorkel surveys.

Reach	Salmonids				Other		
	Brook	Chinook/Coho	Steelhead	Whitefish	Dace	Sculpin	Shiner
UWP North	0	0	0	0	0	0	0
UWP South	11	9	0	0	1	0	495
Main Channel	NS	NS	NS	NS	NS	NS	NS
UWP Total	11	9	0	0	1	0	495
Control 1	NS	NS	NS	NS	NS	NS	NS

NS =not surveyed due to high water conditions.
Notes for this snorkel survey indicate that UWP north likely contained fish, however, due to high water levels, fish were likely residing in submerged vegetation and not visible for counting.

Table 2. Fish counts by species observed during the September 2013 UWP snorkel surveys.

Reach	Salmonids					Other		
	Brook	Chinook	Coho	Steelhead	Whitefish	Dace	Sculpin	Shiner
UWP North	141	42	0	0	0	0	0	0
UWP South	146	126	0	0	0	0	0	789
Main Channel	0	22	1	0	158	0	0	0
UWP Total	287	190	1	0	158	0	0	789
Control 1	0	30	1	9	103	0	4	0

Table 3. Fish counts by species observed during the March 2014 UWP snorkel surveys.

Reach	Salmonids						Other	
	Brook	Chinook	Coho	Steelhead	Whitefish	Bull Trout	Sculpin	Shiner
UWP North	19	10	0	5	0	0	3	0
UWP South	1	0	0	0	0	0	0	198
Main Channel	0	39	0	190	0	0	4	0
UWP Total	20	49	0	195	0	0	7	198
Control 1	0	73	0	136	0	3	3	0
Control 2	88	1	0	0	0	0	0	0

Table 4. Fish counts by species observed during the June 2014 UWP snorkel surveys.

Reach	Salmonids						Other	
	Brook	Chinook	Coho	Steelhead	Whitefish	Bull Trout	Sculpin	Shiner
UWP North	4	75	0	0	0	0	0	0
UWP South	29	3	0	1	0	0	0	286
Main Channel	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
UWP Total	33	78	0	1	0	0	0	286
Control 1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Control 2	0	0	0	0	0	0	0	0

Table 5. Fish counts by species observed during the September 2014 UWP snorkel surveys.

Reach	**Salmonids**				**Other**	
	Brook	**Chinook**	**Steelhead**	**Whitefish**	**Sculpin**	**Shiner**
UWP North	86	16	0	0	0	0
UWP South	24	101	2	0	0	1377
Main Channel	0	6	22	49	4	0
UWP Total	110	123	24	49	4	1377
Control 1	0	0	2	86	2	0
Control 2	76	1	0	0	0	0

Site Descriptions:
UWP North = Floodplain wetland to be reconnected by the proposed project
UWP South = Historic channel currently connected to Nason Creek by 3’ diameter x 100’ long culvert
Main Channel = Mainstem Nason Creek RM 13.26 – 13.78
Control 1 = Nason Creek mainstem reference site RM 14.65 – 15.2
Control 2 = Off-channel area near the mainstem reference site

Table 6: Scope of Work

Task	Who	Deliverable	Timeline
Landowner feedback	BNSF	60% design comments	May 2015
Permitting	CCNRD	JARPA submittal and Local, State, Federal authorizations	June 2015 – May 2016
Construction Agreement	CCNRD-CPUD	Interlocal Agreement 2	August 2015
NEPA completion	USFS	Special Use Permit	September 2015
Powerline material procurement	CPUD	Powerline materials	Fall 2015 – June 2016
Powerline corridor clearing	CCNRD	Salvaged trees and cleared corridor	Fall 2015 or Spring 2016
Stream Restoration Final Design	Interfluve	Final Design plans and specs	Fall 2015-Spring 2016
Powerline re-location	CPUD	Re-located powerlines	Summer 2016
Stream restoration Phase 1	CCNRD	New channel excavation, construct FESL's, place wood and plants in new channel	Summer 2017
Stream Restoration Phase 2	CCNRD	Levee removal, introduce flows to new channel, channel backfill	Summer 2018

Table 7: Nason Creek Upper White Pine Stream Restoration Alternatives Evaluated*

Option	Description	Design Team Comments
A	Levee removal/breach only	Levee removal without channel bed raise only (significantly) increases floodplain reconnection above the 50 year flood recurrence interval due to river channelization.
B	"Mini me" construction of channel meanders within current stream alignment (with or without levee removal)	Further analysis indicated that there was not sufficient area to construct channel meanders or a floodplain bench without levee removal. Removing the levee in order to construct meanders within the existing alignment would result in large scale tree removal and it would be very expensive considering that the "mini-me" alternative would not provide substantial short term in-stream benefits.
C	Full levee removal and channel reconstruction (re-alignment) from RM 13.4-13.8	During a June 2012 field visit, USFS stated that excavation of a meander above RM 13.5 would likely result in "trading an incised channel for another incised channel"
D	Partial levee removal and partial channel re-construction - adding one meander in the mainstem	This scenario was advanced to 30% design with a stream channel meander proposed in the vicinity of floodplain meander scars visible in the LIDAR (near RM 13.5).
"Go Big"	Nason Creek re-location from RM 13.4-13.8 – adding 3 meanders in the mainstem	USFS had some concern about the westernmost channel meander cross-cutting the valley slope gradient. In addition, soil sampling indicated >9' deep sandy-silty soils above RM 13.7
Levee breach and "Let it go"	Upstream and downstream levee breach and letting Nason Creek cut it's own channel through the floodplain	This alternative was not pursued due to: 1) uncertainty with channel formation through project area; 2) potential downstream impacts to habitat and aquatic organisms; and 3) potential downstream impacts to infrastructure
Current Design	Levee removal plus construction of two mainstem meanders	Provides short term biological benefit such as floodplain connectivity and increased in-stream channel complexity. Levee removal and mainstem re-construction will set the stage for future changes in site conditions such as channel migration, additional floodplain connectivity, and restoration of natural channel processes such as wood accumulation, sediment deposition, etc.

*Options A-D are further described with graphics and text in the Restoration Plan (TEAMS 2012). Maps depicting all seven alternatives evaluated are available upon request.