Final Report

Nason Creek Subreach Unit Prioritization ■ Chelan County Natural Resource Department
June 2009

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Nason Creek Subreach Unit Prioritization
Final Report

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Acronyms and Abbreviations

BNSF	Burlington Northern Santa Fe
BPA	Bonneville Power Administration
CCNRD	Chelan County Natural Resources Department
DIZs	disconnected inner zones
DOZs	disconnected outer zones
GIS	global information system
HSC	Habitat Subcommittee
IZ	inner zone
OZ	outer zone
PUD	public utility district
Reclamation	U.S. Bureau of Reclamation
RM	River Mile
SR	State Route

UCRTT	Upper Columbia Regional Technical Team
USFS	U.S. Forest Service

Introduction

This report presents the prioritization of subreach units on Nason Creek, a tributary of the Wenatchee River, between River Mile (RM) 4.65 and RM 14.25 (Study Area) (Figure 1). This prioritization is a the product of a collaborative effort between the U.S. Bureau of Reclamation (Reclamation), and the Chelan County Natural Resource Department (CCNRD) to implement a sequenced, reach-scale restoration approach on Nason Creek. This prioritization is intended to support the efforts of the Wenatchee Habitat Subcommittee (HSC) by prioritizing subreach unit projects identified in the three Nason Creek reach assessments (Reclamation 2009a, 2009b, 2009c) based on biological benefit and social, economic, and construction feasibility criteria.

Background

The Upper Columbia Region Biological Strategy (UCRTT 2008a) and the Upper Columbia Spring Chinook Salmon and Steelhead Recovery Plan (UCSRB 2007) have identified Nason Creek as the top priority for habitat restoration in the Wenatchee subbasin. Given the importance of Nason Creek to the recovery of listed salmonids in the Wenatchee subbasin, Reclamation completed the Nason Creek Tributary Assessment (Reclamation 2008). The assessment presented a comprehensive geomorphic analysis of the fluvial system within the Study Area. Subsequently, Reclamation conducted reach assessments on three unconfined reaches identified within the tributary assessment. These reaches are:

- Kahler (RM 4.5 to RM 8.9)
- Lower White Pine (RM 9.42 to – RM 11.55)
- Upper White Pine (RM 12.0–to RM 14.25)

These reach assessments (Reclamation 2009a, 2009b, 2009c) present baseline conditions through the examination of fluvial geomorphic forms and processes and their interaction with forming and maintaining fish habitat. Reclamation has applied a hierarchical implementation of restoration strategies based on Roni et al. (2002) to prescribe site-specific actions within the reach and watershed context. Based on this strategy, a restoration strategy has been generated for each subreach unit (distinct inner and outer channel and floodplain zones) identified within each reach. The restoration strategies based on Roni et al. (2002) are as follows:

- Protect and Maintain Processes. Preservation sites.
- Reconnect Isolated Habitats. Reconnection of disconnected inner zones (DIZs) and disconnected outer zones (DOZs).
- Reconnect Processes (Long Term). Reconnection of outer zone (OZ) and inner zone (IZ).
- Reconnect Processes and Habitats. Restore riparian habitat.
- Reconnect Habitat Units (Short Term). Restore instream complexity.

Reclamation recommends a dual-track rehabilitation approach that focuses both on protection and rehabilitation goals to reestablish Nason Creek's geomorphic potential and healthy stream conditions.

Prioritization Methods

The prioritization of subreach units follows the recommendations for prioritization strategies as outlined by the Upper Columbia Regional Technical Team (UCRTT) in its letter to the HSC dated April 11, 2008 (UCRTT 2008b), and uses the "Logic Approach" as described in Beechie et al. (2008). The Beechie et al. (2008) strategy recommends a simple score-sheet approach in which values are assigned for each of the evaluation criteria and a total score is used to rank the subreach unit projects. The benefit of this approach is the relative simplicity and the transparency of the scoring system.

Due to the nature of the Reclamation's hierarchical strategy and the dual-track rehabilitation approach, the subreach units have been prioritized within each of their respective restoration strategies. All of the subreach units within each class of restoration strategy are ranked by their biological benefit score and then by their social criteria score (social feasibility, construction feasibility, and construction cost). This method has "weighted" the biological benefit score to reflect the overall importance of considering biological benefit to project prioritization.

For the purpose of this prioritization effort the restoration action for each subreach unit is the recommended Option 1 as listed in each of the reach assessments. Per UCRTT's recommendation, each subreach unit was evaluated based on biological and social criteria, which were first presented at the March 18, 2009, Wenatchee HSC meeting and then revised at the HSC meeting held on May 20, 2009. The final evaluation criteria and the scoring are described in detail below.

Evaluation Criteria and Scoring

Biological Benefit

The biological benefit was evaluated for this assessment in general terms, based largely on the acreage of habitat restored, protected, or improved by each given restoration strategy.

Protect and Maintain Processes

This restoration strategy was evaluated based on the total acreage of the subreach unit.

- High Biological Benefit - greater than 10 acres total size

- Medium Biological Benefit - between 5 and 10 acres total size
- Low Biological Benefit - less than 5 acres total

Reconnect Isolated Habitat

This restoration strategy was evaluated based on the acreage of new inundation potential with human features removed, as reported in Reclamation's reach assessments (2-year flow event).

- High Biological Benefit - greater than 5 acres of new inundation potential
- Medium Biological Benefit - between 1 and 5 acres of new inundation potential
- Low Biological Benefit - less than 1 acre of new inundation potential

Reconnect Processes (Long Term), Non-Inner Zone projects

This restoration strategy was evaluated based on the acreage of new inundation potential at a 2-year flow event with human features removed, as reported in the Reclamation reach assessments.

- High Biological Benefit - greater than 5 acres of new inundation potential
- Medium Biological Benefit - between 1 and 5 acres of new inundation potential
- Low Biological Benefit - less than 1 acre of new inundation potential

Reconnect Processes (Long Term), Inner Zone projects

This restoration strategy was evaluated based on the total acreage of the subreach unit.

- High Biological Benefit - greater than 10 acres total size
- Medium Biological Benefit - between 5 and 10 acres total size
- Low Biological Benefit - less than 5 acres total size

Riparian Restoration

This restoration strategy was evaluated based on the total acreage of revegetation necessary in the subreach unit.

- High Biological Benefit - greater than 2 acres of revegetation
- Medium Biological Benefit - between 0.5 and 2 acres of revegetation
- Low Biological Benefit - less than 0.5 acre of revegetation

Reconnect Habitats (Short-term)

This restoration strategy was evaluated based on total acreage of the subreach area.

- High Biological Benefit - greater than 10 acres total size

- Medium Biological Benefit - between 5 and 10 acres total size
- Low Biological Benefit - less than 5 acres total size

Overall Feasibility (Social Criteria)

The overall feasibility score is based on an evaluation of social feasibility, construction feasibility, and construction cost. The scores for each of these criteria were added for the overall feasibility score.

Social Feasibility

Social feasibility was based on the total number of stakeholders with ownership or jurisdiction of property within the subreach area. The evaluation reflects the greater level of complexity involved in implementing a project with increasing numbers of stakeholders. The total percent area of each subreach that is privately owned was also reported, but was not used to rank the project's social feasibility.

- High Social Feasibility - 1 to 2 stakeholders
- Medium Social Feasibility - 3 to 5 stakeholders
- Low Social Feasibility - more than 5 stakeholders.

Construction Feasibility

Most of the restoration actions recommended by Reclamation will require the delivery of people, equipment, and materials to a project site. To evaluate construction feasibility for a subreach unit that requires restoration actions, our project engineer examined the likely construction methods, the ease of equipment access, and limitations of the work area. The scoring is as follows:

- High. Existing site access/materials and equipment easily delivered to the site, and construction is performed with standard equipment and materials.
- Medium. Site access is limited but available with additional work (e.g., temporary bridge) or access is only available during short periods of time, and/or specialized equipment is needed (e.g., helicopters, tunneling machines) to construct.
- Low. Site access is restricted to the point of disallowing traditional equipment and construction methods, and/or construction methods required are extremely unique and will likely have difficulty finding a qualified contractor, including projects where the property owner will place significant restrictions on construction methods.

Construction Cost

Construction cost was estimated based on Reclamation's proposed action for each subreach unit and the evaluation of construction feasibility.

- High Construction Cost - greater than $1,000,000

- Medium Construction Cost - $100,000 to $1,000,000
- Low Construction Cost - less than $100,000

Sequencing

For each subreach unit we evaluated whether the actions prescribed for the site were dependent on other actions. This criterion was not included in the overall scoring; however, it does address key implementation questions:

- Can the project be constructed as “stand alone”?
- Will the project preclude a higher biological priority project that is not currently feasible?
- Is the project part of a “cluster” of other projects that need to be addressed as a whole?

The examination of project sequencing led to the development of subreach unit clusters as described below.

Geospatial Processing

Some data processing and queries for this project were performed in the ArcGIS™ environment. Data tables were also created and managed using Microsoft Excel® and sometimes linked with spatially referenced data within ArcGIS™. Final data deliverables are in Microsoft Excel® and ESRI shapefile format.

Platform used:

- ArcGIS Desktop version 9.3

Data sources:

- Chelan County
- Reclamation

Analysis-performed global information system (GIS):

- Acreage calculation on subreach units (Calculate Geometry)
- Intersection of county parcel shapefile with subreach units (Intersect)
- Acreage of each parcel within a subreach (Calculate Geometry)
- Joining of Microsoft Excel® data tables to spatially referenced shapefiles (Join)

Independent processing:

- Estimated project costs
- Benefits and limitations to project feasibility
- Tally of number of stakeholders

Data processing within Microsoft Excel®:

- Entry of Reclamation data into data tables
- Summary of total private acreage
- Sum of all feasibility scores
- Project sorting

Results

Summary tables of the subreach unit prioritization are presented for each restoration strategy below. Additional data is provided as follows:

- Figures are provided in Appendix A.
- Subreach unit summaries are provided in Appendix B.
- Microsoft Excel® and ArcGIS™ data files are contained in the attached compact disc.

The descriptions below provide an overview of the prioritization and call attention to particular sites of interest. Please refer to Appendix B for complete descriptions of each subreach unit and justification for the scoring.

Protect and Maintain Processes

Reclamation identified 21 subreach units that focus primarily on the protection and maintenance of processes (Table 1). The subreach units are primarily OZ floodplain areas that are currently hydrologically connected to Nason Creek flood flows. These subreach units can be assumed to be functioning properly.

The evaluation of overall feasibility did not work well for these project sites as construction feasibility and construction costs do not apply. As recommended by the Chelan-Douglas Land Trust, we recommend a new prioritization effort be applied to these subreach units using the following criteria:

- Identify the area of private land and proximity to public lands.
- Identify county zoning and evaluate it based on permissible density.

Table 1. Prioritization of Protect and Maintain Processes Subreach Units

Sub-Reach Unit	Biological Benefit	Social Feasibility	Construction Feasibility	Cost	Overall Feasibility	Description
K OZ-16	5	3	X	X	3	30 acres; 35% private ownership
UWP OZ-1	5	3	X	X	3	46 acres; 14% private ownership
UWP OZ-3	5	3	X	X	3	15 acres; 42% private

Sub-Reach Unit	Biological Benefit	Social Feasibility	Construction Feasibility	Cost	Overall Feasibility	Description
						ownership w/ UWP DOZ-4 and 6
LWP OZ-4	5	1	X	X	1	11 acres; 96% private ownership
LWP OZ-7	5	1	X	X	1	25 acres; 93% private ownership w/ LWP OZ-5
UWP IZ-2	3	3	X	X	3	10 acres; 0% private ownership
LWP OZ-1	3	3	X	X	3	9 acres; 70% private ownership
LWP OZ-8	3	3	X	X	3	6 acres; 0% private ownership
K OZ-15	3	1	X	X	1	8.5 acres; 87% private ownership
K OZ-1	1	5	X	X	5	4 acres; 0% private ownership
K OZ-17	1	5	X	X	5	3 acres; 0% private ownership
K OZ-18	1	5	X	X	5	3 acres; 13% private ownership
K OZ-8	1	5	X	X	5	3 acres; 0% private ownership
K OZ-10	1	5	X	X	5	1 acre; 0% private ownership
K OZ-12	1	5	X	X	5	1.5 acres; 0% private ownership
K OZ-13	1	5	X	X	5	2 acres; 0% private ownership
K OZ-2	1	5	X	X	5	0.3 acre; 0% private ownership
UWP OZ-2	1	5	X	X	5	1 acre; 0% private ownership
LWP OZ-2	1	3	X	X	3	3 acres; 96% private ownership
K OZ-5	1	1	X	X	1	4 acres; 98% private ownership
K OZ-6	1	1	X	X	1	1 acre; 82% private ownership

Reconnect Isolated Habitat

Reclamation identified nine subreach units that have Reconnect Isolated Habitat as the prime restoration strategy (Table 2). These subreach units are all disconnected DIZs and DOZs resulting from the past construction of the Burlington Northern Santa Fe (BNSF) railway prism, the United States Highway (US) 2 and State Route (SR) 207 road prism, and levees. Those subreach units with the highest biological benefit are the DIZ subreach units; the areas of disconnected former channel. Currently these DIZs maintain areas of year-round aquatic habitat that, through reconnection efforts, can provide immediate fish habitat. The overall feasibility of reconnecting these highest-ranked sites is made difficult because of the effort required to coordinate multiple stakeholders at each site and the high overall cost of reconnecting via the installation of bridges or culverts through the BNSF railway prism.

UWP-DOZ-1is the highest priority project within the Medium biological benefit class of subreach unit. While inundation potential is only 4 acres, the existing levee can be easily breached, construction costs will be low, and stakeholder coordination consists of working with the U.S. Forest Service (USFS) and Chelan Public Utility District (PUD). K-DIZ-3 is a subreach unit project that deserves additional examination as this subreach unit was not examined fully in the reach assessment. The end of the reach assessment cuts off the majority of this subreach unit. The area is two to three times larger than described in the subreach unit and could be reconnected through the installation of culverts under SR 207. K-DIZ-1 and K-DIZ-2 received low biological benefit scores because of their very small size. The reconnection of these sites will require culvert installation under US 2, which would require a fairly expensive construction effort to reconnect very small habitats.

Several of the disconnected IZ sites have associated disconnected OZ subreach units that are listed under the Reconnect Processes (Long-Term) category below. These relationships are noted in the Description column and are discussed in greater detail below in the section titled Subreach Unit Clusters.

Table 2. Prioritization of Reconnect Isolated Habitat Subreach Units

Sub-Reach Unit	Biological Benefit	Social Feasibility	Construction Feasibility	Cost	Overall Feasibility	Description
LWP DIZ-1	5	3	3	1	7	Railroad reconnection w/ LWP DOZ-2
UWP DIZ-1	5	3	3	1	7	Railroad reconnection
LWP DIZ-2	5	1	3	1	5	Railroad reconnection w/ LWP DOZ-4
UWP DOZ-1	3	5	5	5	15	Levee breach
K DIZ-3	3	5	3	3	11	SR 207 reconnection
LWP DOZ-3	3	3	3	3	9	US 2 reconnection
UWP DOZ-4	3	3	3	3	9	US 2 reconnection w/

Sub-Reach Unit	Biological Benefit	Social Feasibility	Construction Feasibility	Cost	Overall Feasibility	Description
						UWP OZ-3
K DIZ-2	1	5	3	3	11	US 2 reconnection w/ K DOZ-4
K DIZ-1	1	3	3	3	9	US 2 reconnection w/ K DOZ-2

Reconnect Processes (Long-Term)

Reclamation identified 24 subreach units that have Reconnect Processes (Long Term) as the prime restoration strategy (Table 3). These subreach units are a mix of DOZs, e.g., OZ areas that contain disconnecting features such as roads, and incised IZ areas.

Two of the subreach units with the highest biological benefit are the DOZs (LWP DOZ-2 and LWP DOZ-4) that are associated with DIZs and the BNSF railway prism. These subreach units are the higher floodplain areas adjacent to the historic channel. The overall feasibility of reconnecting these highest-ranked sites is made difficult due to the effort required to coordinate multiple stakeholders at each site, but this effort will be taken jointly with the effort to reconnect the associated IZs. The construction feasibility and cost for implementation of Reclamation's restoration action scores favorably as these two IZs prescribe riparian planting only.

LWP-DOZ-5 is a moderate-sized DOZ site to the north of US 2. There is an opportunity to improve the function of this site as backwater habitat (high flows) in combination with preservation actions at LWP OZ-1. UWP DOZ-5 also has the potential to provide seasonal high-flow refuge and is also associated with a protection project, UWP OZ-1.

Many of the subreach units with moderate biological benefit are limited by their small size and provide only seasonal inundation potential. Most of these require reconnection through US 2 or the railroad, making for a high project cost versus biological benefit.

There are several IZ projects listed within this class of restoration action that prescribe the placement of instream habitat structures to increase flow interaction with adjacent floodplains. As a reminder, the biological benefit for IZ projects (area) was analyzed differently than for OZ projects (inundation potential). We recommend grouping all of the IZ projects with those listed in Reconnect Habitats (Short Term) below and conducting a new assessment of biological benefit. This would help rank all of the instream structure projects (IZs) against each other.

Table 3. Prioritization of Reconnect Processes (Long-Term) Subreach Units

Sub-Reach Unit	Biological Benefit	Social Feasibility	Construction Feasibility	Cost	Overall Feasibility	Description
LWP DOZ-2	5	1	5	5	11	Railroad reconnection w/ LWP DIZ-1
LWP DOZ-4	5	1	5	5	11	Railroad reconnection w/ LWP DIZ-2
LWP DOZ-5	5	3	3	3	9	US 2 reconnection w/ LWP OZ-7
UWP DOZ-5	5	3	3	3	9	Railroad reconnection
K IZ-3	5	1	3	3	7	Instream structures
K DOZ-1	3	5	3	3	11	US 2 reconnection
K DOZ-3	3	5	3	3	11	US 2 reconnection
LWP OZ-9	3	3	5	3	11	US 2 reconnection - Yakama acclimation pond
K DOZ-4	3	3	3	3	9	US 2 reconnection w/ K DIZ-2
K DOZ-5	3	3	3	3	9	US 2 reconnection
LWP DOZ-1	3	3	3	3	9	Railroad reconnection
UWP IZ-4	3	3	3	3	9	Instream structures
LWP-IZ-4	3	1	3	3	7	Instream structures
K OZ-19	1	5	5	5	15	Road removal
K OZ-20	1	3	5	5	13	Levee breach
K OZ-7	1	3	5	5	13	Road removal
LWP-IZ-6	1	5	3	5	13	Instream structures
LWP-IZ-2	1	3	5	3	11	Instream structures
K OZ-3	1	1	5	5	11	Road removal
K OZ-4	1	1	5	5	11	Road removal
UWP DOZ-6	1	5	3	3	11	US 2 reconnection w/ UWP OZ-3
K DOZ-2	1	3	3	3	9	US 2 reconnection w/ K DIZ-1
UWP DOZ-2	1	5	3	1	9	Railroad reconnection
UWP DOZ-3	1	3	3	3	9	US 2 reconnection

Riparian Restoration

Reclamation identified six subreach units that have Riparian Restoration as the prime restoration strategy (Table 4). All of these subreach units are associated with cleared areas under Bonneville Power Administration (BPA) and Chelan County PUD power line corridors. Prior to planting, BPA and the PUD will need to review and approve species composition.

The majority of subreach units within the Reconnect Processes restoration strategies also prescribe riparian planting. We recommend the examination of riparian restoration opportunities in other subreach units and then a new prioritization of riparian restoration opportunities. This will provide a more complete list of riparian opportunities for Nason Creek.

Table 4. Prioritization of Riparian Restoration Subreach Units

Sub-Reach Unit	Biological Benefit	Social Feasibility	Construction Feasibility	Cost	Overall Feasibility	Description
K OZ-11	5	5	5	5	15	BPA corridor revegetation
LWP OZ-5	5	3	5	5	13	BPA and PUD corridor revegetation
K OZ-14	3	3	5	5	13	BPA corridor revegetation
LWP OZ-6	3	1	5	5	11	PUD corridor revegetation
K OZ-9	1	5	5	5	15	BPA corridor revegetation
LWP OZ-3	1	5	5	5	15	PUD corridor revegetation

Reconnect Habitats (Short-Term)

Reclamation identified eight subreach units that have Reconnect Habitats as the prime restoration strategy (Table 5). All of these subreach units prescribe the installation of woody instream structures to increase instream complexity. For the purpose of this evaluation we assumed that the structures would be engineered log jam structures. The number of structures was estimated as a measure of existing access points. A closer examination of appropriate sites for the installation of instream complexity will be required.

As mentioned above we recommend grouping all of the IZ projects with those listed in the Reconnect Processes (Long-Term) section and conducting a new assessment of biological benefit. This would rank all of the instream structure projects (IZs) against each other.

Table 5. Prioritization of Reconnect Habitats (Short-Term) Subreach Units

Sub-Reach Unit	Biological Benefit	Social Feasibility	Construction Feasibility	Cost	Overall Feasibility	Description
K IZ-2	5	3	3	3	9	Instream structures - BPA corridor
K IZ-1	5	1	3	3	7	Instream structures - PUD corridor
K IZ-4	5	1	3	3	7	Instream structures - Along US 2
LWP-IZ-3	3	1	3	3	7	Instream structures - along railroad
UWP IZ-1	3	3	1	3	7	Instream structures - along railroad
LWP-IZ-5	3	1	1	3	5	Instream structures - along railroad
UWP IZ-3	1	5	3	5	13	Instream structures - along US 2 (Rayrock)
LWP-IZ-1	1	1	3	3	7	Instream structures - along railroad

Subreach Unit Clusters

Subreach unit clusters are groups of subreach units adjacent to each other that have interconnected actions. These clusters typically consist of three or more subreach units having actions that should be sequenced with respect to each other. These clusters have been identified to help implementers and project sponsors sequence actions. Table 6 below lists the subreach unit clusters.

Table 6. Subreach Unit Clusters with Interconnected Actions

Cluster River Mile	Subreach Units	Description
4.4 to 5.8	K IZ-4 K DIZ-2 & K DOZ-4 K DOZ-3 K DIZ-3	K IZ-4 recommends instream structures. The placement of these structures should consider the reconnection of several DIZ and DOZ projects along this subreach.
9.6 to 10.2	LWP IZ-5 LWP DIZ-2 & LWP DOZ-4	LWP IZ-5 recommends instream structures adjacent to the BNSF railway prism. The placement of these structures should consider the reconnection of LWP DIZ-2 and LWP DOZ-4 and the effects of this reconnection on future main channel hydraulic and geomorphic conditions.
9.4 to 10.0	LWP OZ-7 LWP DOZ-5 LWP OZ-9	The reconnection of LWP DOZ-5 and LWP OZ-9 should consider prescribed preservation actions at LWP OZ-7. The reconnection of those two subreach units may also require earthwork in OZ-7.
10.7 to 11.1	LWP IZ-3 LWP DIZ-1 & LWP DOZ-2	LWP IZ-4 recommends instream structures adjacent to the BNSF railway prism. The placement of these structures should consider the reconnection of LWP DIZ-1 and LWP DOZ-2 and the effects of this reconnection on future main channel hydraulic and geomorphic conditions.
12.0 to 12.4	UWP OZ-3 UWP DOZ-4 UWP DOZ-6	The reconnection of UWP DOZ-4 and UWP DOZ-6 should consider prescribed preservation actions at UWP OZ-3. The reconnection of those two subreach units may also require earthwork in OZ-3.
13.3 to 14.3	UWP IZ-1 UWP DIZ-1 UWP DOZ-1	UWP IZ-1 recommends instream structures adjacent to the BNSF railway prism. The placement of these structures should consider the reconnection of UWP DIZ-1 and UWP DOZ-1 and the effects of this reconnection on future main channel hydraulic and geomorphic conditions.

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Appendix A

Figures

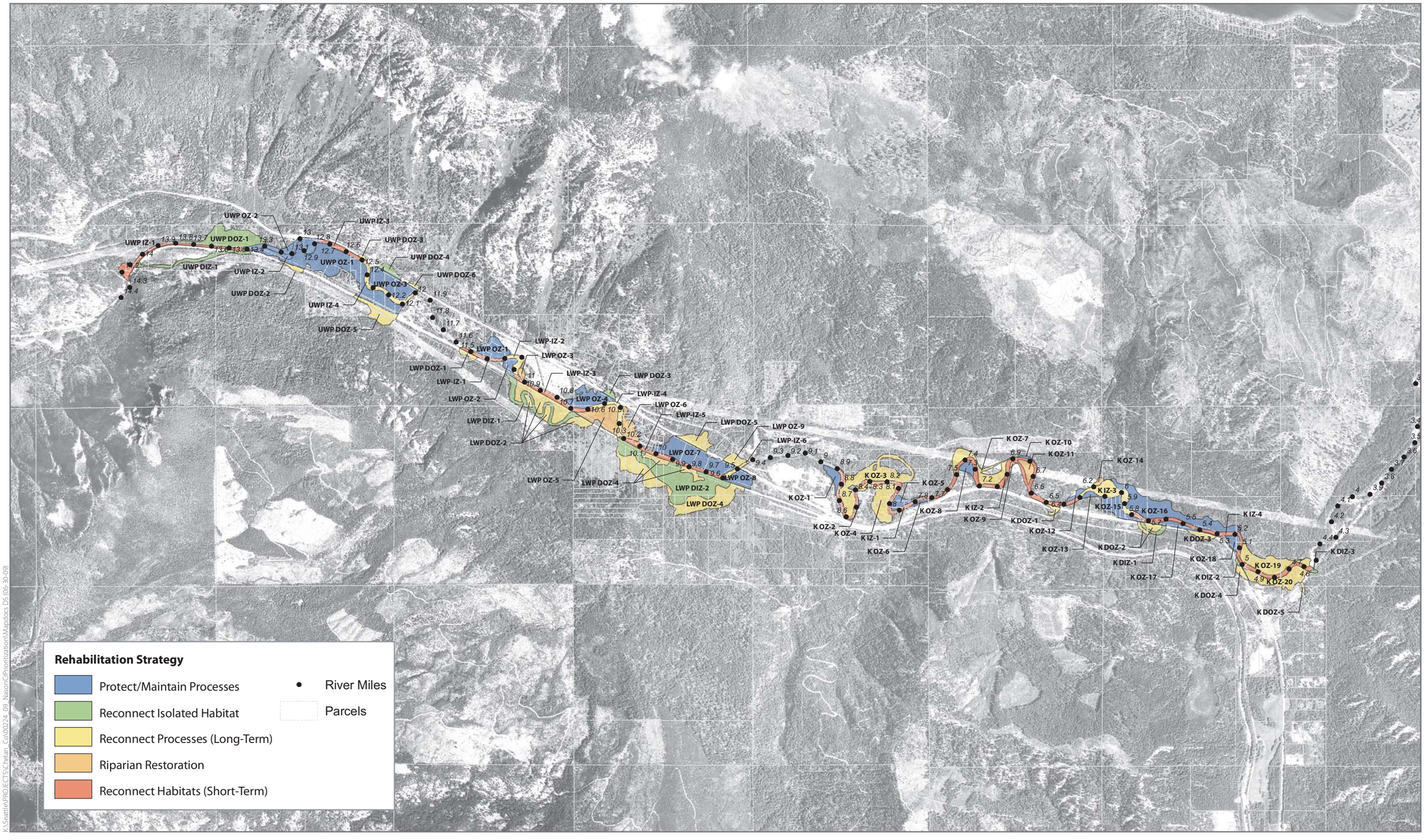

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Figure 1. Subreach Units
Nason Creek Subreach Unit Prioritization

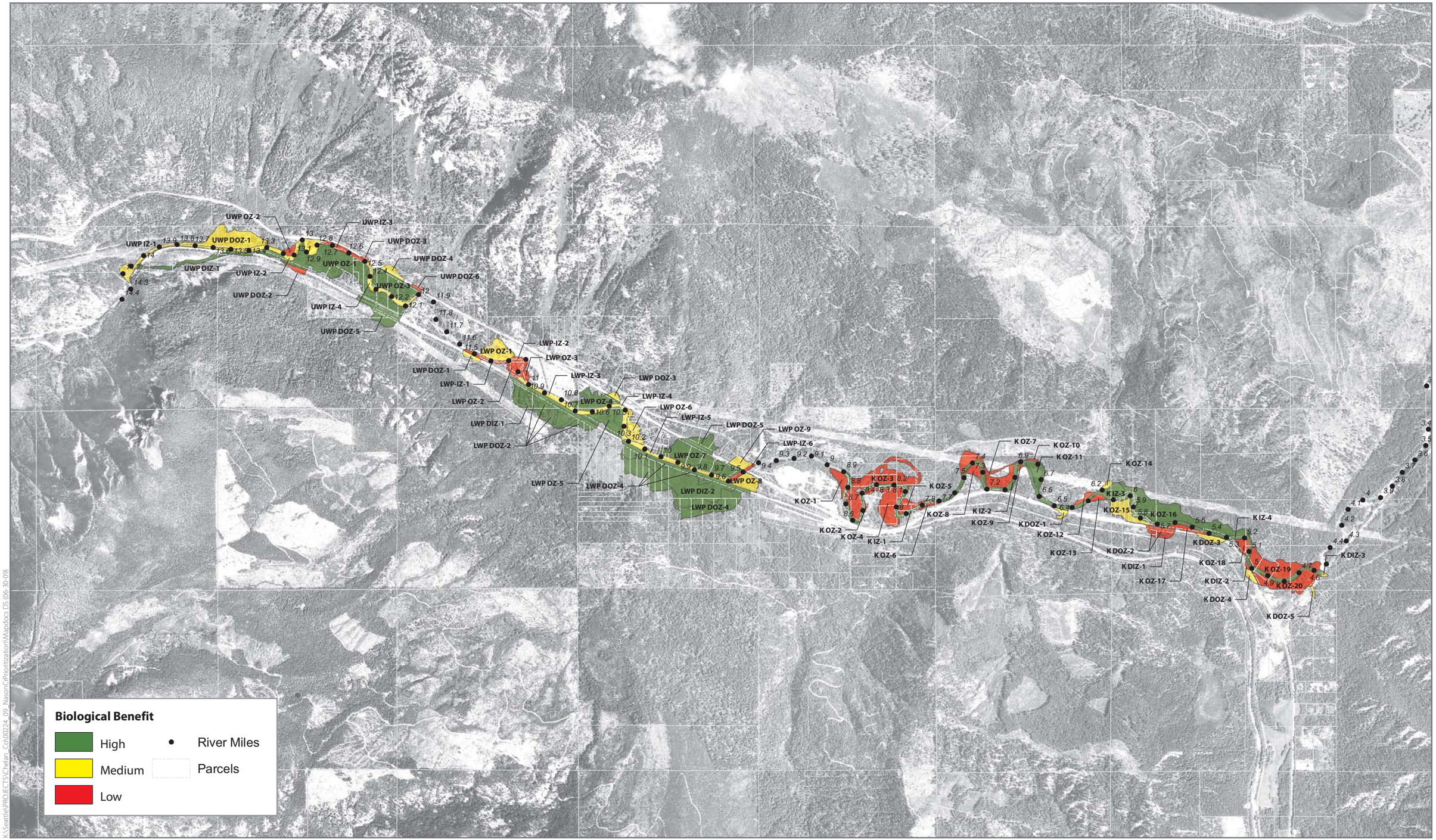

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Figure 2. Biological Benefit
Nason Creek Subreach Unit Prioritization

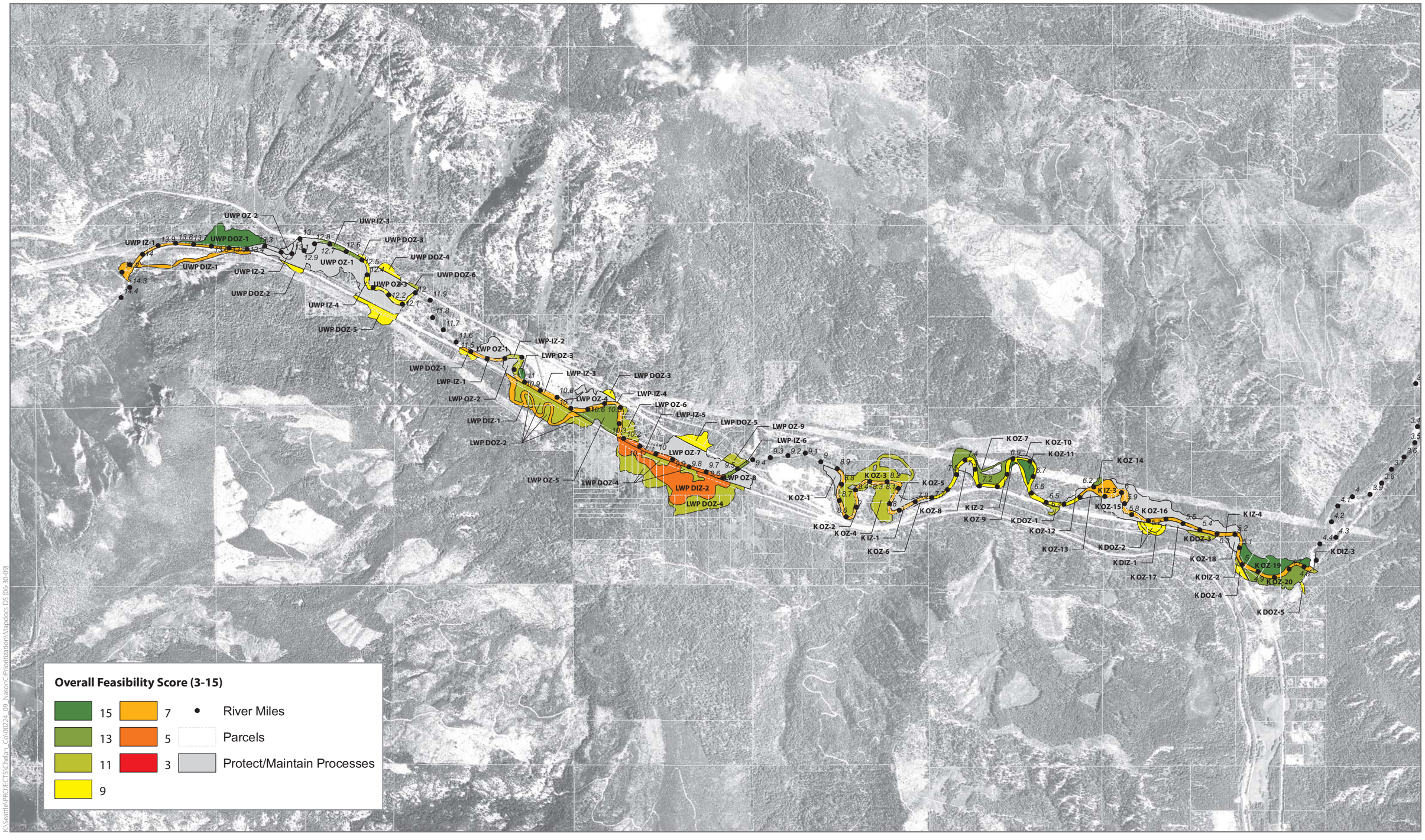

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Figure 3. Overall Feasibility
Nason Creek Subreach Unit Prioritization

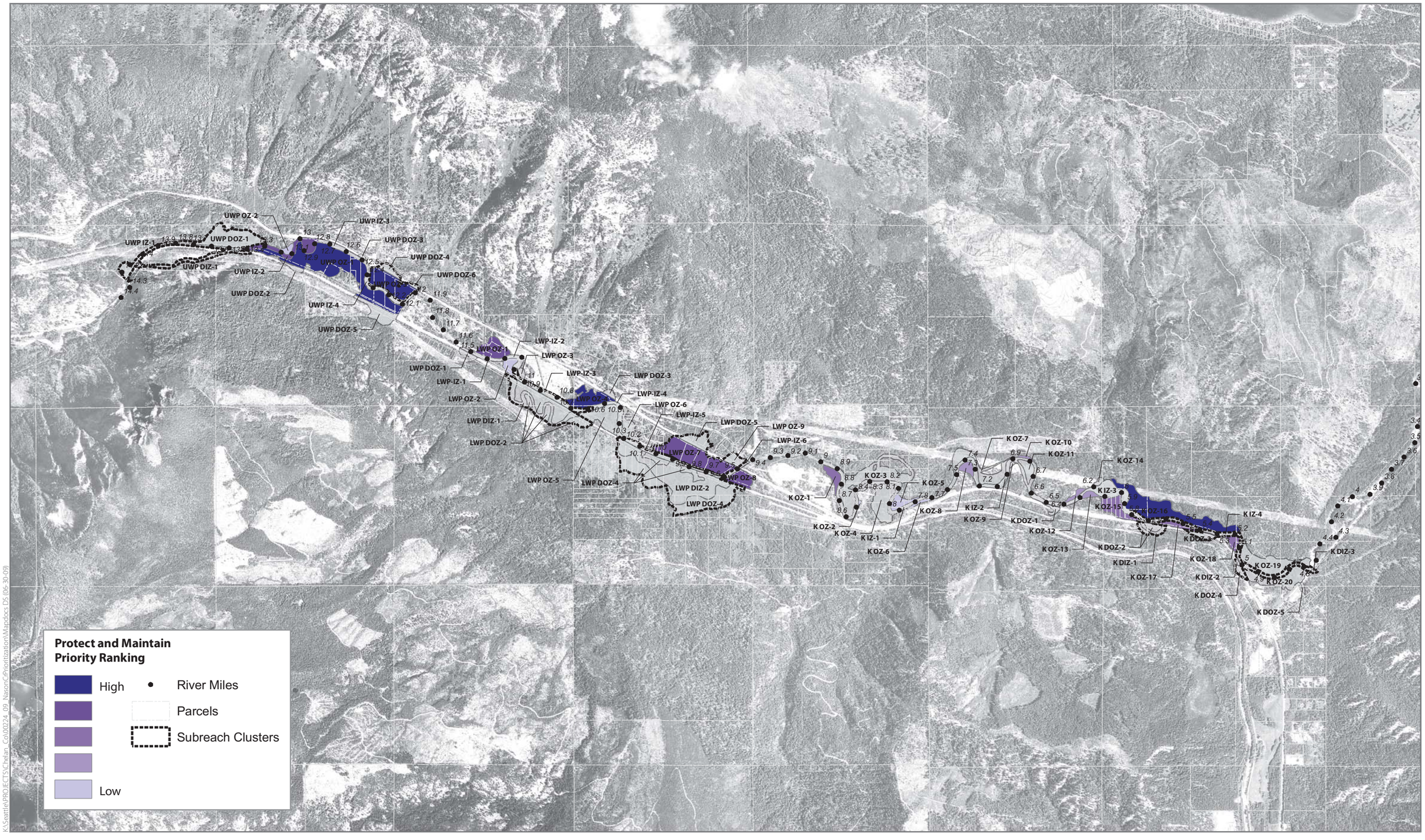

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Figure 4. Protect and Maintain Priority Ranking
Nason Creek Subreach Unit Prioritization

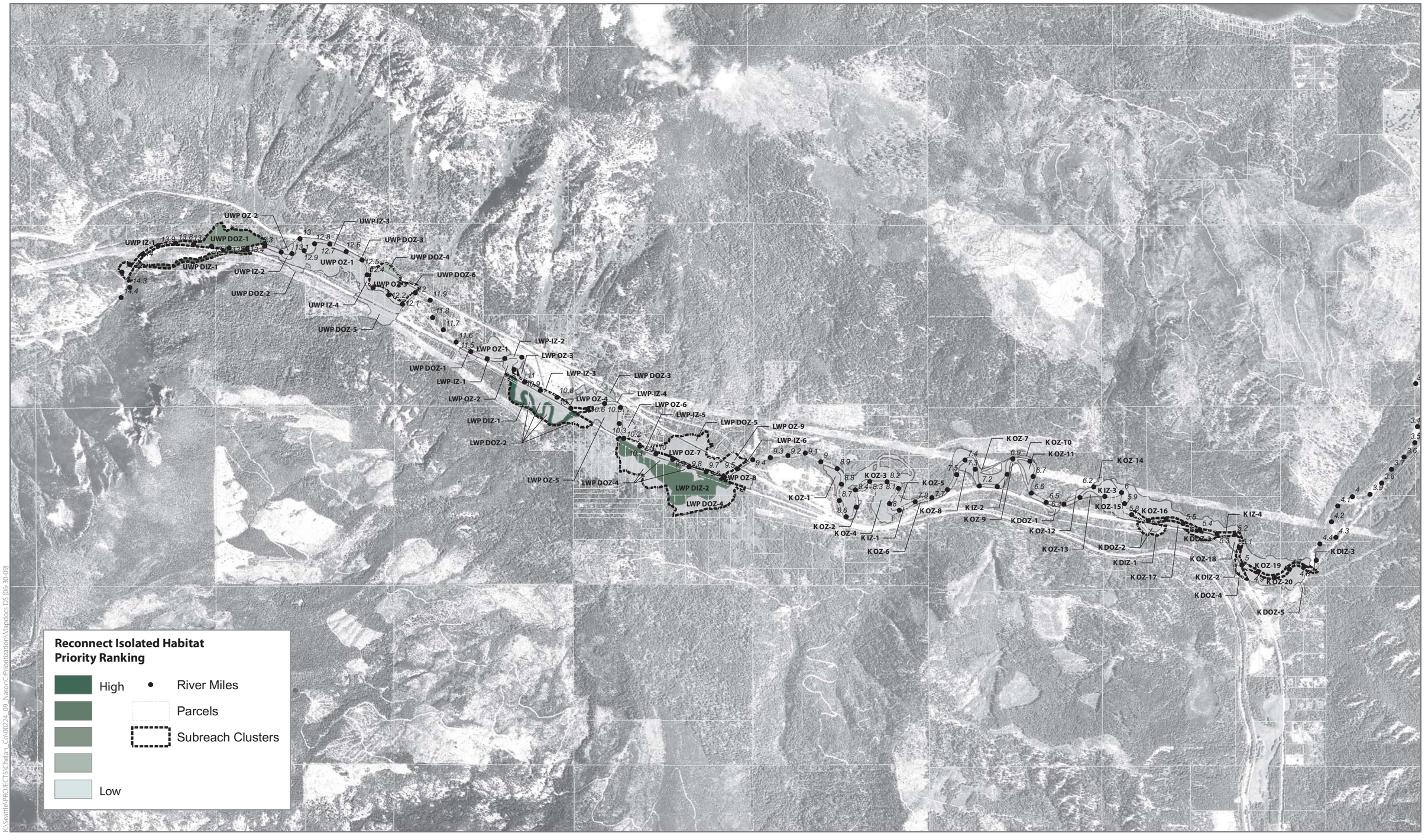

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Figure 5. Reconnect Isolated Habitat Priority Ranking
Nason Creek Subreach Unit Prioritization

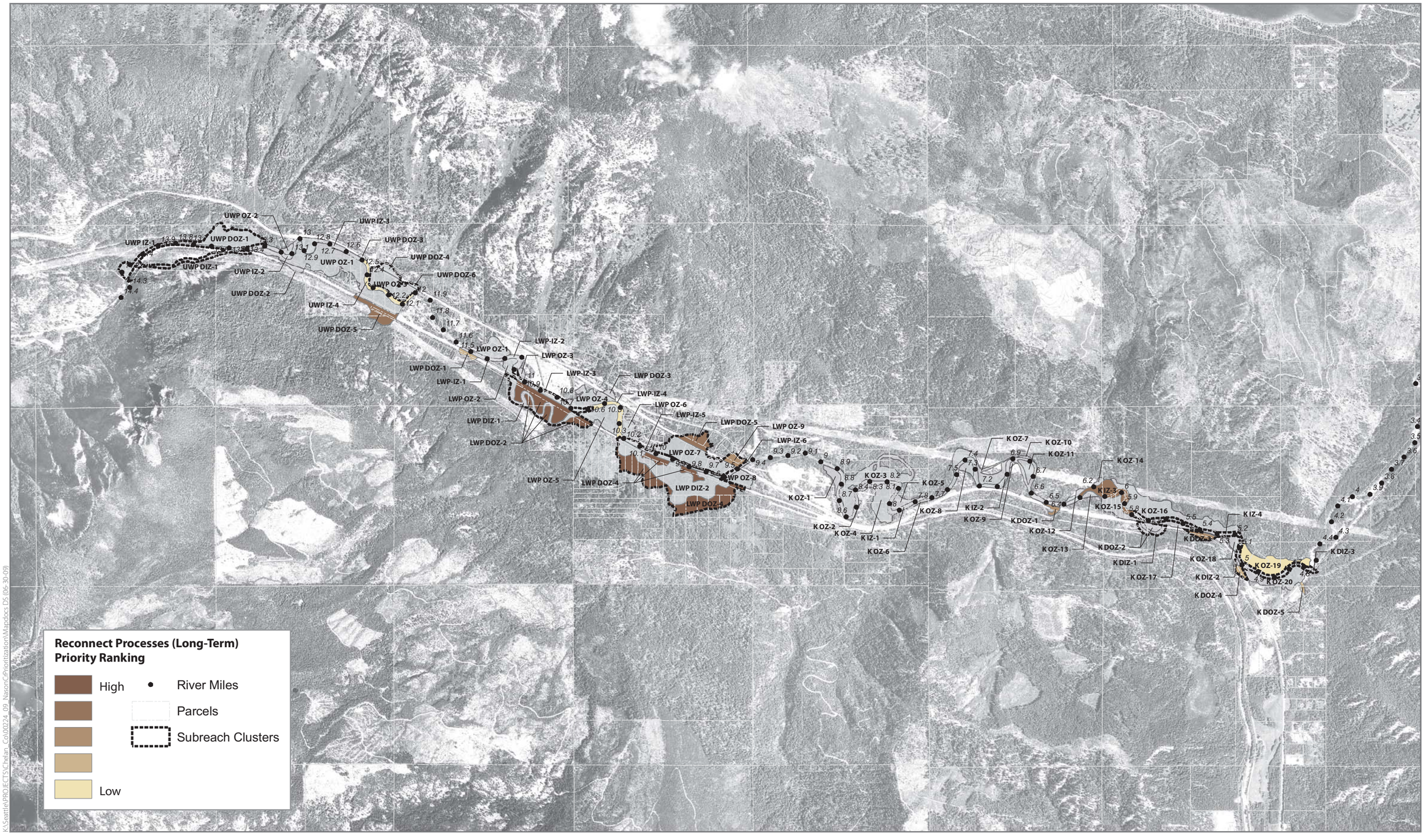

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Figure 6. Reconnect Processes (Long-Term) Priority Ranking
Nason Creek Subreach Unit Prioritization

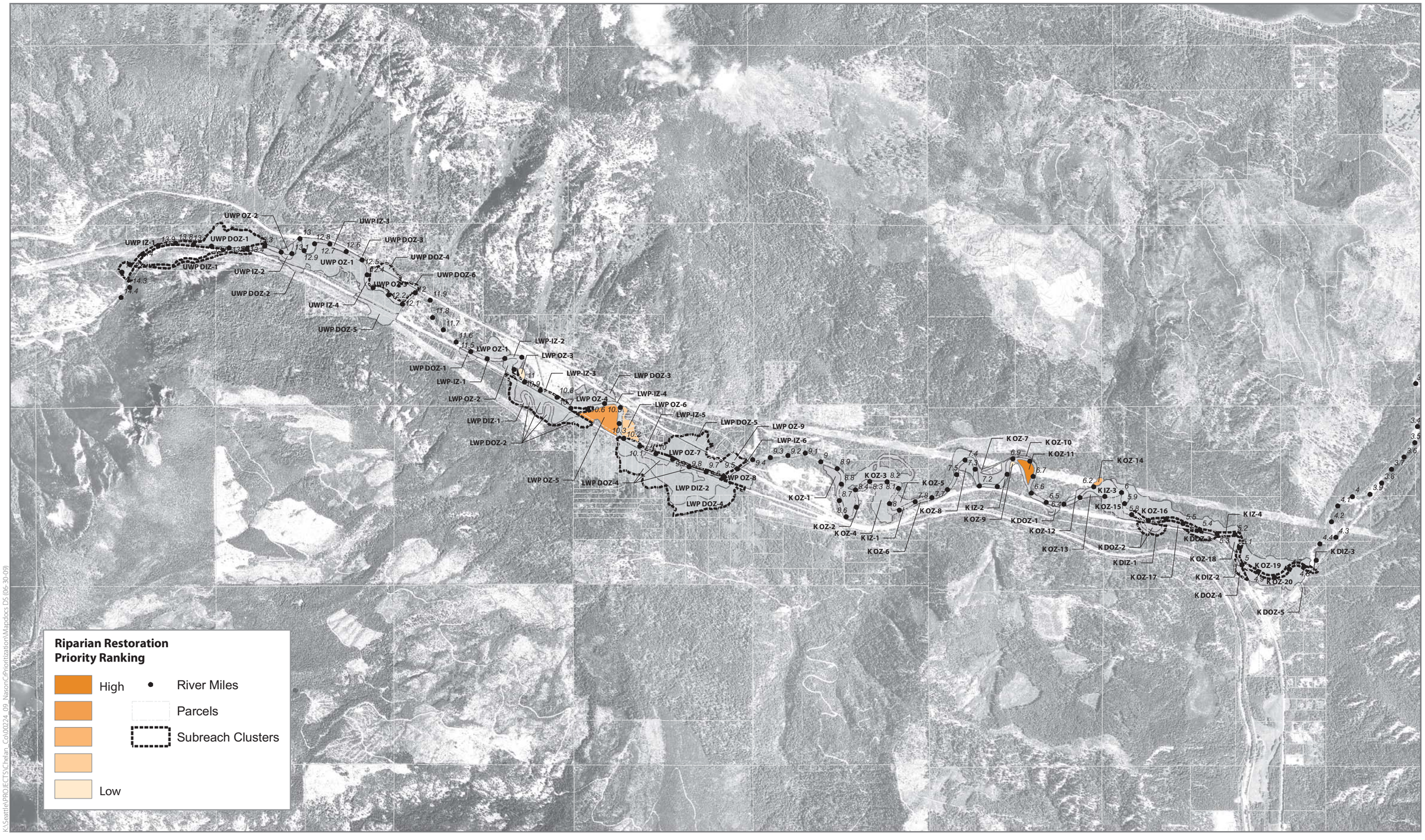

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Figure 7. Riparian Restoration Priority Ranking
Nason Creek Subreach Unit Prioritization

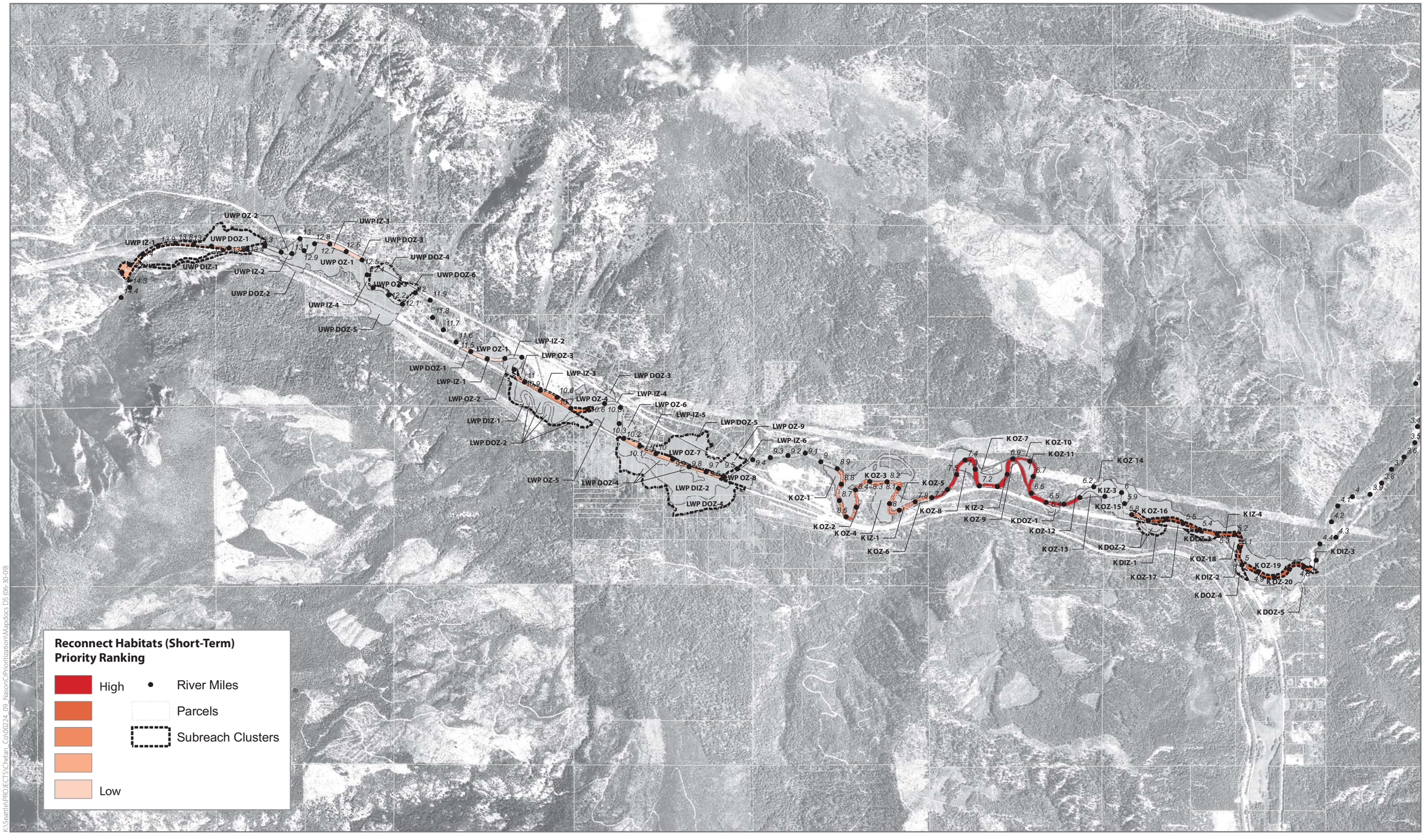

Figure 8. Reconnect Habitats (Short-Term) Priority Ranking
Nason Creek Subreach Unit Prioritization

Appendix B

Subreach Unit Summaries

UWP DIZ-1

Restoration Actions

Reconnect Isolated Habitat: Remove or modify railroad grade with bridges where appropriate to reconnect historic channel and reinitiate habitat-forming processes. Combine with riparian rehabilitation at 10-meter, 30-meter, and floodplain width to provide adequate composition, canopy cover, and large woody debris recruitment potential within the rehabilitated floodplain. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	5	Large historic channel. Full or partial reconnection will greatly improve fish access and use. Inundation potential, 7 acres. Total size, 7.1 acres.
Social Criteria	3	4 Stakeholders, 3% Privately owned
Construction Feasibility	3	Construction equipment can be brought in on rail through BNSF coordination. Construction of bridges or large culverts are feasible.
Cost	1	Two connection points will require large culverts or bridges.
Overall Feasibility	**7**	
Sequencing	y	This reconnection project should be constructed prior to any instream structures associated with UWP-IZ-1. Full reconnection may effect inundation potential at UWP-DOZ-1.

UWP DOZ-1

Restoration Actions

Reconnect Isolated Habitat: Remove or modify levee, in combination with resloping of the left bank to reconnect existing wetlands and floodplain and reinitiate habitat-forming processes. Combine with riparian rehabilitation at 10-meter, 30-meter, and floodplain width to provide adequate composition, canopy cover, and large woody debris recruitment potential within the rehabilitated floodplain. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	3	Inundation potential, 4 acres. Total size, 19.6 acres. Revegetation, 2 acres. Wetlands, 5 acres.
Social Criteria	5	2 Stakeholders, 0% Privately owned
Construction Feasibility	5	Construction equipment can be brought in through PUD road. Levee removal or selective breaching can be conducted with typical equipment.
Cost	5	Simple levee breach project will cost <$100,000
Overall Feasibility	**15**	
Sequencing	y	This reconnection project should be constructed prior to any instream structures associated with UWP-IZ-1. Reconnection of UWP-DIZ-1 may effect inundation potential at this site.

UWP DOZ-2

Restoration Actions

Reconnect Processes: Modify railroad with bridges or culverts where appropriate to reconnect floodplain area to riverine system Combine with riparian rehabilitation at 10-meter, 30-meter, and floodplain width to provide adequate composition, canopy cover and large woody debris recruitment potential within the rehabilitated floodplain. Address noxious weeds through planting and education/prevention programs. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	1	No permanent standing water available to connect to. Reconnection would not increase inundation potential. Total size, 1.7 acres. Revegetation, 1 acre.
Social Criteria	5	2 Stakeholders, 0% Privately owned
Construction Feasibility	3	Construction equipment can be brought in on rail through BNSF coordination. Due to size of habitat no full channel reconnection is recommended. Installation of large culvert is feasible.
Cost	1	Two connection points will require large culverts or bridges.
Overall Feasibility	**9**	
Sequencing	n	

UWP DOZ-3

Restoration Actions

Reconnect Processes: Modify Highway 2 with bridges or culverts where appropriate to reconnect existing floodplain to riverine system and reinitiate habitat-forming processes. Combine with riparian rehabilitation at 10-meter, 30-meter, and floodplain width to provide adequate composition, canopy cover and large woody debris recruitment potential within the rehabilitated floodplain. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	1	No permanent standing water available to connect to. Inundation potential, 0.3 acres. Total size, 0.5 acres. Revegetation, 0.3 acres.
Social Criteria	3	3 Stakeholders, 15% Privately owned
Construction Feasibility	3	Replace existing culvert under US2. Narrow shoulder work area, deep excavation, and high traffic complicate construction.
Cost	3	A single culvert (8 to 12' diameter) installation across the 2-lane highway will cost <$500,000.
Overall Feasibility	**9**	
Sequencing	n	As a backwater/off-channel project this site can be constructed as a stand-alone project.

UWP DOZ-4

Restoration Actions

Reconnect Isolated Habitat: Remove or modify Highway 2 with bridges where appropriate to reconnect floodplain and existing wetlands and reinitiate habitat-forming processes. Combine with riparian rehabilitation at 10-meter, 30-meter, and floodplain width to provide adequate composition, canopy cover and large woody debris recruitment potential within the rehabilitated floodplain. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	3	Reconnection would provide seasonal high flow refuge. Inundation potential, 3 acres. Total size, 2.9 acres. Revegetation, 1 acre. Wetlands, 0.4 acres.
Social Criteria	3	4 Stakeholders, 51% Privately owned
Construction Feasibility	3	Replace existing culvert under US2. Narrow shoulder work area, deep excavation, and high traffic complicate construction.
Cost	3	A single culvert (8 to 12' diameter) installation across the 2-lane highway will cost <$500,000.
Overall Feasibility	**9**	
Sequencing	y	As a backwater project this site can be constructed as a stand-alone project. Reconnection here may be combined with protection actions at UWP-OZ-3.

UWP DOZ-5

Restoration Actions

Reconnect Processes: Modify railroad grade with ridges or culverts where appropriate to reconnect floodplain area to riverine system Combine with riparian rehabilitation at 10-meter, 30-meter, and floodplain width to provide adequate composition, canopy cover and large woody debris recruitment potential within the rehabilitated floodplain. Address noxious weeds through planting and education/prevention programs. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	5	Reconnection would provide seasonal high flow refuge. Inundation potential, 7 acres. Total size, 8.4 acres. Revegetation, 5 acres.
Social Criteria	3	4 Stakeholders, 23% Privately owned
Construction Feasibility	3	Construction equipment can be brought in on rail through BNSF coordination. Construction of bridges or large culverts are feasible.
Cost	3	Multiple culverts (8 to 12' diameter) within the BNSF prism will cost >$500,000.
Overall Feasibility	**9**	
Sequencing	n	As a backwater project this site can be constructed as a stand-alone project. Reconnection here may be combined with protection actions at UWP-OZ-1.

UWP DOZ-6

Restoration Actions

Reconnect Processes: Modify Highway 2 with culverts or bridges where appropriate to reconnect existing floodplain area to riverine system; Combine with riparian rehabilitation of sections of riparian vegetation at 10-meter, 30-meter, and floodplain width to address the disturbed area and to improve canopy cover, large woody debris recruitment potential, and riparian composition within the floodplain. Address noxious weeds through planting and education/prevention programs. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	1	Inundation potential, 0.1 acres. Total size, 0.7 acres. Revegetation, 0.5 acres.
Social Criteria	5	2 Stakeholders, 8% Privately owned
Construction Feasibility	3	Replace existing culvert under US2. Narrow shoulder work area, deep excavation, and high traffic complicate construction.
Cost	3	A single culvert (8 to 12' diameter) installation across the 2-lane highway will cost <$500,000.
Overall Feasibility	**11**	
Sequencing	y	As a backwater project this site can be constructed as a stand-alone project. Reconnection here may be combined with protection actions at UWP-OZ-3.

UWP IZ-1

Restoration Actions

Riparian rehabilitation: Apply efforts for a long-term approach that will result in increased large woody debris recruitment potential, increased sinuosity, sorting and retention of spawning gravels, increased number of complex pools, and water quality. This habitat action should be implemented in conjunction with Reconnect Habitat Unit: Modify riprap and/or construct large woody debris complexes to improve habitat-forming processes by increasing retention of incorporated large woody debris and sediment retainment. Short-term benefits include improvement of channel complexity, cover and biomass. Existing instream structures should be evaluated and potentially modified to improve the functionality of refugia and hiding cover, sorting and retention of spawning gravel, and large woody debris retention. This is listed as a Tier 1 habitat action in the Biological Strategy (UCRTT 2007). Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	3	ELJs or rock structures will provide complexity in a low-complexity inner-zone subreach. Avoidance of impacts to infrastructure limit placement and quantity of structures. Total size, 9.3 acres. 0.8 river miles.
Social Criteria	3	5 Stakeholders, 26% Privately owned
Construction Feasibility	1	Construction access from left or right bank is severely limited due to the BNSF prism and high/steep streambanks.
Cost	3	Cost assumes 5-7 total structures and riparian planting ($100,000 - $250,000).
Overall Feasibility	**7**	
Sequencing	y	Project should be completed following completion of UWP-DIZ-1. Project approach will change if UWP-DIZ-1 provides for full channel reconnection.

UWP IZ-2

Restoration Actions

Protect and maintain current levels of geomorphic, hydrologic, and riparian function. Riparian Rehabilitation: Replant sections of riparian vegetation at 10-meter, 30-meter, and floodplain width to address the area impacted by the transmission and power lines (about 0.5 acres) and to improve canopy cover, large woody debris recruitment potential, and riparian composition within the floodplain. Address noxious weeds through planting and education/prevention programs. Reconnect Habitat Unit: Modify riprap and sheet piling with and/or construct large woody debris complexes to improve habitat-forming processes by increasing retention of incorporated large woody debris and sediment retainment. Shortterm benefits include improvement of channel complexity, cover, and biomass. Existing In-stream structures should be evaluated and potentially modified to improve the functionality of refugia and hiding cover, sorting and retention of spawning gravel, and large woody debris retention. This is listed as a Tier 1 habitat action in the Biological Strategy (UCRTT 2007).

	Score	Evaluation
Biological Benefit	3	Total size, 9.7 acres. 0.66 river miles. Revegetation, 0.5 acres.
Social Criteria	3	3 Stakeholders, 0% Privately owned
Construction Feasibility	NA	Preservation
Cost	NA	Preservation
Overall Feasibility	**3**	
Sequencing	NA	Preservation

UWP IZ-3

Restoration Actions

Reconnect Habitat Unit: Modify riprap and/or construct large woody debris complexes to improve habitat-forming processes by increasing retention of incorporated large woody debris and sediment retainment. Short-term benefits include improvement of channel complexity, cover and biomass. Existing in-stream structures should be evaluated and potentially modified to improve the functionality of refugia and hiding cover, sorting and retention of spawning gravel, and large woody debris retention. This is listed as a Tier 1 habitat action in the Biological Strategy (UCRTT 2007). This habitat action should be implemented in conjunction with Riparian rehabilitation: Apply efforts for a long-term approach that will result in increased large woody debris recruitment potential, increased sinuosity, sorting and retention of spawning gravels, increased number of complex pools, and water quality. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	1	ELJ and boulder clusters (Alt 3 of Ray Rock AER) will provide the greatest benefit in this reach currently limited by complexity and cover. Structures should be located to protect and recruitment spawning gravel. Total size, 3.5 acres. 0.25 river miles.
Social Criteria	5	2 Stakeholders, 0% Privately owned
Construction Feasibility	3	Construction access along US 2 is adequate despite narrow shoulder. Work can be conducted from the stream bank.
Cost	5	Cost assumes 3 ELJs and 4 boulder clusters total structures and riparian planting (<$100,000).
Overall Feasibility	**13**	
Sequencing	n	May be completed independent of the large reconnection project upstream (UWP-DIZ-1)

UWP IZ-4

Restoration Actions

Reconnect Processes through the use of various habitat actions from multiple habitat action classes including in-stream structures, floodplain Rehabilitation and large woody debris Rehabilitation that will result in an increase in the current bed elevation. This will in turn allow fluvial processes to work within adjacent outer zones more frequently. Combine with Riparian rehabilitation: Apply efforts for a long-term approach that will result in increased large woody debris recruitment potential, increased sinuosity, sorting and retention of spawning gravels, increased number of complex pools, and water quality. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	3	ELJ and boulder cluster placement will provide the greatest benefit while maintaining large wood complexes and protecting/recruiting spawning gravels. Riparian planting is also recommended along the left bank. Total size, 6.5 acres. 0.5 river miles.
Social Criteria	3	5 Stakeholders, 13% Privately owned
Construction Feasibility	3	Access to left bank from private roads and to the right bank through BNSF and PUD alignment.
Cost	3	Cost assumes 3-5 total structures and riparian planting ($100,000 - $250,000).
Overall Feasibility	**9**	
Sequencing	n	May be completed independent of the large reconnection project upstream (UWP-DIZ-1)

UWP OZ-1

Restoration Actions

Protect and maintain current levels of geomorphic, hydrologic, and riparian function. Riparian Rehabilitation: Replant sections of riparian vegetation at 10-meter, 30-meter, and floodplain width to address the area impacted by the transmission and power lines (about 0.5 acres) and to improve canopy cover, large wood recruitment potential, and riparian composition within the floodplain. Address noxious weeds through planting and education/prevention programs.

	Score	Evaluation
Biological Benefit	5	Contains historic overflow channels, no wetlands, and is inundated at higher flows. Total size, 46.5 acres. Revegetation, 2.5 acres. Inundation potential, 1 acre.
Social Criteria	3	5 Stakeholders, 14% Privately owned
Construction Feasibility	NA	Preservation
Cost	NA	Preservation
Overall Feasibility	**3**	
Sequencing	NA	Preservation here may be combined with reconnection actions at UWP-DOZ-5.

UWP OZ-2

Restoration Actions Protect and maintain current levels of geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	1	Contains historic overflow channels, no wetlands, and is inundated at higher flows. Total size, 1.4 acres.
Social Criteria	5	1 Stakeholders, 0% Privately owned
Construction Feasibility	NA	Preservation
Cost	NA	Preservation
Overall Feasibility	**5**	
Sequencing	NA	Preservation

UWP OZ-3

Restoration Actions

Protect and maintain current levels of geomorphic, hydrologic, and riparian function. Riparian Rehabilitation: Replant sections of riparian vegetation at 10-meter, 30-meter, and floodplain width to address the area impacted by the transmission and power lines (about 0.3 acres) and to improve canopy cover, large woodt debris recruitment potential, and riparian composition within the floodplain. Address noxious weeds through planting and education/prevention programs.

	Score	Evaluation
Biological Benefit	5	Contains historic overflow channels, wetlands, and is inundated at higher flows. Total size, 15.0 acres. Revegetation, 0.3 acres. Inundation potential, 0.2 acres. Wetlands, 0.3 acres.
Social Criteria	3	5 Stakeholders, 42% Privately owned
Construction Feasibility	NA	Preservation
Cost	NA	Preservation
Overall Feasibility	**3**	
Sequencing	y	Preservation here may be combined with reconnection actions at UWP-DOZ-4 and UWP-DOZ-6.

LWP DIZ-1

Restoration Actions

Reconnect Isolated Habitat: Remove or modify railroad grade with bridges where appropriate to reconnect floodplain and reinitiate habitat-forming processes. Combine with riparian rehabilitation at 10-meter, 30-meter, and floodplain width to provide adequate composition, canopy cover, and large wood recruitment potential within the rehabilitated floodplain. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	5	Large historic channel. Full or partial reconnection will greatly improve fish access and use. Inundation potential, 9 acres. Total size, 11.2 acres. Revegetation, 3 acres. Existing wetland, 5 acres.
Social Criteria	3	5 Stakeholders. 41% Privately owned.
Construction Feasibility	3	Construction equipment can be brought in on rail through BNSF coordination. Construction of bridges or large culverts are feasible.
Cost	1	Two connection points will require large culverts or bridges.
Overall Feasibility	**7**	
Sequencing	y	This reconnection project should be constructed prior to any instream structures associated with LWP-IZ-3. Construction will also reconnect LWP-DOZ-2.

LWP DIZ-2

Restoration Actions

Reconnect Isolated Habitat: Remove or modify railroad grade with bridges where appropriate to reconnect subwatersheds and floodplain and reinitiate habitat-forming processes. Combine with riparian rehabilitation at 10-meter, 30-meter, and floodplain width to provide adequate composition, canopy cover, and large wood recruitment potential within the rehabilitated floodplain. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	**5**	Large historic channel. Full or partial reconnection will greatly improve fish access and use. Inundation potential, 37 acres. Total size, 40.4 acres. Revegetation, 2 acres. Existing wetland, 36 acres.
Social Criteria	1	15 Stakeholders (inc. Yakima Nation). 32% Privately owned.
Construction Feasibility	3	Construction equipment can be brought in on rail through BNSF coordination. Construction of bridges or large culverts are feasible.
Cost	1	Two connection points will require large culverts or bridges.
Overall Feasibility	**5**	
Sequencing	y	This reconnection project should be constructed prior to any instream structures associated with LWP-IZ-5. Construction will also reconnect LWP-DOZ-4.

LWP DOZ-1

Restoration Actions

Reconnect Processes: Remove or modify railroad grade with culverts where appropriate to reconnect floodplain. Combine with riparian rehabilitation at 10-meter, 30-meter, and floodplain width to provide adequate composition, canopy cover, and large wood recruitment potential within the rehabilitated floodplain. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	3	Small habitat area for reconnection. Reconnection at single downstream location will create a backwater. Inundation potential, 2 acres. Total area, 1.7 acres. Revegetation, 0.9 acres.
Social Criteria	3	3 Stakeholders. 32% Privately owned.
Construction Feasibility	3	Construction equipment can be brought in on rail through BNSF coordination. Due to size of habitat no full channel reconnection is recommended. Installation of large culvert is feasible.
Cost	3	A single connection point will require a large culvert for fish passage.
Overall Feasibility	**9**	
Sequencing	n	As this reconnection project would only reconnect partial flows, instream projects on LWP-IZ-1 may proceed prior to construction.

LWP DOZ-2

Restoration Actions

Riparian Rehabilitation: Restore sections of riparian vegetation impacted by the railroad grade and power line (~5 acres) by planting trees and shrubs at 10-meter, 30-meter, and floodplain width. This will also provide adequate composition, canopy cover, and large wood recruitment potential within the rehabilitated floodplain. Address noxious weeds through planting and education/prevention programs. Protect existing wetlands (7 acres) and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	5	Large area of floodplain to be reconnected in association with LWP-DIZ-1. Inundation potential, 5.5 acres. Total size, 20.6 acres. Revegetation, 4.9 acres. Existing wetland, 7 acres.
Social Criteria	1	7 Stakeholders. 22% Privately owned.
Construction Feasibility	5	Access through BPA roads. Riparian planting within BPA lines limited by vegetation management.
Cost	5	Cost for plant materials only.
Overall Feasibility	**11**	
Sequencing	y	This planting project should be combined with the reconnection of LWP-DIZ-1

LWP DOZ-3

Restoration Actions

Reconnect Isolated Habitat: Remove or modify Highway 2 with bridges where appropriate to reconnect floodplain and reinitiate habitat-forming processes. Combine with riparian rehabilitation at 10-meter, 30-meter, and floodplain width to provide adequate composition, canopy cover, and large wood recruitment potential within the rehabilitated floodplain. Protect existing wetlands and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	3	Reconnection will provide year-round off-channel habitat. Inundation potential, 1 acre. Total size, 1.4 acres. Revegetation, 0.6 acres. Existing wetlands, 1 acre.
Social Criteria	3	3 Stakeholders. 27% Privately owned.
Construction Feasibility	3	Replace existing culvert under US2. Narrow shoulder work area, deep excavation, and high traffic complicate construction.
Cost	3	A single culvert (8 to 12' diameter) installation across the 2-lane highway will cost <$500,000.
Overall Feasibility	**9**	
Sequencing	n	As a backwater/off-channel project this site can be constructed as a stand-alone project.

LWP DOZ-4

Restoration Actions

Riparian Rehabilitation: Restore sections of riparian vegetation impacted by the railroad grade and power line (~1 acre) by planting trees and shrubs at 10-meter, 30-meter, and floodplain width. This will also provide adequate composition, canopy cover, and large wood recruitment potential within the rehabilitated floodplain. Address noxious weeds through planting and education/prevention programs. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	5	Large area of floodplain to be reconnected in association with LWP-DIZ-2. Inundation potential, 34 acres. Total size, 38.8 acres. Revegetation, 1.3 acres. Existing wetland, 22 acres.
Social Criteria	1	17 Stakeholders. 74% Privately owned.
Construction Feasibility	5	Access through existing roads.
Cost	5	Cost for plant materials only.
Overall Feasibility	**11**	
Sequencing	y	This planting project should be combined with the reconnection of LWP-DIZ-2

LWP DOZ-5

Restoration Actions

Reconnect Isolated Habitat: Remove or modify Highway 2 with bridges where appropriate to reconnect floodplain and reinitiate habitat-forming processes. Combine with riparian rehabilitation at 10- meter, 30-meter, and floodplain width to provide adequate composition, canopy cover and large wood recruitment potential within the rehabilitated floodplain. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	5	No permanent standing water available to connect to. Reconnection would provide seasonal high flow refuge. Inundation potential, 6 acres. Total size, 6.6 acres. Revegetation, 2 acres.
Social Criteria	3	4 Stakeholders. 61% Privately owned.
Construction Feasibility	3	Replace existing culvert under US2. Narrow shoulder work area, deep excavation, and high traffic complicate construction. The reconnection here may require excavation of a connection channel in LWP OZ-7.
Cost	3	A single culvert (8 to 12' diameter) installation across the 2-lane highway will cost <$500,000.
Overall Feasibility	**9**	
Sequencing	y	Reconnection should consider preservation efforts in LWP OZ-7 and reconnection efforts immediately downstream at LWP OZ-9.

LWP OZ-1

Restoration Actions

Protect existing wetlands (2 acres) and maintain current levels of geomorphic and hydrologic function. Combined with Riparian Rehabilitation: Re-plant sections of riparian vegetation at 10-meter, 30-meter, and floodplain width to address the area impacted by the powerline (~0.6 acres) and to improve canopy cover, large wood recruitment potential, and riparian composition within the floodplain. Address noxious weeds through planting and education/prevention programs.

	Score	Evaluation
Biological Benefit	3	Contains historic overflow channels, wetlands, and is inundated at higher flows including off-channel habitats. Total size, 8.9 acres. Revegetation, 0.6 acres. Existing wetland, 2 acres.
Social Criteria	3	5 Stakeholders. 70% Privately owned.
Construction Feasibility	NA	Preservation
Cost	NA	Preservation
Overall Feasibility	**3**	
Sequencing	NA	Preservation

LWP OZ-2

Restoration Actions

Protect and maintain current levels of geomorphic and hydrologic function. Combine with Riparian Rehabilitation: Re-plant sections of riparian vegetation at 10-meter, 30-meter, and floodplain width to address the area impacted by the powerline (~0.4 acres) and to improve canopy cover, large wood recruitment potential, and riparian composition within the floodplain. Address noxious weeds through planting and education/prevention.

	Score	Evaluation
Biological Benefit	1	Contains historic overflow channels, no wetlands, and is inundated at higher flows. Total size, 3.3 acres. Revegetaion, 0.4 acres.
Social Criteria	3	4 Stakeholders. 96% Privately owned.
Construction Feasibility	NA	Preservation
Cost	NA	Preservation
Overall Feasibility	**3**	
Sequencing	NA	Preservation

LWP OZ-3

Restoration Actions

Reconnect Processes: Remove, relocate, or modify sections of unimproved roads within the floodplain to decrease amount of fine sediment input to the system. Combine with riparian rehabilitation of sections of riparian vegetation at 10-meter, 30-meter, and floodplain width to address the area impacted by the transmission line (~0.4 acres) and to improve canopy cover, large wood recruitment potential, and riparian composition within the floodplain. Address noxious weeds through planting and education/prevention programs. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	1	Limited biological benefit due to planting restrictions associated with PUD lines. Revegetation, 0.4 acres. Total size, 1.2 acres.
Social Criteria	5	2 Stakeholders. 78% Privately owned.
Construction Feasibility	5	Access roads to site. Planting within PUD corridor will limit plant material.
Cost	5	Cost for plant materials only.
Overall Feasibility	**15**	
Sequencing	n	This site can be planted as a stand-alone project

LWP OZ-4

Restoration Actions

Protect and maintain current levels of hydrologic, riparian, and geomorphic function. Riparian Rehabilitation: Re-plant sections of riparian vegetation at 10-meter, 30-meter, and floodplain width to address the area impacted by the transmission line (~3 acres) and to improve canopy cover, large wood recruitment potential, and riparian composition within the floodplain. Address noxious weeds through planting and education/prevention programs.

	Score	Evaluation
Biological Benefit	5	Contains historic overflow channels, no wetlands, and is inundated at higher flows. Total size, 11.4 acres. Revegetation, 2.6 acres.
Social Criteria	3	4 Stakeholders. 96% Privately owned.
Construction Feasibility	NA	Preservation
Cost	NA	Preservation
Overall Feasibility	**3**	
Sequencing	NA	Preservation

LWP OZ-5

Restoration Actions

Riparian Rehabilitation: Re-plant sections of riparian vegetation at 10-meter, 30-meter, and floodplain width to address the area impacted by the transmission and power lines (~4 acres) and to improve canopy cover, large wood recruitment potential, and riparian composition within the floodplain. Address noxious weeds through planting and education/prevention programs. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	5	Revegetation along PUD and BPA lines. Revegetation, 4 acres. Total size, 12.7 acres. Inundation potential, 1 acre.
Social Criteria	3	5 Stakeholders. 85% Privately owned.
Construction Feasibility	5	Access roads to site. Planting within PUD and BPA corridors will limit plant material.
Cost	5	Cost for plant materials only.
Overall Feasibility	**13**	
Sequencing	n	This site can be planted as a stand-alone project

LWP OZ-6

Restoration Actions

Riparian Rehabilitation: Re-plant sections of riparian vegetation at 10-meter, 30-meter, and floodplain width to address the area impacted by the transmission and power lines (~2 acres) and to improve canopy cover, large wood recruitment potential, and riparian composition within the floodplain. Address noxious weeds through planting and education/prevention programs. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	3	Limited biological benefit due to restrictions from PUD lines but the corridor runs along the creek bank. Planting here could provide increased riparian cover over the channel. Revegetation, 1.8 acres. Total size, 6.1 acres.
Social Criteria	1	11 Stakeholders. 98% Privately owned.
Construction Feasibility	5	Access roads to site. Planting within PUD corridor will limit plant material.
Cost	5	Cost for plant materials only.
Overall Feasibility	**11**	
Sequencing	n	This site can be planted as a stand-alone project

LWP OZ-7

Restoration Actions

Protect and maintain current levels of geomorphic, hydrologic, and riparian function. Riparian Rehabilitation: Re-plant sections of riparian vegetation at 10-meter, 30-meter, and floodplain width to address the area impacted by the transmission and power lines (~0.5 acres) and to improve canopy cover, large wood recruitment potential, and riparian composition within the floodplain. Address noxious weeds through planting and education/prevention programs.

	Score	Evaluation
Biological Benefit	5	Contains historic overflow channels, wetlands, and is inundated at higher flows. Total size, 25.4 acres. Revegetation, 0.5 acres. Wetlands, 0.2 acres.
Social Criteria	1	10 Stakeholders. 93% Privately owned.
Construction Feasibility	NA	Preservation
Cost	NA	Preservation
Overall Feasibility	**1**	
Sequencing	y	Preservation efforts should consider the reconnection of LWP DOZ-5 and reconnection efforts immediately downstream at LWP OZ-9. Both projects may require earthwork within LWP OZ-7.

LWP OZ-8

Restoration Actions Protect and maintain current levels of hydrologic, riparian, and geomorphic function.

	Score	Evaluation
Biological Benefit	3	No overflow channels. No wetlands. Inundated at higher flows. Mature riparian forest. Total size, 6.3 acres.
Social Criteria	3	4 Stakeholders. 0% Privately owned.
Construction Feasibility	NA	Preservation
Cost	NA	Preservation
Overall Feasibility	**3**	
Sequencing	NA	Preservation

LWP OZ-9

Restoration Actions

Reconnect Isolated Habitat: Remove or modify Highway 2 with bridges where appropriate to reconnect wetlands to the adjacent floodplain and reinitiate habitat-forming processes. Combine with riparian rehabilitation at 10-meter, 30-meter, and floodplain width to provide adequate composition, canopy cover, and large wood recruitment potential within the rehabilitated floodplain. Protect existing wetlands (1 acre) and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	3	Currently used by Yakama Nation for salmonid acclimation. Functions as off-channel habitat. Inundation potential, 1 acre. Total size, 3.7 acres. Revegetation, 1 acre. Wetlands, 1 acre.
Social Criteria	3	5 Stakeholders. 53% Privately owned.
Construction Feasibility	5	Access is good from highway. Minor modifications needed to improve connectivity of wetland area.
Cost	3	Minor earthwork and LWD placement would be under$250,000.
Overall Feasibility	**11**	
Sequencing	y	Reconnection should consider preservation efforts in LWP OZ-7 and reconnection efforts immediately upstream at LWP DOZ-5.

LWP IZ-1

Restoration Actions

Reconnect Habitat (Short Term): Modify riprap with and/or construct large wood complexes to increase retention of incorporated large wood, improve channel complexity, and provide cover and biomass. Existing in-stream structures should be evaluated and potentially modified to improve the functionality of refugia and hiding cover, sorting and retention of spawning gravel, and large wood retention. This is listed as a Tier 1 habitat action in the Biological Strategy (RTT, 2007). This habitat action should be implemented in conjunction with Riparian rehabilitation: Apply efforts for a longterm approach that will result in increased large wood recruitment potential, increased sinuosity, sorting and retention of spawning gravels, increased number of complex pools, and water quality. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	1	ELJs will provide complexity in a low-complexity inner-zone subreach. Avoidance of impacts to infrastructure limit placement and quantity of structures. Total size, 2.7 acres. 0.24 river miles.
Social Criteria	1	6 Stakeholders. 23% Privately owned.
Construction Feasibility	3	Equipment access is limited but available through the PUD corridor. ELJ structures should be located to avoid impacts to BNSF prism and PUD towers.
Cost	3	Cost assumes 3-5 total structures with limited construction access ($100,000 - $250,000).
Overall Feasibility	**7**	
Sequencing	n	Completion of LWP-DOZ-1 will likely be for partial flow reconnection and would not effect work within this subreach.

LWP IZ-2

Restoration Actions

Reconnect Processes through the use of various habitat actions from multiple habitat action classes including in-stream structures, floodplain restoration and large wood restoration that will result in an increase in the current bed elevation. This will in turn allow fluvial processes to work within adjacent outer zones more frequently. Combine with Riparian rehabilitation: Apply efforts for a longterm approach that will result in increased large wood recruitment potential, increased sinuosity, sorting and retention of spawning gravels, increased number of complex pools, and water quality. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	1	ELJs placement upstream of RM 10.3 will provide the greatest benefit while maintaining large wood complex and pool habitat downstream. Riparian planting is also recommended along the left bank. Total size, 3.4 acres. 0.24 river miles.
Social Criteria	3	4 Stakeholders. 70% Privately owned.
Construction Feasibility	5	Open access to left bank from private roads in the middle of the subreach where ELJ placement would be most appropriate.
Cost	3	Cost assumes 3-5 total structures and riparian planting ($100,000 - $250,000).
Overall Feasibility	**11**	
Sequencing	n	May be completed independent of the large reconnection project downstream (LWP-DIZ-1)

LWP IZ-3

Restoration Actions

Reconnect Habitat (Short Term): Modify riprap with and/or construct large wood complexes to increase retention of incorporated large wood, improve channel complexity, and provide cover and biomass. Existing in-stream structures should be evaluated and potentially modified to improve the functionality of refugia and hiding cover, sorting and retention of spawning gravel, and large wood retention. This is listed as a Tier 1 habitat action in the Biological Strategy (RTT, 2007). This habitat action should be implemented in conjunction with Riparian rehabilitation: Apply efforts for a longterm approach that will result in increased large wood recruitment potential, increased sinuosity, sorting and retention of spawning gravels, increased number of complex pools, and water quality. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	3	ELJs will provide complexity in a low-complexity inner-zone subreach. Avoidance of impacts to infrastructure limit placement and quantity of structures. Riparian planting opportunities exist along the left bank. Total size, 7.5 acres. 0.48 river miles.
Social Criteria	1	8 Stakeholders. 49% Privately owned.
Construction Feasibility	3	Equipment access is limited but available through the PUD corridor. ELJ structures should be located to avoid impacts to BNSF prism and PUD towers.
Cost	3	Cost assumes 5-7 total structures with limited construction access ($100,000 - $250,000).
Overall Feasibility	**7**	
Sequencing	y	Project should be completed following completion of LWP-DIZ-1. Project approach will change if LWP-DIZ-1 provides for full channel reconnection.

LWP IZ-4

Restoration Actions

Reconnect Processes through the use of various habitat actions from multiple habitat action classes including in-stream structures, floodplain restoration and large wood restoration that will result in an increase in the current bed elevation. This will in turn allow fluvial processes to work within adjacent outer zones more frequently. Combine with Riparian rehabilitation: Apply efforts for a longterm approach that will result in increased large wood recruitment potential, increased sinuosity, sorting and retention of spawning gravels, increased number of complex pools, and water quality. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	3	ELJs will provide complexity in a low-complexity inner-zone subreach. Avoidance of impacts to infrastructure (BPA lines, PUD lines, SR2) limit placement and quantity of structures. Total size, 5.0 acres. 0.36 river miles.
Social Criteria	1	11 Stakeholders. 89% Privately owned.
Construction Feasibility	3	Access to left bank from SR 2; access to right bank is limited.
Cost	3	Cost assumes 3-5 total structures and riparian planting ($100,000 - $250,000).
Overall Feasibility	**7**	
Sequencing	n	May be completed independent of the large reconnection projects upstream and downstream (LWP-DIZ-1 & LWP-DIZ-2)

LWP IZ-5

Restoration Actions

Reconnect Habitat (Short Term): Modify riprap with and/or construct large wood complexes to increase retention of incorporated large wood, improve channel complexity, and provide cover and biomass. Existing in-stream structures should be evaluated and potentially modified to improve the functionality of refugia and hiding cover, sorting and retention of spawning gravel, and large wood retention. This is listed as a Tier 1 habitat action in the Biological Strategy (RTT, 2007). This habitat action should be implemented in conjunction with Riparian rehabilitation: Apply efforts for a longterm approach that will result in increased large wood recruitment potential, increased sinuosity, sorting and retention of spawning gravels, increased number of complex pools, and water quality. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	3	ELJs will provide complexity in a low-complexity inner-zone subreach. Avoidance of impacts to infrastructure limit placement and quantity of structures. Total size, 8.5 acres. 0.62 river miles.
Social Criteria	1	14 Stakeholders. 20% Privately owned.
Construction Feasibility	1	Construction access from left or right bank is severely limited due to the BNSF prism and high/steep streambanks.
Cost	3	Cost assumes 3-5 total structures and riparian planting ($100,000 - $250,000).
Overall Feasibility	**5**	
Sequencing	y	Project should be completed following completion of LWP-DIZ-2. Project approach will change if LWP-DIZ-2 provides for full channel reconnection.

LWP IZ-6

Restoration Actions

Reconnect Processes through the use of various habitat actions from multiple habitat action classes including in-stream structures, floodplain restoration and large wood restoration that will result in an increase in the current bed elevation. This will in turn allow fluvial processes to work within adjacent outer zones more frequently. Combine with Riparian rehabilitation: Apply efforts for a longterm approach that will result in increased large wood recruitment potential, increased sinuosity, sorting and retention of spawning gravels, increased number of complex pools, and water quality. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	1	ELJs will provide complexity in a low-complexity inner-zone subreach. Total size, 1.8 acres. 0.14 river miles.
Social Criteria	5	1 Stakeholders. 0% Privately owned.
Construction Feasibility	3	Access to left bank from gravel road; access to right bank is limited.
Cost	5	Cost assumes 2-3 total structures and riparian planting (<$100,00).
Overall Feasibility	**13**	
Sequencing	n	May be completed independent of the large reconnection projects upstream and downstream (LWP-DIZ-1 & LWP-DIZ-2)

K DIZ-1

Restoration Actions

Reconnect Isolated Habitat: Remove or modify Highway with bridges where appropriate to reconnect historic channel and reinitiate habitat-forming processes. Combine with riparian rehabilitation at 10- meter, 30-meter, and floodplain widths to provide adequate composition, canopy cover, and large wood recruitment potential within the rehabilitated floodplain. Protect and maintain resulting levels ofrehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	1	No permanent standing water available to connect to. Reconnection may provide cool water input from wetlands. No new inundation potential. Total size, 2.2 acres. Revegetation, 1 acre. Existing wetland, 1 acre.
Social Criteria	3	5 Stakeholders, 15% Privately owned
Construction Feasibility	3	Replace existing culvert under US2. Narrow shoulder work area, deep excavation, and high traffic complicate construction.
Cost	3	A single culvert (8 to 12' diameter) installation across the 2-lane highway will cost <$500,000.
Overall Feasibility	**9**	
Sequencing	y	Reconnection of this site should consider instream components of K DIZ-4.

K DIZ-2

Restoration Actions

Reconnect Isolated Habitat: Remove or modify Highway with bridges where appropriate to reconnect historic channel and reinitiate habitat-forming processes. Combine with riparian rehabilitation at 10-meter, 30-meter, and floodplain widths to provide adequate composition, canopy cover, and large wood recruitment potential within the rehabilitated floodplain. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	1	No permanent standing water available to connect to. Reconnection may provide cool water input from wetlands. No new inundation potential. Total size, 0.5 acres. Revegetation, 0.4 acres.
Social Criteria	5	2 Stakeholders, 4% Privately owned
Construction Feasibility	3	Replace existing culvert under US2. Narrow shoulder work area, deep excavation, and high traffic complicate construction.
Cost	3	A single culvert (8 to 12' diameter) installation across the 2-lane highway will cost <$500,000.
Overall Feasibility	**11**	
Sequencing	y	Reconnection of this site should consider instream components of K DIZ-4.

K DIZ-3

Restoration Actions

Reconnect Isolated Habitat: Remove or modify Highway with bridges where appropriate to reconnect historic channel and reinitiate habitat-forming processes. Combine with riparian rehabilitation at 10-meter, 30-meter, and floodplain widths to provide adequate composition, canopy cover, and large wood recruitment potential within the rehabilitated floodplain. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	3	Historic channel. Full or partial reconnection will greatly improve fish access and use. Inundation potential, 3 acres. Total size, 0.5 acres (within study area).
Social Criteria	5	2 Stakeholders, 52% Privately owned
Construction Feasibility	3	Replace existing culvert under SR207. Narrow shoulder work area and high traffic complicate construction.
Cost	3	A single culvert (8 to 12' diameter) installation across the 2-lane highway will cost <$500,000.
Overall Feasibility	**11**	
Sequencing	y	Reconnection of this site should consider instream components of K DIZ-4.

K DOZ-1

Restoration Actions

Reconnect Processes: Modify road embankments with bridges or culverts where appropriate to reconnect floodplain area to riverine system. Modify unimproved roads to control fine sediment input to the system. Combine with riparian rehabilitation at 10-meter, 30-meter, and floodplain widths to provide adequate composition, canopy cover and large wood recruitment potential within the rehabilitated floodplain. Address noxious weeds through planting and education/prevention programs. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	3	Reconnection will provide high flow off-channel habitat. Inundation potential, 1 acre. Total size, 1.5 acres. Revegetaion, 0.9 acres.
Social Criteria	5	2 Stakeholders, 0% Privately owned
Construction Feasibility	3	Replace existing culvert under US2. Narrow shoulder work area, deep excavation, and high traffic complicate construction.
Cost	3	A single culvert (8 to 12' diameter) installation across the 2-lane highway will cost <$500,000.
Overall Feasibility	**11**	
Sequencing	n	As a backwater/off-channel project this site can be constructed as a stand-alone project.

K DOZ-2

Restoration Actions

Reconnect processes of fluvial and riparian interaction throught Riparian Rehabilitation: Restore sections of riparian vegetation impacted by highway by planting trees and shrubs to increase large wood recruitment potential within the current floodplain and reduce the amount of altered vegetation. Address noxious weeds through planting and education/prevention programs. Protect and maintain current levels of geomorphic, hydrologic, and rehabilitated levels of riparian function.

	Score	Evaluation
Biological Benefit	1	No new inundation potential. Total size, 3.3 acres. Revegetaion, 1 acre. Existing wetland, 0.4 acres.
Social Criteria	3	5 Stakeholders, 24% Privately owned
Construction Feasibility	3	Replace existing culvert under US2. Narrow shoulder work area, deep excavation, and high traffic complicate construction.
Cost	3	A single culvert (8 to 12' diameter) installation across the 2-lane highway will cost <$500,000.
Overall Feasibility	**9**	
Sequencing	y	This site can be constructed as a stand-alone project as part of K-DIZ-1.

K DOZ-3

Restoration Actions

Reconnect Isolated Habitat: Remove or modify Highway with bridges where appropriate to reconnect historic channel and reinitiate habitat-forming processes. Combine with riparian rehabilitation at 10-meter, 30-meter, and floodplain widths to provide adequate composition, canopy cover, and large wood recruitment potential within the rehabilitated floodplain. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	3	Historic overflow channels. Inundation potential, 1.4 acres. Total size, 2.8 acres. Revegetaion, 1 acre.
Social Criteria	5	2 Stakeholders, 0% Privately owned
Construction Feasibility	3	Replace existing culvert under US2. Narrow shoulder work area, deep excavation, and high traffic complicate construction.
Cost	3	A single culvert (8 to 12' diameter) installation across the 2-lane highway will cost <$500,000.
Overall Feasibility	**11**	
Sequencing	y	Reconnection of this site should consider instream components of K IZ-4.

K DOZ-4

Restoration Actions

Reconnect Isolated Habitat:Remove or modify highway with bridges where appropriate to reconnect historic channel and reinitiate habitat-forming processes. Combine with riparian rehabilitation at 10-meter, 30-meter, and floodplain widths to provide adequate composition, canopy cover, and large wood recruitment potential within the rehabilitated floodplain. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	3	Historic overflow channels. Most of the subreach unit area is "under" the highway. To achieve the total inundation potential the highway must be moved. Inundation potential, 2.3 acres. Total size, 1.8 acres. Revegetaion, 1 acre.
Social Criteria	3	3 Stakeholders, 43% Privately owned
Construction Feasibility	3	Replace existing culvert under US2. Narrow shoulder work area, deep excavation, and high traffic complicate construction.
Cost	3	A single culvert (8 to 12' diameter) installation across the 2-lane highway will cost <$500,000.
Overall Feasibility	**9**	
Sequencing	n	This site can be constructed as a stand-alone project as part of K-DIZ-2.

K DOZ-5

Restoration Actions

Reconnect Processes: Modify road embankments with bridges or culverts where appropriate to reconnect floodplain area to riverine system. Remove fill material to allow maximum floodplain inundation. Combine with riparian rehabilitation at 10-meter, 30-meter, and floodplain widths to provide adequate composition, canopy cover and large wood recruitment potential within the rehabilitated floodplain. Address noxious weeds through planting and education/prevention programs. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	3	Inundation potential, 1 acre. Total size, 0.7 acres. Revegetaion, 1 acre.
Social Criteria	3	4 Stakeholders, 85% Privately owned
Construction Feasibility	3	Replace existing culvert under SR207. Narrow shoulder work area and high traffic complicate construction.
Cost	3	A single culvert (8 to 12' diameter) installation across the 2-lane highway will cost <$500,000.
Overall Feasibility	**9**	
Sequencing	n	This site can be constructed as a stand-alone project.

K IZ-1

Restoration Actions

Reconnect Habitat: Modify riprap with and/or construct large wood complexes to increase retention of incorporated large wood, improve channel complexity, and provide cover and biomass. This is listed as a Tier 1 habitat action in the Biological Strategy (RTT 2007). This habitat action should be implemented in conjunction with Riparian rehabilitation: Apply efforts for a long-term approach that will result in increased large wood recruitment potential, increased sinuosity, sorting and retention of spawning gravels, increased number of complex pools, and water quality. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	5	ELJs placement is recommended as the reach lacks complexity. Potential for riprap removal. Transmission line crossings provide opportunites for riparian planting. Total size, 14.34 acres. 1.2 river miles.
Social Criteria	1	22 Stakeholders, 40% Privately owned
Construction Feasibility	3	Access is available through transmission line corridors and potentiall through private landonwers.
Cost	3	Cost assumes 5-7 total structures and riparian planting ($100,000 - $250,000).
Overall Feasibility	**7**	
Sequencing	n	May be completed independent of other projects.

K IZ-2

Restoration Actions

Reconnect Habitat: Modify riprap with and/or construct large wood complexes to increase retention of incorporated large wood, improve channel complexity, and provide cover and biomass. This is listed as a Tier 1 habitat action in the Biological Strategy (RTT 2007). This habitat action should be implemented in conjunction with Riparian rehabilitation: Apply efforts for a long-term approach that will result in increased large wood recruitment potential, increased sinuosity, sorting and retention of spawning gravels, increased number of complex pools, and water quality. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	5	ELJs placement is recommended as the reach lacks complexity. Potential for riprap removal. Transmission line crossings provide opportunites for riparian planting. Total size, 18.8 acres. 1.4 river miles.
Social Criteria	3	3 Stakeholders, 0% Privately owned
Construction Feasibility	3	Access is available through transmission line corridors and potentiall through private landonwers.
Cost	3	Cost assumes 5-7 total structures and riparian planting ($100,000 - $250,000).
Overall Feasibility	**9**	
Sequencing	n	May be completed independent of other projects.

K IZ-3

Restoration Actions

Reconnect Processes through the use of various habitat actions from multiple habitat action classes including in-stream structures, floodplain Rehabilitation and large wood Rehabilitation that will result in an increase in the current bed elevation. This will in turn allow fluvial processes to work within adjacent outer zones more frequently. Combine with Riparian rehabilitation: Apply efforts for a long-term approach that will result in increased large wood recruitment potential, increased sinuosity, sorting and retention of spawning gravels, increased number of complex pools, and water quality. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	5	ELJs placement is recommended as the reach lacks complexity. Potential for riprap removal. Transmission line crossings provide opportunites for riparian planting. Total size, 11.5 acres. 0.5 river miles.
Social Criteria	1	9 Stakeholders, 54% Privately owned
Construction Feasibility	3	Access is available through transmission line corridors and potentiall through private landonwers.
Cost	3	Cost assumes 3-5 total structures and riparian planting ($100,000 - $250,000).
Overall Feasibility	**7**	
Sequencing	n	May be completed independent of other projects.

K IZ-4

Restoration Actions

Reconnect Habitat: Modify riprap with and/or construct large wood complexes to increase retention of incorporated large wood, improve channel complexity, and provide cover and biomass. This is listed as a Tier 1 habitat action in the Biological Strategy (RTT 2007). This habitat action should be implemented in conjunction with Riparian rehabilitation: Apply efforts for a long-term approach that will result in increased large wood recruitment potential, increased sinuosity, sorting and retention of spawning gravels, increased number of complex pools, and water quality. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	5	ELJs placement is recommended as the reach lacks complexity. Potential for riprap removal. Total size, 15.6 acres. 1.2 river miles.
Social Criteria	1	6 Stakeholders, 25% Privately owned
Construction Feasibility	3	Access is available along the US2 ROW for much of the reach.
Cost	3	Cost assumes 5-7 total structures and riparian planting ($100,000 - $250,000).
Overall Feasibility	**7**	
Sequencing	y	ELJ locations need to consider the potential reconnection of K DIZ-1, K DOZ-2, K DOZ-3, K DIZ-2, K DOZ-4, and K DIZ-3.

K OZ-1

Restoration Actions

Protect and maintain current levels of geomorphic, hydrologic, and riparian function. Riparian Rehabilitation: Restore sections of riparian vegetation impacted by the power line (less than 1 acre) by planting trees and shrubs to increase large wood recruitment potential within the current floodplain and reduce the amount of altered vegetation. Address noxious weeds through planting and education/prevention programs.

	Score	Evaluation
Biological Benefit	1	No overflow channels. No wetlands. Inundated at higher flows. Total size, 3.8 acres. Revegetation, 0.1 acres.
Social Criteria	5	2 Stakeholders, 0% Privately owned
Construction Feasibility	NA	Preservation
Cost	NA	Preservation
Overall Feasibility	**5**	
Sequencing	NA	Preservation

K OZ-2

Restoration Actions Protect and maintain current levels of geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	1	Contains historic overflow channels. No wetlands. Inundated at higher flows. Total size, 0.3 acres.
Social Criteria	5	1 Stakeholders, 0% Privately owned
Construction Feasibility	NA	Preservation
Cost	NA	Preservation
Overall Feasibility	**5**	
Sequencing	NA	Preservation

K OZ-3

Restoration Actions

Reconnect Processes: Remove or modify road embankments and bridge abutment to reconnect floodplain to riverine system. Combine with riparian rehabilitation at 10-meter, 30-meter, and floodplain widths to provide adequate composition, canopy cover and large wood recruitment potential within the rehabilitated floodplain. Address noxious weeds through planting and education/prevention programs. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	1	Road removal will not change area of inundation. No new inundation potential. Total size, 25.3 acres. Revegetation, 1.1 acres.
Social Criteria	1	Road removal is feasible only with support from private landowners. 14 Stakeholders, 96% Privately owned
Construction Feasibility	5	Road removal and retirement is accomplished with standard heavy equipment.
Cost	5	< $100,000.
Overall Feasibility	**11**	
Sequencing	n	May be completed independent of instream projects associated with K IZ-1.

K OZ-4

Restoration Actions

Reconnect Processes: Modify road embankments with bridges or culverts where appropriate to reconnect floodplain area to riverine system. Modify unimproved roads to control fine sediment input to the system. Combine with riparian rehabilitation at 10-meter, 30-meter, and floodplain widths to provide adequate composition, canopy cover and large wood recruitment potential within the rehabilitated floodplain. Address noxious weeds through planting and education/prevention programs. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	1	Road removal will not change area of inundation. No new inundation potential. Total size, 14.4 acres. Revegetation, 1 acre.
Social Criteria	1	Road removal is feasible only with support from private landowners. 9 Stakeholders, 63% Privately owned
Construction Feasibility	5	Road removal and retirement is accomplished with standard heavy equipment.
Cost	5	< $100,000.
Overall Feasibility	**11**	
Sequencing	n	May be completed independent of instream projects associated with K IZ-1.

K OZ-5

Restoration Actions

Protect and maintain current levels of geomorphic, hydrologic, and riparian function. Riparian Rehabilitation: Restore sections of riparian vegetation impacted by the power line by planting trees and shrubs to increase large wood recruitment potential within the current floodplain and reduce the amount of altered vegetation. Address noxious weeds through planting and education/prevention programs.

	Score	Evaluation
Biological Benefit	1	Contains historic overflow channels, no wetlands. Inundated at high flows. Total Size, 3.8 acres. Revegetaion, 0.5 acres.
Social Criteria	1	7 Stakeholders, 98% Privately owned
Construction Feasibility	NA	Preservation
Cost	NA	Preservation
Overall Feasibility	**1**	
Sequencing	NA	Preservation

K OZ-6

Restoration Actions

Protect and maintain current levels of geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	1	Contains historic overflow channels, no wetlands, inundated at higher flows. Total size, 1.0 acres.
Social Criteria	1	6 Stakeholders, 82% Privately owned
Construction Feasibility	NA	Preservation
Cost	NA	Preservation
Overall Feasibility	**1**	
Sequencing	NA	Preservation

K OZ-7

Restoration Actions

Reconnect Processes: Re-slope vertical banks where appropriate to reconnect floodplain and existing wetlands and reinitiate habitat-forming processes.

	Score	Evaluation
Biological Benefit	1	Road removal will not change area of inundation. No new inundation potential. Total size, 12.5 acres. Revegetation, 3 acres. Existing wetland, 1 acre.
Social Criteria	3	3 Stakeholders, 9% Privately owned
Construction Feasibility	5	Road removal and retirement is accomplished with standard heavy equipment.
Cost	5	< $100,000.
Overall Feasibility	**13**	
Sequencing	n	May be completed independent of instream projects associated with K IZ-2.

K OZ-8

Restoration Actions

Protect and maintain current levels of geomorphic, hydrologic, and riparian function. Riparian Rehabilitation: Restore sections of riparian vegetation impacted by the power line (less than 1 acre) by planting trees and shrubs to increase large wood recruitment potential within the current floodplain and reduce the amount of altered vegetation. Address noxious weeds through planting and education/prevention programs.

	Score	Evaluation
Biological Benefit	1	Contains historic overflow channels, no wetlands, inundated at higher flows.Total size, 2.6 acres. Revegetation, 0.1 acres.
Social Criteria	5	2 Stakeholders, 0% Privately owned
Construction Feasibility	NA	Preservation
Cost	NA	Preservation
Overall Feasibility	**5**	
Sequencing	NA	Preservation

K OZ-9

Restoration Actions

Riparian Rehabilitation: Restore sections of riparian vegetation impacted by the power line by planting trees and shrubs to increase large wood recruitment potential within the current floodplain and reduce the amount of altered vegetation. Address noxious weeds through planting and education/prevention programs. Protect and maintain current levels of geomorphic, hydrologic, and rehabilitated levels of riparian function.

	Score	Evaluation
Biological Benefit	1	Revegetation along BPA powerline corridor. Revegetation, 0.2 acres. Total size, 0.5 acres.
Social Criteria	5	2 Stakeholders, 0% Privately owned
Construction Feasibility	5	Access roads to site. Planting within BPA corridor will limit plant material.
Cost	5	Cost for plant materials only.
Overall Feasibility	**15**	
Sequencing	n	This site can be planted as a stand-alone project

K OZ-10

Restoration Actions Protect and maintain current levels of geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	1	Contains historic overflow channels, no wetlands, inundated at higher flows.Total size, 0.7 acres.
Social Criteria	5	1 Stakeholders, 0% Privately owned
Construction Feasibility	NA	Preservation
Cost	NA	Preservation
Overall Feasibility	**5**	
Sequencing	NA	Preservation

K OZ-11

Restoration Actions

Riparian Rehabilitation: Restore sections of riparian vegetation impacted by the power line by planting trees and shrubs to increase large wood recruitment potential within the current floodplain and reduce the amount of altered vegetation. Address noxious weeds through planting and education/prevention programs. Protect and maintain current levels of geomorphic, hydrologic, and rehabilitated levels of riparian function.

	Score	Evaluation
Biological Benefit	5	Revegetation along BPA powerline corridor. Revegetation, 2 acres. Total size, 3.8 acres.
Social Criteria	5	2 Stakeholders, 0% Privately owned
Construction Feasibility	5	Access roads to site. Planting within BPA corridor will limit plant material.
Cost	5	Cost for plant materials only.
Overall Feasibility	**15**	
Sequencing	n	This site can be planted as a stand-alone project

K OZ-12

Restoration Actions

Protect and maintain current levels of geomorphic, hydrologic, and riparian function. Riparian Rehabilitation: Restore sections of riparian vegetation impacted by the power line (less than 1 acre) by planting trees and shrubs to increase large wood recruitment potential within the current floodplain and reduce the amount of altered vegetation. Address noxious weeds through planting and education/prevention programs.

	Score	Evaluation
Biological Benefit	1	High flow gravel bar area. Inundated at higher flows. Total size, 1.5 acres.
Social Criteria	5	1 Stakeholders, 0% Privately owned
Construction Feasibility	NA	Preservation
Cost	NA	Preservation
Overall Feasibility	**5**	
Sequencing	NA	Preservation

K OZ-13

Restoration Actions Protect and maintain current levels of geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	1	High flow gravel bar area. Total size, 1.6 acres.
Social Criteria	5	1 Stakeholders, 0% Privately owned
Construction Feasibility	NA	Preservation
Cost	NA	Preservation
Overall Feasibility	**5**	
Sequencing	NA	Preservation

K OZ-14

Restoration Actions

Riparian Rehabilitation: Restore sections of riparian vegetation impacted by the power line by planting trees and shrubs to increase large wood recruitment potential within the current floodplain and reduce the amount of altered vegetation. Address noxious weeds through planting and education/prevention programs. Protect and maintain current levels of geomorphic, hydrologic, and rehabilitated levels of riparian function.

	Score	Evaluation
Biological Benefit	3	Revegetation along BPA powerline corridor. Revegetation, 0.9 acres. Total size, 1.0 acres.
Social Criteria	3	3 Stakeholders, 6% Privately owned
Construction Feasibility	5	Access roads to site. Planting within BPA corridor will limit plant material.
Cost	5	Cost for plant materials only.
Overall Feasibility	**13**	
Sequencing	n	This site can be planted as a stand-alone project

K OZ-15

Restoration Actions Protect and maintain current levels of geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	3	Contains historic overflow channels, no wetlands, inundated at higher flows.Total size, 8.5 acres.
Social Criteria	1	8 Stakeholders, 87% Privately owned
Construction Feasibility	NA	Preservation
Cost	NA	Preservation
Overall Feasibility	**1**	
Sequencing	NA	Preservation

K OZ-16

Restoration Actions

Protect and maintain current levels of geomorphic, hydrologic, and riparian function. Riparian Rehabilitation: Restore sections of riparian vegetation impacted by the power line by planting trees and shrubs to increase large wood recruitment potential within the current floodplain and reduce the amount of altered vegetation. Address noxious weeds through planting and education/prevention programs.

	Score	Evaluation
Biological Benefit	5	Contains historic overflow channels, 4 acres of wetlands, and is inundated at higher flows. Total size, 30.3 acres.
Social Criteria	3	5 Stakeholders, 35% Privately owned
Construction Feasibility	NA	Preservation
Cost	NA	Preservation
Overall Feasibility	**3**	
Sequencing	NA	Preservation

K OZ-17

Restoration Actions Protect and maintain current levels of geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	1	Narrow strip of floodplain along US 2. Contains historic overflow channels, no wetlands, and is inundated at higher flows. Total size, 3.2 acres.
Social Criteria	5	2 Stakeholders, 0% Privately owned
Construction Feasibility	NA	Preservation
Cost	NA	Preservation
Overall Feasibility	**5**	
Sequencing	NA	Preservation

K OZ-18

Restoration Actions Protect and maintain current levels of geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	1	Contains historic overflow channels, no wetlands, and is inundated at higher flows. Total size, 2.8 acres.
Social Criteria	5	2 Stakeholders, 13% Privately owned
Construction Feasibility	NA	Preservation
Cost	NA	Preservation
Overall Feasibility	**5**	
Sequencing	NA	Preservation

K OZ-19

Restoration Actions

Reconnect Processes: Remove or modify embankments to reconnect floodplain area to riverine system. Protect existing wetlands and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	1	Road removal will not change area of inundation. No new inundation potential. No new inundation potential. Total size, 16.2 acres. Revegetation, 0.9 acres.
Social Criteria	5	2 Stakeholders, 22% Privately owned
Construction Feasibility	5	Road removal and retirement is accomplished with standard heavy equipment.
Cost	5	< $100,000.
Overall Feasibility	**15**	
Sequencing	n	May be completed independent of instream projects associated with K IZ-4.

K OZ-20

Restoration Actions

Reconnect Processes: Remove or modify embankments and levee to reconnect floodplain area to riverine system. Protect and maintain resulting levels of rehabilitated geomorphic, hydrologic, and riparian function.

	Score	Evaluation
Biological Benefit	1	No new inundation potential. Total size, 13.5 acres. Revegetaion, 0.25 acres.
Social Criteria	3	4 Stakeholders, 56% Privately owned
Construction Feasibility	5	Levee removal is accomplished with standard heavy equipment.
Cost	5	< $100,000.
Overall Feasibility	**13**	
Sequencing	n	May be completed independent of instream projects associated with K IZ-4.