

Appendix C | Restoration Strategy

MIDDLE ENTIAT RIVER REACH ASSESSMENT UPDATE

February 2026

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1 Restoration Strategy

1.1 INTRODUCTION

The Restoration Strategy uses field surveys, inventories, and analyses performed in the reach assessment and accompanying appendices (Appendix A: Habitat Assessment and Appendix B: Reach-based Ecosystem Indicators), as the technical basis for identifying and prioritizing restoration actions. This framework of developing a restoration strategy provides a direct linkage between the technical analyses, identified limiting factors, and the actions that are moved forward towards implementation. The restoration objectives (targets) are used to guide the development of appropriate restoration action types for the assessment area. The Segment-Scale Restoration Strategies (Section 1.4) present the summarized and compiled information in table format for the four Entiat segments. Conceptual maps and descriptions of the project opportunities are presented in Section 1.1.1. Project ranking is provided in Section 0, and lays out the targets, benefits, and costs scoring involved in prioritizing project opportunities for the restoration strategy.

1.2 RESTORATION OBJECTIVES

Restoration objectives were developed for multiple ecological attributes, including instream habitat, geomorphologic processes, and riparian function. These objectives are presented as restoration targets. They are made to be as quantifiable as possible at this stage of analysis. These target conditions are compared to existing conditions from the reach assessment. This highlights habitat deficiencies and the “gap” that needs to be filled to recover habitat.

Target conditions were developed using the Reach-Based Ecosystem Indicators (REI) targets (see Appendix B) as well as reference to site conditions and inference from local and regional studies. See the reach assessment main report and Appendix B for more information on the REI analysis.

1.3 ACTION TYPES

Recommended actions are categorized here into five action types. There are four restoration action types plus a conservation action. We use the term ‘restoration’ as a broad catch-all when we refer to actions; however, we acknowledge that many of the actions are not restoration in the true sense of the word and would be more appropriately labeled as “enhancement” or “creation.” We consider true restoration actions to be those that address root causes of impairments that aim to return the system close to its naturally functioning state. This is often not achievable, or advisable, due to past changes to the underlying processes or to process impairments that are unlikely to change. An example of a true restoration project would be a project that fully removes a levee, returns the channel to its historical form, and replants the valley floor to restore natural floodplain inundation patterns. Enhancement measures are those that improve or rehabilitate habitat to the extent possible given existing impaired processes and anthropogenic constraints. Placement of large wood in an existing pool to provide cover is an example of habitat enhancement. Creation projects are those that create new habitat that is currently lacking or that will not be created on its own in a reasonable timeframe given existing impairment. Excavation of a new side-channel where one did not exist

already is an example of a creation project. Action types are often combined, and each project typically incorporates numerous action types. The five action types are described below.

1. Riparian Restoration

Riparian restoration projects are recommended in areas where native riparian vegetation communities have been impacted by historical or current anthropogenic activities such that riparian function and connection with the stream are compromised. In the Entiat River assessment area, large sections of the floodplain vegetation were logged in the past and the forests are still recovering. Near some private property and infrastructure, riparian vegetation has been cleared (or impacted) for homes/buildings, agricultural purposes, roads and trails, or crossings. Restoration actions are focused on restoring native riparian vegetation communities to reestablish natural stream stability (including supporting beaver), stream shading, nutrient exchange, ecologic diversity, long-term large wood recruitment, and wildfire resilience. Riparian restoration may also include the development or enhancement of wetlands or riparian function along off-channel features. Even though it is not always explicitly stated, riparian restoration is a recommended component of most restoration actions, particularly within the disturbance limits of the action.

Examples:

- ▶ Replanting a riparian buffer area with native vegetation.
- ▶ Controlling invasive species within the riparian zone.
- ▶ Placing willow or cottonwood baffles on bars to encourage vegetated island development.

2. Enhance Channel Complexity

Channel complexity enhancement actions are aimed at increasing quantity or improving the quality of existing channel habitat and geomorphology. This type of action is designed to improve the geomorphic complexity of the system, which in turn supports instream aquatic habitat conditions and builds system resiliency. Sections of the Entiat River assessment area lack geomorphic and habitat complexity as a result of historical logging, floodplain grading, channel manipulations, and channel clearing practices. Due to the removal of old-growth trees, many of the riparian and floodplain forests lack sufficiently-sized trees to act as “key logs” that are capable of influencing and maintaining channel complexity. Where sufficient large wood jams do occur, geomorphic complexity and habitat function are notably increased. The Enhance Channel Complexity strategy includes a broad range of large wood installation types of varied sizes and purposes. Enhance Channel Complexity is recommended in the mainstem channel, side channels, and off-channel habitat. The recommendations include broad treatment types as well as site-specific actions. For example, log placement may be recommended in a field-identified existing pool to provide salmonid hiding cover. In contrast, several thousand feet of the channel may be identified as appropriate for large wood loading by helicopter. The structural elements (e.g., large wood) included in these actions are placed in areas where they would naturally accumulate and be maintained by stream hydrology and geomorphology. These actions can exhibit a wide range of intended function, from helping to restore reach-scale geomorphic processes (e.g., apex jams to create multi-thread channel

conditions) to simply adding structural cover and complexity habitat (e.g., adding large wood to an existing pool).

Examples:

- ▶ Helicopter large wood loading in areas with difficult ground access to increase quantity of effective in-channel large wood to promote log jam development, instigate bedload retention, and increase available in-channel habitat.
- ▶ Installation of individual large wood pieces or jams for cover, pool scour, sediment sorting, and hydraulic complexity (e.g., high flow refuge for rearing juvenile fish).
- ▶ Installation of apex jam to promote scour, sediment retention, and split-flow conditions to support mid-channel bar/island development or side-channel initiation.

3. Side and Off-Channel Habitat Creation or Enhancement

Off-channel habitat creation or enhancement projects are located in areas where there is the potential to increase the quantity, quality, or connectivity of off-channel habitat (i.e. alcoves, side channels, floodplain wetlands). Off-channel habitat features provide important rearing and refugia areas for juvenile salmonids, including high flow refugia, temperature refugia, and highly productive feeding areas. These projects may include the activation of existing habitat areas that have been disconnected via channel incision or floodplain alterations. In other cases, off-channel areas can be created via excavation and construction of features such as side channels or alcoves. Off-Channel Habitat Creation or Enhancement is often paired with Enhance Channel Complexity actions.

Examples:

- ▶ Increase the degree of connectivity (i.e., for surface flow and fish passage) of an existing off-channel area such as a floodplain oxbow wetland for juvenile feeding, flood refuge, or thermal refuge.
- ▶ Create new connected side-channel or off-channel habitat via excavation.
- ▶ Enhance conditions in new or created off-channel habitat.

4. Floodplain and Channel Migration Zone Reconnection

Floodplain and CMZ connectivity actions are those that increase the frequency, duration, or extent of hydrologic connection between the mainstem channel and the floodplain or that re-establish natural channel migration functions. Floodplain and CMZ connectivity projects are located in areas where there is the potential to increase the quantity or quality of floodplain habitats and are typically located in areas where floodplains have been disconnected via channel incision/straightening, channel bypass or diversions, anthropogenic confinement such as undersized bridges or levees, or floodplain modifications that inhibit connectivity such as road prisms or hardened banks. This strategy includes a broad range of potential project types, including floodplain grading to create valley-wide hydraulic connectivity, inset floodplains, or wetlands, as well as removal of constructed levees that in turn reengage existing floodplain surfaces or oxbows. It may

also require grading to reactivate or reconnect abandoned channel sections or flow routes, especially those resulting from anthropogenic manipulations.

Examples:

- ▶ Remove or modify levees, bank armor, roads, or bridges to reestablish natural floodplain inundation and channel migration processes.
- ▶ Raise or promote aggradation of an incised channel.
- ▶ Create multi-threaded channel corridor with valley-wide hydraulic connectivity.

6. Conservation

Conservation actions include such things as land acquisitions, easements, or other measures that provide enduring protection to channels, riparian zones, and floodplains. They are only identified where they would complement and/or increase restoration action potential, or where there is believed to be specific future risk of impairment. Some of the Entiat River assessment area is already protected by federal lands, including much of the surrounding hillslopes. However, a substantial portion of the valley bottom and existing floodplain within the assessment area is privately-owned. Working with landowners to develop conservation easements within the riparian zones on their parcels, or to conduct riparian revegetation, would also have benefits in many areas. In many areas, the private parcels are relatively small with narrow river-frontage; in these cases, strategic and opportunistic acquisition of several neighboring parcels may be necessary prior to restoration implementation. Conservation measures in these areas would help to prevent development of currently undeveloped parcels and would also help facilitate restoration actions. Because these parcels lie within the floodplain and/or channel migration zone of the river, portions of nearly all of these private lands could be considered targets for conservation. However, existing county-level shorelines, critical areas, and floodplain regulations would apply to many of these parcels and in theory would provide important protections. This assessment does not, however, include any type of land-use analysis such as looking at zoning patterns or the adequacy of local regulations. Due to these uncertainties, conservation actions are not identified broadly for the private lands. Instead, this assessment identifies conservation actions in the following situations: 1) private lands with high restoration value, where long-term protection of the land would complement or increase the opportunity for restoration actions, and 2) where site or other observations indicate there are impending encroachments or development potential, such as land clearing, road building, land subdivision, or undeveloped properties advertised for sale.

1.4 SEGMENT-SCALE RESTORATION STRATEGIES

Restoration strategies for each segment of the assessment area are provided below. The segment-scale restoration strategies identify existing ecologic/geomorphic conditions, project objectives and recovery potential, a list of projects, and recommended restoration action types. The ecological function (Low, Moderate, or High) of each segment is characterized by the ratings that resulted from

the REI (see Appendix B). The trajectory (decline, same, improve) is determined by evaluation of the modern geomorphic trends, related existing habitat conditions, and continued limitations such as infrastructure and land-use (see the main reach assessment report and Appendix A-Habitat Assessment). The recovery potential (Low, Moderate, and High) is based on the potential for the site to recover functioning habitat and processes with implementation of restoration actions. To do so, the potential for the REI indicator ratings to improve via restoration actions is considered. The recovery potential rating considers known limitations to recovery that are unlikely to be eliminated as part of implementation of this restoration strategy, such as the presence of transportation and residential infrastructure.

1.4.1 Segment 1 (Reaches 1 – 4) Restoration Strategy

Overall ecological function	Low <i>Segment 1 (RM 15.6-19.0) ranked low-moderate in the REI for habitat access and quality. There are no complete fish passage barriers, although the McKenzie irrigation diversion has the potential to impede passage. The amount of large woody material (LWM) and availability of off-channel habitat is limited, however. The frequency of pool habitat is limited also. Riparian conditions ranked low in the REI. Mature trees are lacking, resulting in low canopy cover and limited recruitment potential for LWM. There was visual evidence of human disturbance, including road and residential development. Channel dynamics in Segment 1 are moderately functional. There is natural confinement that limits channel dynamics, but artificial bank protection limits lateral migration and floodplain connectivity elsewhere. Past restoration actions have improved floodplain connectivity, but not to adequate levels. There is localized incision from the McKenzie irrigation diversion, but otherwise there is no measurable trend in incision or aggradation.</i>
Trajectory if no action taken	Decline <i>Continued degradation due to persistent anthropogenic impacts on floodplain surfaces and large wood processes, including the effects of channel incision, bank armoring, riparian vegetation clearing, and anthropogenic development. Though the CDLT owns large portions of the segment, there is substantial private landownership adjacent to the channel and in the floodplain that may increase potential for ecological decline trajectory without intervention.</i>
Recovery potential	Moderate <i>Projects address lack of large in-channel structure but have limited impact on recovery of root causes due to effects of reach-wide incision related to floodplain and CMZ lateral constrictions that are assumed to remain. The Gray Canyon Fan project has one of the highest uplift potentials in the assessment area, however, if actions are not limited by private landownership concerns.</i>
Restoration objectives	Target conditions from REI <i>Target “Adequate” functional rating criteria as described in the Reach-based Ecosystem Indicators (REI), provided in Appendix B.</i>
Action Types	Riparian Restoration Enhance Channel Complexity Floodplain and CMZ Connectivity Side and Off-Channel Habitat Creation or Enhancement <i>Actions include enhancement of channel complexity via LWM placements. Modification of anthropogenic features, such as bank riprap or road fill, would improve channel condition and floodplain connectivity. LW placement could also encourage more frequent connectivity of existing natural or constructed side channels to increase accessible off-channel habitat areas in a moderately high fish use migration corridor. Revegetation within the riparian zone in Reach 1 would improve long-term conditions. The potential to improve the quantity and quality of available habitat in Reach 1 and the lower portion of 2 is moderate, and primarily includes LWM addition. There are also opportunities for uplift in the upper portion of Reach 2 (Gray Canyon Fan) and Reaches 3-4 (Shamel). Existing private land uses and infrastructure may limit recovery potential, however. Riparian restoration where banks have been cleared can support long-term recovery of LW processes. If needed, projects could be phased or divided into multiple smaller projects.</i>
Project Areas & Prioritization	Potato Gray F Revisited Gray Canyon Fan Shamel

1.4.2 Segment 2 (Reaches 5 - 7) Restoration Strategy

Overall ecological function	Moderate <i>Segment 2 (RM 19.0-22.1) had moderate overall functional ratings in the REI in terms of habitat access and quality. Pool frequency in the segment is adequate in some areas (Reach 4 and Reach 7) and at risk in others (Reach 5 and Reach 6). There is adequate amount of LWM throughout the segment; however, the recruitment potential for LWM is lacking and without restoration efforts augmenting LWM, LWM would be limited. Off-channel habitat is limited in certain areas (Reach 4 and Reach 6) of the segment, though restoration efforts have created adequate conditions in certain sections (Reach 7). The riparian vegetation in Segment 2 ranked low in the REI. Throughout the segment, the riparian buffer lacks the stand age and structural complexity to function adequately, from residential development within the floodplain and the history of logging throughout the basin. Certain sections (Reach 5 and Reach 7) have adequate canopy cover, since the riparian vegetation immediately adjacent to the channel remains intact. Channel dynamics in Segment 2 ranked moderate in the REI. Floodplains are adequately connected or naturally disconnected in some areas of the segment, however, the lack of LWM to drive geomorphic processes limits floodplain connectivity and channel complexity. Lateral migration of the channel is occurring, but in certain sections (Reaches 5-7) the road embankment limits or poses a risk to lateral processes. There are no measurable trends in aggregation or incision of the channel in Segment 2.</i>
Trajectory if no action taken	Maintain-Decline <i>Although previous restoration efforts have improved habitat conditions and ecological function in the segment, continued long-term degradation due to persistent anthropogenic impacts to floodplain and channel, riparian zone, and large wood processes are assumed if no action is taken.</i>
Recovery potential	Moderate <i>Segment 2 has moderate potential for uplift due to the level of restoration that has already occurred in this segment from the previous Stormy A and B projects. However, currently proposed projects supplement or extend the enhancement actions, largely focusing on addressing the lack of large in-channel structure, encouraging increased connectivity of existing constructed side-channel/off-channel habitat, and addressing recent channel avulsion.</i>
Restoration objectives	Target conditions from REI <i>Target "Adequate" functional rating criteria as described in the Reach-based Ecosystem Indicators (REI), provided in Appendix B.</i>
Action Types	Riparian Restoration Enhance Channel Complexity Side and Off-Channel Habitat Creation or Enhancement <i>Actions include enhancement/improvement of channel complexity via large wood placements and creation or enhancement of side channel habitats, and riparian revegetation. Revegetation of open field areas would improve long-term riparian conditions. Proposed treatment areas tend to have a single or small number of landowners, potentially increasing feasibility of actions in this segment. If needed, the projects could be phased or divided into multiple smaller projects.</i>
Project Areas & Prioritization	Shamel Stormy Avulsion Stormy B Revisited Stormy A Revisited

1.4.3 Segment 3 (Reaches 8 – 10) Restoration Strategy

Overall ecological function	Low-Moderate <i>The habitat conditions in Segment 3 (RM 22.1-24.9) ranked low-moderate in the REI. Much of the segment is naturally confined and off-channel habitat would be naturally infrequent. Where the channel is unconfined, off-channel habitat exists (primarily from restoration) but could be increased. Pool frequency and limited LWM are not functioning adequately. There is a lack of mature trees that would naturally support creation of in-channel habitat features, such as pools, as well as offer cover and velocity refugia. The riparian conditions in Segment 3 ranked low-moderate in the REI. Human disturbance has reduced the structural complexity of riparian vegetation. However, even in areas of development, the vegetation immediately adjacent to the channel is relatively intact and provides canopy cover. The channel dynamics in Segment 3 ranked high in the REI. Throughout most of the segment, the channel is naturally confined and functioning similar to assumed natural conditions. There are localized areas (Reach 9 near RM 23.2 and RM 23.7) of potential limited floodplain connectivity and lateral migration, where artificial levees prevent geomorphic processes. However, aside from the levees, there is little anthropogenic activity affecting floodplain connectivity, lateral migration, or vertical channel stability.</i>
Trajectory if no action taken	Decline-Maintain <i>Effects of historical and ongoing degradation will remain due to anthropogenic impacts that have resulted in primarily altered riparian and large wood processes, particularly in Reaches 8 and 9, where more dense private landownership is present.</i>
Recovery potential	Moderate-High <i>Project actions address lack of large in-channel structure and loss of off-channel/floodplain habitat where it would be present but have limited impact on recovery of root causes of riparian condition and the large wood cycle due to persistent development impacts. Channel conditions in Reach 8 and the lower portion of Reach 10 are not conducive to restoration actions. However, the Tyee to Dill project has one of the highest uplift potentials in the assessment area if constraints can be addressed to allow for a majority of proposed actions to be implemented.</i>
Restoration objectives	Target conditions from REI <i>Target “Adequate” functional rating criteria as described in the Reach-based Ecosystem Indicators (REI), provided in Appendix B.</i>
Action Types	Riparian Restoration Enhance Channel Complexity Floodplain and CMZ Connectivity Side and Off-Channel Habitat Creation or Enhancement <i>The potential to improve the quantity and quality of available habitat in Segment 3 is relatively high where the channel is not naturally confined (primarily Reach 9). Opportunities for side channel creation and enhancement occur where low floodplain surfaces are present. Removal of fill bisecting the floodplain in Reach 9, as well as replacement of riprap bank armor with large wood bank stabilization measures, would substantially improve habitat conditions in this reach. If needed, the Tyee to Dill project could be phased or divided into multiple smaller projects.</i>
Project Areas & Prioritization	Tyee to Dill

1.4.4 Segment 4 (Reaches 11 - 12) Restoration Strategy

Overall ecological function	Low-Moderate <i>The habitat access and quality in Segment 4 (RM 24.9-26.7) ranked low-moderate. There are no fish passage barriers or substrate risks to spawning fish, as of the 2024-2025 assessments. However, LWM, pool frequency, and off-channel habitat are all limited in Segment 4. Restoration efforts have improved conditions, but a lack of mature trees to drive geomorphic processes and development in the floodplain limits habitat quality and channel complexity. The riparian vegetation in Segment 4 ranked low in the REI. Human disturbance, including a history of logging and residential/road development in the riparian corridor, has reduced the structural complexity of the riparian vegetation. The downstream section has adequate canopy cover, but canopy cover is lacking in the upstream section. Channel dynamics in Segment 4 ranked low-moderate in the REI. The channel is naturally confined in certain areas of the segment (Reach 11), however, historical channel straightening (also in Reach 11) and artificial bank protection (Reach 12) limits lateral migration and floodplain connectivity. There are no measurable trends in aggregation or incision of the channel in Segment 4.</i>
Trajectory if no action taken	Decline-Maintain <i>Continued impairment due to persistent anthropogenic impacts to floodplain/channel migration zone, riparian conditions, and large wood processes. Possible long-term recovery of riparian condition in Reach 12 due to some CDLT land ownership, though recent development in Reach 11 suggests action to protect riparian vegetation is important to maintain ecological condition.</i>
Recovery potential	Moderate-High <i>Moderate-High potential for recovery, assuming off-channel enhancement actions in the Entiat 3D Revisited project area on property owned by CDLT are able to be implemented. Ownership by CDLT and a single other private landowner increases potential feasibility of actions. The Brennegan project area has a significant number of private landowners, however, with recent residential development in the riparian zone, limiting project opportunities and recovery potential of Reach 11.</i>
Restoration objectives	Target conditions from REI <i>Target “Adequate” functional rating criteria as described in the Reach-based Ecosystem Indicators (REI), provided in Appendix B.</i>
Action Types	Riparian Restoration Enhance Channel Complexity Side and Off-Channel Habitat Creation or Enhancement Floodplain and CMZ Connectivity Conservation <i>Actions include enhancement/improvement of channel complexity via large wood placements and creation or enhancement of side channel habitats, and riparian revegetation. Revegetation of open field areas would improve long-term riparian conditions. If needed, the projects could be phased or divided into multiple smaller projects.</i>
Project Areas & Prioritization	Brennegan Entiat 3D Revisited

2 Project Opportunities

2.1 PROJECT IDENTIFICATION AND EVALUATION APPROACH

Projects were identified through field surveys and analysis performed in the reach assessment. A map of the project areas is provided in Figure 1. Project elements were identified that are believed to best achieve target conditions and address fish habitat limiting factors. The projects represent an initial first step; it is expected that projects will be modified once project-specific surveys, analysis, and stakeholder coordination are performed. Project descriptions and maps are provided below. Project prioritization was performed to rank the projects into three priority tiers. Prioritization occurred by subjecting the projects to a set of scoring criteria. These criteria are based on several factors, including how well projects address the “gap” between existing and target conditions, species use/potential use of the area, and whether or not projects address root causes of impairments. Projects are also given a relative cost score estimate and feasibility designation in order to provide a relative cost perspective in project selection and planning. A description of the scoring methods and guidance is provided at the end of this document (Section 3.2).

2.2 PROJECT OPPORTUNITIES OVERVIEW

A total of 10 project areas were identified. An effort was made to identify project boundaries that group similar actions or that address similar reach-scale conditions; however, in many cases the selection of boundaries was qualitative, but a necessary means to divide up the study area into distinct projects that can be evaluated and ranked. Actual project extents for projects that are brought forward for implementation are likely to change depending on factors such as funding, landowner cooperation, schedule, phasing, etc. Areas where there are believed to be very few restoration opportunities are not included in the project maps. In some cases, project opportunities proposed here include revisiting or additional treatments to previous restoration project areas. Project opportunities are intended to complement and/or extend the lifespan or trajectory of the previous project actions. The appetite for stakeholders and landowners to revisit previously enhanced areas for additional project treatments may vary and influence the ultimate direction of project opportunities proposed.

A summary of the prioritization results is included in Table 1. The projects in the table are ranked by the Benefit-to-Cost score. The highest ranked projects are spread throughout the Entiat River reach assessment area. The Tye to Dill project is located in a relatively unconfined reach with opportunities to build upon previous projects to improve side channel and floodplain connection. The Stormy B Revisited project has the potential to drastically expand off-channel habitat over a long section where main channel large wood has already been supplemented through the Stormy B restoration project. The Gray Canyon Fan project has large bars lacking naturally recruited wood; these areas provide an opportunity to add additional roughness and complexity to the reach while enhancing side channel connection. The Entiat 3D Revisited project contains a large wetland that could be conserved and enhanced through providing additional connectivity.

These ranking results should be considered draft results and open to adjustment by technical teams and project sponsors depending on various circumstances and interpretations. In particular, the emphasis on total benefit versus cost-benefit may depend on funding levels or other considerations.

Table 1. Summary results of project prioritization. The full matrix is presented in Section 3.1.

Tiers	Project Name	Reach	Downstream RM	Upstream RM	Total Length (mi)	Total Benefit Score	Cost Score (1-4)	Benefit-to-Cost Score	Feasibility Designation
1	Tyee to Dill	9	22.55	23.70	1.15	8.5	2.5	3.4	Moderate
	Stormy B Revisited	6-7	20.20	21.30	1.10	7	2.5	2.8	High
	Gray Canyon Fan	2	17.35	17.85	0.50	6.5	2.5	2.6	Moderate-High
	Entiat 3D Revisited	12	25.65	26.50	0.85	6.5	2.5	2.6	High
2	Gray F Revisited	2	16.75	17.35	0.60	4.5	2	2.3	High
	Shamel	3-4	18.10	19.30	1.20	5	2.5	2.0	Moderate-High
	Stormy A Revisited	7	21.65	22.10	0.45	4	2	2.0	High
3	Brennegan	10-11	24.70	25.55	0.85	3.5	2	1.8	Low-Moderate
	Stormy Avulsion	5	19.50	20.10	0.60	3.5	2.5	1.4	High
	Potato	1	15.60	16.65	1.05	3	2.5	1.2	Moderate

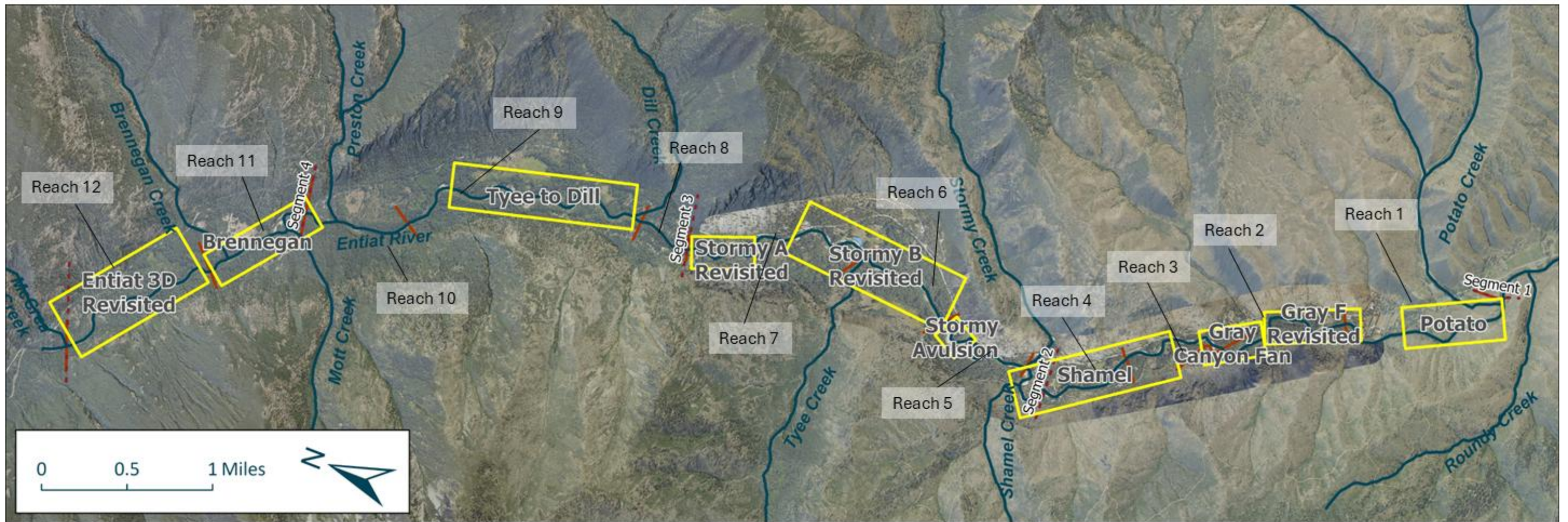


Figure 1. Overview of project locations.

2.3 PROJECT DESCRIPTIONS

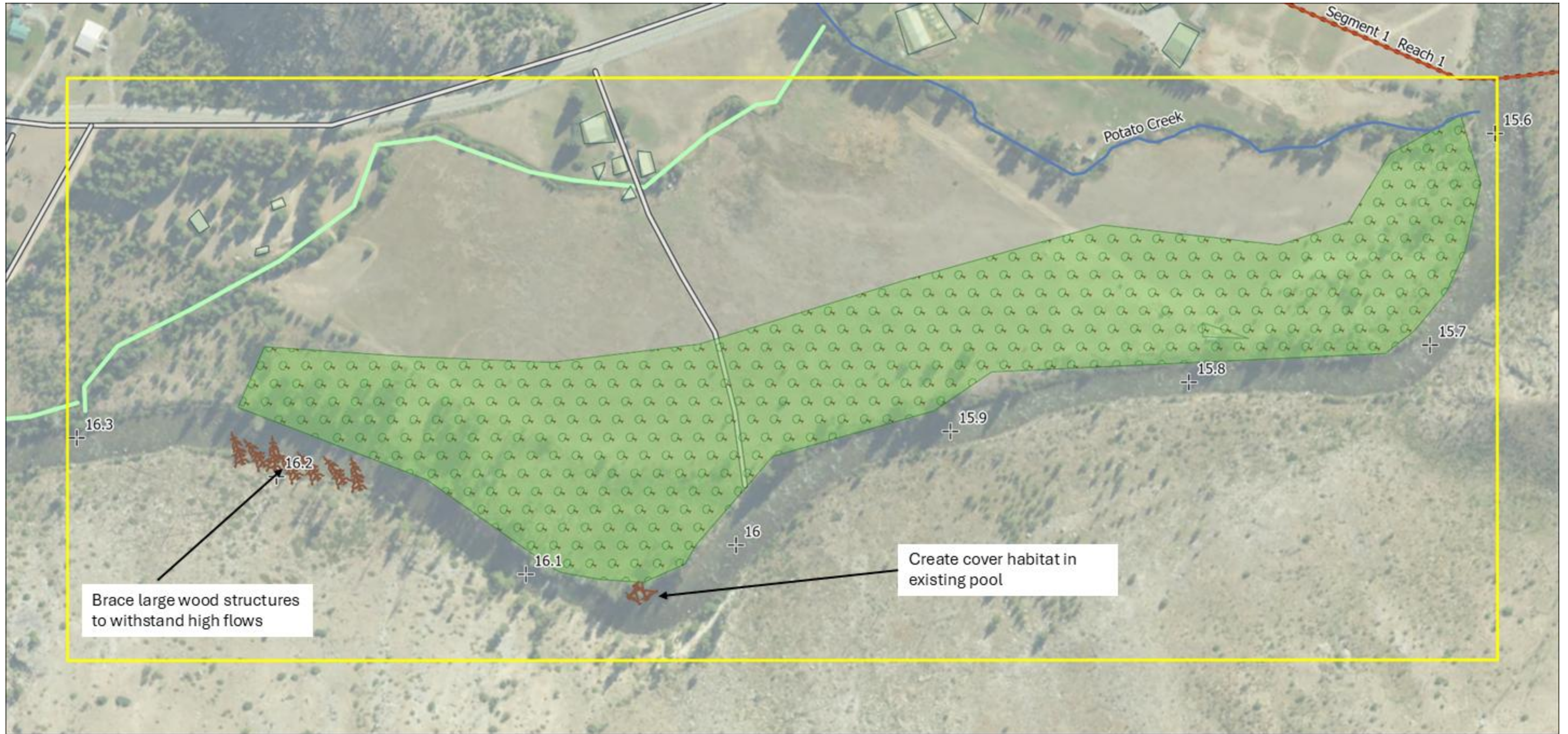
This table describes project opportunities by project area within the Entiat River assessment area. Concept maps of the project opportunities are included below the table.

Reach	River Miles	Project Name	Project Description
1	15.6 – 16.3	<i>Potato</i>	The channel within this project area is relatively steep and confined, with little floodplain area available. Limited sources of large wood are available on site. Hillslope vegetation is sparse, with recent wildfires impacting the overstory canopy. No previous restoration efforts are known to have occurred in this area. Property ownership is both public and private, with public land throughout a majority of the lower channel in this reach. Private property ownership is present on river left, largely outside of the 100-year floodplain. Residential structures are on upper terraces away from the channel. Project opportunities are somewhat limited given the nature of the channel through this reach. Large wood placement to enhance channel complexity near RM 16.05 would create cover habitat in an existing large pool identified during the habitat assessment. The pool is deep and located just downstream of a bedrock exposure/cascade, however, it is lacking cover. Wood placement would improve the quality of this pool for migrating and rearing salmonids. If needed, existing boulders could be moved to further enhance or increase the size of the pool. Near RM 16.2, there is some existing large wood present along the channel margin, which could be supplemented with additional large wood placed on the inside of the bend.
2	16.65 – 17.35	<i>Gray F Revisited</i>	The channel in the Gray F Revisited project area has a low gradient and a sinuous planform that meanders back and forth between the valley walls. Prior restoration efforts included the Middle Entiat Restoration - Area F project, which primarily consisted of side channel creation and large wood structure placements in the main channel and side channels. Project opportunities include large wood structures that increase channel and habitat complexity. Between the downstream end of the previous Area F restoration project and McKenzie Ditch (near RM 16.7), the channel is flat, over-widened, and simplified and would benefit from large wood structures in the channel. At the upstream end of Reach 1, near RM 16.65, is a boulder weir associated with the McKenzie Irrigation ditch. Although the weir is not known to be a fish passage barrier, it diverts a small portion of instream flows out of the Entiat River and is an artificially-maintained structure within the channel. Modification or removal of this structure should be evaluated to the extent possible given existing ownership, management, and uses. Large wood structures placed on the outside of a meander bend near RM 16.85 would offer cover and complexity while diverting more flow into the existing constructed side channel on river right. This constructed channel is dry at low flow under existing conditions. Similarly, adding large wood structures near RM 16.95 would divert additional flow into a constructed side channel complex on river left that currently functions as intermittently-wetted pools, with a portion of the downstream end of the complex offering perennial off-channel habitat. Large wood installation on both banks upstream of the side channel complex inlet could extend existing structures or build new structures further into the main channel to capture more flows. Near RM 17.15, the river-left bank is cleared of riparian vegetation. Large wood placements on that river-left bank would encourage lateral channel migration into the river-right bank, to eventually yield natural large wood recruitment from bank erosion. Riparian revegetation activities on the cleared river-left bank could provide a long-term LW source. Near RM 17.3, several large wood structures from the Area F project are located on the river-left bank. Additional large wood structures could be placed on the outside of the meander bend on river-right (in an existing pool) near RM 17.35. An apex large wood structure could be placed at the head of the river-left bar. The additional LWS would increase cover and complexity in the channel.
2	17.35 – 17.8	<i>Gray Canyon Fan</i>	Prior restoration efforts nearby include the Middle Entiat Restoration - Area F project just downstream and the Middle Entiat Restoration - Area E project just upstream. No prior restoration actions are known to have occurred in the Gray Canyon Fan project area. Project opportunities include large wood placements to increase channel complexity between Areas E and F (from approximately RM 17.35 to 17.7). This section of the channel is straight and simplified. Adding large wood structures, both bank and apex-type LWS, in strategic locations would increase channel complexity and habitat quality. Apex large wood structures placed on the head of the river-right gravel bar between 17.7 and 17.8, as well as large wood placed on the river-left bank of the meander bend near RM 17.75, may encourage increased flow and connectivity into the river-left side channel, which is currently dry during low flow conditions. This area is low energy and low complexity under existing conditions, lacking wood. Several relatively narrow private parcels on river-left upstream of RM 17.4 may influence the degree to which this project can be implemented. Residences are primarily located on an upper terrace; however, some residential structures appear to be located within the 100-year floodplain extents.

Reach	River Miles	Project Name	Project Description
3 - 4	18.1 – 19.3	<i>Shamel</i>	<p>Prior restoration efforts in this reach include the Middle Entiat Restoration - Area E project, which primarily consisted of large wood structure placements in the main channel and the Cottonwood Flats project, which included side channel construction and large wood placement, bridge removal, and mainstem large wood jams. The upstream extent of this project area ties into the downstream-most features implemented as part of the Stormy C restoration project.</p> <p>Project opportunities in the Shamel project area include placement of large wood bank structures on river-right between RM 18.1 and 18.2, which is currently armored with riprap. Large wood structures along the bank would provide bank protection in the near-term, while riparian revegetation in the cleared portions of the river-left floodplain would provide material for longer-term mitigation of lateral migration processes and natural LW recruitment. Increasing the connectivity of the floodplain on both sides of the channel and constructed side channel on river-right between RM 18.25 and 18.6 could include excavation of pilot channels, or flow-through side channels that are wetted year-round, which would increase the availability of off-channel habitat and refugia. Both sides of the floodplain are bisected near RM 18.45 by former road fill, and could be regraded to encourage more frequent connection with the mainstem. Near RM 18.5, the river-left bank has been cleared and appears to be actively migrating towards existing residential structures. Proactive measures to install large wood bank protection (rather than potential “emergency” riprap) could be implemented here to provide cover and habitat features on the outside of a meander bend. Between RM 18.6 to 18.8 the channel is straight, flat, and highly simplified. There is limited potential for natural large wood recruitment from the river-right hillslopes due to recent wildfire and sparse vegetation observed during field surveys. Large wood placement in several locations in this stretch of channel would bounce flows side-to-side and add instream aquatic habitat complexity. Large wood placements between RM 19 – 19.1 would provide similar functions, and may encourage additional lateral migration against the river-left terrace, supporting natural LW recruitment processes into a cluster of larger pines along the bank. Riparian restoration actions between RM 19 to 19.3 on property owned by CDLT could provide long-term stock of recruitable LW and prevent potential future channel simplification through a mature meander bend cutoff / avulsion. Constraints within this project area include predominately private landownership and associated built residential and outbuilding structures, as well as a private driveway bridge crossing the channel at RM 18.08. In many locations, the Entiat River mainstem channel is directly adjacent to the Entiat River Road, limiting the potential for more extensive project opportunities.</p>
5	19.9 – 20.1	<i>Stormy Avulsion</i>	<p>The Stormy Avulsion project includes, and extends upstream of, the prior Stormy C project, which included large wood structures placed in the mainstem. Project opportunities in this area include adding large wood and selected regrading. The side channel where a recent avulsion occurred (RM 19.9 – 20) lacks LW for cover and complexity, particularly in the upstream end (approximately RM 20). Large wood throughout this avulsion side channel would also help deflect flow and nudge this new avulsion channel trajectory away from the road so the channel doesn’t become locked in place or have limited opportunities for enhancement due to the proximity of the road prism. LW placements in the avulsion side channel could be complemented by targeted fill at the head of the avulsion side channel to reduce the potential for full mainstem channel capture, while still allowing for some flow through. Land ownership is entirely CDLT, although Entiat River Road right-of-ways would need to be considered for these project actions.</p>
6 - 7	20.2 – 21.3	<i>Stormy B Revisited</i>	<p>Prior restoration projects in this area include the Stormy B project. Proposed actions for this Stormy B Revisited project extend upstream to the lowermost LW structures installed as a part of the Stormy A project. Project opportunities include enhancing channel complexity with large wood, creation of side channel habitats, and riparian revegetation. The channel is relatively straight and simplified between RM 20.2 and 20.6 (downstream of the Stormy B project), and although gravel bars are present, LW is generally lacking. Large wood structures could be added to provide habitat complexity and to encourage lateral channel processes. In this same section (between RM 20.2 and 20.6), floodplain channels are hydraulically connected at the 2-year flow under existing conditions. Project actions to use LW structures to encourage additional flow into these floodplain channels, as well as targeted excavation within the flow paths, could increase the connectivity and provide high-quality velocity refugia and rearing areas for salmonids. Within the Stormy B Reach, there is a substantial amount of existing LW placed as a part of the previous project. Additional LW supplementation, which would include LW structures extending further out into the channel, could be placed near RM 20.7 and 21.05, both to push flows into river-right floodplain channels. The terrace between Entiat River Road and the channel (RM 20.8 to 20.95) is currently cleared of riparian vegetation, and the river-left bank is eroding where the channel abuts the road prism (RM 21.2 to 21.3). In these locations, habitat/bank protection structures could be paired with riparian revegetation actions to improve habitat cover/complexity. Large wood placed on the river-right bank near RM 21.3 could encourage flow into existing high-flow floodplain channels on river-right between the previous Stormy A and B projects. Excavation would likely be needed for side channel activations in the river-right floodplains of this project area. Large wood structures would be placed within the excavated side channel features. A couple privately-owned parcels cover the majority of the project actions proposed between RM 20.2 – 20.6. CDLT owns and manages most of the upstream portion of the project area.</p>
7	21.65 – 22.1	<i>Stormy A Revisited</i>	<p>Prior restoration work in this area includes the Stormy A project. Project opportunities are focused on supplementation of additional large wood structures. In the main channel, an additional LW structure could be added to the river-right bank near RM 21.7 to fill in a small gap between previous structures. Adding several bank structures and a mid-channel apex jam around RM 22 to create split flow and several bank jams to encourage flows to bounce from bank to bank would increase channel complexity, but would require private landowner approval. Upstream of RM 22.05, channel energy and private landownership increase, limiting restoration and enhancement options.</p>

Reach	River Miles	Project Name	Project Description
9	22.55 – 23.7	<i>Tyee to Dill</i>	<p>Prior restoration projects in this area include the Entiat Tyee project, the Entiat RM 21.5 project, and the Dillwater LWD Enhancement project. Project opportunities in this area include large wood placement, replacement of existing armored banks with large wood and grading, and actions to increase side channel and floodplain features more frequently. Riprap exists along the river-left bank near RM 22.6 and 22.8. Riprap could be removed (including riprap spurs extending into channel, which were a part of the Entiat RM 21.5 project) and replaced with LW bank protection structures. Regrading of the banks to reduce the bank slope and support riparian revegetation would provide a long-term source for channel shading and LW recruitment. The levee that extends from RM 23.2 up into the floodplain to approximately RM 23.3 could be removed, with the ground surface regraded to enhance river-left floodplain connectivity. A side channel / historical channel meander scar near RM 22.7 was observed to be dry during low flows, but could be enhanced through bank large wood placements or side channel excavation.</p> <p>An avulsion channel has developed between RM 22.7 and 23.3, but has limited LW loading and complexity. This avulsion channel is gradually transitioning to the main channel, which could result in a very straight and simple stretch of river without LW placement to encourage sinuosity and habitat complexity. This is a dynamic area likely to change dramatically in the near-term therefore it may be preferred to see how the channel evolves before treating the avulsion channel. An apex LWS placed mid-channel near RM 23.35 (just downstream of the Entiat Tyee project area) could encourage split flow and lateral channel migration into relatively well-forested banks, as well as encourage the regraded floodplain on river-left to activate more frequently. Within the former Entiat Tyee project area, supplemental LW, both bank-buried and apex-type structures, could be placed on gravel/cobble bars and on the outside of meander bends between RM 23.4 and 23.6. Additional LW structures could be added at the inlet/outlet of the river-left constructed side channel between RM 23.5 and 23.7 to capture more flow (upstream), and provide habitat (at confluence). On river-right between RM 23.4 and 23.6, existing high-flow floodplain channels could be excavated and LW placed throughout the side channel as well as in the mainstem near the inlet to encourage additional flow into the side channel. Riparian restoration is suggested in several cleared areas on the river-left floodplain.</p> <p>Project constraints in this area include a combination of public and private landownership, which can add complexity for side channel projects that span larger sections of the floodplain and channel. Project opportunities may need to be refined following evaluation of flood elevations to avoid potential impacts to existing infrastructure.</p>
10 – 11	24.7 – 25.55	<i>Brennegan</i>	<p>The Brennegan project area covers a small upstream portion of Reach 10 and all of Reach 11. No prior restoration projects have occurred in this area. Project opportunities include work near the outlet of Mott Creek, which is a cold-water input to the Entiat River. Enhancement of the confluence of Mott Creek and the Entiat River near RM 24.75, which currently has riprap armoring the bank, could provide paired bank stabilization and protection while offering habitat cover and cool-water refugia for salmonids rearing or migrating through the Entiat. Between RM 25 and 25.15 the Entiat splits off into a side channel on river-right – a LW structure in the main channel just downstream of the inlet would back water and encourage additional flow into the side channel. Significant LW loading could occur in the side channel on river-right to increase channel roughness and habitat complexity. Between RM 25.2 and 25.4, the channel is straight and highly simplified. LW structures on both banks would help encourage sinuosity in the low-flow channel, sediment sorting and scour, and offer cover and velocity refugia to salmonids. In the upper portion of Reach 11 (RM 25.45 to 25.55), project opportunities include loading up the main channel with several large jams. Riparian restoration may be supported in the cleared floodplain area between RM 25.2 and 25.35. There is also a private driveway bridge at RM 25. Potential project actions in the Brennegan project area should be evaluated within the context of that landowner access need.</p>
12	25.65 – 26.5	<i>Entiat 3D Revisited</i>	<p>Prior restoration work in this area includes the Entiat 3D project. Project opportunities include the addition of complexity via LW loading to the plane bed channel section between RM 25.65 and 26.2. The amount, and location, of LW structures may be dependent on analysis of flood elevations and landowner interest. An existing wetland/side channel complex is present on the river-left floodplain throughout much of Reach 12, which could be enhanced via targeted grading and excavation and large wood placement throughout the floodplain and side channel. The potential for conservation of this wetland/side channel complex should be evaluated to preserve the current function, even if no enhancement actions are undertaken. Approximately half of this wetland/side channel complex is on CDLT property, whereas the upstream portion is owned by a single landowner. In the upstream portion of Reach 12, a side channel on river-right between RM 26.2 -26.5 could be enhanced by loading the main channel with LW just downstream of the side channel inlet to encourage flow into the side channel. Excavation within the side channel alignment may also be necessary to achieve more frequent hydraulic connectivity. An elevated portion of the floodplain between the main channel and the side channel near RM 26.35 could be regraded to restore floodplain connectivity.</p>

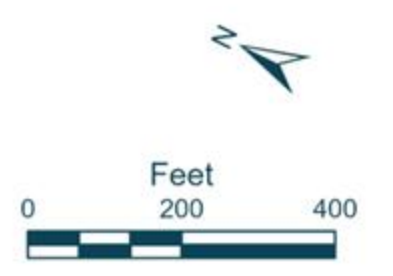
2.4 PROJECT MAPS

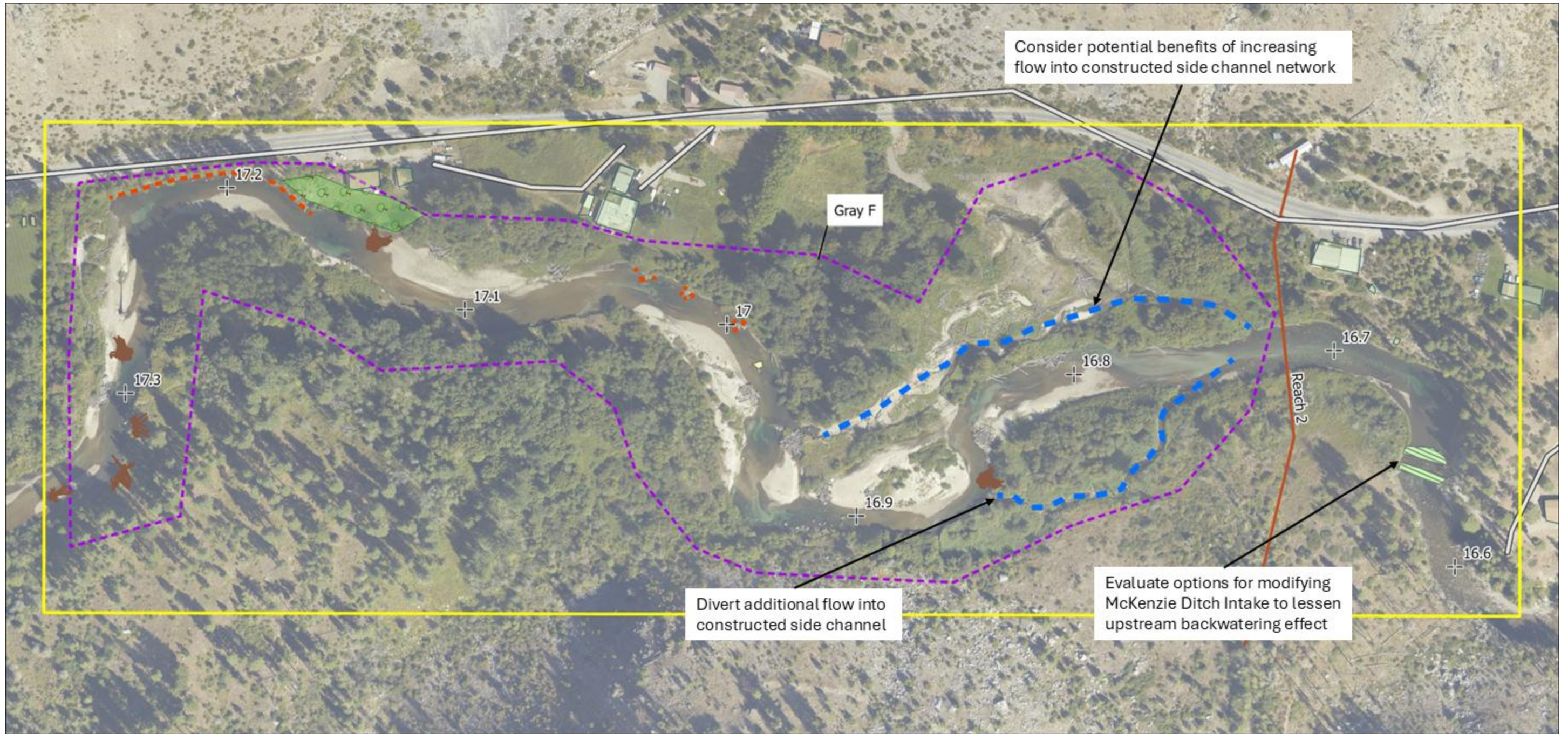


Entiat River Reach Assessment
Project Opportunities
Potato

- Project Elements**
- Log & log with rootwad
 - 2, 3, & 4 log structures
 - Small & large whole tree
 - Small & large apex jams
 - Sm, med & lrg bank jams
 - Side Channel Excavation
 - Side Channel Enhancement
 - Revegetation
 - Remove/Replace Armoring
 - Regrade
 - Reach Breaks
 - Segments

- Built Features**
- Prior Restoration Projects
 - Canal
 - Road
 - Structure

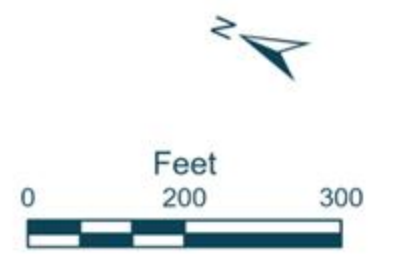


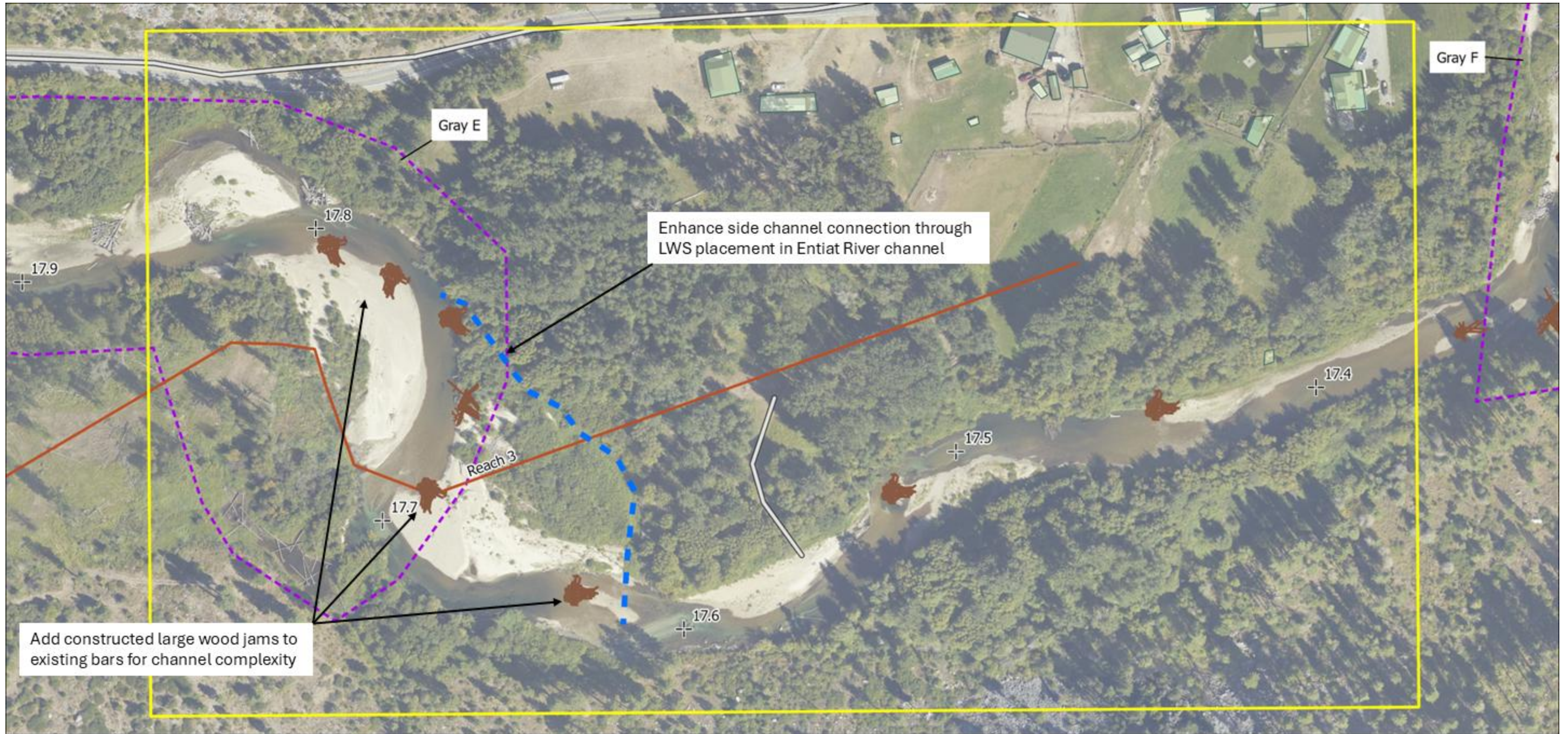


Entiat River Reach Assessment
Project Opportunities
Gray F Revisited

- | Project Elements | | | | | |
|------------------|--------------------------|--|--------------------------|--|--------------|
| | Log & log with rootwad | | Side Channel Excavation | | Reach Breaks |
| | 2, 3, & 4 log structures | | Side Channel Enhancement | | Segments |
| | Small & large whole tree | | Revegetation | | |
| | Small & large apex jams | | Remove/Replace Armoring | | |
| | Sm, med & lrg bank jams | | Regrade | | |

- | Built Features | |
|----------------|----------------------------|
| | Prior Restoration Projects |
| | Riprap/Bank Protection |
| | Road |
| | Debris |
| | Structure |
| | Weir |

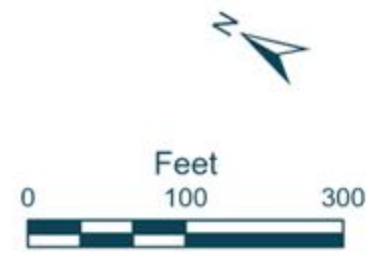


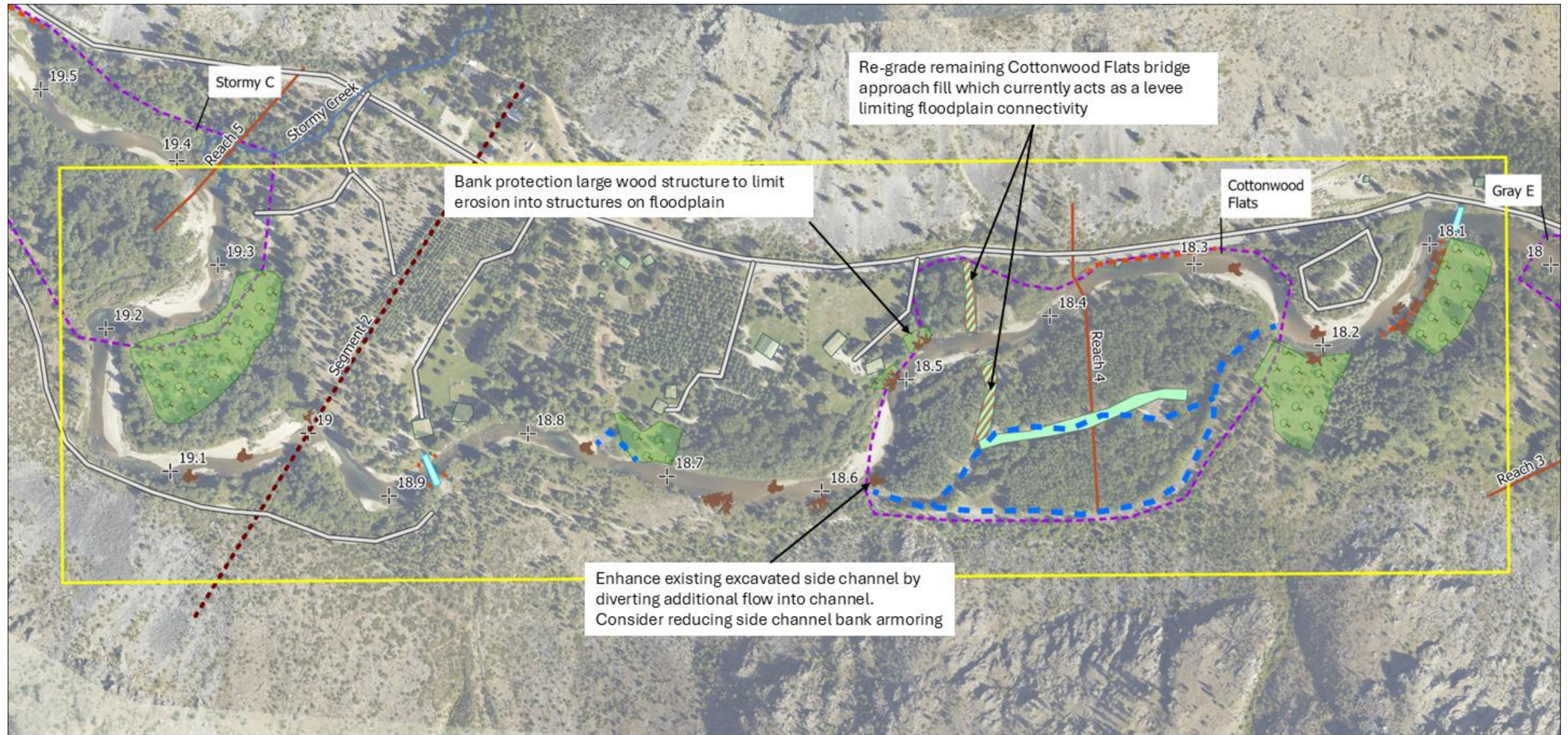


Entiat River Reach Assessment
Project Opportunities
Gray Canyon Fan

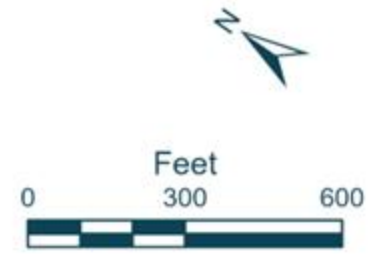
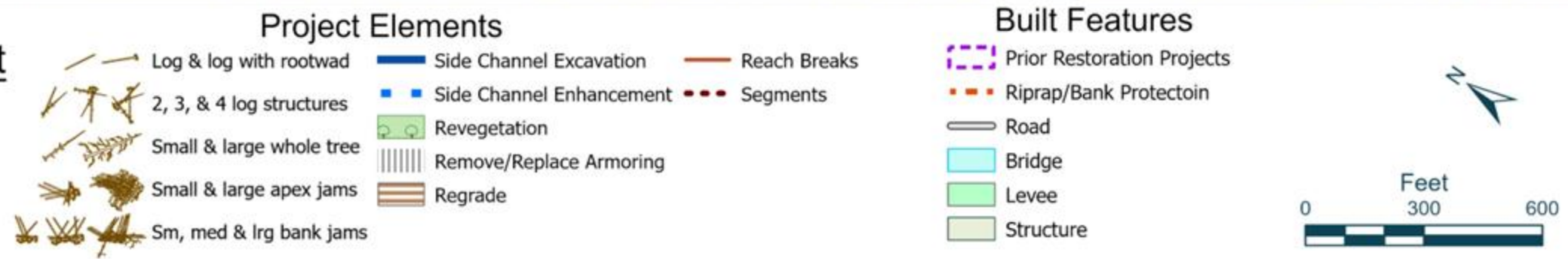
- | Project Elements | |
|------------------|--------------------------|
| | Log & log with rootwad |
| | 2, 3, & 4 log structures |
| | Small & large whole tree |
| | Small & large apex jams |
| | Sm, med & lrg bank jams |
| | Side Channel Excavation |
| | Side Channel Enhancement |
| | Revegetation |
| | Remove/Replace Armoring |
| | Regrade |
| | Reach Breaks |
| | Segments |

- Built Features**
- Prior Restoration Projects
 - Road
 - Structure





Entiat River Reach Assessment
Project Opportunities
Shamel

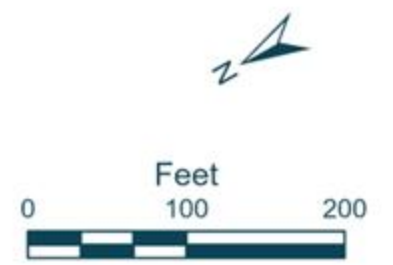


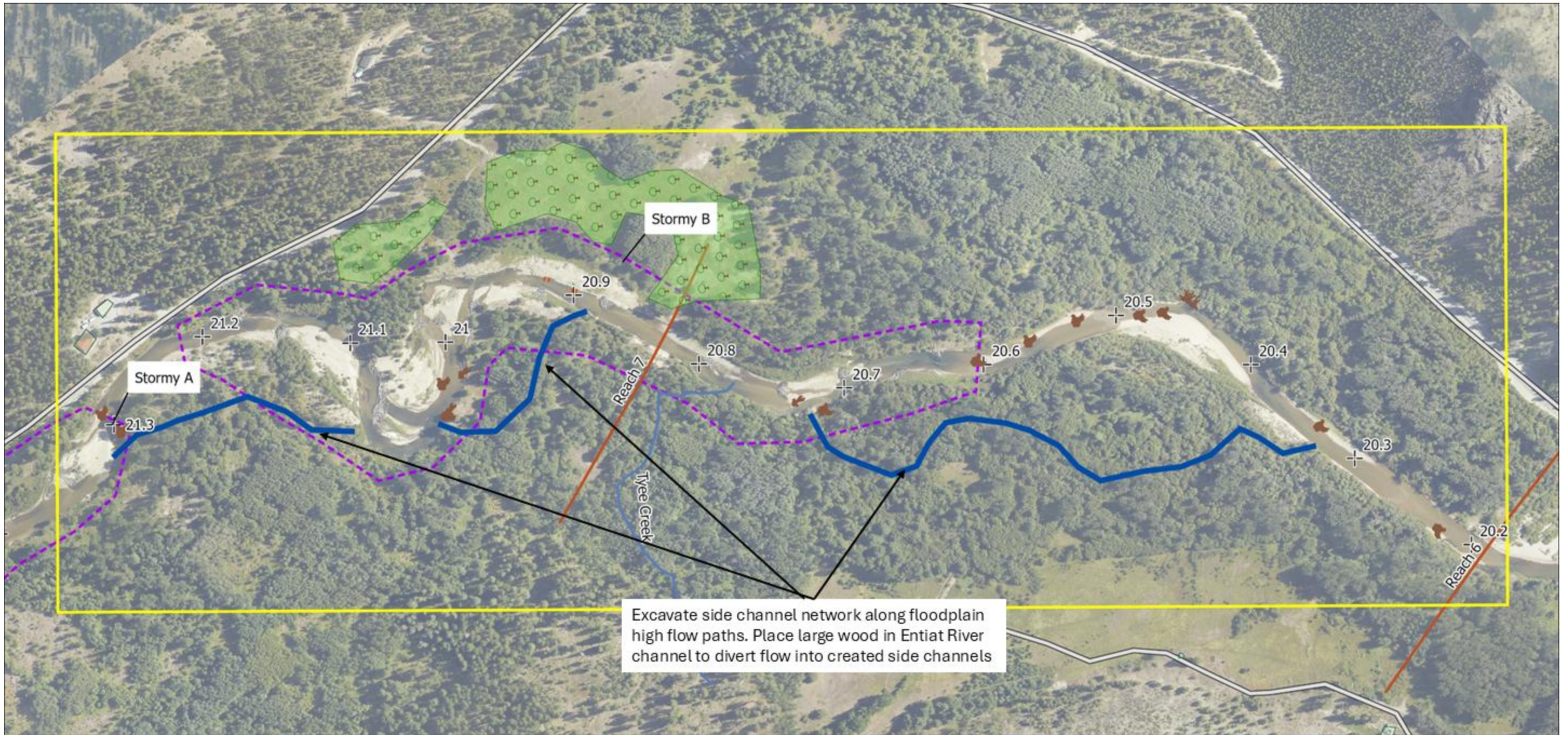


Entiat River Reach Assessment
Project Opportunities
Stormy Avulsion

- Project Elements**
- Log & log with rootwad
 - 2, 3, & 4 log structures
 - Small & large whole tree
 - Small & large apex jams
 - Sm, med & lrg bank jams
 - Side Channel Excavation
 - Side Channel Enhancement
 - Revegetation
 - Remove/Replace Armoring
 - Regrade
 - Reach Breaks
 - Segments

- Built Features**
- Prior Restoration Projects
 - Other
 - Road
 - Debris





Entiat River Reach Assessment
Project Opportunities
Stormy B Revisited

- | Project Elements | |
|------------------|--------------------------|
| | Log & log with rootwad |
| | 2, 3, & 4 log structures |
| | Small & large whole tree |
| | Small & large apex jams |
| | Sm, med & lrg bank jams |
| | Side Channel Excavation |
| | Side Channel Enhancement |
| | Revegetation |
| | Remove/Replace Armoring |
| | Regrade |
| | Reach Breaks |
| | Segments |

- Built Features**
- Prior Restoration Projects
 - Riprap/Bank Protection
 - Road
 - Structure

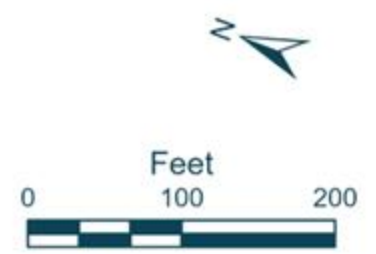


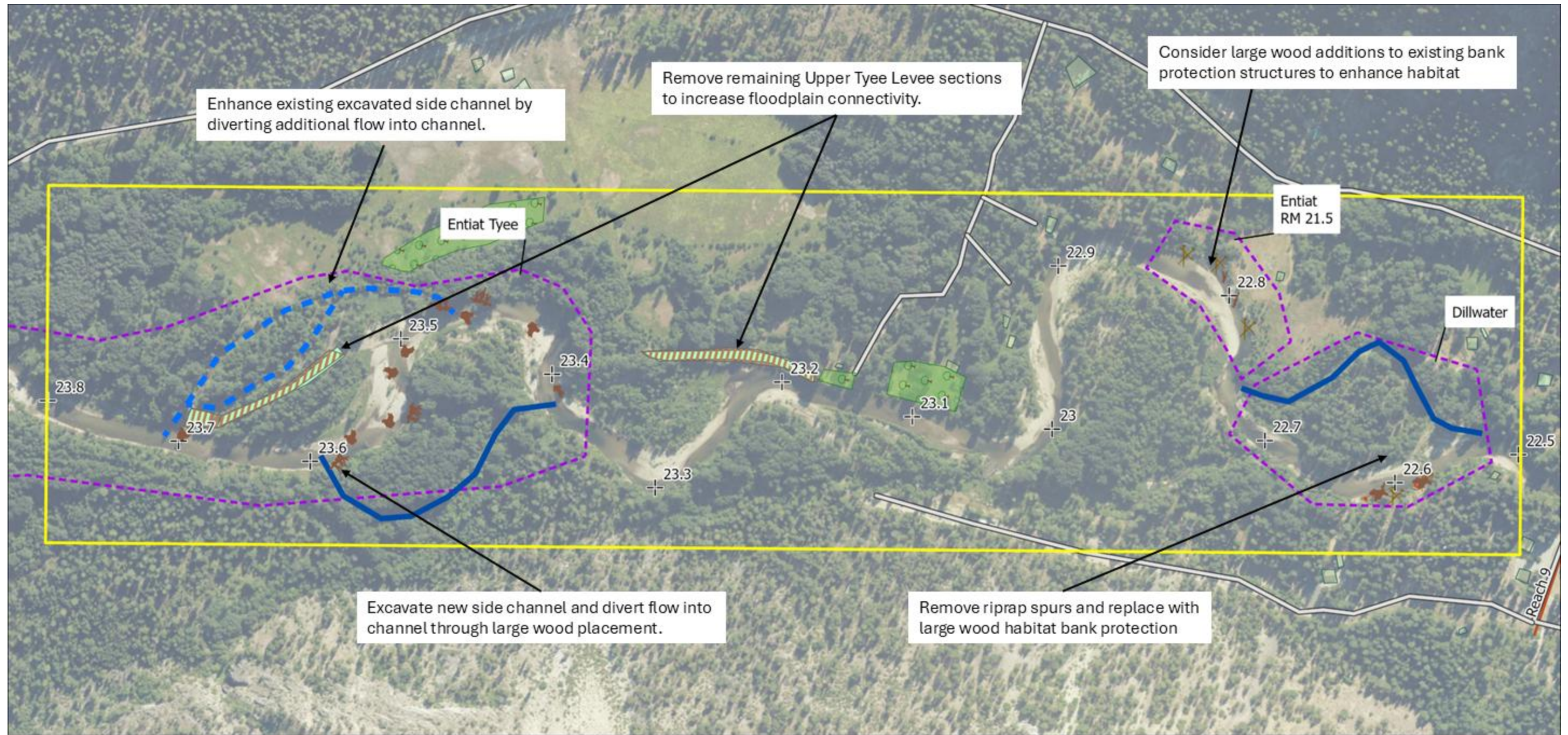


Entiat River Reach Assessment
Project Opportunities
Stormy A Revisited

- | Project Elements | | | |
|------------------|--------------------------|--|--------------------------|
| | Log & log with rootwad | | Side Channel Excavation |
| | 2, 3, & 4 log structures | | Side Channel Enhancement |
| | Small & large whole tree | | Revegetation |
| | Small & large apex jams | | Remove/Replace Armoring |
| | Sm, med & lrg bank jams | | Regrade |
| | | | Reach Breaks |
| | | | Segments |

- | Built Features | |
|----------------|----------------------------|
| | Prior Restoration Projects |
| | Riprap/Bank Protection |
| | Road |
| | Structure |

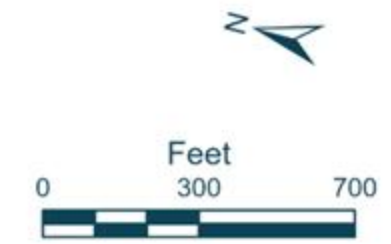


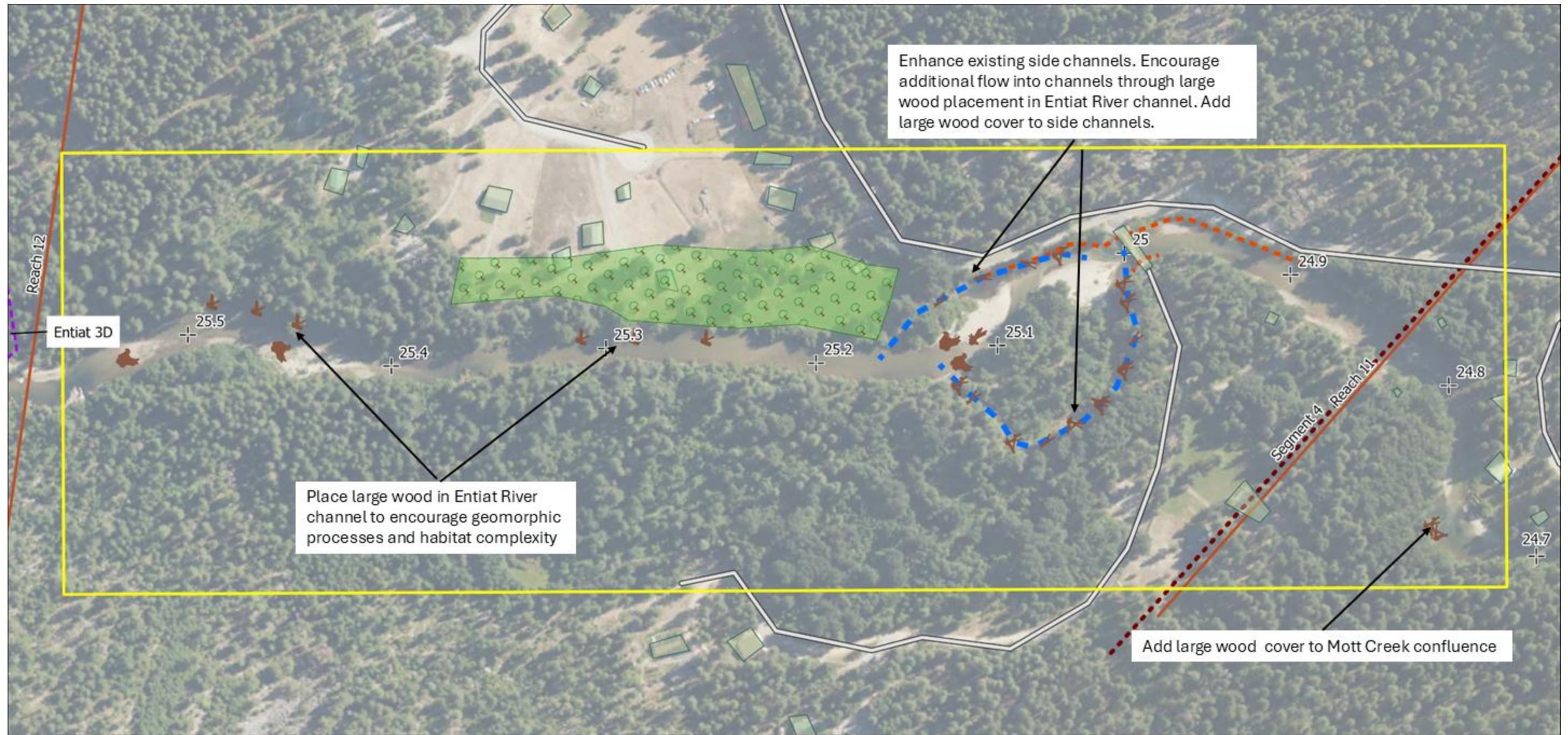


Entiat River Reach Assessment
Project Opportunities
Tye to Dill

- | Project Elements | | | | | |
|------------------|--------------------------|--|--------------------------|--|-------------------------|
| | Log & log with rootwad | | Side Channel Excavation | | Reach Breaks |
| | 2, 3, & 4 log structures | | Side Channel Enhancement | | Segments |
| | Small & large whole tree | | Revegetation | | Remove/Replace Armoring |
| | Small & large apex jams | | Regrade | | |
| | Sm, med & lrg bank jams | | | | |

- | Built Features | |
|----------------|----------------------------|
| | Prior Restoration Projects |
| | Riprap/Bank Protection |
| | Road |
| | Levee |
| | Structure |



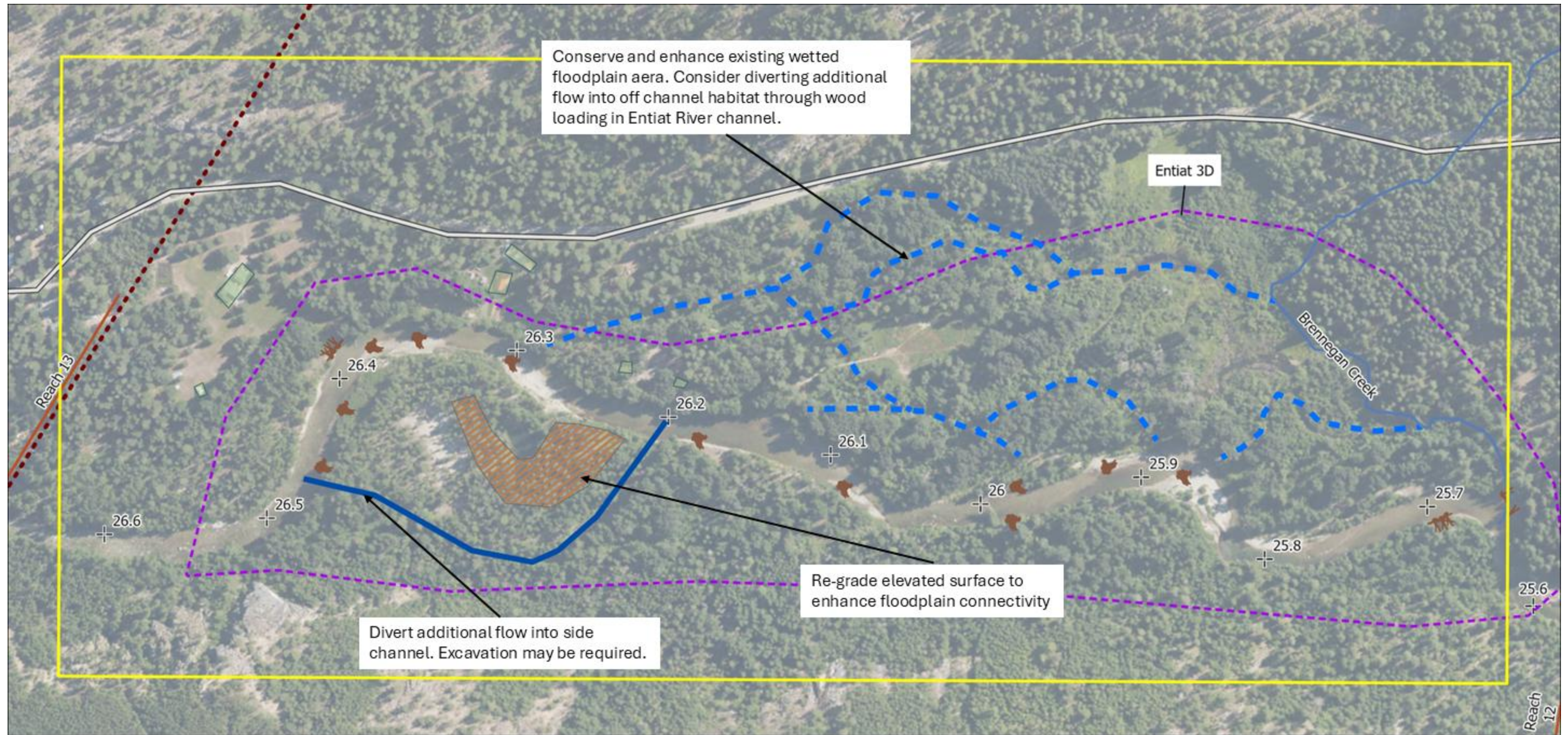


Entiat River Reach Assessment
Project Opportunities
Brennegan

- | Project Elements | |
|------------------|--------------------------|
| | Log & log with rootwad |
| | 2, 3, & 4 log structures |
| | Small & large whole tree |
| | Small & large apex jams |
| | Sm, med & lrg bank jams |
| | Side Channel Excavation |
| | Side Channel Enhancement |
| | Revegetation |
| | Remove/Replace Armoring |
| | Regrade |
| | Reach Breaks |
| | Segments |

- | Built Features | |
|----------------|----------------------------|
| | Prior Restoration Projects |
| | Riprap/Bank Protection |
| | Road |
| | Structure |

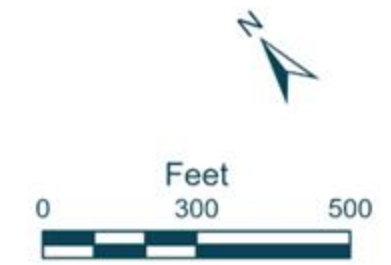




Entiat River Reach Assessment
Project Opportunities
Entiat 3D Revisited

- | Project Elements | | | | | |
|------------------|--------------------------|--|--------------------------|--|--------------|
| | Log & log with rootwad | | Side Channel Excavation | | Reach Breaks |
| | 2, 3, & 4 log structures | | Side Channel Enhancement | | Segments |
| | Small & large whole tree | | Revegetation | | |
| | Small & large apex jams | | Remove/Replace Armoring | | |
| | Sm, med & lrg bank jams | | Regrade | | |

- Built Features**
- Prior Restoration Projects
 - Road
 - Structure



3 Project Prioritization and Ranking

3.1 PRIORITIZATION MATRIX

Project Area						Benefit Score								Cost Score		Cost Benefit	Feasibility Designation		
Tiers	Project Name	Reach	Down-stream RM	Up-stream RM	Total Length (mi)	Restoration Gap Analysis				Existing and Potential Fish Use		Root Causes		Total Benefit Score	Cost Score (1-4)	Rationale/ assumption	Benefit-to-Cost Score	Feasibility Designation	Rationale/ assumption
						Existing Condition (1-7)	Achievable Target (1-7)	Final Gap Score (Target - Existing) (0-6)	Rationale/ assumption	Score (1-3)	Rationale/ assumption	Score (1-3)	Rationale/ assumption						
Tier 1	Tyee to Dill	9	22.55	23.70	1.15	3	6	3	Major FP/SC activation possible.	3	Reach has moderate use for spawning but the project would increase quality of in-channel aquatic habitat as well as expand quantity / access to off-channel habitat for rearing.	2.5	Addresses lack of large in-channel structure but is not able to fully address root causes due to effects of reach-wide incision related to floodplain and CMZ constrictions that are assumed to remain. Berm removal	8.5	2.5	Standard LW loading, off-channel enhancement, berm removal. Generally good access.	3.4	Moderate	Good access. But private lands in downstream portion of project area. Upstream portion owned by CDLT.
	Stormy B Revisited	6-7	20.20	21.30	1.10	3	6	3	Supplemental LW loading and activation of major FP/side channels possible.	2.5	Reach has moderate use for spawning but the project would increase quality of in-channel aquatic habitat as well as expand quantity / access to off-channel habitat for rearing.	1.5	Increases the diversity of habitats and natural processes within the project area. Doesn't address watershed-scale loss of old-growth riparian forests for natural recruitment or system-wide incision-related disconnection from floodplains	7	2.5	Decent access. Some significant digs for off-channel connections. Bigger channel, some private parcels (risk)	2.8	High	Few landowners, including CDLT; access to river-right may be tricky for heavy construction equipment
	Gray Canyon Fan	2	17.35	17.85	0.50	3	6	3	Good opportunity to add substantial complexity to a fairly simple section of channel where houses are further away from banks	2	Limited spawning (Stlhd, SpChin) has been observed in this reach; LW loading and SC activation could increase available habitat for spawning and rearing	1.5	LW loading doesn't address watershed-scale loss of old-growth riparian forests for natural recruitment. Homes are set back from the channel and may allow for more natural CMZ process, however, impacts to 100-yr WSEs may limit	6.5	2.5	Fairly standard LW loading. Some substantial digs for floodplain fill removal or for reconnection of off-channel connections.	2.6	Moderate-High	Houses further away, but a number of different private landowners
	Entiat 3D Revisited	12	25.65	26.50	0.85	4	6	2	Major FP/SC activation possible.	2.5	Reach has moderate use for spawning and the project would slightly increase quality of in-channel aquatic habitat as well as expand quantity / access to off-channel habitat for rearing.	2	Addresses lack of large in-channel structure but is not able to fully address root causes due to effects of reach-wide incision related to floodplain and CMZ constrictions that are assumed to remain.	6.5	2.5	Good access. Some significant digs for off-channel connections.	2.6	High	Private and CDLT landownership

Project Area						Benefit Score							Cost Score		Cost Benefit	Feasibility Designation			
Tiers	Project Name	Reach	Down-stream RM	Up-stream RM	Total Length (mi)	Restoration Gap Analysis				Existing and Potential Fish Use		Root Causes		Total Benefit Score	Cost Score (1-4)	Rationale/ assumption	Benefit-to-Cost Score	Feasibility Designation	Rationale/ assumption
						Existing Condition (1-7)	Achievable Target (1-7)	Final Gap Score (Target - Existing) (0-6)	Rationale/ assumption	Score (1-3)	Rationale/ assumption	Score (1-3)	Rationale/ assumption						
Tier 2	Gray F Revisited	2	16.75	17.35	0.60	4	5	1	Previously constructed side channels present; could increase connectivity by LW loading and possibly targeted excavation	2	Spawning (Stlhd, SpChin) has been observed in this reach; LW loading and SC activation could increase available habitat for spawning and rearing	1.5	LW loading doesn't address watershed-scale loss of old-growth riparian forests for natural recruitment or loss of CMZ that allows for natural formation of off-channel habitats. Removal of weir would restore root causes.	4.5	2	Fairly standard LW loading; access may be more challenging now after previous restoration work.	2.3	High	Previous project done here
	Shamel	3-4	18.10	19.30	1.20	3	5	2	Major FP/SC activation possible, but full uplift limited by residential uses within the project area and floodplain	1.5	Limited spawning (Stlhd, SpChin) has been observed in this reach, especially upstream where confinement is higher; LW loading and SC activation could increase available habitat for spawning and rearing	1.5	Major FP/SC activation possible within CMZ, but full uplift limited by residential uses within the project area and floodplain	5	2.5	Decent access. Some substantial LW loading, possibly some excavation for reconnection of off-channel areas.	2.0	Moderate-High	Primarily CDLT; some private landownership
	Stormy A Revisited	7	21.65	22.10	0.45	4	5	1	Supplemental LW will increase condition, but not by much given previous project	2	Reach is used for spawning and project increases cover and complexity of habitat, but may not dramatically increase potential fish use from current.	1	Addresses lack of large in-channel structure but is not able to fully address root causes due to effects of reach-wide incision related to floodplain and CMZ constrictions that are assumed to remain.	4	2	Standard LW loading; access may be more challenging now after previous restoration work.	2.0	High	Previous project done here
Tier 3	Brennegan	10-11	24.70	25.55	0.85	3	4	1	Straight channel not going to change in upper portion of project area; limited due to recent residential development	1.5	Area has moderate use but the higher-energy channel in the upstream portion of the project area may limit potential enhancement and not dramatically increase potential fish use from current.	1	Addresses lack of large in-channel structure but is not able to fully address root causes due to effects of reach-wide incision related to floodplain and CMZ constrictions that are assumed to remain, including bridge.	3.5	2	Standard LW loading. Good access.	1.8	Low-Moderate	Lots of private landownership
	Stormy Avulsion	5	19.50	20.10	0.60	4	5	1	Small project area, but beneficial to keep channel from flowing fully against the road.	1.5	Spawning (Stlhd, SpChin) has been observed in this reach; LW loading could restore/maintain habitat for spawning and rearing	1	Reduces potential for full side channel capture against the road prism, but doesn't provide substantial uplift or addressing root causes of degradation in the system.	3.5	2.5	Decent access, some earthwork and LW loading likely.	1.4	High	Decent access, single landowner.
	Potato	1	15.60	16.65	1.05	3	4	1	The channel within this project area is relatively steep and confined, with little floodplain area available, limiting restoration potential	1	The channel within this project area is relatively steep and confined, limited potential spawning or rearing activities.	1	The channel within this project area is relatively steep and confined. LW loading doesn't address watershed-scale loss of old-growth riparian forests for natural recruitment	3	2.5	Some potential access challenges. Ballasting jams could be challenging due to large substrate.	1.2	Moderate	Decent access to left bank but challenging on river-right. Private lands.

3.2 PROJECT RANKING METHODS

- Step 1:** **Benefit Score:** Projects are scored according to 3 benefit categories, which include a “recovery gap” category and 2 additional categories. Scores for each category are summed to obtain the **Benefit Score**.
- Step 2:** **Cost Score:** Projects are given a **Cost Score**, which reflects the overall *relative cost* for the project based on techniques, access, and construction feasibility issues.
- Step 3:** **Benefit-to-Cost Score:** Total benefit score (sum of all 4 benefit scores) is divided by the cost score to obtain the **Benefit-to-Cost Score**.
- Step 4:** **Feasibility Designation:** Projects are given a **Feasibility Designation** based on the overall likely feasibility of being able to implement the project within a 10-year timeframe.

Benefit Score

The Benefit Score includes the summation of scores from 3 categories. These include the Recovery Gap score (0-6 points), the Fish Use score (1-3 points), and the Root Causes score (1-3 points). The guidelines for scoring are provided below.

Recovery Gap

Existing Condition Rating (1-7)

- 1 – Very low ecosystem function and habitat quality. Highly altered systems.
- 2 – Low ecosystem function and habitat quality.
- 3 – Low-to-moderate ecosystem function and habitat quality.
- 4 – Moderate ecosystem function and habitat quality.
- 5 – Moderate-to-high ecosystem function and habitat quality.
- 6 – High ecosystem function and habitat quality.
- 7 – Very high level of natural ecosystem function and habitat quality. Pristine, unaltered systems.

Achievable Condition Rating (1-7)

These ratings use the same categories as above but reflect the future potential recovery trajectory. This is a rating of what can realistically be achieved given past and on-going impacts and constraints of land use, infrastructure, social acceptance, and ownership. Ratings should reflect an “optimistic potential scenario” in order to not discount large potential changes.

Final Gap Score (0-6)

This is simply the achievable condition rating minus the existing condition rating. This represents the gap that can be filled between existing and target conditions through restoration measures.

Fish Use

- 3 – High existing or potential productivity area for spawning or rearing for multiple species
- 2 – Moderate existing or potential productivity area for one or more species
- 1 – Low existing or potential productivity area for one or two species

Root Causes

- 3 – Restoration of root causes and key physical processes that create and maintain habitat over time
- 2 – Partial restoration of root causes
- 1 – Primarily a structurally-focused restoration strategy that doesn’t significantly address underlying causes

Cost Score

The cost score reflects the relative cost for the project based on techniques, access, and feasibility issues. This is a relative cost, not an absolute cost, so the scale of the project is NOT factored into this score. The cost score ranges from 1 to 3, with 1 reflecting relatively lower cost projects. The following guidelines/examples can help to determine the cost score.

4 – High relative cost

- Requires high-cost techniques or materials (e.g., highly engineered log jams, extensive channel shaping, water crossings or bridges)
- Deep excavation or long-distance hauling of spoils
- Entails construction of additional new flood control or bank erosion features (e.g. set-back levees or buried rip-rap)
- Intensive de-watering requirements
- Limited, difficult, or remote access

2-3 – Moderate relative cost

- Uses moderate cost techniques (e.g. typical log jam structures)
- Moderate excavation and hauling distance of spoils
- Typical planting or invasive weed control
- Moderate access conditions
- Standard or no de-watering requirements

1 – Low relative cost

- Uses low cost techniques (e.g. non-ballasted log placements)
- Minimal excavation and hauling distance of spoils
- Little to no planting or weed control
- Easy access conditions
- No de-watering required
- Availability of free materials or volunteer labor

Benefit-to-Cost Score

The benefit-to-cost score is simply the benefit score divided by the cost score. This is a relative value used to compare project benefits.

Feasibility Designation

The feasibility designation is the overall likely feasibility of being able to implement the project within a 10-year timeframe. This is based on landownership, as well as economic, regulatory, political, social, permitting, or other considerations that are known to impact the feasibility of conducting projects within a reasonable timeframe. The feasibility designation is not used as part of the project scoring because feasibility issues may change over time and it is desirable to evaluate project benefits independent of feasibility. The designations include the following:

High feasibility

- No known feasibility issues.
- One or two landowners; or landowner(s) has already indicated willingness

Moderate feasibility

- There are potential feasibility constraints that could affect the likelihood of project implementation within a 10-year timeframe
- Three to five landowners; or there is reason to believe landowner(s) would grant permission

Unlikely feasibility

- There are known feasibility constraints that would be expected to limit the ability to implement the project within a 10-year timeframe
- More than five landowners: or there is reason to believe landowner(s) would not grant permission