
















Appendix C: Lower Twisp Project Opportunities



Reach	Project Number	Sub-Unit	Strategy Category	Project Name	Description	Photo
1	Project RM 0.3R	Inner Zone 1 (IZ-1)	In-stream Habitat Enhancement	LWD habitat enhancement	The bank in this area has been protected with riprap beginning at the bridge and extending down to RM 0.25. The riprap is currently protecting residences built in DOZ-3. Riprap limits geomorphic connectivity (e.g. channel migration), riparian function, and habitat complexity. Bank protection should be maintained for safety, but could be enhanced with LWD to enhance in-stream habitat cover/complexity.	 <p>Looking downstream to the northeast at the river-right bank near RM 0.3 where LWD could enhance a riprap protected bank (October 2009).</p>
1	Project RM 0.53L	Inner Zone 1 (IZ-1)	Reconnect Stream Channel Processes	Side-channel habitat reconnection	In 1985, this side-channel was mapped as active split flow. Currently, the channel is scoured and contains un-vegetated alluvial material indicating a frequent high-flow connection; however, there is no active flow when water levels are low. A low-flow connection could be enhanced to provide a perennial split flow channel. Protection of adjacent residences would be a primary consideration. A small portion of riprap near the downstream outlet could be moved to the margin of the floodplain surface.	 <p>View looking upstream toward the northwest at a small high-flow channel that could be enhanced to provide side-channel habitat at all flow levels (October 2009).</p>
2a	Project RM 0.87R	Disconnected Outer Zone 1 (DOZ-1)	Off-Channel Habitat Enhancement	Wetland habitat enhancement	The downstream outlet of the acclimation ponds is near RM 1.05. Downstream of that point, there is topographic and vegetative evidence of a more active hydrologic connection between the channel and DOZ-1. This area is also managed by MSRF. MSRF breached the levee in several places, allowing for semi-annual flooding. Groundwater investigation by MSRF does not support a flow augmentation here. This channel could be developed with a surface connection to an active side-channel near RM 0.9, enhancing connectivity between channel and floodplain processes and habitats. There is also potential to create an active low-flow side-channel through this area in combination with Project RM 1.0R.	 <p>Floodplain channel near RM 0.9. This channel is continuous across the surface but is currently not well-connected (October 2009).</p>




Reach	Project Number	Sub-Unit	Strategy Category	Project Name	Description	Photo
2a	Project RM 0.88L	Inner Zone 2 (IZ-2)	Reconnect Stream Channel Processes	LWD enhancement and side-channel reconnection	LWD jams at this location would enhance LWD that is naturally being deposited in this area and could enhance flows into adjacent high-flow channels. Downstream near RM 0.86, a bar apex log jam would be used to enhance a gravel bar high-flow cut-off. The cut-off channel is scoured and appears active. The purpose of the jam would be to increase scour, increase low flow discharge in the channel, and provide improve habitat.	 <p>View looking upstream toward the west at LWD near RM 0.9 (October 2009).</p>
2a	Project RM 0.95R	Inner Zone 2 (IZ-2)	Off-Channel Habitat Enhancement	Alcove habitat enhancement	This wood structure would enhance an existing backwater pool that has above average residual depth, providing cover and habitat complexity.	 <p>View looking downstream toward the east at an alcove near RM 0.95 (October 2009).</p>
2a	Project RM 1.0R	Disconnected Outer Zone 1 (DOZ-1)	Reconnect Floodplain Processes	Levee removal	There is a 560 ft long push-up levee that creates a barrier to downstream connection to high-flow across the floodplain, and to the connectivity of off-channel and floodplain side-channel habitat. The levee does not appear to provide protection to vital infrastructure and could be removed to re-establish floodplain connectivity.	 <p>View looking east in the downstream direction at an old irrigation ditch in the center of the photo protected by a levee on the right (October 2009).</p>




Reach	Project Number	Sub-Unit	Strategy Category	Project Name	Description	Photo
2a	Project RM 1.05L	Inner Zone 2 (IZ-2)	Reconnect Stream Channel Processes	Riprap modification or removal	A 300 ft levee is located on the left bank of the river centered on RM 1.05. There are houses on the floodplain about 200 ft to the north. This levee could be set back to provide protection to the structure while allowing more dynamic inner zone processes to take place. Or the current location of the revetment could be maintained, but replaced/enhanced with LWD.	 <p>View looking towards the left bank at a levee near RM 1.05 (October 2009).</p>
2a	Project RM 1.15L	Inner Zone 2 (IZ-2)	In-Stream Habitat Enhancement	LWD enhancement	This project would involve the placement of several log jams along the river-left bank in order to control erosion and provide cover to improve habitat quality.	 <p>View looking towards the left bank at eroding bank near RM 1.15 (October 2009).</p>
2a	Project RM 1.19R	Inner Zone 2 (IZ-2)	Reconnect Stream Channel Processes	Side-channel reconnection	An existing side-channel would be enhanced with placement of an apex wood jam. There is an existing jam at this location that would be enhanced.	 <p>View looking downstream at point bar with potential for apex jam placement near RM 1.19 (October 2009).</p>

Reach	Project Number	Sub-Unit	Strategy Category	Project Name	Description	Photo
2a	Project RM 1.21R	Inner Zone 2 (IZ-2)	In-Stream Habitat Enhancement	LWD enhancement	This project includes placement of several log jams along the river right bank to control erosion and increase cover for habitat enhancement.	 <p>View looking upstream at eroding bank on river-right near RM 1.21. Smolt trap in background (October 2009).</p>
2a	Project RM 1.25R	Disconnected Outer Zone 1 (DOZ-1)	Riparian Habitat Enhancement	Riparian re-vegetation	Several acres of riparian forest have been cleared on the south side of the valley for residential and agricultural development. There is no active agricultural or residential use for this cleared area, and the potential exists to re-plant native riparian vegetation to enhance habitat quality. The land is currently under protection and slated for riparian restoration.	 <p>View to the south at a cleared floodplain area near RM 1.25 (October 2009).</p>
2a	Project RM 1.2L	Disconnected Outer Zone 2 (DOZ-2)	Riparian Restoration	Riparian re-vegetation	Several acres of riparian forest have been cleared north of the channel between RM 1.0 and 1.3. This clearing was originally agricultural, but now appears to be fallow. The land is under protection and is slated for riparian restoration. Re-planting native riparian vegetation would enhance habitat quality and stream processes by increasing solar shading of the channel, and eventually providing a source for large woody debris.	
2a	Project RM 1.28L	Disconnected Outer Zone 2 (DOZ-2)	Reconnect Floodplain Processes	Levee removal	Along the channel margin at the upstream end of DOZ-2, a levee protects an abandoned irrigation canal. Without the need to protect the canal, the levee could be removed to re-establish channel/floodplain connection between processes and habitat.	 <p>View looking east in the downstream direction at an old irrigation ditch in the center of the photo protected by a levee on the right (October 2009).</p>





Reach	Project Number	Sub-Unit	Strategy Category	Project Name	Description	Photo
2a	Project RM 1.45C	Inner Zone 1 (IZ-1)	In-Stream Habitat Enhancement	LWD enhancement	Between RM 1.4 and 1.5 there are several opportunities for placement of LWD on both sides of the channel. These structures would increase habitat cover and complexity.	 <p>View looking east in the downstream direction near RM 1.45 where both sides of the channel provide opportunities for LWD enhancement (October 2009).</p>
2a	Project RM 1.7R	Disconnected Outer Zone 1 (DOZ-1)	Reconnect Floodplain Processes	Levee removal or set-back	At the upstream end of the reach, a levee runs along the right bank of the channel for approximately 1,869 feet. Residential development does not begin for several hundred feet downstream. The levee could be set back farther on the floodplain to provide more direct protection for residential development, and re-establish a connection between channel/floodplain processes and habitats.	 <p>View looking downstream towards the east at a levee along river-right (October 2009).</p>
2b	Project RM 1.72L	Disconnected Outer Zone 5 (DOZ-5)	Off-Channel/Side-Channel Habitat Enhancement	Alcove habitat enhancement	This project would create an off-channel backwater/alcove at the upstream end of the north channel of the split-flow area between RM 1.68 and 1.73. The backwater would provide high-flow refugia for fish in the active channel and provide connectivity between channel and floodplain habitat.	
2b	Project RM 1.75L	Inner Zone 5 (IZ-5)	Reconnect Stream Channel Processes	Riprap removal	Downstream of the bridge at RM 1.85, the river-left channel is protected by riprap for over 700 feet. There is no residential development or other infrastructure in the adjacent floodplain. The riprap could be removed and replaced with LWD in order to reconnect stream channel and floodplain processes and to increase habitat cover and complexity. Alternatively, the riprap could remain in place and be enhanced with LWD additions.	 <p>Northeast view in the downstream direction of riprap bank along river-left downstream of the bridge at RM 1.87 extending to RM 1.71 (October 2009).</p>



Reach	Project Number	Sub-Unit	Strategy Category	Project Name	Description	Photo
2b	Project RM 1.87L	Inner Zone 5 (IZ-5)	Reconnect Stream Channel Processes	Abutment removal	An old bridge abutment is located along the river-left channel margin. The abutment currently serves no purpose, but creates a process barrier. Removal would enhance inner zone processes.	 <p>Northeast view in the downstream direction at an old bridge abutment along river-left near RM 1.87 (October 2009).</p>
2b	Project RM 2.0R	Disconnected Outer Zone 4 (DOZ-4)	Reconnect Floodplain Processes	Wetland habitat reconnection	A larger effort to reconnect habitat and process throughout DOZ-4 would require several culverts on Poorman road, multiple private roads, and multiple landowner approval. This approach is mentioned by the BOR as the “Spokane Grade” project (BOR 2008). The effort faces too many constraints to be considered here. A scaled-back approach with one culvert to connect floodplain wetlands at the downstream end is described here. This project involves replacing a culvert at RM 2.0 in order to re-connect off-channel habitat south of Poorman Road between RM 2.0 and 2.4.	 <p>View to the west in the upstream direction at wetlands south of Poorman Road in DOZ-4 (November 2009).</p>
2b	Project RM 2.25C	Disconnected Outer Zone 4 (DOZ-4)	Reconnect Floodplain Processes	Bridge and road relocation	The Twisp River Road and Poorman Road corridor create disconnected outer zone areas and limit channel processes through the downstream end of the reach. Limited reconnection can be achieved by installing culverts or bridges as described in Project RM 2.0L. However greater physical and ecological connectivity could be gained by a large scale relocation of the road junction. Several options exist for this modification. The greatest benefit may be gained by removing the bridge at RM 1.85, and decommissioning Twisp River Road between RM 1.85 and 2.2. This, along with riprap removal on river left near RM 1.8, would reconnect DOZ5. Poorman road between RM 1.85 and 2.7 would be moved south against the hillslope, thus reconnecting a large portion of DOZ4. The bridge would be moved near RM 2.25 with multiple culverts providing hydrologic connection through Twisp River Road as it traverses DOZ4 and then climbs out of the floodplain onto the terrace to the north of the channel.	



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2b	Project RM 2.25R	Inner Zone 5 (IZ-5)	Reconnect Stream Channel Processes	Riprap modification or removal	This project involves incorporation of LWD along the riprap bank with the goal of increasing habitat complexity and quality. There is a backwater created by the crest of a riffle. A LWD structure could provide enhanced pool habitat in this area.	 <p>Northwest view in the upstream direction at a potential LWD location along river-right near RM 2.25 (October 2009).</p>
2b	Project RM 2.3L	Outer Zone 7 (OZ-7)	Off-Channel Habitat Enhancement	Side-channel habitat enhancement	An existing meander scar could be excavated and opened up to create a floodplain channel. There is no evidence that the feature is frequently inundated. The downstream end of the channel could be widened to create a backwater/alcove connected to the active channel.	
2b	Project RM 2.65R	Inner Zone 4 (IZ-4)	Reconnect Stream Channel Processes	Riprap modification or removal	This project involves in-channel work over a 640 ft section of the river-right bank centered on RM 2.65. The bank is hardened to protect homes on the terrace near the channel margin. The riprap could be replaced with, or enhanced by, LWD structures in order to provide increased habitat complexity, enhanced inner zone process, and to maintain bank stability and protection. At the downstream end of the bank protection there is an area of deep slow moving water along the edge of the riprap. An LWD structure here could enhance this slack water forming a pool with higher habitat value.	 <p>Southeast view in the downstream direction at a portion of the riprap that extends along river right between RM 2.58-2.75 (October 2009).</p>
2b	Project RM 2.7L	Disconnected Inner Zone 3 (DIZ-3)	Reconnect Stream Channel Processes	Levee removal and side-channel reconnection	This project involves removing anthropogenic features to reconnect inner zone processes. A portion of the high flow channel is currently ditched, lined, and routed into a catch basin near RM 2.7. There are also two push-up levees in this area that limit connectivity of channel and floodplain processes. These features could be removed to enhance floodplain and side-channel connectivity.	 <p>View to the east in the downstream direction at a catch basin that has been built to capture high-flow from a side-channel near RM 2.7 (October 2009).</p>




Reach	Project Number	Sub-Unit	Strategy Category	Project Name	Description	Photo
2b	Project RM 2.9C	Inner Zone 4 (IZ-4)	In-Stream Habitat Enhancement	LWD enhancement.	LWD structures on both sides of the channel would increase habitat cover, pool scour, and complexity	 <p>Northeast view in the downstream direction at a potential LWD location along river-right near RM 2.9. The left side of the channel provides a similar opportunity (October 2009).</p>
2b	Project RM 2.93L	Inner Zone 4 (IZ-4)	In-Stream Habitat Enhancement	LWD enhancement	This is a location where LWD could be added to the channel along river-left near RM 2. This project is located in an active side-channel. The log jam would provide habitat complexity in the side channel.	 <p>View to the northwest in the upstream direction at a side channel near RM 2.93 (October 2009).</p>
2b	Project RM 3.0R	Disconnected Outer Zone 4 (DOZ-4)	Reconnect Floodplain Processes	Levee removal, side-channel reconnection	Habitat actions proposed for this project would re-connect several floodplain sub-units and the active channel. Currently a large levee extends 550 ft between RM 3.1 and 3.2. The levee creates a process and habitat barrier between DOZ-3, DOZ-4, and OZ-4. High-flow channels and wetlands occupying older channel scars intersect the levee and terminate, with the water entering the levee prism and going sub-surface. LiDAR data suggests that these high flow channels historically extended beyond the levee connecting with wetland features in DOZ-4. The levee does not appear to serve a protection purpose; there is no residential development or transportation corridor nearby. In addition to removing the levee, high flow channels and off-channel habitat would be enhanced to re-establish historical floodplain connections and functions in the system.	 <p>Northeast view along the top of the levee near RM 3.2 that creates an ecological and physical barrier between multiple floodplain sub-units (October 2009).</p>









Reach	Project Number	Sub-Unit	Strategy Category	Project Name	Description	Photo
2b	Project RM 3.13C	Inner Zone 4 (IZ-4)	Reconnect Stream Channel Processes	Re-establish channel LWD dynamics	This project entails enhancing an existing apex jam in order to increase channel complexity, and enhance an existing side-channel by encouraging split-flow at all flow levels. The side-channel currently sees active flow during annual high-flow events. Creating a split-flow condition would increase habitat complexity. Habitat features could be installed throughout the side-channel as well.	 <p>View to the northeast in the downstream direction at a side-channel near RM 3.13 (October 2009).</p>
2b	Project RM 3.25R	Inner Zone 4 (IZ-4)	In-Stream Habitat Enhancement	LWD enhancement	A LWD meander bend jam would improve local habitat and cover. Existing riparian vegetation is in good condition along the bank and enhancing lateral channel adjustment processes could drive future LWD recruitment	 <p>Northeast view in the downstream direction at a potential LWD jam location on river-right near RM 3.25 (October 2009).</p>
2b	Project RM 3.35L	Inner Zone 4 (IZ-4)	Reconnect Stream Channel Processes	Levee removal and side-channel reconnection	This project involves enhancement of a river-left side-channel that runs between RM 3.22 and 3.38. This side-channel was the active channel location in 1954 and 1964 aerial photos. Geomorphic and vegetative evidence suggests an active connection to inner zone processes that could be enhanced through a combination of actions. Enhancement of an existing bar apex jam would encourage flow into the side-channel. The existing jam is limited by current wood recruitment levels. A 200 ft long push-up levee currently creates a flow barrier between the main channel and the side-channel at the downstream end. Removing this levee would allow inner zone processes to proceed unimpeded.	 <p>Northeast view in the downstream direction at a small LWD jam at a bar apex near RM 3.38 (October 2009).</p>
2b	Project RM 3.5L	Outer Zone 3 (OZ-3)	Off-Channel Habitat Enhancement	Side-channel habitat enhancement	This project involves re-activating a high-flow channel between RM 3.3 and 3.6. Currently, the channel does not appear to be regularly inundated, but cross-section geometry suggests that moderate flows were historically accommodated in this channel. Excavation would be required to lower the upstream end of the channel and activate flow at a 1.5-2 yr frequency. The channel is well defined in its upstream half and would require minimal mechanical enhancement to accommodate flow. Excavation is needed to construct a channel and outlet at the downstream end of the project. Dry ground and upland vegetation suggest that groundwater would not be a significant contributor to flow in this channel.	 <p>Northeast view in the downstream direction at the historical high-flow channel found between RM 3.3 and 3.6 in OZ-3 (October 2009).</p>




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2b	Project RM 3.6L	Inner Zone 3 (IZ-3)	In-Stream Habitat Enhancement	LWD enhancement	The project includes a LWD bank structure on the outside of a bend in the river. Several pieces could be placed to enhance cover and habitat, and drive pool formation on the outside of the meander.	 <p>East looking view of the river left bank of the channel near RM 3.6 where a LWD structure would enhance habitat and re-establish inner-zone processes (October 2009).</p>
2b	Project RM 3.7R	Disconnected Outer Zone 3 (DOZ-3)	Off-Channel Habitat Enhancement	Wetland habitat enhancement	The overall goal of this project is to re-connect the “Chain of Lakes”, a large area of off-channel habitat, and re-establish hydrologic and geomorphic connection between DOZ-3 and the main channel. Fish access to this off-channel habitat would be enhanced by developing up and downstream surface connections and by improving culvert passability between wetlands to create a well-connected longitudinal system. The upstream surface connection could be developed off an active side-channel near RM 4.05. This side-channel is proposed for enhancement under Project RM 4.1C. Culvert passability through 6 dikes would need to be addressed to ensure flow-through connection between each of the ponds. Currently there are several downstream drainage points. Some of the ponds appear completely blocked at the downstream end and surface flow is diverted to the channel. This occurs at RM 3.85 and 3.9. Neither of these outflows provides habitat connection between the channel and off-channel locations. The downstream-most outlet locations are at RM 3.32 and 3.45. One or all of these outlets would be enhanced to allow connection to the channel. Water quality and presence of non-native fish would be of concern.	
2b	Project RM 3.9R	Disconnected Outer Zone 3 (DOZ-3)	Off-Channel Habitat Enhancement	Alcove habitat enhancement	At RM 3.9, there is a low area on the channel margin that forms the drainage point for the upstream end of the “Chain of Lakes” (Figure 20). Despite the berms that surround the wetlands, and the lack of natural drainage, there is a small surface discharge into the channel. This topographic low point could be excavated into the floodplain to create an off-channel alcove that connects channel and floodplain habitats.	 <p>View to the southwest toward the outlet of the upstream end of the "Chain of Lakes" near RM 3.9 (October 2009).</p>





Reach	Project Number	Sub-Unit	Strategy Category	Project Name	Description	Photo
2b	Project RM 4.15C	Inner Zone 2 (IZ-2)	Reconnect Stream Channel Processes	Levee removal and channel process reconnection	Between RM 4.0 and 4.2 there are several side-channels that provide the opportunity to encourage split flow processes, increase side-channel habitat, and reduce shear stress that may be responsible for observe bank erosion. Placement of a bar-apex LWD jam on river right at RM 4.18 could increase side-channel flow, enhance channel processes, and improve in-stream habitat. A bar-apex LWD jam placed on river left near RM 4.2 would encourage split flow between RM 4.05 and 4.2 at all flow levels. A push up levee located down the middle of the gravel bar could be removed to re-establish natural channel processes in this area. Increased channel width and cross-sectional area would decrease flow velocity for a given discharge, and could alleviate some of the erosion problems that are necessitating riprap just downstream. An LWD jam at 4.1 would enhance split flow into an existing side-channel on river right between RM 4.0 and 4.1.	
2b	Project RM 4.2R	Disconnected Outer Zone 2 (DOZ-2)	Off-Channel Habitat Enhancement	Off-Channel Habitat Enhancement at fish return channel	The fish return channel from the fish screen near RM 4.2 could be developed to provide access to off-channel habitat. The channel currently provides some off-channel habitat, but placement of habitat features would increase the quality of habitat components in the channel.	
2b	Project RM 4.25L	Inner Zone 2 (IZ-2)	Reconnect Stream Channel Processes	Riprap modification or removal	This project involves the removal or modification of large riprap and installation of LWD structures to maintain bank stability while allowing for greater connection of process and enhanced in-stream habitat.	 <p>Looking east in the downstream direction at riprap along river-left near RM 4.25 (October 2009).</p>
2b	Project RM 4.3L	Disconnected Outer Zone 1 (DOZ-1)	Reconnect Floodplain Processes	Wetland Habitat Reconnection	This project involves reconnecting wetland habitats to inner zone habitats, and re-establishing channel/floodplain connection. Groundwater fed wetlands provide potentially valuable off-channel habitat, but lack passable fish access. The outflow channel is blocked by fill, garbage, and riprap at the channel margin creating a steep fall into the channel that is impassible except at very high flows. The outflow channel could be opened up to allow fish passage into off-channel habitat. The wetlands themselves could be enhanced to provide increased quality of fish habitat	 <p>Wetland outflow channel that has been altered with floodplain fill behind riprap. The channel does not currently provide habitat connection at any flow level except high flows (October 2009).</p>

Reach	Project Number	Sub-Unit	Strategy Category	Project Name	Description	Photo
2b	Project RM 4.5R	Disconnected Outer Zone 2 (DOZ-2)	Reconnect Floodplain Processes	Levee removal and floodplain reconnection	The goal of this project is to re-connect the floodplain and the channel. Explore opportunities to re-locate the irrigation diversion and dam upstream to near RM 4.5 adjacent to the hillslope toe and remove or set-back the levee that forms the upstream boundary of DOZ-2. Given the amount of alteration to the sub-unit, the constraints are considerable (Figure 19). The irrigation canal and fish screen depend on protection from this levee.	 <p>Looking southwest in the upstream direction at a levee that is a process and habitat barrier for DOZ-2 (October 2009).</p>
2b	Project RM 4.55L	Disconnected Inner Zone 1 (DIZ-1)	Reconnect Stream Channel Processes	Levee removal, side-channel reconnection	This project involves removing or modifying the push-up levee between RM 4.75 and 4.85. LWD enhancement near inlet locations of disconnected side-channels could direct high-flow into high flow channels, re-establishing process and enhancing habitat connection. Downstream outlets of the high flow channels are unimpeded, and would not require and mechanical enhancement.	 <p>Southeast view of DIZ-1 looking across a push-up levee into the thinned riparian forest (October 2009).</p>
2b	Project RM 4.6C	Inner Zone 2 (IZ-2)	Reconnect Stream Channel Processes	Re-establish channel LWD dynamics	This portion of the inner zone is geomorphically active. The channel is eroding into a glacial terrace to the south and forming a gravel bar with the eroded material. Large wood is being deposited at the apex of this gravel bar. There are large boulders in the channel creating a scour pool. A large, channel spanning wood jam here would increase pool scour, provide cover, and re-establish large wood and lateral channel dynamics.	
2b	Project RM 4.75R	Inner Zone 1 (IZ-1)	In-Stream Habitat Enhancement	LWD enhancement	Existing root wads and small wood could be enhanced with a LWD bank structure to increase the quality of pool habitat	 <p>Potential LWD location along river right near RM 4.75. Existing woody bank structure could be enhanced to provide increased habitat quality (October 2009).</p>





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2b	Project RM 4.8R	Outer Zone 1 (OZ-1)	Reconnect Floodplain Processes	Wetland Habitat Reconnection	At the downstream end of the sub-unit there is a long, narrow wetland that has been developed for stock watering. The upstream end of the wetland has been extended and bermed to allow storage for stock water. The downstream en rains to the channel near RM 4.7 and the confluence of Poorman Creek. Connection to the wetland could be enhanced by excavating the downstream end to make the feature passable during certain biologically significant flows.	
2b	Project RM 4.8L	Inner Zone 1 (IZ-1)	Reconnect Stream Channel Processes	LWD enhancement and side-channel reconnection	At this location, there is some natural LWD accumulation near the upstream inlets to several high flow channels across DIZ-1. LWD supplementation could encourage overbank flow into DIZ-1, re-establishing inner-zone processes, enhancing side-channel habitat, and supporting Project RM 4.55L.	 <p>LWD jam on river left near RM 4.8. Enhancement of this LWD could encourage overbank flow into DIZ-1, as well as improve pool habitat (October 2009).</p>
2b	Project RM 4.85C	Inner Zone 1 (IZ-1)	In-Stream Habitat Enhancement	LWD enhancement	There are several potential locations on both sides of the channel where placements of meander bend log jams can enhance in-stream habitat and re-establish natural geomorphic conditions	 <p>Looking toward the southeast in the downstream direction where LWD placements on both sides of the channel could increase habitat quality and diversity (October 2009).</p>
3a	Project RM 5.23L	Inner Zone 1 (IZ-1)	In-Stream Habitat Enhancement	LWD enhancement	There is an existing boulder step-pool and bedrock outcrop in the channel. The pool has good residual depth but lacks cover. This project entails placing a meander-bend LWD jam to increase the amount of cover and quality of habitat provided in this deep pool.	 <p>View to the northeast in the downstream direction at a deep bedrock pool near RM 5.23 (October 2009).</p>




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3b	Project RM 5.45L	Inner Zone 3 (IZ-3)	In-Stream Habitat Enhancement	LWD enhancement	Similar to Project RM 5.7L, this is a location where an existing root mass and pool could be enhanced with a LWD meander-bend jam.	 <p>View to the west in the upstream direction at an overhanging root mass on the left bank near RM 5.45 (October 2009).</p>
3b	Project RM 5.5R	Inner Zone 3 (IZ-3)	Reconnect Stream Channel Processes	Side-channel reconnection	A high-flow channel between RM 5.4 and 5.6 appears to be inundated and scoured on an annual recurrence. This channel could be enhanced to provide side-channel habitat at a wider range of flows. LWD structures and select excavation would be used to provide low-flow access to the side-channel and to increased habitat complexity and quality.	 <p>View to the east in the downstream direction at an active high-flow channel near RM 5.5 (October 2009).</p>
3b	Project RM 5.55L	Outer Zone 2 (OZ-2)	Off-Channel Habitat Enhancement	Off-channel habitat enhancement	This project involves increasing the availability and connectivity of off-channel habitat. A low-flow channel could be created to connect floodplain wetlands to the main channel.	
3b	Project RM 5.7L	Inner Zone 3 (IZ-3)	In-Stream Habitat Enhancement	LWD enhancement	There is an existing overhanging root mass and scour pool at an outside bend. Placement of a LWD meander-bend log jam would increase cover, pool scour, and complexity. Planting of the riparian area should be a part of project work at this location.	 <p>View to the north at the river-left bank near RM 5.7 (October 2009).</p>





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3b	Project RM 5.8L	Inner Zone 3 (IZ-3)	Reconnect Stream Channel Processes	Side-channel reconnection	This project involves enhancing the active side-channel and high-flow channels that have developed in the re-worked deposits of an alluvial fan between RM 5.7 and 5.9. LWD apex jams near the upstream end at RM 5.9 would enhance inundation of high-flow channels. Select excavation could be used to create a low flow side-channel. High-flow channel outlets could be enhanced to allow for habitat connection throughout the project area.	 <p>View to the southeast in the downstream direction at the upstream inlet to a network of high flow channels located along river-left between RM 5.7 and 5.9 (October 2009).</p>
3b	Project RM 5.9R	Disconnected Outer Zone 2 (DOZ-2)	Riparian Restoration	Riparian re-vegetation	There is only a narrow forested riparian buffer (10 – 50 ft wide) on river-right between RM 5.8 and RM 6.2. This project would involve reforestation of the riparian zone up to 100 feet (or greater if possible) from the channel. Address livestock access if it is an issue on this parcel.	
3b	Project RM 6.0C	Inner Zone 2 (IZ-2)	Reconnect Stream Channel Processes	LWD placement to enhance lateral dynamics	This location is just upstream of the transition from IZ-2 to IZ-3 where the channel width begins to expand and flow splits around a mid-channel bar. This project would involve placing LWD jams on point bars and mid-channel bar apexes to enhance split flow conditions.	 <p>Downstream view to the east at an apex log jam on a mid-channel bar. LWD jams in this area would enhance lateral channel dynamics and improve habitat cover and complexity (October 2009).</p>
3b	Project RM 6.08C	Inner Zone 2 (IZ-2)	Reconnect Stream Channel Processes	Bridge modification	The bridge at RM 6.08 creates a hydraulic constriction at high flows. An improvement of the bridge with a wider span could alleviate hydraulic effects of increased energy in the channel during high flows.	 <p>View to the east in the downstream direction at a bridge crossing near RM 6.08. As stage increases, the bridge becomes a hydraulic constriction (October 2009).</p>

Reach	Project Number	Sub-Unit	Strategy Category	Project Name	Description	Photo
3b	Project RM 6.18R	Inner Zone 2 (IZ-2)	In-Stream Habitat Enhancement	LWD enhancement	At this location an existing root mass creates an area of cover along the river-right. A lateral meander-bend LWD jam on the river-right bank could enhance the existing habitat and encourage pool scour.	 <p>View to south at the right bank of the channel near RM 6.18. The undercut root mass could be enhanced to provide increased habitat quality and enhance inner-zone processes (October 2009).</p>
3b	Project RM 6.3L	Disconnected Outer Zone 1 (DOZ-1)	Off-Channel Habitat Enhancement	Wetland habitat enhancement	This project is described in the DIZ-1 sub-unit summary, but also involves habitat found in DOZ-1. There are wetlands in DOZ-1 that would provide valuable off-channel habitat if access were created. As part of Project RM 6.65L, surface connection between inner-zone side-channels and outer-zone off channel habitat could be enhanced. This would require some excavation to create channels providing low-flow pathways.	 <p>Floodplain wetlands located in DOZ-1 that could be re-connected to inner-zone processes and habitat (October 2009).</p>
3b	Project RM 6.35R	Inner Zone 1 (IZ-1)	Reconnect Stream Channel Processes	Levee removal and side-channel reconnection	This project involves reconnecting the two main areas of side-channel habitat in this sub-unit. Both side-channels are located on river-right. The upstream side-channel is centered on RM 6.5; the downstream side-channel is centered on RM 6.25. A narrow high flow channel runs along the toe of the hillslope and connects the two side-channels. This connecting channel is being as an irrigation diversion. As part of the project, the diversion would be re-engineered to re-connect the upstream side-channel to inner-zone processes and habitat. A levee blocks the downstream side-channel. This levee would be removed to promote reconnection of inner-zone processes	 <p>View to the southwest in the upstream direction at the diversion dam near RM 6.51. Removal of the dam would enhance side-channel habitat (October 2009).</p>
3b	Project RM 6.65L	Disconnected Inner Zone 1 (DIZ-1)	Reconnect Stream Channel Processes	Levee removal and side-channel reconnection	This project would involve levee removal between RM 6.6 and 6.65. The levee currently blocks one large side-channel and several smaller high flow channels across the inside of a meander bend). Removal of the levee would re-establish active inner zone processes in the sub-unit. Excavation at the upstream end of the primary side-channel could provide side-channel habitat at all flow levels. LWD jams could be used to push flow into the high-flow channel network. Once this inner-zone sub-unit is reconnected, it becomes possible to provide access to off-channel habitat in DOZ-1. Coordination with ongoing restoration efforts would be necessary.	 <p>View to the southeast in the downstream direction at a push-up levee near RM 6.4. The levee has been breached / lowered as part of an enhancement project (October 2009).</p>



Reach	Project Number	Sub-Unit	Strategy Category	Project Name	Description	Photo
3b	Project RM 6.7L	Inner Zone 1 (IZ-1)	Reconnect Stream Channel Processes	Riprap modification	A short length of bank has been protected with riprap adjacent to new residential construction. The riprap could be replaced or enhanced with LWD jams to provide commensurate protection as well as provide enhanced channel habitat.	 <p>View to the north in the downstream direction at a short section of riprap that could be enhanced with LWD (October 2009).</p>
3c	Project RM 6.8L	Inner Zone 2 (IZ-2)	Reconnect Stream Channel Processes	Re-establish channel LWD dynamics	This site consists of a left-bank high-flow side channel between RM 6.78 and 6.8. Placement of bar apex jams at this location would enhance lateral channel dynamics and side-channel activation at lower flows.	 <p>View to the east in the downstream direction at a high-flow side-channel near RM 6.8 (October 2009).</p>
3c	Project RM 6.89R	Inner Zone 2 (IZ-2)	In-Stream Habitat Enhancement	LWD enhancement	There is another good location for LWD enhancement on river-left at RM 6.89. Construction of a meander-bend log jam would increase pool scour, cover, and habitat complexity.	 <p>View to the north at river-left near RM 6.89 where LWD would enhance in-channel habitat (October 2009).</p>
3c	Project RM 6.95R	Inner Zone 2 (IZ-2)	In-Stream Habitat Enhancement	LWD enhancement	This project opportunity involves placement of LWD along the margins of an existing bedrock pool to increase habitat cover and complexity.	 <p>View to the southeast in the downstream direction at a potential LWD placement location along river-right near RM 6.95 (October 2009).</p>

Reach	Project Number	Sub-Unit	Strategy Category	Project Name	Description	Photo
3c	Project RM 7.05L	Inner Zone 2 (IZ-2)	Reconnect Stream Channel Processes	Riprap modification	There are approximately 200 feet of riprap along the river-left bank between RM 7 and 7.1. The riprap could be modified through removal and replacement with LWD meander-bend jams that would enhance habitat while also providing bank protection. Alternatively, the riprap could be modified in situ through incorporation of LWD to provide habitat cover and complexity.	 <p>View to the east in the downstream direction at riprap along the river-left bank near RM 7.05 (October 2009).</p>
3c	Project RM 7.15L	Disconnected Inner Zone 1 (DIZ-1)	Off-Channel Habitat Enhancement	Off-channel habitat enhancement	The oxbow wetlands in this sub-unit provide the potential for valuable habitat that is rare in Reach T3c. This project would re-establish/enhance the connection between the wetlands and main channel habitats while maintaining protection of the irrigation diversion, fisheries facilities, and residential access. Improved culverts at the upstream road crossing could provide a stronger high-flow connection with the main channel. Culverts under the access road are either completely overgrown or non-existent. The downstream outlet could be enhanced to ensure low flow fish access to the ponds.	 <p>Oxbow pond located near RM 7.15 that provides valuable, although largely disconnected, off-channel habitat (October 2009).</p>
3c	Project RM 7.15R	Inner Zone 2 (IZ-2)	In-Stream Habitat Enhancement	LWD enhancement	This location is just downstream of the bridge crossing at RM 7.15. Installation of LWD would enhance cover and habitat along the right bank. Currently, the bank is protected with riprap and large alluvial material. LWD would increase pool scour, cover, and habitat complexity.	 <p>View to the west in the upstream direction at a potential LWD jam location along river-right near RM 7.15 (October 2009).</p>
3c	Project RM 7.3L	Disconnected Inner Zone 1 (DIZ-1)	Reconnect Stream Channel Processes	Levee removal	This project involves removing 150 ft of push-up levee that has been constructed out of local alluvium. The levee may provide some protection for the TVIP canal. The levee could be set-back to provide more direct protection to the canal while re-connecting inner zone processes.	

Reach	Project Number	Sub-Unit	Strategy Category	Project Name	Description	Photo
3c	Project RM 7.5L	Inner Zone 1 (IZ-1)	Reconnect Stream Channel Processes	Re-establish channel LWD dynamics	There are several LWD jams along the banks and at island apexes near RM 7.5 in the north split-channel. This project would enhance existing and create new jams to enhance active channel dynamics including split-flow and pool scour.	 <p>View the east in the downstream direction near RM 7.5 (October 2009).</p>
3c	Project RM 7.5R	Inner Zone 1 (IZ-1)	In-Stream Habitat Enhancement	LWD enhancement	This project involves constructing a LWD jam along the right bank of the south split-channel near RM 7.5. The location is in a backwater just upstream of a riffle crest where the grade breaks and steepens. LWD would provide cover in the pool and increase local habitat complexity.	 <p>View to the east in the downstream direction at a potential LWD jam location along river-right near RM 7.5 (October 2009).</p>
3c	Project RM 7.6L	Inner Zone 1 (IZ-1)	Reconnect Floodplain Processes	Levee removal	An older push-up levee starts at the edge of the active channel near RM 7.58 and extends about 190 ft. along the inner/outer-zone margin. Removal of the levee would enhance floodplain connectivity to DOZ-1. Appliances have also been dumped in this area and could be removed as part of enhancement work.	 <p>View of an older, vegetated push-up levee near RM 7.6 that could be removed to re-connect channel/floodplain processes (October 2009).</p>
3c	Project RM 7.7R	Inner Zone 1 (IZ-1)	In-Stream Habitat Enhancement	LWD alcove enhancement	This project involves placing LWD along river-right near RM 7.7. The placement is in a backwater just upstream of a break in slope where the channel steepens. Some large trees have been cut down and cleared along the stream edge. Installing LWD could replace some of the bank stability and habitat complexity lost by the riparian clearing.	 <p>View to the northeast in the downstream direction at a potential LWD structure location along river-right near RM 7.7 (October 2009).</p>