

APPENDIX A
PROJECT DESCRIPTIONS

0.5R – Riparian Restoration

Project Description

The intent of this project concept is to remove dredged materials and create a 150 foot wide low riparian/marsh bench along the right bank of the Lower Cowlitz River at RM 0.5. Some native vegetation already exists in this reach, primary action would be excavation and removal of dredged materials and removal of non-native species and replanting with native species.



Preliminary Costs

The proposed riparian zone area extends for 5,400 feet along the right bank. An estimate of removal of 60,000 CY of dredged materials to create riparian benches and excavate side channel was based on removal of average 2 feet of dredged material for 150 feet in width over 5,400 feet in length. Removal of material estimated at \$10/CY for grading and hauling, and \$10k per acre riparian revegetation. Preliminary construction cost of \$750,000 for project. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

- Reach: Lower Cowlitz 1 – Tier 2.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would create a riparian and wetland bench along the right bank to provide shallow water habitat and cover.
- Review of proposed benefits:
 - Restore riparian habitat on one side of mainstem for approximately 5400 feet
- Current habitat conditions are highly degraded due to placement of Mt. St. Helens material in floodplain. Sediment continuing to deposit in this reach. Likely risk that sediment will continue to deposit in this reach, but also strong possibility of dredging to keep reach deeper.
- Effectiveness was based on assumptions:
 - Restoration of 5,400 feet of riparian for 150 feet wide, assumes 100% effective for 5.4 HUs.

1.0L –Side Channel Restoration and Enhancement

Project Description

The intent of this project concept is to restore an existing distributary channel near the mouth of the Lower Cowlitz River to provide tidal slough rearing habitat for salmonids. This channel is located just downstream of the RR bridge at approximately Rivermile (RM) 1.0 on the left bank. This channel is connected when the Columbia River flows are high, but disconnected the rest of the time. It is surrounded on both sides by dredged material piles. Proposed actions include excavation of the mouth of this channel and excavation in the channel to reconnect at most flows, placement of LWD at the mouth to keep it scoured open, removal of dredged materials along the channel (approximately 150 feet on both sides) to create a riparian/floodplain bench, and riparian plantings. Additionally, a riparian/marsh bench will be created along the mainstem Cowlitz downstream of the side channel inlet.





Image looking towards left bank at dredge spoils disposal site and vertical eroding bank near RM 0.5.

Preliminary Costs

The side channel and riparian zone area is approximately 25 acres. An estimate of removal of 130,000 CY of dredged materials to create riparian benches and excavate side channel was based on removal of approximately 3 feet of dredged material over 25 acres. Removal of material estimated at \$5/CY due to only grading the material on-site, but not removing because this site sells dredged materials for construction purposes, and \$10k per acre riparian revegetation. Preliminary construction cost of \$800,000 for project. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

- Reach: Lower Cowlitz 1 – Tier 2.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would reconnect side channel/distributary channel in lower tidal reach. Would include some removal of dredged material and creation of riparian/wetland bench along mainstem. Place LWD jam to promote scour of entrance to channel.
- Review of proposed benefits:
 - Reconnect and restore side channel habitat, approximately 2,000 feet (will include access, enhancement, and riparian restoration)
 - Restore riparian habitat on one side of mainstem, approximately 2,200 feet
- Current habitat conditions are highly degraded due to placement of Mt. St. Helens material in floodplain. Remnant side channel has been cut off due to continued deposition. Likely risk that

sediment will continue to deposit in this reach, but also strong possibility of dredging to keep reach deeper.

- Effectiveness was based on assumptions:
 - Side channel length is approximately 2,000 feet (4 HUs). Assume project will 100% effectively restore a side channel
 - Restoration of 2,200 feet of riparian zone on one side of mainstem for 150' wide. Assume 100% effective for 2.2 HUs.

C3.5R – Side Channel Restoration

Project Description

The intent of this project concept is to restore a connection to a remnant oxbow in the floodplain of Coweeman River about RM 3.5.

Preliminary Costs

Approximately 10,000 CY of excavation at \$10/CY and place 50 pieces of LWD. Restore riparian zone on 2 acres at \$10-15k per acre. Total preliminary construction cost is \$350,000. Does not include costs for acquisition of real estate or easement, probably owned by City of Kelso.

Assumptions for Fish Benefit Scoring

C3.5R

- Reach: Coweeman 2A – Tier 4
- Populations: Winter steelhead (P), fall chinook (P+), coho (P), chum (C)
- Project would restore and reconnect oxbow at RM 3.5 and riparian restoration
- Review of proposed benefits:
 - Reconnect off channel habitat, approximately 2,000 feet, includes access, LWD, and riparian restoration
- Current habitat conditions are highly degraded due channelization, lack of instream habitat, and lack of riparian zone.
- Effectiveness was based on assumptions:
 - Side channel length is approximately 2,000 feet, includes access, LWD, and riparian restoration, assume 100% effectiveness.

C4.0B – Stream Channel Enhancement

Project Description

The intent of this project concept is to place LWD to enhance habitat and cover and trap spawning gravels upstream of the levees along the lower Coweeman River (RM 4).

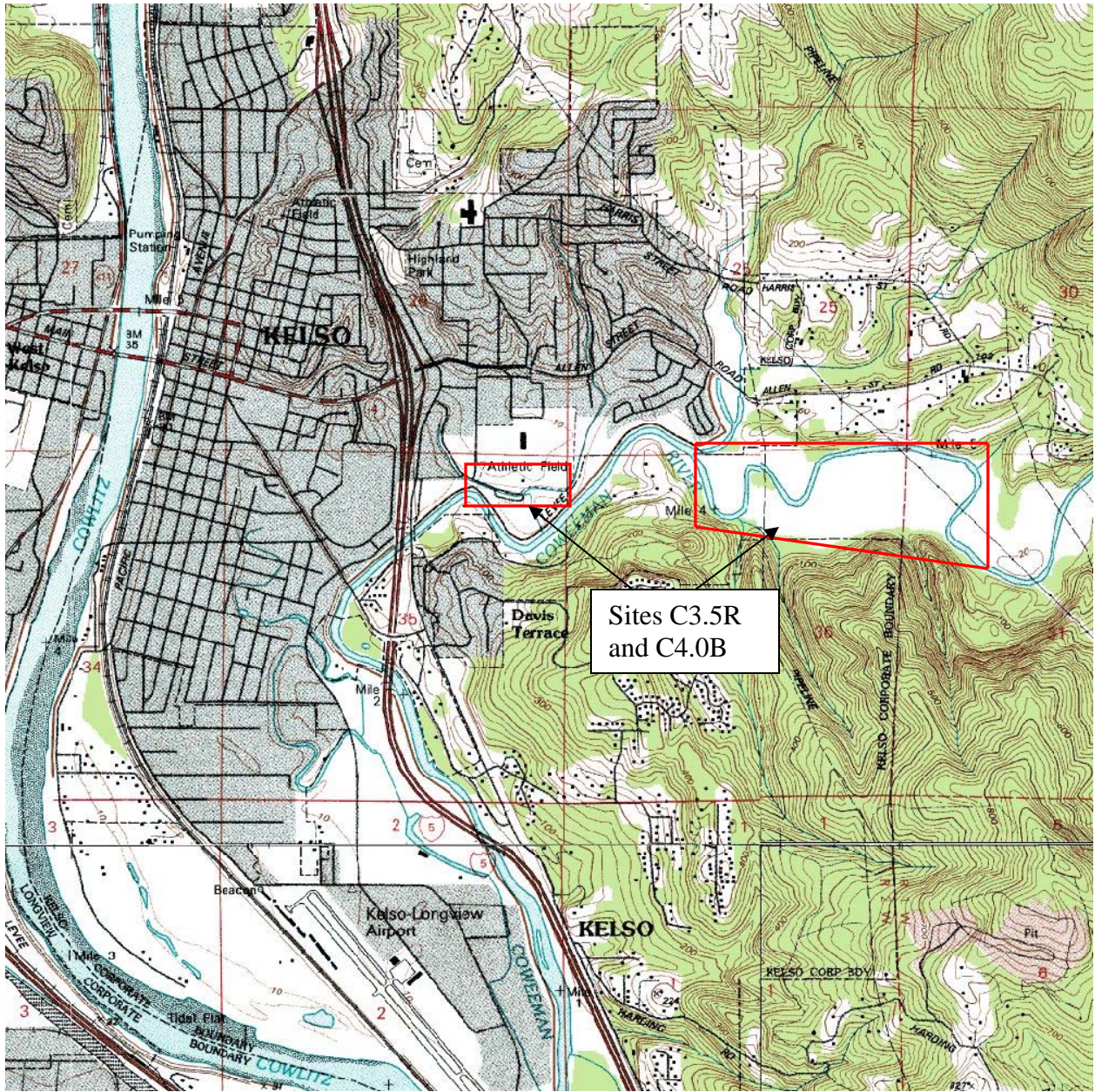
Preliminary Costs

Approximately 80 pieces of wood and 2 ELJs will be placed. Total preliminary construction cost is \$350,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

C4.0B

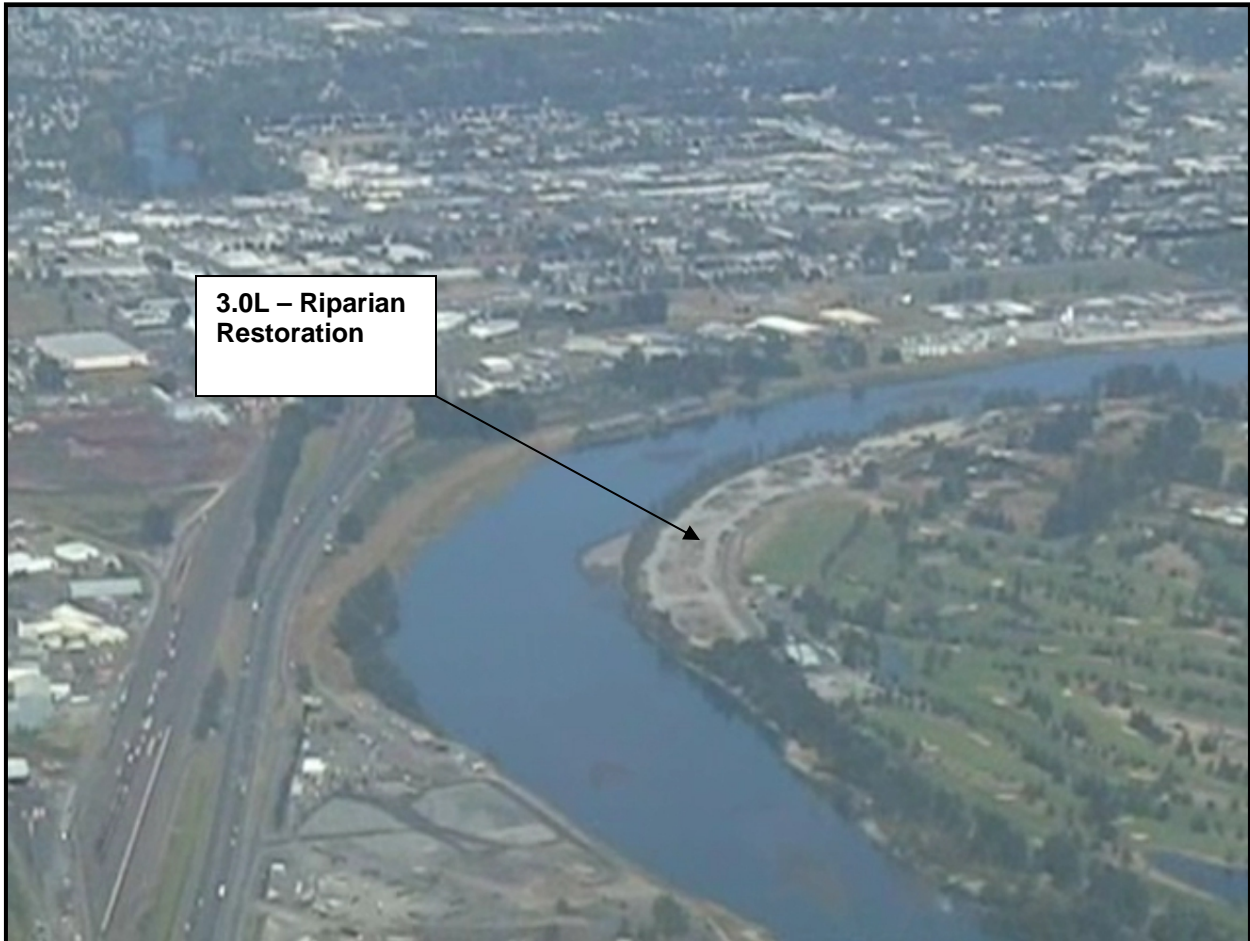
- Reach: Coweeman 2A – Tier 4.
- Populations: Winter steelhead (P), fall chinook (P+), coho (P), chum (C)
- Project would place LWD to trap spawning gravels, provide scour and cover.
- Review of proposed benefits:
 - Enhance stream channel habitat
- Current habitat conditions are degraded due to channelization, lack of instream habitat, and lack of riparian zone.
- Effectiveness was based on assumptions:
 - Placement of 80 pieces of LWD out of PFC of 80/mile is 100%



3.0L – Riparian Restoration

Project Description

The intent of this project concept is to restore a high quality riparian zone along the Lower Cowlitz mainstem at RM 3.0 on the left bank. Actions would include some removal of dredged material and bank protection, sloping banks back to provide a riparian bench, revegetation with native riparian species. Assume flood control levees would need to be setback or redesigned to protect lands behind.



Preliminary Costs

The proposed riparian zone area is approximately 7,000 feet in length. An estimate of \$400 per linear foot of project was used to account for levee removal/setback/sloping and revegetation, based on A Primer on Habitat Project Costs (Evergreen Funding Consultants 2003). Total preliminary construction cost is \$3,000,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

- Reach: Lower Cowlitz 2A – Tier 3.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would create a riparian and wetland bench along the left bank near the golf course to provide cover.
- Review of proposed benefits:
 - Restore riparian habitat on one side of channel for approximately 7,000 feet
- Current habitat conditions are highly degraded due to placement of Mt. St. Helens material in floodplain and significant urban development. Likely risk that sediment will continue to deposit in this reach, but also strong possibility of dredging to keep reach deeper.
- Effectiveness was based on assumptions:
 - Restoration of 7,000 feet of riparian for 150 feet in width, assumes 100% effectiveness for 7 HUs.

4.5R –Riparian Restoration

Project Description

The intent of this project concept is to restore a high quality riparian zone along the Lower Cowlitz mainstem at RM 4.5 on the right bank. Actions would include modification of the flood control levee, sloping banks back to provide a riparian bench, revegetation with native riparian species. Large wood may be placed (if feasible) to improve bankline conditions.



Preliminary Costs

The proposed riparian zone area is approximately 2,200 feet in length. An estimate of \$400 per linear foot of project was used to account for levee setback/sloping and revegetation, based on A Primer on Habitat Project Costs (Evergreen Funding Consultants 2003). Total preliminary construction cost is \$900,000. Does not include costs for acquisition of real estate or easement; although this land is primarily City or County owned.

Assumptions for Fish Benefit Scoring

- Reach: Lower Cowlitz 2A – Tier 3.
- Populations: Winter steelhead (C), fall chinook (C), coho (P), chum (C)
- Project would restore riparian zone along right bank for approximately 9,800 feet in front of levee. Levee may be sloped back and/or bench created as feasible.
- Review of proposed benefits:
 - Restore riparian habitat on one side of mainstem for approximately 2,200 feet.
- Current habitat conditions are highly degraded due to placement of Mt. St. Helens material in floodplain and significant urban development. Likely risk that sediment will continue to deposit in this reach, but also strong possibility of dredging to keep reach deeper. Levee and other development will constrain riparian zone to approximately 50 feet wide.
- Effectiveness was based on assumptions:
 - Restoration of 2,200 feet of riparian zone, but only 50 feet in width, assumes 33% effectiveness on 2.2 HUs.

7.3R – Riparian Restoration

Project Description

The intent of this project concept is to setback the levee at RM 7.3 on the right bank to restore a low riparian zone along approximately 2,000 feet of bankline. Actions would include set back levee, removal of some dredged material, and plant riparian/floodplain vegetation on bench. Large wood will be placed as feasible.



Preliminary Costs

The proposed riparian zone area is approximately 2,000 feet in length. An estimate of \$400 per linear foot of project was used to account for levee setback and revegetation, based on A Primer on Habitat Project Costs (Evergreen Funding Consultants 2003). Total preliminary construction cost is \$900,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

- Reach: Lower Cowlitz 2C – Tier 3.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would remove dredged material from floodplain and restore riparian habitat on approximately 2,000 feet of shoreline.
- Review of proposed benefits:
 - Restore riparian habitat on one side of mainstem for approximately 2,000 feet.
- Current habitat conditions are highly degraded due to placement of Mt. St. Helens material in floodplain and significant urban development. Site is likely to be developed and one of few remaining undeveloped sites in Kelso/Longview area. Risk of continued sediment deposition in reach, but also strong possibility of dredging to keep reach deeper.
- Effectiveness was based on assumptions:
 - Restoration of 2,000 feet of riparian for 150 foot width, assumes 100% effectiveness for 2 HUs.

8.5R – Riparian Restoration

9.0L – Riparian Restoration

9.0LA - Tributary Enhancement

Project Description

8.5R – Riparian Restoration

The intent of this project concept is to set back the levee at Riverside Park to restore riparian functions. Actions would include setting back the levee along 2,000 feet of bankline (while maintaining existing park uses), extensive native riparian plantings along the site and dispersed placement of large wood to provide cover/refuge during higher flow conditions.

9.0L – Riparian Restoration

The intent of this project concept is to excavate dredged materials along a 150 foot wide corridor to create a riparian bench. Actions would include excavation and regrading (with possible removal) of dredge spoils materials, extensive native riparian plantings along the site and dispersed placement of large wood to provide cover/refuge during higher flow conditions.

9.0L-A – Tributary Enhancement

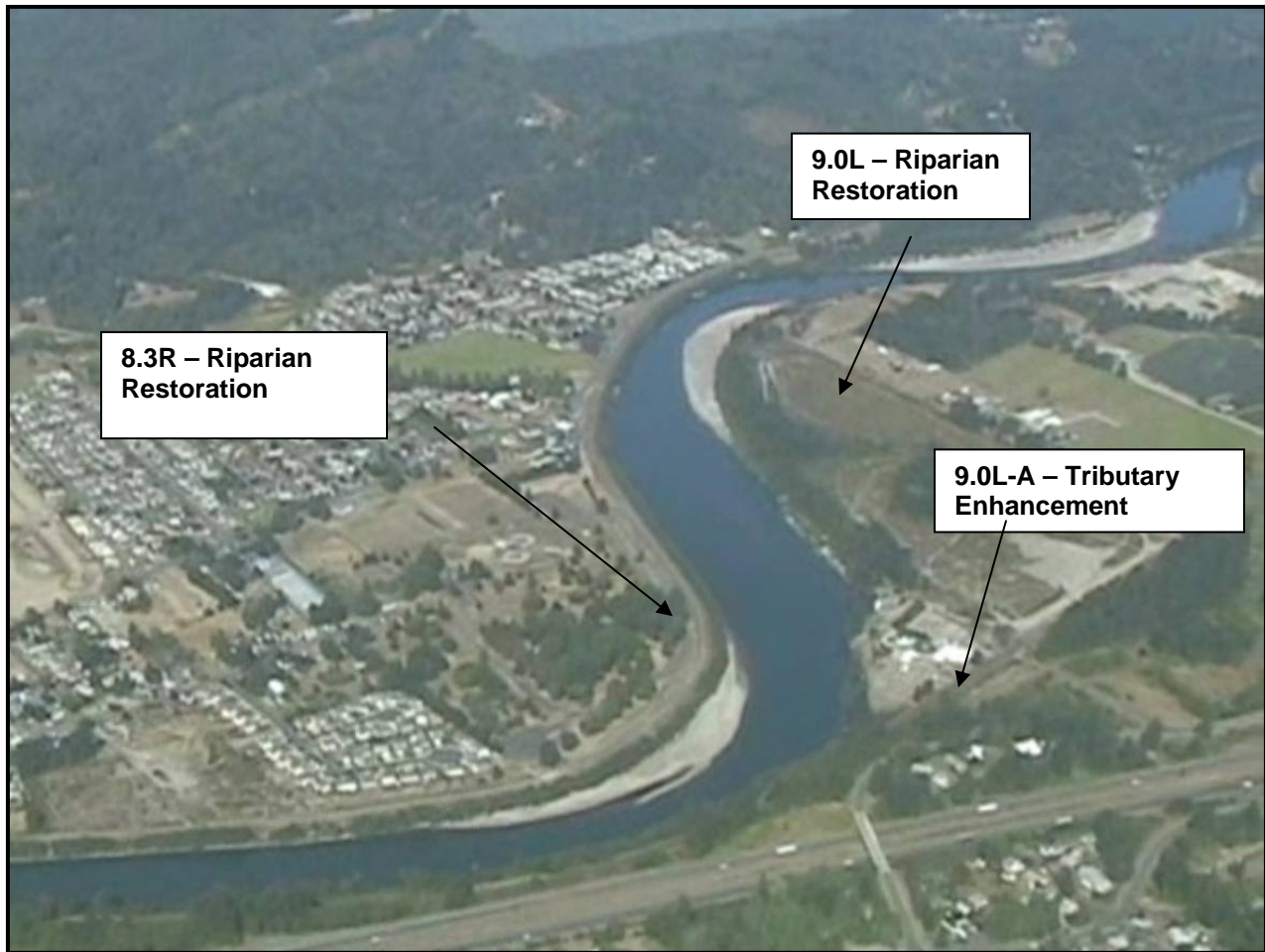
The intent of this project concept is to improve the lower end of Ostrander Creek and its delta in the Cowlitz River to provide off-channel and in-channel rearing habitat and adult holding habitat. Actions would include extensive native riparian plantings along the lower 1,000 feet of the creek and dispersed placement of large wood within the creek channel and on the delta to provide refuge during juvenile out migration.

Preliminary Costs

8.5R -- The proposed riparian zone area is approximately 2,000 feet in length. An estimate of \$400 per linear foot of project was used to account for levee setback along half of the length, and revegetation, based on A Primer on Habitat Project Costs (Evergreen Funding Consultants 2003). Total preliminary construction cost is \$1,000,000. Does not include costs for acquisition of real estate or easement (this site is publicly owned).

9.0L – Removal of dredged materials would occur 150 feet in width along the shoreline for 3,500 feet in length. Assume an average of 6 feet of material would be removed at \$10/yd to haul away. Twelve acres of riparian would be restored at \$10-15k per acre. Total preliminary construction cost is \$2,000,000. Does not include costs for acquisition of real estate or easement.

9.0L-A – The lower 1,000 feet of Ostrander Creek would be restored including 100 foot riparian zone on each bank (approximately 5 acres). 10 pieces of LWD would be placed at the delta and in the lower creek. Total preliminary construction cost is \$150,000. Does not include costs for acquisition of real estate or easement.



Assumptions for Fish Benefit Scoring

8.5R

- Reach: Lower Cowlitz 2D – Tier 3.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would expand and restore riparian zone by setting back levee somewhat in Riverside Park. Did not include protection value because publicly owned and maintained as open space.
- Review of proposed benefits:
 - Restore riparian habitat on one side of channel for approximately 2,000 feet.
- Current habitat conditions are highly degraded due to levees and urban development. This is one of few undeveloped sites (park) with room to restore a riparian zone.
- Effectiveness was based on assumptions:
 - Restoration of 2,000 feet of riparian zone for 150 feet in width, assumes 100% effectiveness for 2 HUs.

9.0L

- Reach: Lower Cowlitz 2E – Tier 3.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would remove dredged material to restore riparian zone and reconnect side channel.
- Review of proposed benefits:

- Reconnect and restore side channel habitat, approximately 3,000 feet
- Restore riparian habitat for approximately 3,500 feet along mainstem.
- Current habitat conditions are highly degraded due to placement of Mt. St. Helens material in floodplain. Remnant side channel has been cut off due to continued deposition. Likely risk that sediment will continue to deposit in this reach, but also strong possibility of dredging to keep reach deeper. Site is likely to be developed in near future and one of few remaining undeveloped sites.
- Effectiveness was based on assumptions:
 - Side channel length is approximately 3,000 feet, assume provide access, enhancement and riparian restoration for 100% effectiveness
 - Restoration of 3,000 feet of riparian zone along mainstem, assumes 100% effectiveness for 3 HUs.

9.0L-A

- Reach: Ostrander 1A – Tier 4.
- Populations: Winter steelhead (C), coho (P), chum (C)
- Project would place wood at mouth of Ostrander Creek to provide cover and enhance diversity of habitat at delta and provide riparian restoration.
- Review of proposed benefits:
 - Provide stream channel habitat structure and enhance delta to provide refuge and potential spawning habitat if wood promotes scour of sands.
- Current habitat conditions are highly degraded due to urbanization and confinement of channel. Delta experiences deposition of Mt. St. Helens material and gravel at delta is buried. Juvenile salmon that migrate out of tributary into mainstem have no cover habitat.
- Effectiveness was based on assumptions:
 - Placement of approximately 15 pieces of LWD along 1,000 feet of stream channel will achieve properly functioning conditions (80 pieces/mile) for treated reach.
 - Restore 100 foot width riparian along 1,000 feet, both sides, achieves 67% effectiveness on 2 HUs.



Image looking towards left bank from top of levee near RM 8.0.



Image looking at Ostrander Creek confluence near RM 9.0

T1 – Riparian Restoration/Noxious Weed Removal

Project Description

The intent of this project concept is to remove Japanese knotweed and restore native riparian zone along the majority of Ostrander Creek.

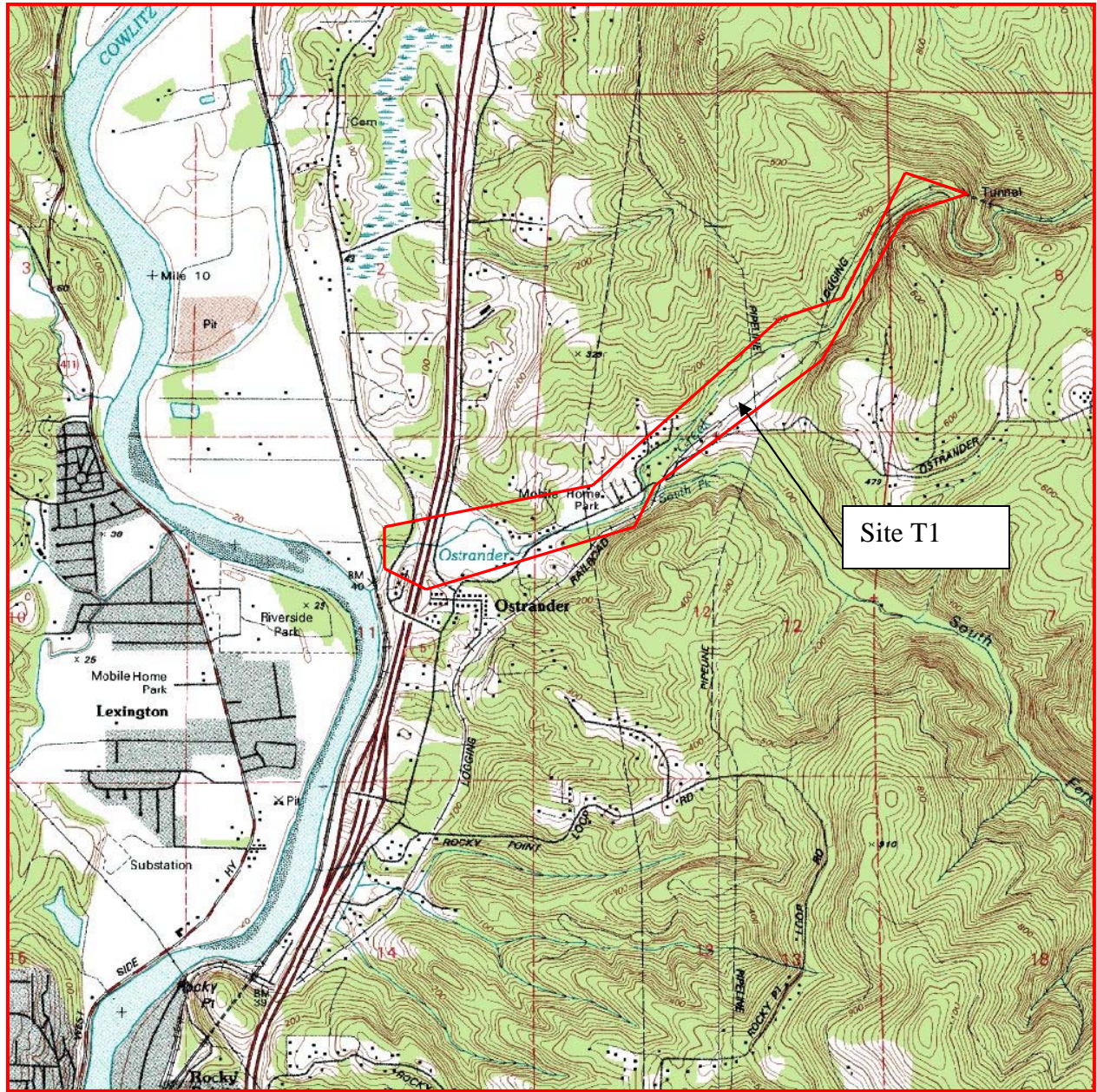
Preliminary Costs

Remove knotweed and revegetate approximately 42,000 feet of stream. Total preliminary construction cost is \$750,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

T1

- Reach: Ostrander Creek – Tier 4 and 2.
- Populations: Winter steelhead (C), coho (P)
- Project would remove invasive species (knotweed) and restore riparian zone along entire reach.
- Review of proposed benefits:
 - Restore riparian habitat on both sides of creek
- Current habitat conditions are highly degraded due to invasive species and livestock
- Effectiveness was based on assumptions:
 - Restoration of 42,000 feet of riparian, assumes 100% effectiveness.



9.7R – Bar Enhancement

Project Description

The intent of this project concept is to enhance and protect bar and side channel features in the Lower Cowlitz River near RM 9.7 on the right bank. There is an existing sandbar at this location, but the side channel has filled in. Actions would include placement of large wood along bar to provide cover during high flows for out migrating juvenile salmon, also place an engineered log jam at the upstream and downstream ends of the bar to promote scour of side channel at back of bar. .



Preliminary Costs

Proposed actions include placement of 39 pieces of LWD and 2 engineered log jams (ELJ). Cost estimate of \$1,000 per individual LWD and \$100,000 per ELJ. Total preliminary construction cost is \$250,000. Does not include acquisition of real estate or easement. This is likely DNR land.

Assumptions for Fish Benefit Scoring

- Reach: Lower Cowlitz 2G – Tier 3.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would enhance small existing side channel and bar. Place LWD jam to promote scour of entrance to channel and LWD on bar. Riparian restoration along approximately 1900 feet adjacent to side channel.
- Review of proposed benefits:
 - Restore and reconnect 1,500 feet of side channel habitat, including access, LWD, and riparian restoration.
- Side channels are highly ephemeral in this reach due to high sediment load from Toutle River, and there is no cover. This project would be designed to maintain the side channel and bar for a longer period of time and provide cover and diversity of habitat.
- Effectiveness was based on assumptions:
 - Restoration of 1,500 feet of side channel habitat, assumes 100% effectiveness for 3 HUs.

T2 – Replace Culvert

Project Description

The intent of this project concept is to replace a fish passage barrier culvert on Leckler Creek at Hazel Dell Road.

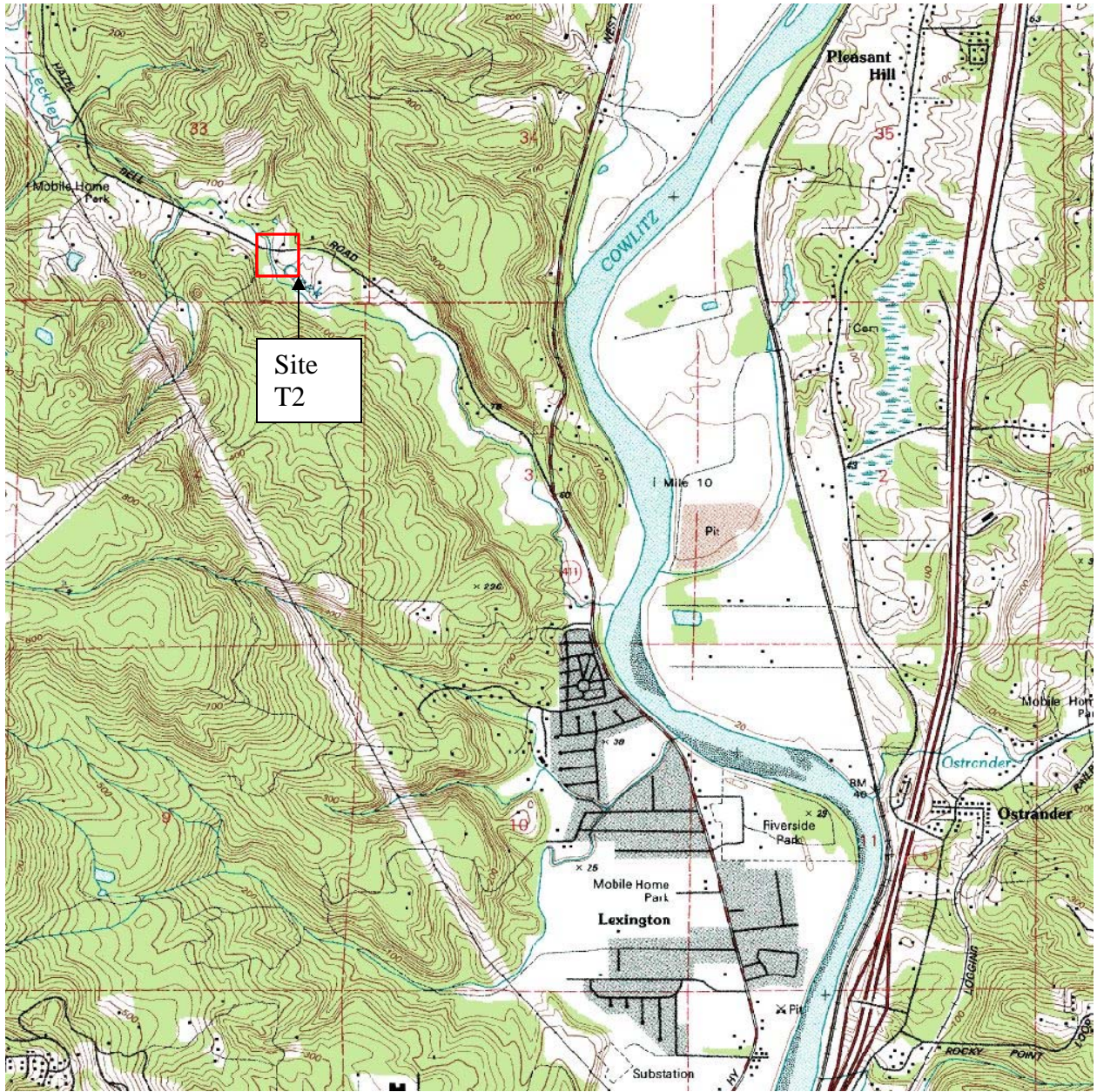
Preliminary Costs

Replace culvert under 2-lane county road, estimated culvert length of 50 feet and 10 feet diameter. Total preliminary construction cost is \$300,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

T2

- Reach: Leckler Creek 1A – Tier 2.
- Populations: Winter steelhead (C), coho (P)
- Project would replace culverts at Hazel Dell Road
- Review of proposed benefits:
 - Restore access to 3.7 miles of tier 3 habitats



9.8L – Riparian Restoration

Project Description

The intent of this project concept is to restore part of the site for riparian and floodplain functions. Actions will include removal of dredged materials along a 2,000 foot length of bankline for approximately 150 feet in width and revegetation of the low floodplain/riparian bench with native species.



Preliminary Costs

The proposed riparian zone area is approximately 2,000 feet in length. Approximately 50,000 CY of material will be removed at \$10/CY. Seven acres will be revegetated at \$10-15k per acre. Total preliminary construction cost is \$750,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

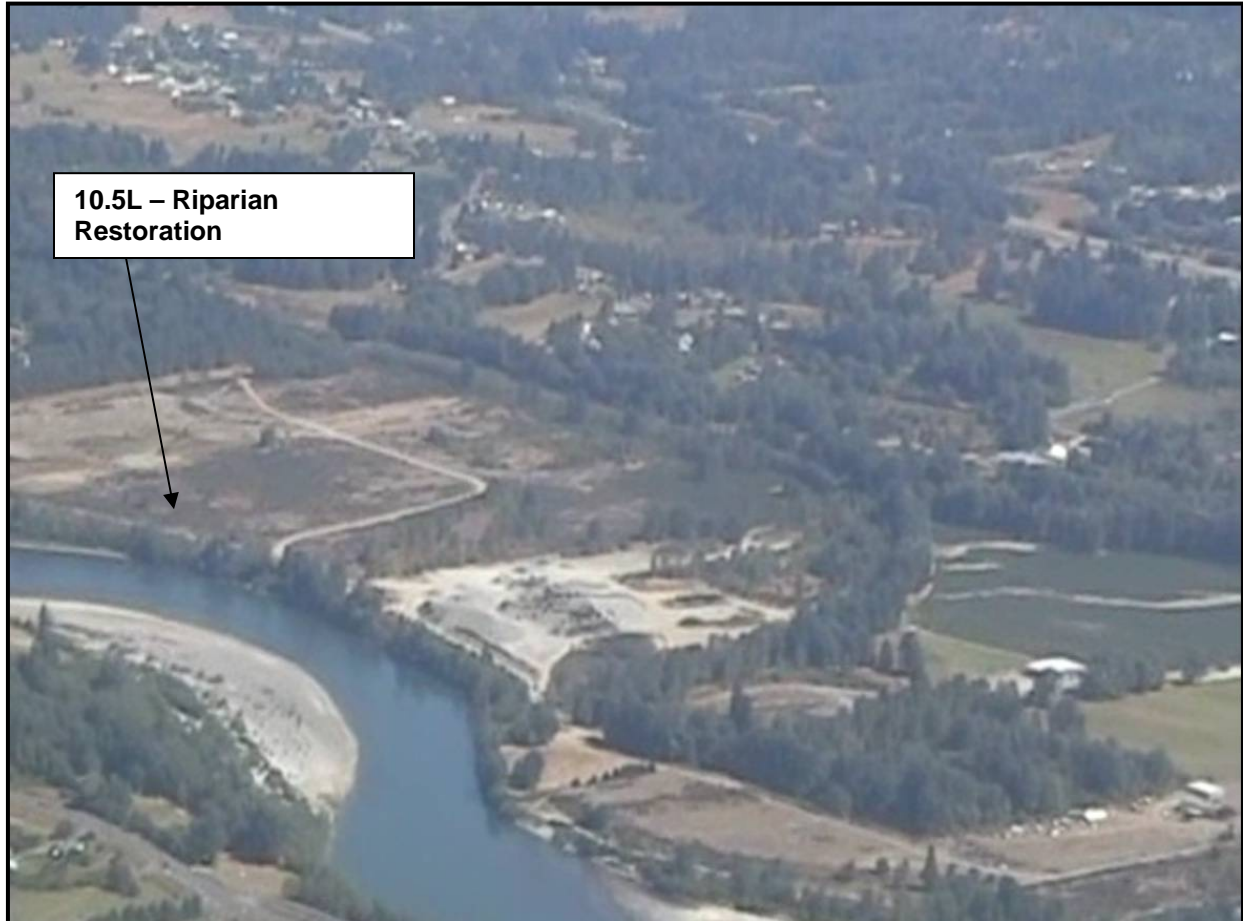
- Reach: Lower Cowlitz 2G – Tier 3.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)

- Project would remove revetment, slope banks back and restore riparian zone.
- Review of proposed benefits:
 - Restore riparian habitat on one side of mainstem for 2000 feet.
- Current habitat conditions are highly degraded due to placement of Mt. St. Helens material in floodplain and riprap. There is no existing riparian.
- Effectiveness was based on assumptions:
 - Restoration of 2,000 feet of riparian zone for 150 foot width, assumes 100% effectiveness for 2 HUs.

10.5L – Riparian Restoration

Project Description

The intent of this concept project is to partially restore floodplain and riparian functions at this site. Actions would include removal of dredged material along a 3,500 length for approximately 150 feet in width. The approximately 10 acres would be revegetated with native species.



Preliminary Costs

The proposed riparian zone area is approximately 10 acres and 3,500 feet in length. Approximately 100,000 CY of material will be removed at \$10/CY. Ten acres will be revegetated at \$10-15k per acre. Total preliminary construction cost is \$1,300,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

- Reach: Lower Cowlitz 2H – Tier 3.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would remove dredged materials and restore riparian habitat along 3,500 feet.
- Review of proposed benefits:
 - Restore riparian habitat on one side of mainstem for approximately 3,500 feet.
- Current habitat conditions are highly degraded due to placement of Mt. St. Helens material in floodplain.
- Effectiveness was based on assumptions:
 - Restoration of 3,500 feet of riparian zone for 150 foot width, assumes 100% effectiveness on 3.5 HUs.

11.2L – Bar and Island Enhancement

Project Description

The intent of this concept project is to enhance instream habitat and promote longer-term stability of an existing bar and side channel in the lower river. Actions would include placement of large wood along bar to provide cover for out migrating juvenile salmon during high flows, and placement of engineered log jams at the upstream and downstream end of the side channel to promote scour to keep it open.



Preliminary Costs

Proposed actions include placement of 30 pieces of LWD and 2 engineered log jams (ELJ). Cost estimate of \$1,000 per individual LWD and \$50-100,000 per ELJ. Total preliminary construction cost is \$250,000. Does not include costs for acquisition of real estate or easement. This is assumed to be DNR land.

Assumptions for Fish Benefit Scoring

- Reach: Lower Cowlitz 2H – Tier 3.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would enhance existing side channel and bar. Place LWD jam to promote scour of entrance to channel and LWD on bar.
- Review of proposed benefits:
 - Place wood for stream channel habitat.
 - Restore/reconnect side channel
- Side channels are highly ephemeral in this reach due to high sediment load from Toutle River, and there is no cover. This project would be designed to maintain the side channel and bar for a longer period of time and provide cover and diversity of habitat.
- Effectiveness was based on assumptions:
 - Restore/reconnect 2,000 feet of side channel habitat, including access, LWD, and riparian for 100% effectiveness for 4 HUs.



Image looking towards bar on river left near RM 11.2

12.5L – Side Channel Restoration and Enhancement

Project Description

The intent of this project concept is to protect and enhance an existing low floodplain that was formerly a bar with a side channel. Actions would include excavating side channel, placing LWD in the floodplain and an ELJ to keep the entrance scoured open and riparian revegetation as necessary.



Preliminary Costs

The proposed channel would be approximately 2,000 feet long, and approximately 10,000 CY of material at \$10/CY would be excavated. 20 pieces of LWD and one ELJ would be placed to provide high flow cover and keep the side channel scoured open. Ten acres will be revegetated at \$10k per acre. Total preliminary construction cost is \$400,000. Does not include acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

- Reach: Lower Cowlitz 2H – Tier 3.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would reconnect/create side channel along left bank lower floodplain. Would include some removal of dredged material and riparian/wetland revegetation. Place LWD jam to promote scour of entrance to channel.
- Review of proposed benefits:
 - Reconnect/restore side channel habitat, approximately 2,000 feet, including access, LWD and riparian restoration
- Current habitat conditions are highly degraded due to placement of Mt. St. Helens material in floodplain. Remnant side channel has been cut off due to continued deposition. Likely risk that sediment will continue to deposit in this reach, so need to promote scour of side channel via placement of LWD.
- Effectiveness was based on assumptions:
 - Side channel length is approximately 2,000 feet and includes access, LWD, and riparian restoration so assumed to be 100% effective.



Image looking upstream towards left bank near RM 12.5.

12.5R – Riparian Restoration

Project Description

The intent of this concept project is to remove riprap and/or bioengineer an existing armored bank as feasible to include native riparian plantings along upper and top portions of bank. Bank would be sloped back to create a riparian bench of approximately 100 feet in width.



Preliminary Costs

The proposed riparian zone area is approximately 3,500 feet in length. An estimate of \$400 per linear foot of project was used to account for revetment removal, bank sloping, and revegetation, based on A Primer on Habitat Project Costs (Evergreen Funding Consultants 2003). Total preliminary construction cost is \$1,000,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

- Reach: Lower Cowlitz 2H – Tier 3.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would remove dredged materials to restore riparian and narrow floodplain zone.
- Review of proposed benefits:
 - Restore riparian habitat on one side of channel for approximately 3,500 feet
- Current habitat conditions are highly degraded due to placement of Mt. St. Helens material in floodplain. No existing riparian or floodplain. Site is likely to be developed.
- Effectiveness was based on assumptions:
 - Restoration of 3,500 feet of riparian zone for 100 foot width, assumes 67% effectiveness.

13.5L – Riparian Restoration

Project Description

The intent of this project concept is to remove riprap and other bank armoring as feasible and slope back banks to create a riparian bench approximately 100 feet in width. Construction will involve regrading banks back to stable configurations to prevent erosion, and protection of lower bank using large wood debris. Upper bank areas will be stabilized using fabric encapsulated lifts and extensive native riparian plantings. The large wood will provide habitat and cover for migrating salmon. The site, due to the proximity of residential housing is experiencing placement of rock, concrete and other debris for protection.





Image looking towards left bank at Horseshoe Bend near RM 13.5. (Photo from 2006, much of this bank has been armored with riprap in 2007)

Preliminary Costs

The proposed riparian zone area is approximately 3,000 feet in length. Approximately 40,000 CY of material will be removed at \$10/CY. Seven acres will be revegetated at \$10-15k per acre. 250 pieces of LWD will be installed at approximately \$1,000 each. Total preliminary construction cost is \$900,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

- Reach: Lower Cowlitz 2H – Tier 3.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would slope back steep eroding banks and create riparian bench for approximately 3000 feet.
- Review of proposed benefits:
 - Restore riparian habitat on one side of mainstem for 3,000 feet.
- Current habitat conditions are highly degraded due to placement of Mt. St. Helens material in floodplain that is steep and eroding. No existing riparian. High risk of landowners placing riprap along reach.
- Effectiveness was based on assumptions:
 - Restoration of 3,000 feet of riparian zone for 100 foot width, assumes 67% effectiveness.

14.0L – Side Channel Restoration

Project Description

The intent of this project concept is to restore a historic side channel to the east side of Horseshoe Bend at RM 14.0 on the left bank. This channel at one time was the main channel of the river. Actions would involve excavation of upstream connection and any excavation along the channel as necessary, placement of large wood in the side channel and in ELJs at the upstream end to provide scour, and cover and refuge during salmon migration. A riparian zone would be restored along the channel on both sides for approximately 100 feet in width.



Preliminary Costs

The proposed side channel is approximately 4,200 feet in length, with an estimated 25,000 CY of material to be excavated at \$10/CY. Twenty acres will be revegetated at \$10-15k per acre, and 80 pieces of LWD and 2 ELJs will be placed. Total preliminary construction cost is \$750,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

- Reach: Lower Cowlitz 2H – Tier 3.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would reconnect/restore former major side channel behind Horseshoe Bend. Would include some removal of dredged material and riparian revegetation. Place LWD jam to promote scour of entrance to channel and in channel for cover.
- Review of proposed benefits:
 - Reconnect/restore side channel habitat, approximately 4,200 feet, includes access, LWD, and riparian
- Current habitat conditions are highly degraded due to placement of Mt. St. Helens material in floodplain. Remnant side channel has been cut off due to development and continued deposition. Likely risk that sediment will continue to deposit in this reach, but will place LWD to promote scour.
- Effectiveness was based on assumptions:
 - Side channel length is approximately 4,200 feet, includes access, LWD, and riparian restoration for 100 foot width, assume 89% effectiveness

14.5R – Side Channel Restoration

Project Description

The intent of this project concept is to restore a historic side channel through the floodplain at RM 14.5 on the right bank. Side channel enhancement will involve excavation of historical channel, placement of large wood in the side channel to provide cover and refuge during salmon migration, placement of ELJs to provide scour to keep channel open, and riparian restoration along both sides of the channel. Most of the floodplain in the vicinity of this side channel has not been filled significantly by dredged material and is still within the floodplain.



Preliminary Costs

The proposed side channel will be approximately 4,500 feet in length. Approximately 25,000 CY of material will be removed at \$10/CY. Twenty acres will be revegetated at \$10-15k per acre, and 85 pieces of wood and 2 ELJs will be placed. Total preliminary construction cost is \$750,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

- Reach: Lower Cowlitz 2H – Tier 3.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would reconnect side channel through remnant floodplain. Would include some removal of dredged material and riparian/wetland revegetation. Place LWD jam to promote scour of entrance to channel and place LWD in channel and floodplain.
- Review of proposed benefits:
 - Reconnect side channel habitat, approximately 4,500 feet, includes access, LWD, and riparian restoration
- Current habitat conditions are highly degraded due to placement of Mt. St. Helens material in floodplain. Remnant side channel has been cut off due to development and partial filling of the floodplain. Likely risk that sediment will continue to deposit in this reach, so need to promote scour at entrance of channel to keep open.
- Effectiveness was based on assumptions:
 - Side channel length is approximately 4,500 feet, includes access, LWD, and riparian restoration for 100% effectiveness.

15.0L – Bar Enhancement

Project Description

The intent of this project concept is to enhance an existing low bar/floodplain at RM 15.0 along the left bank. LWD would be placed to provide cover and refuge during high flows, ELJs would be placed to promote side channel formation, and riparian and floodplain plantings would be done as necessary. Some excavation to create a better opening for Sandy Creek would be done, as well as minor removal of dredged materials.





Preliminary Costs

Approximately 10,000 CY of material will be removed at \$10/CY. Six acres will be revegetated at \$10-15k per acre. Approximately 20 pieces of wood and 2 ELJs would be placed. Total preliminary construction cost is \$450,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

- Reach: Lower Cowlitz 2I – Tier 3.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would remove dredged materials and enhance bar/floodplain and riparian zone. Restore connection to Sandy Creek.
- Review of proposed benefits:
 - Reconnect off channel habitat, approximately 1,000 feet
 - Restore riparian habitat along approximately 2,000 feet
- Current habitat conditions are highly degraded due to placement of Mt. St. Helens material in floodplain. Small creek/side channel has been cut off due to continued deposition. Likely risk that sediment will continue to deposit in this reach, so need to promote scour at entrance to creek.
- Effectiveness was based on assumptions:
 - Side channel length is approximately 1,000 feet. Includes access, LWD, and riparian restoration, assume 100% effectiveness.
 - Restoration of 2,000 feet of riparian along mainstem, for 150 foot width, assume 100% effectiveness

16.0R – Bar and Island Enhancement

Project Description

The intent of this project concept is to enhance and restore a historic side channel (now only connected during extreme high flows) and bar/island floodplain. Actions would include placement of LWD and ELJs on the bar to provide cover and refuge during high flows, excavation of the historic side channel, and riparian plantings. This area is currently heavily used as an informal boat launch. The intent would be to allow access in a portion of the site, but restore the remainder of the site.





Image looking upstream at bar near RM 16.0

Preliminary Costs

Approximately 10,000 CY of material will be removed at \$10/CY. Thirty acres will be revegetated at \$10-15k per acre. Approximately 30 pieces of LWD and 2 ELJs would be placed. Total preliminary construction cost is \$500,000. Does not include acquisition of real estate or easement, but it is assumed this site is either county or DNR land.

Assumptions for Fish Benefit Scoring

- Reach: Lower Cowlitz 2J – Tier 3.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would restore an old side channel on bar that is now used as an informal boat launch. Would include excavation of channel, placement of LWD and riparian plantings.
- Review of proposed benefits:
 - Reconnect side channel habitat, approximately 3,000 feet, includes access, LWD and bar enhancement, and riparian restoration
- Current conditions are highly disturbed due to four-wheeler use, boat launching and other unregulated activities. Old channel is occasionally connected during very high flows.
- Effectiveness was based on assumptions:
 - Side channel length is approximately 3,000 feet, includes access, LWD, and riparian, assume 100% effectiveness.
 - Restoration of 3,000 feet of riparian on bar along mainstem, assumes 100% effectiveness.

16.7L – Bar and Island Enhancement

Project Description

The intent of this project concept is to enhance an existing low bar/floodplain at RM 16.7 along the left bank. LWD would be placed to provide cover and refuge during high flows, ELJs would be placed to promote side channel formation, and riparian and floodplain plantings would be done as necessary. Some excavation to remove dredged materials and widen the floodplain to a minimum of 150 feet would be done.





Image looking slightly upstream at left bank near RM 16.7

Preliminary Costs

Approximately 20,000 CY of material will be removed at \$10/CY. Eight acres will be revegetated at \$10-15k per acre. Approximately 30 pieces of LWD and 2 ELJs would be placed to provide cover and promote side channel formation. Total preliminary construction cost is \$525,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

- Reach: Lower Cowlitz 2K – Tier 3.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would restore floodplain and remnant channel. Place LWD jam to promote scour of entrance to channel.
- Review of proposed benefits:
 - Reconnect side channel habitat, approximately 1,500 feet, includes access, LWD, and riparian
- Current habitat conditions are highly degraded due to placement of Mt. St. Helens material in floodplain. Remnant side channel has been cut off due to continued deposition. Likely risk that sediment will continue to deposit in this reach, so need to place LWD to promote scour.
- Effectiveness was based on assumptions:
 - Side channel length is approximately 1,500 feet, includes access, LWD, and riparian restoration, assume 100% effectiveness for 3 HUs.

16.8R – Tributary Enhancement

Project Description

The intent of this project concept is to enhance the lower end and delta of Arkansas Creek that enters the Cowlitz River at RM 16.8 on the right bank. Actions would involve removal of dredged materials to create a floodplain/riparian bench along both sides of the creek, extensive native riparian plantings along the site and dispersed placement of large wood throughout the floodplain and on the delta to provide refuge during juvenile out migration.





Image looking upstream towards right bank near RM 17.0

Preliminary Costs

The proposed riparian zone area is approximately 1,000 feet in length. Approximately 40,000 CY of material will be removed at \$10/CY. Five acres will be revegetated at \$10-15k per acre, and approximately 30 pieces of LWD will be placed in the channel or on the delta. Total preliminary construction cost is \$650,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

- Reach: Lower Cowlitz 2J – Tier 3.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would place LWD at mouth of Delameter Creek to promote natural delta processes and provide cover. Provide small area of riparian restoration along lowest portion of creek and delta.
- Review of proposed benefits:
 - Improve stream channel habitat for 1,000 feet
 - Restore riparian 1,000 feet
- Current habitat is uniform and there is no cover.
- Effectiveness was based on assumptions:
 - Placement of 15 pieces of LWD in 1,000 foot reach is PFC, assume 100% effectiveness
 - Riparian restoration of 1,000 feet on both banks for 150 foot width, assume 100% effectiveness.

T3 – Replace Culvert

Project Description

The intent of this project concept is to replace a fish passage barrier culvert on Delameter Creek at Delameter Road.

Preliminary Costs

Replace culvert under 2-lane county road, estimated culvert length of 40 feet and 10 foot diameter. Total preliminary construction cost is \$250,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

T3

- Reach: Delameter Creek 1 – Tier 2.
- Populations: Winter steelhead (C), coho (P)
- Project would replace culvert at Delameter Road
- Review of proposed benefits:
 - Restore access to 6.6 miles of tier 4 habitats

T4 – Riparian and Floodplain Restoration

Project Description

The intent of this project concept is to fence livestock away from Delameter Creek and do riparian restoration below the fishways at RM 4.

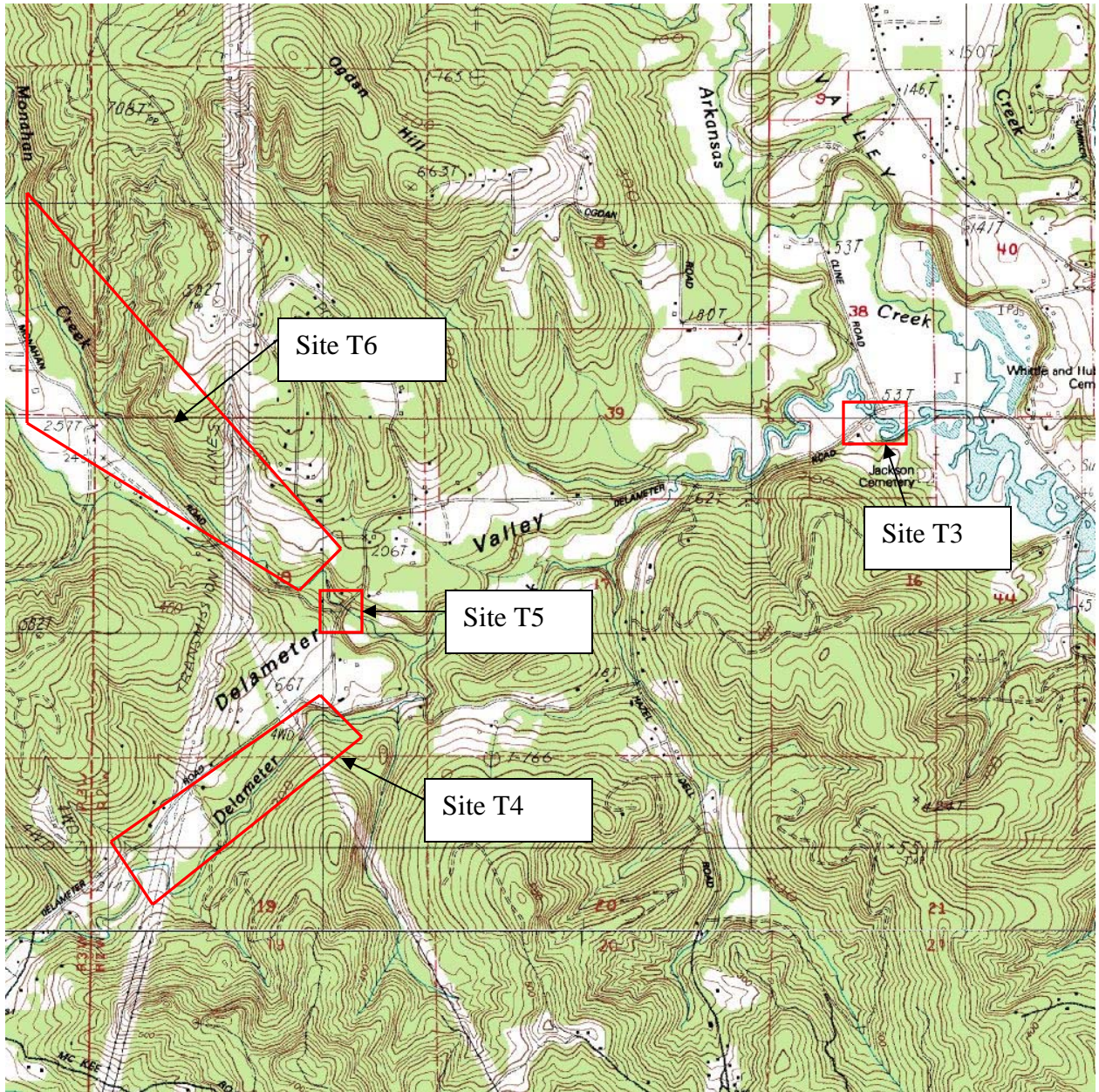
Preliminary Costs

Approximately 2,500 feet and 5 acres of riparian restoration at \$10-15kk per acre. Total preliminary construction cost is \$100,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

T4

- Reach: Delameter 3A – Tier 2.
- Populations: Winter steelhead (C), coho (P)
- Project would restore riparian zone and fence off livestock from creek.
- Review of proposed benefits:
 - Restore riparian habitat on both sides of creek for 2,500 feet
- Current habitat conditions are highly degraded due to livestock
- Effectiveness was based on assumptions:
 - Restoration of 2,500 feet of riparian, assumes 100% effectiveness for 5 HUs.



T5 – Replace Culvert

Project Description

The intent of this project concept is to replace a fish passage barrier culvert on Monahan Creek at Delameter Road.

Preliminary Costs

Replace culvert on 2-lane county road, estimate culvert length at 40 feet and 8 foot diameter. Total preliminary construction cost is \$250,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

T5

- Reach: Monahan Creek 1A – Tier 4.
- Populations: Winter steelhead (C), coho (P)
- Project would replace culvert at Delameter Road
- Review of proposed benefits:
 - Restore access to 8.2 miles of tier 3 habitats

T6 – Riparian Restoration/Noxious Weed Removal

Project Description

The intent of this project concept is to remove Japanese knotweed and restore a native riparian zone along the lower 4 miles of Monahan Creek.

Preliminary Costs

Removal of knotweed and revegetation along 21,000 feet of stream channel. Total preliminary construction cost is \$750,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

T6

- Reach: Monahan Creek 1A and 1B – Tier 4 and 3, respectively.
- Populations: Winter steelhead (C), coho (P)
- Project would remove invasive species (knotweed) and restore riparian zone along lower 4 miles of creek.
- Review of proposed benefits:
 - Restore riparian habitat on both sides of creek for 21,000 feet
- Current habitat conditions are highly degraded due to livestock and invasive species
- Effectiveness was based on assumptions:
 - Restoration of 21,000 feet of riparian zone, assumes 100% effectiveness on 42 HUs.

T7 – Riparian Restoration and Channel Realignment

Project Description

The intent of this project concept is to re-meander the lower end of Whittle Creek and restore the riparian zone and floodplain.

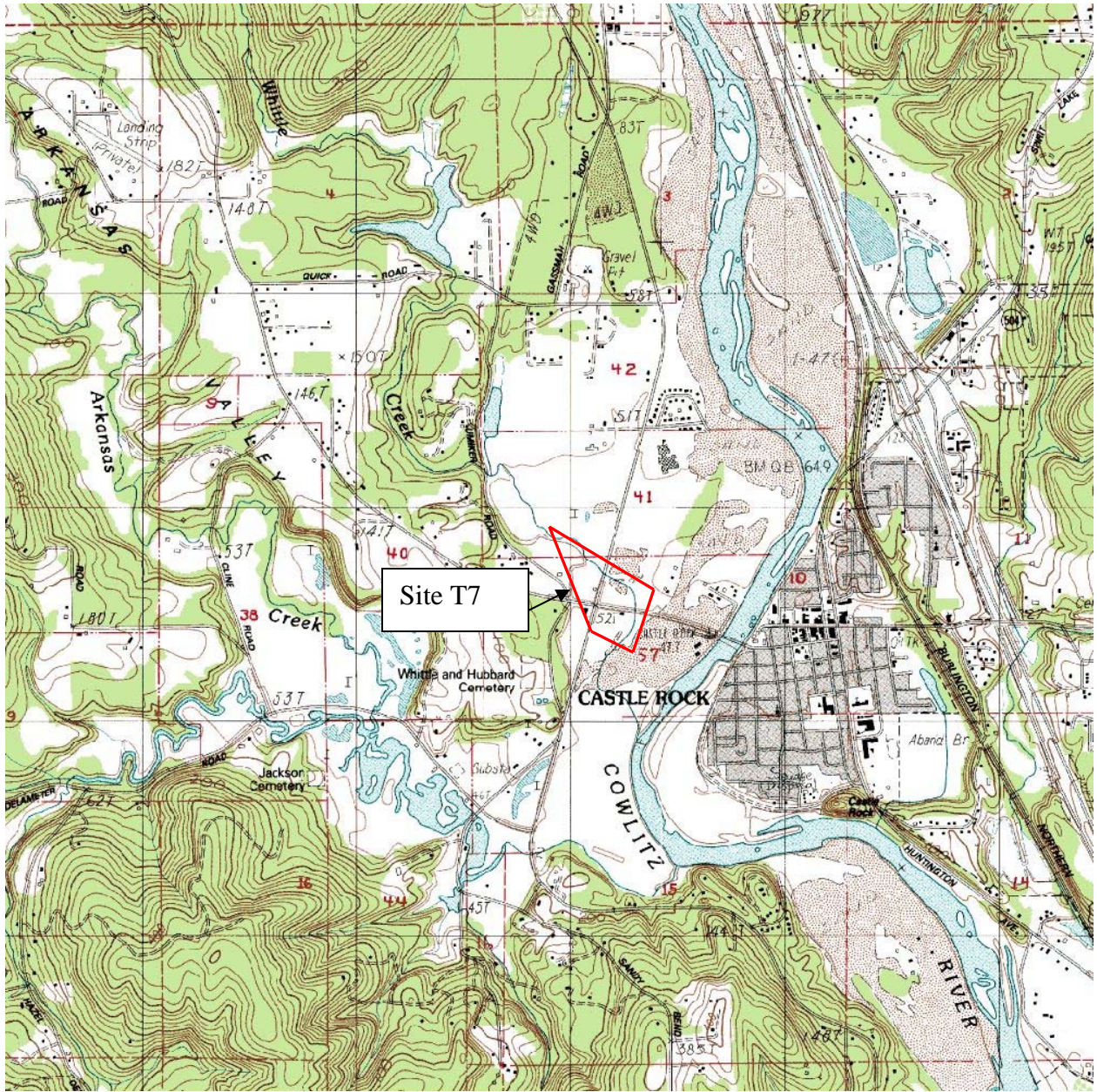
Preliminary Costs

Realign approximately 1,500 feet of channel, will require excavation of 8,000 CY of material at \$10/CY, placement of 30 pieces of LWD and riparian restoration on 6 acres at \$10-15k per acre. Total preliminary construction cost is \$250,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

T7

- Reach: Whittle 1 – Tier 4.
- Populations: Winter steelhead (C), coho (P)
- Project would remove invasive species, restore riparian zone and enhance stream channel habitat.
- Review of proposed benefits:
 - Stream channel habitat enhancement
 - Restore riparian habitat on both sides of creek for 1,500 feet
- Current habitat conditions are highly degraded due to livestock
- Effectiveness was based on assumptions:
 - Stream channel enhanced to PFC for 1,500 feet
 - Restoration of 1,500 feet of riparian zone to width of 87 feet, effectiveness of 58%



17.0R&L – Riparian Restoration

Project Description

The intent of these project concepts is to remove riprap and/or bioengineer already armored bankslopes as feasible which involves integration of wood into riprap, upper bank modifications and native riparian plantings along upper and top portions of bank. These areas currently have a narrow riparian zone, but are channelized and armored to prevent erosion along the Castle Rock city limits.





Image looking downstream from bridge near RM 17.5

Preliminary Costs

17.0L – Approximately 4,000 feet of bank/levee will be modified on the left bank to incorporate wood and provide a riparian bench at \$400 per linear foot based on A Primer for Habitat Project Costs (Evergreen Funding Consultants 2003). Total preliminary construction cost is \$600,000. Does not include costs for acquisition of real estate or easement.

17.0R – Approximately 2,500 feet of bank/levee will be modified on the left bank to incorporate wood and provide a riparian bench at \$400 per linear foot based on A Primer for Habitat Project Costs (Evergreen Funding Consultants 2003). Total preliminary construction cost is \$500,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

17.0L

- Reach: Lower Cowlitz 2L – Tier 3.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would restore a riparian zone along Castle Rock. Even though likely publicly owned, included protection value because it is not maintained for natural habitat.
- Review of proposed benefits:
 - Restore riparian habitat on one side of channel for approximately 4,000 feet
- Current habitat conditions are highly degraded due to development and extensive use.
- Effectiveness was based on assumptions:
 - Restoration of 4,000 feet of riparian zone for 50 foot width, assumes 33% effectiveness.

17.0R

- Reach: Lower Cowlitz 2L – Tier 3.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would restore riparian zone along left bank in Castle Rock adjacent to fairgrounds and school district. Even though publicly owned, included protection value because not currently maintained for habitat.
- Review of proposed benefits:
 - Restore riparian habitat on one side of mainstem for 2500 feet
- Current habitat conditions are highly degraded due to placement of Mt. St. Helens material in floodplain. No existing riparian.
- Effectiveness was based on assumptions:
 - Restoration of 2,500 feet of riparian zone for 50 foot width, assumes 33% effectiveness.

18.0L – Side Channel Restoration

Project Description

The intent of this project concept is to restore access to an existing side channel and creek outlet. Actions would involve excavation of outlet and in-channel as necessary, placement of large wood in side channel and placement of ELJ at outlet to provide scour at opening. Removal of dredged material and riparian revegetation would occur as necessary.



Preliminary Costs

Approximately 5,000 CY of material will be removed at \$10/CY. Five acres will be revegetated at \$10-15k per acre, and approximately 10 pieces of LWD and 1 ELJ would be placed. Total preliminary construction cost is \$300,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

- Reach: Lower Cowlitz 2L – Tier 3.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would remove dredged material and reconnect backwater channel
- Review of proposed benefits:
 - Reconnect off-channel backwater habitat, approximately 1,500 feet, includes access, LWD, and riparian restoration
- Current habitat conditions are highly degraded due to placement of Mt. St. Helens material in floodplain. Remnant side channel has been cut off due to continued deposition. Likely risk that sediment will continue to deposit in this reach, so need to keep entrance scoured open.
- Effectiveness was based on assumptions:
 - Off-channel length is approximately 1,500 feet, includes access, LWD, and riparian restoration, assume 100% effectiveness for 3 HUs.

18.5L – Dredged Materials Removal

Project Description

The intent of this project concept is to remove dredged materials from a portion of this site to restore a floodplain and riparian bench at the appropriate elevation. Actions would involve excavation and regrading of dredge spoils materials, placement of wood and riparian/floodplain plantings.

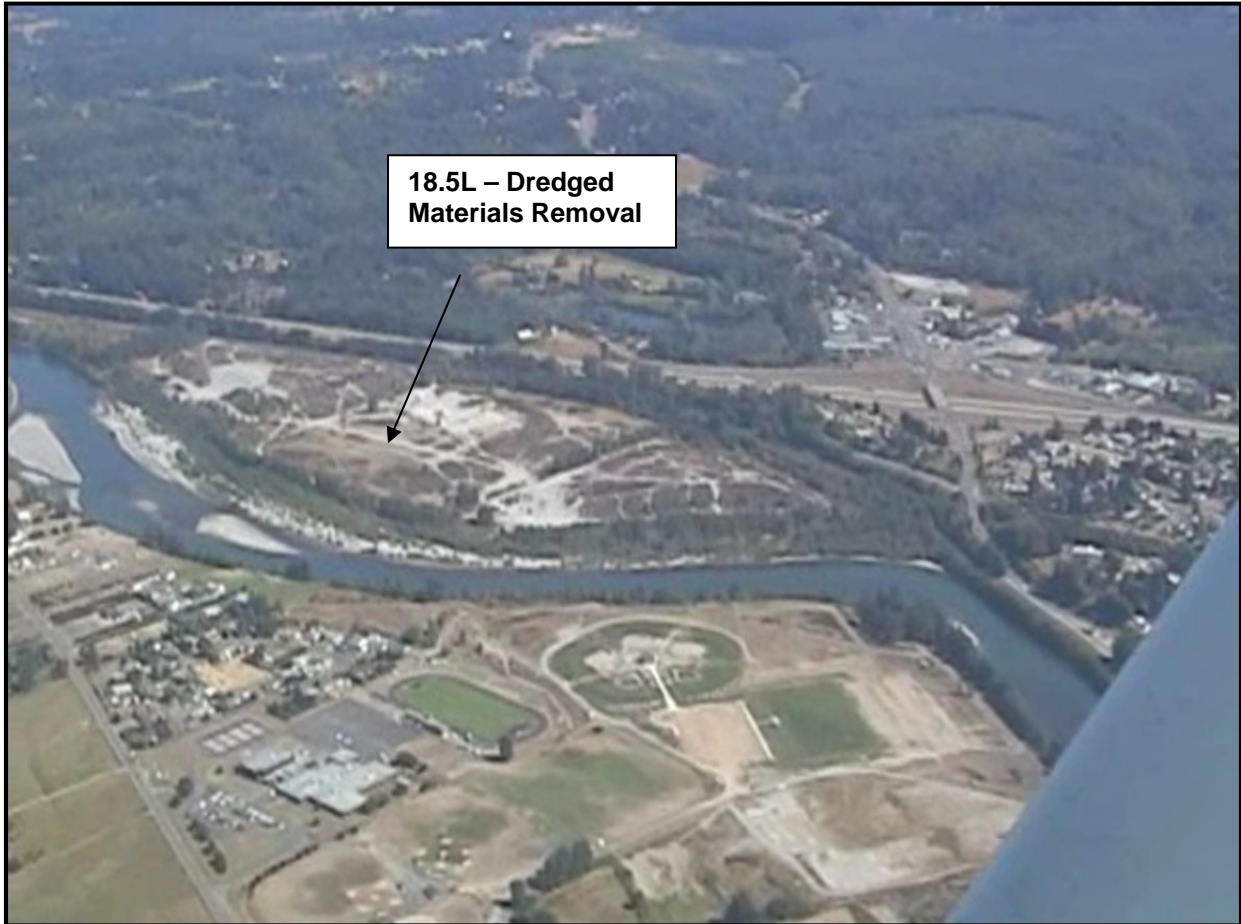




Image looking downstream at left bank near RM 18.5

Preliminary Costs

The proposed riparian and floodplain zone area is approximately 2,500 feet in length. Approximately 200,000 CY of material will be removed at \$10/CY. Ten acres will be revegetated at \$10-15k per acre. Total preliminary construction cost is \$2,500,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

- Reach: Lower Cowlitz 2M – Tier 3.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would remove dredged materials and restore floodplain and riparian zone.
- Review of proposed benefits:
 - Restore riparian habitat on one side of mainstem for approximately 2,500 feet
- Current habitat conditions are highly degraded due to placement of Mt. St. Helens material in floodplain.
- Effectiveness was based on assumptions:
 - Restoration of 2,500 feet of riparian for 150 foot width, assume 100% effectiveness

18.8R – Bar and Island Enhancement

Project Description

The intent of this project concept is to place large wood along an existing bar to provide cover for out migrating juvenile salmon and promote scour of the remnant side channel. Excavate one or more overflow or side channels, and plant riparian vegetation. Evaluate boat launch access and possible alternatives to allow boat launching in one area, but protect and restore the remainder of the site.





Image looking downstream along boat launching/parking area.

Preliminary Costs

The proposed side channel and riparian zone area is approximately 2,000 feet in length. Approximately 10,000 CY of material will be removed at \$10/CY. Ten acres will be revegetated at \$10-15k per acre, and 50 pieces of LWD and 2 ELJs will be placed. Assume a one-lane bridge over new side channel will be placed to allow boat launching in one area. Total preliminary construction cost is \$500,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

- Reach: Lower Cowlitz 2M – Tier 3.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would enhance floodplain and riparian habitat in another boat launching area.
- Review of proposed benefits:
 - Restore riparian habitat on one side of mainstem for approximately 2,000 feet
 - Restore/reconnect side channel habitat for approximately 2,000 feet, includes access, LWD, and riparian
- Current habitat conditions are highly degraded due to heavy public use.
- Effectiveness was based on assumptions:
 - Restoration of 2,000 feet of riparian zone for 150 foot width, assumes 100% effectiveness.
 - Reconnection/restoration of 2,000 feet of side channel habitat, includes access, LWD, and riparian restoration, assume 100% effectiveness for 4 HUs.

Lower Cowlitz River



Project: Restoration Project Siting

Page: 1 of 1

Crew: DRC, MM, DS

Date: 9/14/06

Location (Lat/Long):

Project ID: 17

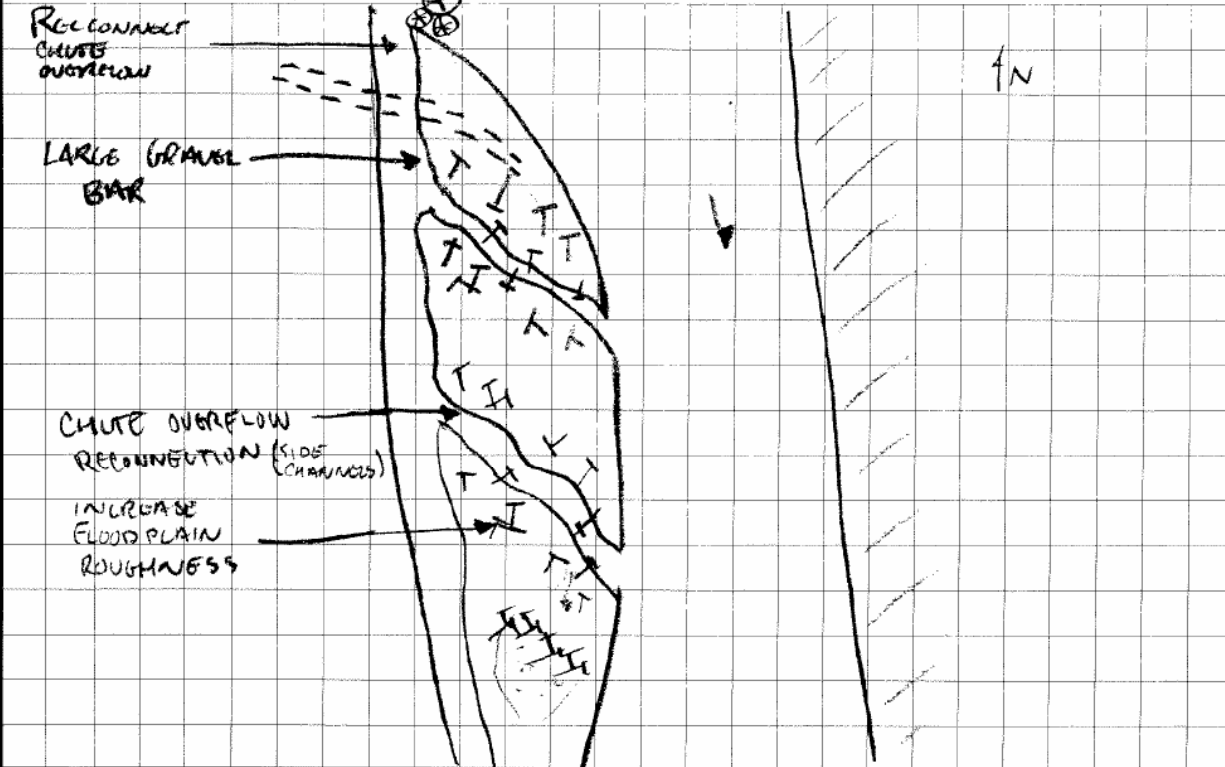
Time: 10:00 PPT

River Mile: 18.5

PROJECT INFO:

Dredge material spoils area has eroding bank

SITE SKETCH (1/4" grid)



NOTES

- RECONNECTION OF CHUTE OVERFLOW AND SIDE CHANNELS TO PROVIDE JUVENILE REFUGE DURING WINTER HIGH FLOWS.
- ADD ROUGHNESS ELEMENTS TO BAR SURFACE TO INCUBATE SEDIMENT DEPOSITION OF FINES, POSITIVE OR BENEFICIAL FOR O/S FLOOD STORAGE AND NAVIGATION.

19.8L – Dredged Materials Removal

Project Description

The intent of this project concept is to remove dredged materials downstream from the mouth of the Toutle to increase floodplain area, reduce the erosion of existing dredged materials and provide a high quality riparian zone. Actions will include excavation and regrading of dredge spoils materials, native riparian plantings throughout site, and placement of large wood.



**19.8L – Dredged
Materials Removal**



Image looking downstream at dredge spoils near RM 19.2.

Preliminary Costs

Approximately 800,000 CY of material will be removed at \$10/CY for a width of 200 feet back from the current bank. Twelve acres will be revegetated at \$10-15k per acre. Total preliminary construction cost is \$8,500,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

- Reach: Lower Cowlitz 2M – Tier 3.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would remove dredged materials to restore floodplain and riparian zone.
- Review of proposed benefits:
 - Restore riparian habitat on one side of mainstem for approximately 3,000 feet
- Current habitat conditions are highly degraded due to placement of Mt. St. Helens material in floodplain. Banks are eroding, contributing further fine materials to river.
- Effectiveness was based on assumptions:
 - Restoration of 3,000 feet of riparian, for 200 foot width, assumes 100% effectiveness.

20.2L – Dredged Materials Removal

T0.2R – Dredged Material Removal (Toutle)

Project Description

The intent of these project concepts is to remove dredged materials upstream from the mouth of the Toutle to increase floodplain area and provide a high quality riparian zone. Actions will include excavation and regrading of dredge spoils materials, native riparian plantings throughout site, and placement of large wood. Sites are on mainstem Cowlitz at RM 20.2 left bank and on lower Toutle River at RM 0.2 right bank.



Preliminary Costs

20.2L – Approximately 250,000 CY of material will be removed at \$10/CY for a width of 200 feet back from the current bank. Ten acres will be revegetated at \$10-15k per acre. Total preliminary construction cost is \$3,000,000. Does not include costs for acquisition of real estate or easement.

T0.2R -- Approximately 225,000 CY of material will be removed at \$10/CY for a width of 150 feet back from the current bank. Seven acres will be revegetated at \$10-15k per acre. Total preliminary construction cost is \$2,500,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

20.2L

- Reach: Mid Cowlitz 1A – Tier 3.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would remove dredged materials and restore floodplain and riparian zone.
- Review of proposed benefits:
 - Restore riparian habitat on one side of mainstem for approximately 1,200 feet
- Current habitat conditions are highly degraded due to placement of Mt. St. Helens material in floodplain.
- Effectiveness was based on assumptions:
 - Restoration of 1,200 feet of riparian zone for more than 200 foot width, assumes 100% effectiveness.

T0.2R

- Reach: Toutle 1 – Tier 1.
- Populations: Winter steelhead (P), spring chinook (C), fall chinook (S), coho (P), chum (C)
- Project would remove dredged materials to restore floodplain and riparian zone.
- Review of proposed benefits:
 - Restore riparian habitat on one side of mainstem for approximately 2,000 feet
- Current habitat conditions are highly degraded due to placement of Mt. St. Helens material in floodplain.
- Effectiveness was based on assumptions:
 - Restoration of 2,000 feet of riparian zone for 150 foot width, assumes 100% effectiveness.

T3.2R – Reconnect Off-Channel Pond

Project Description

The intent of this project concept is to reconnect off-channel ponds located behind dredged material spoils to provide off-channel rearing habitat along the lower Toutle River. Fish access will be enhanced by ensuring the pipeline crossing is passable and, if necessary, placing large wood to promote scour at the confluence of this small tributary with the Toutle River. Off-channel habitat will be enhanced by the placement of wood and plantings as needed.

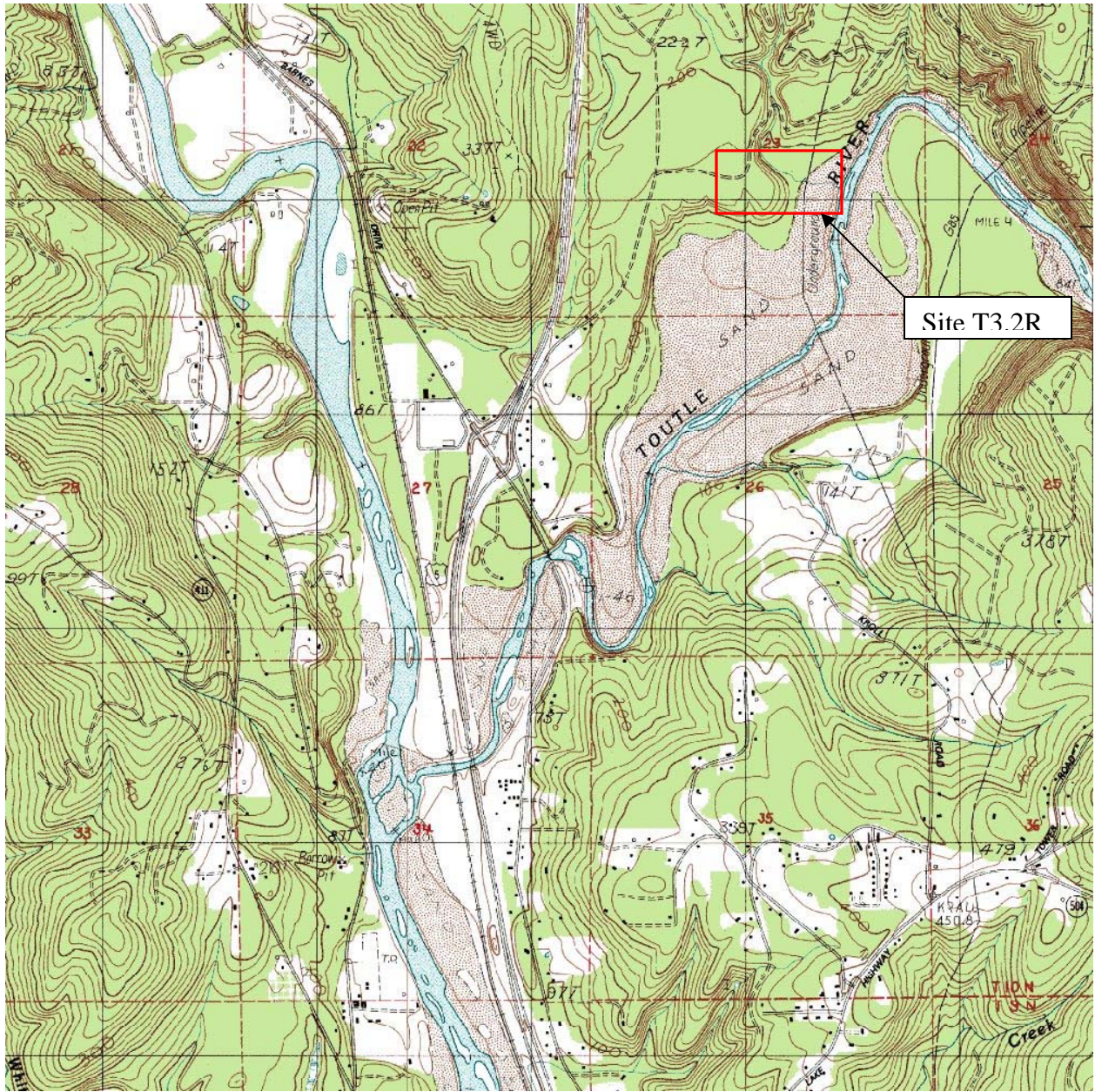
Preliminary Costs

Approximately 8,000 CY of material would be excavated to reconnect ponds at \$10/CY. Total preliminary construction cost is \$100,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

T3.2R

- Reach: Toutle 1 – Tier 1.
- Populations: Winter steelhead (P), spring chinook (C), fall chinook (S), coho (C), chum (C)
- Project would reconnect off-channel ponds isolated because of dredged material
- Review of proposed benefits:
 - Reconnect off channel habitat, approximately 1,500 feet, includes access, LWD, and riparian restoration
- Current habitat is not connected
- Effectiveness was based on assumptions:
 - Side channel length is approximately 1,500 feet, includes access, LWD, and riparian restoration, assume 100% effectiveness.



22.2L – Dredged Materials Removal

Project Description

The intent of this project concept is to remove dredged materials upstream from the mouth of the Toutle to increase floodplain area and provide a high quality riparian zone. Actions will include excavation and regrading of dredge spoils materials, native riparian plantings throughout site, and placement of large wood.



Preliminary Costs

Approximately 120,000 CY of material will be removed at \$10/CY for a width of 200 feet back from the current bank. Seven acres will be revegetated at \$10-15k per acre. Total preliminary construction cost is \$1,500,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

- Reach: Mid Cowlitz 1B – Tier 3.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would remove dredged materials and restore floodplain and riparian zone.
- Review of proposed benefits:
 - Restore riparian habitat on one side of mainstem for approximately 1,500 feet
- Current habitat conditions are highly degraded due to placement of Mt. St. Helens material in floodplain.
- Effectiveness was based on assumptions:
 - Restoration of 1,500 feet of riparian zone for 150 foot width, assumes 100% effectiveness.

23.0L – Off-Channel and Floodplain Restoration

Project Description

The intent of this project concept is to reconnect a large wetland area that has been isolated from the river by the railroad. Actions would include creation of a channel and placement of a culvert connection under the railroad, and riparian plantings as necessary. LWD would be placed at the river entrance to promote scour to keep the channel open.



Preliminary Costs

Approximately 20,000 CY of material will be removed at \$10/CY and a culvert will be placed under the RR. Approximately 2 acres of riparian plantings and one ELJ would be done. Preliminary project cost is \$1,000,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

- Reach: Mid Cowlitz 1B – Tier 3.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would reconnect a wetland and off-channel rearing area. Would include placement of LWD and riparian restoration.
- Review of proposed benefits:
 - Reconnect off channel habitat, approximately 2,000 feet, includes access, LWD, and riparian restoration
- Current habitat conditions are degraded due to adjacent agricultural uses and lack of cover:
 - Side channel length is approximately 2,000 feet, includes access, LWD, and riparian restoration, assume 100% effectiveness for 4 HUs.

23.2R – Bar and Island Enhancement Hog Island

Project Description

The intent of this project concept is to enhance an existing side channel and bar feature in the Cowlitz River near RM 23.2 on the right bank. This side channel is currently high quality, but may become disconnected and the bar could be enhanced to provide cover during high flows. Actions include placement of wood to promote scour at the entrance and exit of the side channel and on the bar to provide cover. Removal of noxious weeds (reed canary grass) and riparian plantings on the bar would also occur.





Preliminary Costs

Placement of 20 pieces of wood and two ELJS would occur. Fifteen acres will be revegetated at \$10-15k per acre. Total preliminary construction cost is \$300,000. Does not include costs for acquisition of real estate or easement; on DNR land.

Assumptions for Fish Benefit Scoring

- Reach: Mid Cowlitz 1C – Tier 2.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would enhance side channel and improve stream channel habitat at Hog Island.
- Review of proposed benefits:
 - Enhance side channel habitat by placement of LWD and riparian restoration
- This side channel is the highest quality one in the lower river. However, there is a lack of cover in and around the channel and bar and channel receives less water over time due to slow sedimentation.
- Effectiveness was based on assumptions:
 - Enhancement of side channel habitat, 2,500 feet, includes access, LWD, and riparian restoration, assume 100% effectiveness.

T8 – Replace Culvert

Project Description

The intent of this project concept is to replace a fish passage barrier culvert on Rock Creek at West Side Highway.

Preliminary Costs

Replace culvert under 4 lane county road, estimated length of culvert is 100 feet and 10 foot diameter. Total preliminary construction cost is \$500,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

T8

- Reach: Rock Creek – Tier 3.
- Populations: Winter steelhead (C), coho (P)
- Project would replace culvert at West Side Highway to allow access to 2.6 miles of habitat
- Review of proposed benefits:
 - Access will be restored to Tier 3 habitats, actual condition unknown

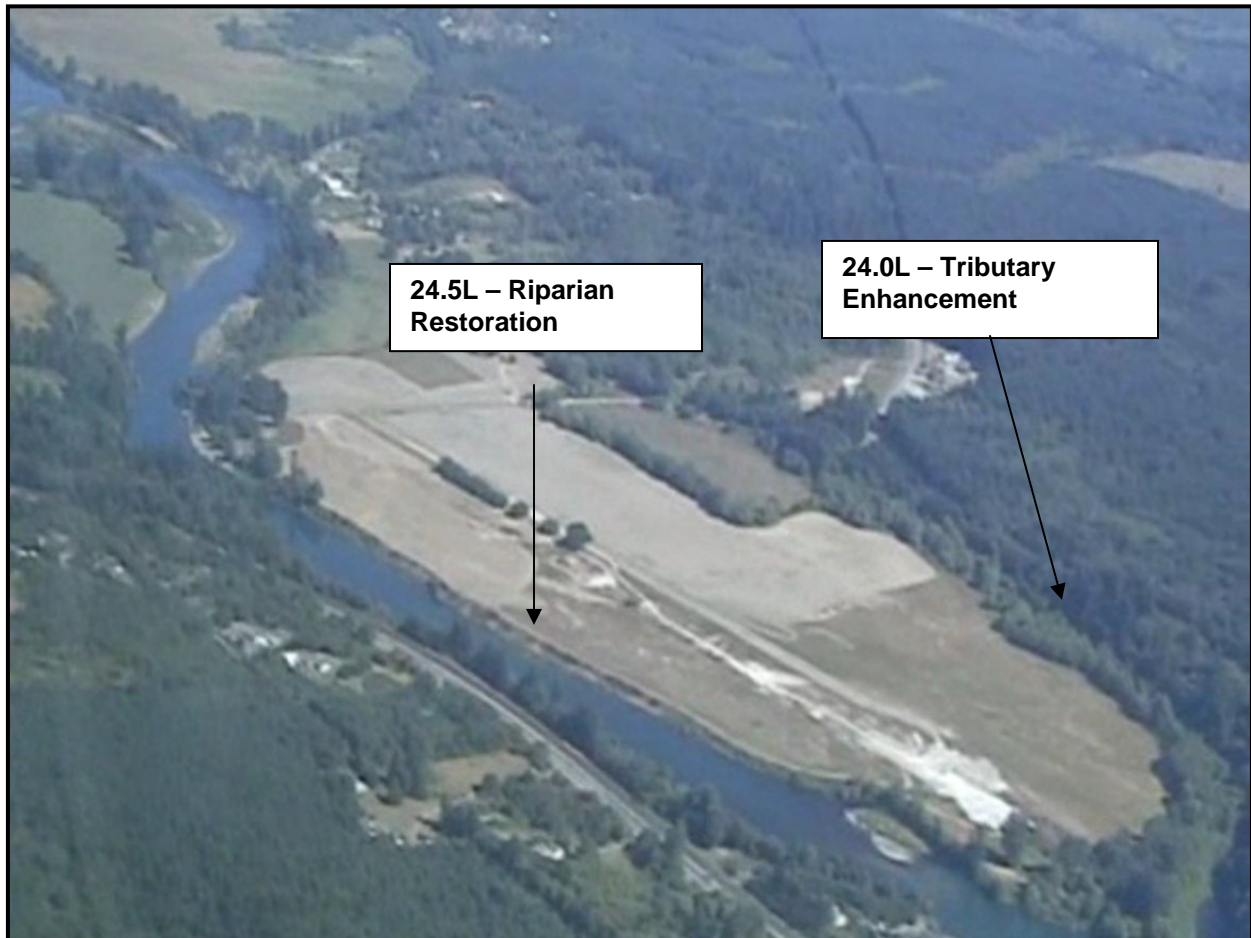
24.0L – Tributary and Off-channel Enhancement

24.5L – Riparian Restoration

Project Description

24.0L – The intent of this project concept is to remove a partial fish passage barrier at the mouth of Hill Creek and restore the stream channel to provide off-channel rearing and refuge habitat during high flows in the mainstem. Actions would include removal of rock and other debris at the mouth, placement of wood to promote scour at the mouth, placement of wood in the channel to provide cover, and riparian restoration.

24.5 L – The intent of this project concept is to remove dredged materials for a width of 150 feet along approximately 2,500 feet of shoreline to restore riparian and floodplain habitat. Actions would include excavation and regrading of dredge spoils materials, and native riparian plantings.



Preliminary Costs

24.0L – Approximately 500 CY of material would be removed, and 20 pieces of wood would be placed. Approximately 7 acres of riparian zone would be enhanced and restored. Total preliminary construction cost is \$150,000. Does not include costs for acquisition of real estate or easement.

24.5L – Approximately 50,000 CY of material would be removed at \$10/CY. The proposed riparian zone area is approximately 5 acres and 2,500 feet in length. Total preliminary construction cost is \$750,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

24.0L

- Reach: Hill Creek – Tier 2.
- Populations: Winter steelhead (C), coho (P)
- Project would reconnect Hill Creek channel by removing barrier structure and place LWD.
- Review of proposed benefits:
 - Provide access to blocked habitats, approximately 1,000 feet
 - Enhance stream channel habitat by providing wood for cover in lowest 1,000 feet and riparian restoration
- Currently, channel is inaccessible except during high flows due to riprap and other material placed to protect the RR embankment and there is no cover in the channel.
- Effectiveness was based on assumptions:
 - Removal of fish passage barrier to allow juvenile access to 1 mile of Hill Creek, assume 67% passage improvement (currently accessible during higher flows in Cowlitz)
 - Enhancement of 1,000 feet of stream channel with LWD
 - Riparian restoration along 1,000 feet of channel, both sides, assumes 100% effectiveness.

24.5L

- Reach: Mid Cowlitz 1F – Tier 2.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would restore floodplain connection by removing fill material, sloping banks back and restore riparian zone.
- Review of proposed benefits:
 - Restore riparian habitat on one side of channel for approximately 2,500 feet
- Currently, floodplain is not connected
- Effectiveness was based on assumptions:
 - Restoration of 2,500 feet of riparian zone for 150 feet width, assumes 100% effectiveness.



Image looking at Hill Creek outlet through historical railroad embankment near RM 24.0

T9A and T9 – Tributary Acquisition and Enhancement/Side-Channel Restoration

Project Description

The intent of this project concept is to restore a side-channel and the riparian zone/floodplain along the lower ½ mile of Olequa Creek, on both banks. There is currently a channel connected at high flows, but there is also a remnant channel along the left bank. The remnant channel could be reconnected for high flow refuge and rearing and the bar and existing channel could be enhanced by placement of wood. Actions include placement of wood to promote scour at the entrance and exit of the side channel and on the bar to provide cover. Removal of noxious weeds (knotweed) and riparian plantings on both banks would also occur. The Cowlitz Tribe currently owns most of the right bank and a willing landowner owns the left bank. This project includes acquisition costs for the privately owned floodplain parcel.

Preliminary Costs

Approximately 40 pieces of LWD and 2 ELJs would be placed to promote scour at the side-channel openings and provide cover during high flows. Noxious weeds would be removed and the riparian zone would be restored along both banks for 2500 feet at \$15k per acre. Approximately 1,500 CY would be excavated to reconnect the remnant side-channel. Total preliminary construction cost is \$440,000. Acquisition costs are estimated at \$10k per acre for 20 acres, which is \$200,000.

Assumptions for Fish Benefit Scoring

- Reach: Olequa Creek 1 – Tier 1.
- Populations: Winter steelhead (C), coho (P), chum (C)
- Project would remove noxious weeds (knotweed) and restore riparian and floodplain for 2,500 feet along both banks, and restore and reconnect remnant side channel, approximately 1,000 feet in length.
- Review of proposed benefits:
 - Restore side channel habitat, approximately 1,000 feet, includes access, LWD, and riparian restoration
 - Remove noxious weeds and restore riparian zone for minimum of 150 feet in width along both banks for 2,500 feet
- Current habitat conditions are degraded due to lack of riparian zone and limited habitat diversity.
- Effectiveness was based on assumptions:
 - Restoration of 1,000 feet of side channel habitat, includes access, LWD, and riparian restoration, assume 100% effectiveness
 - Restoration of 2,500 feet of riparian of 150 foot width on both banks, assume 100% effectiveness over 5 habitat units.



Left bank of Olequa Creek near mouth.

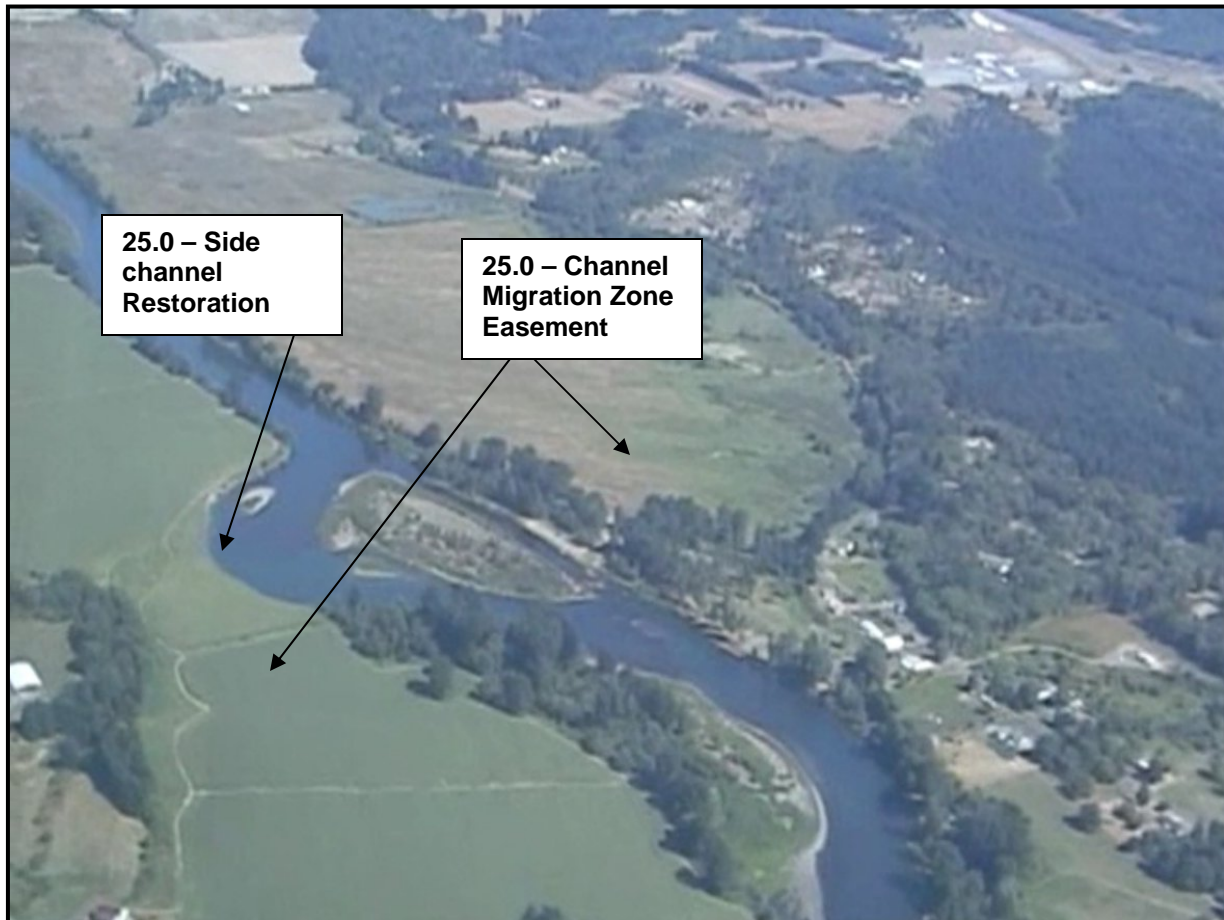
25.0A – Channel Migration Zone Easement

25.0B – Side Channel Restoration and Enhancement

Project Description

25.0A -- The intent of this project is to acquire easements in an active channel migration area, when landowners are willing.

25.0B – The intent of this project is to enhance the existing side channel along the right bank by removing car bodies and other debris, sloping back the bank and planting floodplain and riparian vegetation.



Preliminary Costs

25.0A -- The preliminary cost is based on an assumption of acquiring easements or fee title for 100 acres at an estimated \$10,000 per acre is \$1,000,000.

25.0B – Assume removal of 20,000 CY of debris and sloping banks back (car bodies and hauling) at \$10/CY. 100 acres of riparian and floodplain restoration at \$15k per acre. Total preliminary construction cost is \$500,000.

Assumptions for Fish Benefit Scoring

25.0A

- Reach: Mid Cowlitz 2A – Tier 2.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would obtain channel migration zone easement
- Review of proposed benefits:
 - Protect natural channel migration processes
- Currently an existing side channel, extensive car body riprap, and agricultural use of floodplain with no riparian zone. Bank is fairly stable but vertical.
- Protection potential was based on assumptions:
 - Obtain easement on 100 acres of floodplain along 2,500 feet of channel, to allow migration.

25.0B

- Reach: Mid Cowlitz 2A – Tier 2.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would remove car bodies, place LWD and restore riparian/floodplain vegetation.
- Review of proposed benefits:
 - Enhance side channel habitat, approximately 2,500 feet
 - Restore floodplain habitat on one side of mainstem for approximately 4,500 feet
- Currently an existing side channel, extensive car body riprap, and agricultural use of floodplain with no riparian zone. Bank is fairly stable but vertical.
- Effectiveness was based on assumptions:
 - Restoration of 4,500 feet of floodplain, assume 100% effective
 - Enhance side channel habitat for 2,500 feet, includes LWD, access, riparian restoration



Image looking toward right bank at car “revetment” near RM 25.2.

26.0L – Riparian Restoration

Project Description

The intent of this project concept is to slope back the banks and restore a riparian zone along a 3,500 foot length. Presence of Mandy Road at top of bank may require moving road or else constrain restoration acreage. Actions would include excavation and grading of banks, and riparian plantings.





Image looking at left bank near RM 26.0

Preliminary Costs

The proposed riparian zone area is approximately 3,500 feet in length. Approximately 60,000 CY of material will be removed at \$10/CY. Eight acres will be revegetated at \$10-15k per acre. Total preliminary construction cost is \$750,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

- Reach: Mid Cowlitz 2B – Tier 3.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would create a riparian bench.
- Review of proposed benefits:
 - Restore riparian habitat on one side of mainstem for approximately 3,500 feet
- Current habitat conditions include riprap and concrete on bank to protect road. Could setback road in a portion of the area and slope banks back to create inset floodplain.
- Effectiveness was based on assumptions:
 - Restoration of 3,500 feet of riparian zone for 50 foot width, assumes 33% effectiveness.



Image looking at left bank near RM 26.3, just upstream from previous photo.

27.7R – Side channel Restoration and Enhancement

27.7L – Side channel Restoration and Enhancement

28.0 – Gravel Mined Floodplain Restoration

Project Description

27.7 R – The intent of this project concept is to restore and enhance a remnant side channel/distributary channel at the mouth of Lacamas Creek. Actions would include excavation of channel as necessary, placement of ELJ at mouth to promote scour, riparian restoration.

27.7 L – The intent of this project concept is to restore a remnant side channel along the left bank across from the Lacamas Creek confluence. Small side channel restoration will involve excavation of upstream connection, placement of large wood along side channel to provide cover and refuge during salmon migration.

28.0 L – The intent of this project concept is to restore and reconnect a large gravel mined floodplain area to the river to provide off-channel salmonid rearing and refuge habitat. Actions would include reconnection of gravel mine with river as flood overflow area, and possibly a downstream low flow connection. Regrading of pond shoreline and bottom areas may be required to provide beneficial habitat. Extensive placement of large wood debris and riparian/wetland plantings are part of the plan.

Preliminary Costs

27.7R -- Approximately 5,000 CY of material will be removed at \$10/CY. Two acres will be revegetated at \$10-15k per acre, and 20 pieces of LWD would be placed and 2 ELJs. Total preliminary construction cost is \$250,000. Does not include costs for acquisition of real estate or easement.

27.7L -- Approximately 10,000 CY of material will be removed at \$10/CY. Two acres will be revegetated at \$10-15k per acre, and 20 pieces of LWD would be placed and 2 ELJs. Total preliminary construction cost is \$300,000. Does not include costs for acquisition of real estate or easement.

28.0L – Approximately 100,000 CY of material will be excavated or imported and placed to re-contour the site into a flow-through off-channel area, at \$10/acre. Forty acres will be revegetated at \$10-15k per acre, and 50 pieces of wood and 2 ELJs would be placed. Total preliminary construction cost is \$1,500,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

27.7R

- Reach: Mid Cowlitz 2B – Tier 3.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would enhance and reconnect side channel as necessary at mouth of Lacamas Creek. Would include placement of LWD and riparian restoration.
- Review of proposed benefits:
 - Reconnect side channel habitat, approximately 1,000 feet, includes access, LWD, and riparian restoration

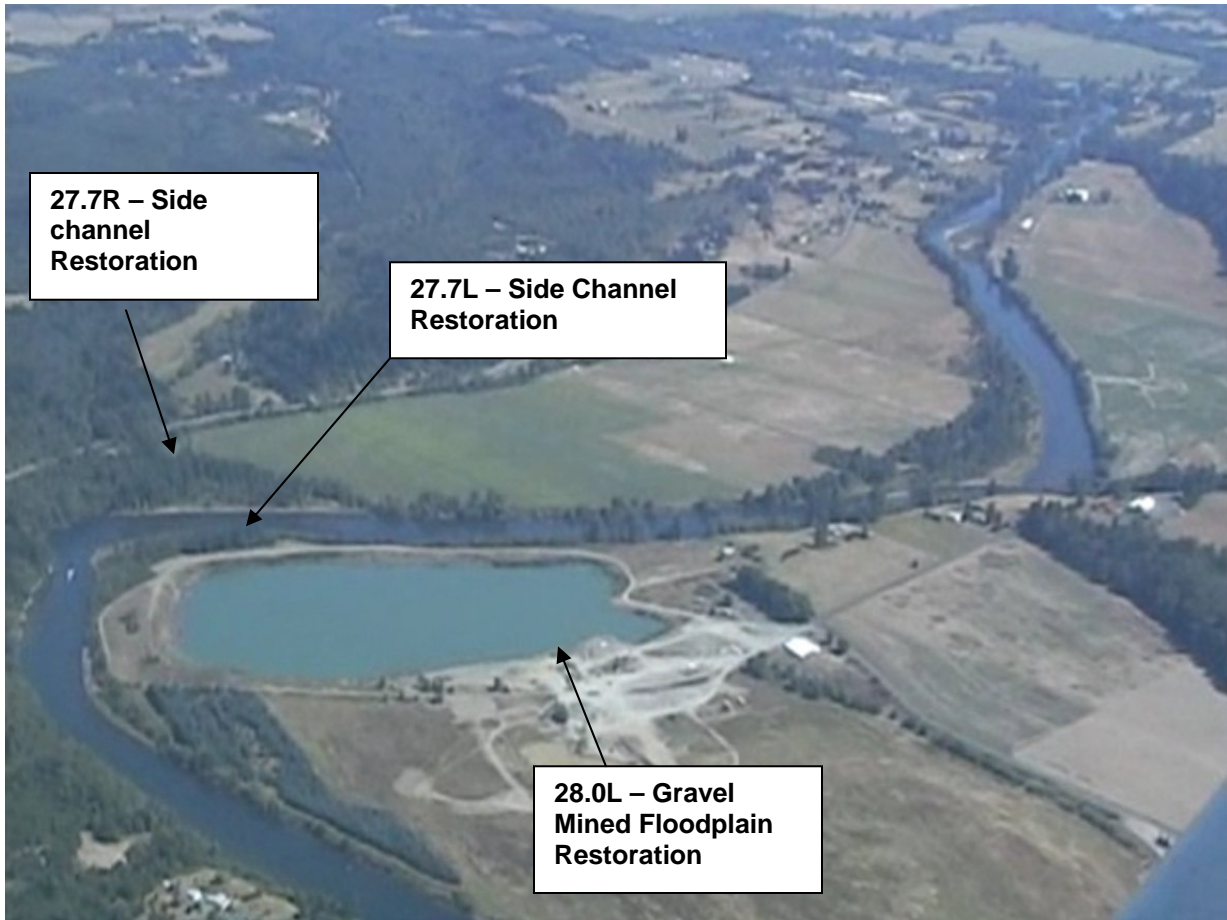
- Current habitat conditions are degraded due to adjacent agricultural uses and lack of cover:
 - Side channel length is approximately 1,000 feet, includes access, LWD, and riparian restoration, assume 100% effectiveness for 2 HUs.

27.7L

- Reach: Mid Cowlitz 3A – Tier 3.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would restore a historic side channel and improve riparian zone and stream channel habitat.
- Review of proposed benefits:
 - Restore side channel habitat, approximately 650 feet, includes access, LWD, and riparian restoration
- Currently the inset floodplain is sparsely vegetated and the side channel has filled in.
- Effectiveness was based on assumptions:
 - Side channel length is approximately 650 feet, includes access, LWD, and riparian restoration, assume 100% effectiveness.

28.0L

- Reach: Mid Cowlitz 3A – Tier 3.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would restore approximately 40 acres of gravel mine to provide off-channel rearing and refuge habitat. Would also restore riparian zone and reconnect mine as floodplain.
- Review of proposed benefits:
 - Reconnect off-channel habitat, approximately 2000 feet
 - Restore riparian habitat on one side of mainstem approximately 2000 feet
 - Restore and reconnect approximately 40 acres of floodplain
- Current habitat conditions are highly degraded due to gravel mining and disconnection of floodplain. No riparian zone.
- Effectiveness was based on assumptions:
 - Side channel length is approximately 2,000 feet, includes access, LWD, and riparian restoration, assume 100% effectiveness
 - Restoration of 2,000 feet of riparian zone along mainstem, 150 foot width, assumes 100% effectiveness.
 - Reconnect approximately 900 feet of floodplain to the river, out of floodplain width of 3,960 feet, assume 22% effectiveness.



Lower Cowlitz River



Project: Restoration Project Siting

Page: 1 of 1

Crew: DRC, MM, JS

Date: 9/13/06

Location (Lat/Long):

Project ID: T2

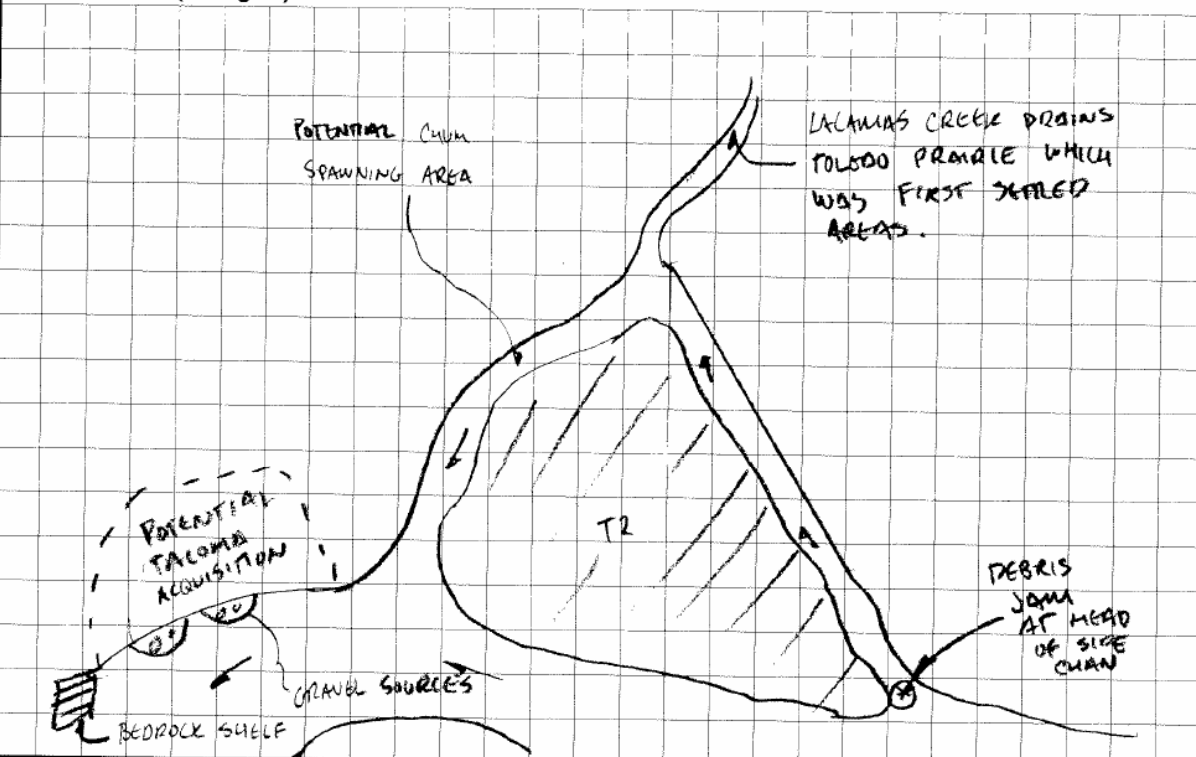
Time: 13:30 PPT

River Mile: 27.7

PROJECT INFO:

Mouth of Lacamas Creek. Chum spawn here, high priority to protect and enhance

SITE SKETCH (1/4" grid)



NOTES

- RSI PROGRAM ON LACAMAS CREEK (UPSTREAM)
- LACAMAS CREEK SETTLED FOR 100-200 YRS.

T10 – Tributary Enhancement

Project Description

The intent of this project concept is to enhance the lower approximately 2,000 feet of Foster Creek by placing LWD, sloping back banks and restoring a riparian zone along both banks. This will provide low-gradient off-channel habitat for fish from both Foster Creek and high flow refuge to mainstem Cowlitz stocks.

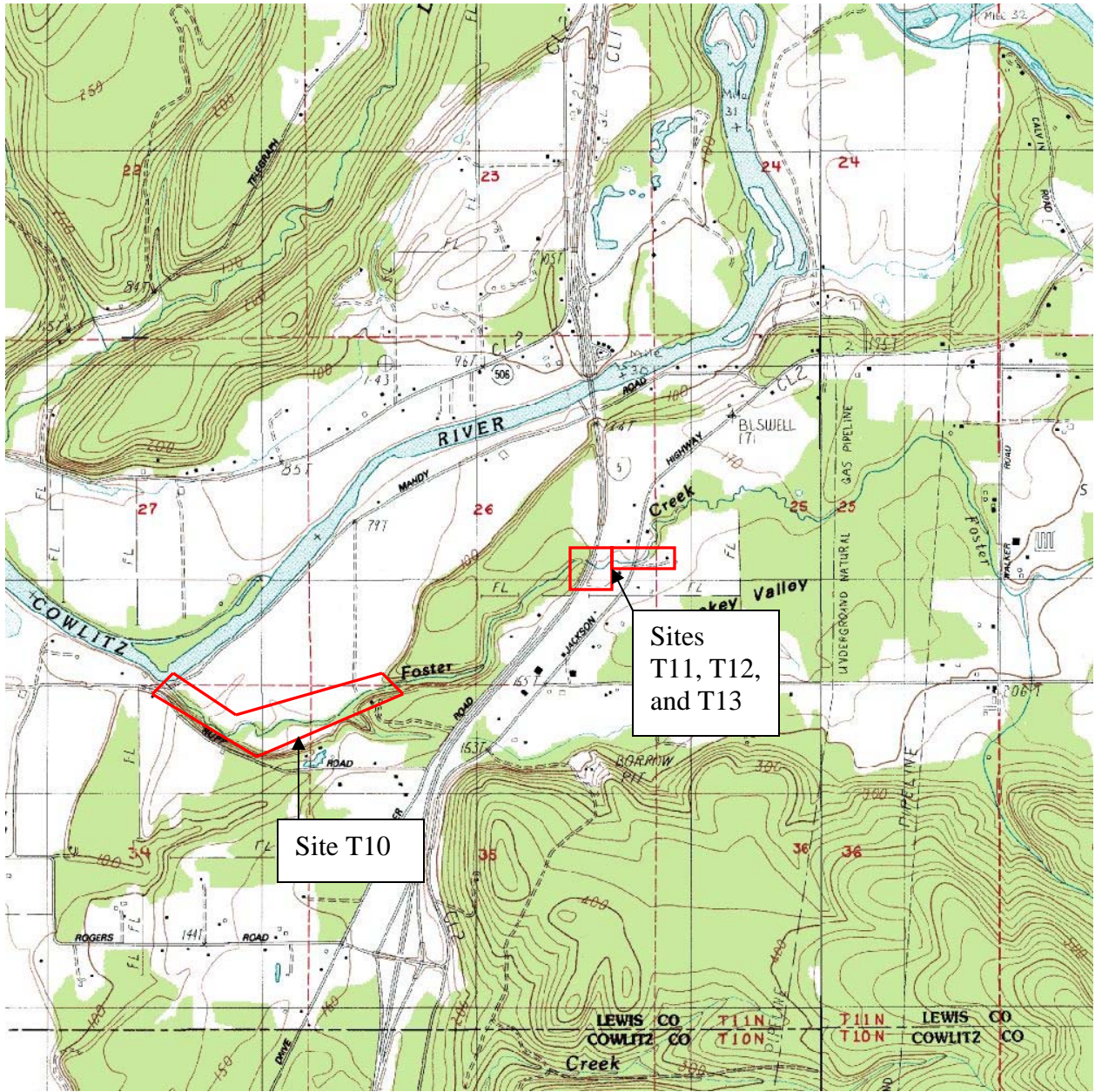
Preliminary Costs

Approximately 30 pieces of wood will be placed. Approximately 10,000 CY of material will be excavated to slope banks back and riparian restoration will occur. Total preliminary construction cost is \$300,000. Does not include costs for acquisition of easement.

Assumptions for Fish Benefit Scoring

T10

- Reach: Foster Creek 1A – Tier 2.
- Populations: Winter steelhead (C), coho (P)
- Project would restore side channel in lower creek and restore riparian zone.
- Review of proposed benefits:
 - Restore in-stream habitat, approximately 2,000 feet
 - Restore riparian habitat on both sides of creek
- Current habitat conditions are highly degraded due to livestock
- Effectiveness was based on assumptions:
 - Placement of LWD to PFC conditions, assume 100% effectiveness
 - Restoration of 2,000 feet of riparian zone on both banks to width of 100 feet, assume effectiveness of 67%



T11 – Replace Culvert

Project Description

The intent of this project concept is to replace a fish passage barrier culvert on Foster Creek at I-5.

Preliminary Costs

Replace culvert under 4-lane state highway, estimated culvert length of 100 feet and 10 foot diameter. Total preliminary construction cost is \$1,000,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

T11

- Reach: Foster Creek 1B – Tier 4.
- Populations: Winter steelhead (C), coho (P)
- Project would replace culvert at I-5 crossing
- Review of proposed benefits:
 - Restore access to 1.7 miles of tier 2 and 4 habitats

T12 – Replace Culvert

Project Description

The intent of this project concept is to replace the fish passage barrier culvert at Jackson Highway on Foster Creek.

Preliminary Costs

Replacement of culvert under 2-lane county roadway, estimated length of culvert at 50 feet, probable diameter of 10 feet. Total preliminary construction cost is \$500,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

T12

- Reach: Foster Creek 1B – Tier 2.
- Populations: Winter steelhead (C), coho (P)
- Project would replace culverts at RR and Jackson Highway to allow access to 3.5 miles of habitat
- Review of proposed benefits:
 - Access will be restored to approximately 1.7 miles of Tier 2 and 4 habitats, not sure of actual condition

T13 – Replace Culvert

Project Description

The intent of this project concept is to replace a fish passage barrier culvert on Foster Creek at a private drive upstream of Jackson Highway.

Preliminary Costs

Replace culvert on one-lane private drive, estimated culvert length of 30 feet and 10 foot diameter. Total preliminary construction cost is \$50,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

T13

- Reach: Foster Creek 1B – Tier 4.
- Populations: Winter steelhead (C), coho (P)
- Project would replace culvert at private drive upstream of Jackson Hwy
- Review of proposed benefits:
 - Restore access to 1.7 miles of tier 2 and 4 habitats

30.5R – Bar and Side Channel Enhancement 30.7L – Bar and Side Channel Enhancement

Project Description

The intent of these project concepts is to enhance existing side channel and bar features in the middle Cowlitz River near RM 30.5 on both banks. These side channels are currently partially connected, but may become disconnected in the near future. The bars could be enhanced to provide cover during high flows. Actions include placement of wood to promote scour at the entrance and exit of the side channels and on the bars to provide cover. Removal of noxious weeds (reed canary grass) and riparian plantings on the bar would also occur.

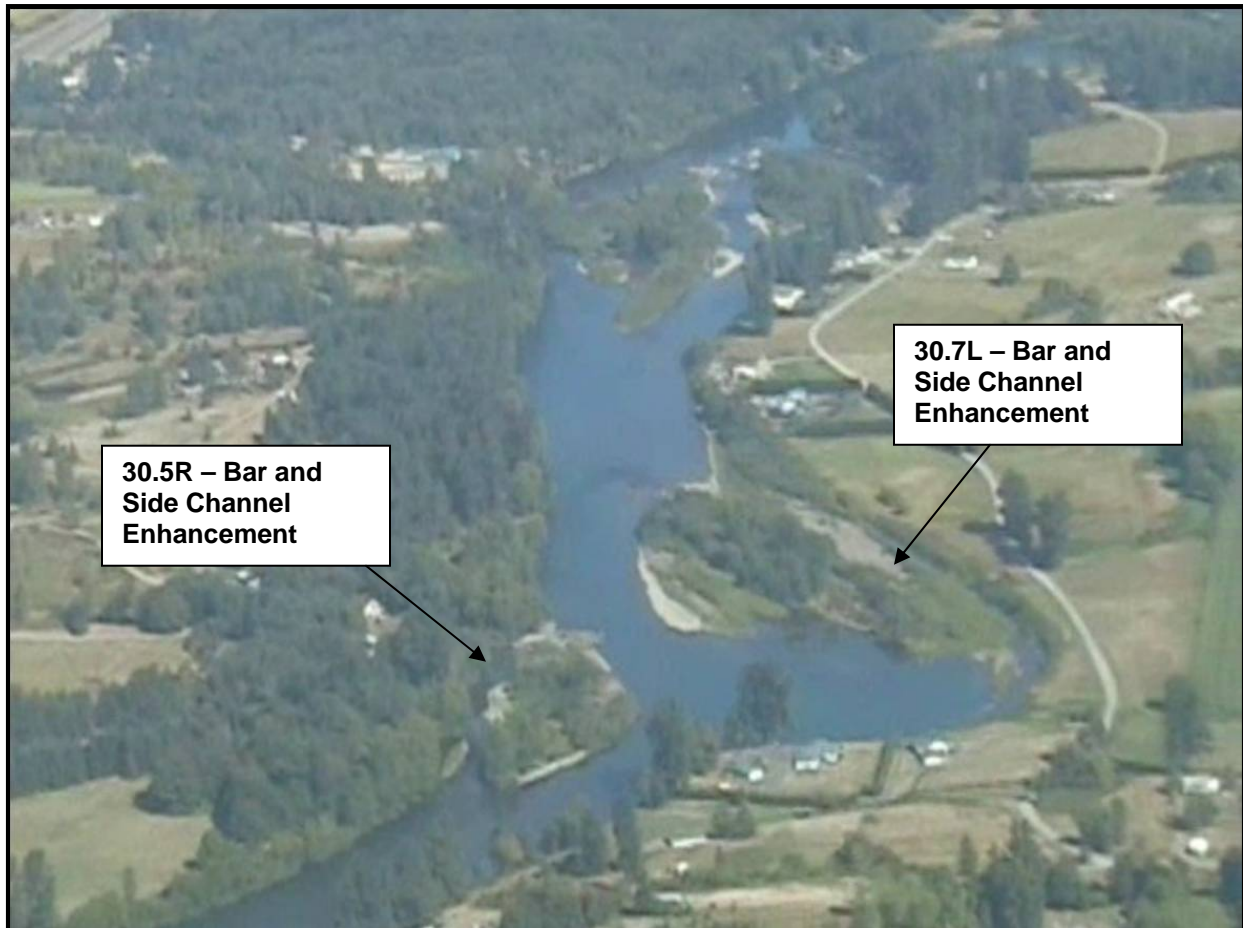




Image looking towards right bank near RM 30.5.

Preliminary Costs

30.5R -- Approximately 40 pieces of LWD and 2 ELJs would be placed to promote scouring the channel to keep it open and to provide cover during high flows. Total preliminary construction cost is \$175,000. Does not include costs for acquisition of real estate or easement; likely to be DNR land.

30.7L -- Approximately 5,000 CY of material will be removed at \$10/CY, and 40 pieces of LWD would be placed and 2 ELJs. Total preliminary construction cost is \$200,000. Does not include costs for acquisition of real estate or easement; likely to be DNR land.

Assumptions for Fish Benefit Scoring

30.5R

- Reach: Mid Cowlitz 4A – Tier 1.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would enhance side channel and place LWD to promote scour and provide cover.
- Review of proposed benefits:
 - Enhance side channel for 1,000 feet, includes access, LWD, and riparian restoration
- Current habitat conditions are degraded due to adjacent land uses and filling in of side channel.
- Effectiveness was based on assumptions:
 - Enhance side channel for 1,000 feet, includes access, LWD, and riparian restoration, assume 100% effectiveness.

30.7L

- Reach: Mid Cowlitz 4A – Tier 1.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would enhance side channel and place LWD to promote scour and provide cover.
- Review of proposed benefits:
 - Enhance side channel for 1,000 feet, includes access, LWD, and riparian restoration
- Current habitat conditions are degraded due to adjacent land uses and filling in of side channel.
- Effectiveness was based on assumptions:
 - Enhance side channel for 1,000 feet, includes access, LWD, and riparian restoration, assumes 100% effectiveness.

Lower Cowlitz River



Project: Restoration Project Siting

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Crew: JRC, MM, DS

Date: 12/15/07

Location (Lat/Long):

Project ID: T3

Time: 9/13/03

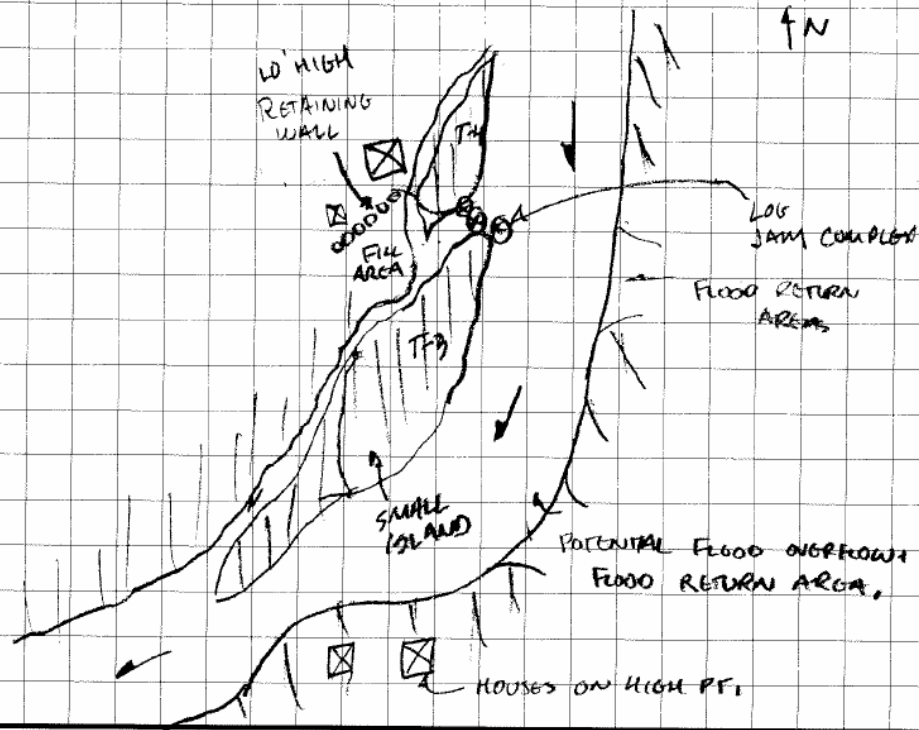
River Mile: 30.5 left

PROJECT INFO:

River has shifted to right of backwater on left side; lots of new houses on high ground on LB. Good juvenile rearing habitat and existing LWD jam.

SITE SKETCH (1/4" grid)

T-3 + T-4



NOTES

- LOG JAM AT HEAD OF T-3 CONTROLLING INFLOW. POSSIBLY ENGINEERED. DAVE BULLER THOUGHT IT WAS FROM U/S ISLANDS FLOW IN BOTH SIDE CHANNELS.

31.5R – Bar and Side Channel Enhancement

Project Description

The intent of this project concept is to enhance an existing side channel and bar in the middle Cowlitz River near RM 31.5 on the right bank. This side channel is currently connected at most flows, but may become disconnected in the near future. The bar could be enhanced to provide cover during high flows. Actions include placement of wood to promote scour at the entrance and exit of the side channel and on the bar to provide cover. Removal of noxious weeds (reed canary grass) and supplemental riparian plantings on the bar would also occur.





Image looking upstream side channel along right bank near RM 31.5

Preliminary Costs

Approximately 45 pieces of LWD and 2 ELJs would be placed to promote scour at the opening, protect the bank and provide cover during high flows. The riparian zone would be restored along the bank for 1500 feet (5 acres) at \$10-15k per acre. Total preliminary construction cost is \$250,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

- Reach: Mid Cowlitz 4B – Tier 2.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would enhance existing side channel.
- Review of proposed benefits:
 - Enhance side channel habitat, approximately 1,500 feet, includes access, LWD, and riparian restoration
- Current habitat conditions are good, but side channel has minimal cover and has been slowly becoming disconnected.
- Effectiveness was based on assumptions:
 - Restoration of 1,500 feet of side channel habitat, includes access, LWD, and riparian restoration, assume only 50 feet of riparian, so effectiveness of 83%

Lower Cowlitz River



Project: Restoration Project Siting

Page: 1 of 1

Crew: DRB, MM, DS

Date: 9/17/06

Location (Lat/Long):

Project ID: T5

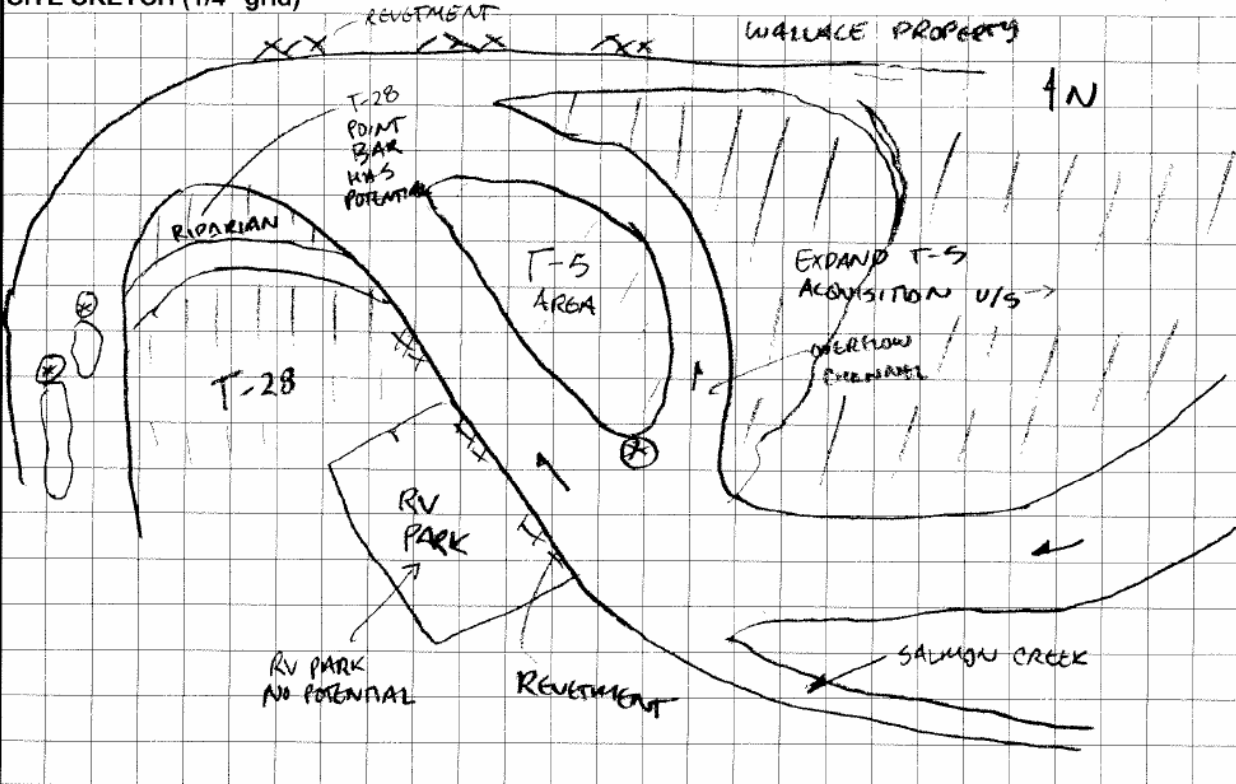
Time: 11:45 PM

River Mile: 31.5

PROJECT INFO:

City plans to protect the dynamic channel in this area. Good juvenile salmon rearing habitat.

SITE SKETCH (1/4" grid)



NOTES

- EXPAND T-5 ACQUISITION U/S TO INCLUDE IN MIGRATION ZONE.
- NOT MUCH POTENTIAL ALONG RV PARK
- SOME POTENTIAL ON T-28 POINT BAR
- ELJ AT HEAD OF T-5 BAR

32.0L – Channel Migration Zone Easement

32.5R – Bar and Side Channel Enhancement

33.0B – Channel Migration Zone Easement

Project Description

32.0L and 33.0B – The intent of these project concepts is to acquire easements to allow the channel to continue to migrate on undeveloped lands and continue to form side channels and other habitat features. These areas are already subject to significant recent migration, particularly at RM 32.0 near the confluence of Salmon Creek, and are providing high quality habitat. In order to prevent the landowners from armoring the banks to prevent further erosion these projects would allow meandering up to a certain point (the landowners could provide buried protection that might or might not eventually become the river bank). Portions of site 32.0 are owned by the Cowlitz Tribe. Additional easements from the adjacent landowners would reduce risk of channelization that has already partially occurred.

32.5R – The intent of this project concept is to enhance an existing side channel and bar by placing LWD to keep the channel open and provide cover during high flows. The landowner has done some armoring of the bank and this project would include riparian restoration along the bank to provide protection from erosion while enhancing the habitat.

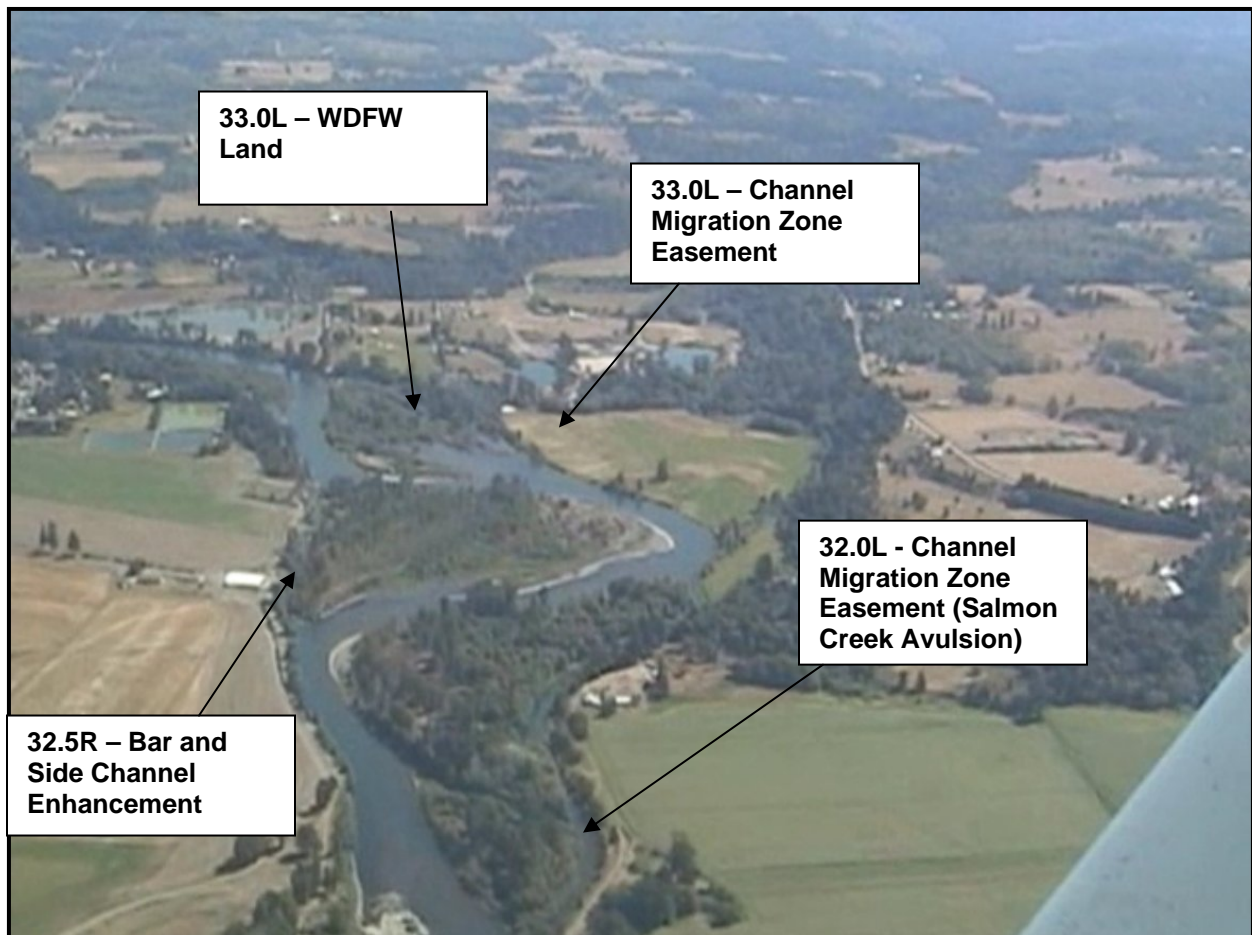




Image looking downstream towards left bank Salmon Creek avulsion channel near RM 32.5

Preliminary Costs

32.0L – Acquire easement on approximately 40 acres to allow continued channel migration. Also restore riparian zone along approximately 2,200 feet of channel at \$10-15k per acre. Total preliminary cost is \$450,000, includes acquisition of real estate or easement; part of this site is owned by the Cowlitz Tribe, so assume minimal acquisition costs for 9 of the acres.

32.5R – Place approximately 50 pieces of LWD and 2 ELJs to promote scour to keep side channel open and protect bank and provide cover during high flows. Approximately 5,000 CY of material may need to be excavated at \$10/CY. Restore riparian along 1500 feet of bank at \$10-15k per acre. Total preliminary construction cost is \$300,000. Does not include acquisition costs.

33.0B – Acquire easement on approximately 25 acres on both sides of channel to allow continued channel migration. Also restore riparian zone along approximately 1,500 feet of channel at \$10-15k per acre. Place approximately 50 pieces of wood and 2 ELJs. Approximately 5,000 CY will be excavated to reconnect side channel. Total preliminary cost is \$500,000, includes acquisition of real estate or easement.



Looking towards left bank with car revetments protecting agricultural land near RM 32.5



Image looking downstream at head of side channel along right bank near RM 32.5

Assumptions for Fish Benefit Scoring

32.0L

- Reach: Mid Cowlitz 4B – Tier 1.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would acquire a channel migration zone easement to allow continued meandering of Salmon Creek confluence area. Also enhance with LWD and riparian restoration.
- Review of proposed benefits:
 - Protect and enhance 40 acres of floodplain
 - Restore riparian habitat on one side of mainstem for approximately 2,500 feet
- Current habitat conditions are moderate in that channel meandering is occurring, but adjacent landowners may take action to prevent it, if lands are not acquired. Also, riparian zone is young and has significant presence of non-native species.
- Effectiveness was based on assumptions:
 - Restoration of 2,500 feet of riparian zone, only 50 foot width, so assume 33% effectiveness.

32.5R

- Reach: Mid Cowlitz 5A – Tier 1.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would protect and enhance existing side channel and floodplain.
- Review of proposed benefits:
 - Restore side channel habitat, approximately 1,500 feet, includes access, LWD, and riparian restoration
- Current habitat conditions are degraded due to landowner attempting to block off side channel and activities in floodplain. High flows in November/December 2006 scoured this side channel open, now plan to restore side channel habitat across island.
 - Restoration 1,500 feet of side channel, includes access, LWD, and riparian restoration of 50 foot width, so only 83% effectiveness.

33.0B

- Reach: Mid Cowlitz 5A – Tier 1.
- Populations: Winter steelhead (C), fall chinook (C), coho (P), chum (C)
- Project would acquire easement to protect channel migration zone and enhance side channel and floodplain.
- Review of proposed benefits:
 - Reconnect side channel habitat, approximately 1,000 feet, includes access, LWD, and riparian restoration
 - Enhance 25 acres of floodplain
- Current habitat conditions are moderate. Side channel is mostly disconnected, and channel wants to migrate into adjacent land that is partially developed.
- Effectiveness was based on assumptions:
 - Side channel length is approximately 1,000 feet, includes access, LWD, and riparian restoration of 50 foot width, so 83% effectiveness.
 - Restoration of 25 acres of floodplain along 1,500 feet, only width of 400 feet out of floodplain width of 1,300 feet, so 30% effectiveness.

Lower Cowlitz River



Project: Restoration Project Siting

Page: \ of \

Crew: DRC, MM, DS

Date:

Location (Lat/Long):

Project ID: 29

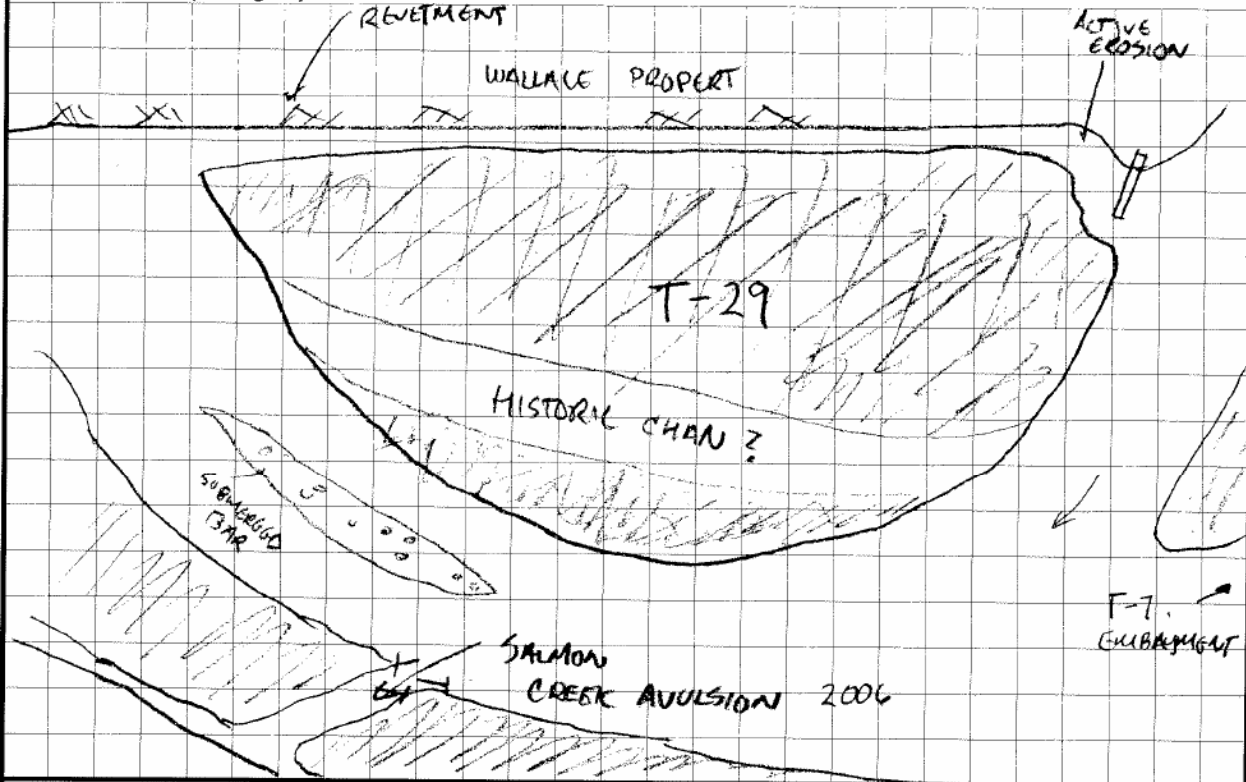
Time:

River Mile:

PROJECT INFO:

Owned by Mr. Wallace, may be interested in something. He had a lot of regulatory enforcement actions against him for filling in channels, etc. He approached City of Tacoma but they never pursued, so didn't know what he was willing to do. There is an existing side channel and good floodplain area.

SITE SKETCH (1/4" grid)



NOTES

- PROTECT + PRESERVE SALMON CREEK AVULSION AREA.
- CAPTURING SIGNIFICANT AMOUNT OF COWLITZ FLOW
- CHANNEL ADJUSTMENTS LIKELY DURING NEXT FEW YEARS
- POTENTIAL FOR FULL AVULSION.

34.5A – Acquire Gravel Mined Floodplain

34.5L – Gravel Mined Floodplain Restoration

Project Description

34.5A – The intent of this project is to acquire approximately 100 acres of the gravel mined floodplain along the Middle Cowlitz at RM 34.5 on the left bank. Over 200 acres have been gravel mined, but acquisition of the whole site is unlikely. Acquisition will prevent the site from being developed entirely as a subdivision and jet-ski ponds.

34.5L – The intent of this project concept is to restore and reconnect the approximately 100 acres that may be acquired in the 34.5A project. Breaches would be made to connect the river for a flow-through side channel, fill would be imported to smooth out the steep banks and provide shallow water habitat, and riparian and wetland plantings would be done throughout the site. It is likely that the remaining property would have to be protected in some manner to prevent the river from completely occupying the lands further back.



Preliminary Costs

34.5A – Acquire 100 acres of gravel mined floodplain. Assume \$10,000/acre. Total acquisition cost \$1,000,000.

34.5L – Approximately 200,000 CY of material would be excavated and/or imported to restore connections and provide shallow water habitat at \$10/CY. Total preliminary construction cost is \$2,500,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

34.5A

- Reach: Mid Cowlitz 5A – Tier 1.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would acquire 100 acres of gravel mined floodplain to protect from development and then restore in next project identified below.
- Review of proposed benefits:
 - Protect 100 acres of floodplain
- Current habitat conditions are highly degraded due to gravel mining activities.
- Effectiveness was based on assumptions:
 - Protection of 100 acres of floodplain in critical reach, which is currently being considered for development.

34.5B

- Reach: Mid Cowlitz 5A – Tier 1.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would restore gravel mine to create floodplain and off-channel habitat. Also restore riparian zone.
- Review of proposed benefits:
 - Restore 6,000 feet of off-channel and floodplain habitat
- Current habitat conditions are highly degraded due to gravel mining activities.
- Effectiveness was based on assumptions:
 - Off channel length is approximately 6,000 feet, includes access, LWD, and riparian restoration, assume 100% effectiveness
 - Restoration of 6,000 feet of floodplain function and CMZ, approximately 576 feet width out of 2,600 foot wide floodplain, assume effectiveness of 22%



Image looking from left bank towards third gravel pond from upstream end near RM 34.0

36.0R – Side Channel and Floodplain Restoration

Project Description

The intent of this project concept is to restore and enhance side channels and floodplain habitat in the Middle Cowlitz at RM 36.0 on the right bank. This area is partially owned by WDFW for the Massey Bar boat launch and partially owned by the City of Tacoma. There is a spring-fed creek that flows off the bluff and outlets at the downstream end of the bar. There are several remnant old channels on the bar that could be reconnected by excavation. Actions include excavation to reconnect remnant channels, placement of LWD and ELJs to keep backwater channel open and enhance bar, and riparian plantings.





Image at downstream end of backwater on right bank near RM 35.5

Preliminary Costs

Approximately 10,000 CY would be excavated to restore side channels, etc. at \$10/CY. Approximately 100 pieces of LWD and 2 ELJs would be placed. Riparian revegetation would occur as necessary on approximately 20 acres at \$10k per acre. Total preliminary construction cost is \$500,000. Does not include costs for acquisition of real estate or easement, but most of the site is already owned by either City of Tacoma or WDFW.

Assumptions for Fish Benefit Scoring

- Reach: Mid Cowlitz 5A – Tier 1.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would restore floodplain and side channels adjacent to WDFW boat launch.
- Review of proposed benefits. Even though most of site is publicly owned, it is not managed for habitat.
 - Restore side channel habitat, approximately 2,000 feet, includes access, LWD, and riparian restoration
- Current habitat conditions are degraded due to use by four-wheelers and other vehicles and mostly non-native species in floodplain.
- Effectiveness was based on assumptions:
 - Side channel length is approximately 2,000 feet, includes access, LWD, and riparian restoration, assumes 100% effectiveness.

36.5L – Gravel Mined Floodplain Restoration

37.5L – Side Channel Restoration

Project Description

36.5L – The intent of this project concept is to restore and enhance a gravel mined floodplain that is currently partially connected to the river and allows fish access partway up a remnant side channel. This site is connected to site 37.5L. Actions would include excavation and/or import of fill to provide good connections throughout site and to the downstream outlet and create shallow water habitats and shallow slopes, placement of LWD and riparian and wetland plantings.

37.5L – The intent of this project concept is to restore a controlled upstream connection to the existing side channel through the IFA nursery that connects with site 36.5L and enhance that side channel. Actions would include creation of an inlet to the side channel (such as large porous rock section), excavation of material as necessary to ensure good connection throughout side channel, placement of LWD and riparian plantings. A new culvert under the county road crossing may be required.

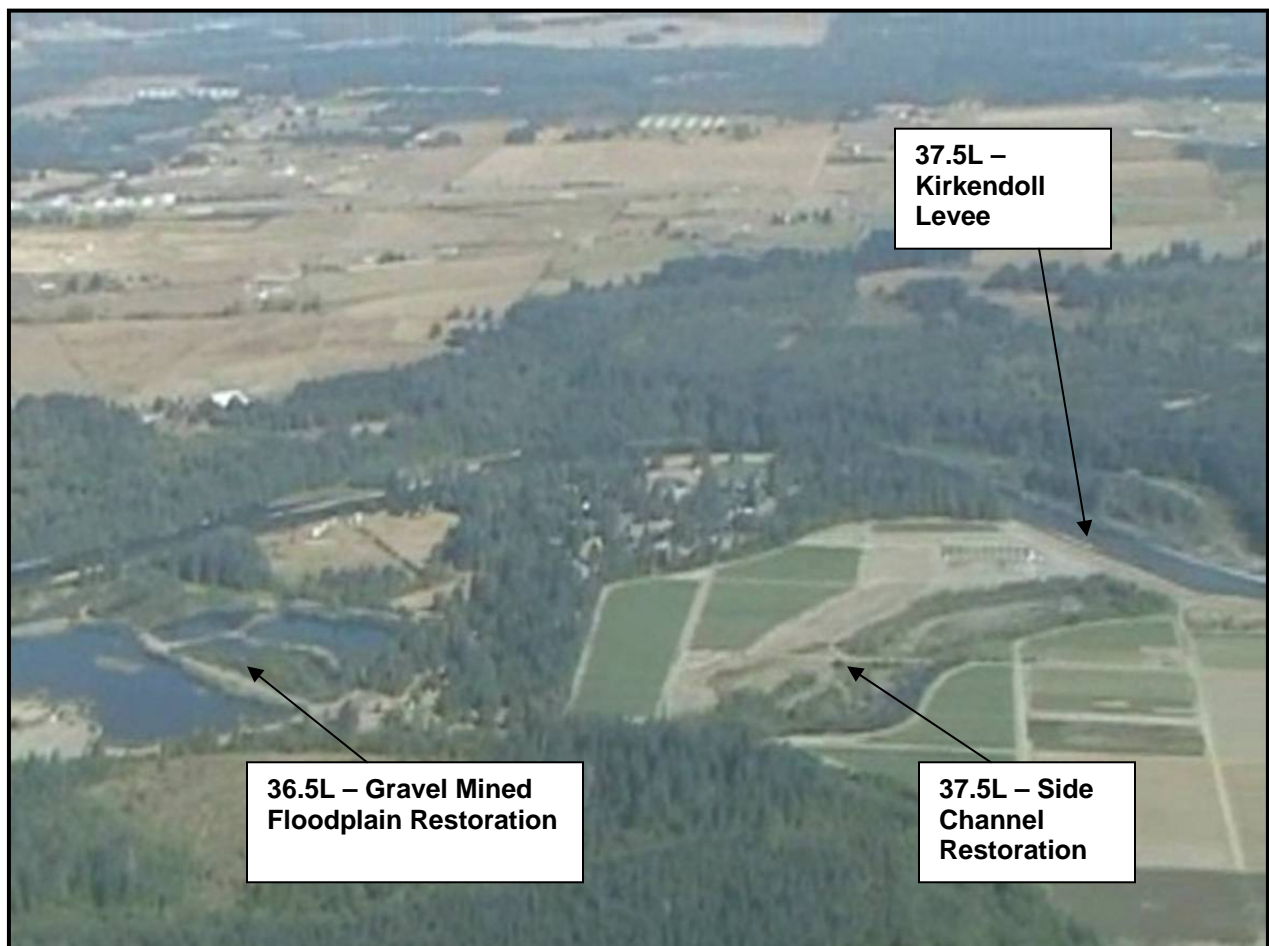




Image looking towards left bank at Kirkendoll Levee near RM 37.5

Preliminary Costs

36.5L – Approximately 100,000 CY of material will be excavated and/or filled at \$10/CY to create shallow water habitats, gentle slopes and connections throughout site. Approximately 100 pieces of LWD and 2 ELJs would be placed. 40 acres would be planted with riparian or wetland species at \$10-15k per acre. Total preliminary construction cost is \$2,000,000. Does not include costs for acquisition of real estate or easement.

37.5L – Approximately 10,000 CY of material would be excavated to improve channel and create connection. Likely require an 8 foot diameter culvert at county road for approximately \$100k. Approximately 50 pieces of LWD would be placed and approximately 20 acres of riparian zone would be restored at \$10k per acre. Total preliminary construction cost is \$500,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

36.5L

- Reach: Mid Cowlitz 5A – Tier 1.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would restore completed gravel mine into floodplain and off-channel rearing and refuge habitat. 1996 flood captured remnant side channel upstream and gravel pond. Some mitigation by landowner is required.
- Review of proposed benefits:
 - Restore 40 acres of floodplain habitat
 - Restore 1,500 feet of off-channel habitat, includes access, LWD, and riparian restoration
- Current habitat conditions are highly degraded due to gravel mining activities.
- Effectiveness was based on assumptions:

- Off channel length is approximately 1,500 feet, includes access, LWD, and riparian restoration, assumes 100% effectiveness.
- Restoration of 1,500 feet of floodplain, width of approximately 900 feet out of 2,600 foot wide floodplain, assume effectiveness of 35%

37.5L

- Reach: Mid Cowlitz 5A – Tier 1.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would create controlled side channel entrance to allow remnant side channel to connect to gravel pond/floodplain (project 36.5L). Restore riparian along channel and mainstem and place LWD.
- Review of proposed benefits:
 - Reconnect side channel habitat, approximately 4,000 feet, includes access, LWD, and riparian restoration
- Current habitat conditions are highly degraded due to nursery operations, filling in of side channel entrance and riprap bank along mainstem. 1996 flood recaptured the side channel, but it has since been filled in again and heavily armored.
- Effectiveness was based on assumptions:
 - Side channel length is approximately 4,000 feet, includes access, LWD, and riparian restoration, assume 100% effectiveness.

37.5R – Side Channel Restoration and Enhancement

Project Description

The intent of this project concept is to restore a more frequent connection to an existing side channel and enhance the channel and bar/floodplain area with LWD and plantings. This site is directly across the river from the 37.5L site/IFA nursery.





Image looking at backwater wetland areas along remnant side channel on right bank near RM 37.5

Preliminary Costs

Approximately 10,000 CY of material would be excavated to reconnect channel at \$10/CY. Approximately 100 pieces of LWD and 2 ELJs would be placed. Approximately 20 acres would be revegetated with riparian species at \$10k/acre. Total preliminary construction cost is \$450,000. Does not include costs for acquisition of real estate or easement, but the bulk of the bar is DNR land.

Assumptions for Fish Benefit Scoring

- Reach: Mid Cowlitz 5A – Tier 1.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would restore and reconnect remnant side channels, place LWD and restore riparian.
- Review of proposed benefits:
 - Reconnect side channel habitat, approximately 2,500 feet, includes access, LWD, and riparian restoration
- Current habitat conditions are moderate, but channels are mostly disconnected. Riparian zone is sparse and dominated by non-native species.
- Effectiveness was based on assumptions:
 - Side channel length is approximately 2,500 feet, includes access, LWD, and riparian restoration, assume 100% effectiveness.

T14 – Riparian Restoration

Project Description

The intent of this project concept is to fence off Skook Creek from livestock and provide riparian restoration upstream of Howe Road.

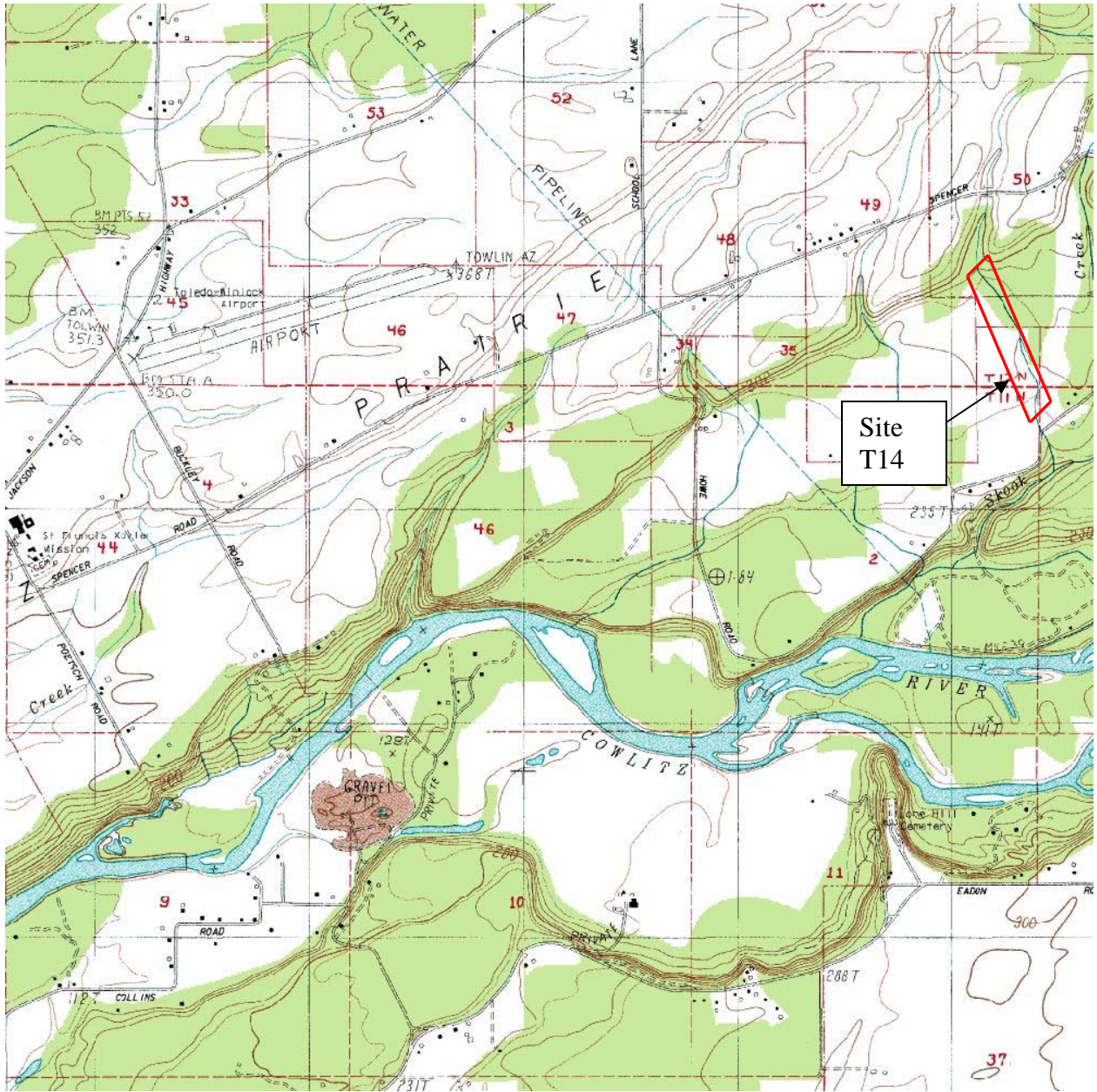
Preliminary Costs

Fencing and riparian restoration along 2,500 feet of creek, both sides of creek. Total preliminary construction cost is \$100,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

T14

- Reach: Skook Creek – Tier 3.
- Populations: Winter steelhead (C), coho (P)
- Project would restore riparian zone and fences off livestock upstream of Howe Road.
- Review of proposed benefits:
 - Restore riparian habitat on both sides of creek for approximately 2,500 feet
- Current habitat conditions are highly degraded due to livestock
- Effectiveness was based on assumptions:
 - Restoration of 2,500 feet of riparian zone, assumes 100% effectiveness for 5 HUs.



38 – 40A – Channel Migration Zone Easement

40.1L – Side Channel Restoration and Enhancement

Project Description

38-40A – The intent of this project concept is to acquire approximately 500-550 acres of islands and riparian zone to allow continued natural channel migration through this high quality area immediately downstream of intensive residential/shoreline development. This action will protect one of the highest quality sites in the Lower Cowlitz.

40.1L – The intent of this project concept is to reconnect the upper end of the Springer side channel to allow unhindered fish access, and provide enhancement through placement of wood and riparian restoration.

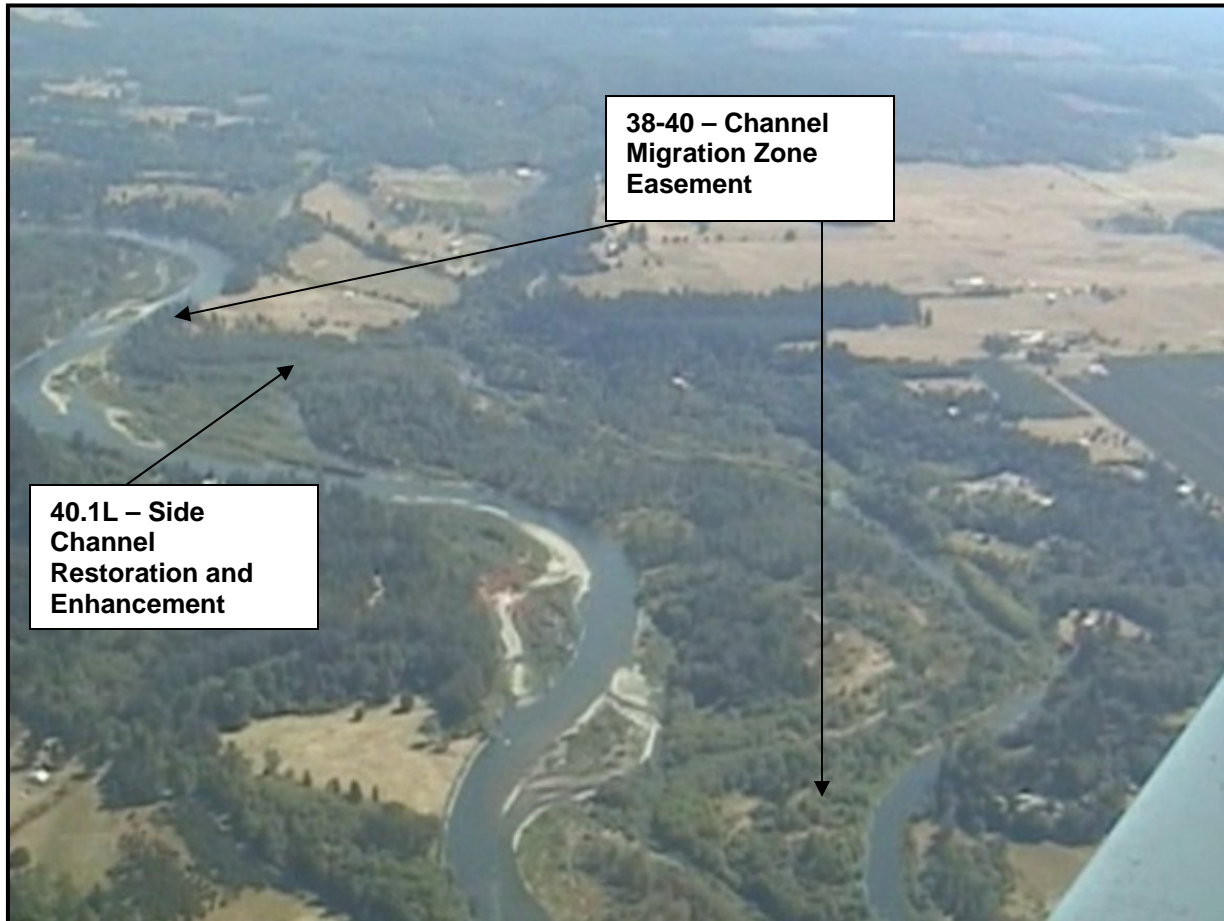




Image looking towards right floodplain areas and active side channels and bars near RM 39.5



Image looking at side channel and bar area near RM 39.5

Preliminary Costs

38-40A – The cost for acquisition of 500-550 acres at \$10,000/acre is estimated at \$5,000,000.

40.1L – Approximately 72,000 CY of material would be removed at \$3/CY. Place approximately 200 pieces of LWD and 2 ELJs, and restore 26 acres of riparian zone at \$10-15k per acre. Total preliminary construction cost is \$1,000,000. Does not include costs for acquisition or easements.

Assumptions for Fish Benefit Scoring

38-40A

- Reach: Mid Cowlitz 5C – Tier 2.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would acquire two-mile stretch of floodplain where extensive channel meandering has occurred in the past to protect these processes. Also place LWD and restore riparian zone.
- Review of proposed benefits:
 - Acquire and protect approximately 550 acres of floodway and floodplain for channel migration zone
- Current habitat conditions are moderate to good quality in that significant side channels still exist. However, some are becoming disconnected and meandering has been reduced due to hydrologic controls. Floodplain habitat is agricultural land and has been disturbed. Riparian zone is of varying quality from poor to good. High risk of development in this reach.
- Effectiveness was based on assumptions:
 - Protection of 550 acres along 11,000 feet for channel migration easement in high priority reach.

38-40B

- Reach: Mid Cowlitz 5C – Tier 2.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would acquire two-mile stretch of floodplain where extensive channel meandering has occurred in the past to protect these processes. Also place LWD and restore riparian zone.
- Review of proposed benefits:
 - Reconnect/restore side channel habitat for 10,000 feet, includes access, LWD, and riparian restoration
- Current habitat conditions are moderate to good quality in that significant side channels still exist. However, some are becoming disconnected and meandering has been reduced due to hydrologic controls. Floodplain habitat is agricultural land and has been disturbed. Riparian zone is of varying quality from poor to good. High risk of development in this reach.
- Effectiveness was based on assumptions:
 - Side channel length is approximately 10,000 feet, currently 50% accessible, but will include access, LWD, and riparian restoration, assume effectiveness of 83%

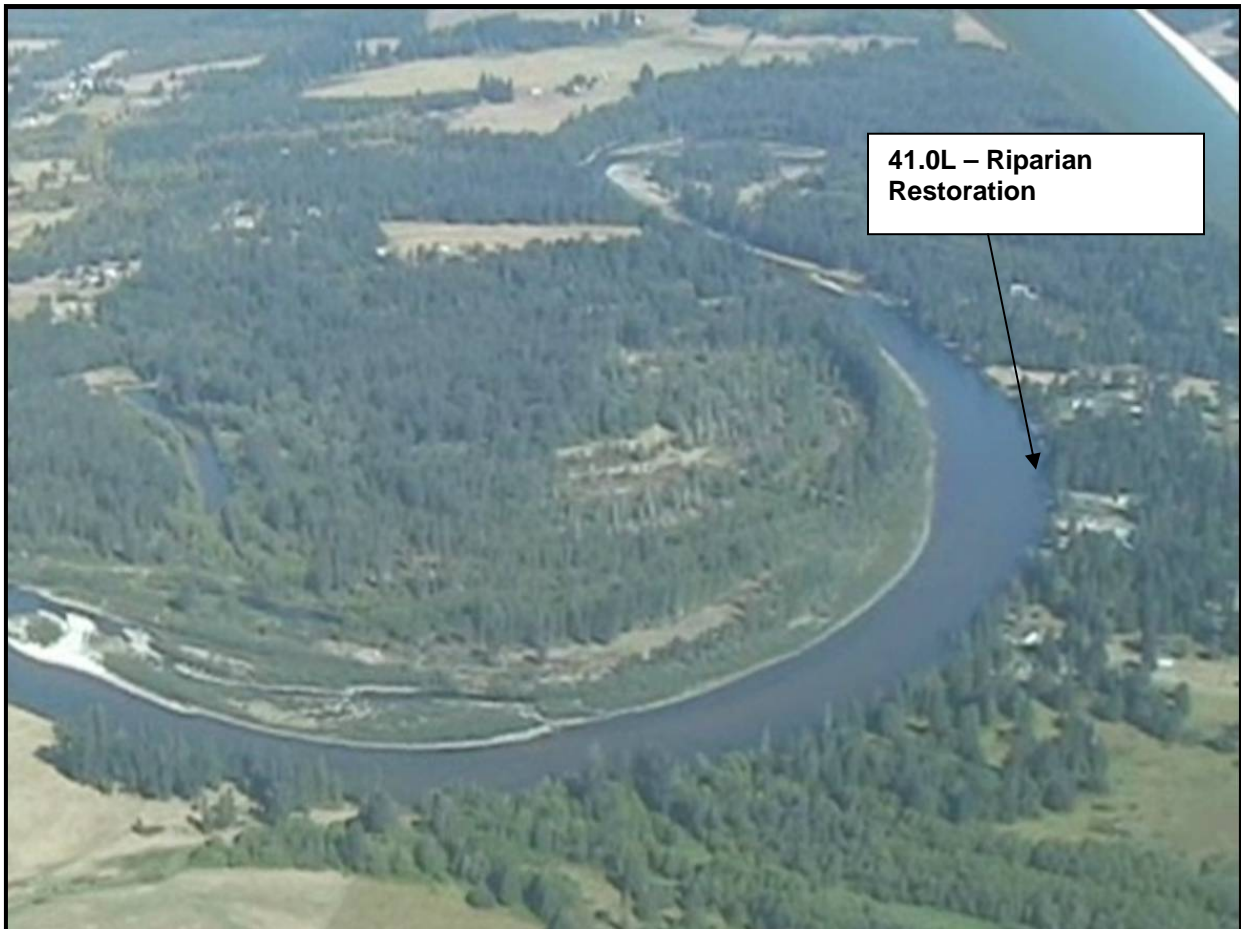


Image looking towards small backwater slough, possible tributary connection on right side river near RM 39.5

41.0L – Riparian Restoration

Project Description

The intent of this project concept is to restore a riparian zone along a reach with rural residential/shoreline development. Actions would include removing riprap and restoring a 50 foot wide riparian zone.



Preliminary Costs

The proposed riparian zone area is approximately 4 acres and 3,500 feet in length. Four acres will be revegetated at \$10-15k per acre. Total preliminary construction cost is \$400,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

- Reach: Mid Cowlitz 5D – Tier 1.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would restore riparian zone along currently riprapped bank.
- Review of proposed benefits:
 - Restore riparian habitat on one side of mainstem for 3,500 feet
- Current habitat conditions are highly degraded due to removal of riparian zone and riprap to protect housing
- Effectiveness was based on assumptions:
 - Restoration of 3,500 feet of riparian for 50 foot width, assume effectiveness of 33%



Image looking towards left bank near RM 41.0

41.9R – Bank Enhancement

Project Description

The intent of this project concept is to stabilize an eroding bluff that is contributing a significant amount of fine sediments into the high quality spawning habitat downstream. This project would include placement of a wood toe at the base of the bluff and stabilization of a higher floodplain vegetated terrace that would trap sediment as it erodes off the bluff and minimize the input of fine sediments into the river.

Preliminary Costs

Approximately 5,000 CY of material would be removed at \$10/CY. Place approximately 150 pieces of LWD and 2 ELJs at \$50,000/structure. Total preliminary construction cost is \$400,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

- Reach: Mid Cowlitz 5D – Tier 1.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (P), coho (P), chum ©
- Project would reduce fine sediment inputs and provide cover
- Review of proposed benefits:
 - Stabilize eroding bluff and provide in-stream habitat structure along 1,000 feet of bankline
- Current habitat conditions are degraded due to lack of riparian zone and wood, and bank erosion
- Effectiveness was based on assumptions:
 - Restoration of 1,000 feet of mainstem habitat and bank stabilization, includes placement of wood and riparian plantings, assume 100% effectiveness.

42.0R – Riparian Restoration and Fish Passage

Project Description

The intent of this project concept is to enhance the lower 2,500 feet of Blue Creek that has been disturbed as part of the hatchery operations, and remove two dams no longer needed by the hatchery that block fish passage. The City of Tacoma has moved its hatchery outfall out of the creek and into the mainstem river. Actions would include removal of the two dams, riparian restoration, placement of LWD, control of non-native species, and improved connection to Cowlitz River.





Image looking upstream along right bank at Blue Creek confluence with Cowlitz near RM 42.0

Preliminary Costs

Approximately 1,000 CY of material would be removed at \$10/CY. Place approximately 100 pieces of LWD, and restore 12 acres of riparian zone at \$10-15k per acre. Total preliminary construction cost is \$300,000. Does not include costs for acquisition of real estate or easement, but most of this site is owned by City of Tacoma.

Assumptions for Fish Benefit Scoring

- Reach: Blue Creek 1A – Tier 2.
- Populations: Winter steelhead (C), coho (P)
- Project would restore and enhance lower end and delta of Blue Creek and provide access to the upper reaches of Blue Creek.
- Review of proposed benefits:
 - Restore riparian habitat on both sides of tributary for approximately 2500 feet
 - Place LWD for stream channel habitat
 - Restore fish access to 6.7 miles of habitat (Tier 2 and 3)
- Current habitat conditions are degraded due to hatchery outflows and operations. Tacoma is moving its outfall to another location. Lower Blue Creek could provide good rearing and refuge habitat and removal of the dams will provide access to good quality habitat for coho and steelhead.
- Effectiveness was based on assumptions:
 - Restoration of 2,500 feet of riparian, 100 foot width, assumes effectiveness of 67% on 5 HUs.
 - Placement of 100 pieces of LWD in reach is 100% effective

- Restoration of access to 6.7 miles of Tier 2 and 3 habitats, ($10^6 \times 50\%$) current barriers are only 50% barriers.

42.5L – Bar and Side Channel Enhancement

Project Description

The intent of this project concept is to enhance an existing bar and side channel by placing LWD to promote scour at the openings and provide riparian restoration as necessary.



Image looking downstream on river left at side channel near Otter Creek near RM 42.5

Preliminary Costs

Approximately 50 pieces of wood and 2 ELJs would be placed. Riparian restoration would occur as needed on up to 10 acres at \$5k per acre. Total preliminary construction cost is \$250,000. Does not include costs for acquisition of real estate or easement; anticipated to be DNR land.

Assumptions for Fish Benefit Scoring

- Reach: Mid Cowlitz 6A – Tier 1.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would enhance existing side channel and bar
- Review of proposed benefits:
 - Side channel enhancement of 2,000 feet, includes access, LWD, and riparian restoration
- Current habitat conditions are good but channel is becoming disconnected. There is limited cover in channel.
- Effectiveness was based on assumptions:
 - Side channel enhancement of 2,000 feet, includes access, LWD, and riparian restoration, assume 100% effectiveness.

42.7R – Bar and Side Channel Enhancement

Project Description

The intent of this project concept is to reconnect off-channel ponds/remnant side channel to the river and enhance the bar with wood and riparian plantings. This site is owned by the City of Tacoma.



Preliminary Costs

Approximately 5,000 CY of material will be excavated to reconnect ponds and create a backwater channel. Approximately 30 pieces of LWD and 1 ELJ will be placed, and up to 10 acres of riparian plantings will occur at \$10k per acre. Total preliminary construction cost is \$300,000. Does not include costs for acquisition of real estate or easement, but owned already by Tacoma.

Assumptions for Fish Benefit Scoring

- Reach: Mid Cowlitz 6A – Tier 1.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would enhance and restore side channel and backwater ponds and restore riparian.
- Review of proposed benefits:
 - Reconnect side channel habitat, approximately 1,500 feet, includes access, LWD, and riparian restoration
- Current habitat conditions are moderate. Previously used by four-wheelers and highly degraded. Property purchased by Tacoma for wildlife habitat.
- Effectiveness was based on assumptions:
 - Side channel length is approximately 1,500 feet, includes access, LWD, and riparian restoration, assume 100% effectiveness.

44.5R – Bar and Side channel Enhancement

Project Description

The intent of this project concept is to enhance an existing bar and side channel by placing LWD to promote scour to keep the side channel open and to provide cover during high flows. Minor riparian restoration will be done as necessary.





Image looking downstream at upper end of side channel area near RM 44.5

Preliminary Costs

Approximately 30 pieces of wood and 2 ELJs will be placed. Minor riparian restoration will occur as necessary. Total preliminary construction cost is \$150,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

- Reach: Mid Cowlitz 6B – Tier 2.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would enhance existing side channel.
- Review of proposed benefits:
 - Enhance/restore 1,500 feet of side channel, includes access, LWD, and riparian restoration
- Current habitat conditions are good, but there is limited cover in side channel or on bar
- Effectiveness was based on assumptions:
 - Side channel enhancement of 1,500 feet, includes access, LWD, and riparian restoration, assume 100% effectiveness.



Image looking upstream at lower end of side channel near RM 44.5

T15 – Replace Culvert

Project Description

The intent of this project concept is to replace a fish passage barrier culvert on Jones Creek at Spencer Road.

Preliminary Costs

Replacement of culvert under 2-lane county roadway, estimated length of culvert at 40 feet, probable diameter of 6 feet. Total preliminary construction cost is \$250,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

T15

- Reach: Jones Creek 1 – Tier 4.
- Populations: coho (P)
- Project would replace culvert at Spencer Road to allow access to allow access to 1 mile of habitat.
- Review of proposed benefits:
 - Access will be restored to Tier 4 habitats, not sure of actual condition

46.5R – Side Channel Restoration

Project Description

The intent of this project concept is to enhance an existing bar and reconnect a remnant side channel by excavation and placing LWD to promote scour to keep the side channel open and to provide cover during high flows. Minor riparian restoration will be done as necessary.

Preliminary Costs

Approximately 30 pieces of wood and 2 ELJs will be placed. Minor riparian restoration will occur as necessary. Total preliminary construction cost is \$150,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

- Reach: Mid Cowlitz 6D – Tier 2.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would restore remnant side channel at Timber Trails and restore riparian.
- Review of proposed benefits:
 - Restore side channel habitat, approximately 1500 feet, includes access, LWD, and riparian restoration
- Current habitat conditions are mostly unvegetated bar with remnant side channel
- Effectiveness was based on assumptions:
 - Side channel length is approximately 1,500 feet, includes access, LWD, and riparian restoration of 100 feet, so effectiveness of 89%

47.0L – Side Channel Protection

Project Description

The intent of this project concept is to acquire and protect an existing very high quality side channel.





Image looking downstream along left side channel near RM 47.0

Preliminary Costs

Acquire approximately 20 acres to protect bar and side channel at \$10,000 per acre. Total acquisition cost estimated at \$200,000.

Assumptions for Fish Benefit Scoring

- Reach: Mid Cowlitz 6D – Tier 2.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would enhance existing side channel and bar.
- Review of proposed benefits:
- Review of proposed benefits:
 - Protect existing highest quality side channel, approximately 2,000 feet in length
- Current habitat conditions are good, but there is limited cover in side channel or on bar
- Effectiveness was based on assumptions:
 - Protection of high quality side channel and riparian zone 2,000 feet in length

49.5L – Side Channel Restoration and Enhancement

Project Description

The intent of this project concept is to reconnect an existing side channel (now just backwater channel) that was cut off by the Barrier Dam. Actions would include excavation of an inlet, placement of LWD and ELJS to promote scour of openings and provide cover and riparian restoration.



Image looking downstream along left bank near side channel connection point near RM 49.5



Image looking upstream at lower end of side channel reconnection area near RM 49.5

Preliminary Costs

Approximately 10,000 CY of material would be excavated to create new inlet at \$10/CY. Approximately 35 pieces of wood and 2 ELJS would be placed. Ten acres would be revegetated with native riparian species. Total preliminary construction cost is \$600,000. Does not include costs for acquisition of real estate or easement.

Assumptions for Fish Benefit Scoring

- Reach: Mid Cowlitz 7 – Tier 1.
- Populations: Winter steelhead (C), spring chinook (P+), fall chinook (C), coho (P), chum (C)
- Project would create connection to remnant side channel immediately downstream of barrier dam to allow flow-through. Restore riparian and place LWD.
- Review of proposed benefits:
 - Reconnect side channel habitat, approximately 1,500 feet, includes access, LWD, and riparian restoration
- Current habitat conditions are poor due to lack of connection to side channel, and riparian zone dominated by Scotch broom.
- Effectiveness was based on assumptions:
 - Side channel length is approximately 1,500, includes access, LWD, and riparian restoration, assume 100% effectiveness.