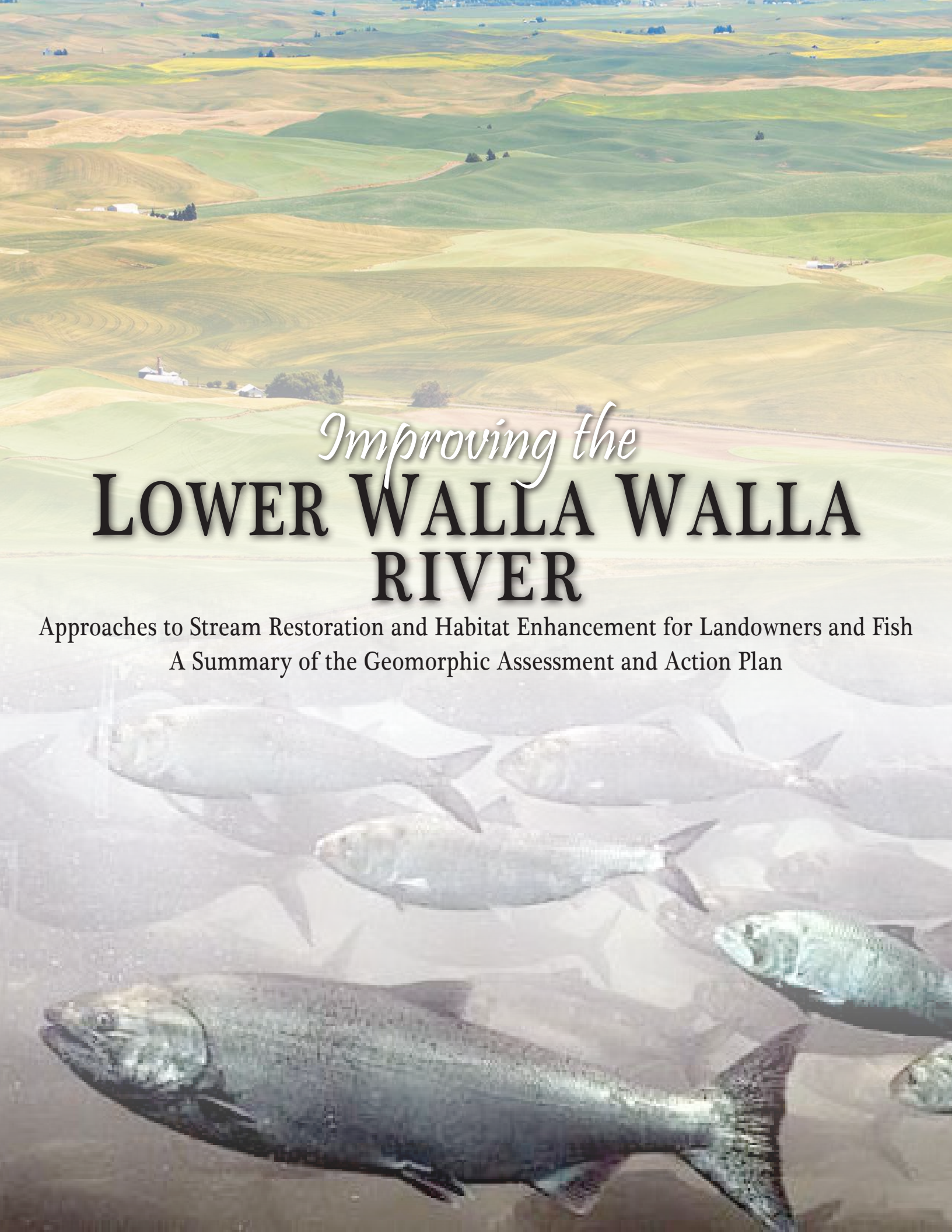


Improving the LOWER WALLA WALLA RIVER

Approaches to Stream Restoration and Habitat Enhancement for Landowners and Fish

A Summary of the Geomorphic Assessment and Action Plan

This publication summarizes
the efforts undertaken by various
private and public entities toward
addressing landowner and fisheries concerns
by identifying potential improvement
opportunities along the
Lower Walla Walla River.

It touches on how these improvements
bring positive changes to landowners
as well as fish and wildlife.

The work accomplished in identifying
these potential improvement opportunities
would not have been possible without the
valuable input and assistance provided by
the following agencies:

Blue Mountain Land Trust

Tri-State Steelheaders

Department of Ecology, State of Washington

Washington Department of Fish and Wildlife

County of Walla Walla

USDA

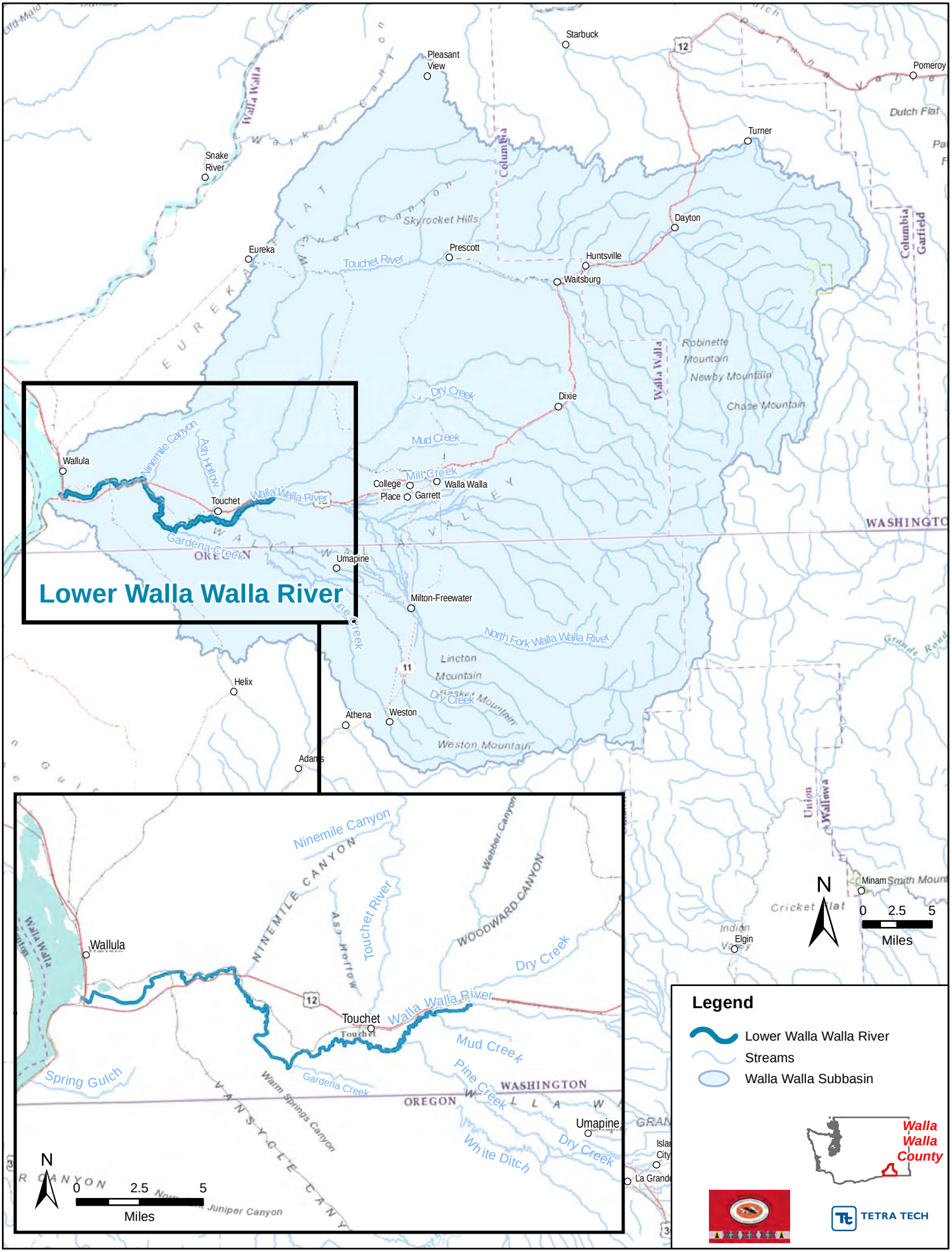
Walla Walla County Conservation District

Walla Walla Basin Watershed Council

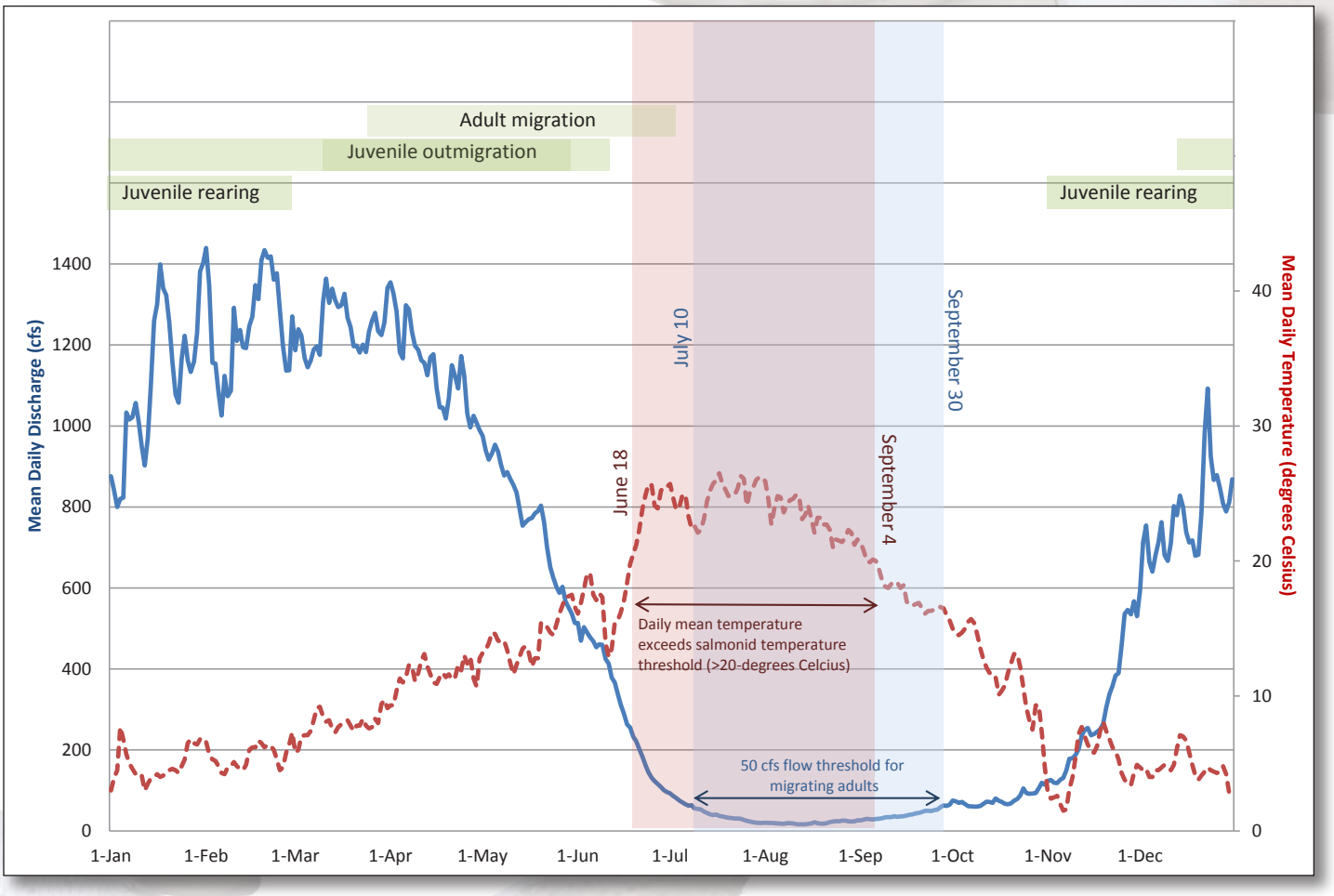
Content

Introduction

- More than four decades of fish and wildlife assessments and plans in the Walla Walla Subbasin
  - Instream flows, surface and ground water quality, riparian vegetation, fish screens and passage, and habitat restoration actions have been implemented throughout the Subbasin, with most actions occurring in the Upper Subbasin
  - However, the Lower Walla Walla River has ranked among the highest for improving fish and wildlife habitat
  - Overwintering holding and rearing habitat in the Lower Walla Walla River have been identified as critical for survival
- Beyond fish and wildlife, assessments and plans have identified channel stability and bank erosion concerns for landowners along the Lower Walla Walla River
- Combined, improvements in the Lower Walla Walla River are critical for both landowners and fish and wildlife



Lower Walla Walla River



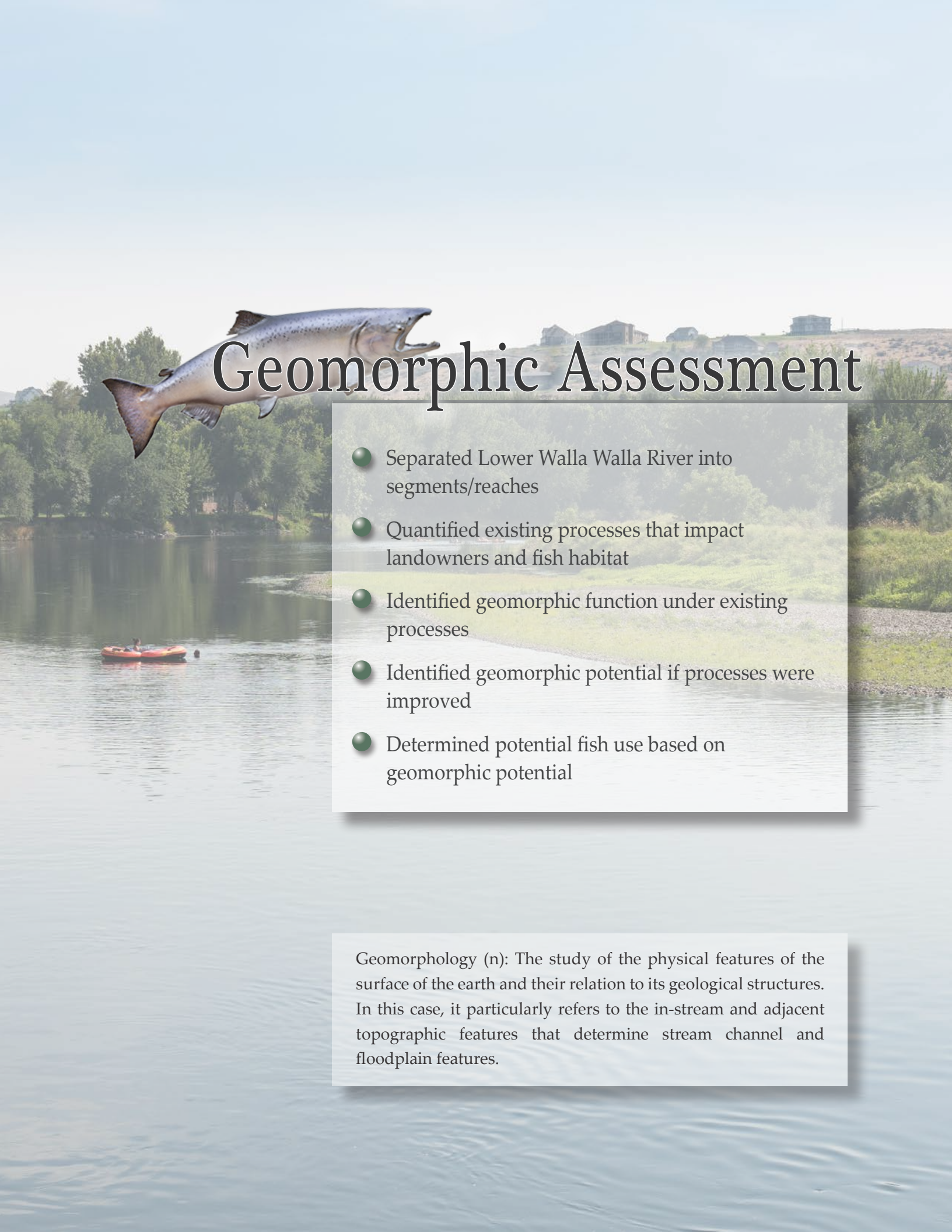
Spring Chinook Salmon Use of the Lower Walla Walla River Assessment Area Relative to Discharge and Stream Temperature

As described in more detail in the Geomorphic Assessment and Action Plan and illustrated in this figure, focal fish species (i.e., salmon and trout) predominantly use the Lower Walla Walla River in the winter months, outside the periods with harmful low flows and high stream temperatures.

Although restoration and enhancement projects being conducted in the upper portions of the Subbasin are expected to help improve low flows and stream temperatures, in general, the scale of actions necessary to achieve a significant impact on low flow and temperature limiting factors in the Lower Walla Walla River must be Subbasin-wide.

History

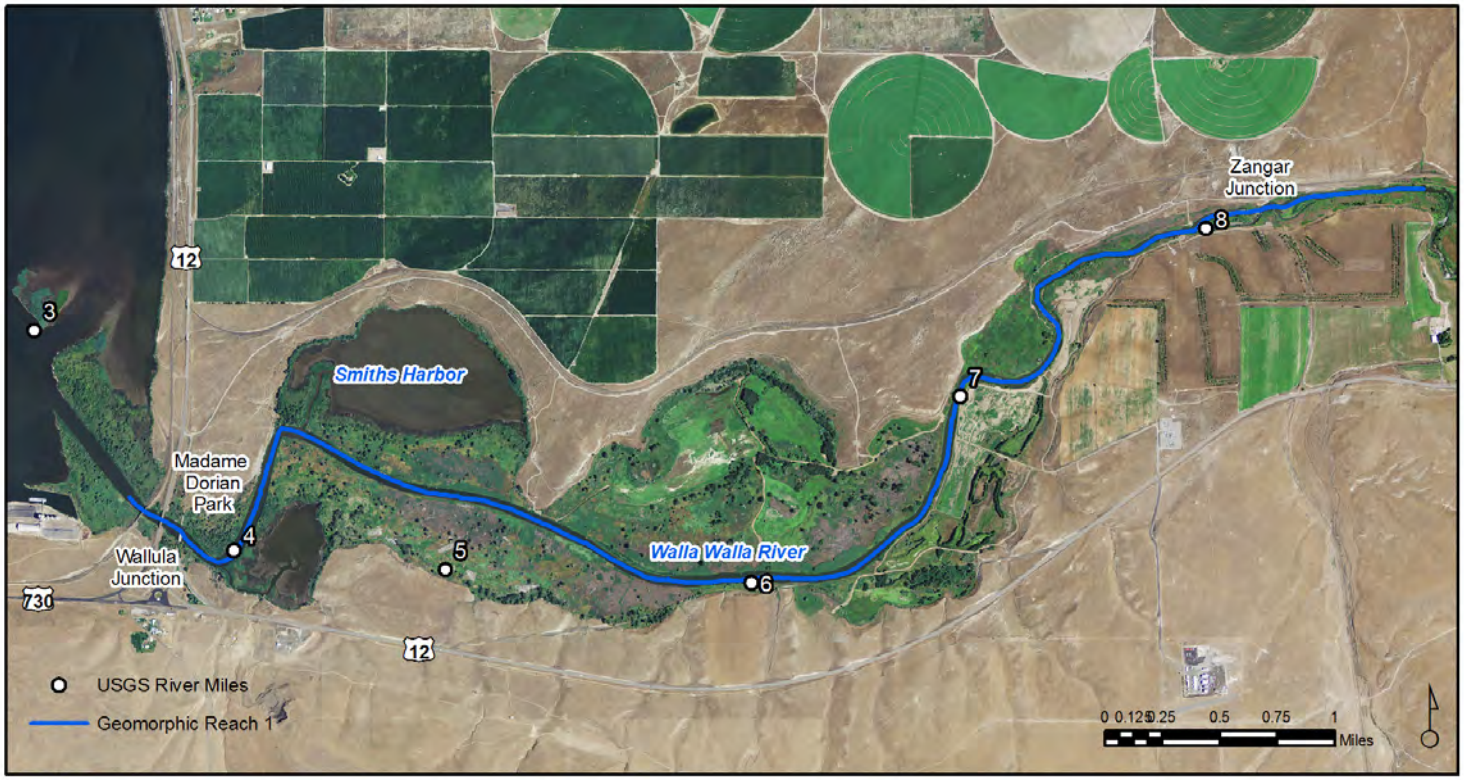
- Lower Walla Walla Working Group (LWWWG) was formed in 2010
  - Blue Mountain Land Trust, The Confederated Tribes of the Umatilla Indian Reservation (CTUIR), Tri-State Steelheaders (TSS), Walla Walla County Conservation District (WWCCD), Washington Department of Ecology (Ecology), and Washington Department of Fish and Wildlife (WDFW)
- Address factors limiting aquatic productivity and landowner concerns
  - Lower Walla Walla River Habitat Improvement Strategy
  - Lower Walla Walla River Geomorphic Assessment and Action Plan
- Identify and prioritize potential project areas and develop concepts that work to address landowner concerns and improve fish habitat



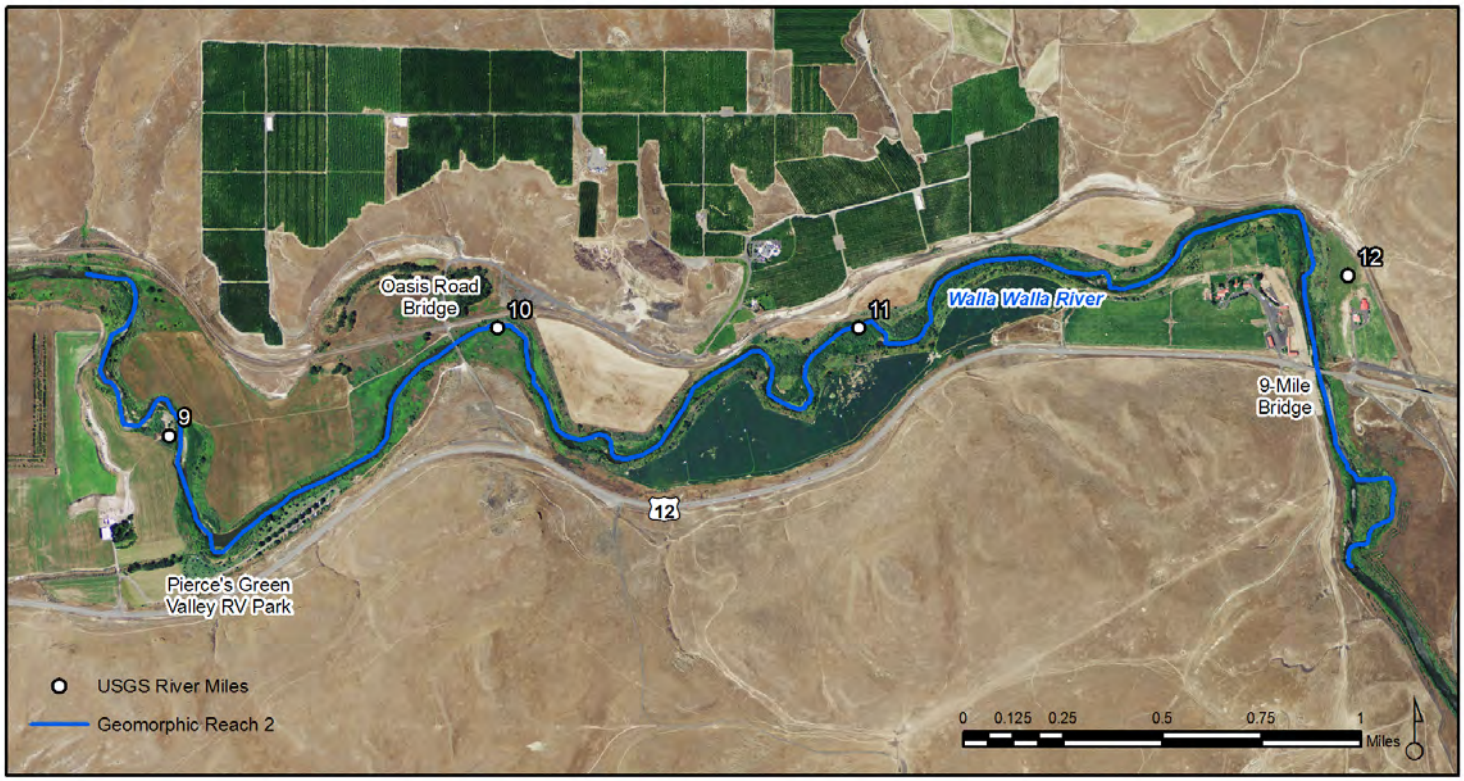
Geomorphic Assessment

- Separated Lower Walla Walla River into segments/reaches
- Quantified existing processes that impact landowners and fish habitat
- Identified geomorphic function under existing processes
- Identified geomorphic potential if processes were improved
- Determined potential fish use based on geomorphic potential

Geomorphology (n): The study of the physical features of the surface of the earth and their relation to its geological structures. In this case, it particularly refers to the in-stream and adjacent topographic features that determine stream channel and floodplain features.

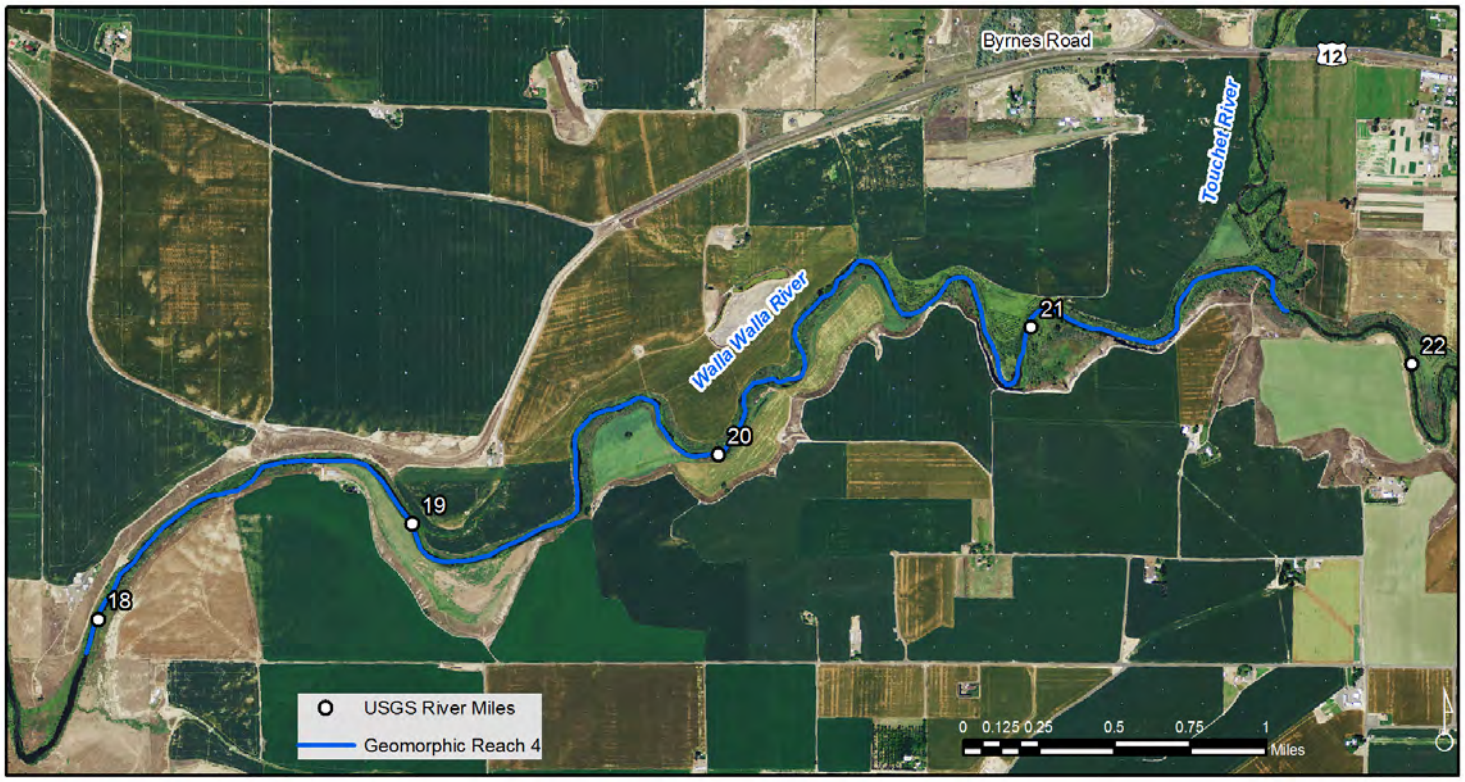


Geomorphic Reach 1 – RM 3.6 to 8.6

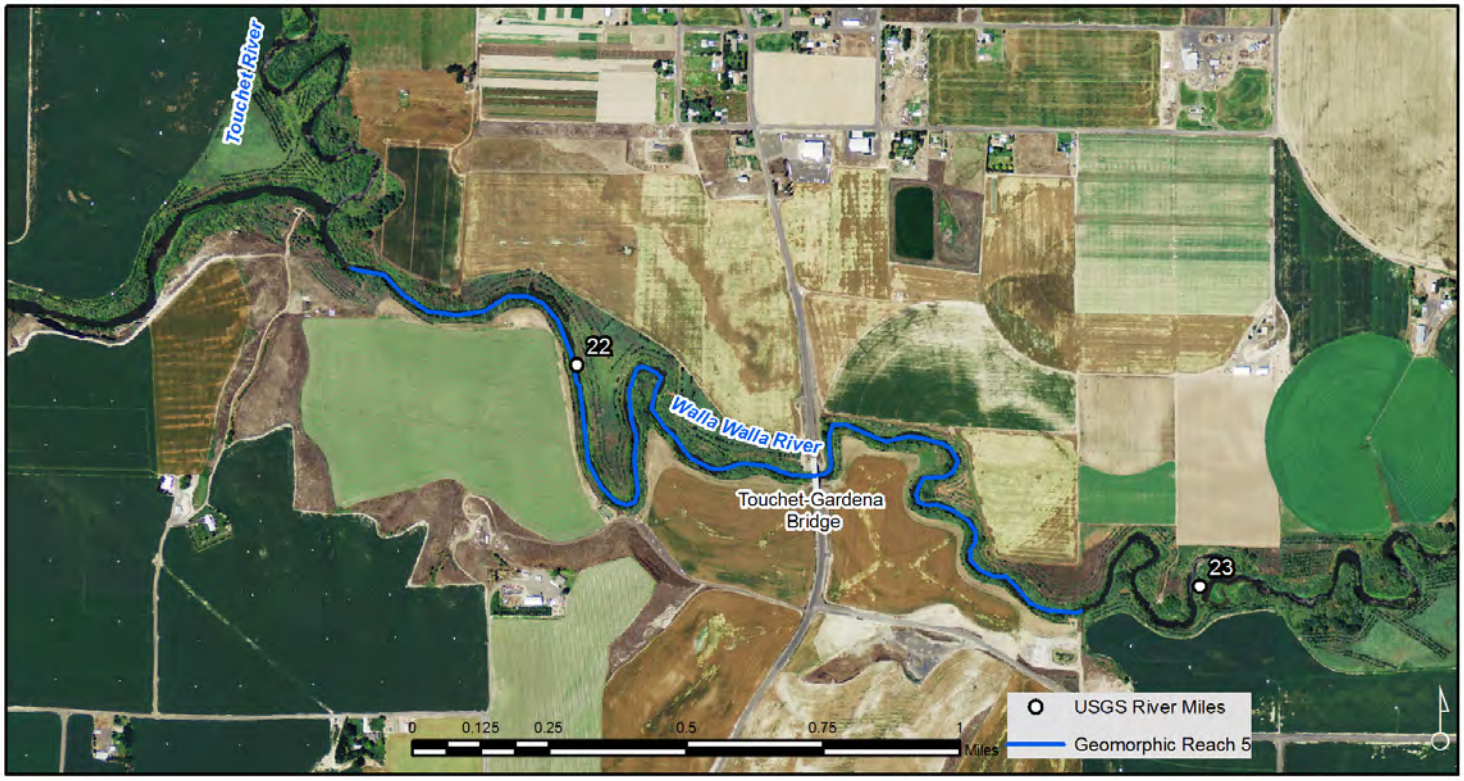


Geomorphic Reach 2 – RM 8.6 to 12.5

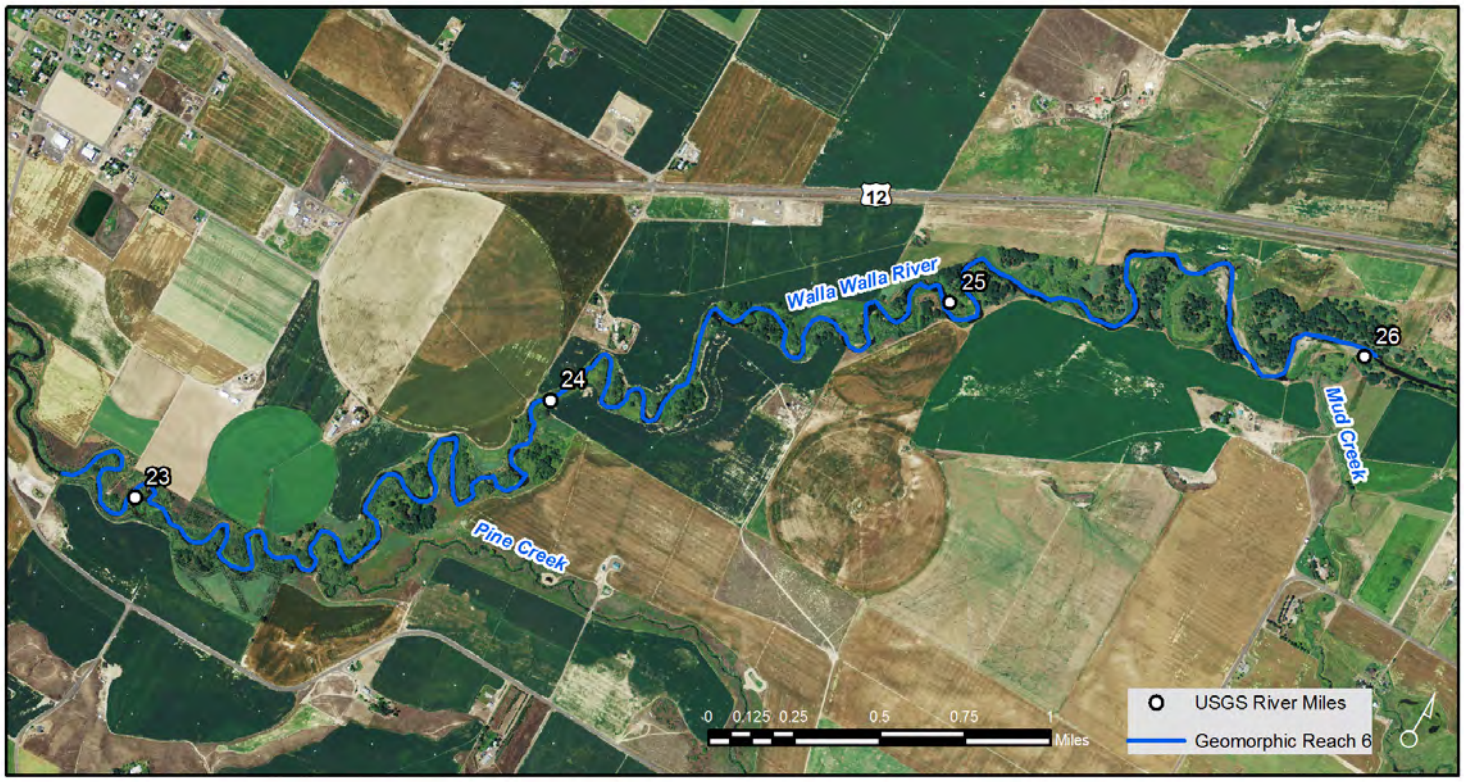
Geomorphic Reach 3 – RM 12.5 to 17.9



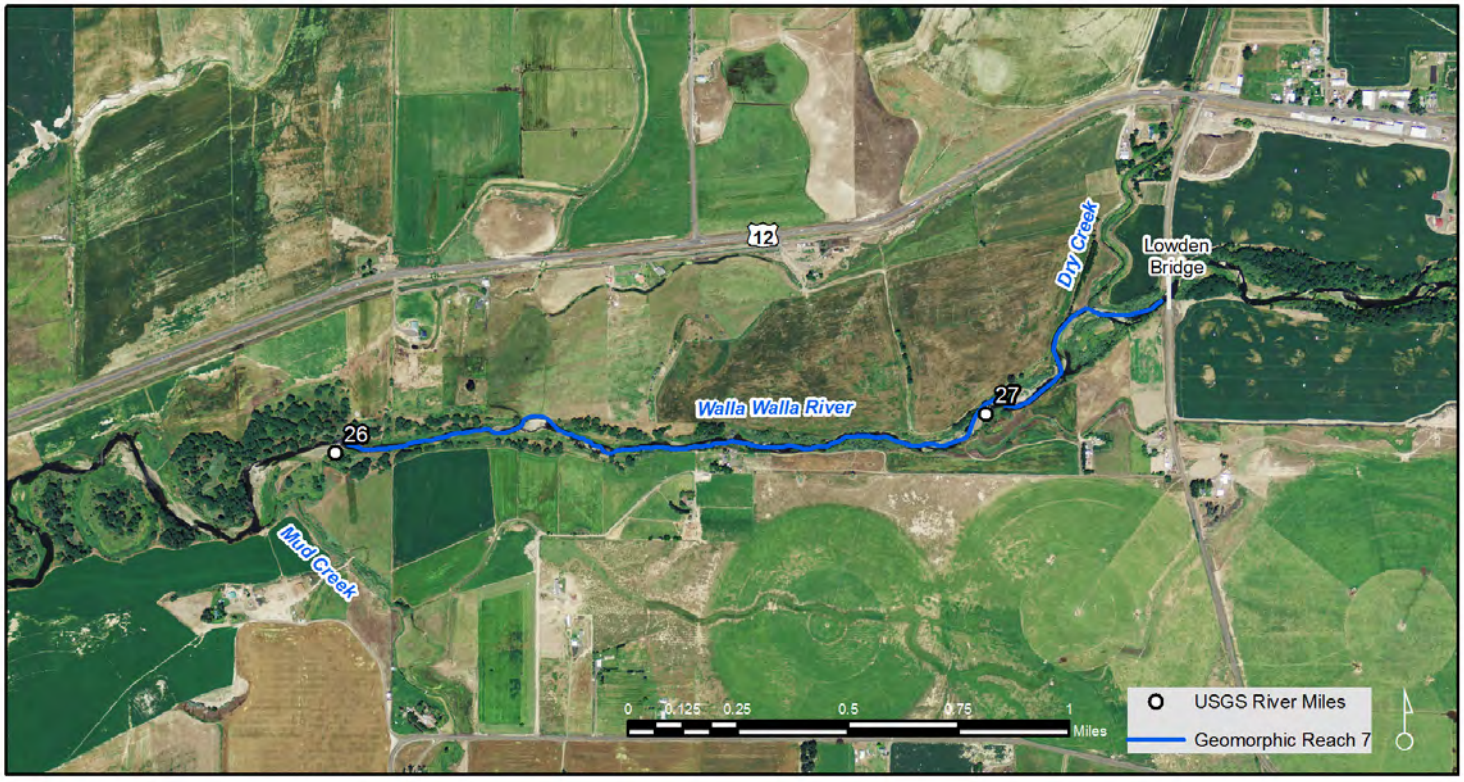
Geomorphic Reach 4 – RM 17.9 to 21.6



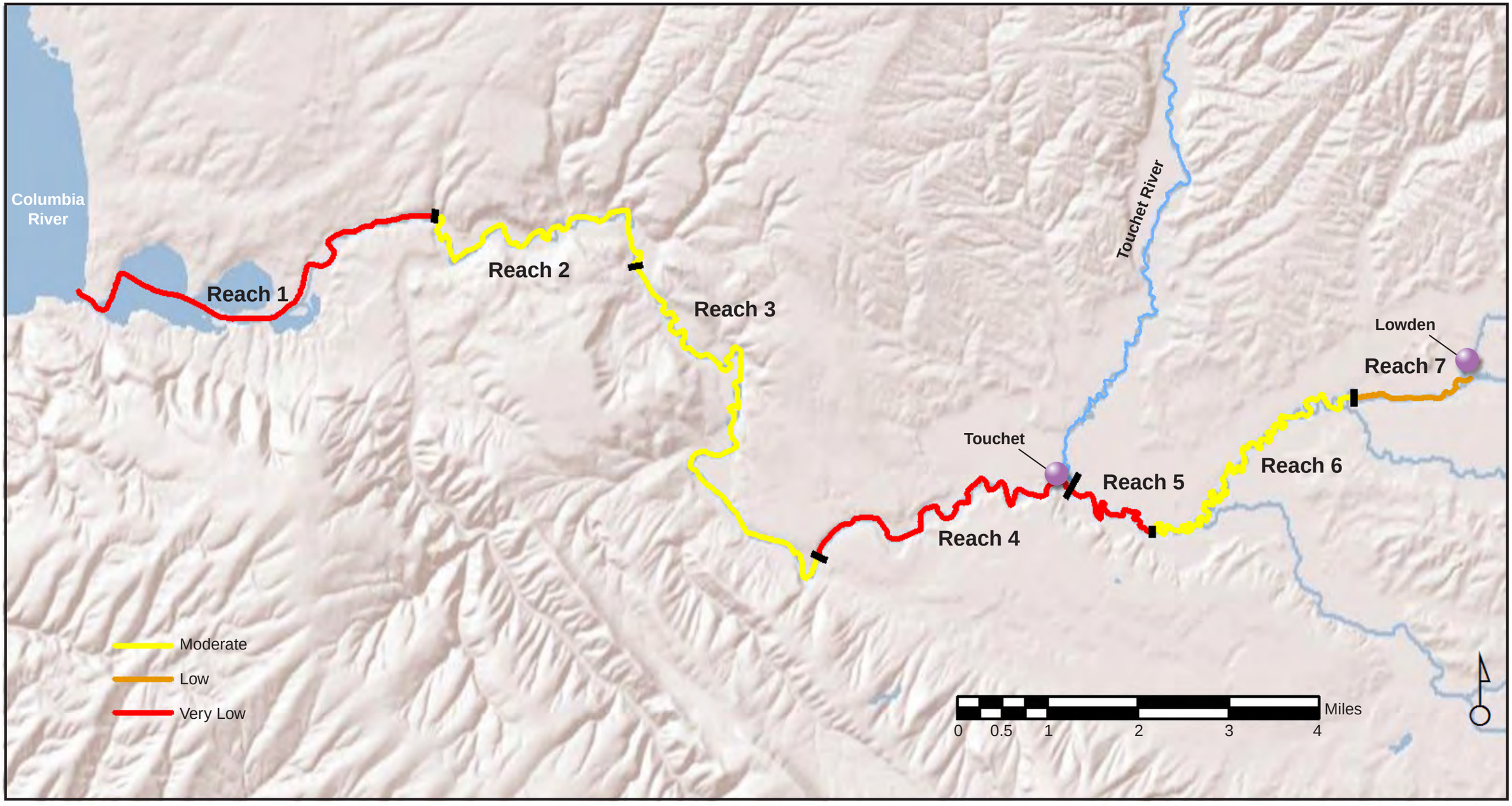
Geomorphic Reach 5 – RM 21.6 to 22.8



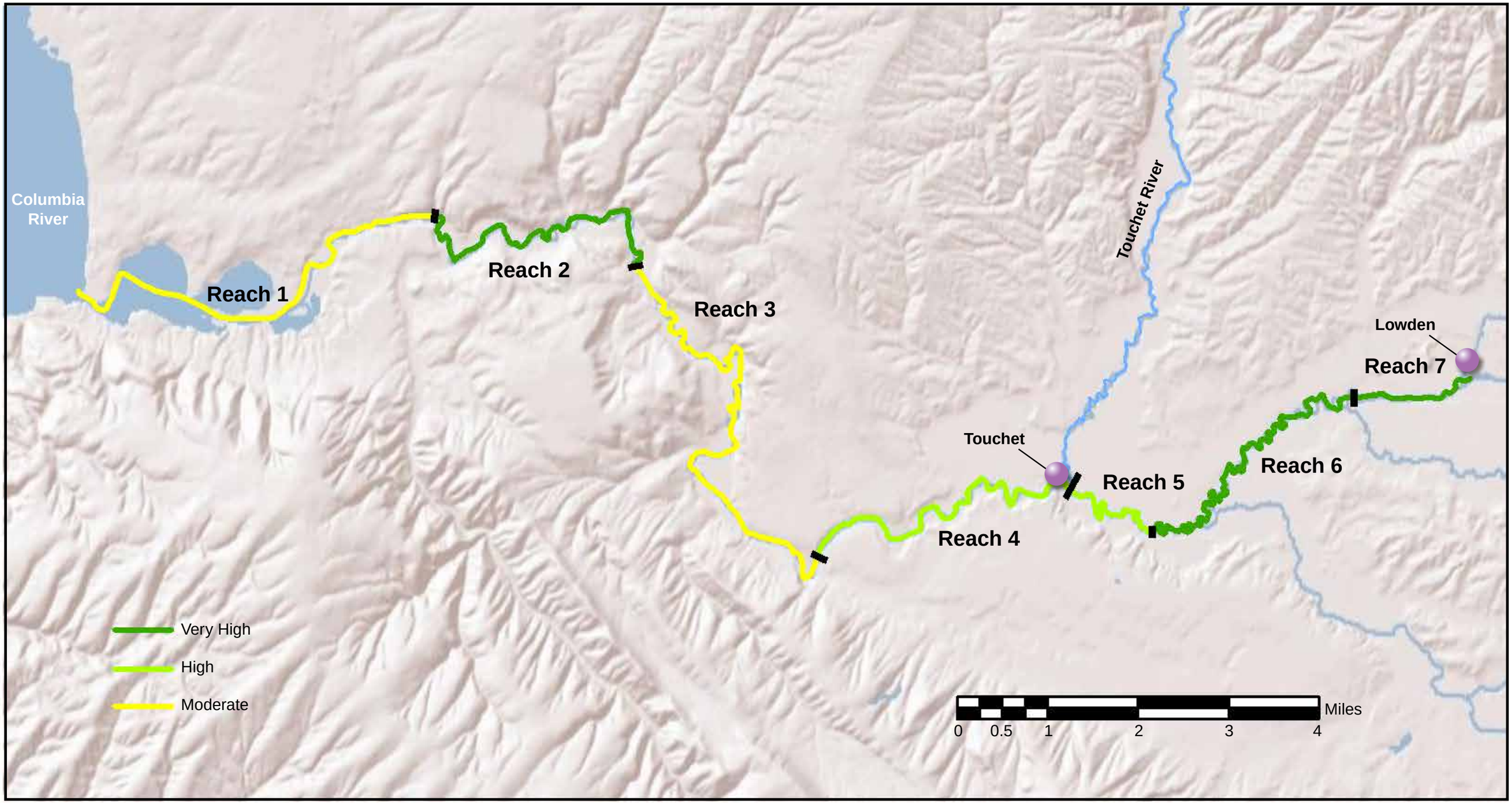
Geomorphic Reach 6 – RM 22.8 to 26.0



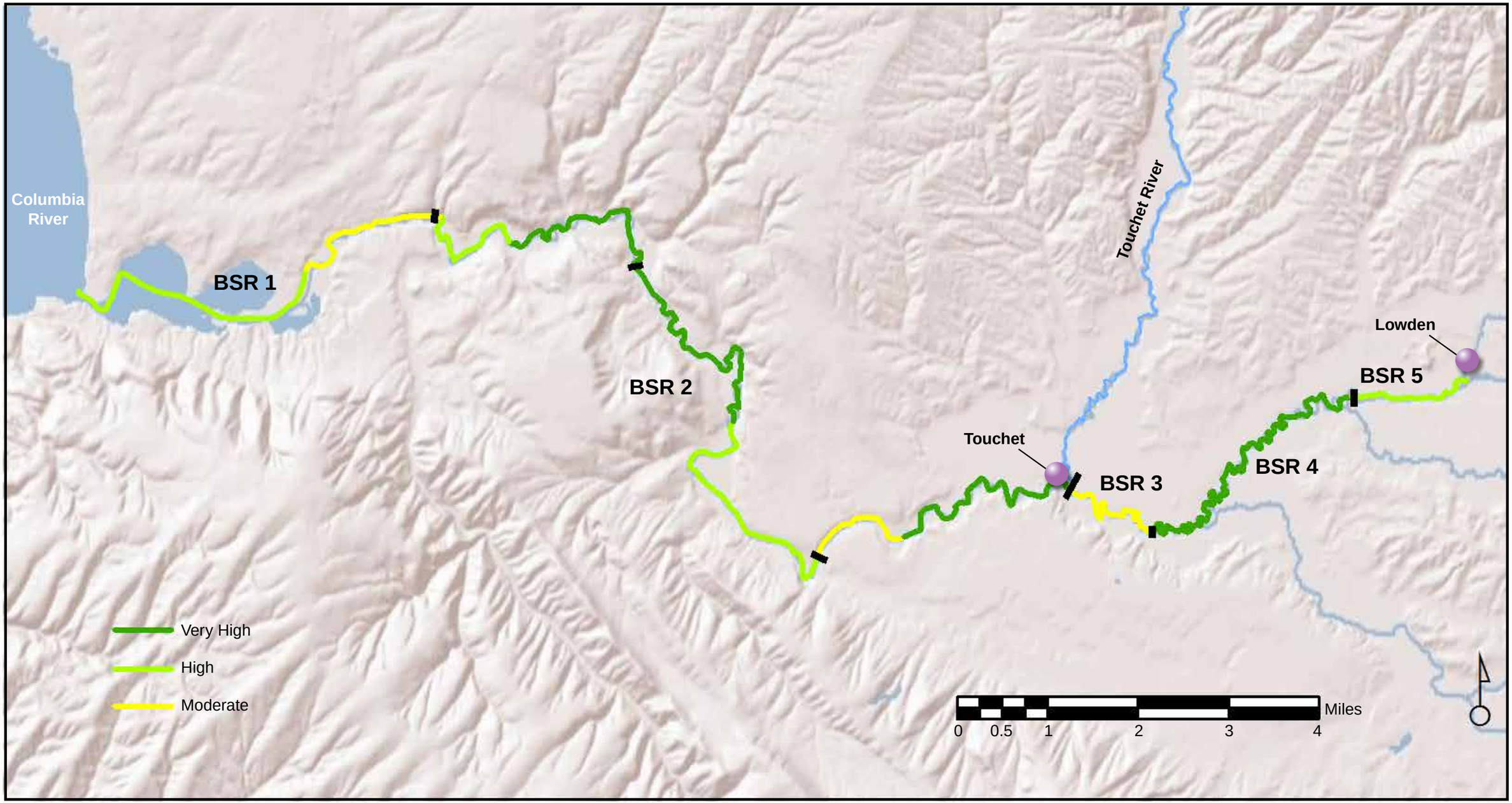
Geomorphic Reach 7 – RM 26.0 to 27.4



Current Geomorphic Function



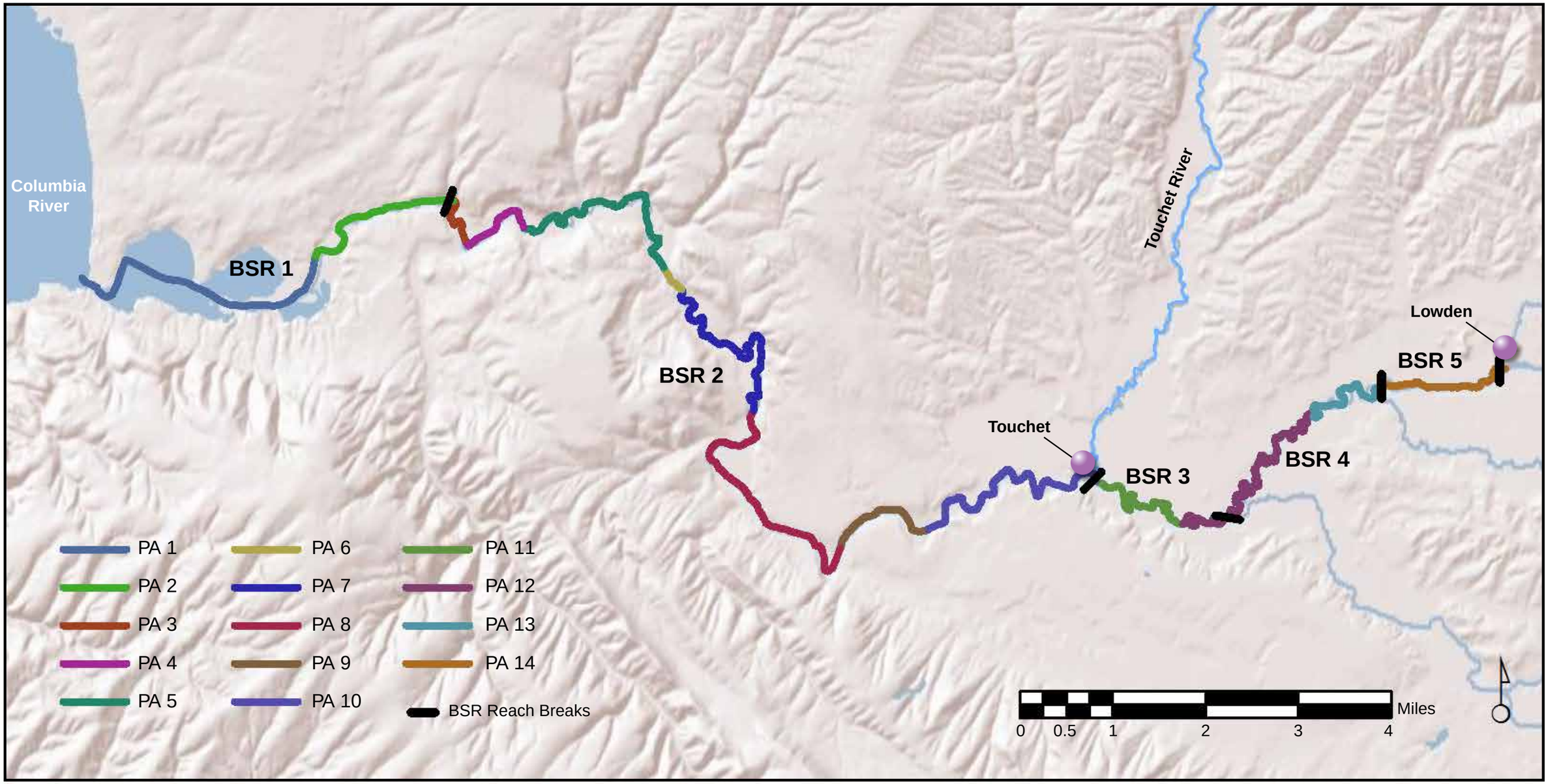
Geomorphic Potential



Focal Species Utilization Potential

Action Plan

- Based on the Geomorphic Assessment, identified project areas and biologically significant areas
- Prioritized project areas based on geomorphic and fish use potential, feasibility, and funding availability
- Developed conceptual restoration categories, design elements, and drawings for representative potential project areas that can be broadly applied to other project areas or sites
- Identified landowner and fish habitat outcomes for each conceptual drawing category



Project Areas and Biologically Significant Reaches

Project Area Prioritization Matrix and Overall Project Area Rankings

Project Area (PA)	Location (RM)	Focal Species Utilization Potential[1/]	Focal Limiting Factors[2/]	Current Geomorphic Function[3/]	Geomorphic Potential[4/]	Cost-Benefit[5/]	Feasibility[6/]	Project Area Cumulative Score	Overall Rank (Tiers I, II, III)
PA 1	3.8–7.0	2	2	3	1	1	3	12	II
PA 2	7.0–8.6	1	1	3	1	1	3	10	III
PA 3	8.6–9.2	2	2	1	1	1	3	10	III
PA 4	9.2–10.2	2	2	1	1	1	3	10	III
PA 5	10.2–12.8	3	3	1	2	2	3	14	II
PA 6	12.8–13.0	3	1	1	1	3	3	12	II
PA 7	13.0–15.0	3	3	1	3	2	3	15	I
PA 8	15.0–17.9	2	2	1	2	2	2	11	III
PA 9	17.9–19.2	1	1	3	2	2	2	11	III
PA 10	19.2–21.6	3	3	3	3	2	2	16	I
PA 11	21.6–22.8	1	3	3	3	2	2	14	II
PA 12	22.8–25.0	3	3	1	3	2	3	15	I
PA 13	25.0 to 26.0	3	2	1	3	3	3	15	I
PA 14	26.0–27.4	2	2	2	3	3	3	15	I

1/ Focal fish species utilization potential was ranked Low (1), Medium (2), or High (3) based on existing focal fish species utilization, channel morphology, sediment characteristics, focal fish species limiting factors, BSRs, professional experience, and best professional judgment.

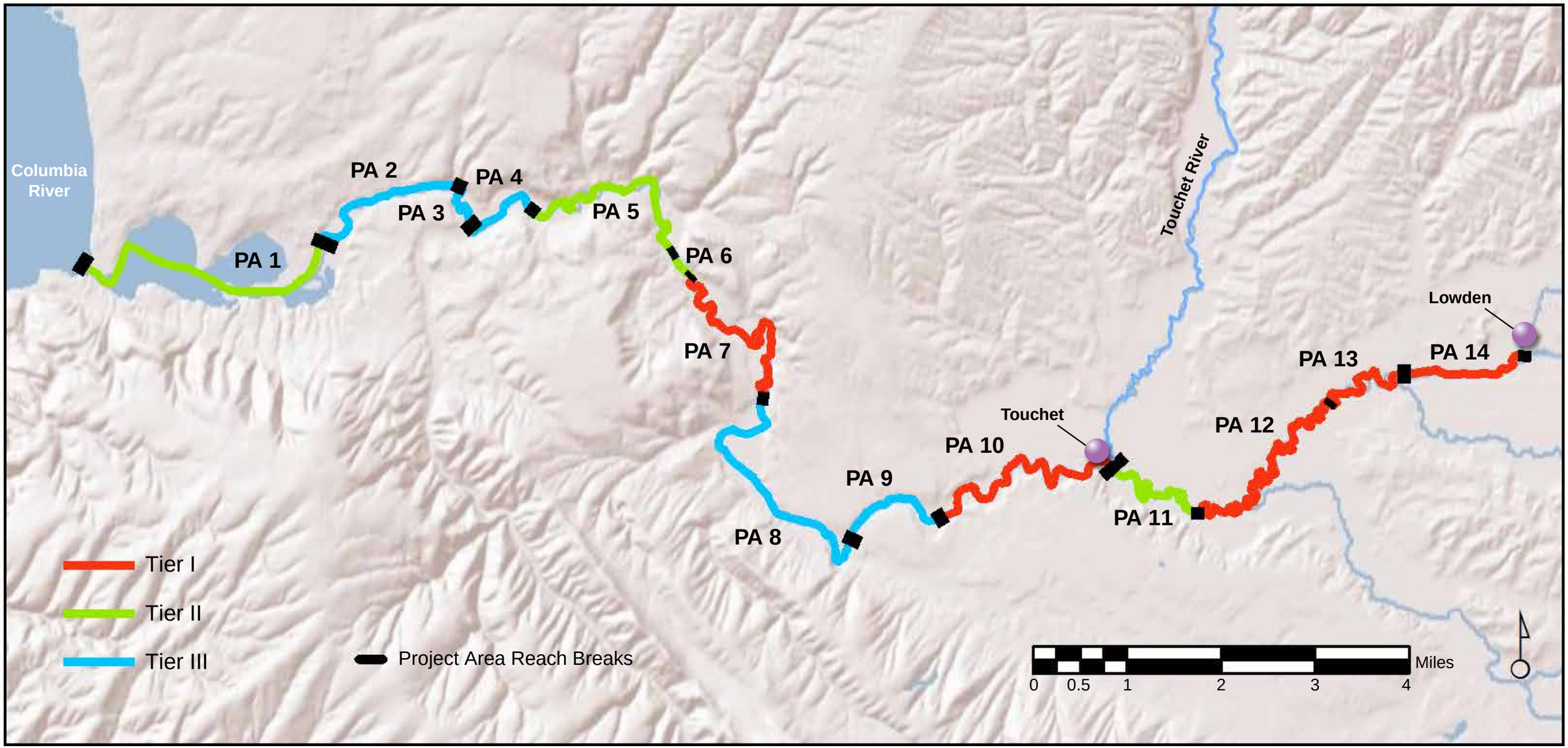
2/ Focal limiting factors were ranked as Low (1), Medium (2), or High (3), based on the number of limiting factors addressed in proposed activities and the rank of those limiting factors (see Table 4-1).

3/ Current geomorphic function was given a Low (1) priority ranking if the Geomorphic Assessment results indicated current function was moderate, Medium (2) if current function was low, or High (3), if the current geomorphic function was very low (see Figure 3-20).

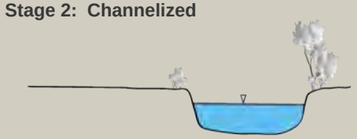
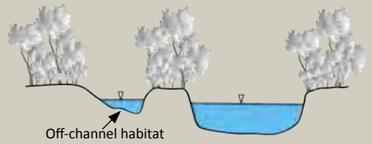
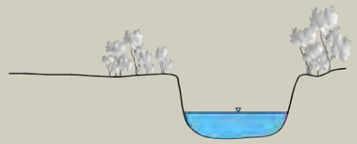
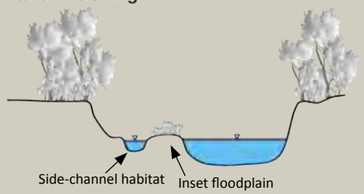
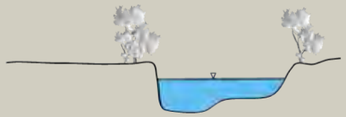
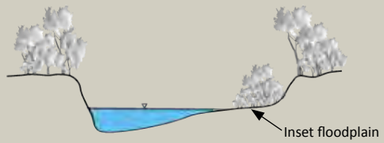
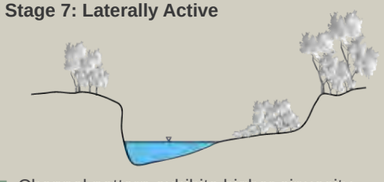
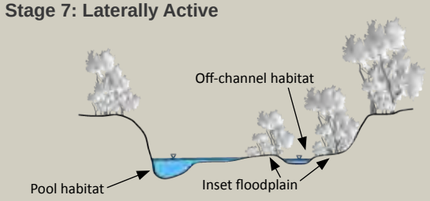
4/ Geomorphic Potential factors were ranked as Low (1), Medium (2), or High (3), based on Geomorphic Assessment results, professional experience, and best professional judgment.

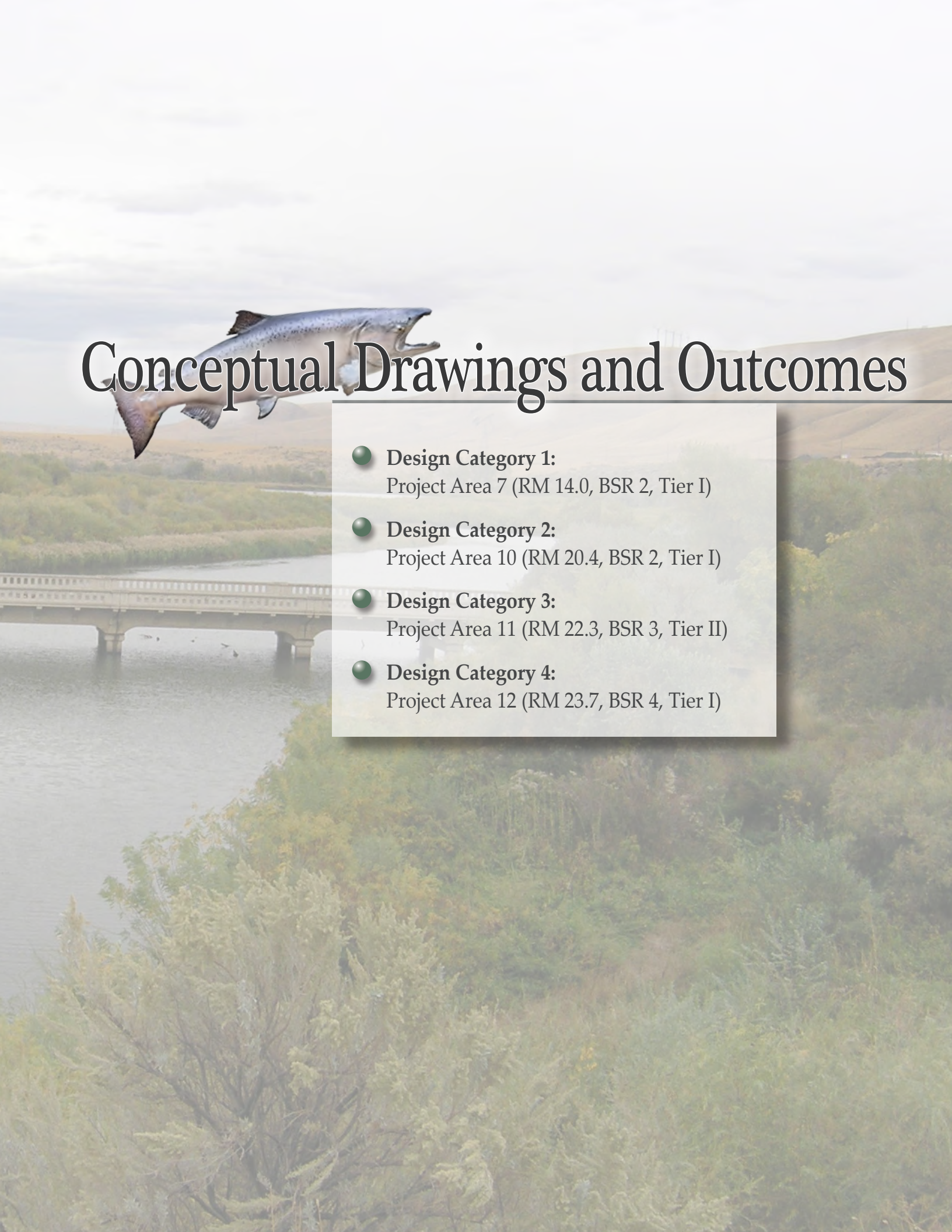
5/ The cost versus benefit was ranked as Low (1), Medium (2), or High (3) based on the relative cost as estimated based on past projects and the expected benefit as defined by measurable effect on focal limiting factors.

6/ Feasibility benefit was ranked as Low (1), Medium (2), or High (3) based on evaluating potential construction access, difficulty of restoration and enhancement actions, probability of achieving a successful outcome from project actions from professional experience, and best professional judgment.



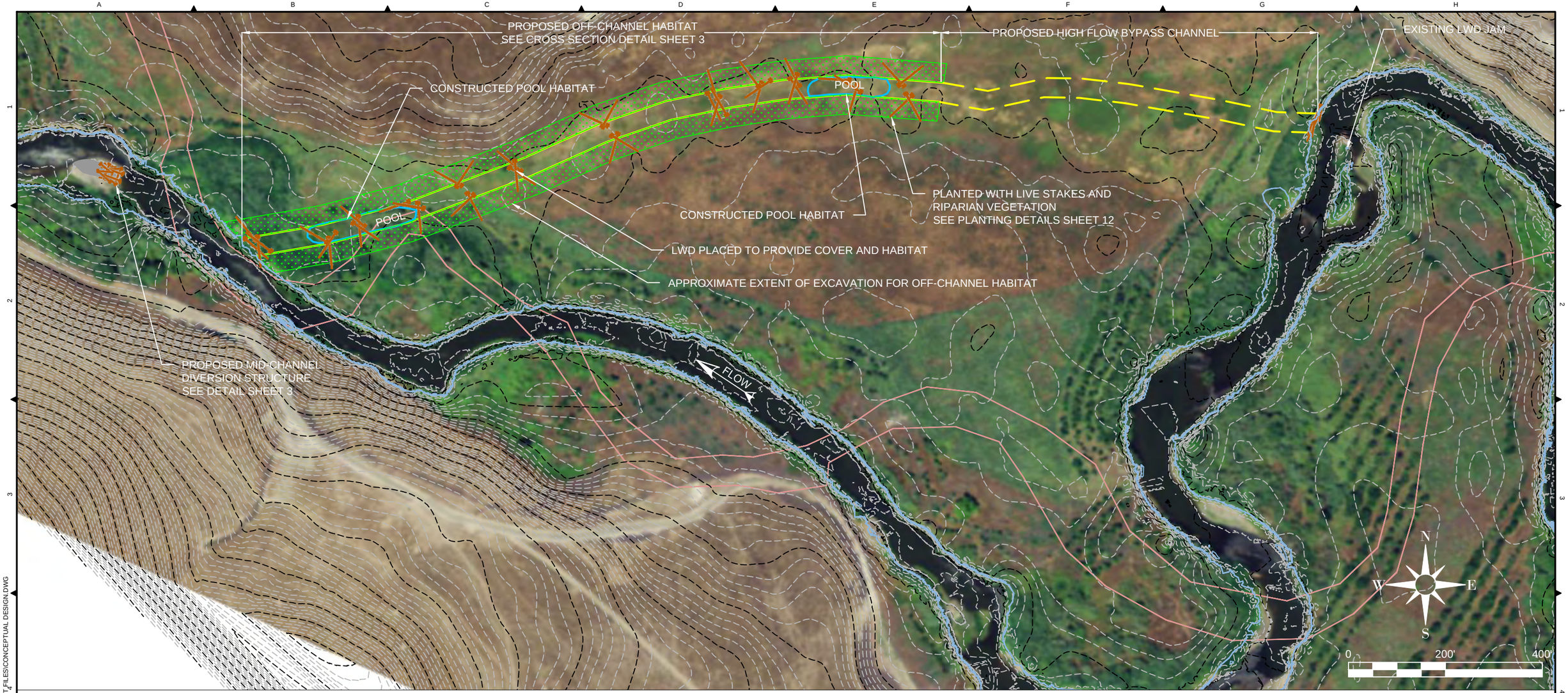
Project Area Prioritization

Location	Focal Limiting Factors (Limiting to Highly Limiting)	Existing Conditions	Proposed Actions	Post-Implementation Conditions
Project Areas 1 and 2 RM 3.8 to 8.6 Geomorphic Reach 1 BSR 1	■ Predation ■ Riparian Condition ■ Large Woody Debris ■ Pool Frequency/Quality	**SEM Stage 2: Channelized**  ■ Heavily modified channel ■ Low gradient and sinuosity ■ Uniform depths and velocities ■ Low habitat diversity	■ Riparian planting ■ Conservation agreements ■ Remove invasive vegetation ■ Implement beaver restoration management ■ Construct perennial off-channel habitat ■ Add LWD to existing off-channel habitat ■ Add instream LWD structure to existing bars	**SEM Stages 3 to 4: Degradation to Degradation and Widening**  ■ Placed LWD provides cover from predators ■ Improved riparian vegetation and floodplain connectivity ■ More diverse depths and velocities ■ Off-channel area provides rearing habitat ■ Improved habitat diversity
Project Areas 9 to 11 RM 17.9 to 22.8 Geomorphic Reaches 4 & 5 BSRs 2 and 3	■ Predation ■ Riparian Condition ■ Streambank Condition ■ Floodplain Connectivity ■ Off-Channel Habitat ■ Flood Refugia (High Velocity) ■ Large Woody Debris ■ Pool Frequency/Quality	**SEM Stage 3s: Arrested Degradation**  ■ Deeply incised channel, caught in Stage 3s of SEM ■ Lowest values for current geomorphic function ■ Relatively narrow riparian corridor with CREP planted areas ■ High velocities with little or no refugia	■ Riparian planting ■ Conservation agreements ■ Construct alcoves including LWD ■ Construct perennial off-channel Habitat ■ Construct high-flow bypass channels ■ Add point bar structures at existing bars and/or other deposits ■ Add LWD to existing off-channel habitat ■ Add instream LWD structure to existing bars and inlet of existing side-channels ■ Remove existing bank armor structures; construct isolated bank protection and habitat structures	**SEM Stages 4 to 5: Degradation and Widening to Aggradation and Widening**  ■ Placed LWD increases channel complexity and provides cover from predators ■ Improved riparian vegetation and floodplain connectivity ■ Alcoves and off-channel areas provide high-velocity refugia and rearing habitat ■ Improved habitat diversity
Project Area 14 RM 26.0 to 27.4 Geomorphic Reach 7 BSR 5	■ Predation ■ Riparian Condition ■ Streambank Condition ■ Floodplain Connectivity ■ Off-Channel Habitat ■ Flood Refugia (High Velocity) ■ Large Woody Debris ■ Pool Frequency/Quality	**SEM Stage 5: Aggradation and Widening**  ■ Extensive channel straightening ■ Prevention of widening by bank armor structures ■ More frequent gravel bars and LWD than any of the downstream reaches ■ Lack of riparian vegetation or CREP planted areas ■ Low habitat diversity	■ Riparian planting ■ Conservation agreements ■ Add point bar structures at existing bars ■ Remove existing bank armor structures ■ Construct isolated bank protection and habitat structures	**SEM Stages 6 to 7: Quasi Equilibrium to Laterally Active**  ■ Inset floodplain increases connectivity ■ Vegetation colonization of inset floodplain improves riparian conditions ■ Asymmetrical channel creates areas of high-flow refugia ■ Instream complexity increases habitat quality and quantity
Project Areas 3 to 8, 12 and 13 RM 8.6 to 17.9 and 22.8 to 26.0 Geomorphic Reaches 2, 3, & 6 BSRs 2, 3, and 4	■ Predation ■ Streambank Condition ■ Floodplain Connectivity ■ Off-Channel Habitat ■ Large Woody Debris ■ Pool Frequency/Quality	**SEM Stage 7: Laterally Active**  ■ Channel pattern exhibits higher sinuosity, particularly in Reach 6 ■ Instream complexity, floodplain connectivity, and habitat quality are higher than other reaches ■ Riparian characteristics range from sparse (Reach 3) to a relatively wide riparian corridor (Reach 6) ■ Limited areas of high-flow refugia	■ Riparian planting ■ Conservation agreements ■ Implement beaver restoration management ■ Construct perennial side-channels with LWD ■ Reconnect existing disconnected off-channel habitat ■ Construct high-flow bypass channels ■ Construct alcoves including LWD ■ Add point bar structures at existing bars and/or other deposits ■ Add instream LWD structure to existing bars and inlet of existing side-channels ■ Remove existing bank armor structures ■ Construct isolated bank protection and habitat structures	**SEM Stage 7: Laterally Active**  ■ Natural processes lead to effective pool development and sediment sorting ■ Improved riparian vegetation and floodplain connectivity ■ Off-channel areas provide rearing habitat ■ Placed LWD increases channel complexity and provides cover from predators ■ Improved habitat diversity



Conceptual Drawings and Outcomes

- **Design Category 1:**
  Project Area 7 (RM 14.0, BSR 2, Tier I)
- **Design Category 2:**
  Project Area 10 (RM 20.4, BSR 2, Tier I)
- **Design Category 3:**
  Project Area 11 (RM 22.3, BSR 3, Tier II)
- **Design Category 4:**
  Project Area 12 (RM 23.7, BSR 4, Tier I)



NOTES:

1. NO FLOWS EXPECTED IN OFF-CHANNEL HABITAT WHEN HIGH FLOW BYPASS IS NOT CONSTRUCTED AS PART OF DESIGN.
2. WOOD INCLUDED IN DESIGN OFF-CHANNEL HABITAT TO PROVIDE COVER FOR FISH.
3. POOLS IN OFF-CHANNEL HABITAT SHALL BE A MINIMUM OF 3 FEET DEEP TO PROVIDE HABITAT FOR FISH IF OFF-CHANNEL IS TEMPORARILY DISCONNECTED FROM MAIN CHANNEL.
4. PROPOSED HIGH FLOW BYPASS CHANNEL NOT APPLICABLE IN ALL CASES.
5. LWD STRUCTURE TO BE PLACED AT INLET OF HIGH FLOW BYPASS CHANNEL TO CONTROL GRADE AND PREVENT AVULSION OF MAIN CHANNEL INTO BYPASS CHANNEL. LWD STRUCTURE TYPE AND LOCATION TO BE DEVELOPED DURING LATER STAGES OF DESIGN.
6. OFF-CHANNEL HABITAT PLANTED WITH LIVE STAKES AND RIPARIAN VEGETATION TO PROVIDE CHANNEL STABILITY. SEE PLANTING NOTES SHEET 12.
7. MID-CHANNEL DIVERSION STRUCTURE PLACED TO CREATE NEW MAIN CHANNEL SPLIT FLOW, OR TO ENHANCE EXISTING MID-CHANNEL BAR TO PROMOTE EXISTING SPLIT FLOW.

LEGEND:

- EXISTING MAJOR CONTOUR - 5FT
- EXISTING MINOR CONTOUR - 1FT
- CURRENT BANKFULL CHANNEL
- 1939/1940 ACTIVE CHANNEL
- PROPOSED OFF-CHANNEL
- PROPOSED HIGH FLOW BYPASS CHANNEL
- LWD STRUCTURES
- ALCOVE / POOL HABITAT
- RIPARIAN PLANTING

TETRA TECH
www.tetratech.com
19803 North Creek Parkway
Bothell, Washington 98011
Phone: 425-482-7600 Fax: 425-482-7652

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK
		PLAN SET SIZE ANSI B (11x17)			
-	10/17/14	CONCEPTUAL DESIGN	ATS	GMS	CSJ

LOWER WALLA WALLA GEOMORPHIC ASSESSMENT AND ACTION PLAN

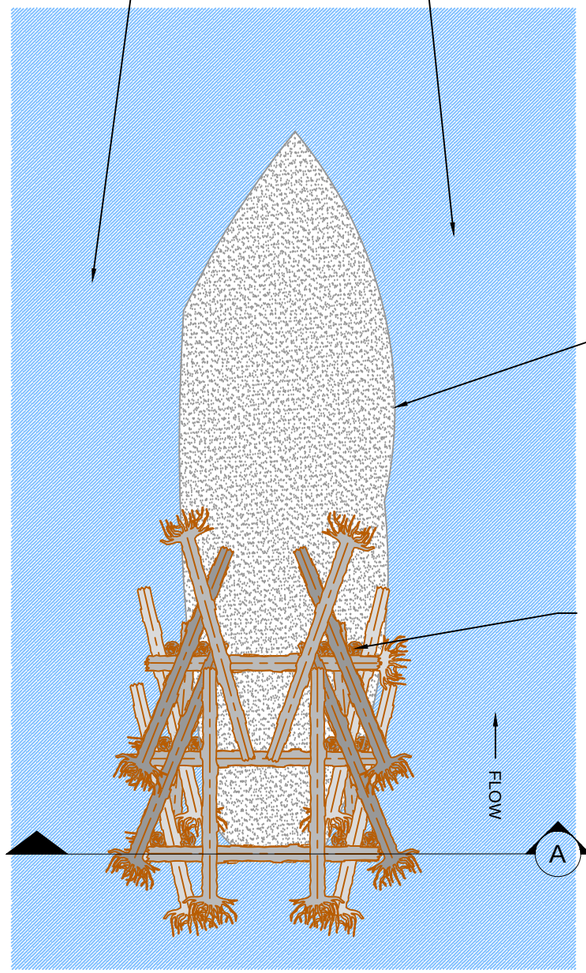
CONCEPTUAL DESIGN CATEGORY 1 - PLAN

DWG. NO.:

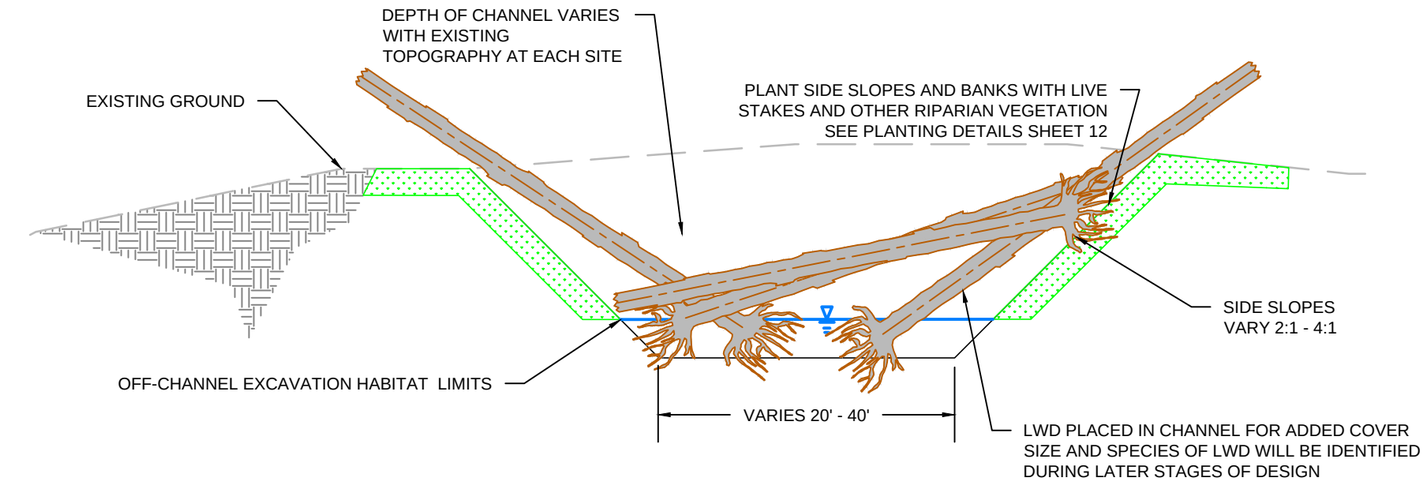
CREATED: 07/11/2014

SHEET: 2 OF 12

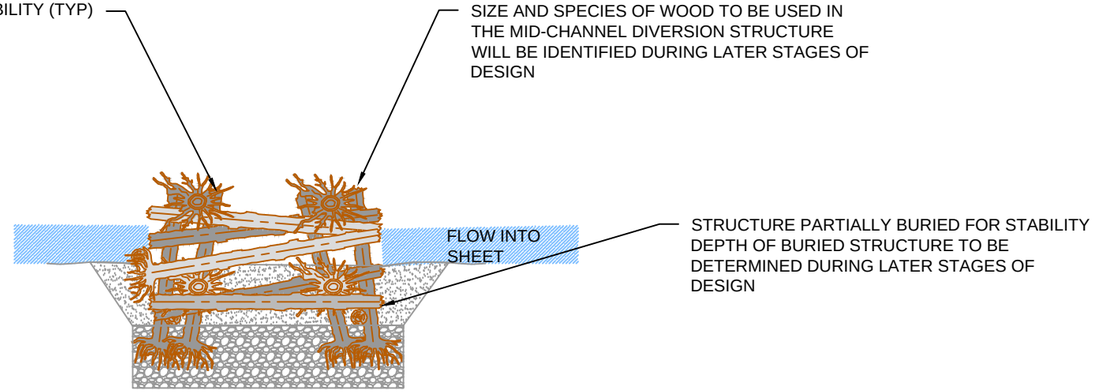
Z:\PROJECTS\194-4907 LOWER WALLA WALLA GEOMORPHIC ASSESSMENT\WORKING DESIGN\SHEET_4\FILES\CONCEPTUAL DESIGN.DWG
PLOT DETAILS: STROM, ALEX October 23, 2014 9:43 AM



PLAN VIEW



OFF-CHANNEL HABITAT / SIDE CHANNEL CROSS SECTION



SECTION VIEW A-A

CHANNEL BAR DIVERSION STRUCTURE

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www.tetratech.com
19803 North Creek Parkway
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REV.	DATE	PLAN SET SIZE ANSI B (11x17) REVISION DESCRIPTION	DRW	ENG	CHK
-	10/17/14	CONCEPTUAL DESIGN	ATS	GMS	CSJ

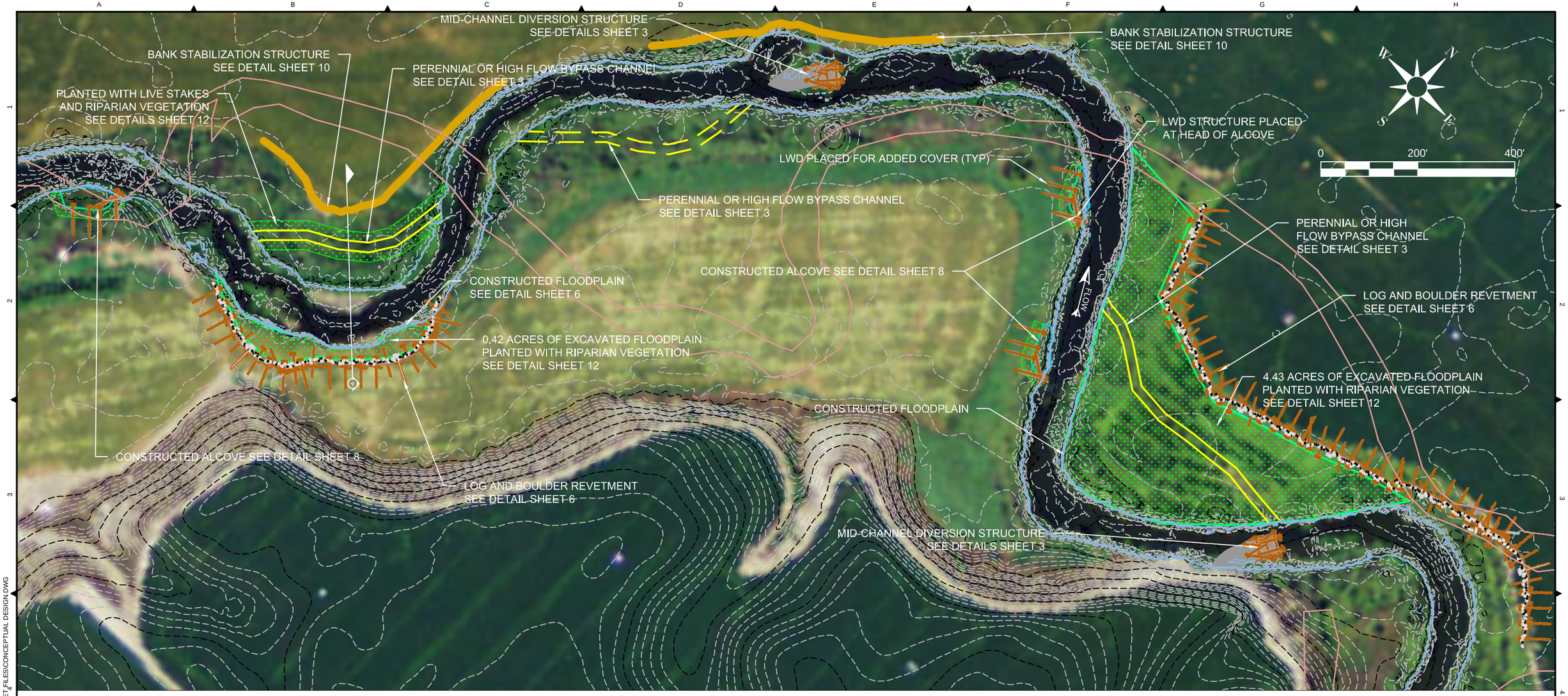
LOWER WALLA WALLA GEOMORPHIC ASSESSMENT AND ACTION PLAN

CONCEPTUAL DESIGN CATEGORY 1 - DETAILS

DWG. NO.:

CREATED: 07/11/2014

SHEET: 3 OF 12



NOTES:

1. MID-CHANNEL DIVERSION STRUCTURES AND ALCOVES CONSTRUCTED ALONG CHANNELIZED SECTIONS OF THE RIVER TO PROVIDE FOR HIGH FLOW REFUGE FOR FISH.
2. MID-CHANNEL DIVERSION STRUCTURE PLACED TO CREATE NEW MAIN CHANNEL SPLIT FLOW.
3. ALCOVE SECTIONS WILL BE EXCAVATED TO PROVIDE IMMEDIATE REFUGE AREAS FOR FISH.
4. LWD ADDED TO CONSTRUCTED ALCOVES TO PROVIDE COVER.
5. AREAS AROUND CONSTRUCTED ALCOVES SHALL BE PLANTED WITH RIPARIAN VEGETATION TO PROVIDE ADDED COVER.
6. HIGH FLOW BYPASS CONSTRUCTED TO ALLEVIATE HIGH VELOCITIES IN STRAIGHT SECTIONS DURING STORM EVENTS.
7. LOG AND BOULDER REVETMENT CONSTRUCTED TO PREVENT FURTHER MIGRATION OF CHANNEL INTO ADJACENT PRIVATE PROPERTY.
8. LENGTH AND ORIENTATION OF LOG AND BOULDER REVETMENTS MAY VARY DUE TO HYDRAULIC MODELING IN LATTER STAGES OF DESIGN.
9. PLACE BANK STABILIZATION STRUCTURES IN AREAS WITH HIGHLY ERODING BANKS.

LEGEND:

- EXISTING MAJOR CONTOUR - 5FT
- EXISTING MINOR CONTOUR - 1FT
- CURRENT BANKFULL CHANNEL
- 1939/1940 ACTIVE CHANNEL
- PROPOSED OFF-CHANNEL
- PROPOSED HIGH FLOW BYPASS CHANNEL
- LWD STRUCTURES
- ALCOVE / POOL HABITAT
- RIPARIAN PLANTING
- CONSTRUCTED FLOODPLAIN
- BANK STABILIZATION

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Bothell, Washington 98011
Phone: 425-482-7600 Fax: 425-482-7652

REV.	DATE	PLAN SET SIZE ANSI B (11x17) REVISION DESCRIPTION	DRW	ENG	CHK
-	10/17/14	CONCEPTUAL DESIGN	ATS	GMS	CSJ

LOWER WALLA WALLA GEOMORPHIC ASSESSMENT AND ACTION PLAN

CONCEPTUAL DESIGN CATEGORY 2 - PLAN

DWG. NO.:

CREATED: 07/11/2014

SHEET: 5 OF 12

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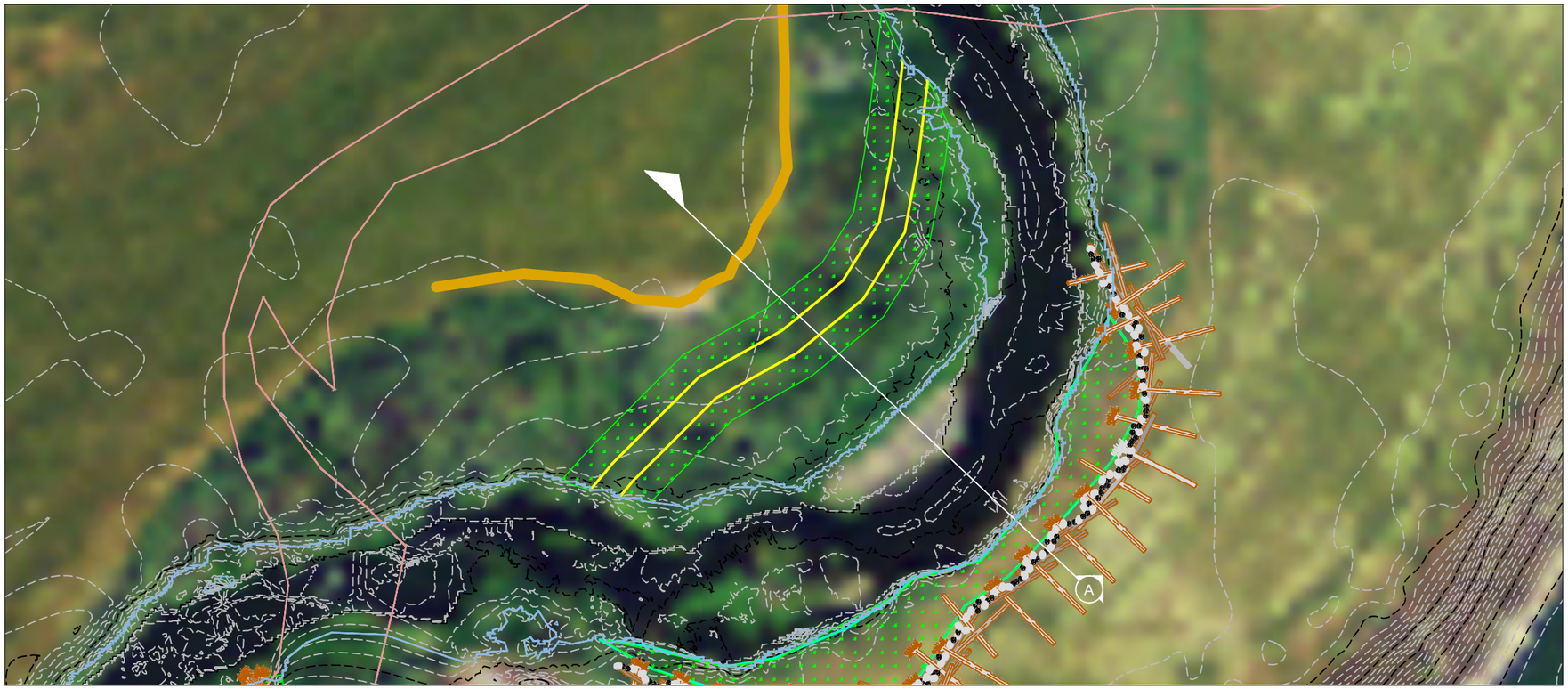
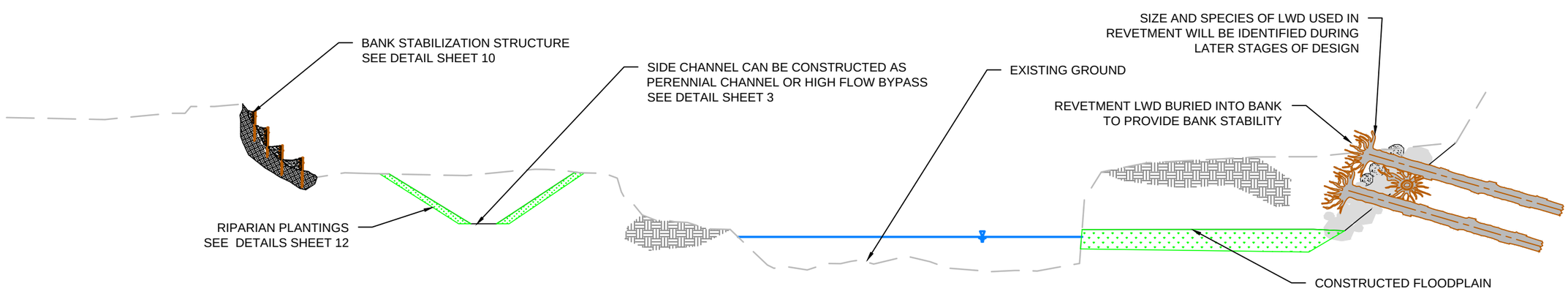


REVETMENT WITH SIDE CHANNEL AND BANK STABILIZATION STRUCTURES - PLAN VIEW



SECTION A-A

TETRA TECH
www.tetratech.com
19803 North Creek Parkway
Bothell, Washington 98011
Phone: 425-482-7600 Fax: 425-482-7652

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		PLAN SET SIZE ANSI B (11x17)			
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LOWER WALLA WALLA GEOMORPHIC ASSESSMENT AND ACTION PLAN

CONCEPTUAL DESIGN CATEGORY 2 - DETAILS

DWG. NO.:

CREATED: 07/11/2014

NOTES:

1. LWD STRUCTURES AND ALCOVES CONSTRUCTED ALONG CHANNELIZED SECTIONS OF THE RIVER TO PROVIDE FOR HIGH FLOW REFUGE FOR FISH.
2. ALCOVE SECTIONS WILL BE EXCAVATED TO PROVIDE IMMEDIATE REFUGE AREAS FOR FISH.
3. LWD ADDED TO CONSTRUCTED ALCOVES TO PROVIDE COVER.
4. AREAS AROUND CONSTRUCTED ALCOVES SHALL BE PLANTED WITH RIPARIAN VEGETATION TO PROVIDE ADDED COVER.
5. HIGH FLOW BYPASS CONSTRUCTED TO ALLEVIATE HIGH VELOCITIES IN STRAIGHT SECTIONS DURING STORM EVENTS.
6. UPSTREAM END OF HIGH FLOW BYPASS PLACED ON INSIDE OF CURVE TO PREVENT AVULSION OF MAIN CHANNEL INTO HIGH FLOW BYPASS CHANNEL.
7. CHANNEL BAR DIVERSION STRUCTURE PLACED TO CREATE NEW MAIN CHANNEL SPLIT FLOW, OR TO ENHANCE EXISTING MID-CHANNEL BAR TO PROMOTE SPLIT FLOW CONDITION IN MAIN CHANNEL.

LEGEND:

- EXISTING MAJOR CONTOUR - 5FT
- EXISTING MINOR CONTOUR - 1FT
- CURRENT BANKFULL CHANNEL
- 1939/1940 ACTIVE CHANNEL
- PROPOSED OFF-CHANNEL
- PROPOSED HIGH FLOW BYPASS CHANNEL
- LWD STRUCTURES
- ALCOVE / POOL HABITAT
- RIPARIAN PLANTING
- CONSTRUCTED FLOODPLAIN

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LOWER WALLA WALLA GEOMORPHIC ASSESSMENT AND ACTION PLAN

CONCEPTUAL DESIGN
CATEGORY 3 - PLAN

DWG. NO.:

CREATED: 07/11/2014

SHEET: 7 OF 12

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October 24, 2014
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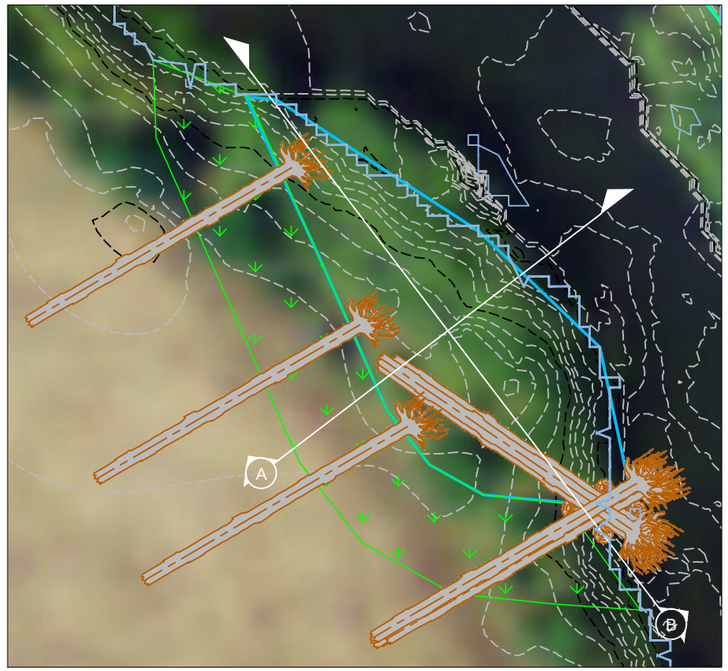
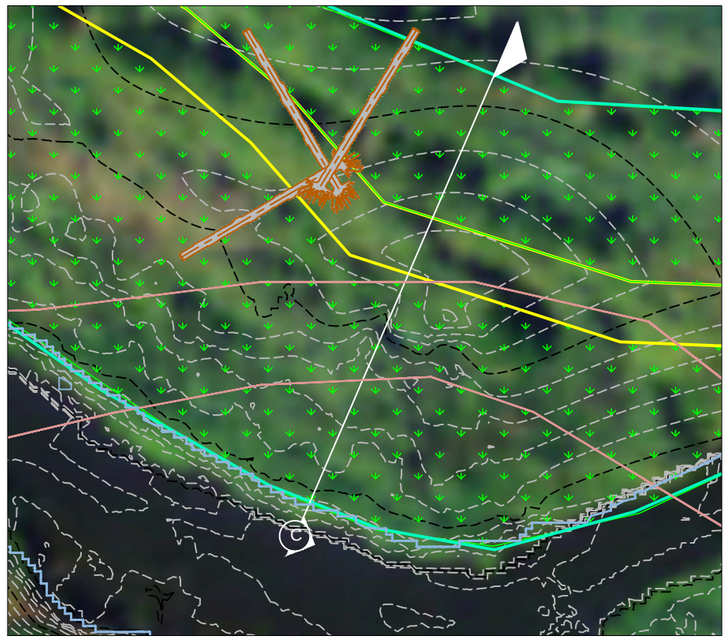
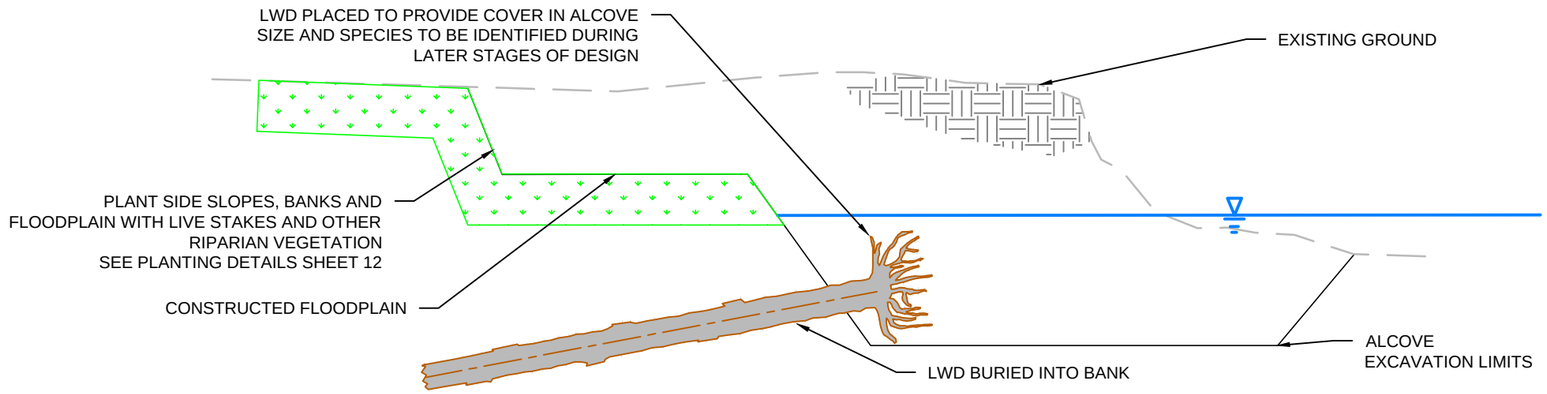


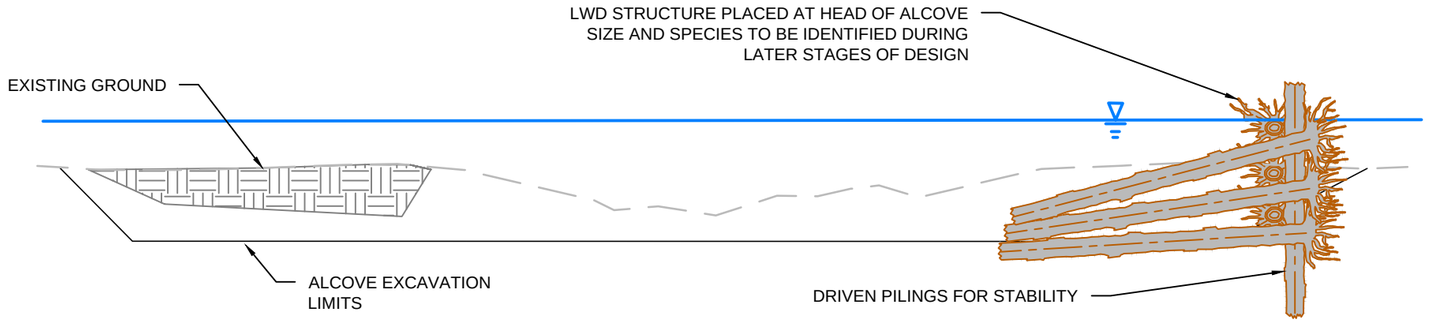
ALCOVE HABITAT (TYP) - PLAN VIEW



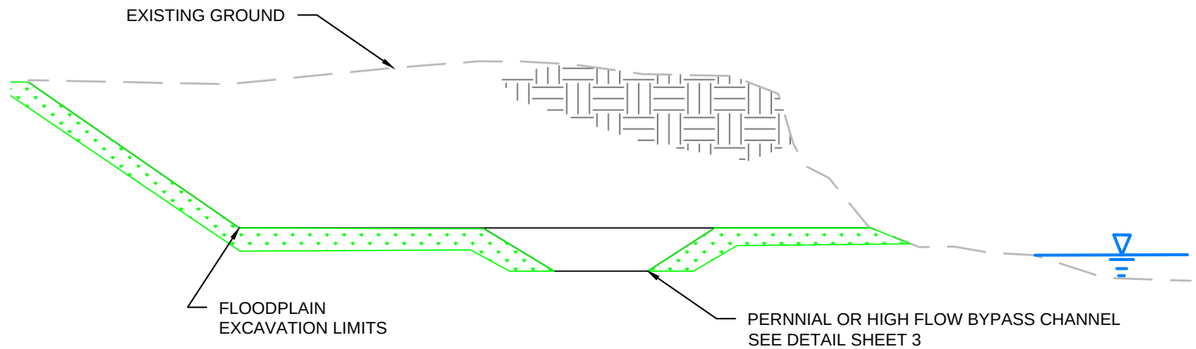
FLOODPLAIN WITH SIDE CHANNEL HABITAT (TYP) - PLAN VIEW



SECTION A-A



SECTION B-B



SECTION C-C

TETRA TECH
www.tetratech.com
19803 North Creek Parkway
Bothell, Washington 98011
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REV.	DATE	PLAN SET SIZE ANSI B (11x17) REVISION DESCRIPTION	DRW	ENG	CHK
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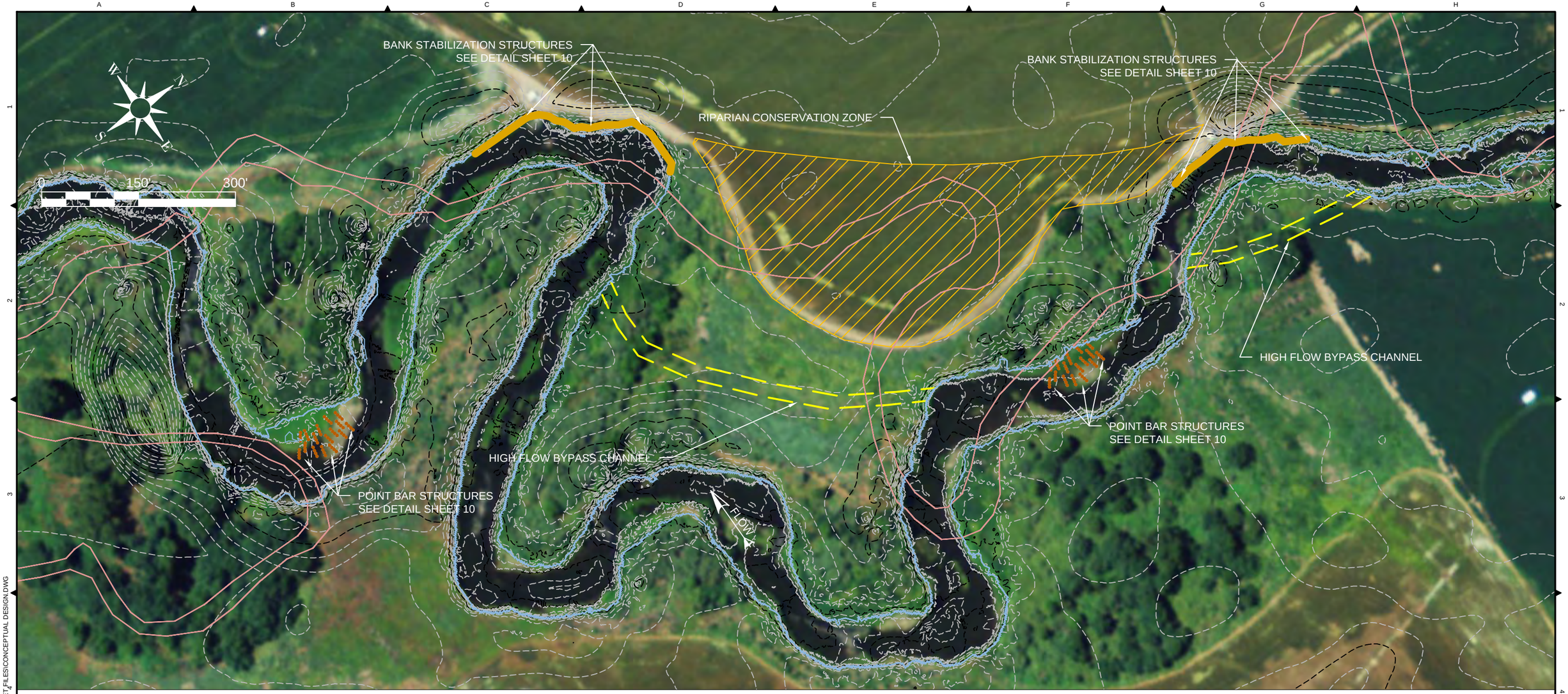
LOWER WALLA WALLA GEOMORPHIC ASSESSMENT AND ACTION PLAN

CONCEPTUAL DESIGN CATEGORY 3 - DETAILS

DWG. NO.:

CREATED: 07/11/2014



NOTES:

1. PLACE BANK STABILIZATION STRUCTURES IN AREAS WITH HIGHLY ERODING BANKS.
2. PLACE BANK STABILIZATION STRUCTURES TO PROTECT PRIVATE LANDOWNER INFRASTRUCTURE.
3. POINT BAR STRUCTURES TO BE PLANTED WITH WILLOW STAKES TO PROVIDE ADDED STABILITY.
4. AREA SHADED ON PLAN SHEET INDICATES POSSIBLE RIPARIAN CONSERVATION ZONE FOR BANK STABILITY EXCHANGE WITH LANDOWNER.
5. HIGH FLOW BYPASS CONSTRUCTED TO REDUCE HIGH FLOW VELOCITY DURING FLOOD EVENTS.
6. UPSTREAM END OF HIGH FLOW BYPASS PLACED ON INSIDE OF CURVE SO AS NOT TO PROMOTE ENTIRE CHANNEL REALIGNMENT INTO CHANNEL.
7. SEDIMENT RETENTION STRUCTURES PLACED ON INSIDE OF CHANNEL MEANDER ON EXISTING BAR TO PROMOTE SEDIMENT RETENTION AND CHANNEL MIGRATION.

LEGEND:

- EXISTING MAJOR CONTOUR - 5FT
- EXISTING MINOR CONTOUR - 1FT
- CURRENT BANKFULL CHANNEL
- 1939/1940 ACTIVE CHANNEL
- PROPOSED OFF-CHANNEL
- PROPOSED HIGH FLOW BYPASS CHANNEL
- LWD STRUCTURES
- ALCOVE / POOL HABITAT
- RIPARIAN PLANTING
- CONSTRUCTED FLOODPLAIN
- BANK STABILIZATION
- RIPARIAN CONSERVATION ZONE

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LOWER WALLA WALLA GEOMORPHIC ASSESSMENT AND ACTION PLAN

CONCEPTUAL DESIGN CATEGORY 4 - PLAN

DWG. NO.:

CREATED: 07/11/2014

SHEET: 9 OF 12

Z:\PROJECTS\194-4907 LOWER WALLA WALLA GEOMORPHIC ASSESSMENT\WORKING DESIGN\SHEET_FILES\CONCEPTUAL DESIGN.DWG
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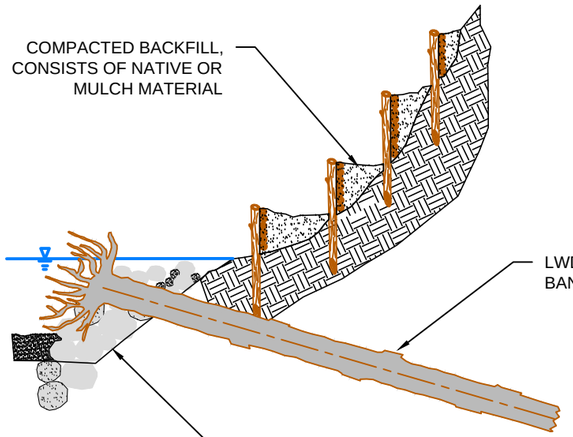
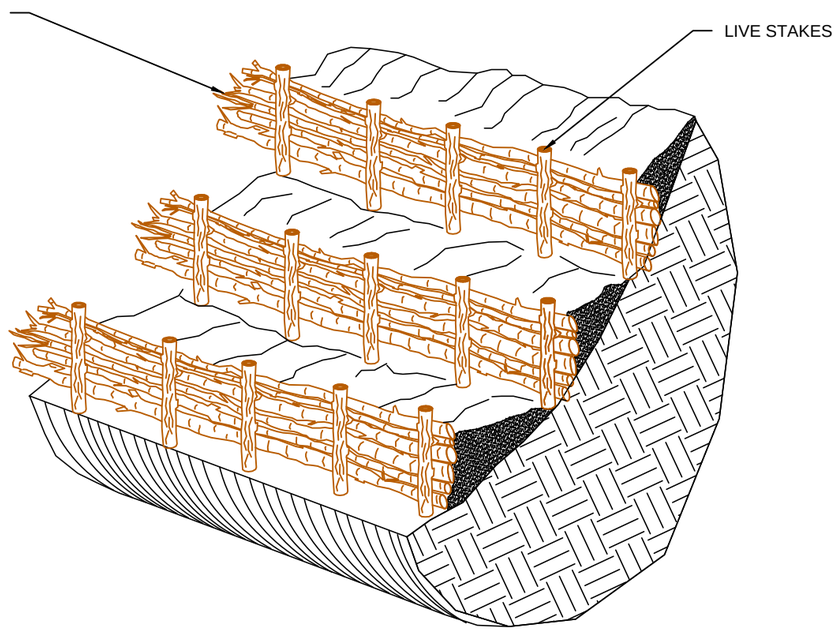
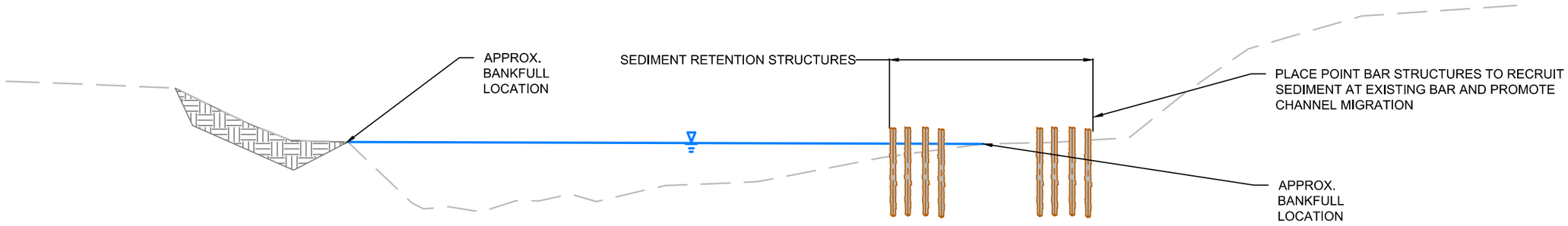


BANK STABILIZATION DETAIL - SECTION VIEW



BANK STABILIZATION DETAIL - ISOMETRIC VIEW



POINT BAR STRUCTURE DETAIL - SECTION VIEW

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CONCEPTUAL DESIGN CATEGORY 4 - DETAILS

DWG. NO.:

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SHEET: 10 OF 12

Conceptual Drawing Category Outcomes

Design Category	Outcomes
1	Reduce flow and hydraulic forces acting on eroding banks, restore floodplain connectivity, expand the riparian zone and increase shade, and provide off-channel habitat that results in improved pool frequency and depth and increased LWD and habitat diversity for year-around habitat use.
2	Restore processes in unfarmed areas and protect farmed areas by constructing side and high flow bypass channels to reduce bank erosion, increase floodplain connectivity, and provide overwinter rearing habitat; excavating alcoves and placing LWD to increase year-around main channel habitat diversity; and constructing bank stabilization structures, log and boulder revetments, and floodplains planted with riparian vegetation to limit bank erosion and increase shade.
3	Reduce channel incision, provide overwinter rearing habitat, and restore floodplain function by adding instream structures, constructing side and high flow bypass channels, and excavating an inset floodplain; and improve year-around main channel habitat complexity and diversity by excavating alcoves and placing LWD that provide increases in pool frequency and depth and cover from predation.
4	Reduce bank erosion in order to protect farmed areas, roads, and infrastructure through riparian conservation zones, high flow bypass channels, bank stabilization structures, and point bar structures that result in expanding riparian and floodplain zones that reduce flow and hydraulic forces acting on eroding banks, provide bank protection, and increase lateral migration away from areas of concern.