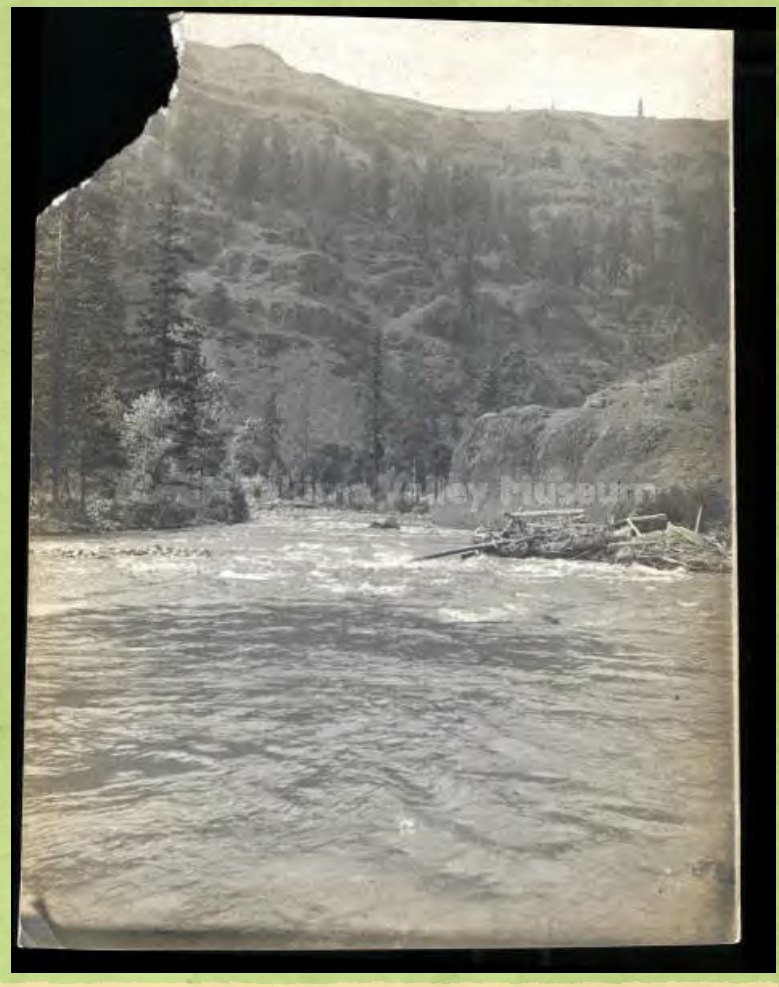
Yakima Basin Habitat Restoration



John Marvin – Yakama Nation Fisheries/Yakima-Klickitat Fisheries Project

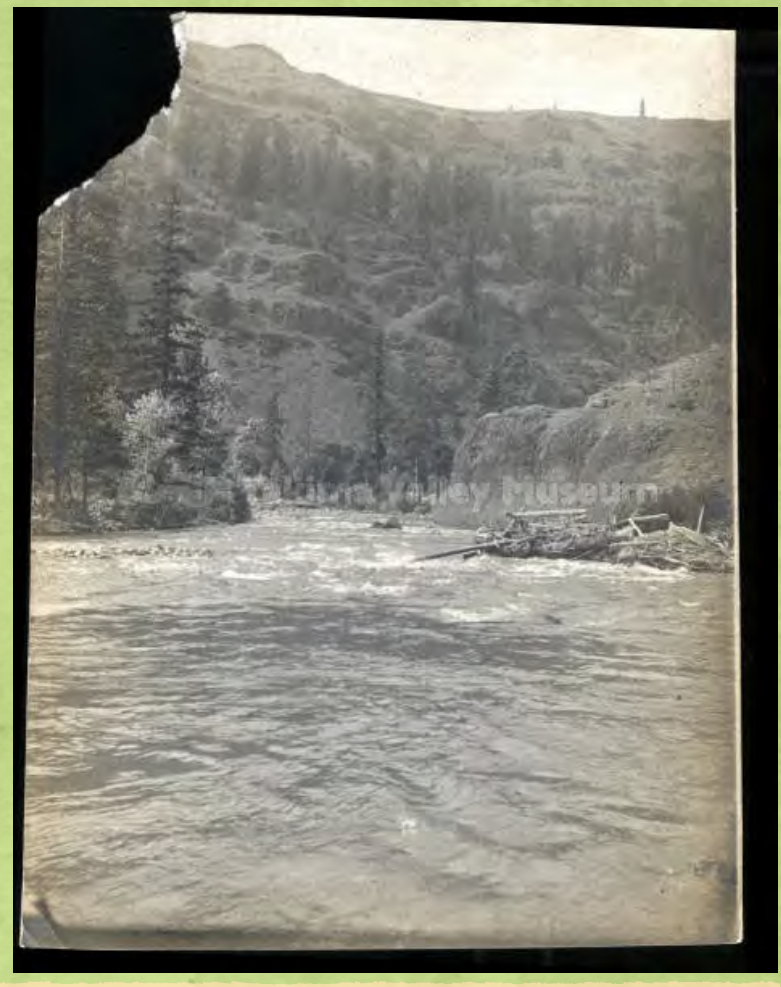
Yakima Basin Science and Management Conference June 17, 2025

Yakima Basin Habitat Restoration

- Project implementation 2025
  - LTBP SF Cowiche (Van Wyk)
  - LTPB SF Taneum Meadow
  - Upper Cle Elum River (Cle Elum Pool Raise)
  - LTPB Taneum Creek at Frost Meadow
  - Vegtation management (forever)
  - Yakima River at Union Gap homeless encampment clean up (18.44 tons of trash)
  - Tieton River Site #4 (RM 4.3) complete

- Project Planning
  - Upper Cle Elum River
  - SF Cowiche (Van Wyk) engineered designs
  - Ahtanum Village – Designs complete
  - Taneum RM 5 (Brain Ranch) Phase I/II – Phase I designs complete, Phase II 30%
  - Frogs Home Yakima River/Blue Slough – Conceptual Designs
  - MF/WF Teanaway
  - Springwood acquisition
  - Reecer Creek at Pott Rd
  - Wood Fiesta II – L Naches, Taneum, Nile
  - Tieton River gravel supplementation
  - Taneum Restoration EA implementation (Taneum Junction)
  - Beaver Management Program
  - Participation in various planning arenas; GMA, SMA, VSP, YBIP, TCF

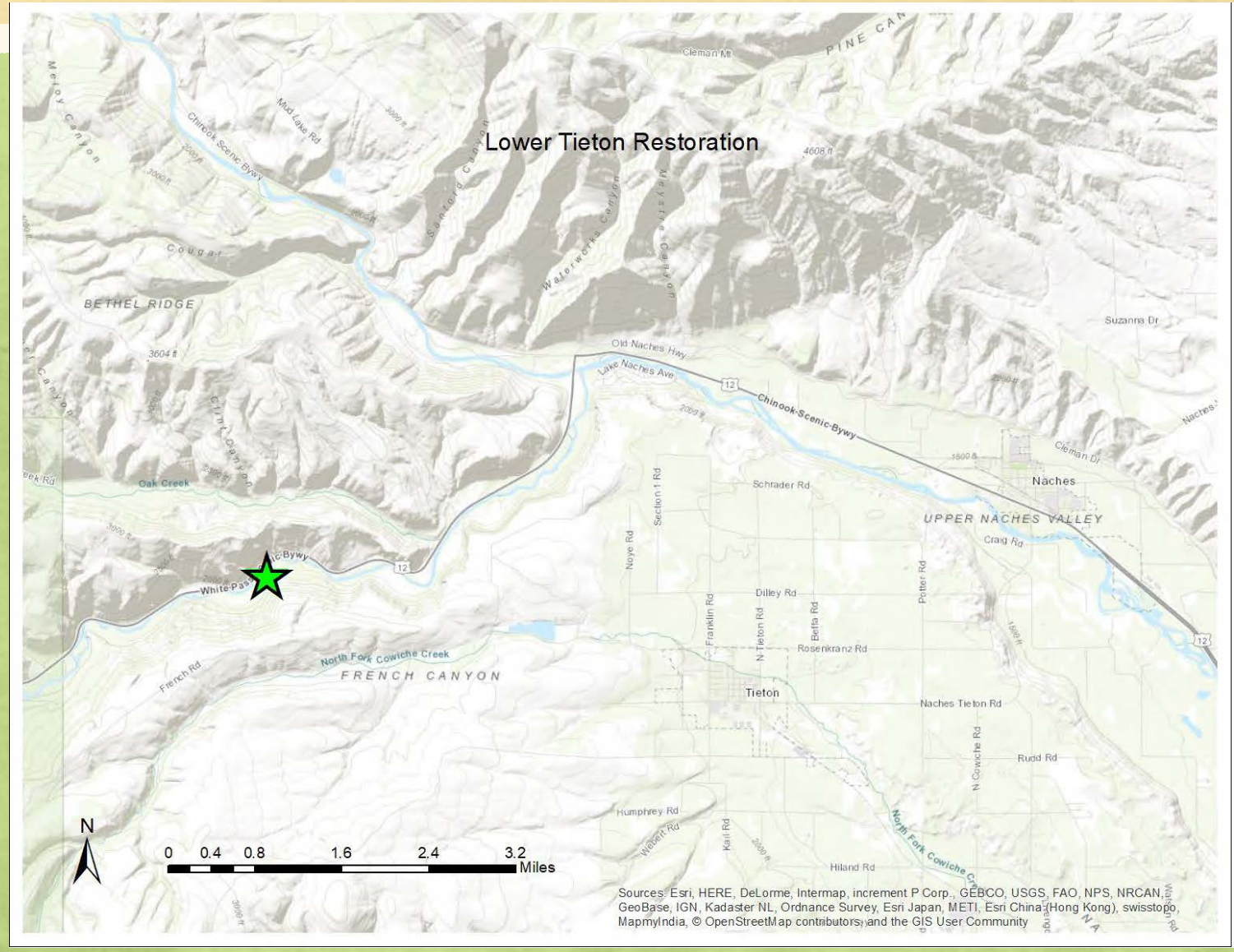
Tieton River Restoration



John Marvin – Yakama Nation Fisheries/Yakima-Klickitat Fisheries Project

Yakima Basin Science and Management Conference June 17, 2025

Tieton River Restoration Design Site #4



Tieton River Restoration

Species	Life History Present (egg, juvenile, adult)	Current Population Trend (decline, stable, rising)	Endangered Species Act Coverage (Y/N)
O. mykiss	Egg, juvenile, adult	Decline*	Y
Salvelinus confluentus	Juvenile, adult	Decline*	Y
O. *tshawytscha*	juvenile	Decline*	N
O. *kisutch*	Egg, juvenile, adult	Decline*	N
*Recent 5 year trend.			

Tieton River Restoration

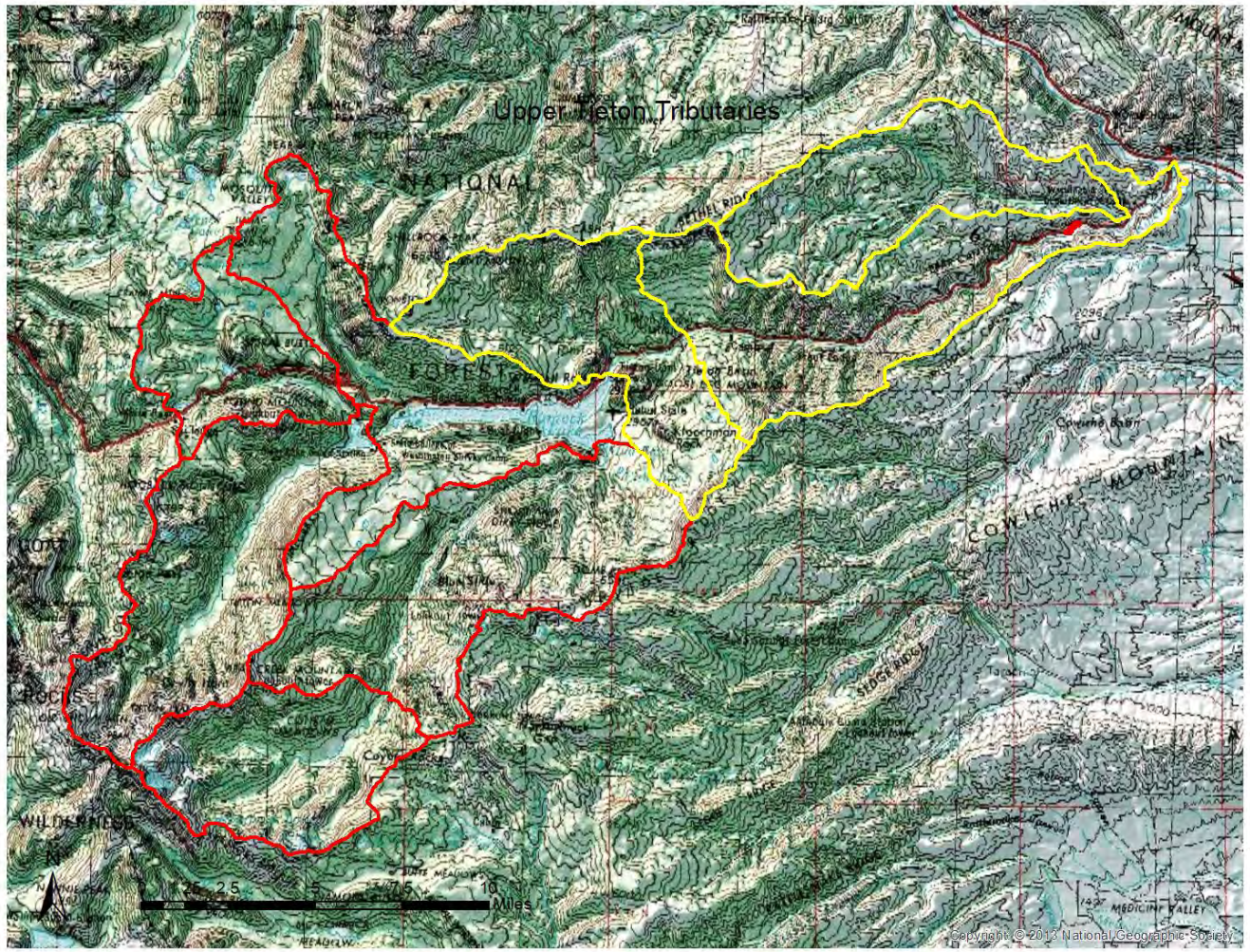
- Three human induced changes have severely altered the physical and ecologic character of the Tieton River:
  - 1) **The Tieton Dam**, built in 1925 (RM 21),
    - Yakima/Tieton Diversion Dam 1910 (RM 14)
  - 2) **Historic clearing** of the river and riparian forests of wood, and
  - 3) **State Route (SR) 12** (1950s).

Tieton River Restoration

- 1) Tieton Dam
  - The dam completely changed the river's **flow regime**:
    - "**Upside down**" Hydrography.
    - "**Flip Flop**" for irrigation.
    - **Cutting off a sediment supply to the lower river**.
      - Dams and Fundamental Fluvial geomorphologic theory.
        - **Reduce sediment = channel incision**.
        - Altered flow regime = reduced transport

Tieton River Restoration

- **Lower Tieton Tributaries** – Drainage Area **70,335 ac**
  - Dry Ponderosa Forest
    - **Oak Creek** (20,048 ac)- P
    - Bear Canyon – I
    - Pine/Hause/Soup Creek – I
    - Wildcat/Thunder Creek –P?
    - Milk Creek – P
- **Upper Tieton Tributaries** - Drainage Area **119,226 ac**
  - Alpine/Glacial/Cascade Crest
    - Indian Creek - P
    - Clear Creek – P
    - NF Tieton – P
    - SF Tieton - P

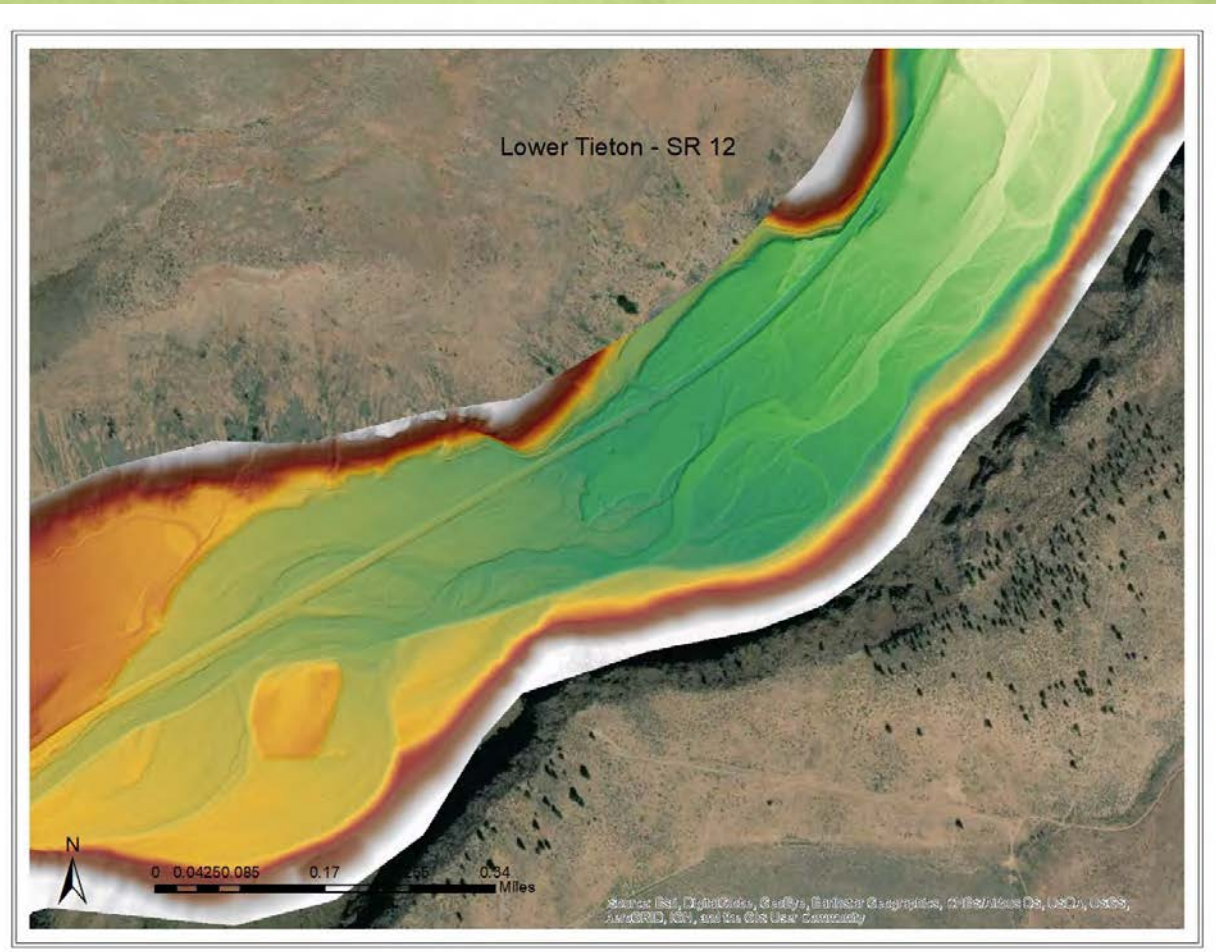


Tieton River Restoration

- 2) Wood clearing:
  - **Simplified habitat** and **lack of cover** and **large woody debris**.
    - Cover elements are used by both **holding adults and rearing juveniles**.
  - **Loss of spawning gravels**.
  - The lack of large wood in the river **diminishes physical complexity** by **decreasing the number of pools, increasing flow**, thereby **increasing the median grain size of the channel substrate**, preventing the creation of anabranch channels, and **decreasing floodplain connectivity** by lowering water levels.

Tieton River Restoration

- 3) **Construction of SR 12** further simplified the river by:
  - **cutting off channel meanders**,
  - **constraining the floodplain**
  - **reduced edge habitat**, and
  - **un-vegetated rock revetments**;
    - Reduces natural LWD recruitment.



Tieton River Restoration

- In summary, **channel confinement**, a **lack of spawning sediment** and **wood supply**, and **flow regulation** have:
  - (1) **disconnection from the historic floodplain**,
  - (2) increased sediment transport capacity which in turn has created a **coarser more uniform substrate**, and
  - (3) created a **simple system** dominated by a single trapezoidal plane bed channel **lacking pools, cover and finer substrate suitable for spawning**.

Tieton River Restoration

- Previous assessment documents (2009 Recovery Plan) considered steelhead use of the Tieton River to be severely limited, and localized use was presumed to occur primarily in Oak Creek.
  - **Triage – left for dead**
- YKFP viable salmonid population (VSP) 2012:
  - **found that among the tributaries of the Naches Subbasin, the Tieton River had the highest number of radio-tagged steelhead spawners,**
  - The "**Cornerstone**" of the Naches population.

Steelhead spawner estimates by sample year

SAMPLE YEAR	NUMBER OF TAGGED FISH DETECTED	EXPANDED ESTIMATE OF SPAWNERS	ERROR[1]
2012	24	270	+/- 112
2013	18	166	+/- 74
2014	15	92	+/- 65

Yakima Nation Fisheries

Yakima Steelhead VSP Project

Yakima River Steelhead Population Status and Trends Monitoring

BPA Project # 2010-030-00

Report covers work performed under BPA contract #(s) 56662 REL 67

Report was completed under BPA contract #(s) 56662 REL 87

For the 2010-030-00 Report Period: 10/15/2014 - 10/14/2015
Steelhead VSP data collected under 1995-063-25 are reported through 10/14/2014

October 14, 2016

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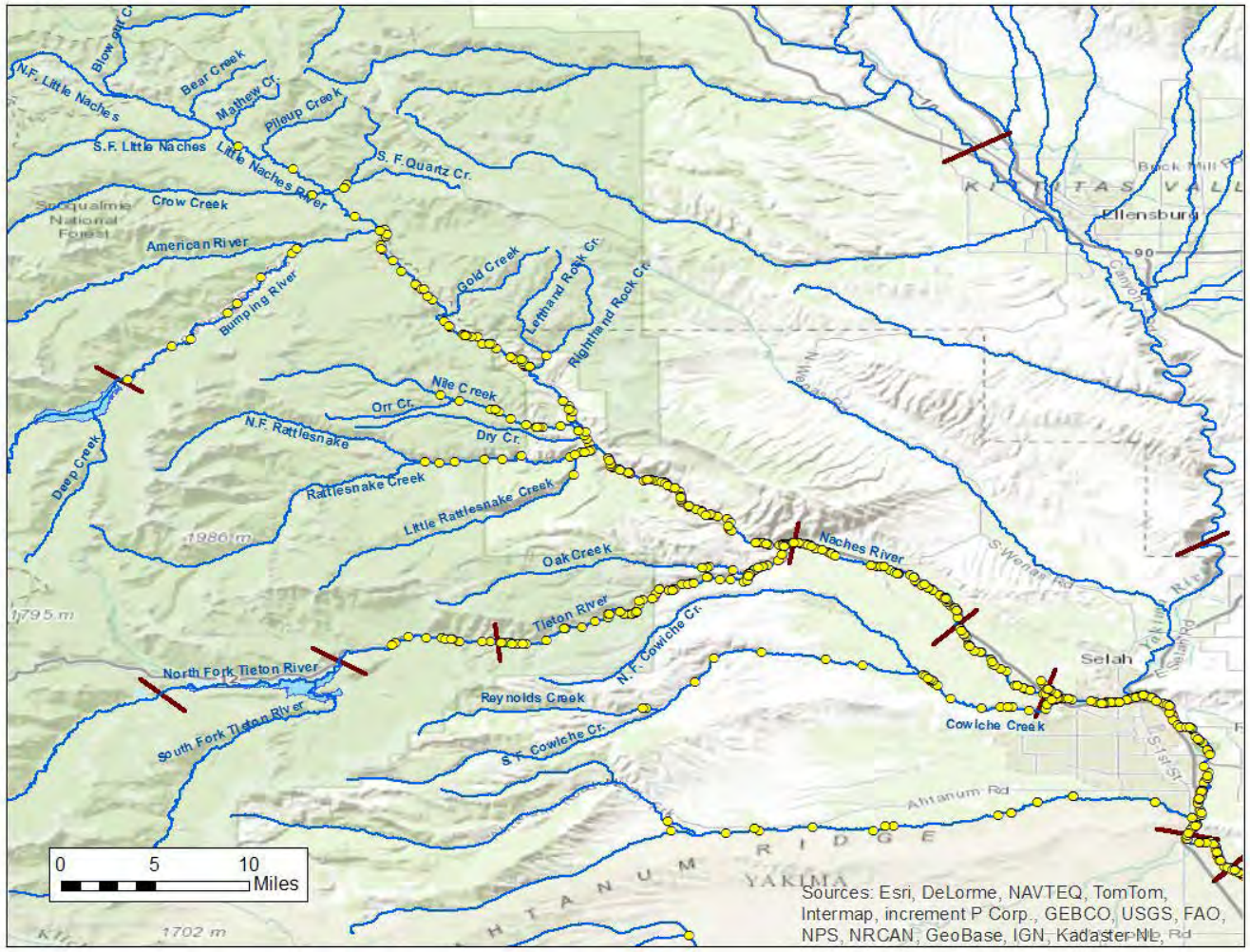
This report was funded by the Bonneville Power Administration (BPA), U.S. Department of Energy, as part of BPA's program to protect, mitigate, and enhance fish and wildlife affected by the development and operation of hydroelectric facilities on the Columbia River and its tributaries. The views in this report are the author's and do not necessarily represent the views of BPA.

This report should be cited as follows:

Frederiksen, C.R., D.E. Fast, W.J. Bosch, and G.M. Temple. Yakima Steelhead VSP Project: Yakima River Steelhead Population Status & Trends Monitoring, 10/15/2014 - 10/14/2015 Annual Report. 2010-030-00

Tieton River Restoration



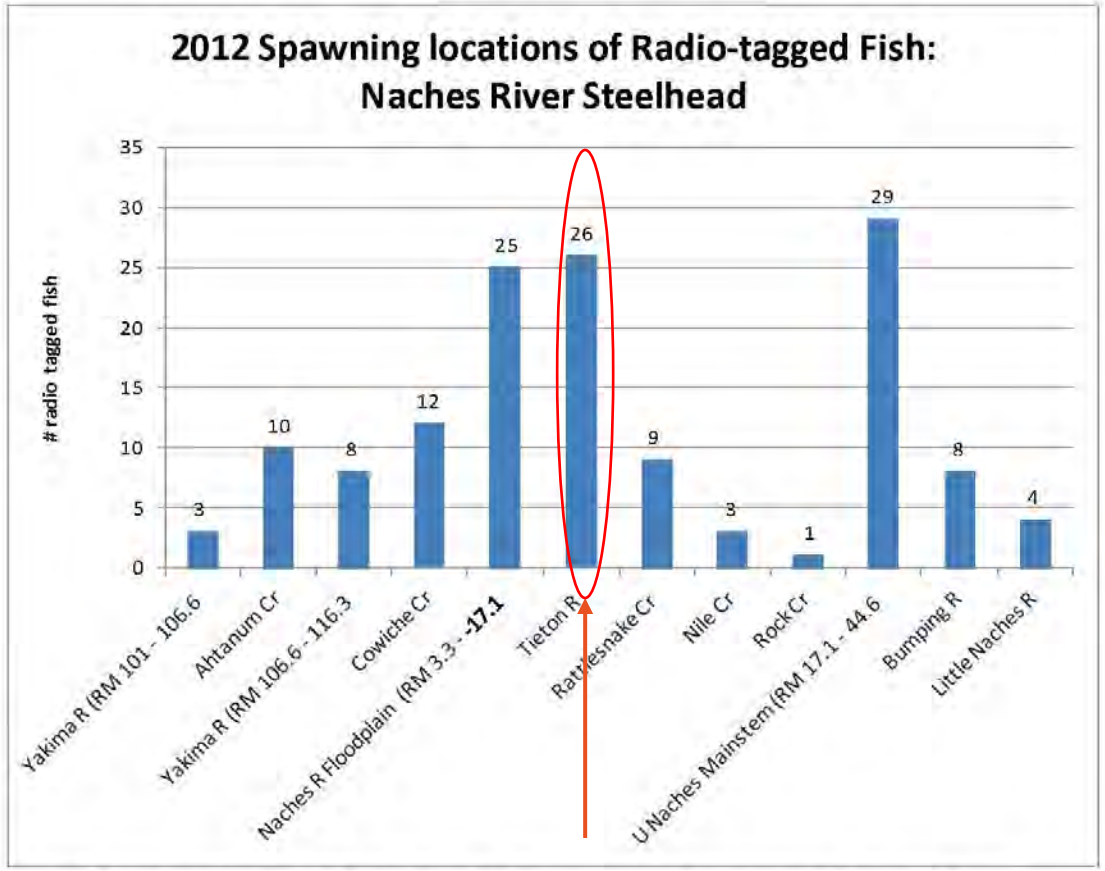
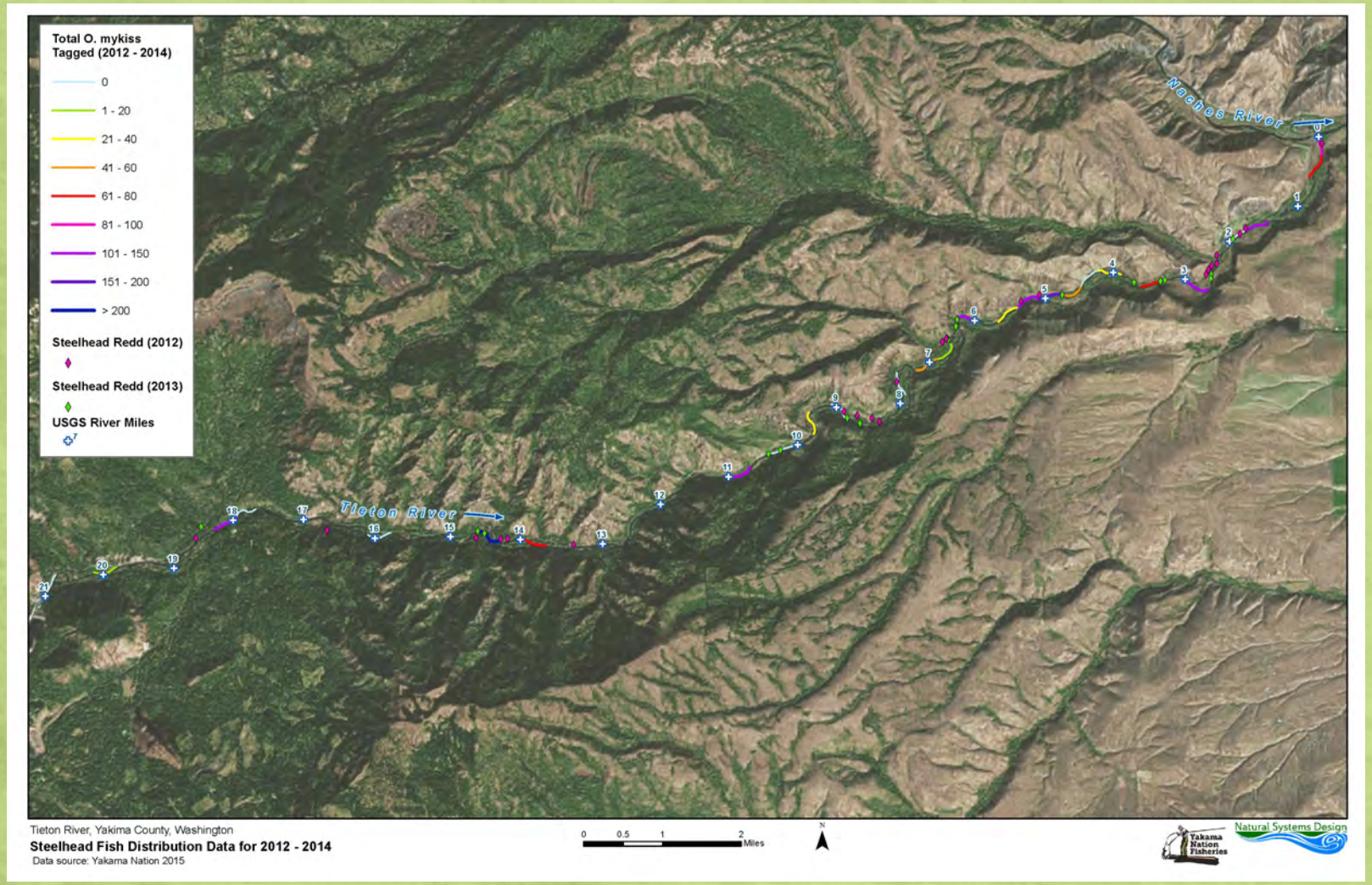
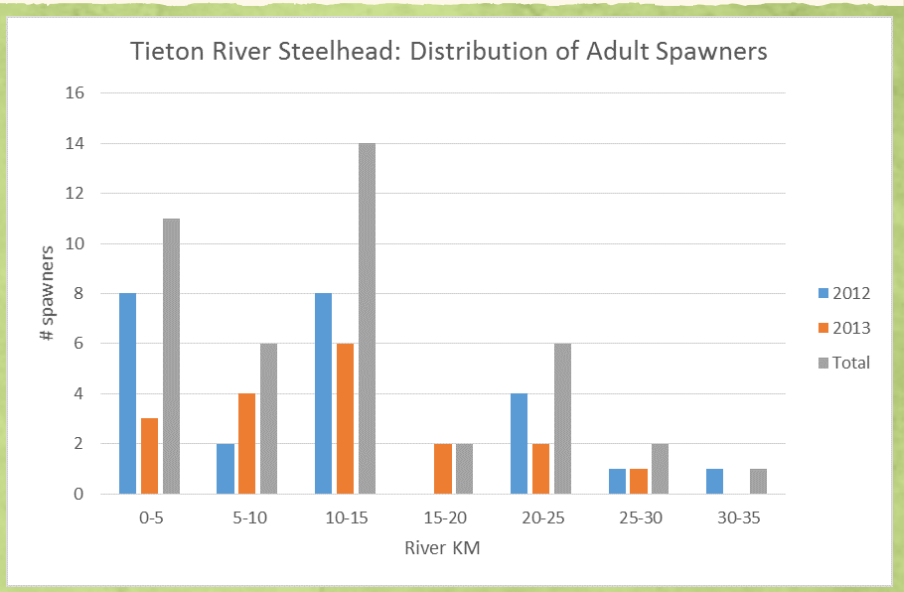


Figure 8. Number and location of Naches River Steelhead spawners in mainstem and tributary locations

Tieton River Restoration Design

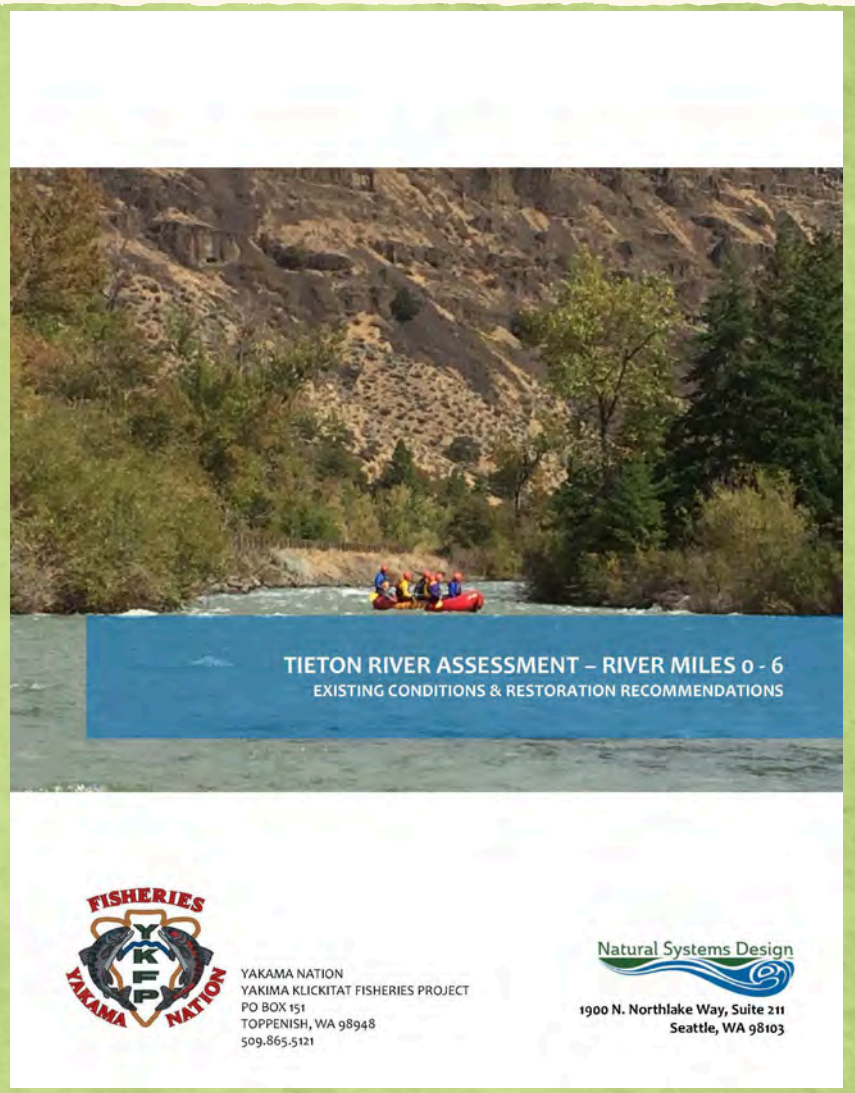




Tieton River Restoration

The Tieton River assessment (2016) objectives were to:

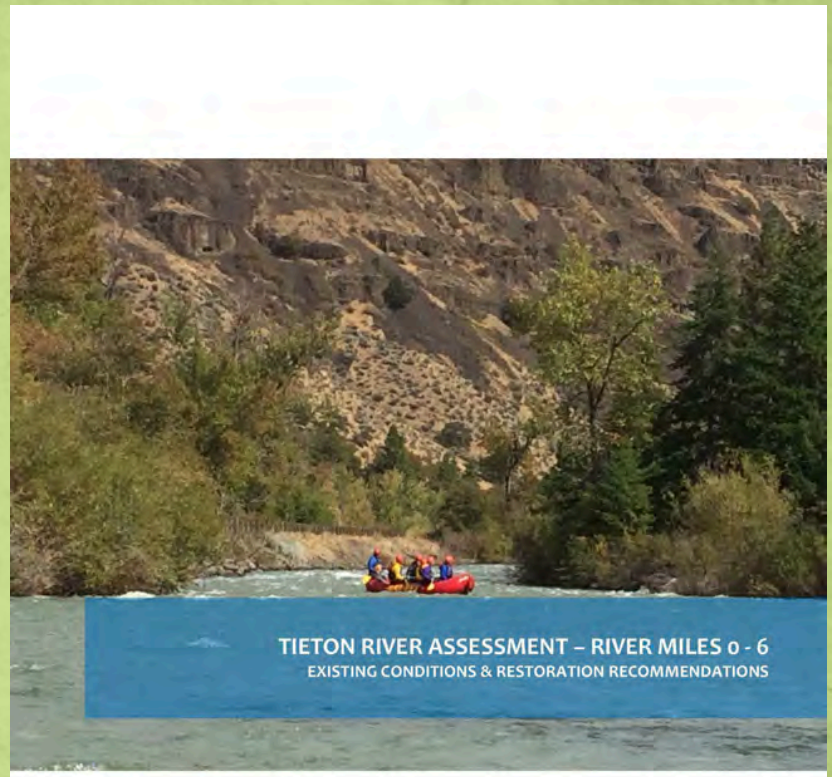
1. **Evaluate existing reach conditions and limiting factors** for steelhead spawning and rearing.
2. **Identify potential restoration project opportunities and actions** to increase steelhead populations.
3. **Identify existing infrastructure** within the channel and floodplain.
4. **Rank identified restoration project opportunities and actions** based on their relative potential benefit for restoring steelhead rearing and spawning habitat and their relative potential cost and risk to public safety and infrastructure.



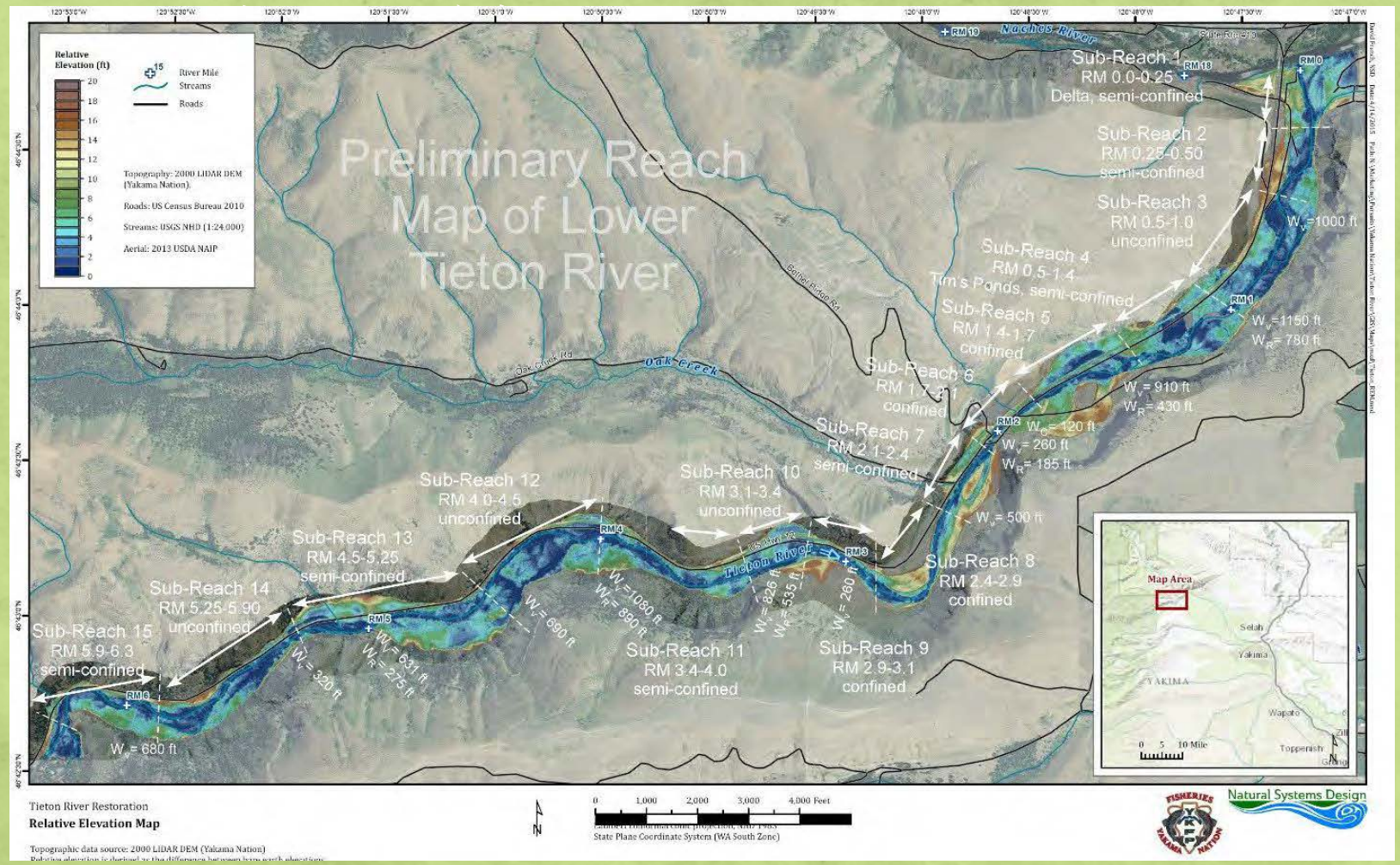
Tieton River Restoration

SUMMARY OF FINDINGS

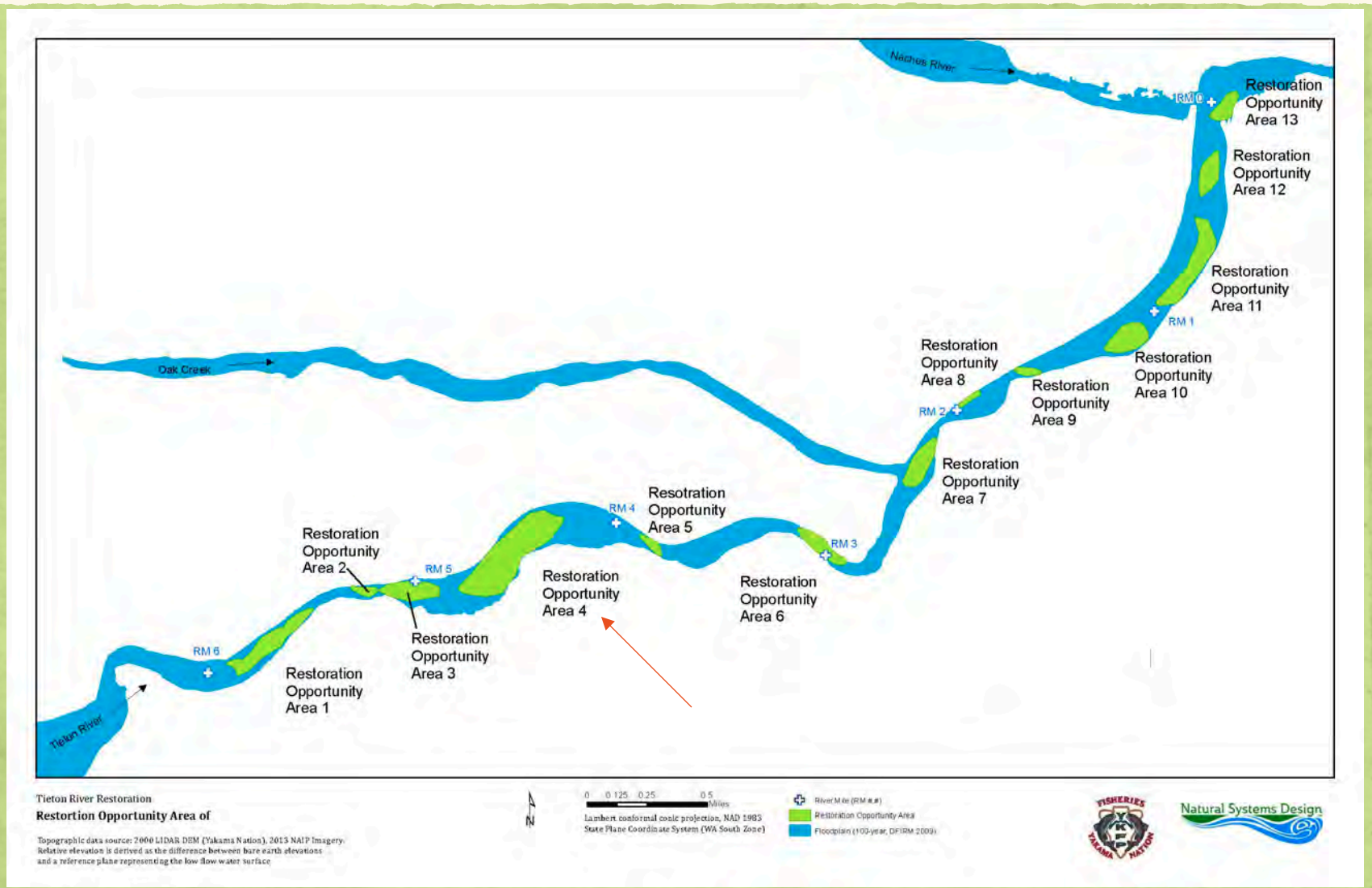
- The Tieton River site assessment has led to a much greater understanding of the potential restoration opportunities available for steelhead spawning and rearing. **13 Restoration Project Opportunity Areas** were identified along the reach. **Seven (7) of the 13 were deemed high priority, with further analysis**. Cumulatively, these restoration opportunities in the lower Tieton River address the goals and objectives for steelhead habitat by proposing to:
  - **Reconnect over 3 miles of historic side channel habitat** with 9 of the 13 sites having the potential to provide perennial connection (restoration objectives 1, 2, and 3);
  - **Install 36 mainstem large wood/rock structures** (restoration objectives 2, 3, and 5);
  - **Restore/enhance 47 acres of riparian vegetation area** along the new proposed side channels (restoration objectives 3 and 6); and
  - **Restore/enhance 35 acres of floodplain vegetation area** by converting from meadow to forest (restoration objective 6).



Tieton River Restoration



Tieton River Restoration Site #4



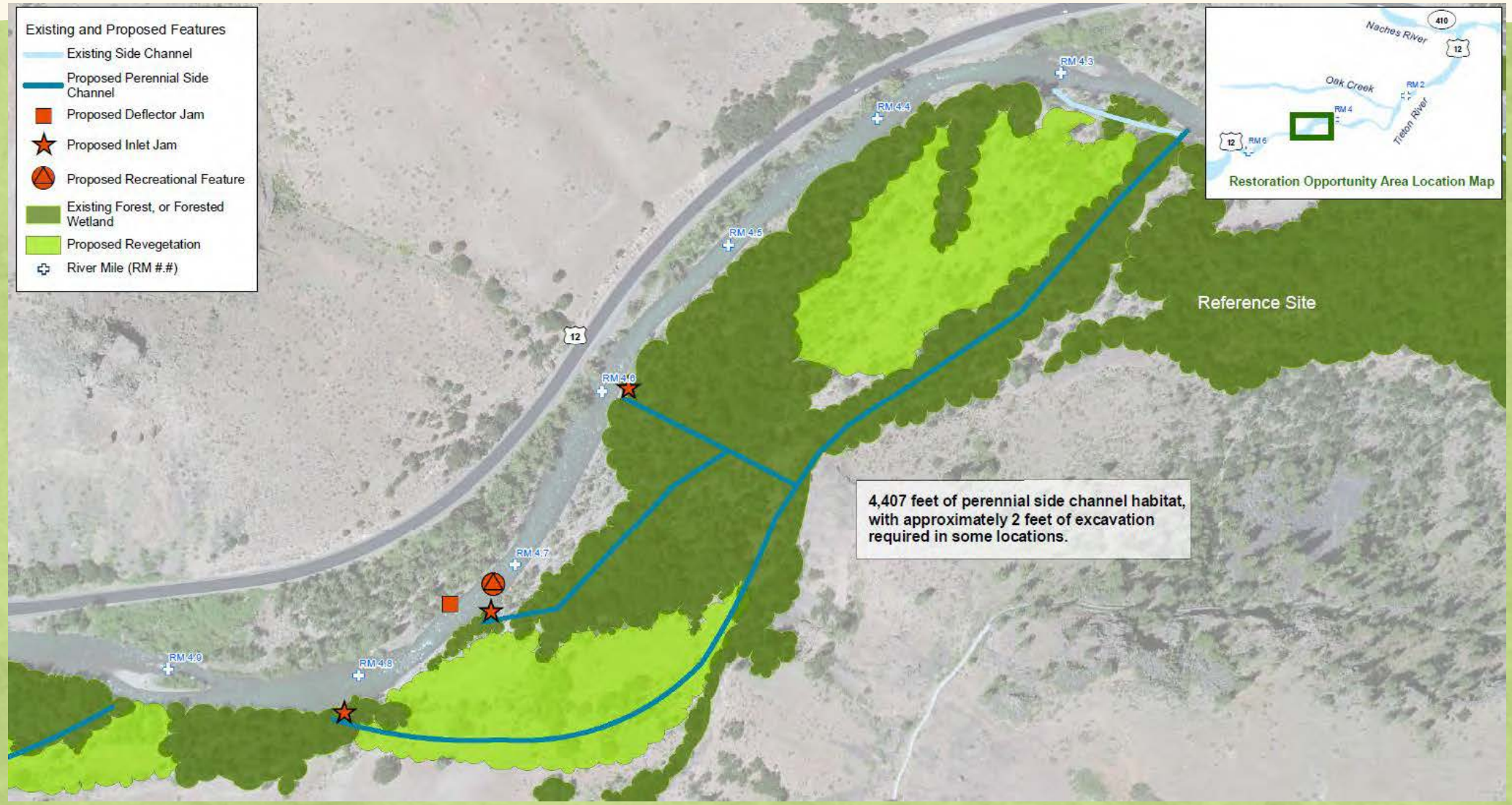
Tieton River Restoration Design Site #4

Table 17. Restoration Project Opportunity Summary Matrix.

RESTORATION OPPORTUNITY AREA ID (RMs)	RIVER MILE (RM)	PROPOSED RESTORATION ELEMENTS – ID (# OF EACH)[1]	PROJECT OBJECTIVES ADDRESSED[2]	TOTAL NEW SIDE CHANNEL LENGTH (FT)	TOTAL NEW RIPARIAN BUFFER (AC)[3]	TOTAL NEW FLOODPLAIN FOREST (AC)[3]	OVERALL BENEFIT RANKING[4,5]	OVERALL COST RANKING[4,5]	OVERALL BENEFIT/COST RANKING[4,5]	PROJECT COST ($) RANGE[6]	
1	5.5 – 5.9	A (1), AE (1), D (2), REC (1), I (1), P (1), RB, FR	1, 2, 3, 4, 5, 6	1,653 (Perennial)	4.9	4.1	3	12	3	$450,000	$575,000
2	5.2	I (1), P (1), RB, FR	1, 2, 3, 6	300 (Perennial)	0.9	0.4	10	1	9	$80,000	$100,000
3	4.9 – 5.1	D (1), I (1), P (1), E (1), RB, FR	1, 2, 3, 6	857 (Perennial), 694 (Ephemeral)	3.6	2.7	6	10	7	$250,000	$325,000
4	4.3 – 4.8	D (1), I (3), REC (1), P (1), RB, FR	1, 2, 3, 4, 5, 6	4,400 (Perennial)	13.2	14.6	1	13	1	$725,000	$950,000
5	3.8	D (1), A (1)	2, 3	0	0	0	12	2	11	$125,000	$175,000
6	3.0 – 3.1	A (1), REC (2), FR	2, 3, 4, 5, 6	0	0	0.3	11	8	12	$200,000	$250,000
7	2.2 – 2.4	D (1), I (1), A (1), REC (1), E (1), RB, FR	1, 2, 3, 6	1,221 (Ephemeral)	1.8	2.1	8	11	10	$350,000	$450,000
8	1.9 – 2.0	A (2)	2, 3	0	0	0	13	5	13	$125,000	$175,000
9	1.6 – 1.7	D (1), I (1), REC (1), P (1), RB	1, 2, 3, 4, 5, 6	459 (Perennial)	1.4	0	9	6	8	$200,000	$250,000
10	1.1 – 1.3	D (1), I (2), P (1), RB, FR	1, 2, 3, 6	1,980 (Perennial)	5.9	1.9	4	9	5	$250,000	$325,000
11	0.6 – 1.0	I (1), REC (1), P (1), RB, FR	1, 2, 3, 4, 5, 6	2,512 (Perennial)	7.5	6.6	2	7	2	$325,000	$400,000
12	0.2 – 0.4	I (2), P (2), RB, FR	1, 2, 3, 6	1,902 (Perennial)	5.7	1.9	5	4	4	$200,000	$250,000
13	0.0	I (1), REC (1), RB	1, 2, 3, 4, 5, 6	646 (Perennial)	1.9	0	7	3	6	$125,000	$175,000

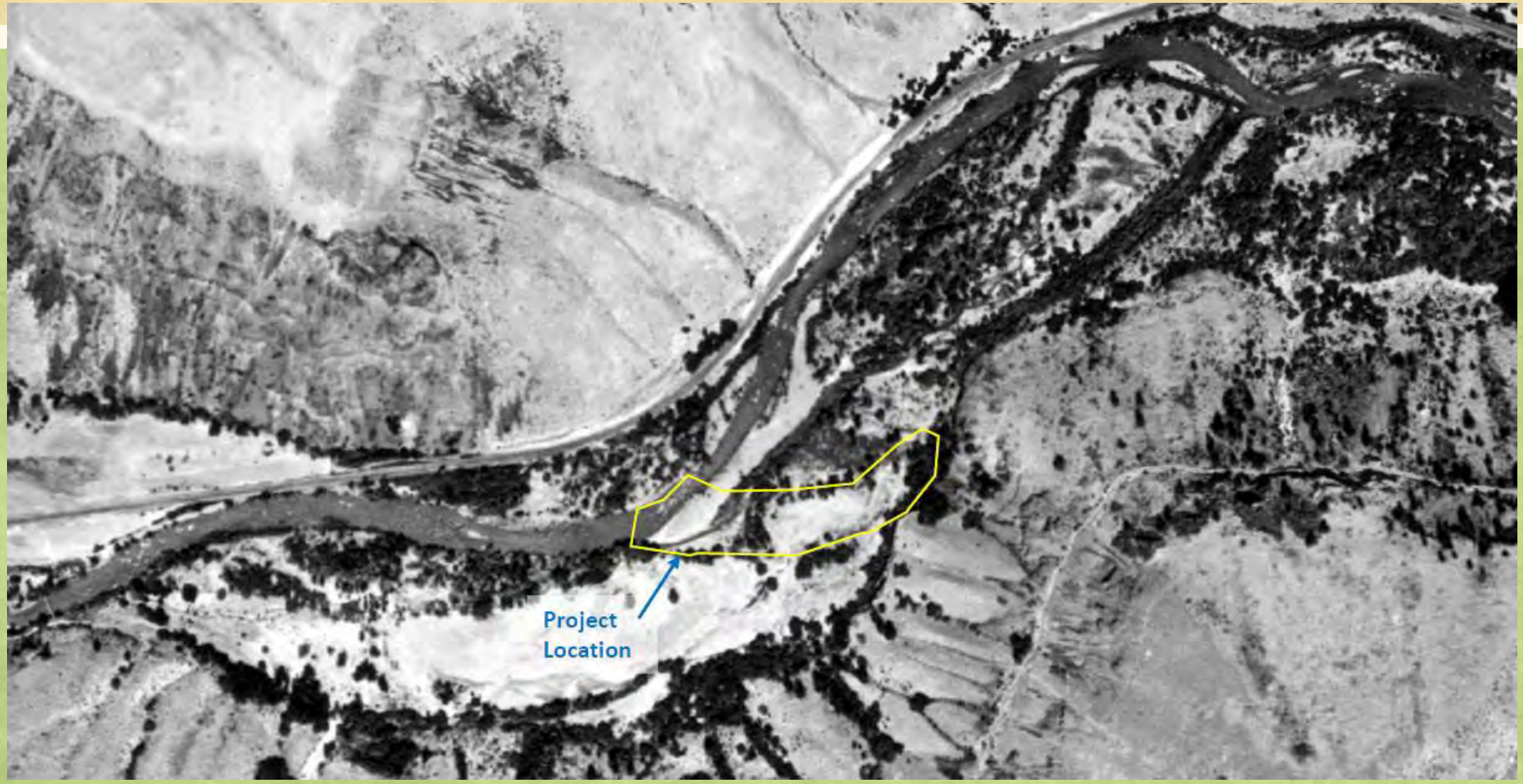
[1] Apex structure (A), enhancement of existing apex structure (AE), deflector structure (D), side channel inlet structure (I), recreational structure (REC), perennial side channel (P), ephemeral side channel (E), riparian buffer (RB), floodplain reforestation (FR). Number of each proposed element in parentheses.
[2] Increase overall channel length (1), increase/retain spawning sized gravels (2), increase/retain supply of functional wood (3), accommodate/reduce risk to recreational users and create boating features where practical (4), incorporate rock features where appropriate (5), restore/enhance riparian/floodplain vegetation (6).
[3] Methods used to calculate riparian buffer and floodplain forest areas provide in Appendix B.
[4] Highest (best) ranking = 1; lowest (least) ranking = 13. Assumptions used to develop the benefit, cost, and benefit/cost rankings are provided in Appendix B.
[5] Relative benefit and cost rankings are based on the scoring assumptions in Appendix B. Weighting of the ranking metrics was applied to give more weight to higher priority project objectives. Subjectivity exists in the weighting and scoring assumptions. Relative rankings should be used as a guide for evaluating overall project benefits and costs. Project prioritization should also be based on user familiarity of the project opportunity areas and experience in restoring steelhead habitat.
[6] See Appendix B for assumptions used in estimating project cost range.

Tieton River Restoration Design Site #4 (Conceptual)



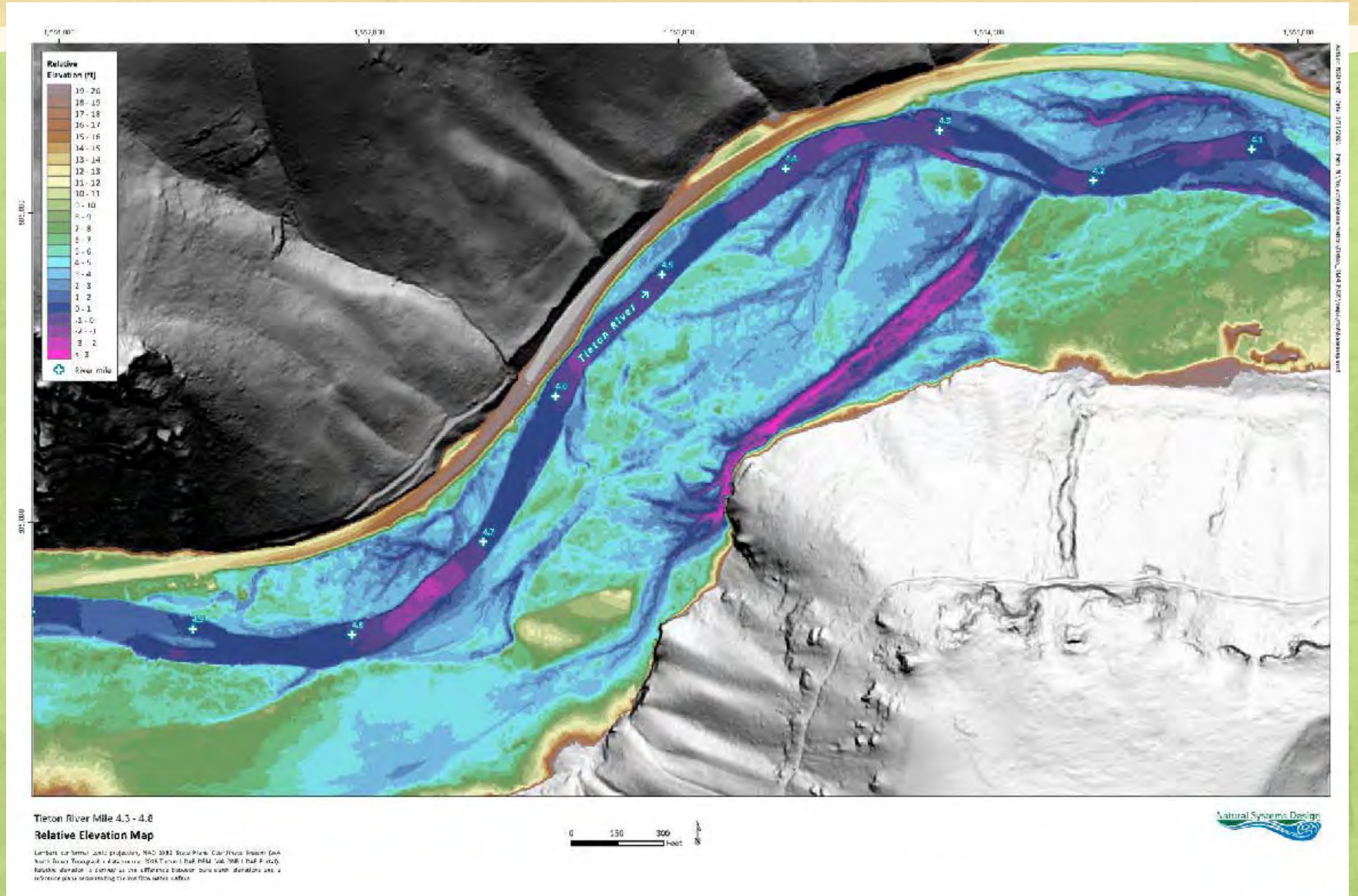
Tieton River Restoration Site #4

Tieton River Restoration Site #4



Aerial photo of the project location, 1949

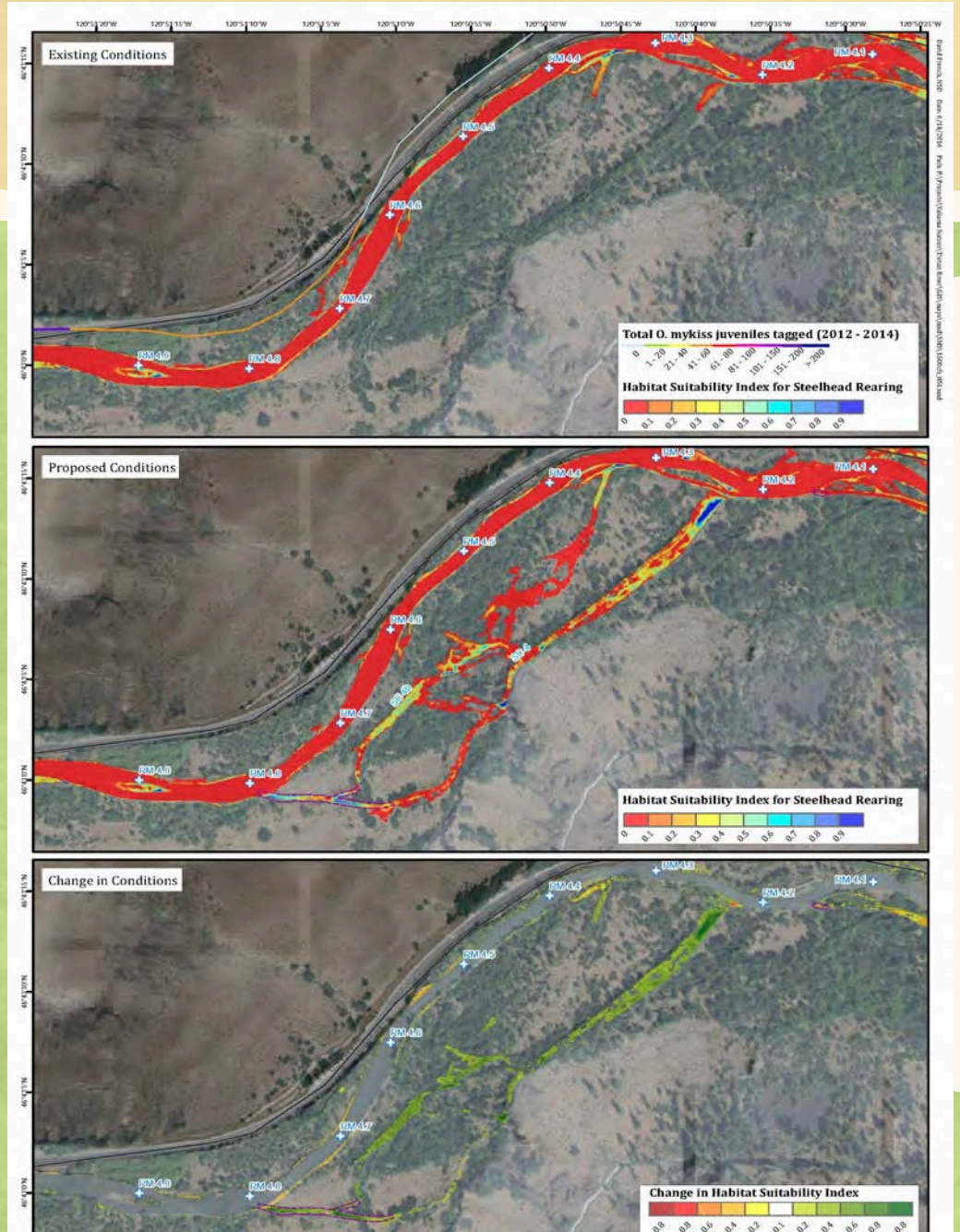
Tieton River Restoration Site #4

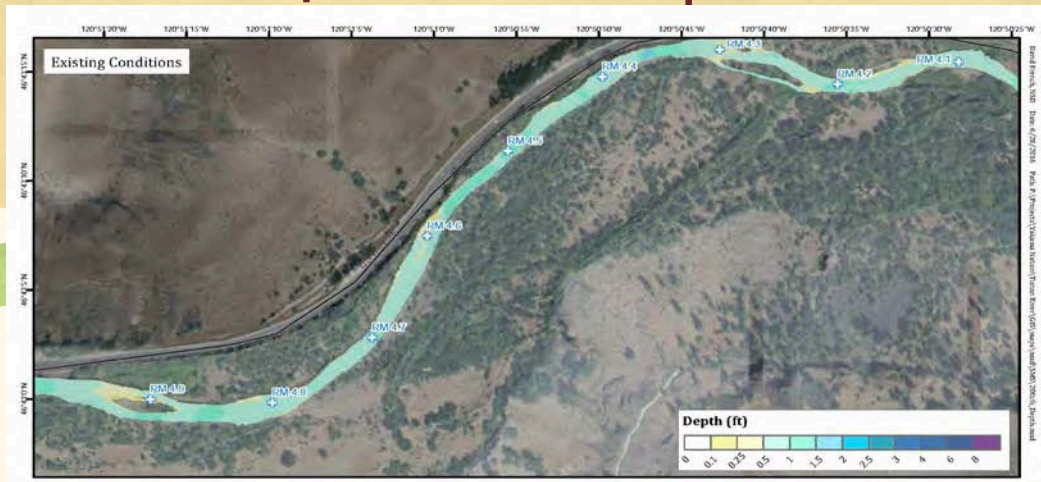


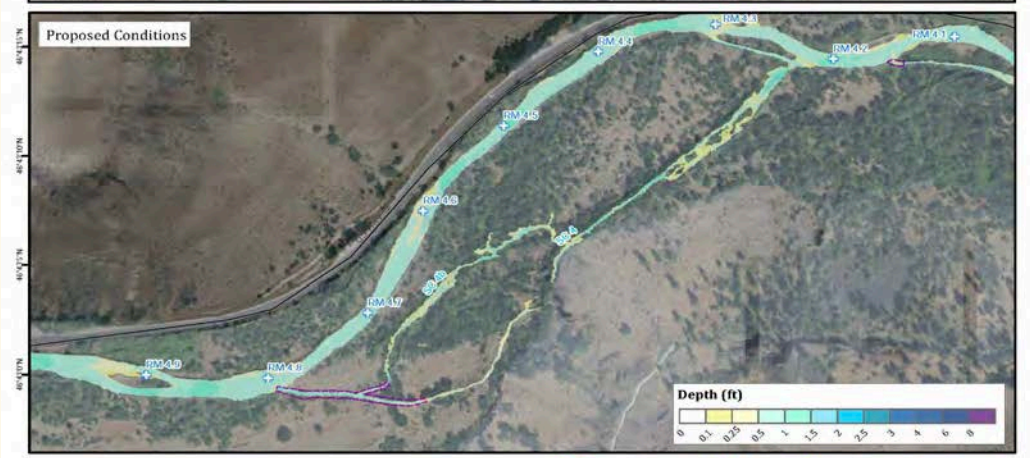
Tieton River Restoration Site #4

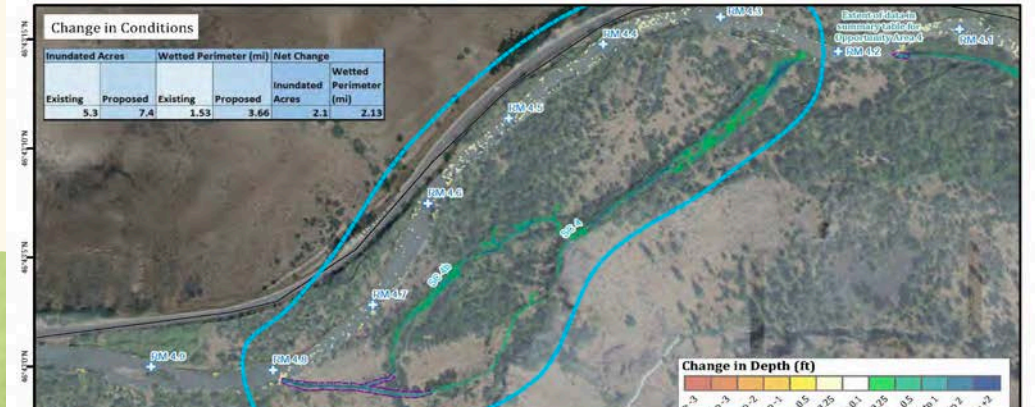
- Habitat Suitability Index (HSI) analyses:
  - Evaluate **flow patterns, hydraulic parameters, and inundation extents** to characterize current riverine conditions and the relative benefits to specific steelhead life stages.
  - Establish baseline **existing hydraulic conditions (EC)** for comparison with **proposed condition (PC)** modeling completed as part of the **conceptual habitat restoration recommendations**
  - Ensuring that design elements are **maximizing habitat and fish benefits without increasing risk to existing habitat, property, and infrastructure**.
    - Flows for modeling were selected based on discharges that are likely to occur during critical habitat time frames such as spawning, emergence, overwintering, and outmigration.

Tieton River Restoration Site #4 (HSI & Depth)



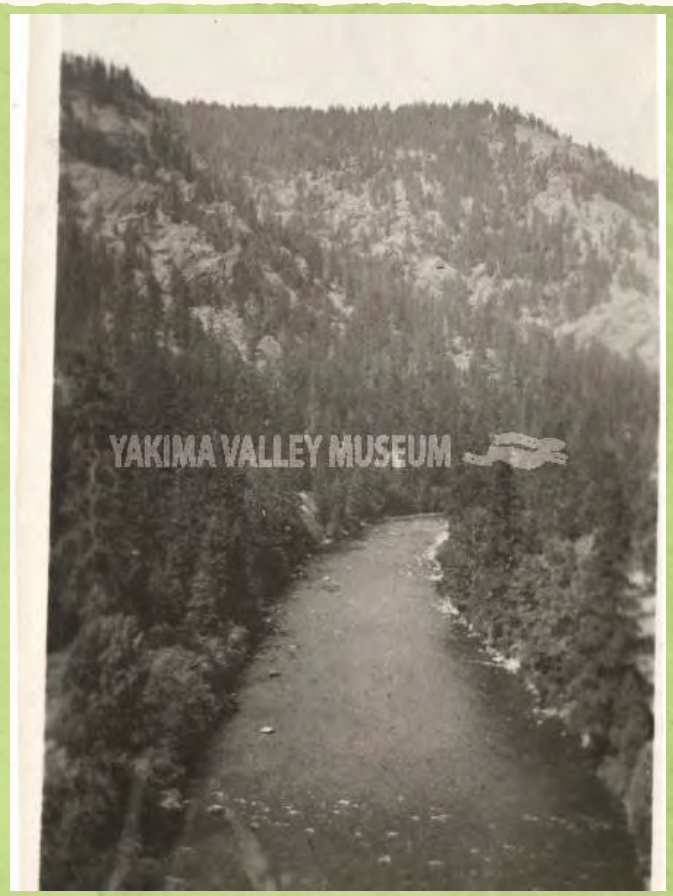






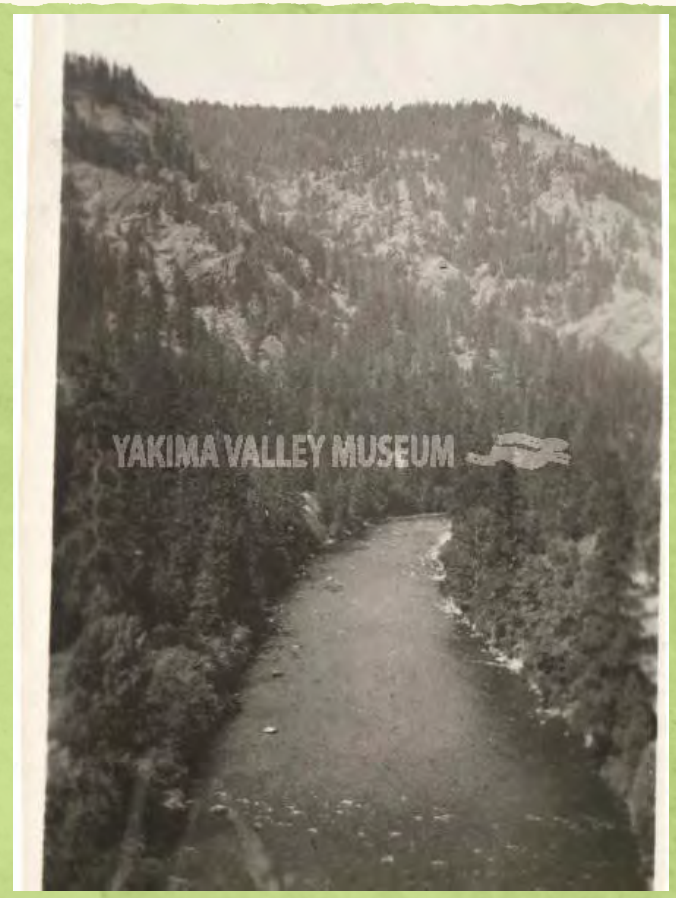
Tieton River Restoration Site #4

- Design funded under SRFB
- The primary project goal is to **improve steelhead spawning and rearing habitat** within the project reach. The project will do this by **raising the water surface in the Tieton River to induce flow into a newly-cut side channel**. Flows will be routed along a relic side channel for **over half a mile** before rejoining the Tieton River, creating new side channel habitat, and increasing the sediment source availability.
- Project objectives relating to habitat uplift include:
  - **Increasing spawning** and rearing habitat for steelhead
  - **Increasing perennial channel length and wetted area**, provide low-flow off-channel habitat
  - **Increasing extent of finer (gravel) substrate** available to steelhead and utilize native alluvium as a sediment supply for the mainstem Tieton
  - **Increasing shade and cover**, restore riparian areas
  - **Increasing floodplain connectivity** (inundated area at range of regulated flows at an increased frequency)
  - **Increasing the area of floodplain wetlands**



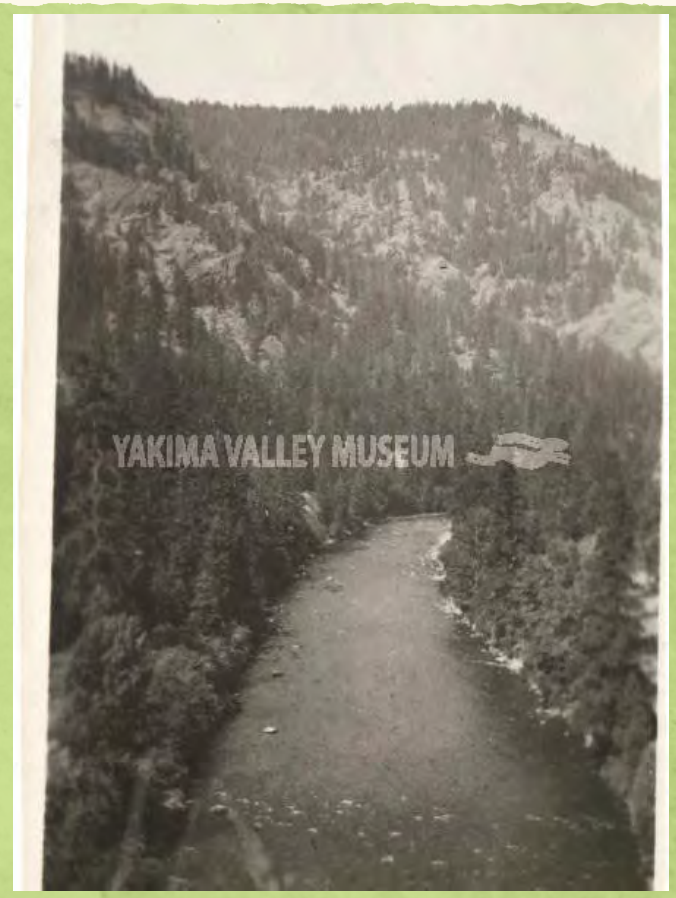
Tieton River Restoration Site #4

- The Tieton River project will provide:
  - an increase of **2280 feet of side channel habitat**,
    - A new **880-foot side channel excavated** (3,045 cubic yards of material),
    - **Engineered Boulder Riffle**,
      - Pool habitat forms along the upstream face of the structure. Turbulence at the inlet assists in mobilizing sediment and preventing it from depositing at the inlet and cutting off the side channel.
    - **Engineered Logjam** - Apex Structure
      - Raises water surface elevation into side channel
  - 1,090 cubic yards of native material for a **gravel nourishment bar**. The bar will be 600 feet in length and will extend 25 feet into the Tieton River.
  - a **4.9 acre increase in floodplain inundation** and
  - riparian revegetation of **2.9 acres**, 880 ft in length and will extend **25 ft** on either side of the new channel
  - Tieton River Nature Trail Re-Alignment



Tieton River Restoration Site #4

- DESIGN UPDATES FOLLOWING ESA REVIEW.
  - Concerns regarding the perennial connection that could cause mortality and stranding due to shallow flow distribution and icing, as well as concerns for summer construction due to the reversed hydrograph generated by the reservoir operations.
    - Due to the dam flow regime, **construction will be proposed during the winter**, with an estimated in water work window of January 1 – March 1.
    - The side channel shall not be inundated except for flows that exceed **200 cfs**.
    - Both design clarifications/revisions have been added to the Final Design Plans.



Tieton RM 4.3 Restoration Project
Risk Assessment and Flood Hazard Report
Tieton River

October 2021

Yakama Nation
Yakima/Klickitat Fisheries Project
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509-865-5121

Natural Systems Design
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Tieton River: RM 4.3 Restoration Project
Final Basis of Design Report

March 2022
Revised October 2022

John Marvin
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Natural Systems Design
1900 N. Northlake Way, Suite 211
Seattle, WA 98103

Figure 7 – 100% Design Project Area with Side Channel Alignment.

Table 7 – Project benefits and impacts with respect to aquatic and riparian habitat.

Restoration Action	Description	Benefit	Impact
Engineered Boulder Riffle (EBR)	Placement of large boulders across mainstem Tieton river. Boulders will cover about 5,850 sq. ft of channel. They will raise riverbed and water surface at side channel inlet. Boulders arranged to provide a navigable chute for boaters and fish.	Will locally raise mainstem water elevations to engage restored side channel. Will collect gravel upstream and create pool downstream. Boulders will create hydraulic refugia for migrating fish.	Fill within existing channel where there is existing riffle. Disturbance during construction to allow for boulder placements.
Engineered Logjam (ELJ)	Rock ballasted logjam constructed outside low-flow channel immediately downstream of side channel inlet. Existing ground will be excavated to embed ELJ down below thalweg of adjacent mainstem and side channel.	ELJ will be at apex of island formed by new side channel. It will help to divert higher flows into side channel and create pool and cover.	No impacts. Tieton has few logjams. This one will be outside main flow path of mainstem channel (thus not posing recreational hazard). Construction will be done outside wetted river channel.
Side Channel Excavation	Excavate channel in left bank floodplain to engage low lying areas on south side of valley (old channels), 880 ft of excavation will be needed to construct side channel inlet to meet grade at low lying area. The total volume of excavated material will be 3,045 cubic yards.	New channel will create 3.4 acres of new perennial aquatic habitat over 2,800 ft of channel length. This will significantly increase low velocity rearing habitat, spawning habitat, shade, and complexity – almost none of which is found in mainstem channel. Reduced flows in mainstem channel are likely to improve retention of bed material that currently flushes through	Side channel will reduce flow in mainstem, but this is not expected to impact existing habitat.
Lateral Sediment Nourishment Bar (LSNB)	Alluvium excavated for side channel will be placed along the right bank of the mainstem channel immediately downstream of the side channel inlet and ELJ.	The lateral bar is expected to erode and provide much needed sand-gravel and cobble bed material to mainstem Tieton which is sediment starved due to the Tieton Dam.	Short-term impact during construction where lateral bar extends into river. Some turbidity during initial placement of initial layer within wetted channel. No long-term impact.

Tieton Nature Trail	Portion of existing trail impacted by new side channel will be relocated further south. Portion of trail along rock escarpment along valley margin will be raised where flow from new side channel is expected to reach valley margin.	Portions of trail will be located further from river thus minimizing human impacts while still allowing access. Trail improvements will improve access and treat portions of the trail currently subject to erosion.	New trail will be located to minimize removal of any trees or sensitive vegetation. Portion of trail along rock escarpment will be done to minimize any wetland impacts. The new wetlands created by the project will be far greater than filled needed to raise and protect trail.

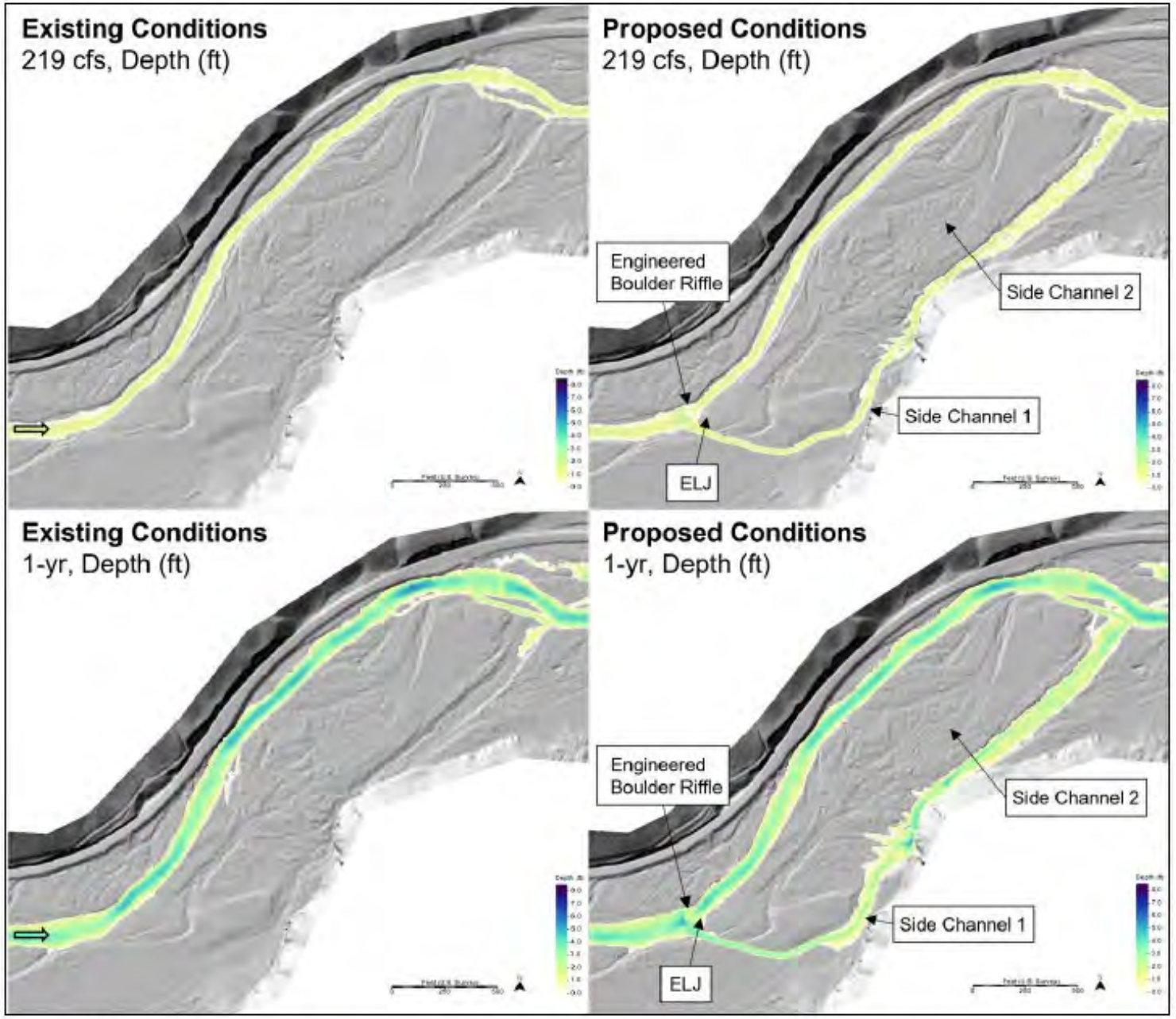


Figure 9. Map of computed depth (ft) under existing and proposed conditions for the survey flow (219 cfs) and 1-year event (1,677 cfs).

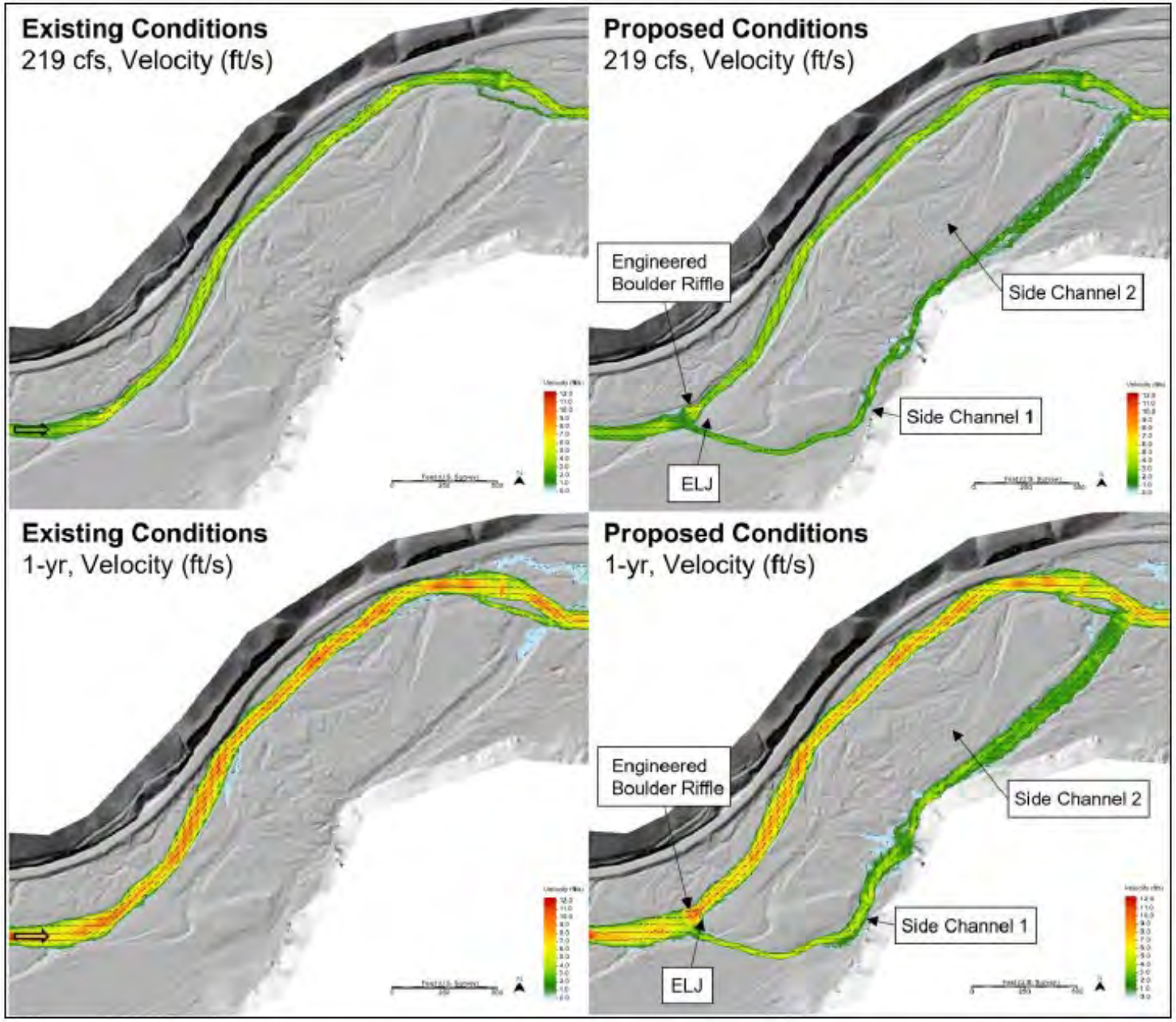


Figure 10. Map of computed velocity (ft/s) under existing and proposed conditions for the survey flow (219 cfs) and 1-year event (1,677 cfs).

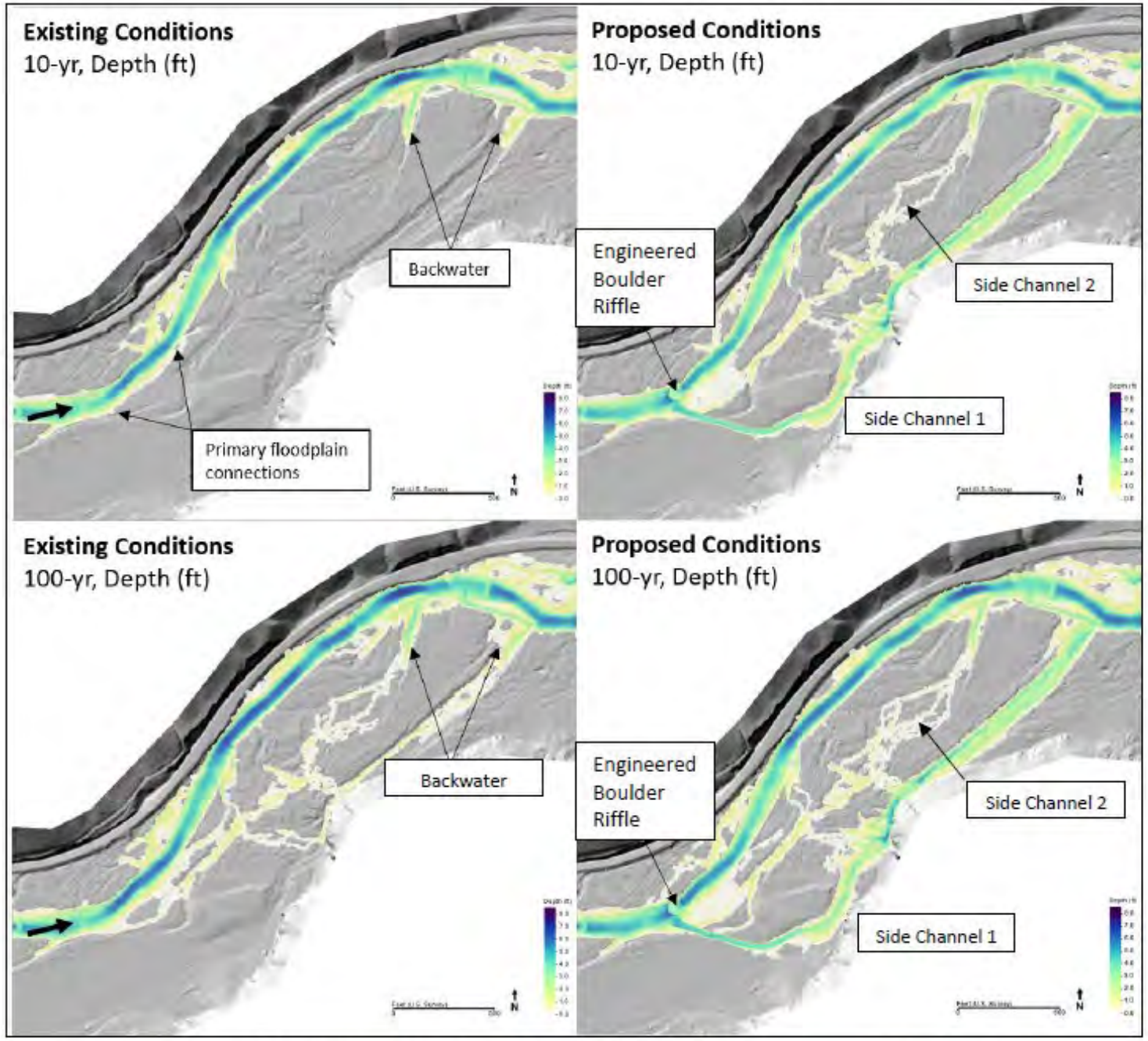


Figure 11. Map of computed depth (ft) under existing and proposed conditions for the 10-year (2,836 cfs) and 100-year (3,325 cfs) events.

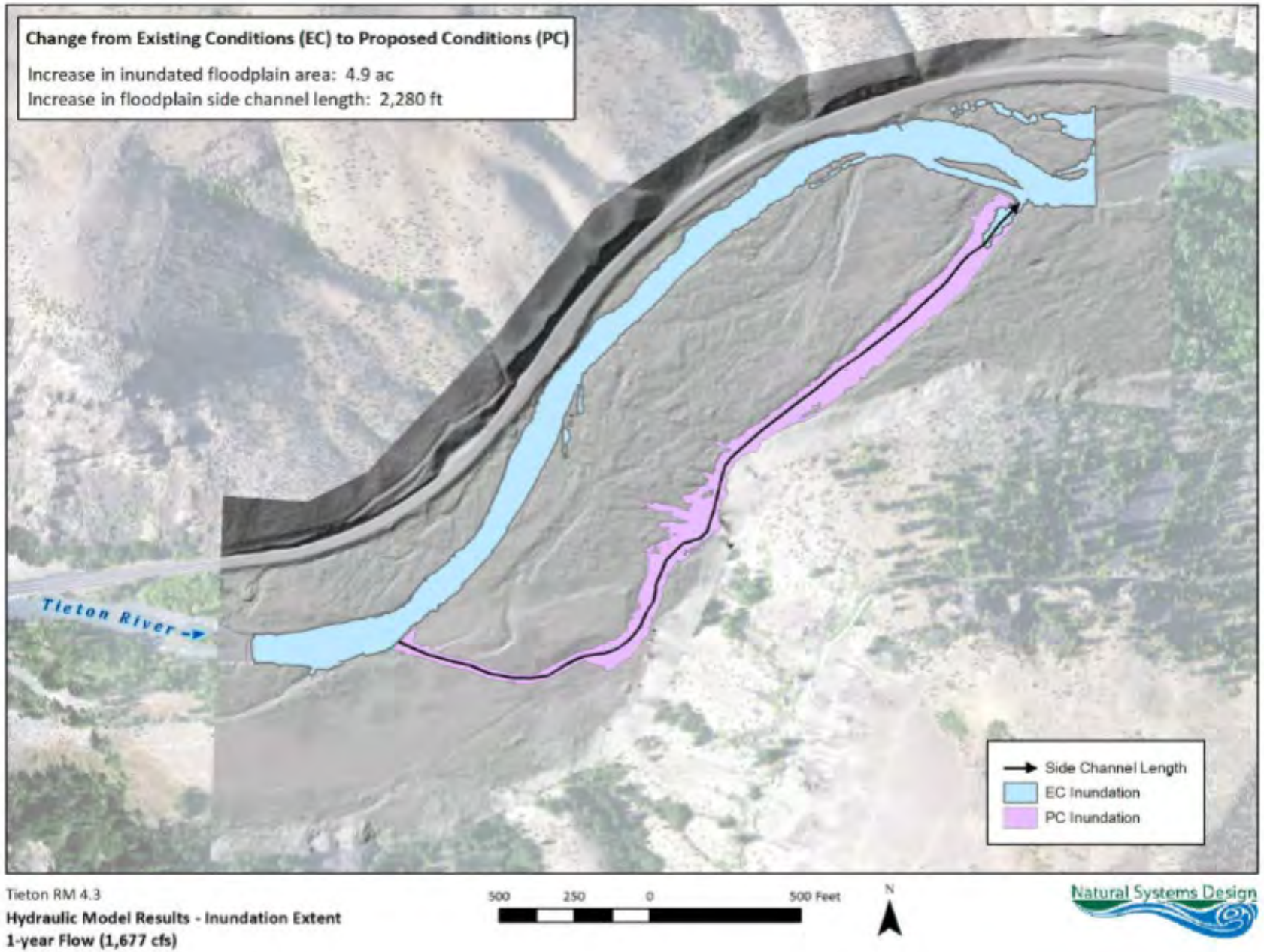


Figure 13. Map of the change in inundation area from Existing Conditions to Proposed Conditions (with project elements).

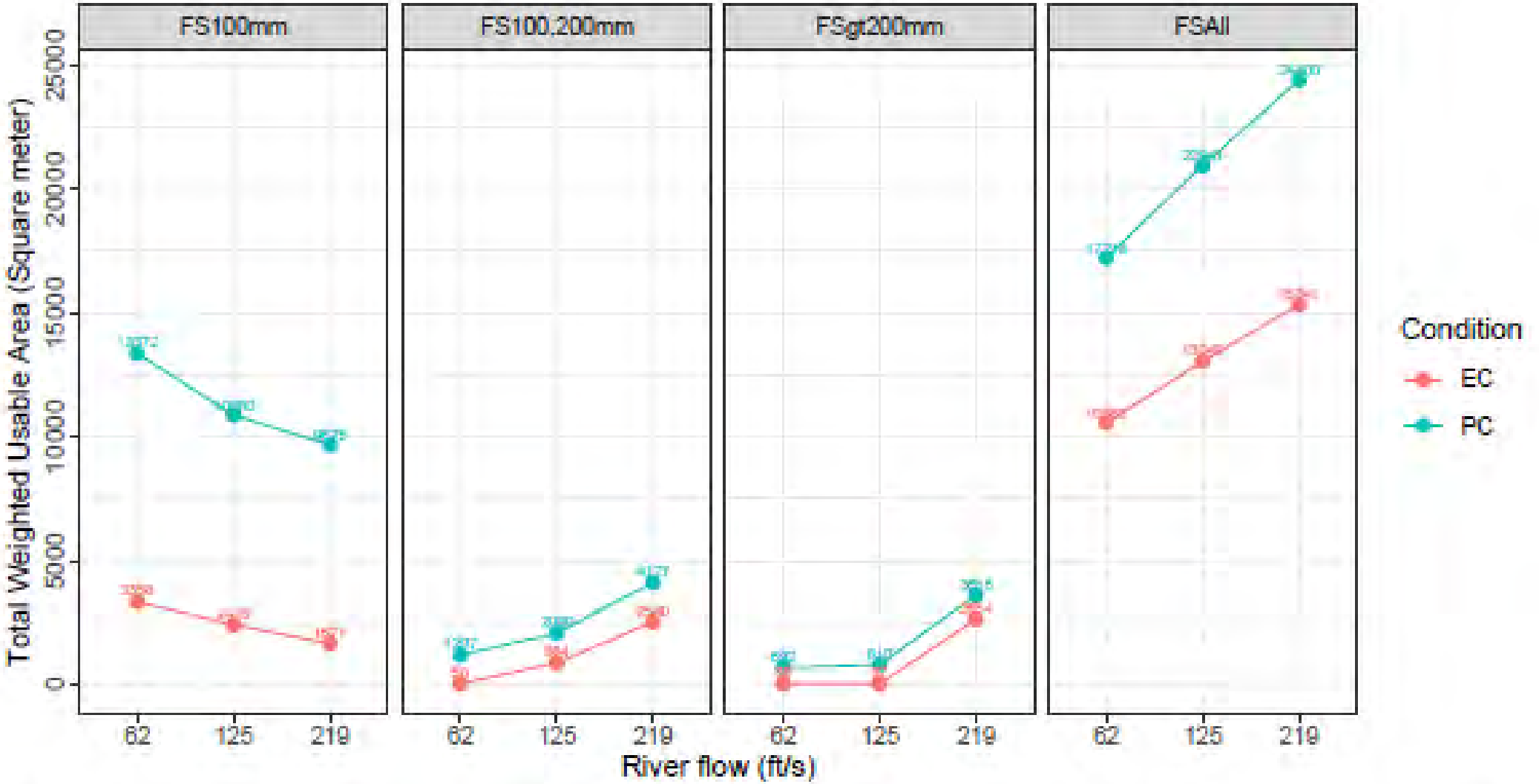


Figure 14. The Total weighted Usable Area with different river flows (62cfs, 125cfs, 219cfs) for the existing (EC) and proposed conditions (PC) for the different fish sizes of O.mykiss. "FS100", "FS100.200mm" and "FSgt200mm" represent the group of fish sizes with a size of <100mm, >100 mm & 200mm, and >200mm, respectively. "FSAll" is the combination of all sizes of the fish. Note: since the habitat preference curve is being refined, the results are considered as a provisional.

Tieton RM 4.3 Restoration Project Functional Lift Assessment

- **The improved floodplain connectivity** would create hydrologic, water quality, and habitat functions in the side channel and **elevate these functions in Wetlands A and B** as a result of the increased the frequency of overbank flooding/riverine hydrology. The project's increase in hydraulic connectivity would result in a net increase in functions and services due of the following ecological processes in the river, across the floodplain, and in the wetlands.
- **Sediment nourishment bar provides much needed sand, gravel, and cobble** bed material to mainstem Tieton.
- **Boulder riffle locally improves instream aquatic habitat**.
- **ELJ creates pool habitat**.
- **Boulder riffle, ELJ, and side channel restore frequency and extent of riverine hydrology** within the floodplain and Wetlands A and B.
- **Off channel habitat areas become connected to river more regularly throughout the year**, increasing habitat for native fish and aquatic-associated wildlife, potentially including breeding areas for amphibians.
- Increasing extent of flooding in currently upland floodplain areas along the side channel during the Q1 event and within the greater floodplain at Q10+ events over time result in the **creation and persistence of new riverine wetland habitats**.
- **Restored riparian zone and floodplain wetlands improves water quality functions**, including temperature, as well as the export of allochthonous organic matter to the Tieton River.

TIETON RIVER

RESTORATION RM 4.3

YAKAMA NATION - YAKIMA/KLICKITAT FISHERIES PROJECT

WASHINGTON STATE
SCALE: 1" = 50 MILES
50 25 0 50 100

VICINITY MAP
SCALE: 1" = 2000'
2000' 1000' 0 2000' 4000'
SCALE: 1"=2000'-0"

SHEET INDEX	
SHT NO	SHEET TITLE
1	COVER SHEET
2	GENERAL NOTES
3	HIP GENERAL CONSERVATION MEASURES 1
4	HIP GENERAL CONSERVATION MEASURES 2
5	HIP GENERAL CONSERVATION MEASURES 3
6	LEGEND
7	EXISTING CONDITIONS SITE PLAN
8	OVERALL SITE PLAN, ACCESS AND STAGING
9	PROPOSED CONDITIONS SITE PLAN
10	PROPOSED CONDITIONS TRAIL SITE PLAN
11	PROFILE AND CROSS-SECTIONS
12	TRAIL REALIGNMENT PROFILE
13	ELJ STRUCTURE DETAIL
14	ENGINEERED BOULDER RIFFLE DETAIL
15	SITE ISOLATION PLAN
16	TESC DETAILS
17	PLANTING RESTORATION PLAN
18	PLANTING DETAILS
19	PLANTING SCHEDULES

PROPOSED PROJECT

THE PROJECT WILL IMPROVE SALMONID SPAWNING AND REARING HABITAT, PARTICULARLY FOR ESA LISTED STEELHEAD. THE PROJECT WILL DO THIS BY RAISING THE WATER SURFACE IN THE TIETON RIVER TO INDUCE FLOW INTO A NEWLY-CUT SIDE CHANNEL. FLOWS WILL BE ROUTED ALONG A RELIC SIDE CHANNEL FOR OVER A HALF A MILE BEFORE REJOINING THE TIETON RIVER, CREATING A NEW SIDE CHANNEL HABITAT, AND INCREASING THE SEDIMENT SOURCE AVAILABILITY. PROJECT ELEMENTS INCLUDE A BOULDER ROCK RIFFLE, SIDE CHANNEL GRADING, AN ENGINEERED LOGJAM, TRAIL REALIGNMENT AND RESTORATION OF DISTURBED AREAS.

IN: TIETON RIVER
NEAR/AT: NACHES, WA
COUNTY: YAKIMA

CONTACT INFORMATION

NATURAL SYSTEMS DESIGN, INC
1900 N NORTHLAKE WAY, SUITE 211
SEATTLE, WA 98103
(206) 834-0175

YAKAMA NATION - YAKIMA/KLICKITAT FISHERIES PROJECT
P.O. BOX 151
TOPPENISH, WA 98948
(509) 865-5121

Timothy B. Abbe

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT PLOTTED TO ORIGINAL SCALE

Natural Systems Design

NAME OR INITIALS AND DATE	
DESIGNED	M. NELSON
CHECKED	T. ABBE
DRAWN	D. MATSUMOTO
CHECKED	M. NELSON

CORPS REFERENCE #
APPLICANT JOHN MARTIN

GEOGRAPHIC INFORMATION	
LATITUDE	47°42'38"N
LONGITUDE	120°51'07"W
TN/SC/RG	T14N/R18/S16E
DATE	MARCH 31, 2022

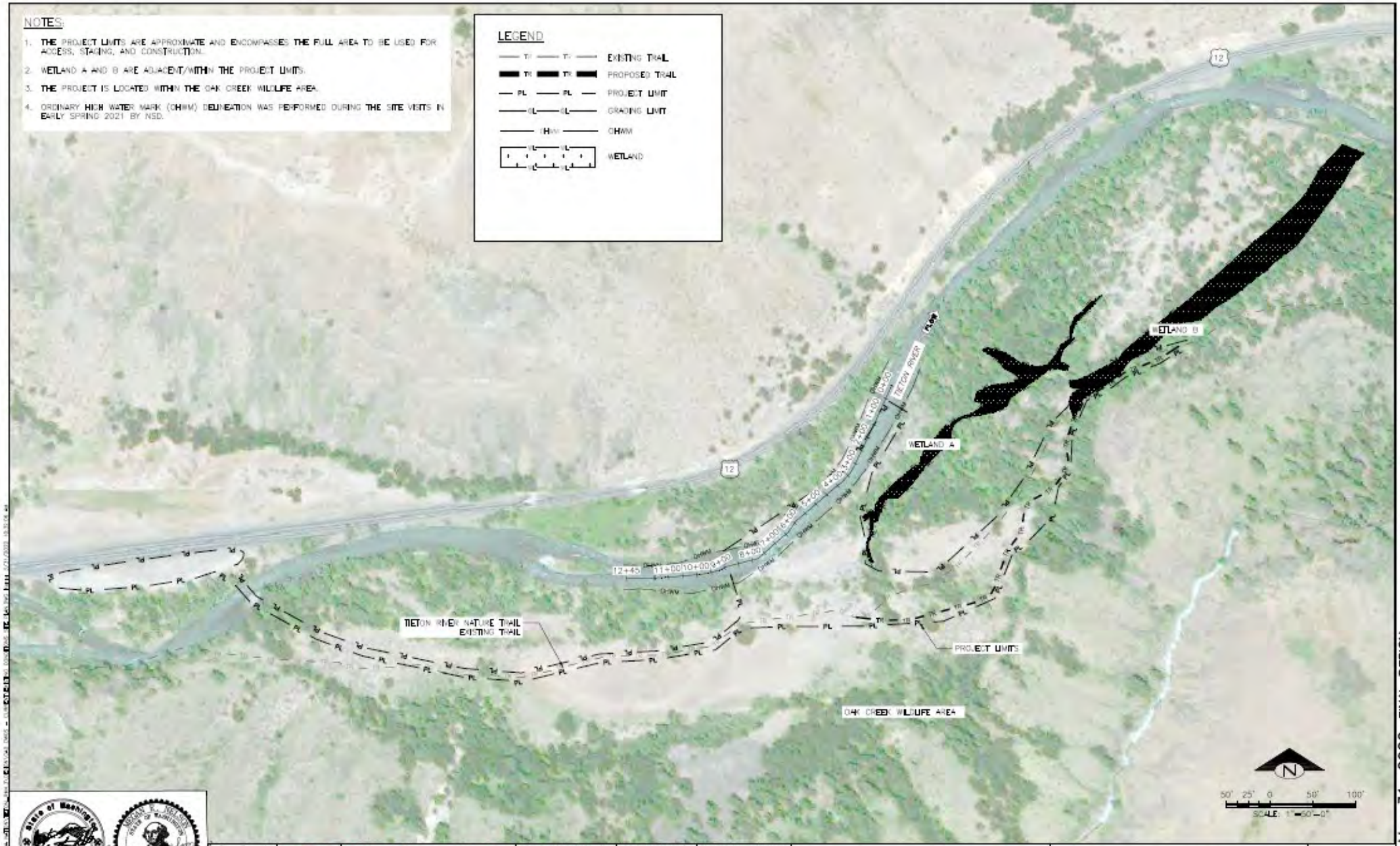
TIETON RM 4.3 RESTORATION

COVER SHEET

1

SHEET 1 OF 19

Mar 31, 2022 FINAL DESIGN



Timothy B. Abbe

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT PLOTTED TO ORIGINAL SCALE

Natural Systems Design

NAME OR INITIALS AND DATE
DESIGNED M. NELSON
CHECKED T. ABBE
DRAWN G. HARTSHORN
CHECKED M. NELSON

CORPS REFERENCE #
#
APPLICANT JOHN MANN

GEOGRAPHIC INFORMATION
LATITUDE 47.42387°N
LONGITUDE 120.51107°W
TWSP/RG T14N/20E/SEC
DATE MARCH 31, 2022

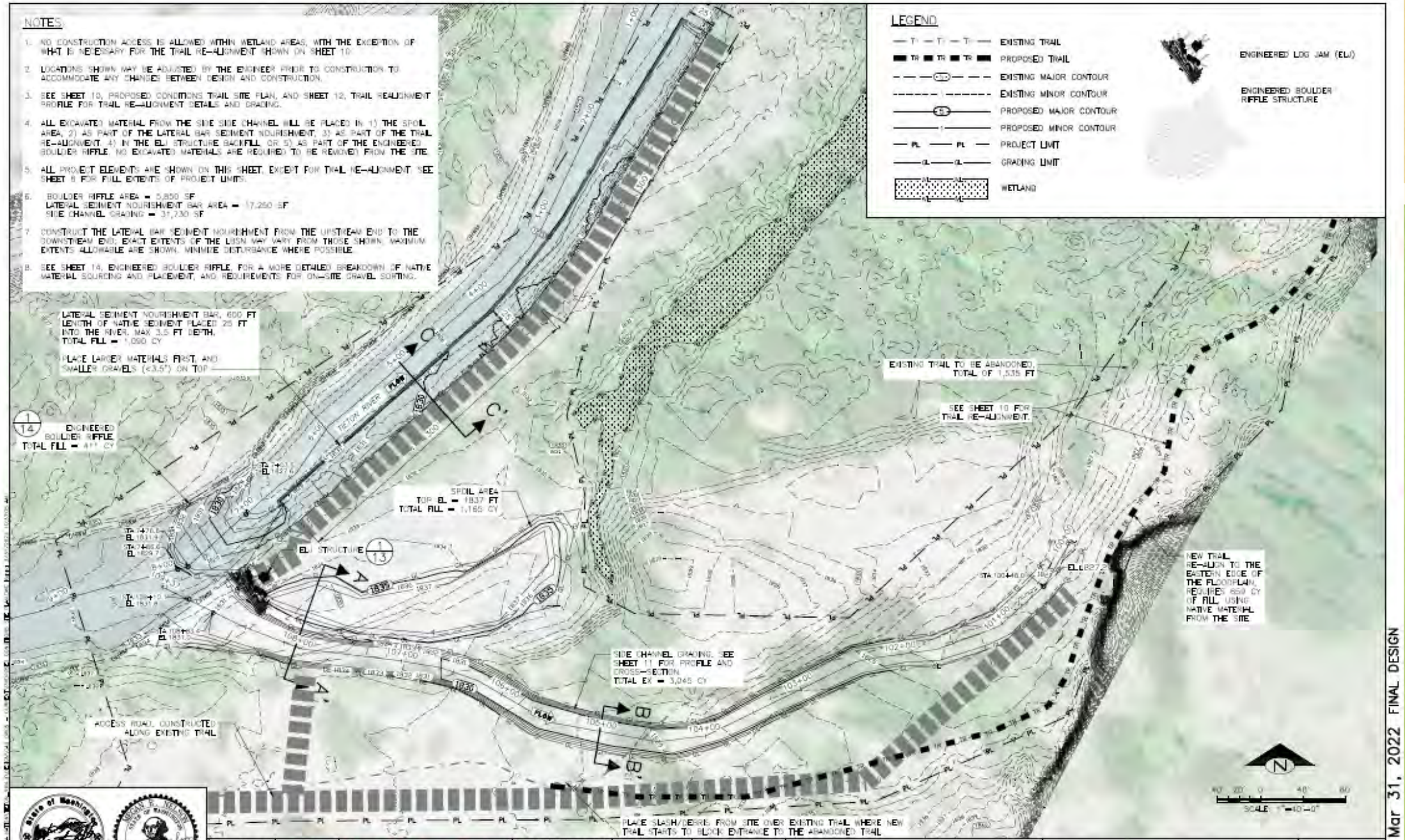
TIETON RM 4.3 RESTORATION

EXISTING CONDITIONS SITE PLAN

7

SHEET 7 OF 19

Mar 31, 2022 FINAL DESIGN



Timothy B. Abbe

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT PLOTTED TO ORIGINAL SCALE

Natural Systems Design

NAME OR INITIALS AND DATE	CORPS REFERENCE #	GEOGRAPHIC INFORMATION
DESIGNED: N. NELSON	#	LATITUDE: 47.42.39"N
CHECKED: T. ABBE	APPLICANT: JOHN WARN	LONGITUDE: 120.51.03"W
DRAWN: C. HARTGARTEL		TWP/RNG/SEC: T14N/R18E/S18
CHECKED: N. NELSON		DATE: MARCH 31, 2022

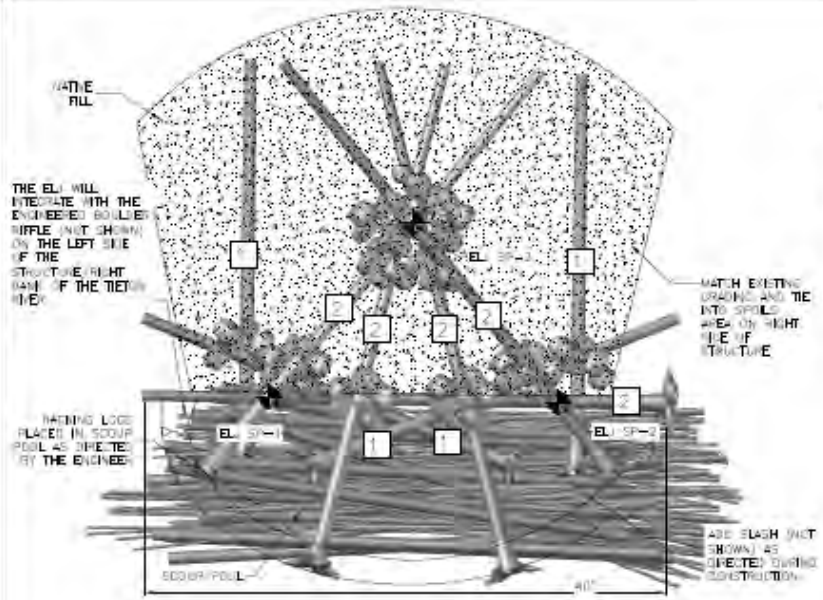
TIETON RM 4.3 RESTORATION

PROPOSED CONDITIONS SITE PLAN

9

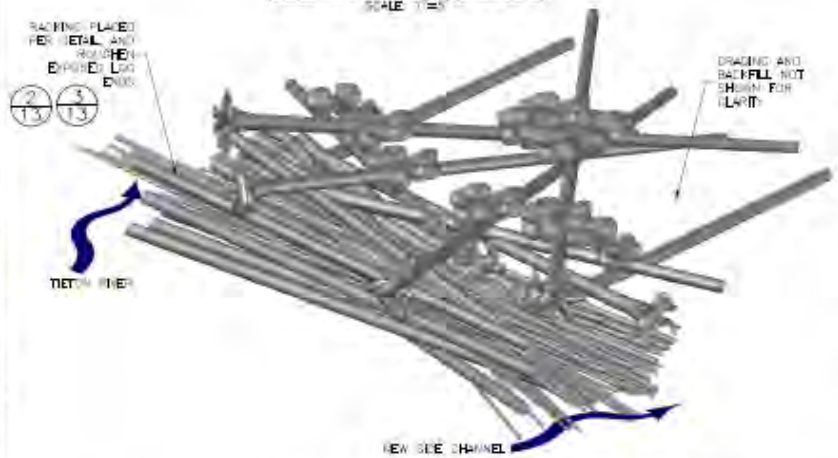
SHEET 9 OF 19

Mar 31, 2022 FINAL DESIGN



ELJ STRUCTURE PLAN

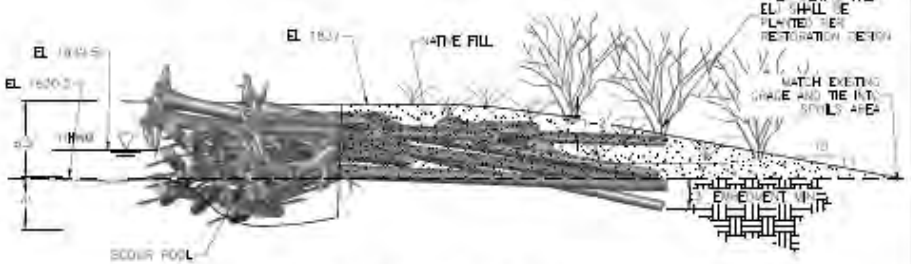
SCALE 1"=5'



ELJ STRUCTURE ISOMETRIC

NOT TO SCALE

ELJ STAKEOUT POINTS		
STAKEOUT POINT NO.	NORTHING	EASTING
ELJ SP-1	504641	1662119
ELJ SP-2	504624	1662133
ELJ SP-3	504642	1662133



ELJ STRUCTURE PROFILE

SCALE 1"=5'

ELJ STRUCTURE NOTES

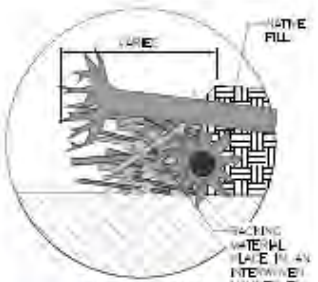
1. INSTALL COFFERDAM PRIOR TO ELJ CONSTRUCTION TO ENSURE AREA REMAINS DRY IF FLOWS FLUCTUATE. DEWATERING MAY BE NECESSARY FOR LOG EMBEDMENT DURING SCOUR POOL EXCAVATION.
2. FINAL ELJ HEIGHT TO BE ACHIEVED AS SPECIFIED REGARDLESS OF ACTUAL LOG DIAMETERS USED OR STACKING ARRANGEMENT. LOCATIONS AND ALIGNMENT OF LOGS, RACKING, AND/OR SLASH MAY BE ADJUSTED BY ENGINEER TO ACCOMMODATE SITE CONDITIONS.
3. ALL LARGE WOOD DIMENSIONS DO NOT INCLUDE BARK THICKNESS.
4. RACKING MATERIAL SHALL CONSIST OF APPROXIMATELY 60 INDIVIDUAL LOGS WITH 3" – 12" DBH AND A MINIMUM OF 30-FEET LENGTH. RACKING PLACEMENT SHALL BE TIGHTLY PACKED AND AUGMENTED WITH SLASH WITH EACH LAYER PLACEMENT TO ENSURE RACKING MATERIAL EXTENDS THROUGH STRUCTURE IN MINED IN PLACE BY SUBSEQUENT LAYERS, TO MINIMIZE FLOW THROUGH THE STRUCTURE TO REDUCE BOATER RISK.
5. STRUCTURE LOCATION WILL BE STAKED IN FIELD BY THE ENGINEER OR OWNER'S REPRESENTATIVE PRIOR TO START OF CONSTRUCTION.
6. EXCAVATION LIMITS SHALL BE FIELD VERIFIED BY THE OWNER'S REPRESENTATIVE OR ENGINEER PRIOR TO EXCAVATION COMMENCING AND PLACEMENT OF ANY LARGE WOOD. EXCAVATION SHALL NOT EXTEND BEYOND THE WATER LINE AT TIME OF CONSTRUCTION.
7. LOG TYPE IDENTIFICATION SHALL BE PAINTED ON ALL LOGS BY THE CONTRACTOR IN A PLACE VISIBLE FOR FIELD VERIFICATION PRIOR TO PLACEMENT WITH LEAD-FREE, BLAZE-ORANGE SURVEY MARKING PAINT.
8. MATERIAL TO BE EXCAVATED FOR TRENCHING IN THE ENDS OF THE ROOTWADS MAY CONTAIN VEGETATION, TREES, SOIL, LARGE ROCKS, COBBLE, GRAVEL AND/OR RUBBLE. TRENCH VOLUME AND PLACEMENT IS APPROXIMATELY 200 CY. MATERIAL SHALL BE PLACED BACK ON TOP OF EMBEDDED LOGS/ROOTWADS AND COMPACTED WITH EXCAVATOR BUCKET TO MAXIMUM EXTENT PRACTICAL WHEN RE-INSTALLING EXCAVATED MATERIAL. LARGE ROCK MOVED DURING EXCAVATION FOR TRENCHING SHALL BE REPLACED IN LOCATION SPECIFIED BY ENGINEER OR OWNER REPRESENTATIVE. EXCESS SOILS SHALL BE MOUNDED ON TOP OF LOG ENDS OR DISPERSED AS DIRECTED BY ENGINEER.
9. BOULDERS SHALL BE PLACED AS BALLAST AS DIRECTED BY THE ENGINEER. EACH ROOTWAD SHALL HAVE BOULDERS PLACED ON THE LEEWARD (DOWNSTREAM) SIDE AND ON TOP TO PROVIDE STRUCTURAL STABILITY. BOULDERS SHALL BE CLUSTERED AROUND LOCATIONS WHERE THE ROOTWADS EMERGE AS SHOWN IN PLAN AND ISOMETRIC VIEWS. LARGE BOULDER/CRANNELS FROM THE SIDE CHANNEL EXCAVATION MAY ALSO BE PLACED ON TOP OF THE ROOTWAD/BOULDER STRUCTURE. ANY NATIVE EXCAVATION MATERIAL MAY BE PLACED AROUND THE REMAINING WOOD SHAPE.

ELJ LOG SCHEDULE

LOG ID	DIAM (INCHES)	LENGTH ** (FEET)	ROOTWAD (Y/N)	QUANTITY (EACH)
1	18	30	Y	6
2	18	40	Y	5
RACKING	3–12	30	N	60
SLASH				75 CY
BOULDERS	36–48			50 TN
* MINIMUM DIAMETER AT GREAT HEIGHT (1" MEN TOP MAXIMUM TAPER)				
** TOTAL LENGTH INCLUDING ROOTWAD				

ELJ STRUCTURE DETAIL 1/13

SCALE AS NOTED



SECTION VIEW DETAIL

NOTE
EXAMPLE PHOTO – NO ELJS ARE INCLUDED IN THE TIETON RESTORATION ELJ

RACKING DETAIL 2/13

NOT TO SCALE

ROUGHEN EXPOSED LOG ENDS TO APPEAR LIKE SHOWN IN PHOTO

ONLY ROUGHEN EXPOSED CUT ENDS OF LARGE RACKING WHERE ALL ROOTWAD ENDS (IF ANY) ARE FULLY BURIED AND NOT ROUGHENED

ROUGHENED LOG ENDS

EXPOSED LOG END DETAIL 3/13

NOT TO SCALE

Timothy B. Abbe

IF THIS SHEET IS NOT 22"x34" THEN DRAWING IS NOT A TRUE TO ORIGINAL SCALE

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TIETON RM 4.3 RESTORATION

ELJ STRUCTURE DETAIL

13

SHEET 13 OF 19

Mar 31, 2022 FINAL DESIGN

NOTES

1. ENGINEERED BOULDER RIFFLE (EBR) SHALL BE CONSTRUCTED WITHOUT A FULL STREAM DIVERSION/BYPASS. PLACEMENT OF ALL AGGREGATE FOR BOTH THE ENGINEERED BOULDER RIFFLE AND THE LATERAL SEDIMENT NOURISHMENT BAR WILL BE PLACED IN THE WET. SEE SITE ISOLATION PLAN FOR PROPOSED CONSTRUCTION SEQUENCING.
2. THE EBR SHALL BE BUILT WITH 669 TN (300 CY) OF IMPORTED BOULDERS. 75% OF THAT QUANTITY WILL BE 3-MAN BOULDERS AND 25% 4-MAN BOULDERS.
3. PLACE A TOTAL OF 411 CY OF COBBLES AND BOULDERS ON EXISTING CHANNEL GRADE AND BANKS. THE STRUCTURE SHALL FULLY SPAN THE CHANNEL. EMBED AT LEAST 5 FT HORIZONTALLY INTO THE BANKS.
4. THE BOULDER QUANTITY MAY BE SOURCED FROM AN OFF-SITE LOCATION, FROM ON-SITE EXCAVATED MATERIALS FROM THE SIDE CHANNEL, OR AS PROVIDED BY THE CLIENT. BOULDERS SHALL BE APPROVED AND INSTALLED AT THE ENGINEER'S DIRECTION.
5. ELJ IS LOCATED ALONG THE RIGHT BANK OF THE EBR AND IS NOT SHOWN FOR CLARITY.
6. THE FILL TABLE BELOW SHOWS THE DISTRIBUTION OF ALL NATIVE MATERIAL EXCAVATED FROM THE SITE. NO EXCAVATED MATERIAL NEEDS TO BE REMOVED/HAULED AWAY FROM THE SITE.
7. A GRIZZLY MACHINE OR APPROVED EQUAL CAPABLE OF SORTING SORTING THE NATIVE MATERIAL IS REQUIRED.

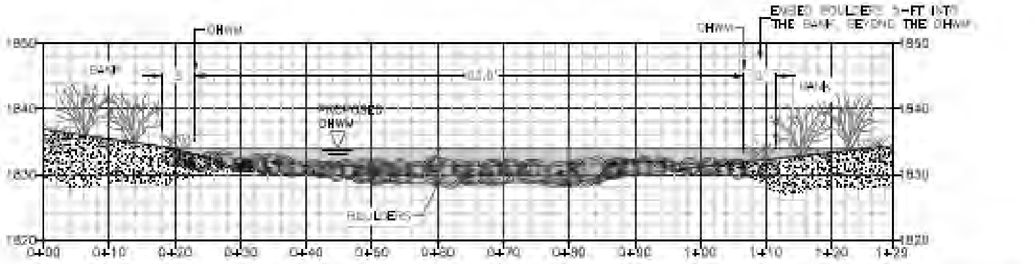
   SORT ALL EXCAVATED ALLUVIUM INTO THREE SIZE CLASSES:
   - SAND/GRAVEL = 0" TO 3.5"
   - COBBLE = 3.5" TO 12"
   - 1-, 2- MAN BOULDERS > 12"
8. PLACE FILL GRADATIONS AS SHOWN IN THE BREAKDOWN FILL TABLE.
9. ALL SORTING IS INCIDENTAL TO EXCAVATION AND FILL ACTIVITIES. COSTS FOR BOULDER INSTALLATION SHALL BE PER TN IMPORTED AND PLACED AT THE SITE. EXCLUDES LOCAL EX/HAUL OF NATIVE SAND/GRAVEL, COBBLES, BOULDERS, WHICH IS A SEPARATE COST ITEM.

FILL QUANTITIES – CY						
DESCRIPTION	SAND/ GRAVEL	COBBLE	1-, 2- MAN BOULDERS	3-, 4-MAN BOULDERS*		NOTES
GRADATION	0" to 3.5"	3.5" to 12"	> 12"	> 28"	TOTAL (CY)	
ENGINEERED BOULDER RIFFLE	0	50	61	300	411	IMPORTED BOULDERS (300 CY = 669 TN). ALL NATIVE BOULDERS > 12". 50 CY COBBLE.
LATERAL SEDIMENT NOURISHMENT BAR	876	214	0	0	1,090	1-FT DEPTH OF COBBLE ALONG THE BOTTOM LAYER. TOP WITH SAND AND GRAVEL.
TRAIL	330	330	0	0	659	50% SAND/GRAVEL, 50% COBBLE. PLACE COBBLE FIRST.
ELJ	22	22	0	22	66	22 CY = 50 TN IMPORTED BOULDERS, REMAINING IS NATIVE BACKFILL ON TOP OF ROOTWADS AND BOULDERS. (EXCLUDES CUT/FILL ASSOCIATED WITH LOG EMBEDMENT.)
SPOIL AREA	1,075	90	0	0	1,165	ALL NATIVE FILL.
TOTAL	2,303	706	61	322	3,392	3,070 CY NATIVE FILL, 322 CY IMPORTED BOULDERS.

* ALL 3- AND 4-MAN BOULDERS ARE IMPORTED TO THE SITE.
BOULDER SIZE – APPROXIMATE RANGE

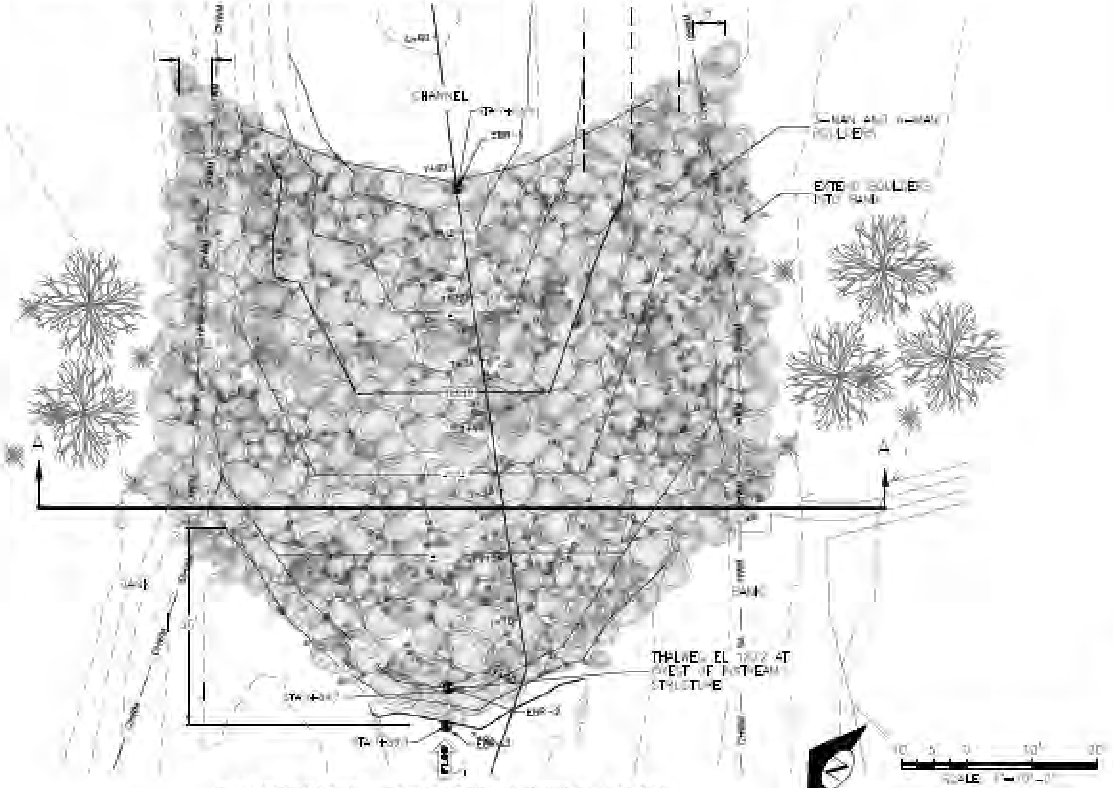
THREE MAN 30"–36"
FOUR MAN 40"–48"

ENGINEERED BOULDER RIFFLE POINT TABLE			
POINT NO.	ELEVATION	NORTHING	EASTING
EBR-1	1827.5	504700	1582115
EBR-2	1832.0	504602	1582055
EBR-3	1829.0	504606	1582050



ENGINEERED BOULDER RIFFLE SECTION A-A'
SCALE: 1" = 10'

NOTE: SECTION CUT FACING DOWNSTREAM



ENGINEERED BOULDER RIFFLE PLAN
SCALE: 1" = 10'

ENGINEERED BOULDER RIFFLE DETAIL 1/14
SCALE: AS NOTED

Timothy B. Abbe

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT PLOTTED TO ORIGINAL SCALE.

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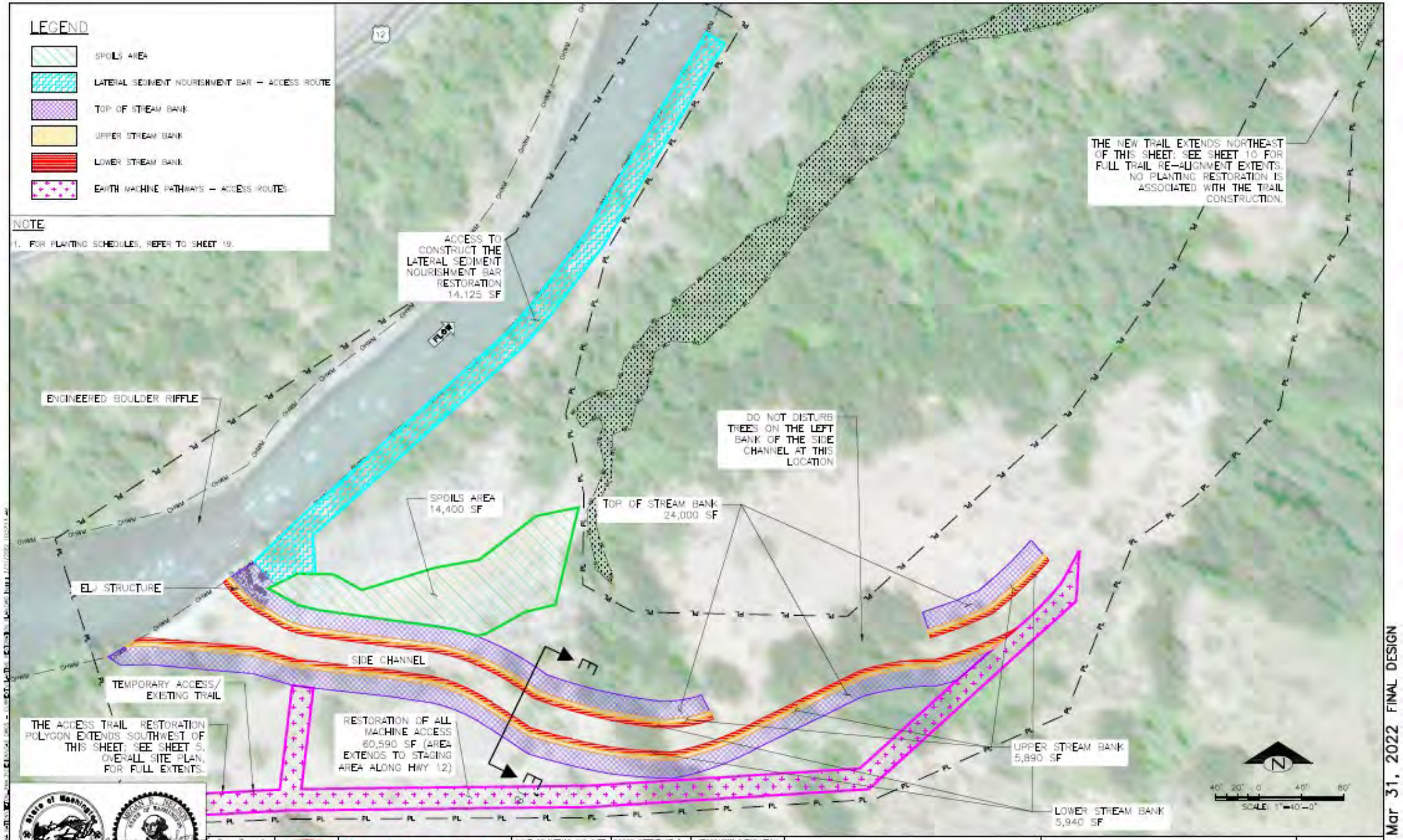
TIETON RM 4.3 RESTORATION

ENGINEERED BOULDER RIFFLE DETAIL

14

SHEET 14 OF 19

Mar 31, 2022 FINAL DESIGN


LEGEND
SPOILS AREA
LATERAL SEDIMENT NOURISHMENT BAR – ACCESS ROUTE
TOP OF STREAM BANK
UPPER STREAM BANK
LOWER STREAM BANK
EARTH MACHINE PATHWAYS – ACCESS ROUTES
NOTE
1. FOR PLANTING SCHEDULES, REFER TO SHEET 19.
ACCESS TO CONSTRUCT THE LATERAL SEDIMENT NOURISHMENT BAR RESTORATION 14,125 SF
THE NEW TRAIL EXTENDS NORTHEAST OF THIS SHEET; SEE SHEET 10 FOR FULL TRAIL RE-ALIGNMENT EXTENTS. NO PLANTING RESTORATION IS ASSOCIATED WITH THE TRAIL CONSTRUCTION.
ENGINEERED BOULDER RIFFLE
DO NOT DISTURB TREES ON THE LEFT BANK OF THE SIDE CHANNEL AT THIS LOCATION
SPOILS AREA 14,400 SF
TOP OF STREAM BANK 24,000 SF
EL./ STRUCTURE
SIDE CHANNEL
TEMPORARY ACCESS/ EXISTING TRAIL
THE ACCESS TRAIL RESTORATION POLYGON EXTENDS SOUTHWEST OF THIS SHEET; SEE SHEET 5, OVERALL SITE PLAN, FOR FULL EXTENTS.
RESTORATION OF ALL MACHINE ACCESS 60,590 SF (AREA EXTENDS TO STAGING AREA ALONG HWY 12)
UPPER STREAM BANK 5,890 SF
LOWER STREAM BANK 5,940 SF
SCALE: 1"=40'-0"
Timothy B. Abbe
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT PLOTTED TO ORIGINAL SCALE
Natural Systems Design
TIETON RM 4.3 RESTORATION
PLANTING RESTORATION PLAN
17
SHEET 17 OF 19
Mar 31, 2022 FINAL DESIGN

To play Drone Video, click HERE.

https://yakamafish-nsn.gov/sites/default/files/John_Marvin_Drone_YBSMC_2025_xtra_sm.mp4
Copy and paste above URL into browser if doesn't start automatically.
(Note: Video is compressed. Please contact author for un-compressed version).

Tieton River Restoration

Questions?

John Marvin – Yakama Nation Fisheries/Yakima-Klickitat Fisheries Project
Yakima Basin Science and Management Conference June 17, 2025