PROCESS-BASED RESTORATION AND ENGINEERED LOGJAMS: A HYBRID APPROACH TO HABITAT RESTORATION, HIGHLIGHTING A PROJECT ON TANEUM CREEK

ENGINEER OR NOT TO ENGINEER?

LARGE RISK	MEDIUM RISK	LOW RISK
YES	MAYBE, CONSIDER A HYBRID APPROACH IF A PROFESSIONAL ENGINEER IS REQUIRED BY REGULATORS	NO!

WORKING WITH NATURE VERSUS CONTROLLING IT

ENGINEERED LOGJAMS

- STATIC STRUCTURES.
- FLOODPLAIN RECONNECTION THROUGH NATURAL PROCESSES IS NOT ALWAYS ACHIEVABLE. DEPENDS ON SCALE OF PROJECT.
- SITE SPECIFIC

PROCESS-BASED RESTORATION

- WOOD IS MOBILE. NOT ANCHORED.
- RESTORE STREAM PROCESS AND FUNCTION. ALLOW THE STREAM TO FIX ITSELF.
- LONG TERM RECRUITMENT OF LARGE WOOD. RIPARIAN CORRIDOR HEALTH.

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Avoid "Band-Aid" Approach to Restoration

TANEUM CREEK HABITAT ENHANCEMENT RAGHEART SITE

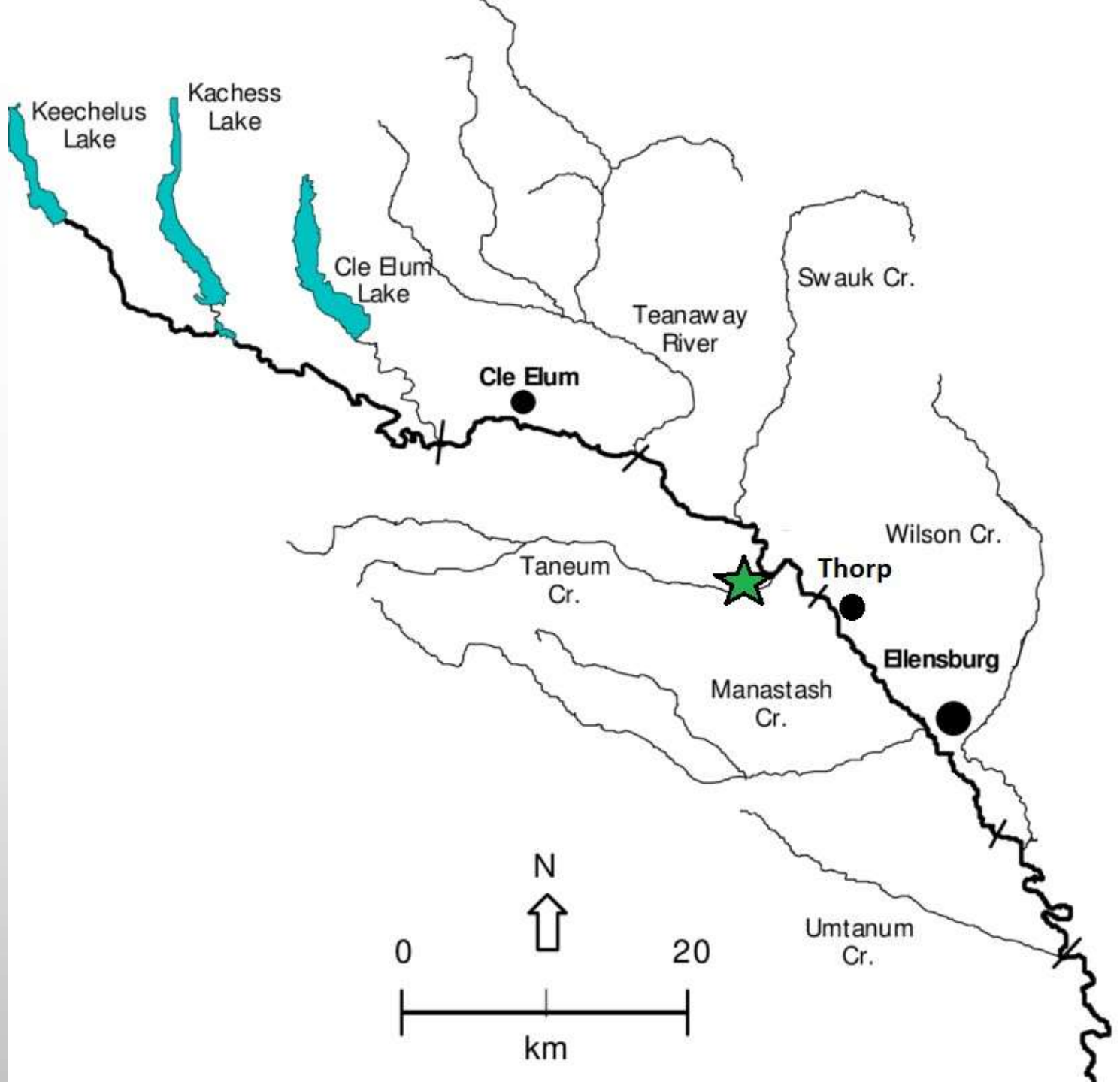
TANUEM CREEK RM 1.8-3.4

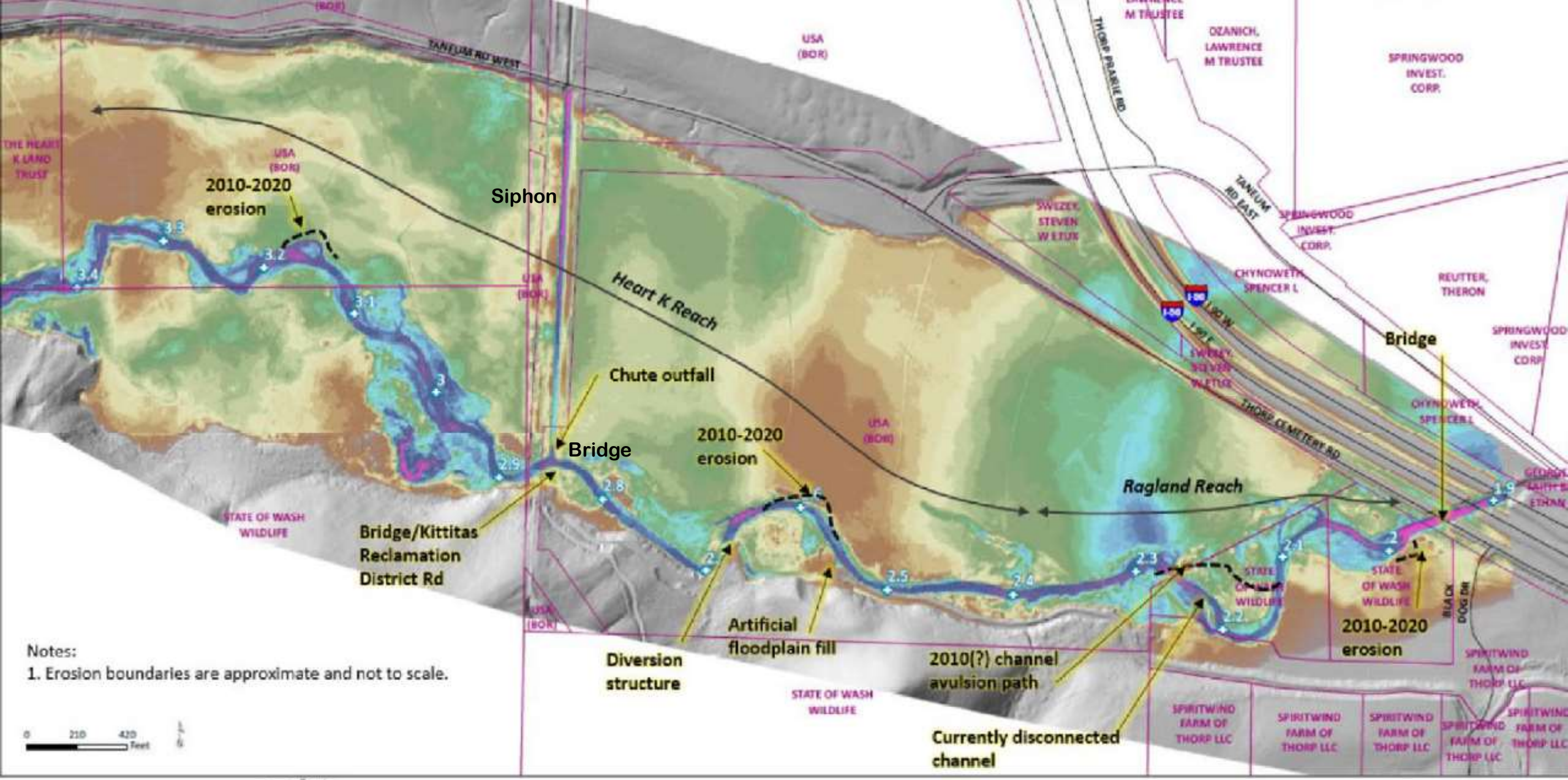
UPPER YAKIMA RIVER

RIGHT BANK TRIBUTARY

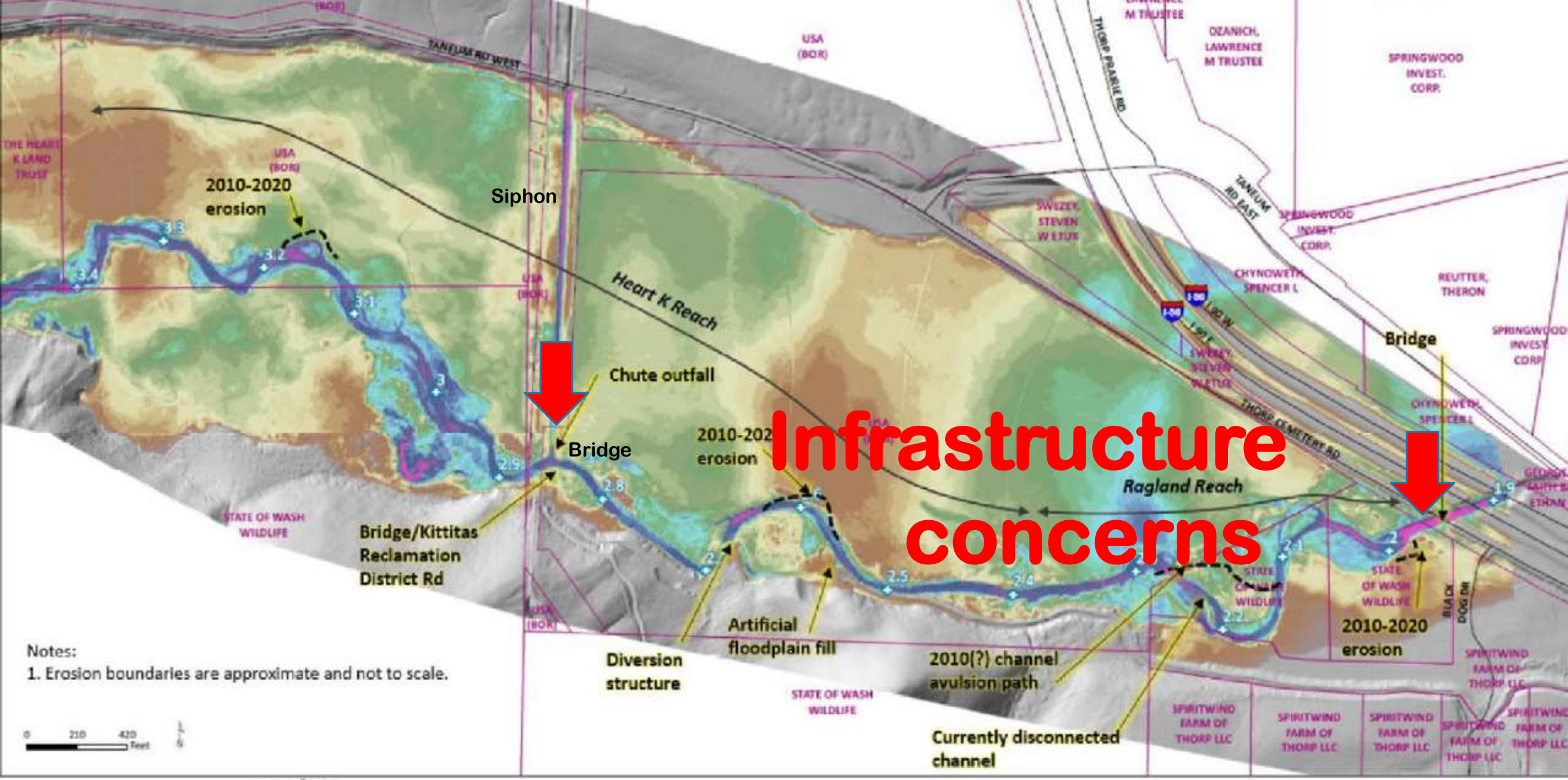
KITTITAS COUNTY

ELLENSBURG, WASHINGTON





TANEUM CREEK HABITAT ENHANCEMENT RAGHEART SITE



TANEUM CREEK HABITAT ENHANCEMENT RAGHEART SITE


West Taneum Road
KRD siphon
KRD overflow ditch to Taneum
Interpreted historic and branch channels
Thorp Cemetery Road
2020
1872
1872
1872
Heart K Reach
2020
Ragland Reach

LIMITING FACTORS TO FISH HABITAT

- Low pool frequency
- Lack of aquatic cover (in-stream wood and overhanging vegetation)
- Lack of physical complexity (local variations in topography, bed texture and channel planform)
- Poor connectivity to floodplain and off-channel features because of channel incision
- Loss of channel length because of channel incision and historic channel alterations
- Elevated stream temperatures because of impaired riparian corridor
- Reduced large wood recruitment potential (a mechanism to force and maintain pools, provide cover, increase channel length, maintain off-channel connections, etc.) because of impaired riparian corridor.

CHANNEL INCISION

RIPRAP

YAKAMA NATION RESTORED ~1.5 MILES OF INSTREAM HABITAT AND FLOODPLAIN CONNECTIVITY

- ADDRESSED ADVANCING HEADCUT TO ALLOW ESA-LISTED STEELHEAD, COHO, CHINOOK, RAINBOW TROUT, AND CUTTHROAT TROUT UNIMPEDED ACCESS TO IMPROVED HABITATS.
- INSTALLED 18 ENGINEERED LOG JAMS
- PLACED 47 KEY PIECES (INDIVIDUAL TREES WITH ROOTWADS ATTACHED)
- PLACED SLASH AND RACKING MATERIAL
- INCREASED:
  - QUALITY OF POOL HABITAT
  - COMPLEX COVER WITHIN THE MAIN CHANNEL
  - FLOODPLAIN FUNCTION AND GROUNDWATER STORAGE
  - CHANNEL LENGTH
  - BEAVER RECOLONIZATION POTENTIAL

ES

ACCESS ROUTES ARE APPROXIMATE AND SHALL BE REFINED PRIOR TO CONSTRUCTION AND APPROVED BY PROJECT SPONSOR.

STREAM DIVERSION AND DEWATERING IS NOT ANTICIPATED. LOGS WILL BE PLACED IN THE WET, BUT MACHINES SHALL NOT ENTER THE FLOWING CHANNEL. CONSTRUCTION SHALL OCCUR FROM BANKS AND DRY GRAVEL BARS.

EQUIPMENT MUST BE STAGED MORE THAN 150 FT AWAY FROM STREAM CHANNEL. NATURAL MATERIALS CAN BE STAGED CLOSER.

FOLLOWING CONSTRUCTION, ALL ACCESS ROUTES, STAGING AREAS, AND OTHER DISTURBED AREAS ARE TO BE DECOMPACTED AND PREPARED FOR SEEDING. SEEDING SHALL

N

200' 100' 0 200' 400'

SCALE: 1"=200'-0"

State of Washington
Licensed Geologist
Timothy B. Abbe

0 1

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

FISHERIES YAKAMA NATION

Natural Systems Design

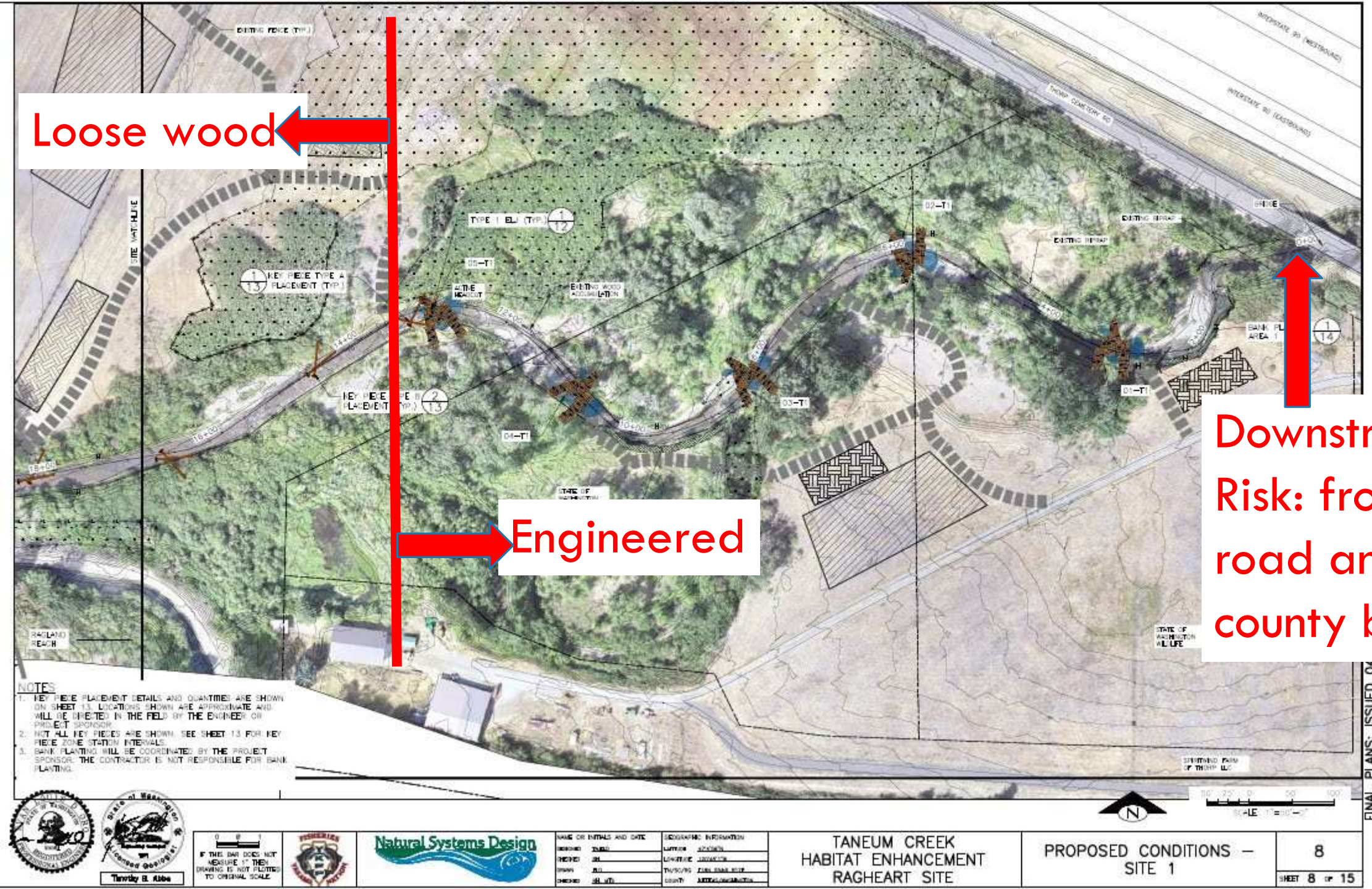
NAME OR INITIALS AND DATE		GEOGRAPHIC INFORMATION	
DESIGNED	TA, B.D	LATITUDE	47°4'56"N
CHECKED	BH	LONGITUDE	120°45'1"W
DRAWN	B.D	TN/SC/RG	T18N S5&6 R17E
CHECKED	BH, MTS	COUNTY	KITTITAS/WASHINGTON

TANEUM CREEK HABITAT ENHANCEMENT RAGHEART SITE

ACCESS AND STAGING PLAN

7

SHEET 7 OF 15


Loose wood
Engineered
Downstream Risk: frontage road and county bridges
NOTES
1. KEY PIECE PLACEMENT DETAILS AND QUANTITIES ARE SHOWN ON SHEET 13. LOCATIONS SHOWN ARE APPROXIMATE AND WILL BE DIRECTED IN THE FIELD BY THE ENGINEER OR PROJECT SPONSOR.
2. NOT ALL KEY PIECES ARE SHOWN. SEE SHEET 13 FOR KEY PIECE ZONE STATION INTERVALS.
3. BANK PLANTING WILL BE COORDINATED BY THE PROJECT SPONSOR. THE CONTRACTOR IS NOT RESPONSIBLE FOR BANK PLANTING.
Natural Systems Design
TANEUM CREEK HABITAT ENHANCEMENT RAGHEART SITE
PROPOSED CONDITIONS – SITE 1
8
SHEET 8 OF 15
FINAL PLANS; ISSUED 04

Loose wood mixed w/ ELJs (Note: further away from the frontage road and county bridges; risk reduced substantially)

Natural Systems Design

TANEUM CREEK HABITAT ENHANCEMENT RAGHEART SITE

PROPOSED CONDITIONS – SITE 2

9

SHEET 9 OF 15

FINAL PLANS: ISSUED 04-26-2021

Natural Systems Design

TANEUM CREEK
HABITAT ENHANCEMENT
RAGHEART SITE

PROPOSED CONDITIONS – SITE 4

10

SHEET 10 OF 15

FINAL PSUED 04-26-2021

NOTES

1. KEY PIECE PLACEMENT DETAILS AND QUANTITIES ARE SHOWN ON SHEET 13. LOCATIONS SHOWN ARE APPROXIMATE AND WILL BE DIRECTED IN THE FIELD BY THE ENGINEER OR PROJECT SPONSOR.
3. NOT ALL KEY PIECES ARE SHOWN. SEE SHEET 13 FOR KEY PIECE ZONE STATION INTERVALS.
4. BANK PLANTING WILL BE COORDINATED BY THE PROJECT SPONSOR. THE CONTRACTOR IS NOT RESPONSIBLE FOR BANK PLANTING.

Natural Systems Design

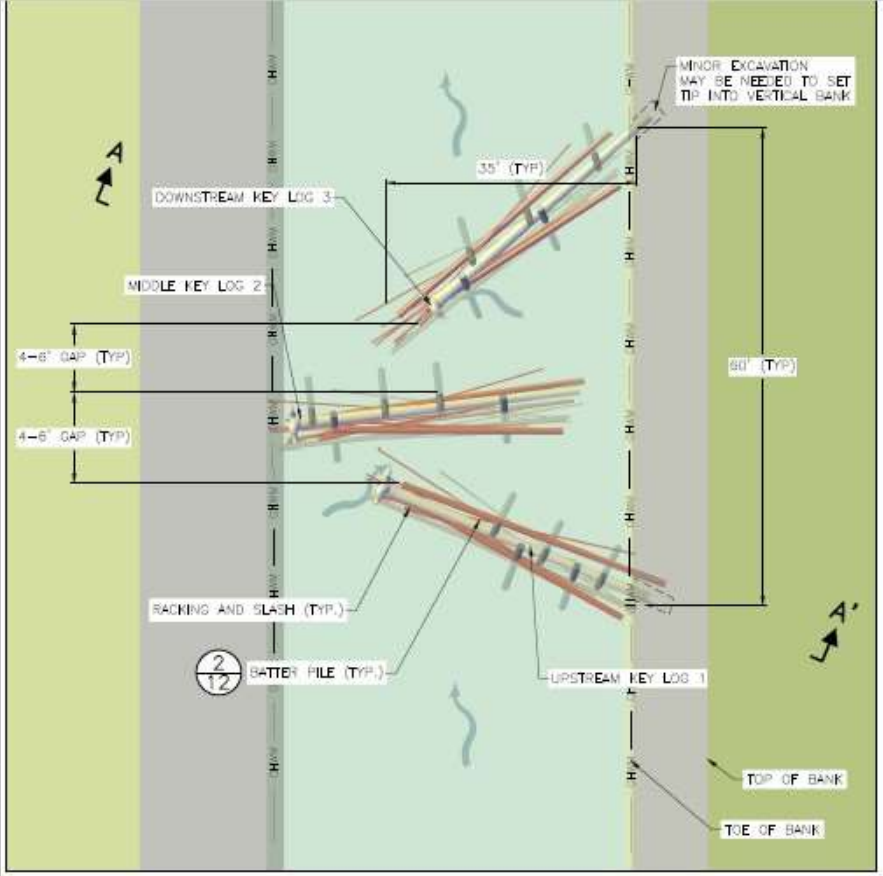
TANEUM CREEK
HABITAT ENHANCEMENT
RAGHEART SITE

PROPOSED CONDITIONS — SITE 5

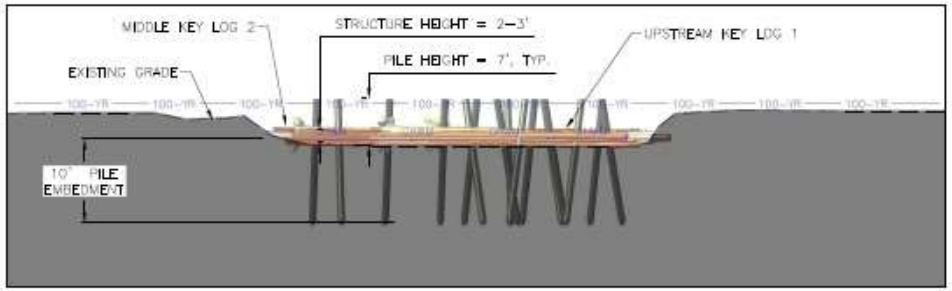
11

SHEET 11 OF 15

FINAL PLANS; ISSUED 04-26-2021

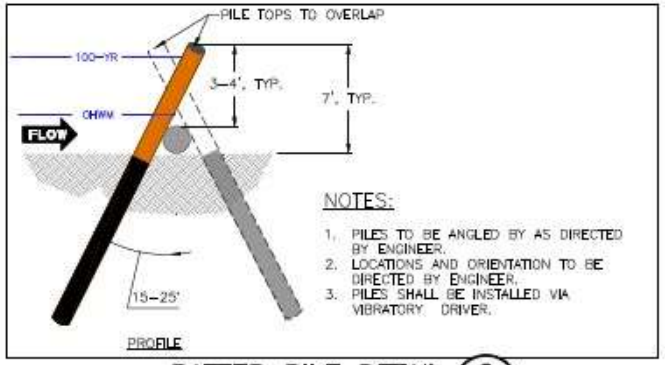


TYPE 1 ELJ PLAN
SCALE: 1" = 10'



TYPE 1 ELJ SECTION A-A'
SCALE: 1" = 10'

Equipment:
Vibratory pile driver
Movax



BATTER PILE DETAIL 2/12
SCALE: NOT TO SCALE

MATERIAL	DIAMETER (IN)	LENGTH (FT)	ROOTWAD DIAMETER (FT)	QUANTITY PER STRUCTURE	UNIT
BATTER PILE	16	20	NA	15	EA
KEY LOG	18-22	40	6	3	EA
RACKING	4-10	20-40	NA	30	EA
SLASH	<1 TO 6	5-10	NA	30	CY

TYPE 1 WOOD QUANTITIES
SCALE: NOT TO SCALE

NOTES

1. STRUCTURE INTENT IS TO DISSIPATE ENERGY WITHIN THE EXISTING LOW FLOW CHANNEL OVER A SERIES OF LOG STEPS IN ORDER TO TRAP AND STORE STREAMBED GRAVEL WHICH WILL RAISE THE WATER TABLE, INCREASE FLOODPLAIN CONNECTIVITY, CREATE POOLS, AND ADD COMPLEX COVER FOR SALMONIDS.
2. NO EXCAVATION BELOW OHWM IS PROPOSED, THUS TURBIDITY SHALL BE MINIMIZED. DEWATERING OF THE FLOWING CHANNEL IS NOT PROPOSED.
3. STRUCTURE LOCATIONS AND DESIGN ELEVATIONS OF LOGS TO BE STAKED IN THE FIELD BY THE ENGINEER PRIOR TO CONSTRUCTION. SITE CONDITIONS VARY AND EROSION OF HIGH EXPOSED BANKS HAS LIKELY OCCURRED SINCE THE TOPOGRAPHIC SURVEY.
4. TYPICAL INSTALLATION SEQUENCE IS AS FOLLOWS:
   - 4.1. REVIEW THE STAKES SET BY THE ENGINEER AND THE OWNER TO UNDERSTAND THE ORIENTATION AND DESIRED ELEVATIONS OF EACH LOG.
   - 4.2. PLACE A LAYER OR SLASH (ROUGHLY 12" THICK, 4' WIDE AND 40' LONG BENEATH LOCATION OF EACH BED LOG.
   - 4.3. ADD ROUGHLY 10 PIECES OF RACKING BENEATH LOCATION OF EACH KEY LOG.
   - 4.4. PLACE KEY LOG ON TOP OF RACKING AND SLASH WITH ROOTWADS IN LOCATION DETERMINED BY ENGINEER OR OWNER.
   - 4.5. MINOR EXCAVATION MAY BE NEEDED TO SITUATE KEY LOG ON STEEP VERTICAL BANKS. EXCAVATION MAY ONLY OCCUR OUTSIDE OF OHWM AND SHOULD NOT RESULT IN TURBIDITY ENTERING THE STREAM CHANNEL. ANY MATERIAL EXCAVATED WILL BE LOCALLY STOCKPILED, THEN BACKFILLED OVER THE LOG AT THE END OF CONSTRUCTION.
   - 4.6. DRIVE BATTER PILES AROUND ALL WOOD MATERIAL TO PIN ALL WOOD TIGHT TO THE CHANNEL BED. BATTER PILES SHOULD HAVE DIRECT CONTACT WITH THE WOOD MATERIAL AND CROSS TO PREVENT ANY GAPS THAT WOOD CAN FLOAT OUTSIDE OF.
   - 4.7. WEAVE REMAINING RACKING MATERIAL BETWEEN DRIVEN PILES TO EXTEND INTO THE WETTED CHANNEL.

TYPE 1 ELJ 1/8,9,10,11
SCALE: NOT TO SCALE

FINAL PLANS; ISSUED 04-26-2021

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	TAB 0
CHECKED	SH
DRAWN	EJO
CHECKED	SH 4/21

GEOGRAPHIC INFORMATION	
LATITUDE	47°43'45"N
LONGITUDE	120°45'17"W
TN/SC/RG	T18N S36S R17E
COUNTY	KITTITAS/WASHINGTON

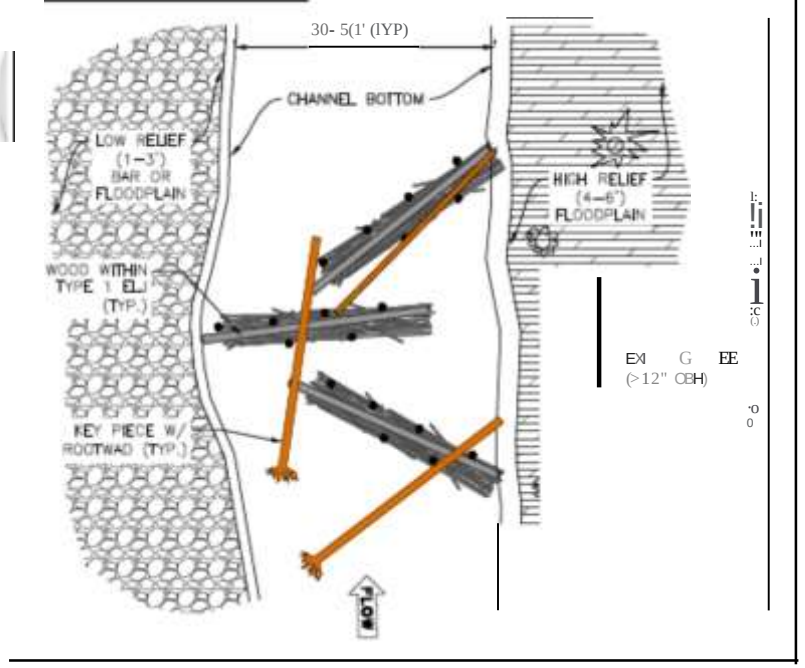
TANEUM CREEK HABITAT ENHANCEMENT RAGHEART SITE

TYPE 1 ELJ DETAILS

12

SHEET 12 OF 15

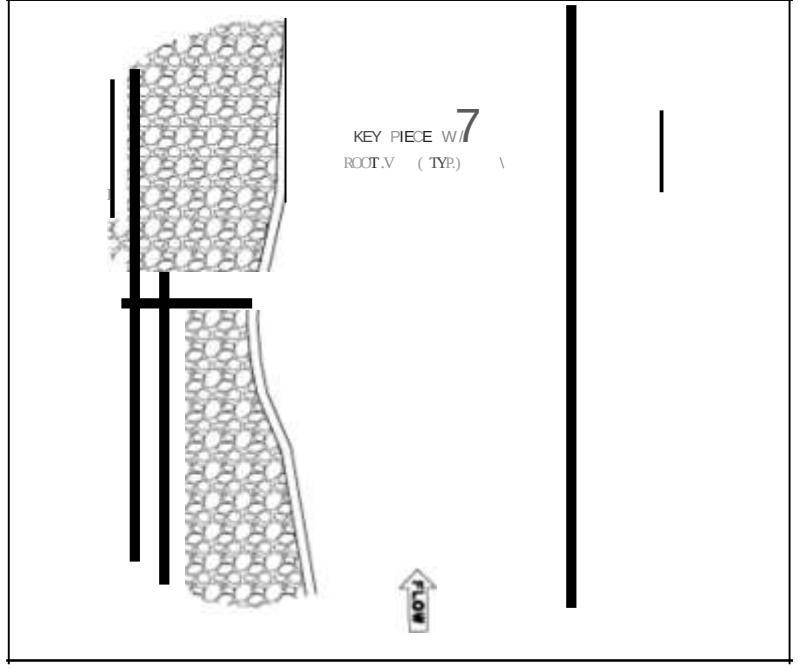
Video



KEYPIECE PLACEMENT TYPE A-LLI

SCALE: NOT TO SCALE

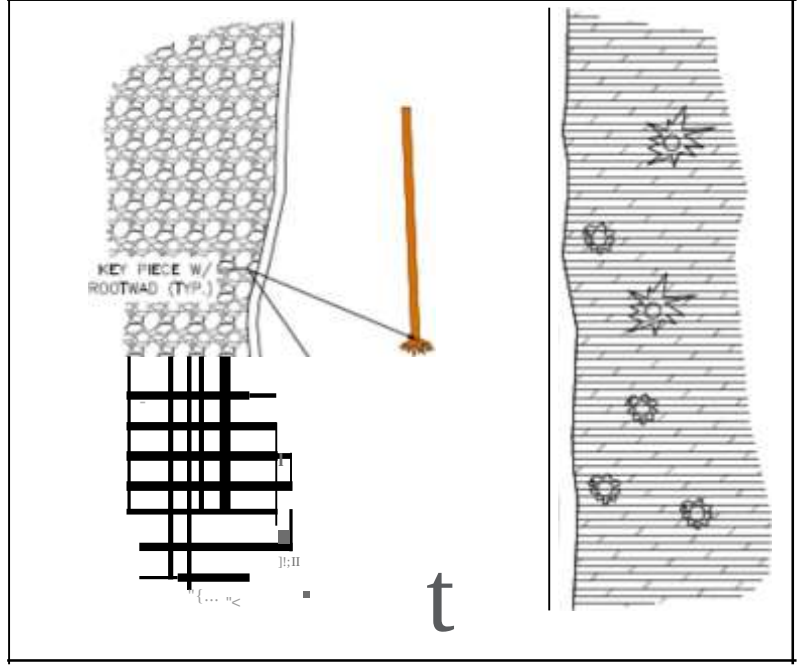
1Q



KEYPIECE PLACEMENT TYPE B L.LJ

SCALE: NOT TO SCALE

11



KEYPIECE PLACEMENT TYPE C @ 1011

SCALE, NOT TO SCALE

HATCHING LEGEND

VEL

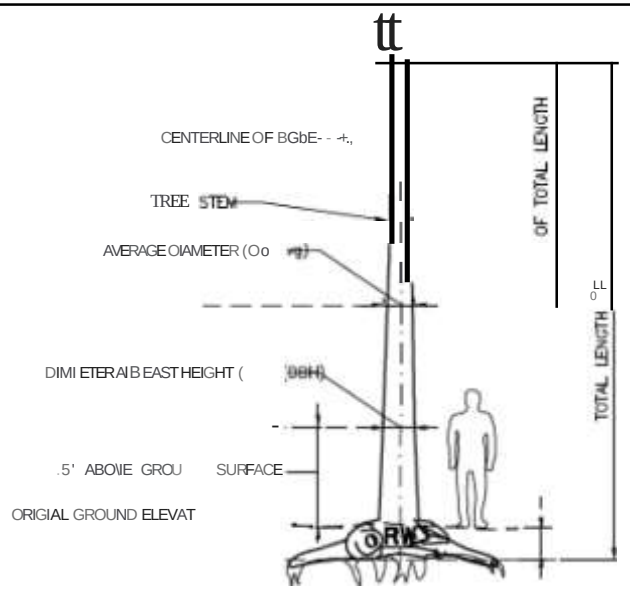
§ FLOODPLOIN

SITE	Si ATIO START	STATION END	PLACEM E T iY PE	IF A, EU rO BUILD ON	# OF KEY PIECES
1	11+50	U +50	A	05-T1	2
1	13+50	18.00	8		6
2	19+00	19+50	A	06-T1	2
2	19+50	22+<10	8		4
2	22+50	23,+00	A	07-T1	2
4	55+00	5H 50	C		3
5	58+DO	60+DO	C		3
5	60+DO	63,+00	C		8
5	63+50	66+<10	C		5
5	66+50	69100	8		6
5	70+DO	71+DO	C		2
5	n+oo	74+DO	C		4
				Totals	,n

NOTES

1. STATIONS LISTED IN TABLE REFER 10STRE.IM CHANNEL STATIONING SHOWNON PLAN VIf;Y/ SHEEr.
2. ALL KEY PIECE LOCATIONS SHALL BE STAKED I THE RE LD BY THE ENGINEER OR GEOMORPHOLOGIST OR NER.
3. NO KEY PIECES SHALL BE PLACED BELOW STATION 12+50 NOR BETWEEN STAJO 25+00 AND 2H QQ

KEYPIECE LOCATIONS AND QUANTITIES

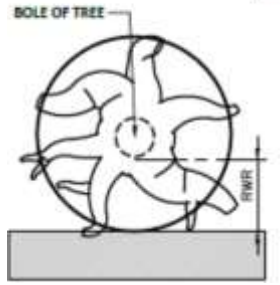


ABBREY.J'TIQHS:

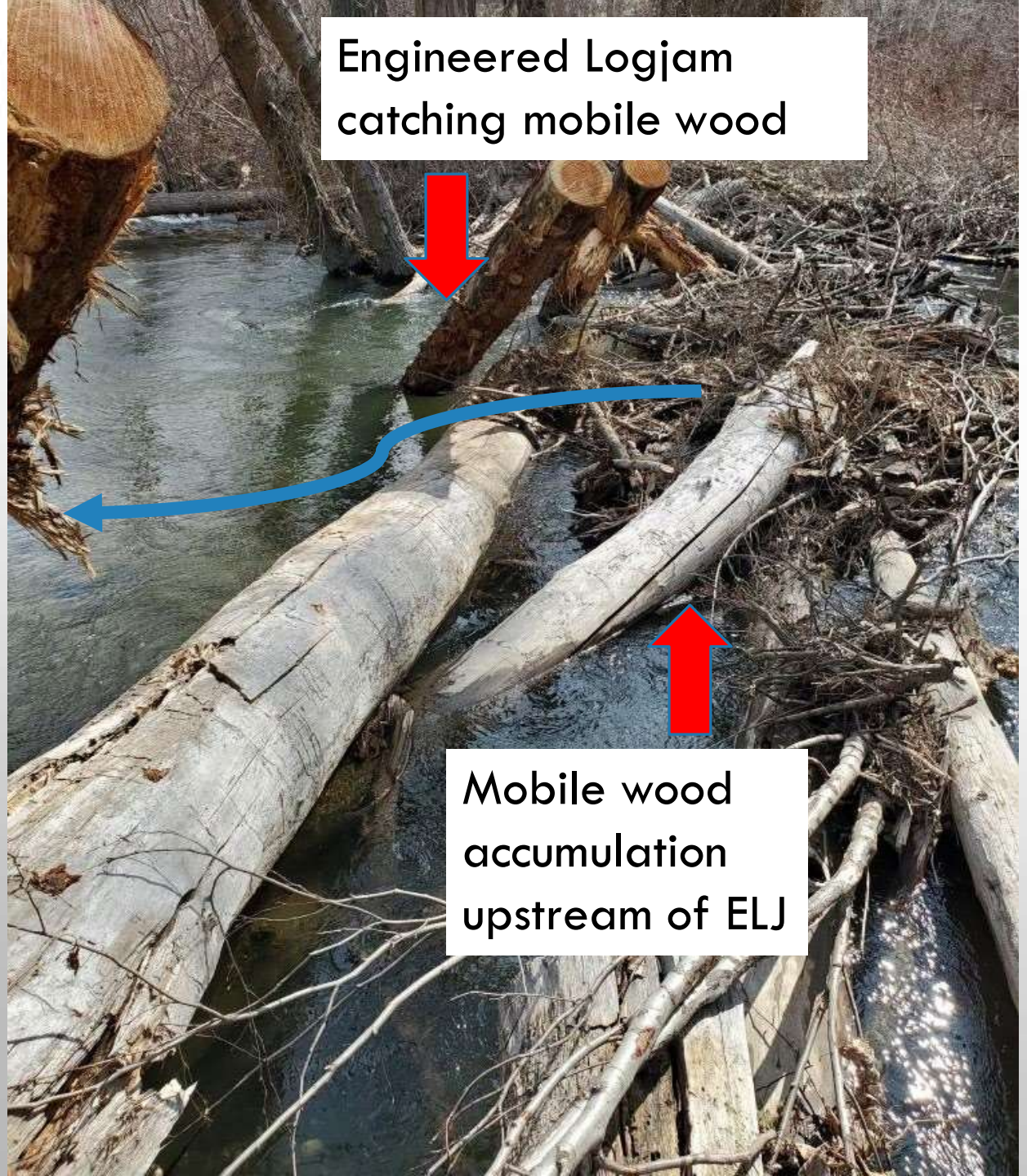
B = BOLE (EG., STD,!, TRUNK) OF TREE
RW=ROOTWAO
RWR=RADIUS OF ROOTWAO
DBH = DloMETER AT BREASI HEJGHT MEASURED WITH BARK OFF OT = DI AMETER AT TIP
Davg= DIAMETER AT HALF OF TOTAL LENGTH

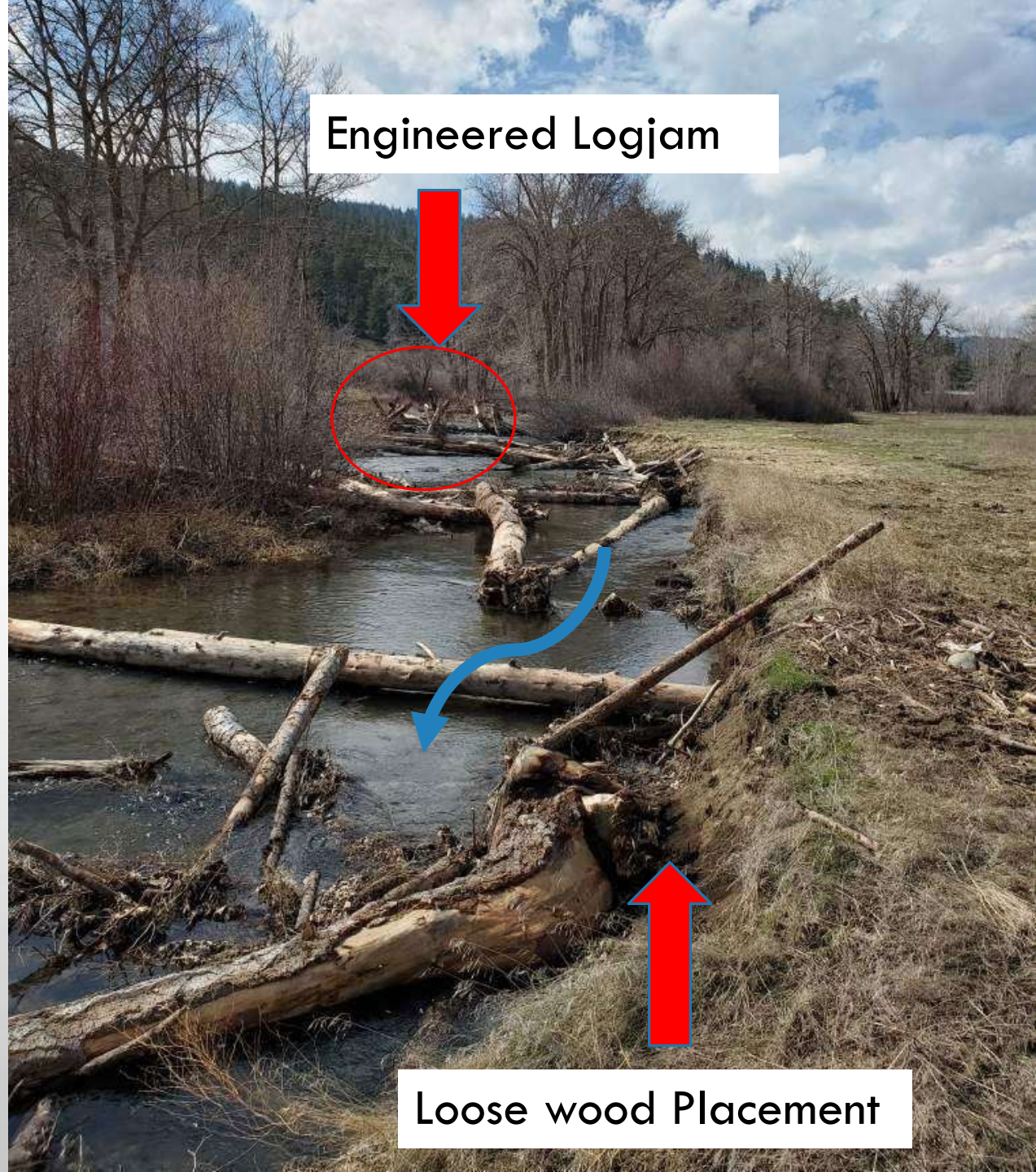
KEY PIECE DIMENSION TABLE

DBH (in)	RWR (ft)	Davg (in)	LENGTH (ft)
24	3.75	22	



1. ROOTWAORAotUS (RRW) IS MEASURED FROM EDGE OF BOLE (E.G. RADIUS DOES OT INCL BOLE OF TREE) TO TIPS OFROOTSLARGE ENOUGH TO SUPPORT WEIGHT OFTREE LAYI C ON GROUND.
2. OIAMITm AIBREASI HEIGHT (DBH) IS MEASURED AITHE POINT 4,5 ' ABOVE THE GROUNO SURFACE AT THE STANDI TREE. DIAMETER DOES NOT INCLUOE BARK THICKNESS.
3. AVERAGE DIAMETER IS MEASURED AT HALF OFTHE TOT,oLLEN<ITH AND DOES NOT I CLUDE BARK THICKNESS.


Engineered Logjam catching mobile wood
Mobile wood accumulation upstream of ELJ


Engineered Logjam
Loose wood Placement

SMALL WOODY MATERIALS

SLASH COMPOSITION

Distribution	Diameter
30%	¾" – 2"
55%	2" – 3"
15%	3" – 6"

RACKING COMPOSITION

Distribution	Diameter
40%	4-6"
40%	6-8"
20%	8-10"

- ~550 LOGS UNTREATED, SOUND, NOT ROTTEN
- RACKING LOGS 6-10 INCH IN DIAMETER, WITH ONLY 20% OF THE PIECES BEING GREATER THAN 8".
- LENGTH OF INDIVIDUAL PIECES OF RACKING MAY VARY BETWEEN 20-40 FT.


Habitat Complexity

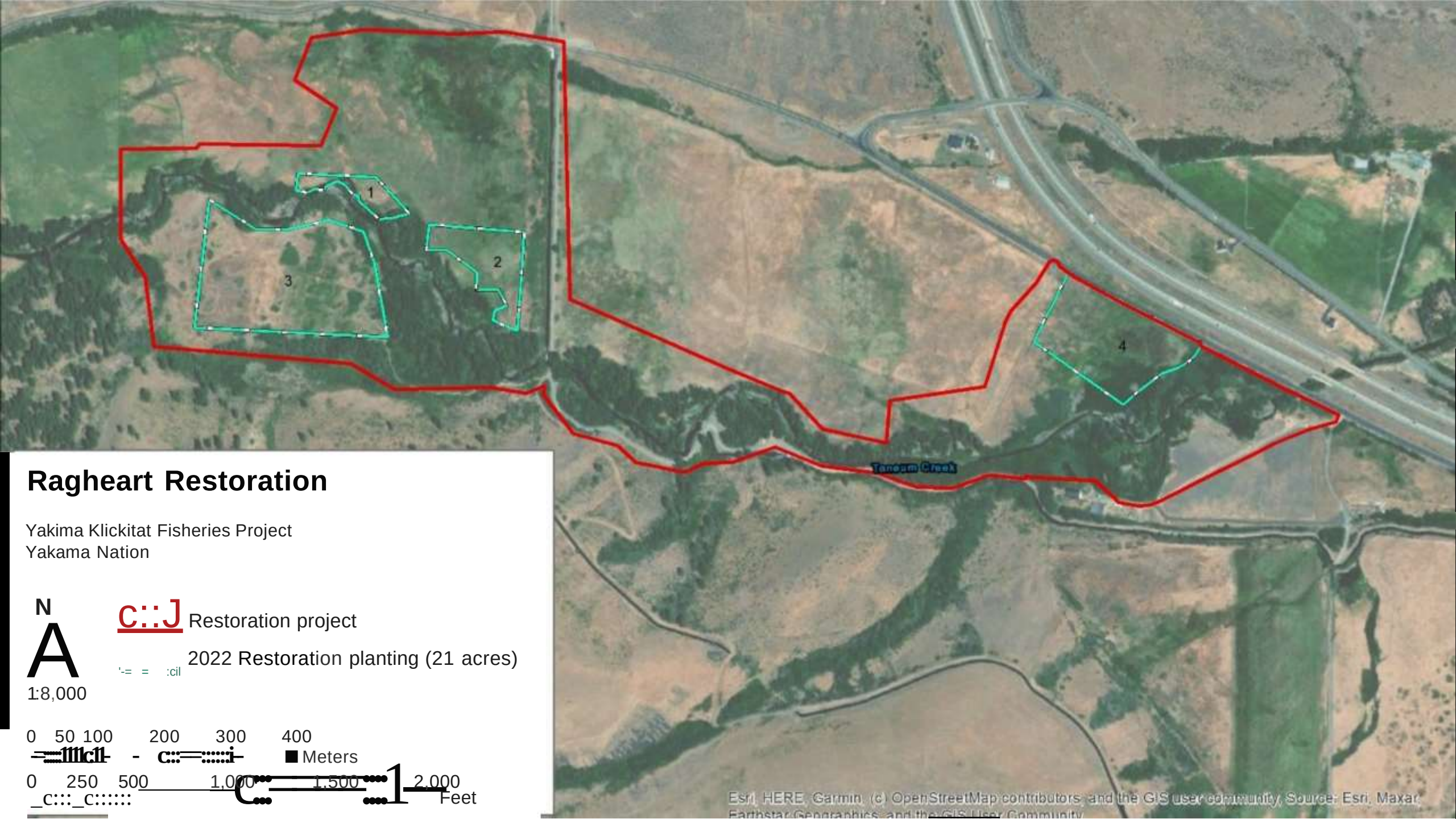
PLANTING OCCURRED TO ESTABLISH RIPARIAN HABITAT ALONG TANEUM CREEK

- INSTALLED 6,000 ROOTED NATIVE RIPARIAN PLANTS ON 21 ACRES.
- EMPHASIZING TREE OVERSTORY THAT WILL MATURE TO PROVIDE SHADE AND COVER FOR TANEUM CREEK AND INCREASE FLOODPLAIN ROUGHNESS.
- TREES WERE INSTALLED 4-6 FEET IN THE GROUND TO ENSURE PLANT ROOTS ARE IN CONTACT WITH PERENNIAL MOISTURE.
- INSTALLED TEMPORARY 8-FOOT WILDLIFE EXCLUSIONARY FENCING TO PROTECT THE RE-ESTABLISHING RIPARIAN CORRIDOR.

PLANTING OCCURRED TO ESTABLISH RIPARIAN HABITAT ALONG TANEUM CREEK

The channel will continue to migrate into pasture and abandon all of your hard work if you don't roughen up the floodplain.

If the goal is to return to an anabranching system, the floodplain also needs to be treated.



Ragheart Restoration

Yakima Klickitat Fisheries Project
Yakama Nation

N

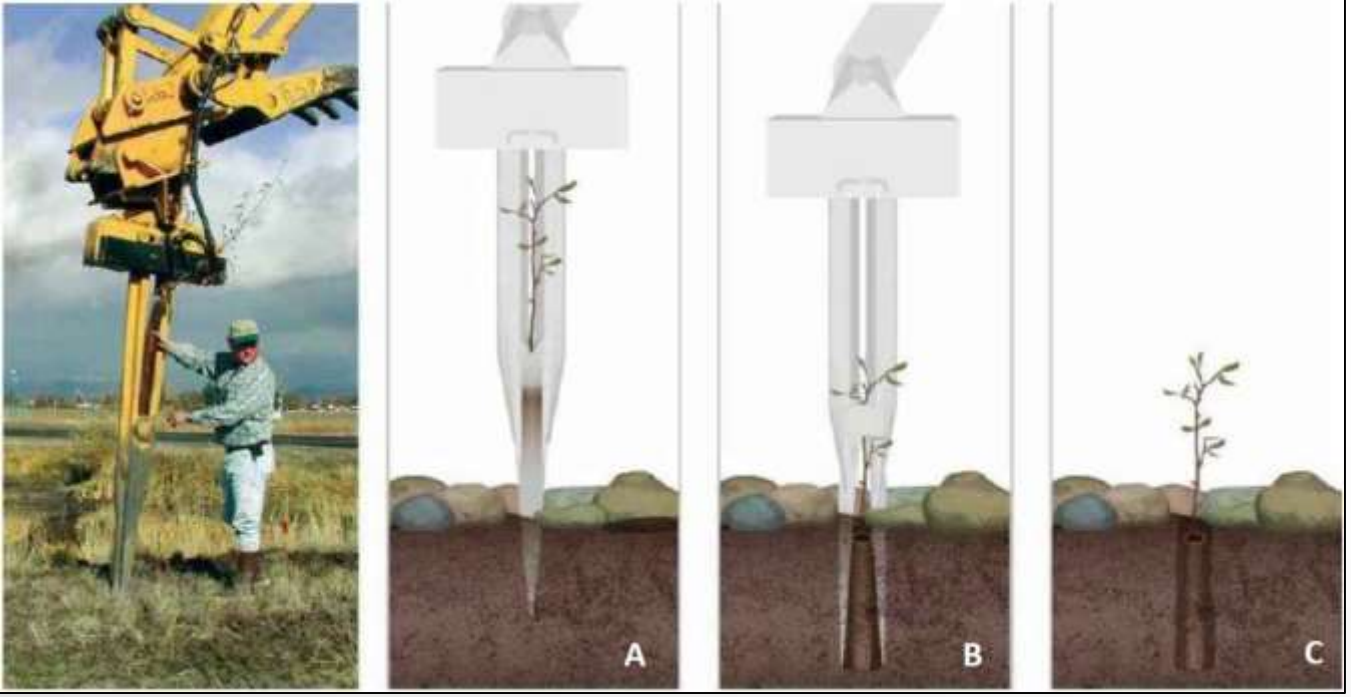
1:8,000

Restoration project

2022 Restoration planting (21 acres)

0 50 100 200 300 400 Meters

0 250 500 1,000 1,500 2,000 Feet



Equipment:
Expandable
stinger

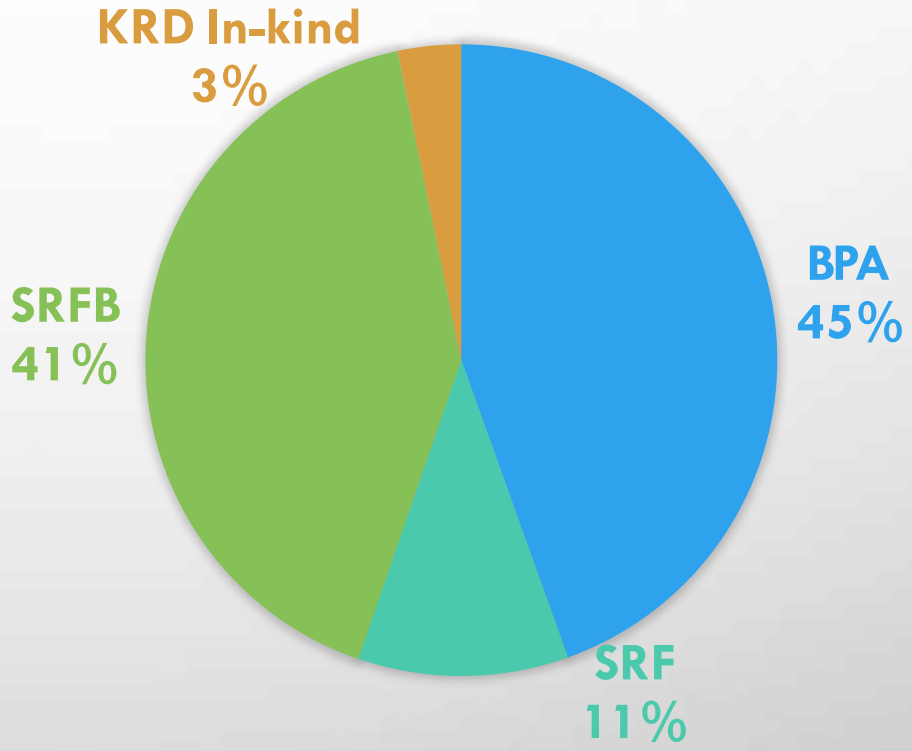
Video


Wildlife exclusionary fencing
Effectively excluding elk


Wildlife exclusionary fencing
Effectively excluding elk
SEE N SAY

FUNDING SOURCES

COST BREAKDOWN	
Engineering	$ 67,923.00
Wood Placements	$ 400,320.00
Wood Acquisition	$ 75,000.00
Riparian Planting	$ 229,187.94
Total	**$ 772,430.94**



Hittitas Reclamation District

Washington State Recreation and Conservation Office
Salmon Recovery Funding Board

Washington State Conservation Commission

Bonneville Power Administration

POTENTIAL RESTORATION ACTIONS

- CONTINUE WOOD PLACEMENTS IN THE MIDDLE REACH OF THE RAGHEART SITE AND DOWNSTREAM OF INTERSTATE-90 ON TANEUM CREEK
- MULTIPLE PHASES WERE PRESENTED IN THE TECHNICAL MEMORANDUM SUBMITTED BY NATURAL SYSTEMS DESIGN FOR THE TANEUM CREEK RAGHEART SITE.
- POTENTIAL FUTURE PHASES INCLUDED:
  - CONTINUED RIPARIAN RESTORATION
  - ENGINEERED RIFFLES TO RAISE THE CHANNEL BED 2-4',
  - RIP RAP REMOVAL TO REPLACE WITH COMPLEX TIMBER REVETMENT,
  - FLOODPLAIN EXCAVATION TO RECONNECT OR PROMOTE SIDE CHANNEL AND ANABRANCH CHANNEL DEVELOPMENT
  - BRIDGE CROSSING MODIFICATIONS
  - IRRIGATION INFRASTRUCTURE MODIFICATIONS

THANK YOU

YKFP Yakima Basin Habitat A-TEAM

- NATURAL SYSTEMS DESIGN
- BCI CONTRACTING
- KITTITAS RECLAMATION DISTRICT
- KITTITAS COUNTY CONSERVATION DISTRICT
- WILDLANDS, INC.
- WASHINGTON DEPARTMENT OF FISH SND WILDLIFE
- U.S. BUREAU OF RECLAMATION
- BONNEVILLE POWER ADMINISTRATION
- WASHINGTON CONSERVATION COMMISSION
- WASHINGTON RECREATION AND CONSERVATION OFFICE

WILD SALMON NEED WILD RIVERS!
QUESTIONS?

Before

February 2021

After

February 2023