1

USDA Forest Service
Watershed Restoration
Enterprise Program

Layout, logistics, limitations, equipment types and timing

Brian Bair,
Watershed Restoration Projects Lead,
USDA Forest Service
Washington Office
Enterprise Program

2

The primary key to getting things on the ground is the “it” factor.

The it factor is the PASSION to leave the earth better than you found it.

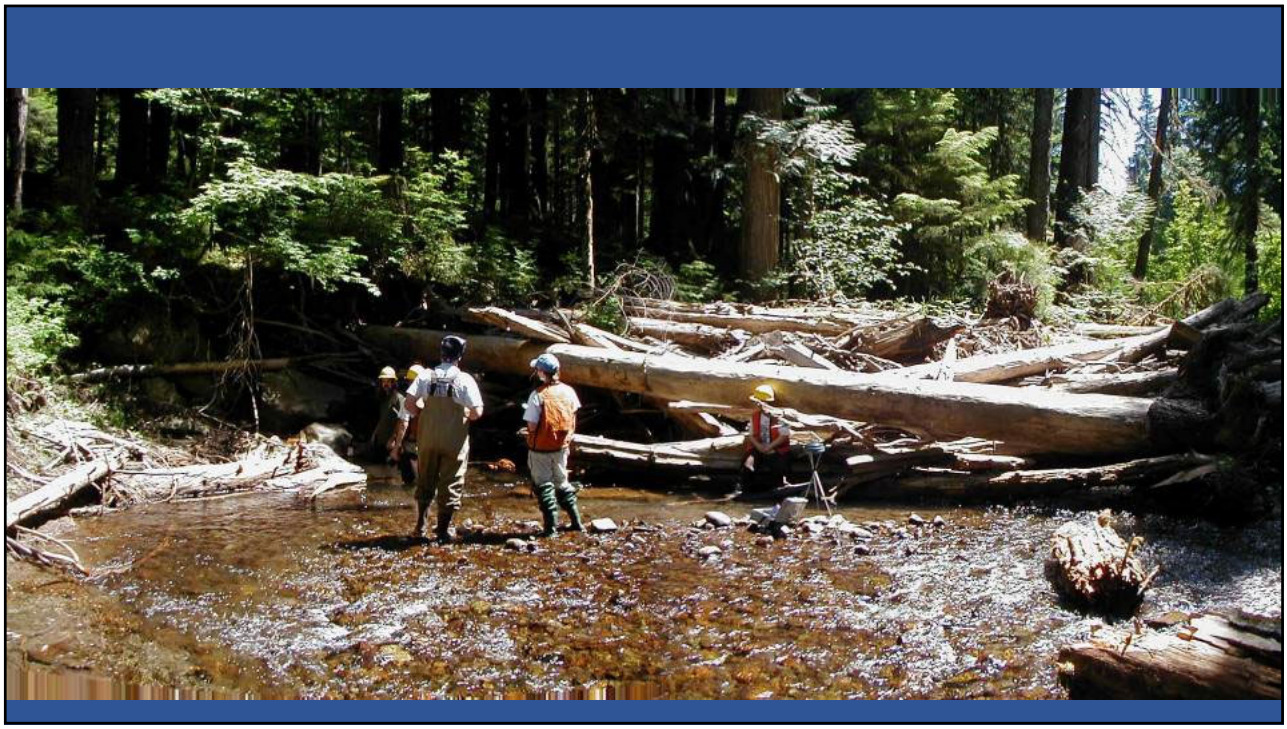
The *PASSION* to leave the earth a better place for the next generation.

The *PASSION* to be the voice for the creatures who cannot speak.

3

Once upon a time……

4



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Sixth field watershed condition summary based on the National Marine Fisheries Service Pathways and Indicators Criteria for threatened and endangered species, Wind River, Skamania County, Washington.

NMFS Matrix and Pathways Criteria	Lower Wind	Bear	Trout	Middle Wind	Dry	Falls	Upper Wind	Panther
Water Quality								
Maximum Water Temperature	16	17	25	21	17	16	16	12
Substrate (% fines < 1.6mm)	ND	ND	11%	14%	11%	ND	15%	14%
Turbidity (Max NTU)	107	26	46	39	25	4	35	46
Chemical contamination	PF	PF	PF	PF	PF	PF	PF	PF
Habitat Access								
Migration barriers	None	Falls/	Dam	None	Falls	Falls	Culverts	None
Habitat Elements								
Substrate (% fines < 1.6mm)	ND	ND	11%	14%	11%	ND	15%	14%
LWD Pieces/River Mile	ND	ND	26	40	55	81	51	78
Pools/Mile	ND	ND	25	23	31	31	35	56
Pool Surface Area/Volume Ratio	ND	ND	52	38	49	54	67	46
Off channel habitat	ND	ND	3%	3%	7%	6%	5%	ND
% Riparian area within Early Seral	17%	9%	40%	24%	16%	22%	15%	15%
% Riparian Area within Late Seral	30%	40%	27%	33%	37%	34%	22%	47%
Channel Conditions & Dynamics								
W/D Ratio (Low Flow)	ND	ND	14	11	7	ND	8	7
Streambank condition	PF	ND	NPF	NPF	NPF	PF	NPF	FAR
Floodplain Connectivity	PF	ND	NPF	NPF	FAR	PF	FAR	ND
Flow/Hydrology & Watershed Conditions								
Increased Peakflows	PF	PF	NPF	FAR	PF	FAR	NPF	NPF
% Watershed in Rain on Snow	33%	71%	85%	59%	78%	70%	84%	72%
ARP	92	95	85	87	94	82	82	85
Drainage network Increase	41%	12%	31%	30%	10%	24%	29%	23%
Road density	2.9	1.4	2.4	2.6	1.1	1.6	2.2	2.2
Landslide Risk								
PF = Properly Functioning								
FAR = Functioning at Risk								
NPF = Not Properly Functioning								
ND = NO DATA								

6

Stream reach ranking for the Wind River and tributaries, Skamania County, Washington.

	Restoration Reach Rating	Restoration Watershed Priority Factor	Stream Name	Stream Reach	6th Field H20shed	7th Field H20shed	Pool Quality Rating	Low Flow W/D Ratio Rating	LWD Rating	Channel Stability Rating	Riparian Rating
Refuge	135	27	E FK TROUT CK, rm 0.6-0.8, 09 92	3	Trout	Upper Trt	1	1	1	1	1
	108	27	E FK TROUT CK, rm 0.3-0.6, 09 92	2	Trout	Upper Trt	0	1	1	1	1
	81	27	E FK TROUT CK, rm 0-0.3 09 92	1	Trout	Upper Trt	0	0	1	1	1
	72	18	FALLS CREEK, rm 2.9-6.0, 09 98	4	Falls	Lower Flls	1	0	1	1	1
	60	20	PANTHER CK, rm 9.2-10.0, 09 94	7	Panther	Lower Pnt	1	0	0	1	1
	56	14	12 MILE CK, rm 0.0-0.5, 09 94	1	Panther	Upper Pnt	0	1	1	1	1
	54	18	FALLS CREEK, rm 1.6-2.9, 09 98	3	Falls	Lower Flls	1	-1	1	1	1
	48	24	COMPASS CREEK, rm 1.7-2.1, 09 93	3	Trout	Crtr/Cmps	1	1	-1	0	1
	27	9	PARADISE CK, rm 1.0-2.3, 09 93	2	Upper Wind	Paradise	1	0	0	1	1
	27	27	E FK TROUT CK, rm 0.8-0.8, 09 92	4	Trout	Upper Trt			-1	1	1
	26	26	SF PLANTING CK 09 92	2	Trout	Lower Trt	1	1	-1	0	0
	24	24	CRATER CREEK, rm 1.5-1.8, 09 93	2	Trout	Crtr/Cmps	1	1	0	0	-1
	24	24	COMPASS CREEK, rm 1.1-1.7, 09 93	2	Trout	Crtr/Cmps	1	0	-1	0	1
	21	21	DRY CREEK, rm 3.4-3.8, 09 92	2	Dry	Dry Cr	1	0	0	0	0
	20	20	PANTHER CK, rm 5.7-6.3, 09 94	3	Panther	Lower Pnt	1	-1	-1	1	1
	20	20	PANTHER CK, rm 6.3-6.9, 09 94	4	Panther	Lower Pnt	1	0	-1	0	1
	20	20	PANTHER CK, rm 7.7-9.2, 09 94	6	Panther	Lower Pnt	1	0	0	-1	1
	18	18	FALLS CREEK, rm 0.6-1.6, 09 98	2	Falls	Lower Flls	1	-1	-1	1	1
	16	16	UPPER WIND R, rm 27.9-28.5, 09 91	4	Upper Wind	Hdwtrs Wind	-1	-1	1	1	1
	16	16	UPPER WIND R, rm 25.3-27.0, 09 91	2	Upper Wind	Hdwtrs Wind	-1	-1	1	1	1
	16	16	UPPER WIND R, rm 27.4-28.4, 07 96	3	Upper Wind	Hdwtrs Wind	0	0	0	0	1
	14	14	10 MILE, rm 0.0-0.8, 09 94	1	Panther	Upper Pnt	0	0	-1	1	1
	10	10	PETES GULCH CK II, rm 0.5-0.6, 09 95	2	Upper Wind	Pete's			-1	1	1

Active

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GOALS AND OBJECTIVES

The specific goals and objectives for the 2023 Zig Zag Floodplain Restoration Project are as follows:

Goal 1. Restore and maximize natural production of, Chinook and coho salmon, steelhead and cutthroat trout within Still Creek. Restore and maximize salmonid productivity within the Zig Zag River by restoring stream channels, floodplains and off-channel aquatic habitat complexity to exceed standards required for optimizing salmonid population production.

Goal 2. Restore Channel Hydrology and Reconnect Stream Channels to Associated Floodplains. Reconnect stream channels to floodplains to allow for natural and frequent inundation to reduce high flow energy impacts to stream channels and aquatic habitat.

Objective 2A. Remove levees to decrease entrenchment ratios (Flood prone width/bankfull width) from 1:1 to greater than 3:1 (RM 1.5 – 2.1). Decreasing the entrenchment ratio will restore floodplain connectivity and allow natural flood flow inundation reducing impacts to stream channels and aquatic habitat.

Objective 2B. Increase the floodplain inundation acreages from 15 acres to greater than 24 acres. Increasing inundation acreages will maximize off-channel aquatic habitat and increase salmonid productivity.

Objective 2C. Reactivate 2,236 feet of historic side channels. Reactivating side channels will provide coho and Chinook with vital off-channel habitat and reduce main stem stream channel and aquatic habitat impacts.

9

Risk Assessment

During the initial site visit this should be foremost on you mind;

What is the land ownership above, below and within the project area? Where is the infrastructure?

Are there utilities, high voltage power lines, bridges, homes, campgrounds or buildings within or downstream?

Water recreation? Rafting, boating or inter-tubing?

Restoration NEPA should cover all these aspects however often one or more of the above get overlooked. ***You cannot ignore or overlook these aspects in your designs, logistics and implementation.***

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Table 1. Restoration design components and potential risks, causes and effects of failure

Treatment	Potential Failure Mode	Potential Effects of Failure	Potential Causes or Mechanisms	Risk Priority #, (1–10; 1 = low, 10 = high)	Design Checks
Formidable Multi-faceted Structures	Burial by incoming sediment	Project not effective	Insufficient design considerations	3	Allowable shear stress check
	Rapid lateral migration	Property or infrastructure damage	Improper design specifications	5	Design experience
	Erosion of opposite bank	Minimal, some sediment input	Improper design, placement or alignment	2	Design experience
	Structure displacement	Minimal, reduce design effectiveness	Improper material sizing, or design	3	Use largest cost-effective materials
	Excessive scouring of bed-BF channel shear 1.71 lb/sq ft	Potential to cause structure failure	Improper design	7	Follow design guidelines for structures, scour/ shear stress check
Gravel Bar and Point Bar Structures	Burial by incoming sediment	Minimal	Insufficient design capacity	3	Allowable shear stress check
	Rapid lateral migration	Property or infrastructure damage	Improper design, placement or alignment	5	Design experience
	Erosion of opposite bank	Minimal, some sediment input	Improper design, placement or alignment	2	Design experience
	Structure displacement	Potential to cause structure failure	Improper design	3	Follow design guidelines for structures

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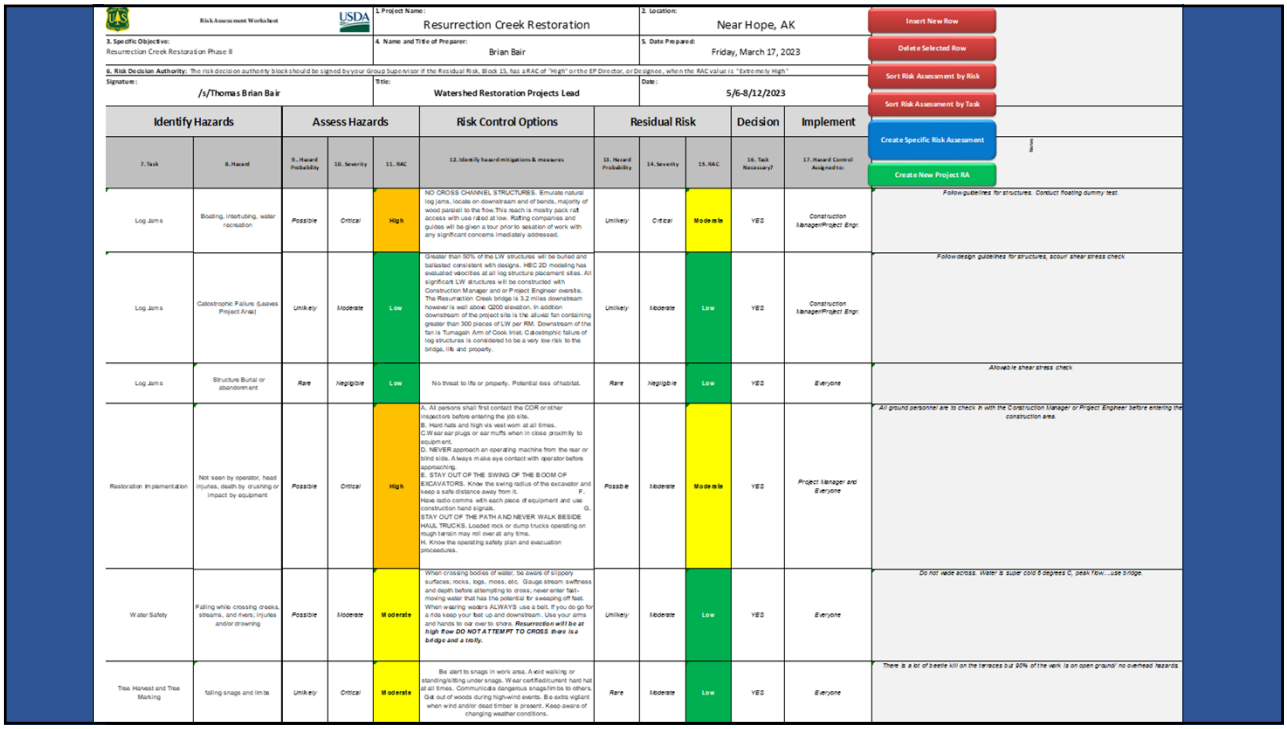

Risk Assessment Worksheet

1. Project Name:	Resurrection Creek Restoration
2. Location:	Near Hope, AK
3. Specific Objective:	Resurrection Creek Restoration Phase II
4. Name and Title of Preparer:	Brian Bair
5. Date Prepared:	Friday, March 17, 2023
6. Risk Decision Authority: The risk decision authority block should be signed by your Group Supervisor if the Residual Risk, Block 15, has a RAC of "High" or the EP Director, or Designee, when the RAC value is "Extremely High"	
Signature:	/s/Thomas Brian Bair
Title:	Watershed Restoration Projects Lead
Date:	5/6-8/12/2023

Insert New Row | Delete Selected Row | Sort Risk Assessment by Risk | Sort Risk Assessment by Task | Create Specific Risk Assessment | Create New Project RA

Identify Hazards		Assess Hazards			Risk Control Options	Residual Risk			Decision	Implement	
7. Task	8. Hazard	9. Hazard Probability	10. Severity	11. RAC	12. Identify hazard mitigations & measures	13. Hazard Probability	14. Severity	15. RAC	16. Task Necessary?	17. Hazard Control Assigned to:	Notes
Log Jams	Boating, intertubing, water recreation	Possible	Critical	High	NO CROSS CHANNEL STRUCTURES. Emulate natural log jams, locate on downstream end of bends, majority of wood parallel to the flow.This reach is mostly pack raft access with use rated at low. Rafting companies and guides will be given a tour prior to cessation of work with any significant concerns imediately addressed.	Unlikely	Critical	Moderate	YES	Construction Manager/Project Engr.	Follow guidelines for structures. Conduct floating dummy test.
Log Jams	Catastrophic Failure (Leaves Project Area)	Unlikely	Moderate	Low	Greater than 50% of the LW structures will be buried and ballasted consistent with designs. HEC 2D modeling has evaluated velocities at all log structure placement sites. All significant LW structures will be constructed with Construction Manager and or Project Engineer oversite. The Resurrection Creek bridge is 3.2 miles downstream however is well above Q200 elevation. In addition downstream of the project site is the alluvial fan containing greater than 300 pieces of LW per RM. Downstream of the fan is Turnagain Arm of Cook Inlet. Catastrophic failure of log structures is considered to be a very low risk to the bridge, life and property.	Unlikely	Moderate	Low	YES	Construction Manager/Project Engr.	Follow design guidelines for structures, scour/ shear stress check
Log Jams	Structure Burial or abandonment	Rare	Negligible	Low	No threat to life or property. Potential loss of habitat.	Rare	Negligible	Low	YES	Everyone	Allowable shear stress check
Restoration Implementation	Not seen by operator, head injuries, death by crushing or impact by equipment	Possible	Critical	High	A. All persons shall first contact the COR or other inspectors before entering the job site. B. Hard hats and high vis vest worn at all times. C.Wear ear plugs or ear muffs when in close proximity to equipment. D. NEVER approach an operating machine from the rear or blind side. Always make eye contact with operator before approaching. E. STAY OUT OF THE SWING OF THE BOOM OF EXCAVATORS. Know the swing radius of the excavator and keep a safe distance away from it. F. Have radio comms with each piece of equipment and use construction hand signals. G. STAY OUT OF THE PATH AND NEVER WALK BESIDE HAUL TRUCKS. Loaded rock or dump trucks operating on rough terrain may roll over at any time. H. Know the operating safety plan and evacuation procedures.	Possible	Moderate	Moderate	YES	Project Manager and Everyone	All ground personnel are to check in with the Construction Manager or Project Engineer before entering the construction area.
Water Safety	Falling while crossing creeks, streams, and rivers; injuries and/or drowning	Possible	Moderate	Moderate	When crossing bodies of water, be aware of slippery surfaces, rocks, logs, moss, etc. Gauge stream swiftness and depth before attempting to cross; never enter fast-moving water that has the potential for sweeping off feet. When wearing waders ALWAYS use a belt. If you do go for a ride keep your feet up and downstream. Use your arms and hands to oar over to shore. ***Resurrection will be at high flow DO NOT ATTEMPT TO CROSS there is a bridge and a trolly.***	Unlikely	Moderate	Low	YES	Everyone	Do not wade across. Water is super cold 5 degrees C, peak flow....use bridge.
Tree Harvest and Tree Marking	falling snags and limbs	Unlikely	Critical	Moderate	Be alert to snags in work area. Avoid walking or standing/sitting under snags. Wear certified/current hard hat at all times. Communicate dangerous snags/limbs to others. Get out of woods during high-wind events. Be extra vigilant when wind and/or dead timber is present. Keep aware of changing weather conditions.	Rare	Moderate	Low	YES	Everyone	There is a lot of beetle kill on the terraces but 90% of the work is on open ground/ no overhead hazards.

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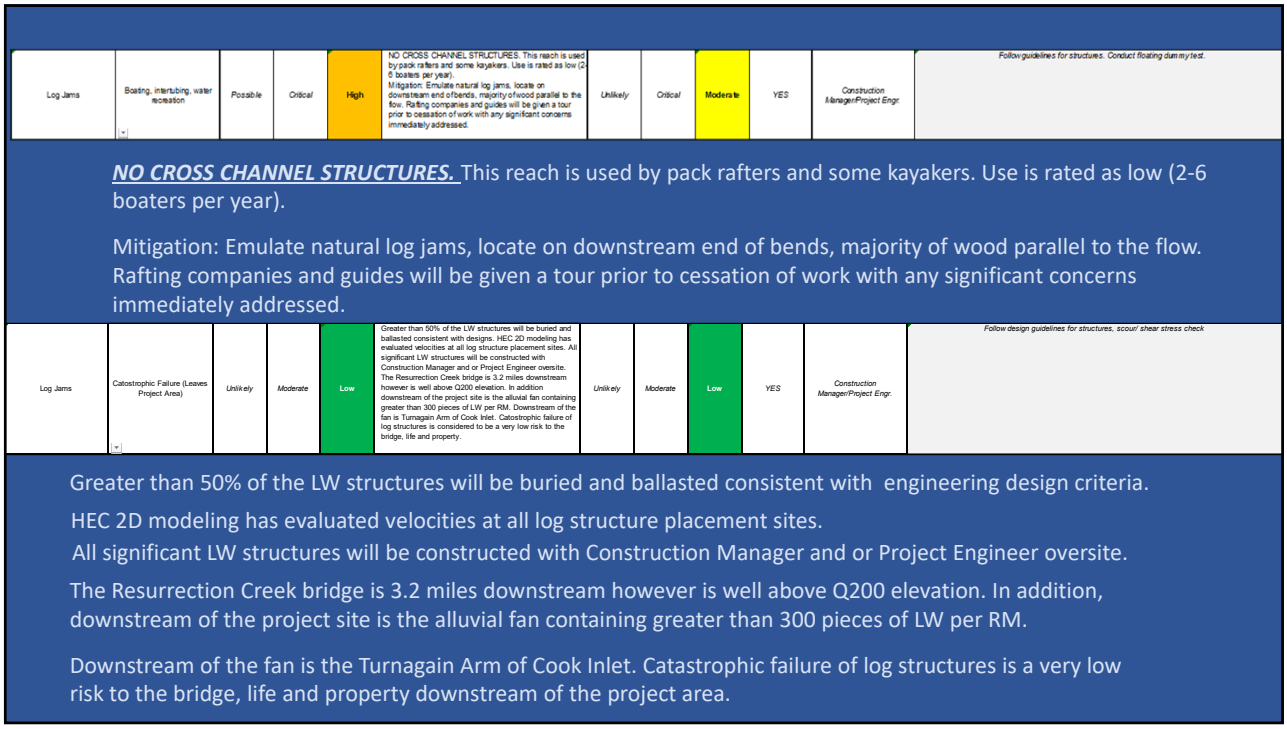

Log Jams	Boating, intertubing, water recreation	Possible	Critical	High	NO CROSS CHANNEL STRUCTURES. This reach is used by pack rafters and some kayakers. Use is rated as low (2-6 boaters per year). Mitigation: Emulate natural log jams, locate on downstream end of bends, majority of wood parallel to the flow. Rafting companies and guides will be given a tour prior to cessation of work with any significant concerns immediately addressed.	Unlikely	Critical	Moderate	YES	Construction Manager/Project Engr.	Follow guidelines for structures. Conduct floating dummy test.

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Log Jams	Catastrophic Failure (Leaves Project Area)	Unlikely	Moderate	Low	Greater than 50% of the LW structures will be buried and ballasted consistent with designs. HEC 2D modeling has evaluated velocities at all log structure placement sites. All significant LW structures will be constructed with Construction Manager and or Project Engineer oversite. The Resurrection Creek bridge is 3.2 miles downstream however is well above Q200 elevation. In addition downstream of the project site is the alluvial fan containing greater than 300 pieces of LW per RM. Downstream of the fan is Turnagain Arm of Cook Inlet. Catastrophic failure of log structures is considered to be a very low risk to the bridge, life and property.	Unlikely	Moderate	Low	YES	Construction Manager/Project Engr.	Follow design guidelines for structures, scour/ shear stress check

Greater than 50% of the LW structures will be buried and ballasted consistent with engineering design criteria.

HEC 2D modeling has evaluated velocities at all log structure placement sites.

All significant LW structures will be constructed with Construction Manager and or Project Engineer oversite.

The Resurrection Creek bridge is 3.2 miles downstream however is well above Q200 elevation. In addition, downstream of the project site is the alluvial fan containing greater than 300 pieces of LW per RM.

Downstream of the fan is the Turnagain Arm of Cook Inlet. Catastrophic failure of log structures is a very low risk to the bridge, life and property downstream of the project area.

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Site Access

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Temp Bridge?

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Harvest

Where?

Riparian areas?

Off Site?

Methods

Push- Pull?

Cut?

Salvage?

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Material Haul

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Stockpile Sites

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Contract
Time and Materials / Equipment
or
Construction Contract/ Lump Sum

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PERMITTING

NEPA

Archaeological Resources Protection Act (ARPA)

ACOE 401 & 404

State ????

Magnuson-Stevens Fishery Protection Act

FEMA Floodway?

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Permitting is not designed to speed things up….

It's designed to make sure you don't screw something else up…..

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Trinity River - Dutch Creek Reach Restoration Project

Trinity River Restoration Program

- Bureau of Reclamation
- U.S. Fish and Wildlife Service
- Hoopa Valley Tribe
- Yurok Tribe
- California Department of Water Resources
- California Department of Fish & Wildlife
- National Marine Fisheries Service
- U.S. Forest Service
- Trinity County

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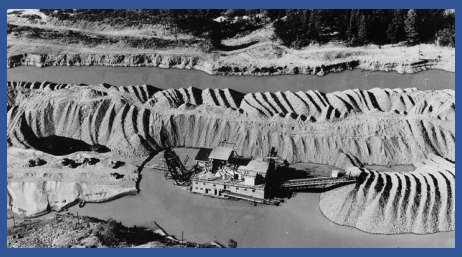
Photo 71. Hydraulic Mining of Bench Gravels, Trinity County. This is a 1933 scene at the Salyer mine. *Photo by Olaf P*

41



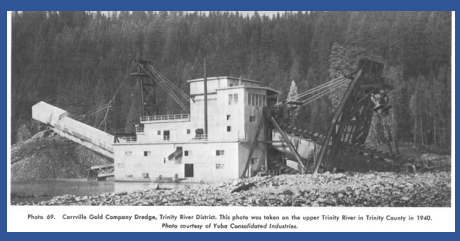


Photo 69. Carrville Gold Company Dredge, Trinity River District. This photo was taken on the upper Trinity River in Trinity County in 1940. Photo courtesy of Yuba Consolidated Industries.

Dragline Operation, Trinity River District. The photo was taken at Coffee Creek, Trinity County, i *Averill.*

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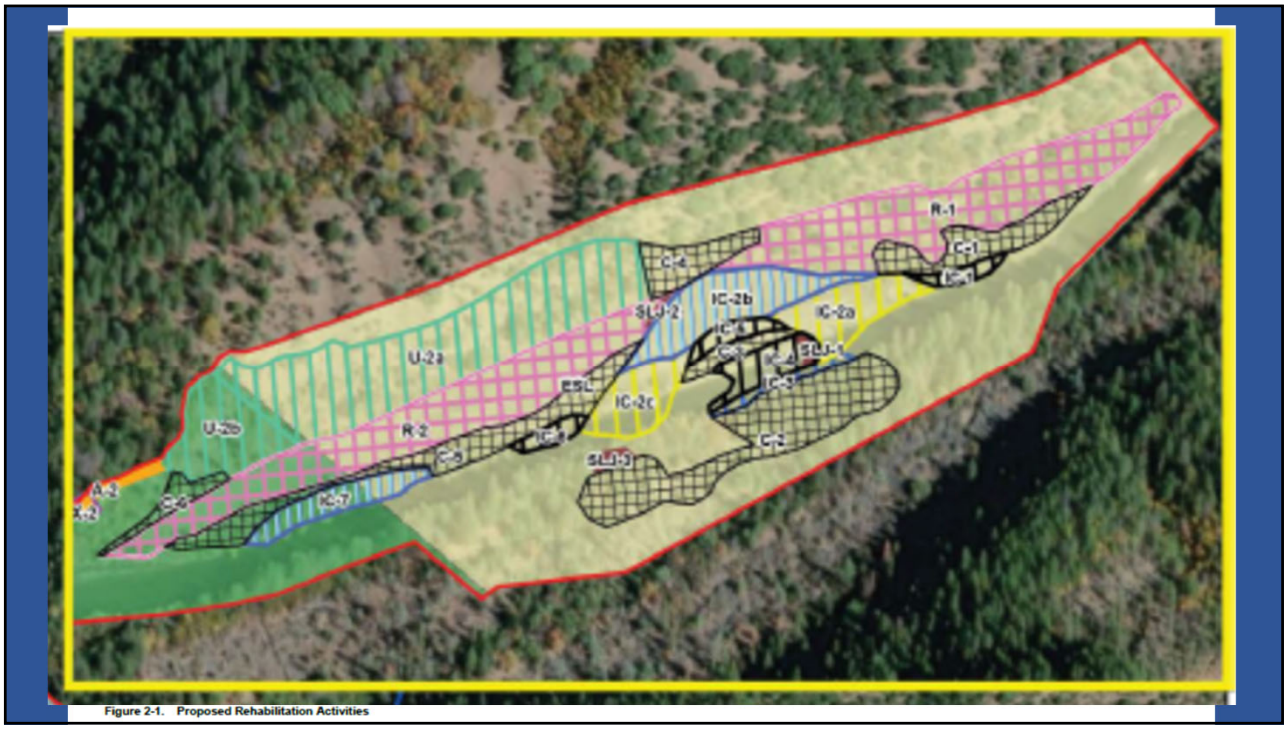

Figure 2-1. Proposed Rehabilitation Activities

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The level of restoration effort typically needs to be commensurate with the degree of the disturbance.

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RANCH RIVER RESTORATION PROJECT
Yurok Tribe and Hoopa Valley Tribe
Trinity River Restoration Program
Bureau of Land Management

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SF Skokomish Rehabilitation Project

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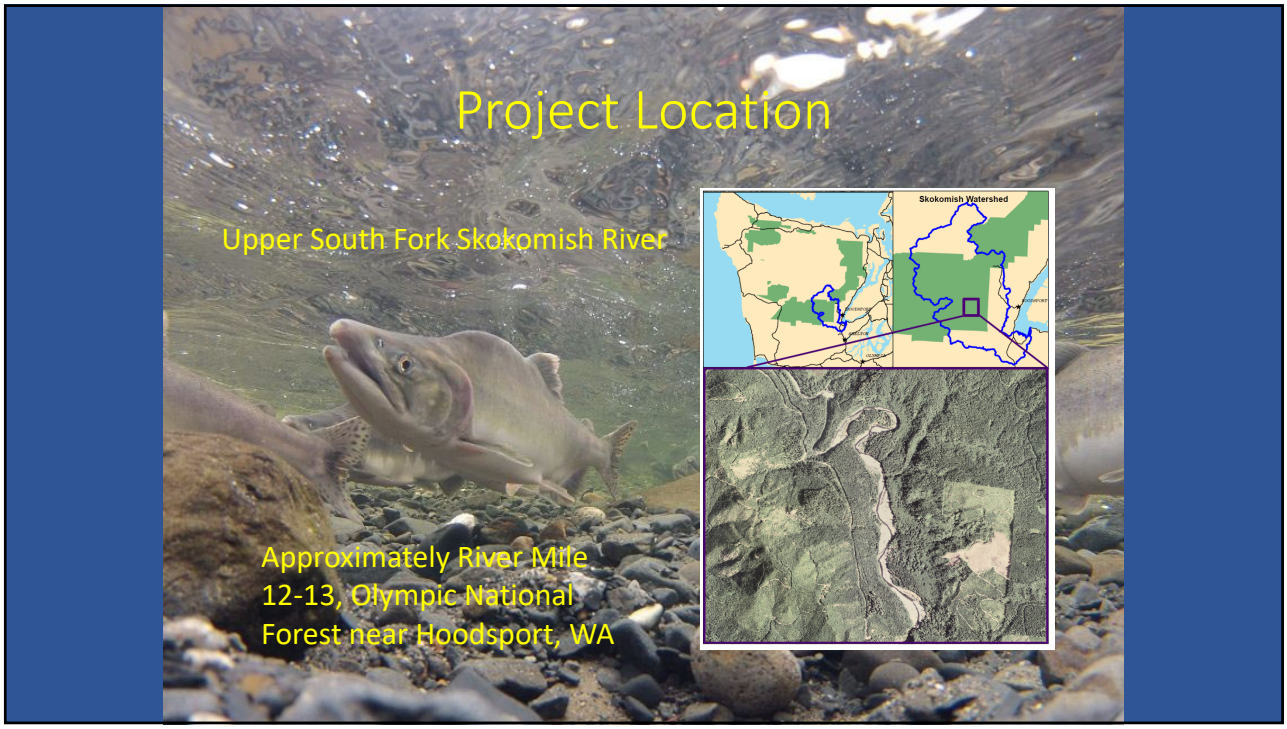
Project Location
Upper South Fork Skokomish River
Skokomish Watershed
Approximately River Mile 12-13, Olympic National Forest near Hoodsport, WA

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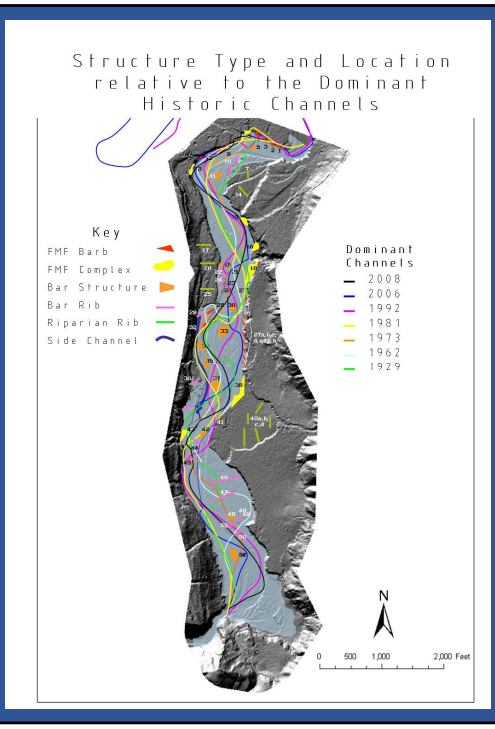
63

Fifty-three structures were designed to reduce coarse and fine sediment delivery, reduce low flow width to depth ratios, protect and reestablish riparian vegetation and flood plain function and last but not least restore fish habitat.

32 Structures were constructed in 2010. The rest were constructed in 2016.

Q1.2 ~ 8,500 cfs



64

SF Skokomish Rehabilitation Project

2150 trees from second growth timber units were pushed over and transported for the project

65

Because this is a big river ~6,000-8,000 cfs bankfull…(flood prone widths >600m) the floodplain and gravel bar structures were critical and needed to work in concert with the FMFs.

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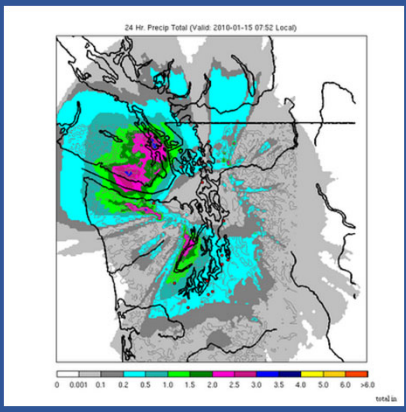
Restoration Law 1.0

After implementation of any stream restoration project, thou shalt be smythed with big water.

16,800 cfs 9th highest on record



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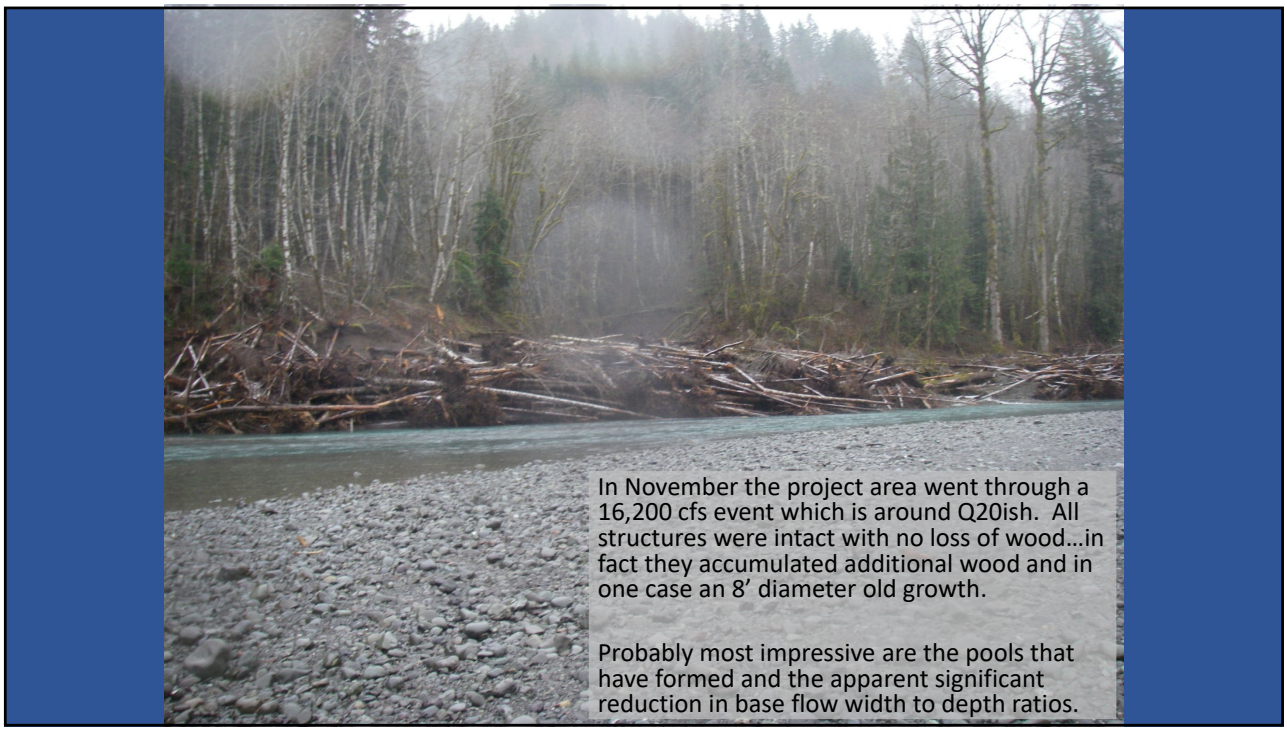
In November the project area went through a 16,200 cfs event which is around Q20ish. All structures were intact with no loss of wood…in fact they accumulated additional wood and in one case an 8' diameter old growth.
Probably most impressive are the pools that have formed and the apparent significant reduction in base flow width to depth ratios.

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Thalweg depth decreased over 2 feet on average through the project reach. Scour at this structure was 7.2 feet…

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On average gravel bar heights increased 2.4 feet through the project reach.

Max accumulation height was 6.6 feet

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Conclusions

- Gravel bars increased 2.4 feet on average throughout the project area
- The thalweg decreased on average -2.0 feet.
- Estimated sediment storage volume accumulated by the bar structures (bar deposition - thalweg scour) is 43,000 yd^3 or 9yd^3 for every linear foot of stream. So instead of producing 8,000 cy/year the project area is now storing
- As a consequence of the bar deposition and thalweg scour the channel forming ~ bankfull width / depth ratios decreased 49% and low flow w/d decreased 36%
- Pools greater than 5' residual pool depth doubled from 3 to 6 within the project reach.
- As far as durability goes this years flow was the 9th highest on record and we did not loose a stick. We did accumulate a lot of wood and even snagged an old growth tree.

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THE RIVER ALWAYS WINS!

When you see something that's working, measure it, try to understand what is creating it, and try to replicate it.

When you try you will sometimes fail.

But when you fail you learn.

When you learn, you will succeed.

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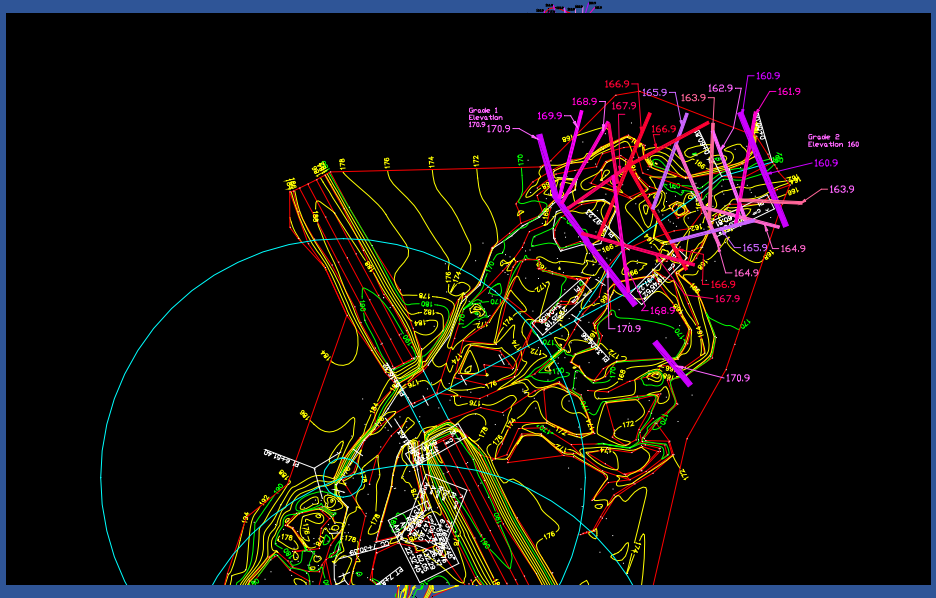

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QUESTIONS?

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