



# The Use of Large Woody Material on the Bird Track Springs Fish Habitat

Presenter: Nick Danis

We support the



UNITED NATIONS DECADE ON  
**ECOSYSTEM  
RESTORATION**  
2021-2030





# Meet the Presenter



## Nick Danis

August 22 / Session A

The Use of Large Woody  
Material on the Bird Track  
Springs Fish Habitat  
Enhancement Project



# Project Scope

- 5,000 Feet of Main Channel Construction
- 9,500 Feet of Side Channel Construction
- 1,200 Feet of Alcove Construction
- 2,000 Feet of Floodplain Swale Construction
- 300 Large Wood Structures Along with Numerous Additional Wood Placements
- 85,000 Cubic Yards of Cut/Fill Material





## U.S. Bureau of Reclamation (BOR)



## Confederated Tribes of the Umatilla Indian Reservation (CTUIR)



Stantec

### Stantec Roles:

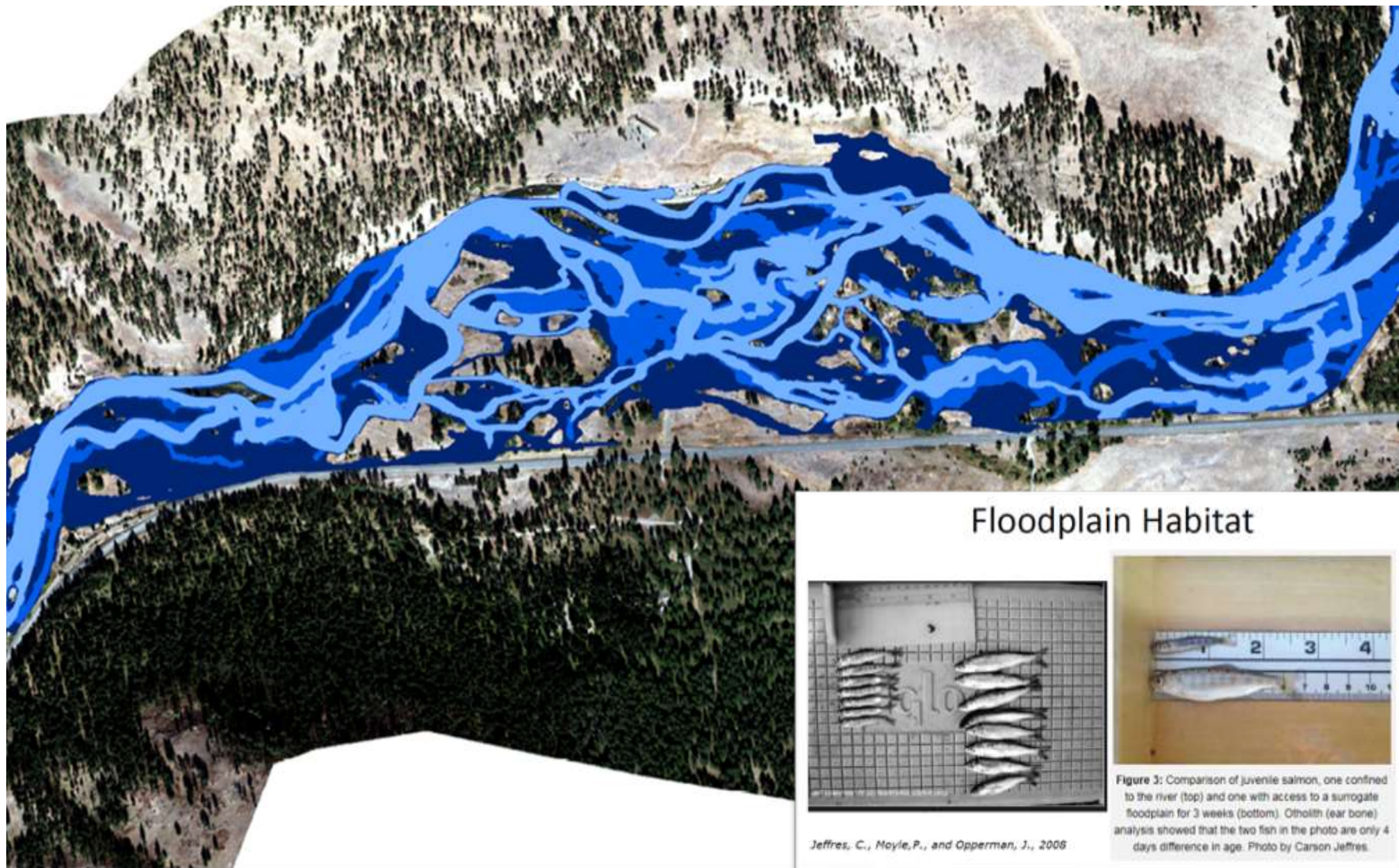
- Channel Dynamics & Floodplain Function Restoration
- Geomorphic, Groundwater, & Vegetation Assessments
- Engineering Design & Environmental Permitting
- Large Wood Structure Design
- Hyporheic Evaluation & Restoration Design
- Construction Observation & Engineering Support





# Floodplain Inundation

- River-Floodplain
- Channel and Hyporheic Complexity
- Channel Bed Diversity
- Summer Rearing Habitat
- Winter Rearing Habitat
- High Flow Fringe Habitat

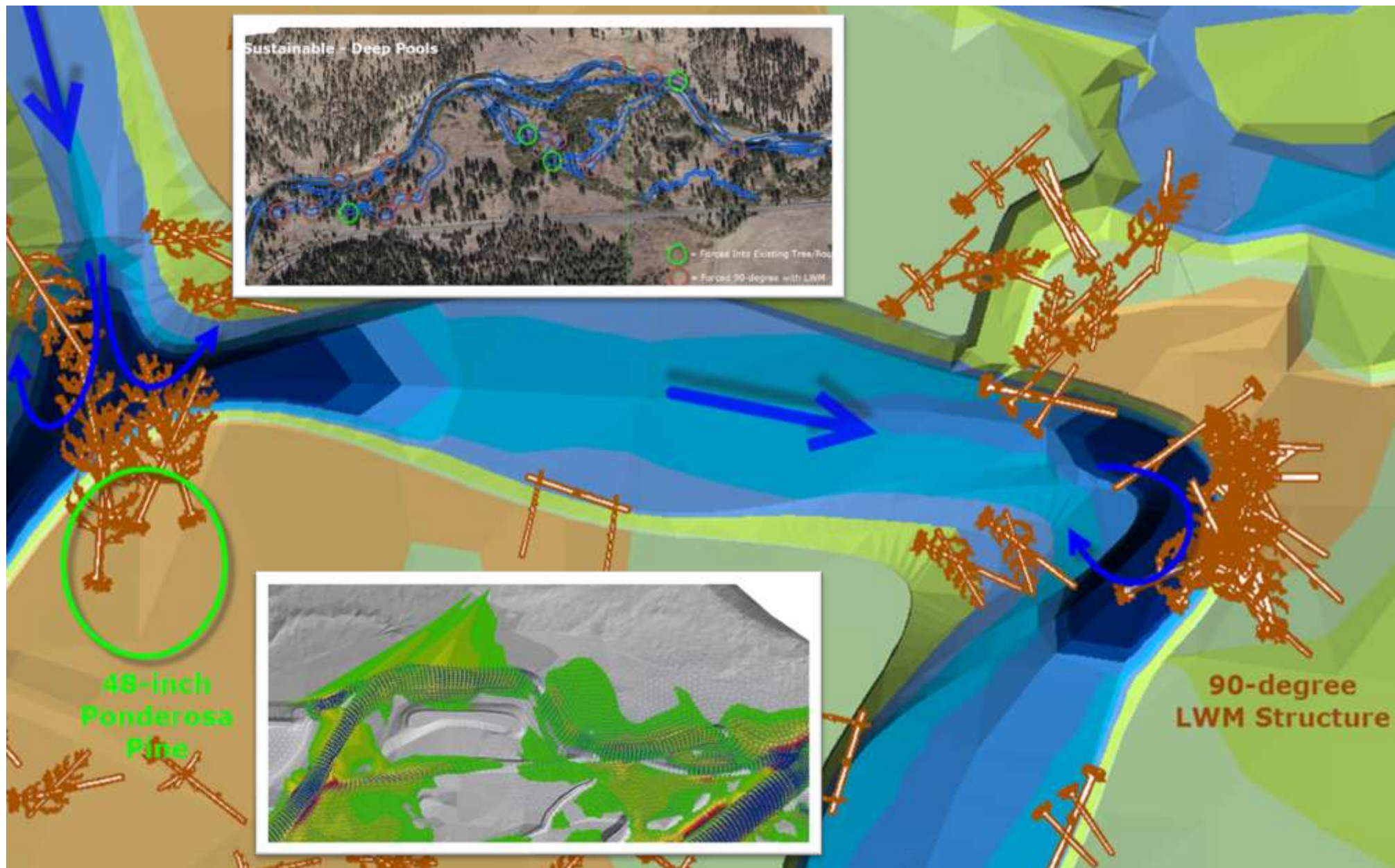






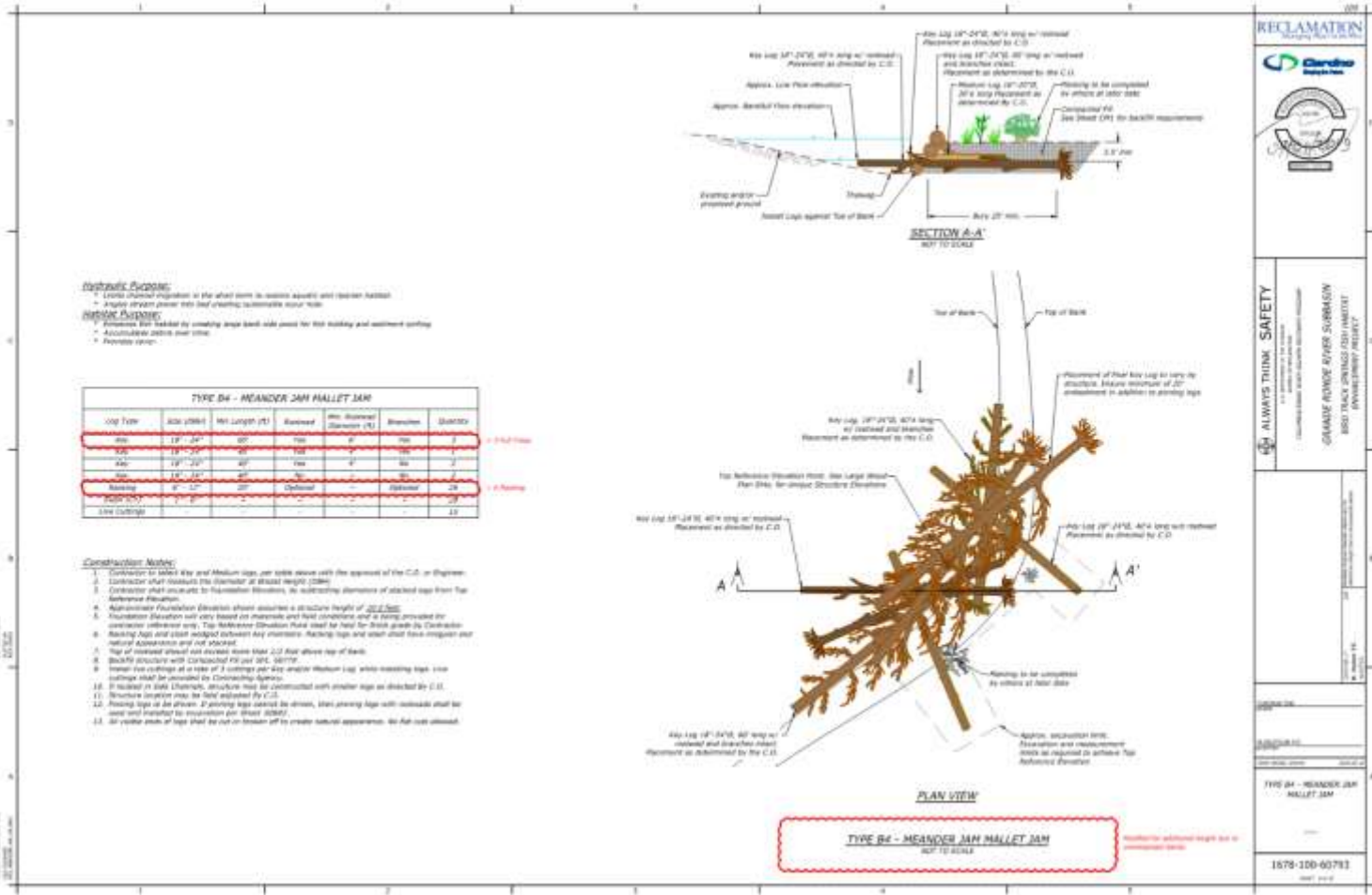
# Sustainable Deep Pools

- Utilize Existing Features
- Sharp 90° Bends
- 2D Hydraulic Model Output
- 10-year Shear Stress
- Criss-Cross Applesauce with Racking

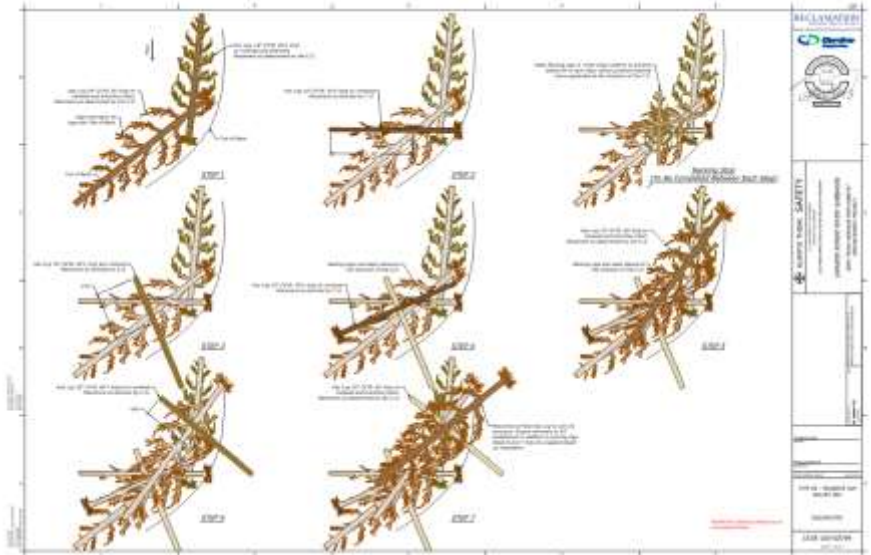




# Type B4 – Meander Mallet Jam



- Implemented During Construction
- Modified to match similar project with CTUIR
- Utilized “Jumbo Trees”
- Very Easy to Construct!

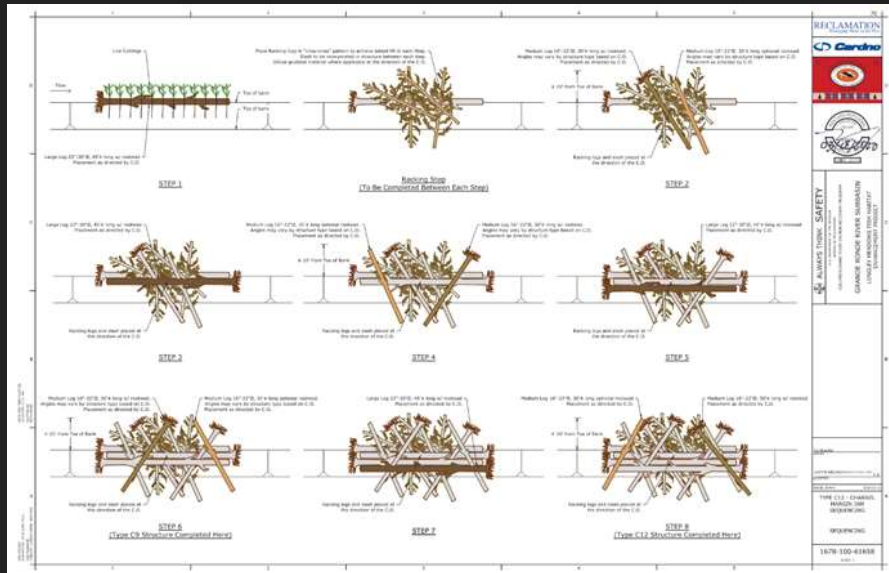






# Type C – Channel Margin Jam

- Easy to Construct
- Very Fishy!
- Fish Biologists have a Lot of Leeway During Construction
- Lots of Space for Racking
- Stackable based on Bank Height
- 3, 6, 9, or 12 Log Configurations



Structure ID	Station	Bank	Structure Type	Structure Description	Top Elevation	Foundation Elevation	Plan Sheet
HC-13	20+50	Right	C12	12-Log Channel Margin	3082.0	3068.0	61609
HC-15	20+90	Right	C12	12-Log Channel Margin	3082.0	3068.0	61609
HC-17	21+35	Right	C12	12-Log Channel Margin	3082.0	3068.0	61609
HC-18	23+90	Right	C12	12-Log Channel Margin	3082.0	3068.0	61609
HC-19	26+70	Left	C12	12-Log Channel Margin	3080.5	3066.5	61610
HC-21	27+10	Left	C12	12-Log Channel Margin	3080.5	3066.5	61610
HC-22	28+85	Right	C12	12-Log Channel Margin	3080.5	3066.5	61610
HC-23	29+20	Right	C12	12-Log Channel Margin	3080.5	3066.5	61610
HC-25	29+80	Right	C12	12-Log Channel Margin	3080.5	3066.5	61610
HC-28	30+30	Right	C12	12-Log Channel Margin	3080.5	3066.5	61610
HC-38	34+70	Left	C12	12-Log Channel Margin	3080.0	3066.0	61611
HC-52	42+10	Right	C12	12-Log Channel Margin	3076.0	3062.0	61612
HC-53	42+30	Right	C12	12-Log Channel Margin	3076.0	3062.0	61612
HC-55	42+70	Right	C12	12-Log Channel Margin	3076.0	3062.0	61613
HC-57	43+05	Right	C12	12-Log Channel Margin	3076.0	3062.0	61613

**Hydraulic Purpose:**

- Temporarily stabilize new banks in the short term to restore aquatic and riparian habitats.
- Maximize instar holes by flow divergence.
- Dissipate high flows into side channels and backflats.
- Sort and retain grain.

**Habitat Purposes:**

- Create diverse fish habitat along channel margins.
- Provide cover.

TYPE C12 - 12-LOG CHANNEL MARGIN JAM						
Log Type	Size (DBH)	Min Length (ft)	Rootwad	Min. Rootwad Diameter (ft)	Branches	Quantity
Large	22" - 30"	45'	Yes	5'	No	6
Medium	18" - 22"	30'	Yes	4'	No	6
Medium	16" - 22"	30'	Optional	-	No	6
Racking	10" - 16"	20'	Optional	-	Optional	20
Slash (CV)	1" - 6"	5'	-	-	Yes	60
Live Cuttings	-	-	-	-	-	36

*Note: DBH = Diameter at breast height.*

**Construction Notes:**

- Contractor to select Large and Medium logs, per table above with the approval of the C.O.
- Contractor shall excavate to Foundation Elevation, by subtracting diameters of stacked logs from Top Reference Elevation. Approximate Foundation Elevation shown assumes a structure height of 34.0 feet. Foundation Elevation will vary based on materials and field conditions and is being provided for contractor reference only. Top Reference Elevation line shall be used for final grade by contractor.
- Contractor shall place logs as depicted in sequence plans on Sheet 61613.
- Racking logs and slash wedged between Large and Medium Logs. Racking logs and slash shall have irregular and natural appearance and not stacked.
- Medium Log shall be placed so its upstream end rests on stream bed, and its downstream end is embedded into 4" backfill and compacted around Medium log with Compacted Fill per Sheet 61643.
- Backfill structure with Compacted Fill per Sheet 61643.
- Install live cuttings at a rate of 3 cuttings per Large and/or Medium Log and/or racking logs. Live cuttings shall be installed near face of each structure within excavated limits as directed by C.O. Live cuttings shall be placed such that a minimum of 4" of cutting is submerged below water table. Live cuttings shall be backfilled with excavated materials and compacted. Live cuttings shall be provided by Contracting Agency.
- If installed in Side Channels, structure may be constructed with smaller logs as directed by C.O.
- Structure location may be later adjusted by C.O.
- All Large and Medium Logs to be brought to structure location in 4x4 lengths. Logs longer than 30' length, shall be broken to length. Any remaining length shall be used in structure as additional racking material.
- All cut ends of logs shall be cut or broken off even if buried to create natural appearance. No flat cuts allowed.

**TYPE C12 - 12-LOG CHANNEL MARGIN JAM**  
NOT TO SCALE

RECLAMATION  
Colorado

Cardno

GRANDE RONDE RIVER SUBBASIN  
LONGLEY WETLANDS FISH HABITAT  
ENHANCEMENT PROJECT

ALWAYS THINK SAFETY

AUSTIN MELLEN

TYPE C12 - 12-LOG CHANNEL MARGIN JAM

1678-100-61657





# Roughened Edge Bank Treatment

- Great Bank Protection
- Utilizes Smaller Wood
- Incorporates Live Cuttings
- Linear Feature and Easy to Quantify
  - Short Roughened Edge < 4'
  - Tall Roughened Edge > 4'



**SECTION A-A' SHORT ROUGHENED EDGE**

**SECTION A-A' TALL ROUGHENED EDGE**

**ROUGHENED EDGE BANK TREATMENT**

**ROUGHENED EDGE BANK TREATMENT**

**NOT TO SCALE**

Roughened Edge Material Schedule (Per 40 ft Length)						
Log Type	Size (DBH)	Min Length (ft)	Rootwad	Min. Rootwad Diameter (ft)	Branches	Quantity
Medium	18" - 22"	40'	No	-	-	1
Racking	10" - 16"	20'	Yes	3"	-	4
Racking	10" - 16"	20'	Optional	-	Yes	2
Racking	10" - 16"	20'	Optional	-	-	36***
Slash (C*)	1" - 6"	5'	-	-	-	20

\* DBH = Diameter at breast height  
 \*\* Quantities listed above and associate with Short Roughened Edge for banks less than 5' in height. For Tall Roughened Edge for banks greater than 5' in height, quantities for racking and slash should be doubled.  
 \*\*\* Additional racking logs may be required based on field conditions and bank height. Placed at the direction of the C.O.  
 \*\*\*\* For quantities associated with Live Brush Layer see Sheet 61665.

**Construction Notes:**

1. Roughened Edge Bank treatment shall be constructed at locations as shown on the plans. The exact location of each occurrence of bank roughness shall be staked by the Contractor and approved by the C.O. prior to constructing a particular occurrence.
2. Medium log (header) shall be placed so its upstream end rests on the stream bed, with 1/2 the log embedded into bank. Backfill and compact around header log with Compacted Fill.
3. Racking logs with rootwads shall be installed on top of Medium log. Rootwads shall be placed over top of header log with rootwad so close to bank as possible and as directed by C.O.
4. Place general fill over placed materials and compact to create an approximate 45-degree surface for installation of Live Brush Layer.
5. Construct Live Brush Layer per detailed on Sheet 61665.
6. Place Compacted Fill per Sheet 61643 from excavation on Brush Layer such that all void spaces are filled and compact.
7. Place Racking Logs, 20' x long with branches parallel to bank and along bank at top of structure, pin with two Racking Logs, 10' x long angled with exposed ends downstream to flow. Ensure that Racking logs are not too steeply vertically angled from front to back by placing fill at backside as necessary. Racking logs shall be placed such that vertical angle is between 0° and 10°.
8. Backfill to top of angled logs with compacted fill per Compacted Fill Sheet 61643.
9. Place slash along top of backfill at bank edge as directed by C.O.
10. Repeat Steps 5,6,7, and 9 at the direction of the C.O. until desired height of bank protection is achieved.
11. Backfill to F.U. Backfill shall be placed in 6" lifts, with the first lift to be washed into the Live Brush Layer with water to eliminate voids. Supplemental lifts shall be compacted per Compacted Fill Sheet 61643.

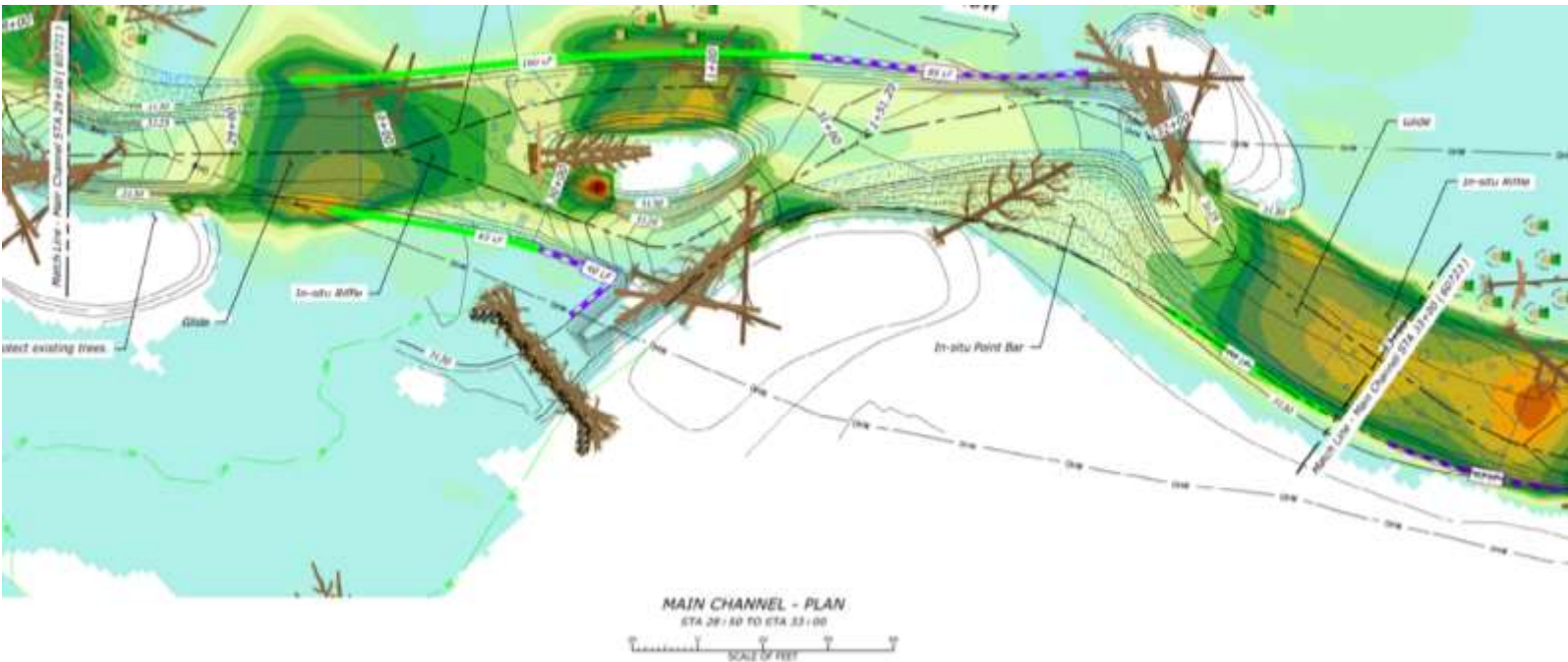
RECLAMATION  
Managing Rivers & Wetlands

GRANDE RONDE RIVER SUBBASIN  
LONGVIEW RACKING LOGS BANKREAT  
ENHANCEMENT PROJECT

ALWAYS THINK SAFETY  
U.S. DEPARTMENT OF THE ARMY  
CORPORATION FOR FINANCIAL PROGRAMS

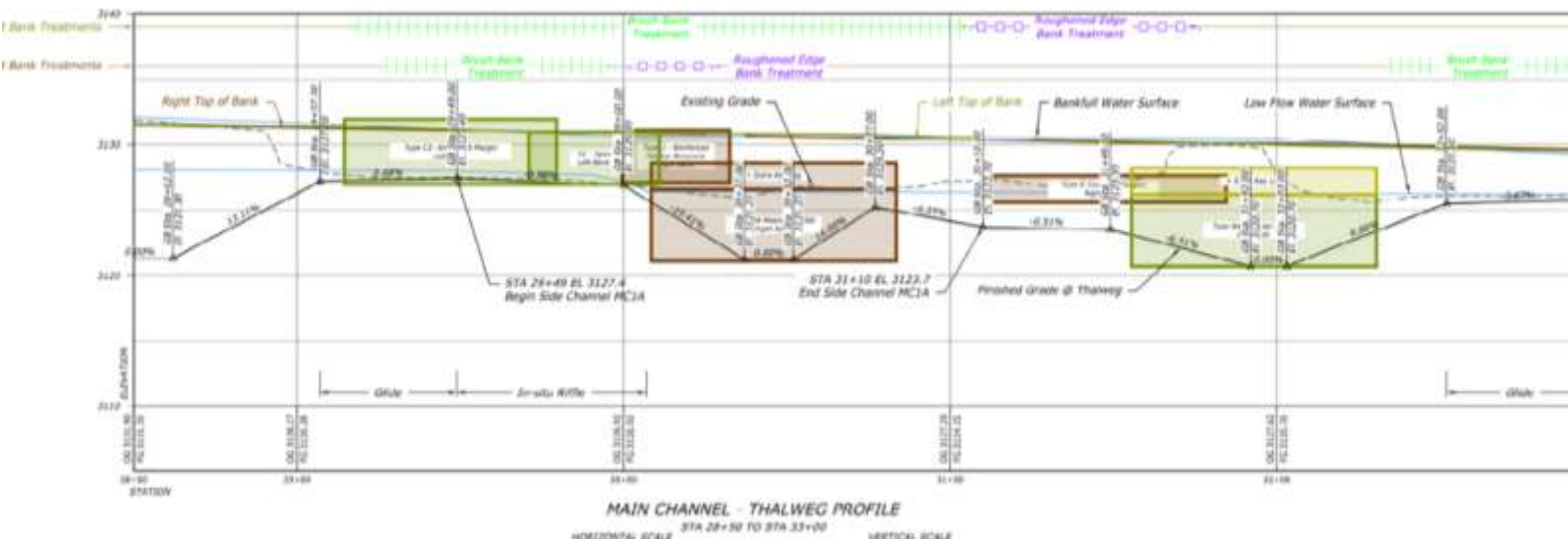
JUSTIN MELLEN  
1678-100-61664  
SHEET 1





# Sheer Stress Overlays

- Dynamic Block for Profiles
- Includes Structure Type
- Left Bank or Right Bank
- Height of Structure
- Length of Structure







# Type I – Ice Crib Jam

- Channel Splitting Structure at Area of Ice Flow Reoccurrence

TYPE I - ICE CRIB JAM						
Log Type	Size (DBH)	Min. Length (ft)	Rootwad	Min. Rootwad Diameter (ft)	Branches	Quantity
Key	18" - 24"	45'	Yes	4'	Yes	2
Key	18" - 24"	45"	Yes	4'	No	24
Key	18" - 24"	45"	No	-	No	9
Key	18" - 24"	35'	No	-	No	1
Key	18" - 24"	30'	Yes	4'	No	2
Medium	12" - 18"	30'	Optional	-	No	7
Racking	6" - 12"	20'	Optional	-	Optional	25
Pinning	12"	20'	Yes	3'	No	19
Constructed Riffle Material	-	-	-	-	-	50 CY
Threaded Rod	-	-	-	-	-	26
Live Cuttings	-	-	-	-	-	80







# Threaded Rod Connections

- 1" Threaded Rod
- 4" Washer
- 1" Nut
- 1 ¼" Drill Bit with 2-3 Extensions
- 1/2 in. Hole Hawg Drill 900 RPM Reversing
- Portable Gas Generator
- This Magical DeWalt Bandsaw





# Large Wood Staging

- 338 Large Wood Structures
- 605 Floodplain Roughness Structures
- 4,000+ Trees

Log Type	DBH	Count
Large Full Tree	>18"	34
Key w/ RW	>18"	299
Key w/o RW	>18"	106
Medium Full Tree	12" – 18"	74
Medium w/ RW	12" – 18"	170
Medium w/o RW	12" – 18"	255
Small Tree w/ RW	6" – 12"	435
Small Tree w/o RW	6" – 12"	2343
Tree Top	6" – 12"	123
Slash	-	3760 CY







**Big Bend – After Season 2 Repair**





## Main Channel Side Channel 5 (Chicken Foot)

Deigned around large existing trees  
(Existing trees will eventually fall into channel and  
support dynamic channel network)

LWM Structures were modified to for field fit

Very complex multithread split

- Side Channel 5 (Left)
- Main Channel (Middle)
- Side Channel 10 (Right)

(Existing trees will eventually fall into channel and  
support dynamic channel network)





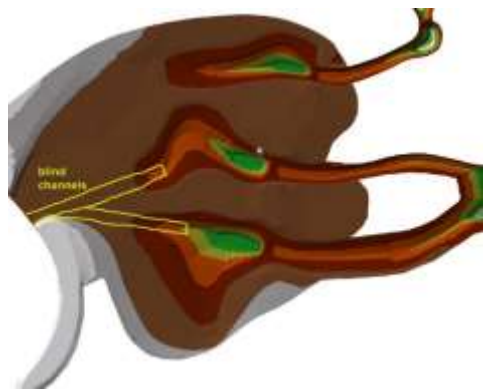
**Main Channel and Side Channel 5  
(Chicken Foot)**





## Staging Area Swale Complex

- Add-on During Construction to Utilize Staging Area for Added Habitat
- Additional Fill Material Needed to Fill Existing Channel
- Blind Channel Entrance





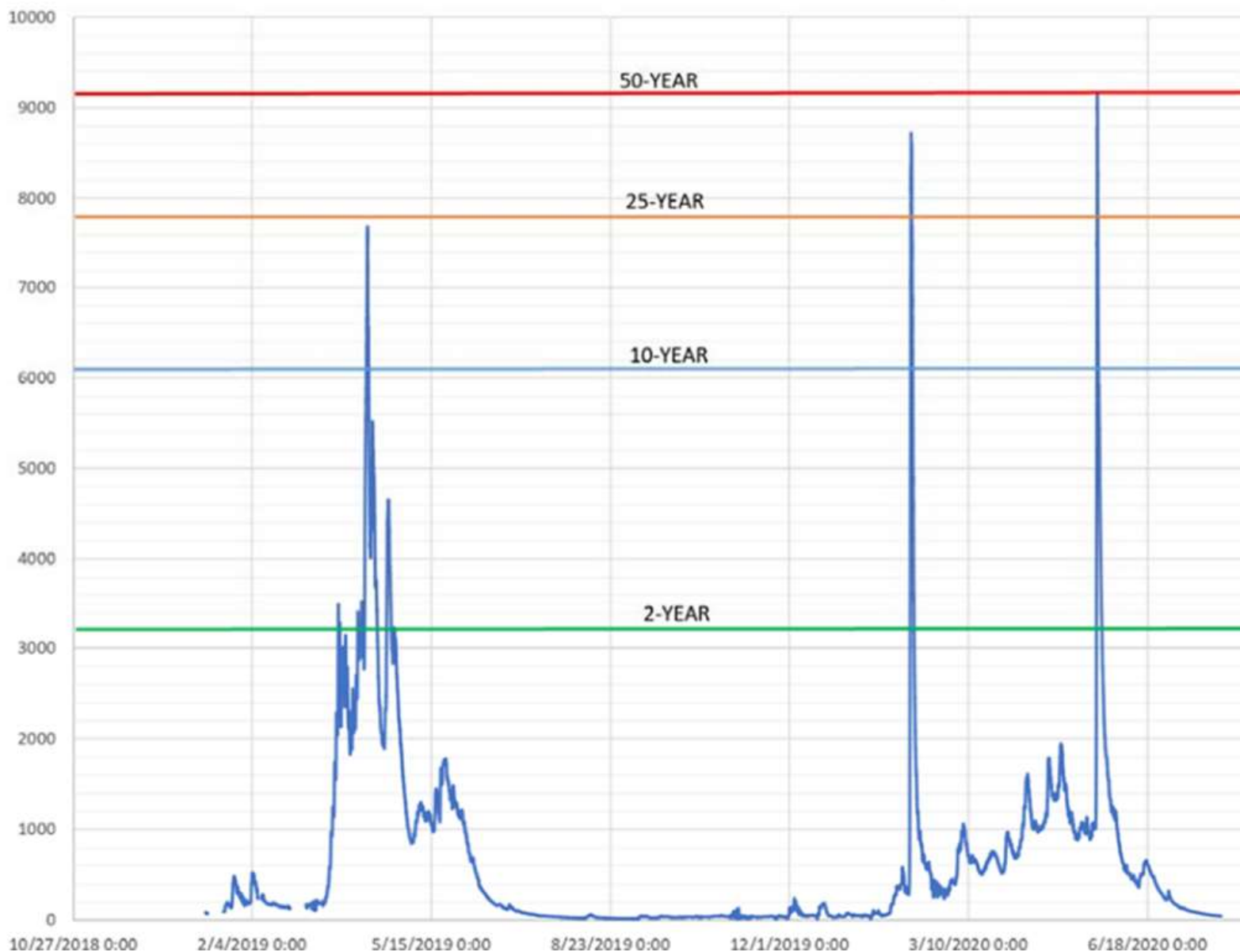


## Side Channel 3 Complex





Grande Ronde near Perry Discharge (CFS)



## Lessons Learned

High Flows Suck!

- 1-25 Year Event
- 2-50 Year Events

It happens every project.  
Get used to it

What do we do about it?

- Remember that we are working with natural dynamic systems
- Expect changes
- Add redundancies within design
- Don't overdesign





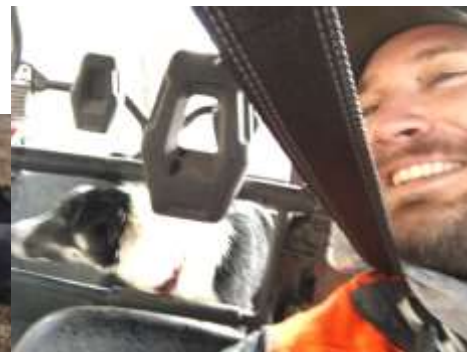
Year	Number	Specific Topic	General Topic	Lesson/Discussion	Additional Notes	Responsible Party
2019	46	Earthwork	Plan Set	Lower the backside of islands in the middle of the channel to reduce stresses on outer banks.	• Similar to reasoning behind pulling back point bars.	• BOR
2019	47	Earthwork	Plan Set	Staging Area 1 Swale Complex.	• Certain Staging Areas are going to get demolished with high traffic. • Don't be afraid to regrade them to create a super habitat friendly feature.	• BOR • Cardno • CTUIR
2019	48	Earthwork	Construction	Earthwork Imbalance	• BOR to fill in on Year 2 Document and Nick will summarize and transpose	• BOR
2019	49	Earthwork	Construction	Compaction	• BOR to fill in on Year 2 Document and Nick will summarize and transpose	• BOR
2019	50	Earthwork	Construction	Contingencies for Imbalance	• BOR to fill in on Year 2 Document and Nick will summarize and transpose	• BOR • Cardno • CTUIR
2019	51	Earthwork	Construction	Contingencies if material is different than expected. (Referring to Side Channel 3 and Side Channel 5)	• Lay back top of bank • import material in critical areas • Add additional LWM and Bank Treatments as necessary.	• BOR • Cardno • CTUIR
2019	52	Earthwork	Construction	How much topsoil are you actually going to have? What do if you have too much unsuitable fill material.	• Upwards of 4 feet of topsoil in some areas.	• BOR • CTUIR
2019	53	Earthwork	Construction	Fill Pads and Critical Fill Areas	Concerns after 2019 Flow Event • Increased bank protection to ensure project success • Lack of quality fill material	
2019	54	Earthwork	Construction	Fill Berm in Side Channel 10	• Think about modeling results vs what is critical for project success.	
2019	55	Earthwork	Construction	Boulder Salvage	• Better game plan for Boulder Salvage so contractor only collects the necessary quantity.	• BOR • Cardno • CTUIR
2019	56	2019 Flood Event	Construction	Peak flood event in 2019. What did we learn?	• BOR to fill in on Year 2 Document and Nick will summarize and transpose	• BOR • Cardno • CTUIR

## Lessons Learned Documentation





# Construction Site Living







# Questions?



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