Two Rivers Side Channel and Mainstem Channel Fish Habitat Enhancement Project

Presentation to the Clackamas River Mitigation Fund Committee

AQUATIC CONTRACTING

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FOREST SERVICE
US
DEPARTMENT OF AGRICULTURE

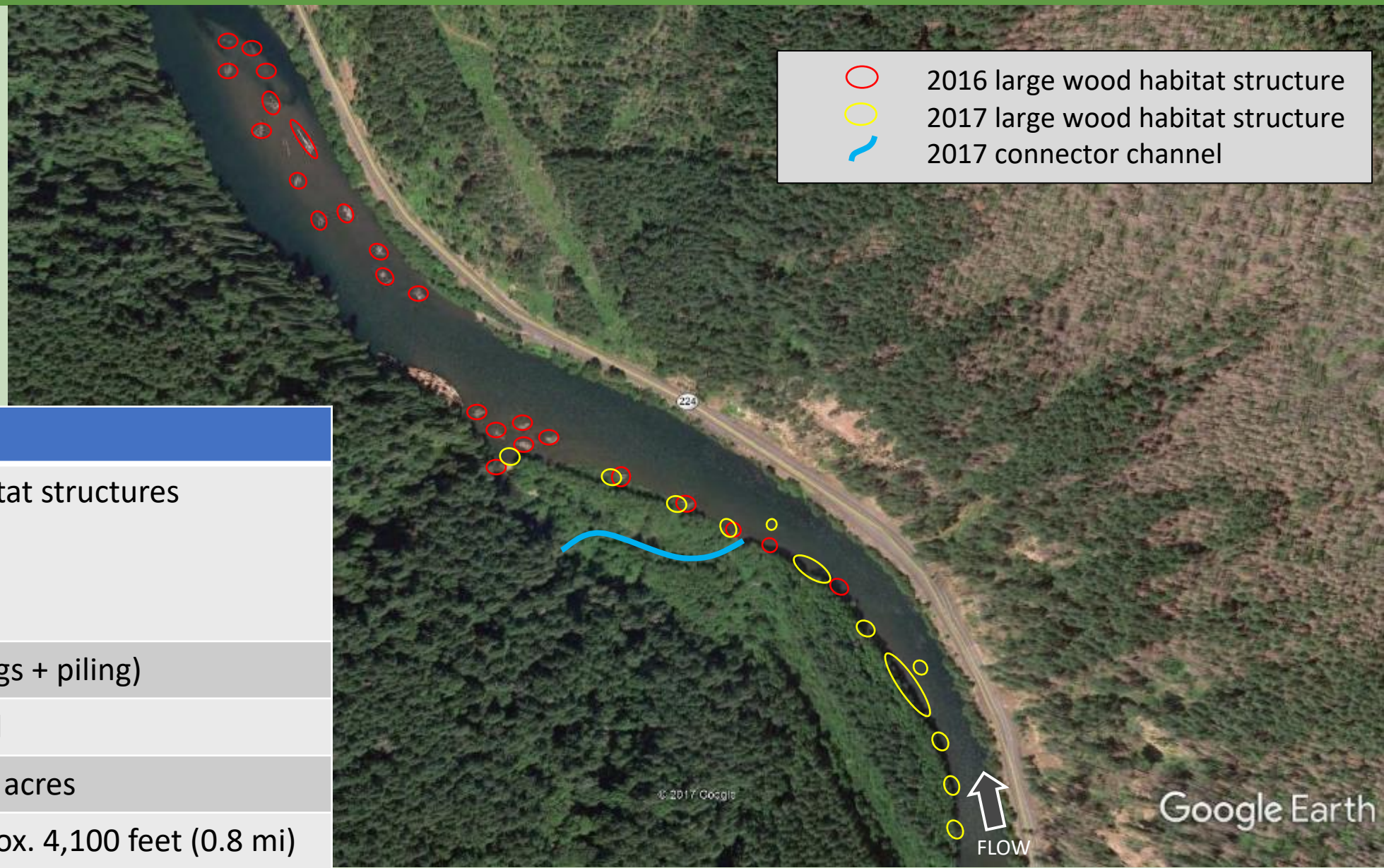
July 16, 2019

Project Team Clackamas River History

- As a team
  - OGF side channel construction and main channel habitat feature construction (2014)
  - North Fork Reservoir Large Wood Fish Enhancement Project (2016, 2017)
- Individually
  - McBain Associates (MA) since 2001: PGE FERC relicensing, study plan development and program implementation, habitat restoration projects.
  - Aquatic Contracting since 2004: habitat restoration projects construction and design-build.
  - USDA-FS since the beginning of time: MHNF Clackamas River Ranger District basin-wide fisheries habitat restoration.

North Fork Reservoir Large Wood Fish Habitat Project

PROJECT TOTAL
33 individual large wood habitat structures ○ 9 deep water ○ 11 shallow water ○ 13 apex jams
Approx. 600 logs (root wad logs + piling)
One 640-ft connector channel
Project footprint = approx. 19 acres
Project channel length = approx. 4,100 feet (0.8 mi)



Two Rivers Site Overview

- Site is a 4.25-acre point bar and 1,000 ft side channel, one of the largest bar/side channel combinations upstream of North Fork Reservoir and second largest active alluvial bar on upper Clackamas River between the OGF and the Collawash River.
  - Alluvial bars with flowing side channels provide critical year-round habitat for all salmonid life stages.
  - Site is located 25 miles upriver of North Fork Reservoir, one of only 8 large alluvial bars with side channels exist.
  - Only one additional bar with side channels exist between the site and the OGF confluence (4 mile reach).

Two Rivers Site Overview

- Site's restoration potential recognized and prioritized previously (USDA-FS, WPN).
- USDA-FS habitat enhancement effort in 2010.
  - Increased side channel habitat complexity and habitat availability by adding large wood, boulders, and enhancing pools.
  - High flow events following construction have caused aggradation at the side channel entrance and exit, and redistributed habitat logs.

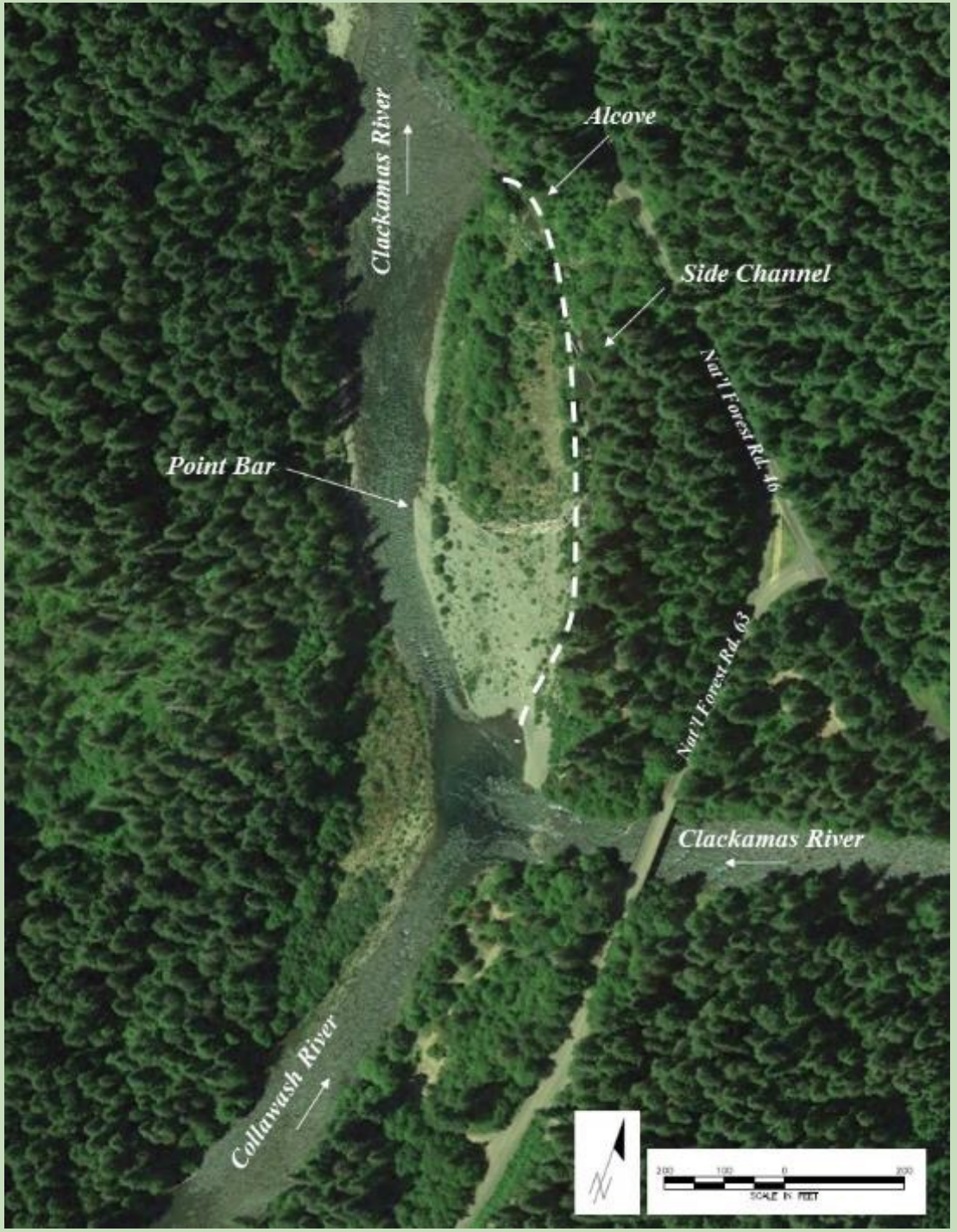
Two Rivers Site Overview (cont'd)

- Current conditions: summer baseflows backwater into downstream side channel alcove, residual pools maintained via hyporheic flow (no continuous side channel flow until moderate or high mainstem flows).
- Most USDA-FS work is in dry channel during summer months.

Two Rivers Site Overview (cont'd)

- Side channel loss is one of the primary habitat limitations in the upper Clackamas River (WPN 2005)
- Restoring side channel flow and function will provide critical off-channel spawning and rearing habitat for wild early- and late-run Coho, spring-run Chinook, and winter steelhead.


Portland
Estacada
Clackamas River
Project Location
Willamette River
Oregon
Clackamas River
Oak Grove Fork
Project Location
Collawash River
Clackamas River
N
0 1 2 3 4 5
Miles
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community


Clackamas River
Alcove
Side Channel
Nat'l Forest Rd. 46
Point Bar
Nat'l Forest Rd. 63
Clackamas River
Collawash River

Project goals

- Improve side channel function and habitat.
  - Rebuild, supplement, enhance the USDA-FS work (increase flow and cover habitat)
- Create new main channel cover and spawning habitat.
  - Opportunistically improve habitat in key areas adjacent to proposed side channel work

Project objectives

Side channel: Restore perennial flow, improve fish habitat, maintain sediment transport continuity.

Main channel: Create cover habitat for (a) adult holding and spawning, and (b) juvenile rearing/refugia along the main channel margin.

Proposed actions to achieve goals

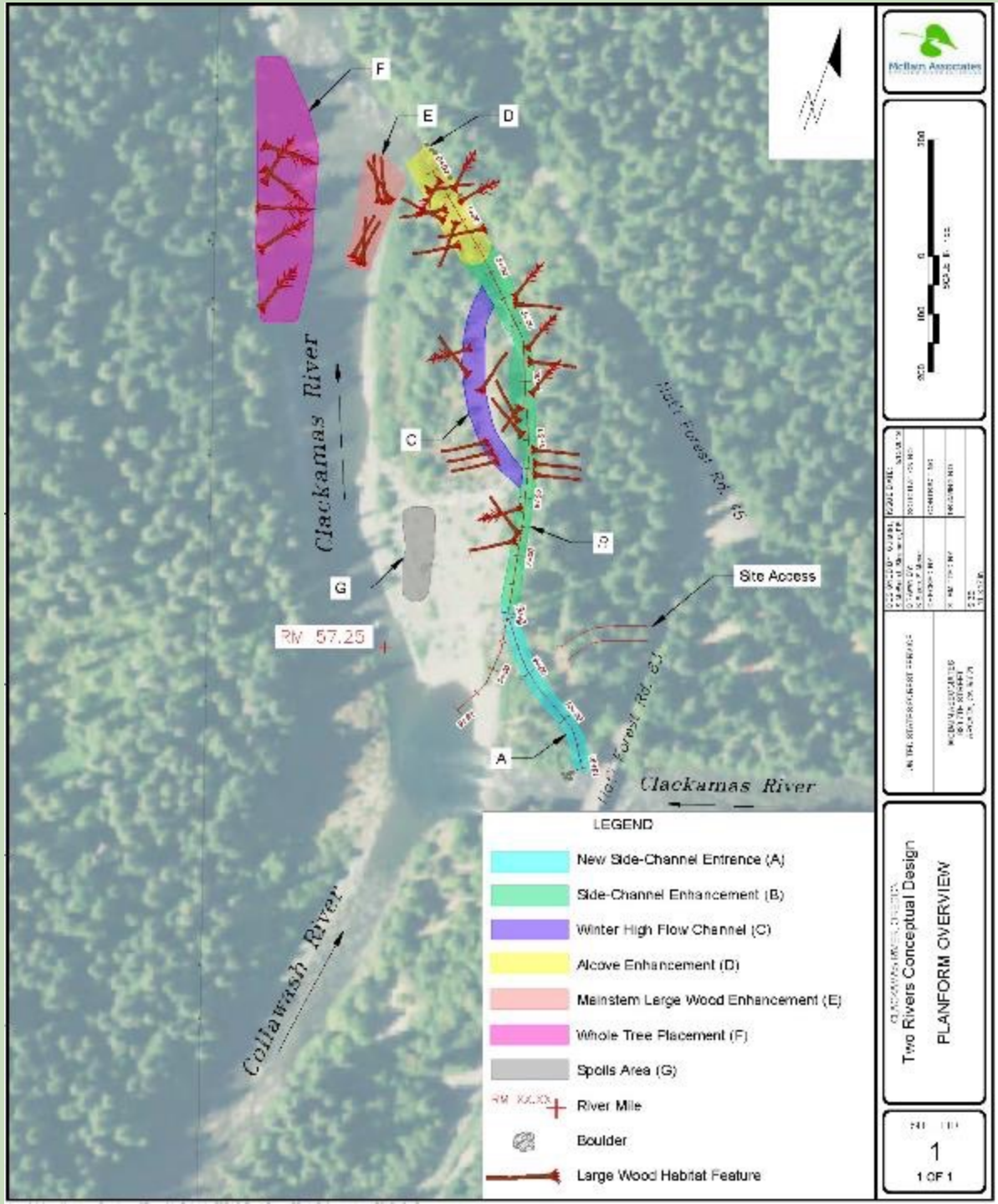
- Restore perennial side channel flow
  - Supplement existing summer baseflow hyporheic connection with Clackamas River flow for geomorphically stable design.
  - Promote sediment transport continuity.
- Add large wood
  - Add single and aggregated logs to side channel.
  - Construct habitat structures along main channel and add whole trees.

Conceptual design features

A. Construct new side channel entrance
   - Existing entrance aggraded; dynamic location
   - New tie in with Clackamas River; longer term and sustainable

B. Enhance existing side channel
   - Enhance and supplement existing USDA-FS work
   - Add logs and improve channel gradient

C. Construct winter high flow channel
   - New construction to increase winter high flow capacity and keep side channel velocities low
   - Add logs for cover and additional velocity refugia



Conceptual design features

D. Alcove enhancement

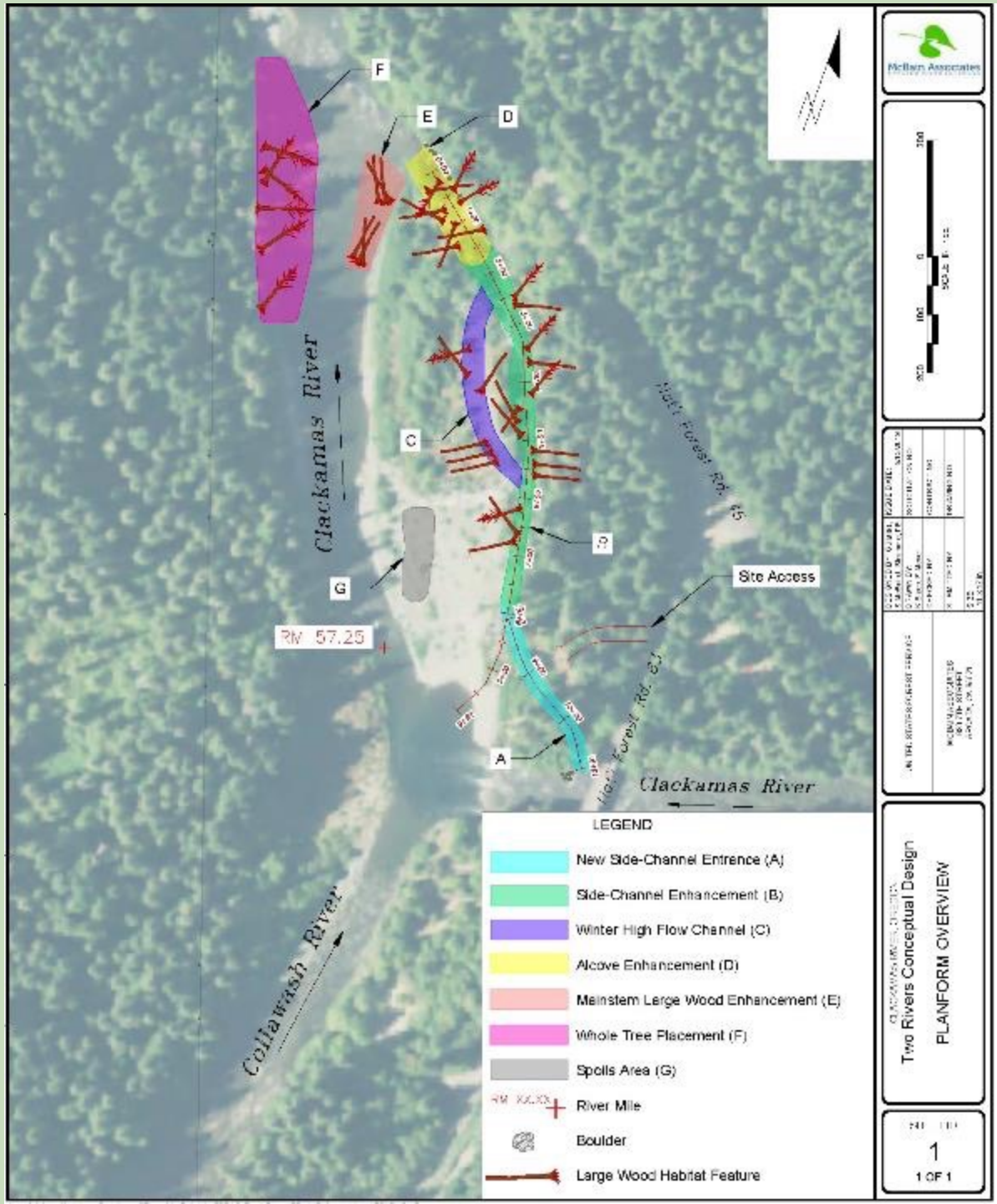
- Sediment plug blocks low flow and fish access; remove and re-grade
- Connect hydraulically and geomorphically to upstream design features (Areas A-C)

E. Mainstem large wood enhancement

- Construct three large wood habitat structures where currently no structure exists (cover, velocity refugia)
- Design modeled after NF Reservoir habitat structures

F. Mainstem whole tree placements

- Fell or pull over trees directly into channel
- Simulates natural wood recruitment and adds wood where currently none exists



New side channel enterance

- Aggraded side channel entrance.
- Construct new Clackamas River connection to create year-round flow.
- Add large boulders at new entrance to provide hydraulic control.

Enhance existing side channel

- Re-grade existing side channel, add large wood and boulders.
- Promote sediment transport.
- Provide off-channel summer and winter juvenile rearing.
- Provide winter high flow refugia

Mid-channel summer residual pools

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Construct new winter high flow channel

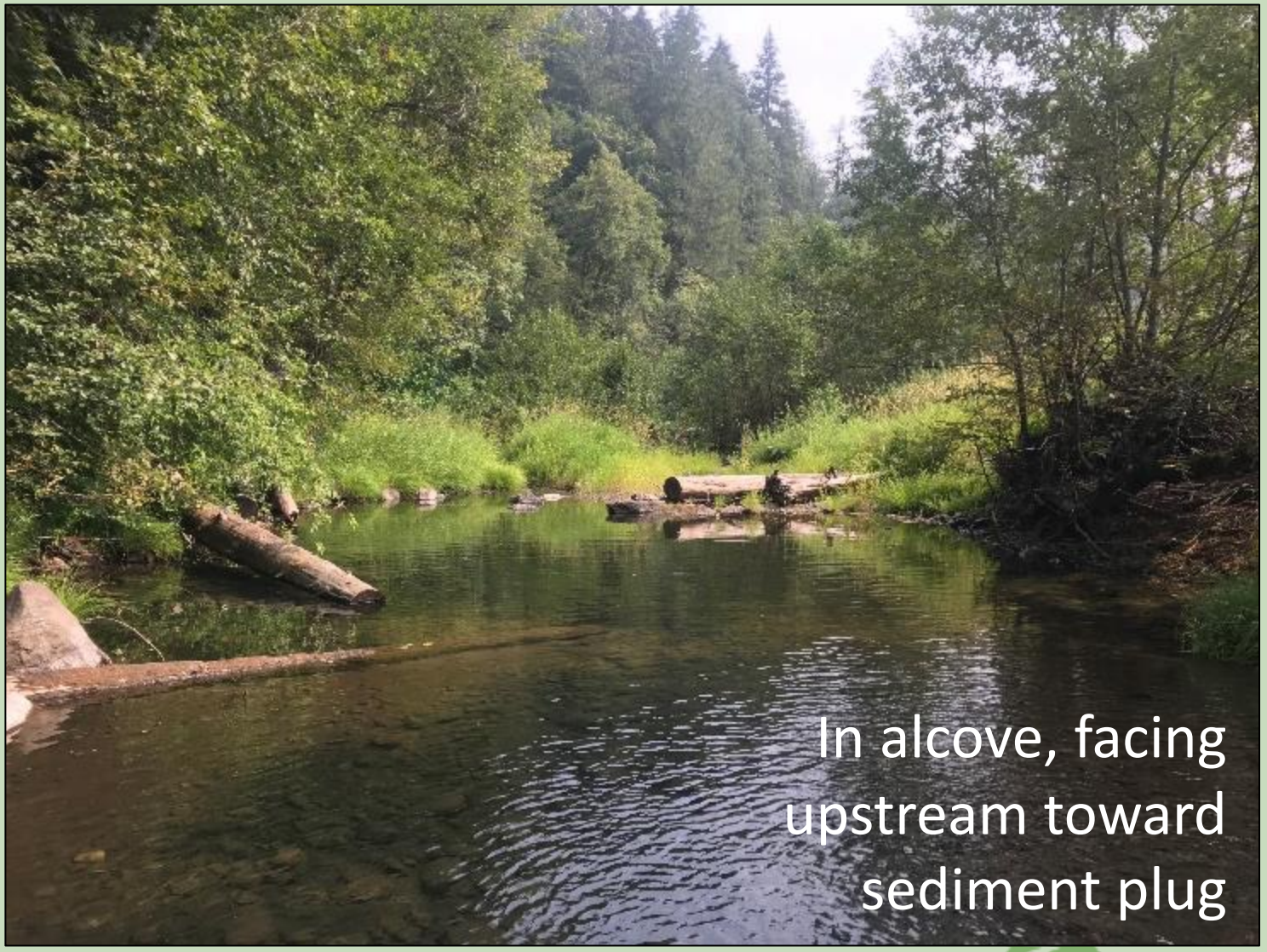
- New high flow channel construction along re-graded side channel.
- Increase overall side channel capacity to decrease flow velocities.
- Add logs.
- Provides high flow refugia.

Alcove transition

Sediment plug separating side channel from alcove

Alcove enhancement

- Currently mainstem backwater at low flow
- Upstream sediment plug blocks flow and sediment transport continuity: remove and re-grade
- Add cover with additional logs to supplement USDA-FS logs.
- Provides off-channel rearing habitat and high flow refugia.



In alcove, facing upstream toward sediment plug

Side channel design components

Alcove from downstream end of sediment plug

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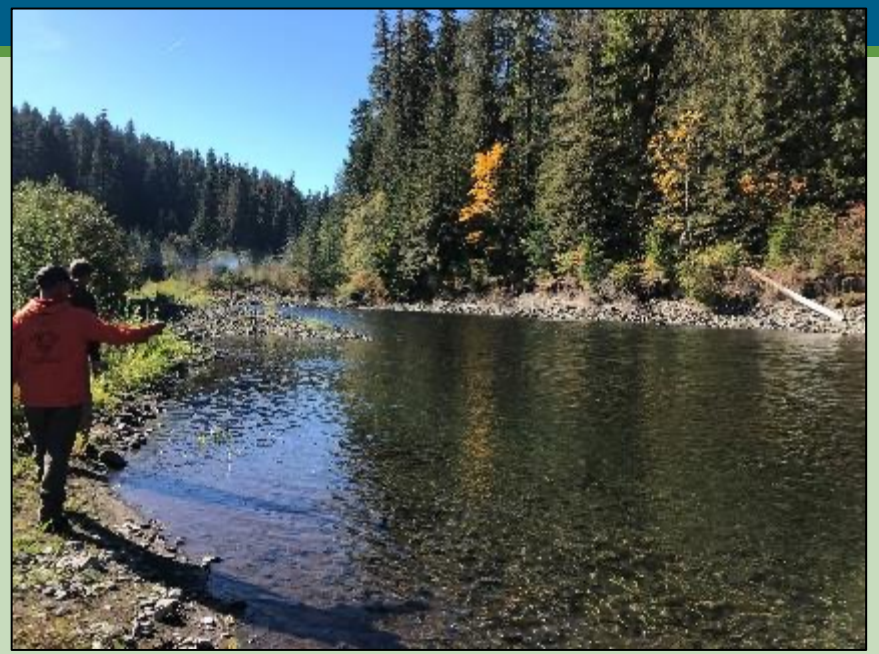
Main channel habitat structures

- Currently no cover habitat.
- Hydraulically suitable (channel widens, loses gradient, velocities slow).
- Creates adult cover habitat and velocity refugia.
- Creates fry and juvenile rearing habitat.



Three large wood habitat structures proposed. For each structure:

- 6 to 8 sub-horizontal root wad logs
- 10 to 12 piling logs
  - No Cables, bolts, fasteners (consistent with permit requirements)
- Alluvial ballast

North Fork Reservoir habitat structure design template

Main channel whole tree placement

- Mature trees along opposite cutbank, pull over into mainstem.
- Creates geomorphic complexity (promotes local scour and deposition).
- Provides fry and juvenile rearing habitat, adult spawning habitat.

Main channel design components

Habitat structure location (n=3 proposed)

Whole tree source area

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Project design status

- Conceptual designs developed, draft and final designs to be prepared
- Draft designs
  - Data collection: site topography survey, stage monitoring.
  - Analysis and modeling: prepare DEM; hydrology, hydraulic modeling.
  - Draft (and final) designs developed as project team collaboration.
  - Regulatory consultation / ARBO-II pre-reporting and review (design feedback loop).
- Final designs
  - Will be prepared to a level of detail that provides sufficient construction, but rely on a “field-fit” approach to adapt to site-specific variability
  - On-site construction coordination

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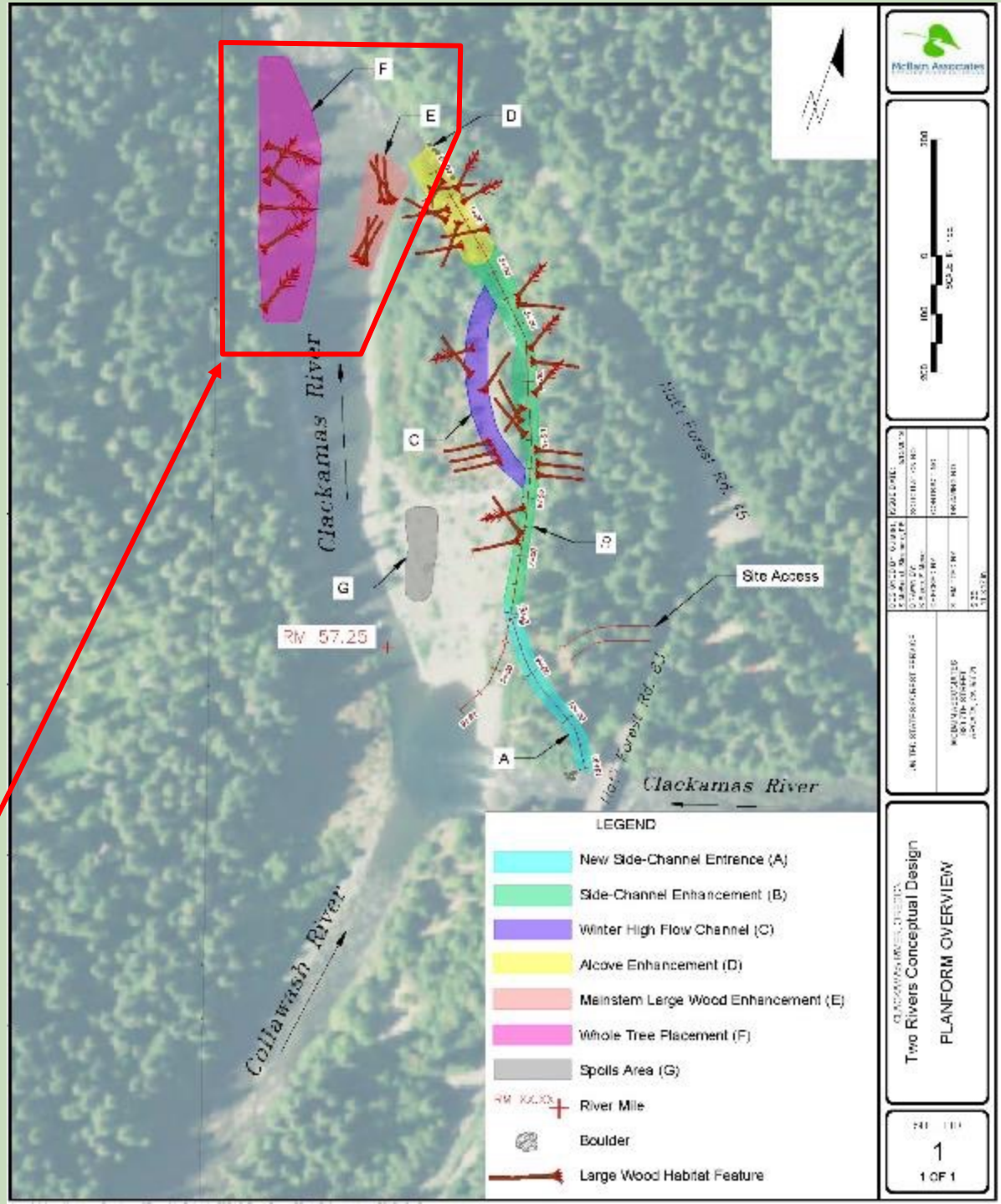
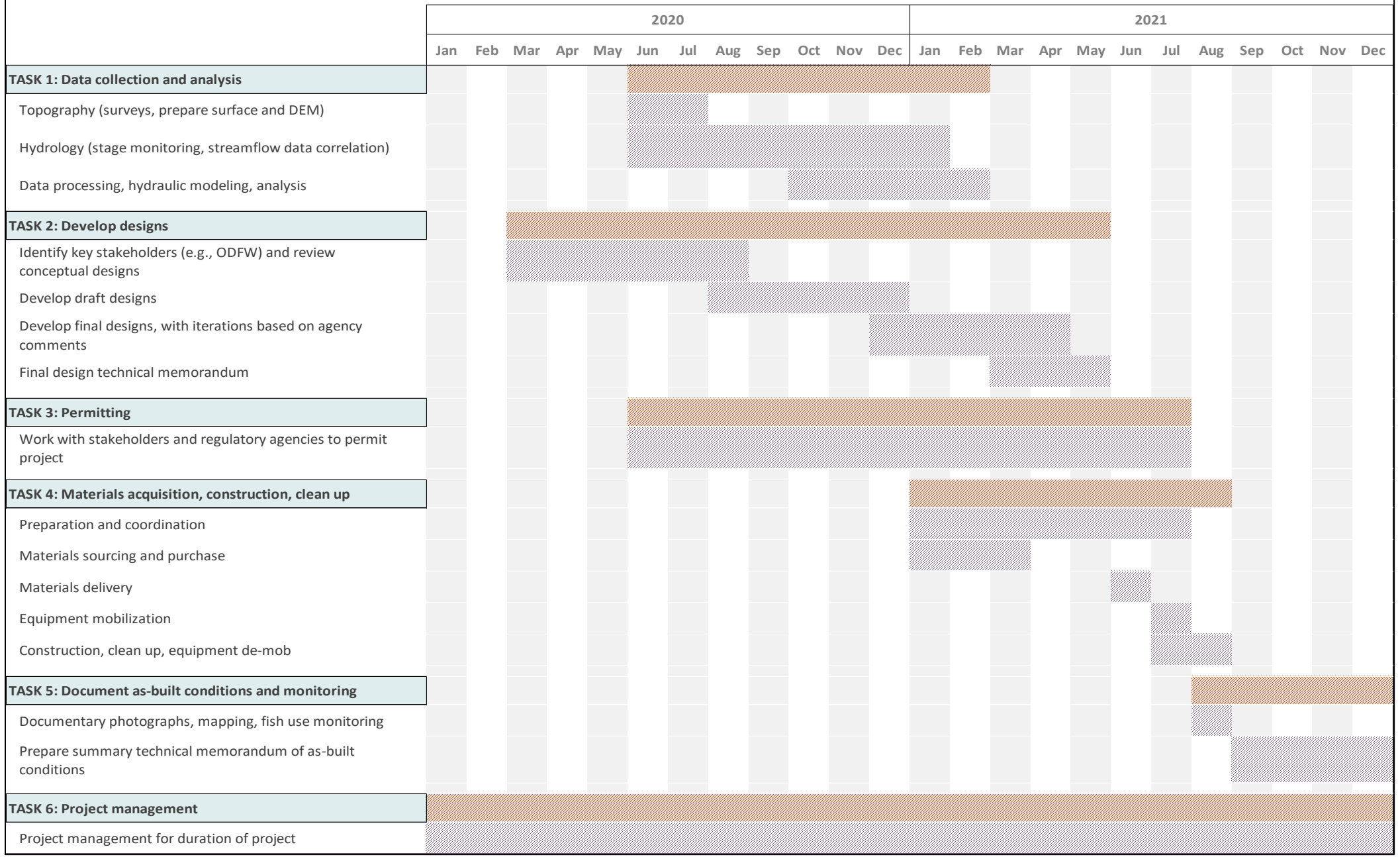
Proposed project cost

Professional Services	
Project management (including administration of funds)	$ 32,800
Plans, designs, permits. Also includes monitoring.	$ 92,000
Construction	
Site preparation	$ 27,200
Equipment	$ 71,800
Materials	$ 100,500
Construction	$ 63,400
SUBTOTAL (amount requested)	**$ 387,700**
Matching Funds (MA, USFS)	$ 8,600
TOTAL	**$ 396,300**

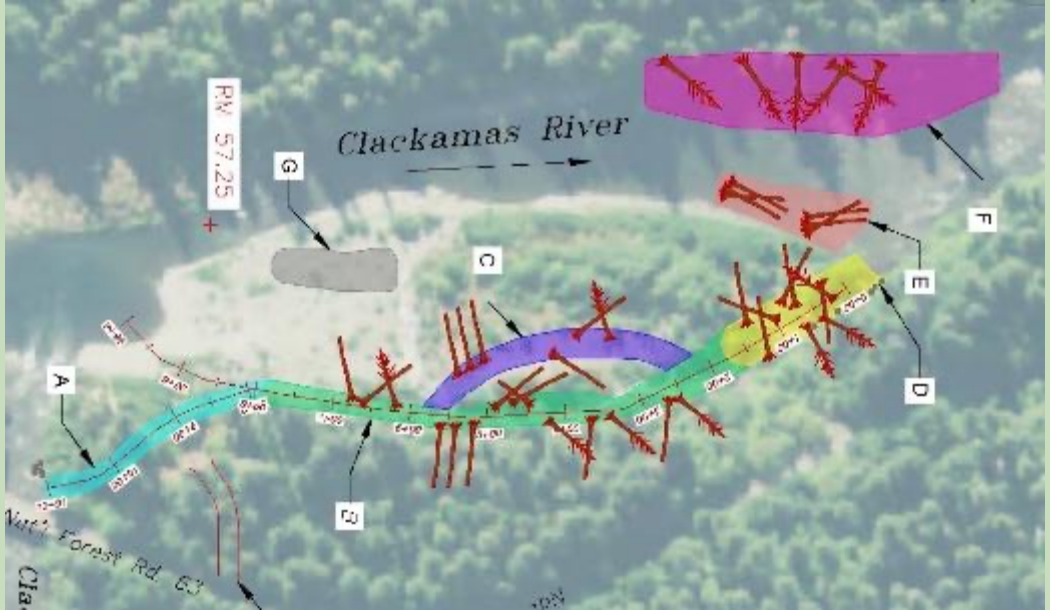
Without mainstem project components: approx. $310,000



Clackamas Mitigation Fund Two Rivers Side Channel and Mainstem Fish Habitat Enhancement Project



Questions?



Two Rivers side channel and mainstem habitat enhancement

Map area designation	Conceptual design element	Excavation / earthwork planned?	Planform area (ft^2)	Estimated excavation depth (ft)	Estimated excavation volume (yd^3)	Spoils plan	No. logs with root wads to be added	No. piling logs	Notes (see additional description on conceptual drawing)
A	New side channel entrance	Y	7,700	5	1,400	Put in Area G	0	-	Assume place boulders at entrance for grade control, use on-site material (no import)
B	Existing side channel enhancement	Y	18,000	varies, assumed minimal	500	Sidecast	60	-	500 yd^3 estimated for local contouring
C	New winter high flow channel	Y	11,600	3	1,300	Sidecast or move to Area G	10	-	
D	Alcove enhancement	Y	12,000	1	400	Sidecast	20	-	Most excavation will be at downstream plug, conservatively estimated 1 ft average excavation depth over entire area.
E	Mainstem Clackamas River large wood habitat structures	N		N/A	-	N/A	30	42	Three habitat structures with piling
F	Mainstem Clackamas River whole tree placement	N		N/A	-	N/A	0	-	Cable over large (30" dbh minimum) live trees into river, if allowed
G	Sediment spoils area	Y (spoils pile)		N/A	-	-	0	-	Contingency spoil area if too much material generated to sidecast or not allowed to sidecast at certain locations
				TOTAL	**3,600** yd3		**120** RW logs	**42** Piling	