



Skookum Edfro Phase 3 Instream Restoration Project – Recent FEMA Regulatory Changes Causing Geomorphic and Ecological Impacts. South Fork Nooksack River, Washington



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Introduction

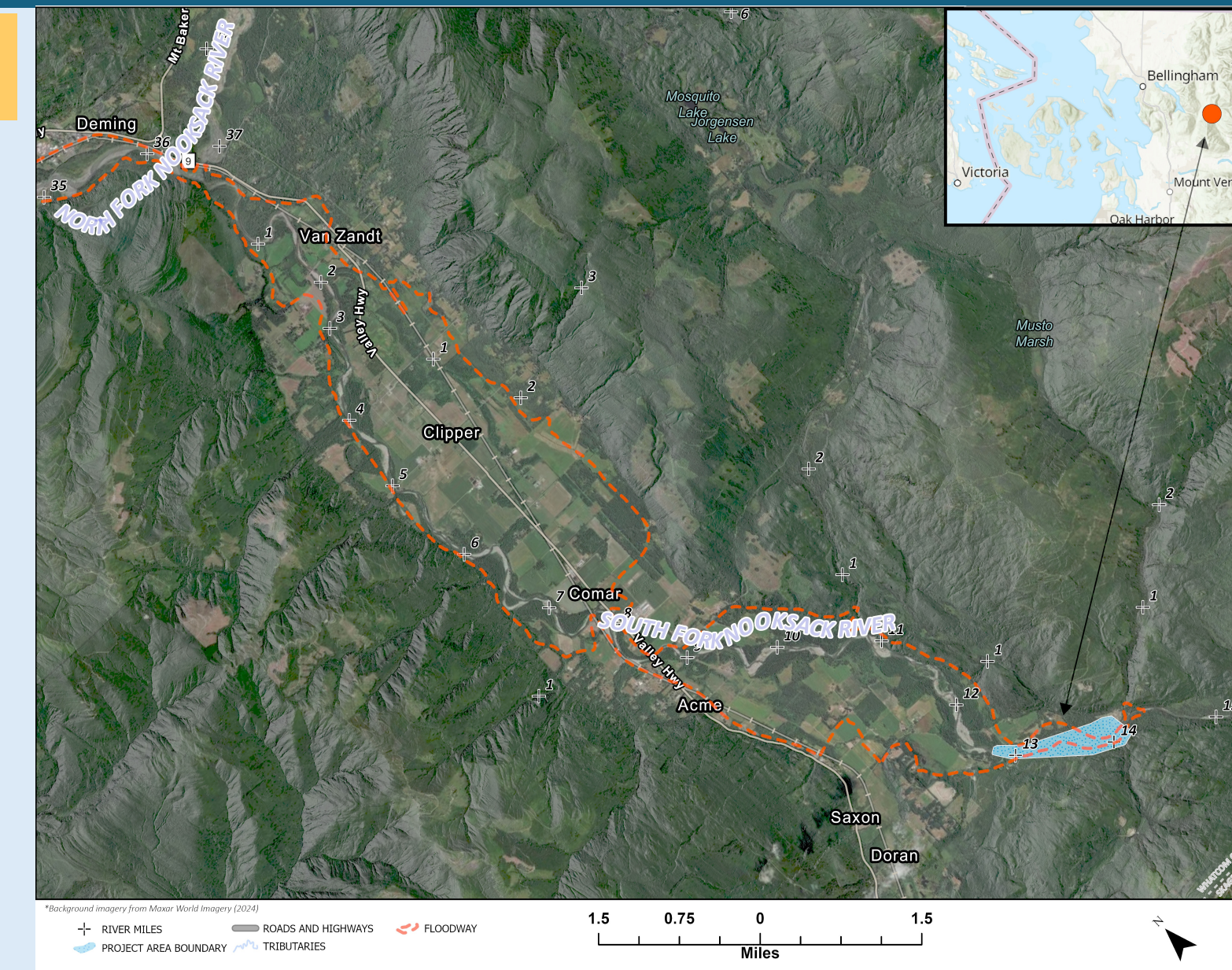
In 2021, a major pre-spawn mortality event occurred in the South Fork Nooksack (SFN) River, killing over 2,400 adult early chinook salmon. Low flows, high water temperatures and poor habitat increased vulnerability to pathogens. Lummi Nation declared the event a disaster. Most mortalities occurred in Skookum Edfro Phase 3 Instream Restoration Project reach.

The project goal is to restore and protect chinook spawning, rearing, and holding habitat to sustain harvestable populations while preventing increased flood or erosion risks. Key restoration actions include engineered log structures (ELs) to form deep, woody pools, and side channel and bank excavations to enhance habitat and geomorphic function. Landowners and stakeholders were included in every stage of the design process and support preliminary designs.

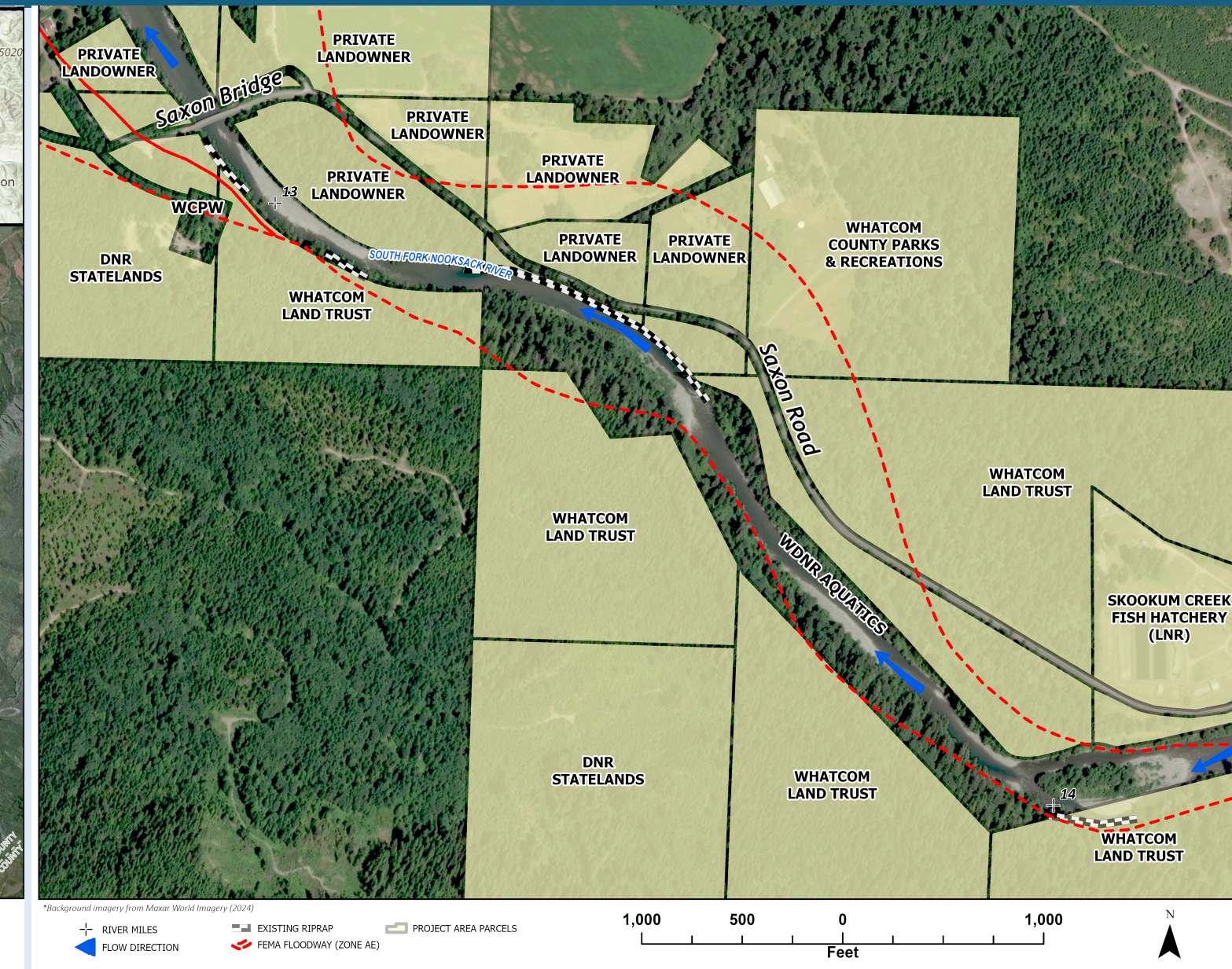
Under FEMA rules, new structures in the 100-year floodplain (Zone AE) must not raise base flood elevations. Meeting this "no-rise" requirement took 10+ hydraulic modeling iterations. Compliance required excavating ~9 acres of riparian habitat, moving 70,000+ CY of material off-site and raising costs by \$2.3 million.

This project showcases the regulatory challenges following FEMA's 2020 rescindment of the Fish Enhancement Structures in the Floodway Policy. Federal regulatory approval and Conditional Letter of Map Revisions (CLOMR) issuance are expected by 2026, with implementation moved to 2027 to account for potential CLOMR delays. ***This poster highlights project constraints, innovative engineering solutions, stakeholder engagement, key lessons, and next steps for implementation.***

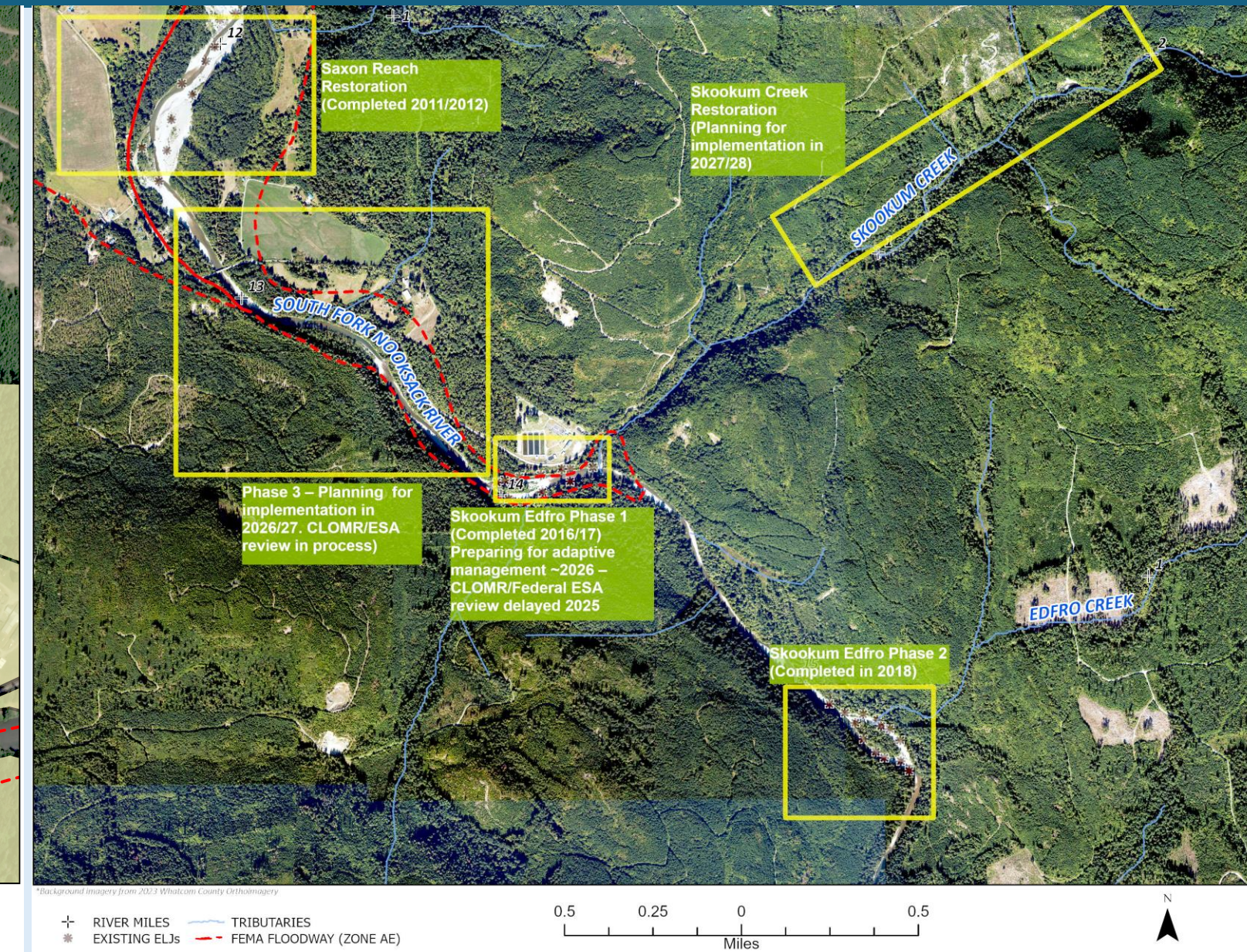
<https://www.lummi-nsn.gov/s/skookum>



Location Map



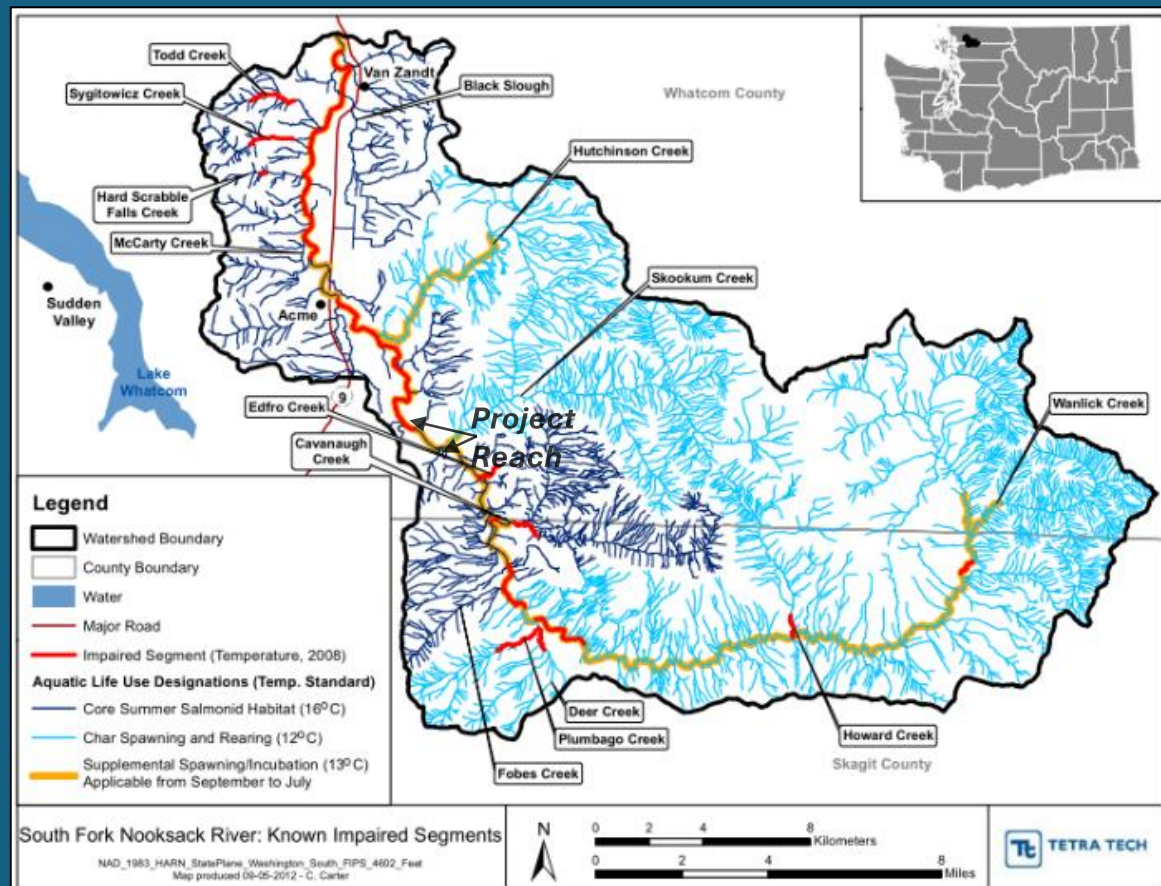
Land Ownership/Infrastructure Map



Current and Planned Projects

Objectives

- Construct 39 or more stable ELs at the 100-yr discharge in 1.25 miles of SFN to increase low flow engagement
- Create 9 primary and 16 secondary pools with ELs to improve habitat quality and diversity
- Create ~2,000 ft of side channel habitat for juvenile rearing
- Enhance cover and edge habitat by removing 250 ft of riprap and covering 1,400+ ft with fish-friendly material
- Employ excavations and ELs to expand channel migration, increase chinook habitat, support climate resilience and reduce flooding
- Plant and interplant over 5.4 acres of riparian forest with conifers to cool the SFN, increase wood recruitment, and improve riparian health.



South Fork Temperature TMDL (Ecology 2020)



Pre-spawn mortality (PSM) mortality event in 2021 (>2,400 adults). High PSM levels observed every year since

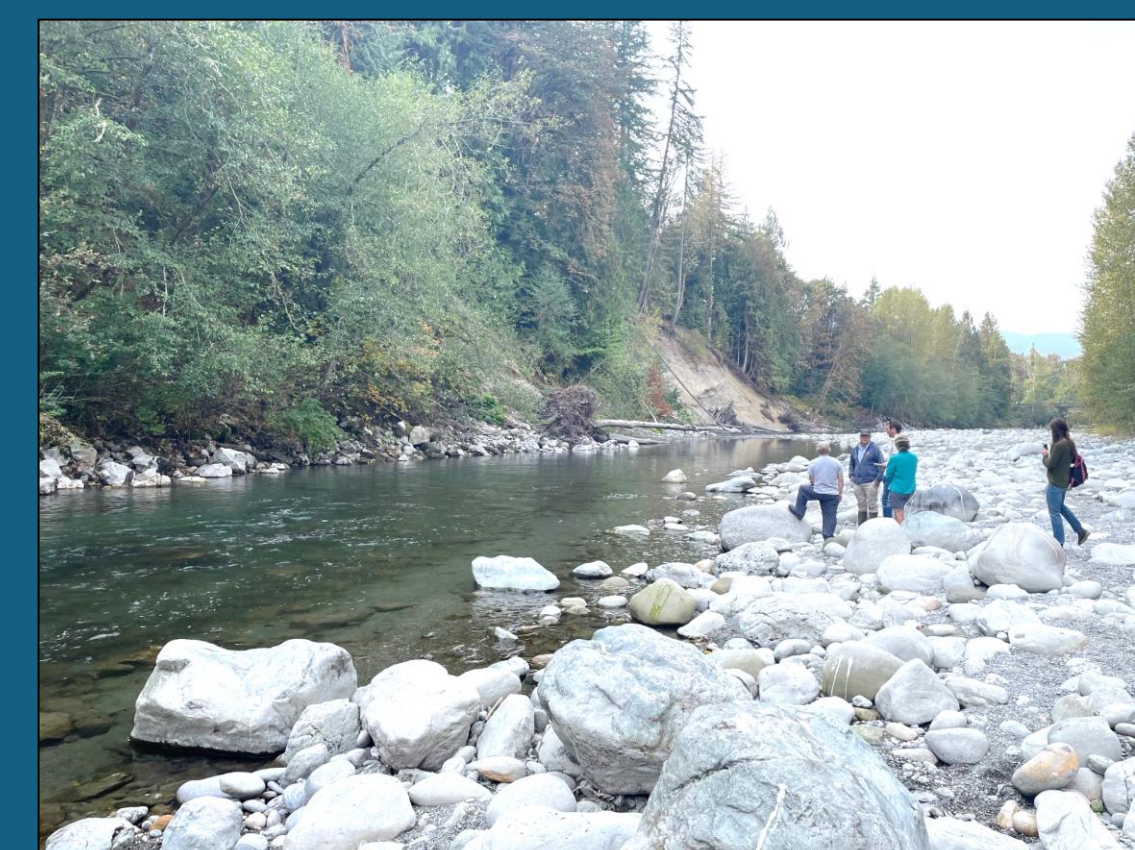
Habitat Limiting Factors

- High water temperatures
- Low habitat diversity
- Limited quality habitat for holding & spawning



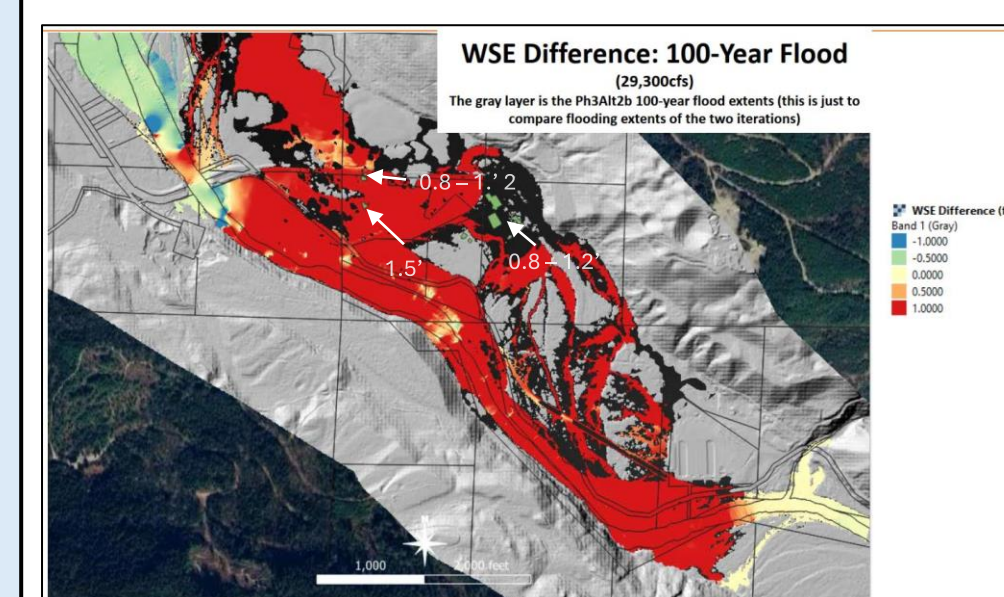
Project Constraints & Landowner Outreach

- Project reach is constrained by roads, riprap, and infrastructure on the floodplain coupled with FEMA no-rise requirements.
- There has been extensive landowner outreach conducted, including community workshops and site visits facilitated by an outreach consultant.
- Landowners agreed to focus on restoring degraded instream habitat and work with the existing infrastructure.



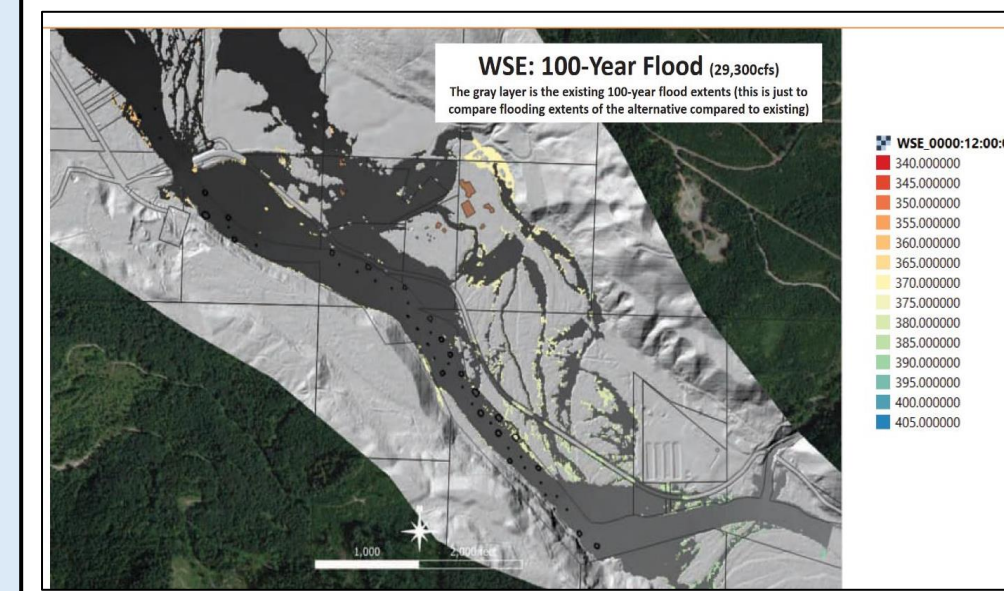
Modeling Results, Impacts & Benefits and Project Designs

Hydraulic Modeling Results and Preliminary Design



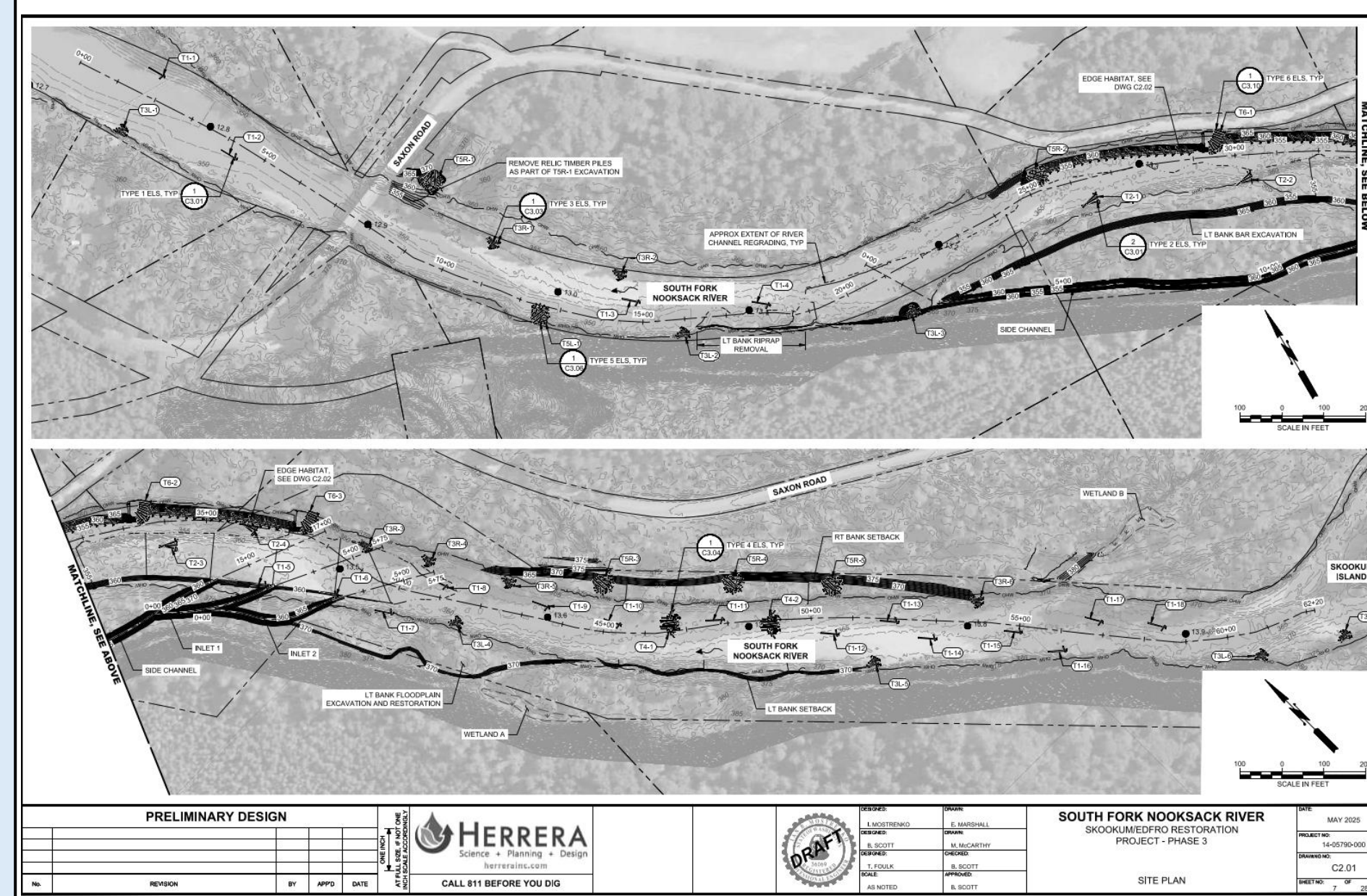
Preferred Alternative without Excavations

- 100-yr flood water surface elevation WSE difference (existing & proposed)
 - Red = >1-foot WSE rise
 - White values are absolute rise at insurable structures
- Could not proceed due to rise on insurable structures***



Preferred Alternative with Excavations

- 100-yr flood WSE difference
 - Gray = existing conditions
 - Blond = proposed conditions
- Excavations prevent rise on insurable structures, enabling project approval***



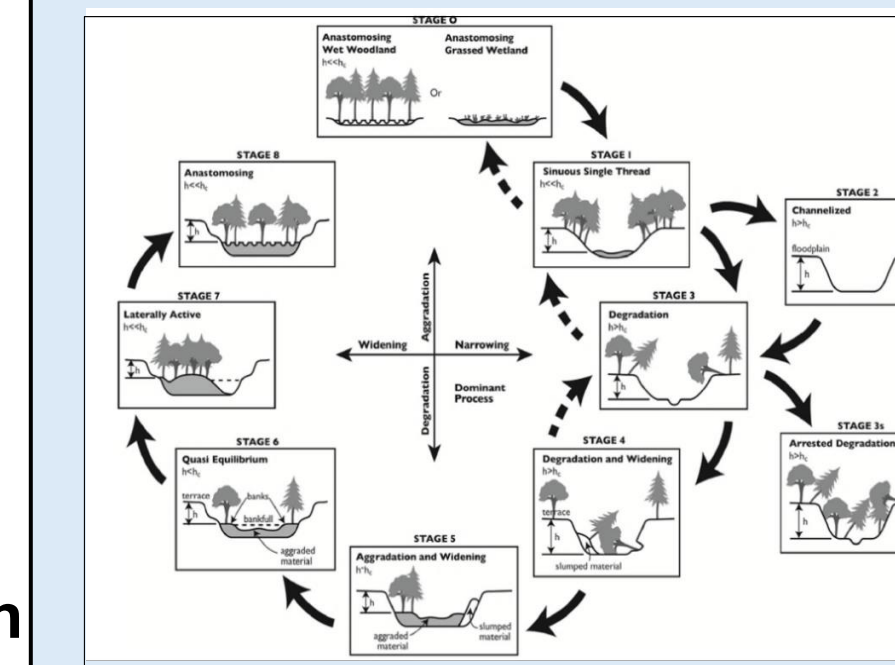
Preliminary Design

- Design package (submitted 1/25) under review by FEMA (CLOMR) and federal/state agencies Secs. 7 & 106, Sec. 401 Water Quality Certification, etc.).

Channel Widening and Regrading

Channel is at Stage 3 ("Degradation") of the Channel Evolution Model (CEM; Schumm et al., 1984). Incision limits floodplain connectivity and reduces riparian health, killing dozens of large conifers in the project reach.

Goal is to reach Stage 6 ("Quasi-equilibrium") through channel widening and instream restoration (e.g., wood placement and side channels).



Channel Evolution Model (Schumm et al. 1984)

ACTIVITY	IMPACT LOCATION	DURATION OF IMPACT	EXCAVATION or FILL FROM WATERBODY (CY)	TOTAL AREA OF WATERBODY DIRECTLY IMPACTED (SF)
TEMPORARY DISTURBANCE for CONSTRUCTION ACCESS	WITHIN OHW	TEMPORARY	N/A	93,345
TEMPORARY DISTURBANCE for CONSTRUCTION ACCESS	OUTSIDE THE OHW (100-YEAR FLOODPLAIN)	TEMPORARY	N/A	63,975
BANK EXCAVATION (PERMANENT)	WITHIN OHW	PERMANENT	26,863	219,976
BANK EXCAVATION (PERMANENT)	OUTSIDE THE OHW (100-YEAR FLOODPLAIN)	PERMANENT	45,183	169,500
TEMPORARY EXCAVATION for EL CONSTRUCTION	WITHIN OHW	TEMPORARY	24,748	49,530
TEMPORARY EXCAVATION for EL CONSTRUCTION	OUTSIDE THE OHW (100-YEAR FLOODPLAIN)	TEMPORARY	5,556	10,000
CHANNEL FILL	WITHIN OHW	PERMANENT	9,280 (0.058 CY OVER RFP)	61,580
CHANNEL FILL	OUTSIDE THE OHW (100-YEAR FLOODPLAIN)	PERMANENT	1,099	30,963
SIDE CHANNEL EXCAVATION	WITHIN OHW	PERMANENT	409	2,692
SIDE CHANNEL EXCAVATION	OUTSIDE THE OHW (100-YEAR FLOODPLAIN)	PERMANENT	11,372	41,473

Relevant Quantities and Duration of Impacts. Note: Top 3 activities correspond to Elements and Impacts map, below.

Short-Term Impacts vs. Short- and Long-Term Benefits

Short-Term Impacts

Channel widening removes 9 acres of riparian habitat, essential for stream shading, nutrient input, nesting, etc.

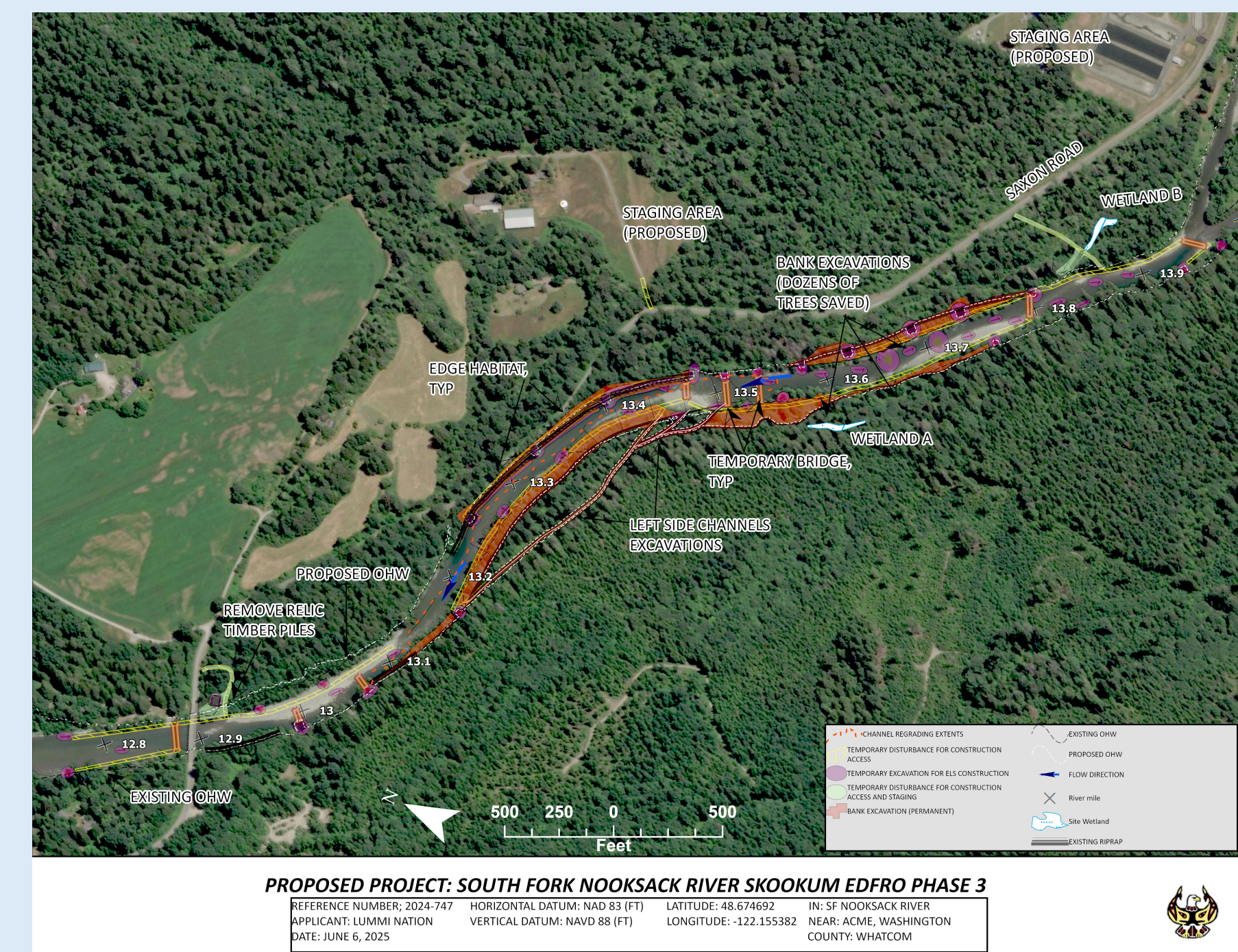
Excavating over 70K CY, 10K CY will be repurposed to cover adjacent riprap to create fish-friendly habitat

Short-Term Benefits

47 new ELS
Create 25 deep pools
Create >2K ft of side channel habitat
Reconnect ~5 acres of floodplain
Remove ~250 ft of riprap
Cover ~1,400 ft of riprap with wood
Plant over 5 acres of riparian vegetation

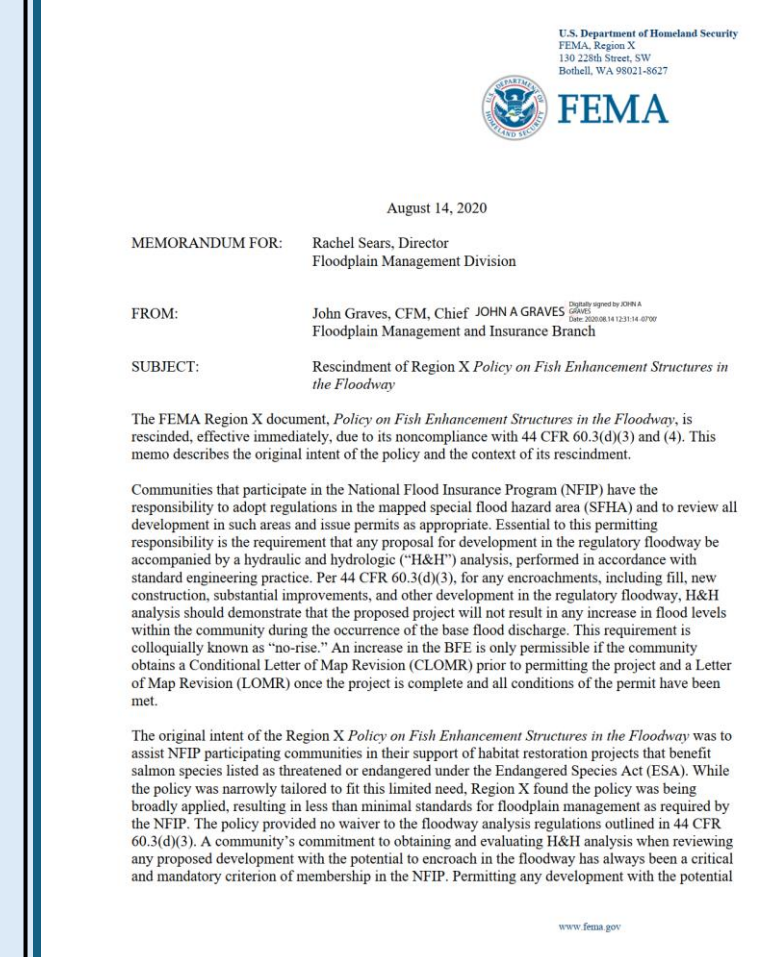
Long-Term Benefits

Restore natural processes in a degraded reach
Provide river space to migrate laterally into the left floodplain, which will reduce incision
Provide resiliency to climate change



Project Elements and Impacts During Construction

Regulations and Impacts to Project



- Aug 14, 2020 – FEMA rescinded Region X policy on Fish Enhancement Structures in Floodways.
- Removed permitting flexibility for ESA-listed salmonid habitat projects.
- Habitat restoration now regulated like development (such as building homes, etc.), ignoring natural river dynamics.
- Projects must show No-Rise to insurable structures during 100-year flood events.



- Factsheet by Nooksack Tribe, American Rivers, and TRCP highlights 2-year delay to SF Nooksack Homesteader Project.
- In 2025, LNR's SF Skookum Edfro Phase 1 Adaptive Management project delayed by federal permitting and CLOMR, hindering chinook recovery.
- FEMA review is slowing critical salmon habitat restoration on the SF Nooksack and across the PNW.
- Lummi Nation and NW Treaty Tribes are asking FEMA to reinstate the Fish Enhancement Structures policy or provide similar exemptions.

STEPS TO ACHIEVE HABITAT TARGETS & MEET FEMA NO-RISE COMPLIANCE

Hydraulically modeled existing conditions

Developed habitat-targeted conceptual alternatives

Preferred concept included ELs and targeted excavations

Model showed 100-year flood rise at insurable structures

Adjusted ELs and increased excavations to meet no-rise

Other projects on Skokomish and Nooksack have successfully used excavations to meet no-rise

Preliminary Designs completed in June 2024, submitted with CLOMR January 2025

ESA compliance & CLOMR review ongoing; implementation pushed to 2027