Implementation of Multi-Benefit Juvenile Salmonid Habitat Restoration on the Lower Yuba River: The Hallwood Side Channel and Floodplain Restoration Project

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Presentation Outline

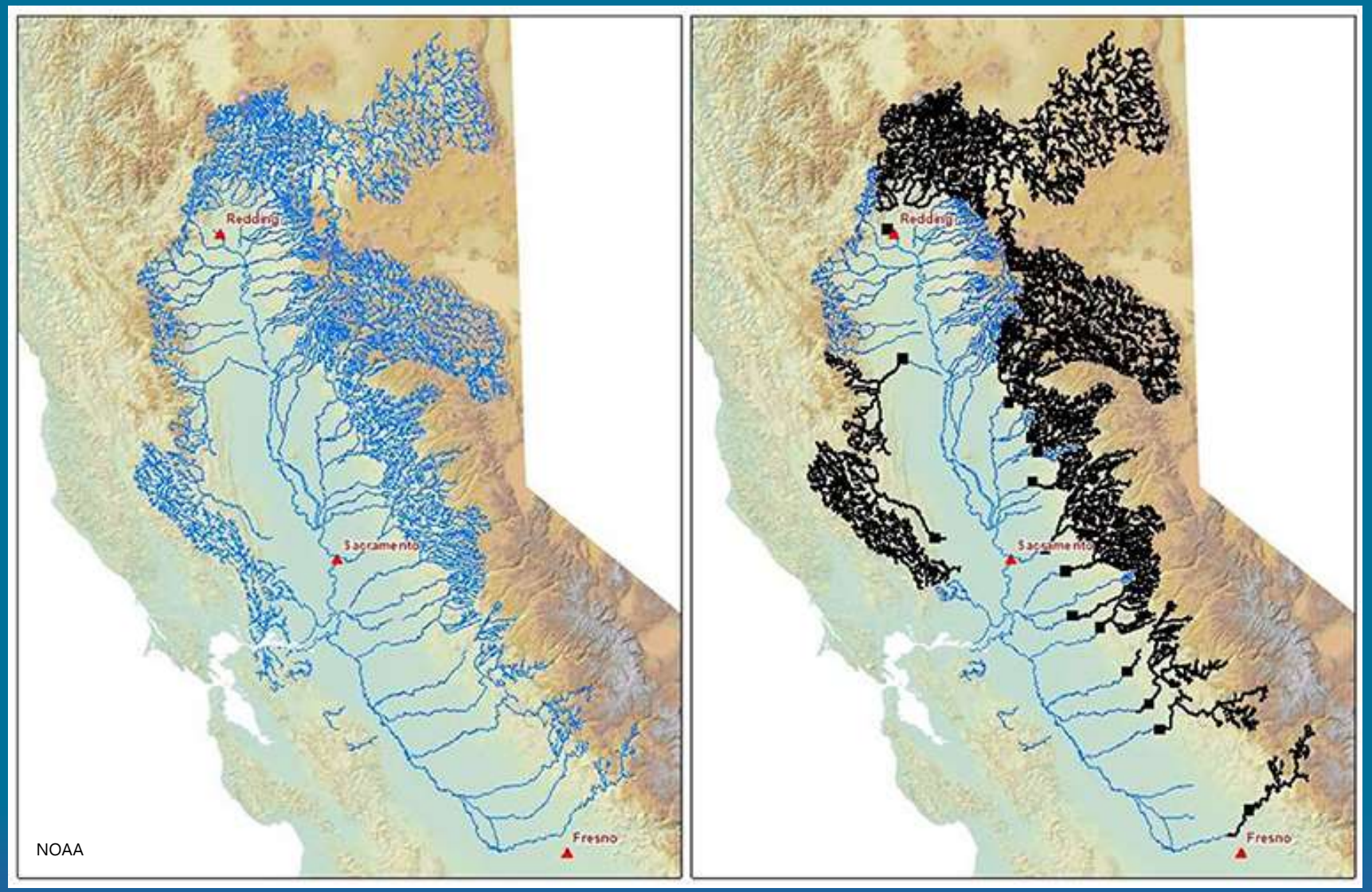
1. Project and Site Background
2. Project Design
3. Construction and Implementation Considerations
4. Post-Project Monitoring

Project Goals

- Restore and enhance ecosystem processes for productive juvenile salmonid rearing habitat
- Increase natural production of Chinook salmon and Central Valley steelhead in the Lower Yuba River
- Support CVPIA Anadromous Fish Restoration Program (AFRP) "Doubling Goal"
- Flood benefit
- Local economy
- Research

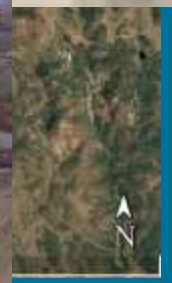
Photos: Cramer Fish Sciences

The Need For Salmon Habitat Restoration in California



NOAA

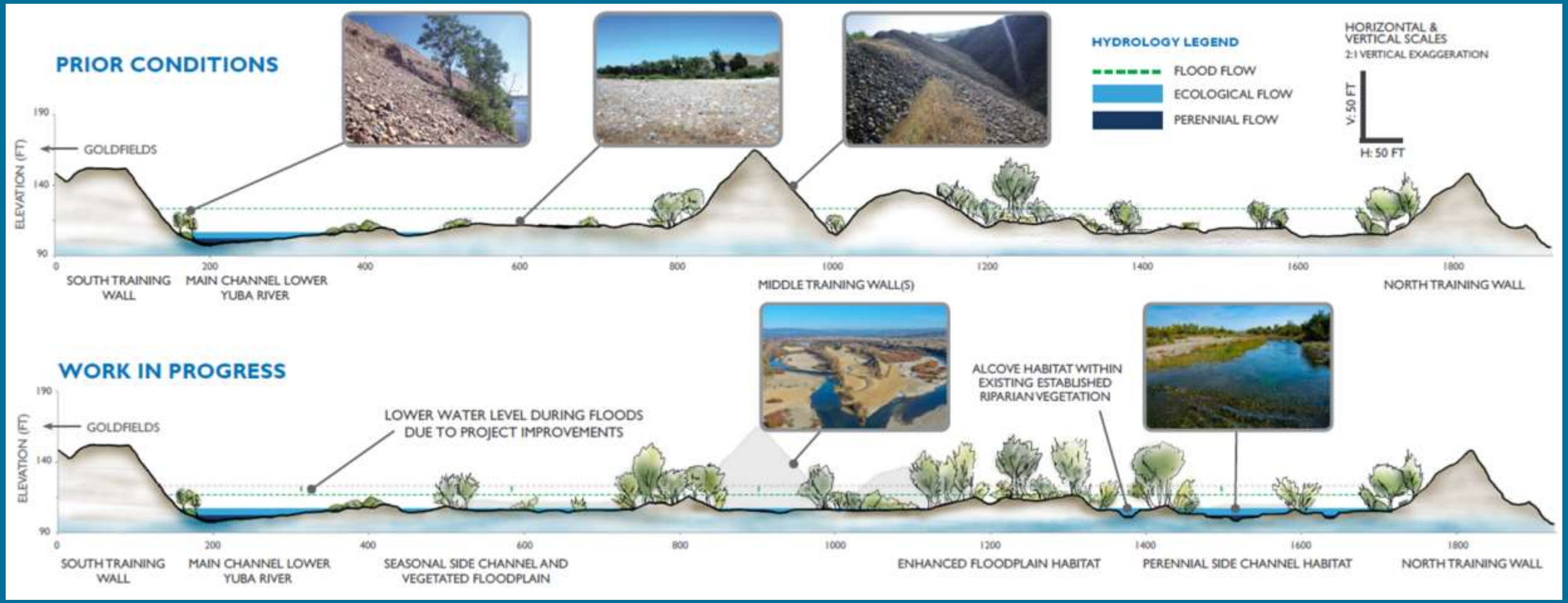
Project Location and Site History



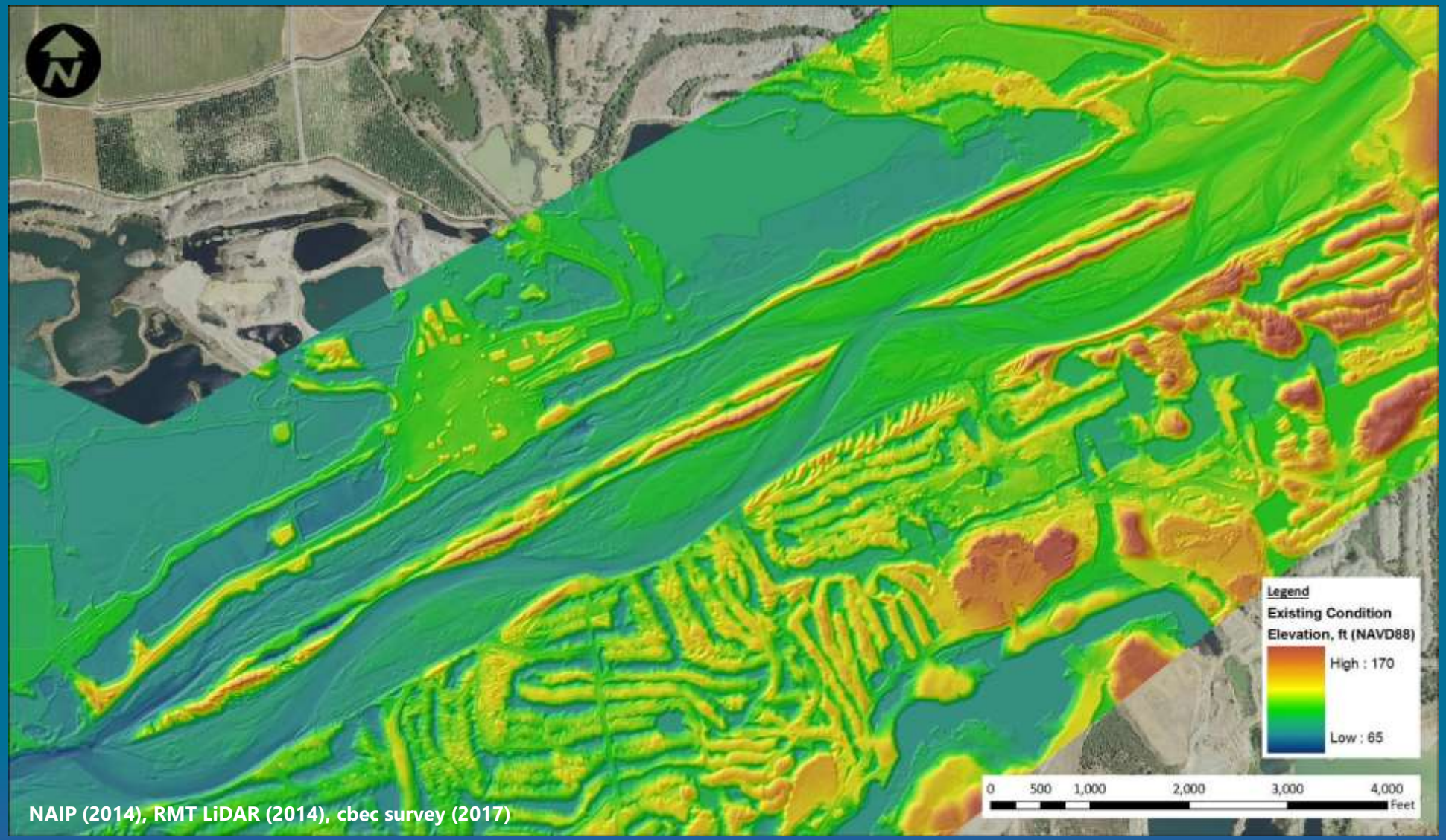
Hydraulic Gold Mining in The Yuba River Watershed

Pre-Project Conditions

Restoration Design

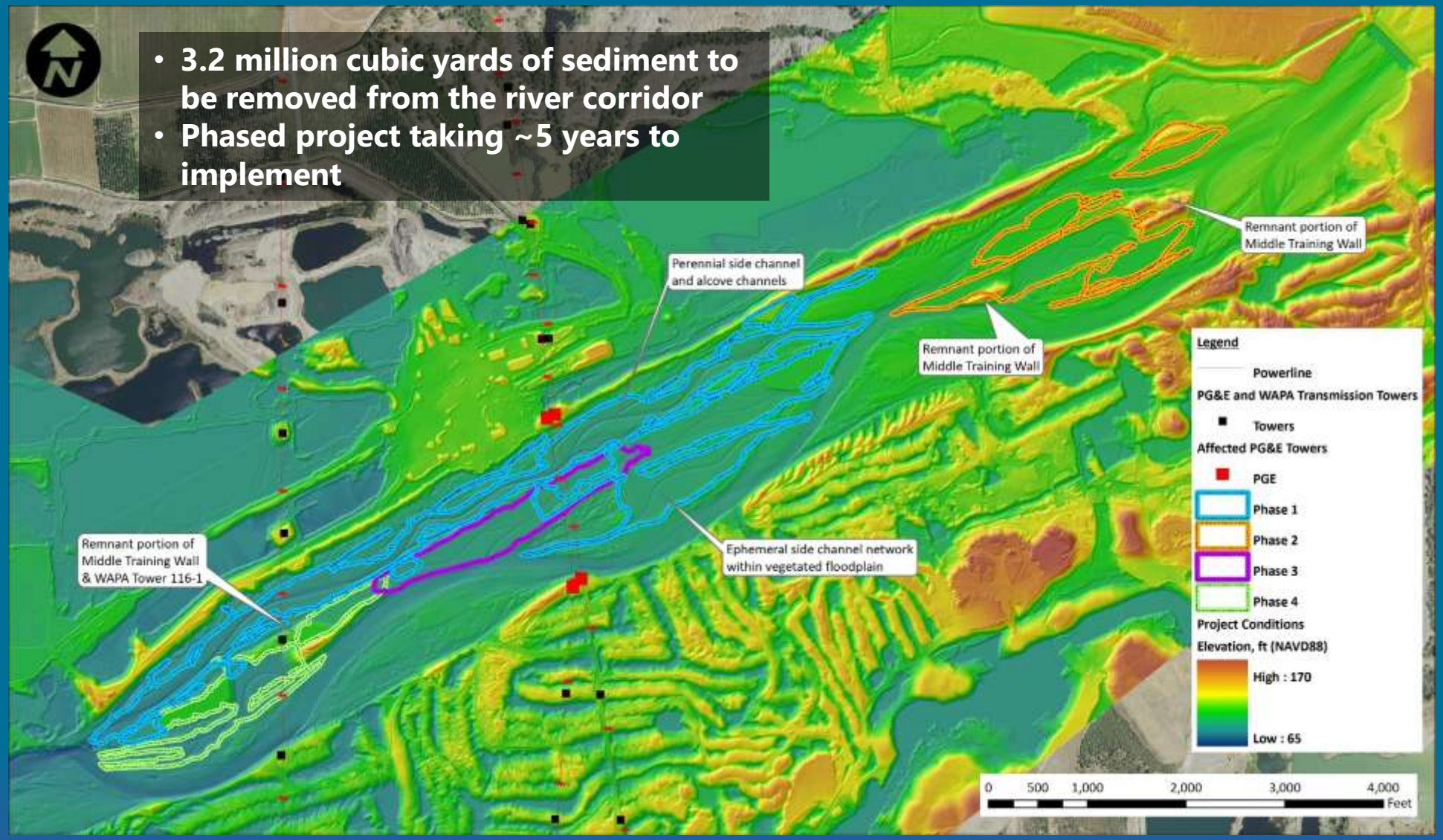


Pre-Project Topography/Bathymetry

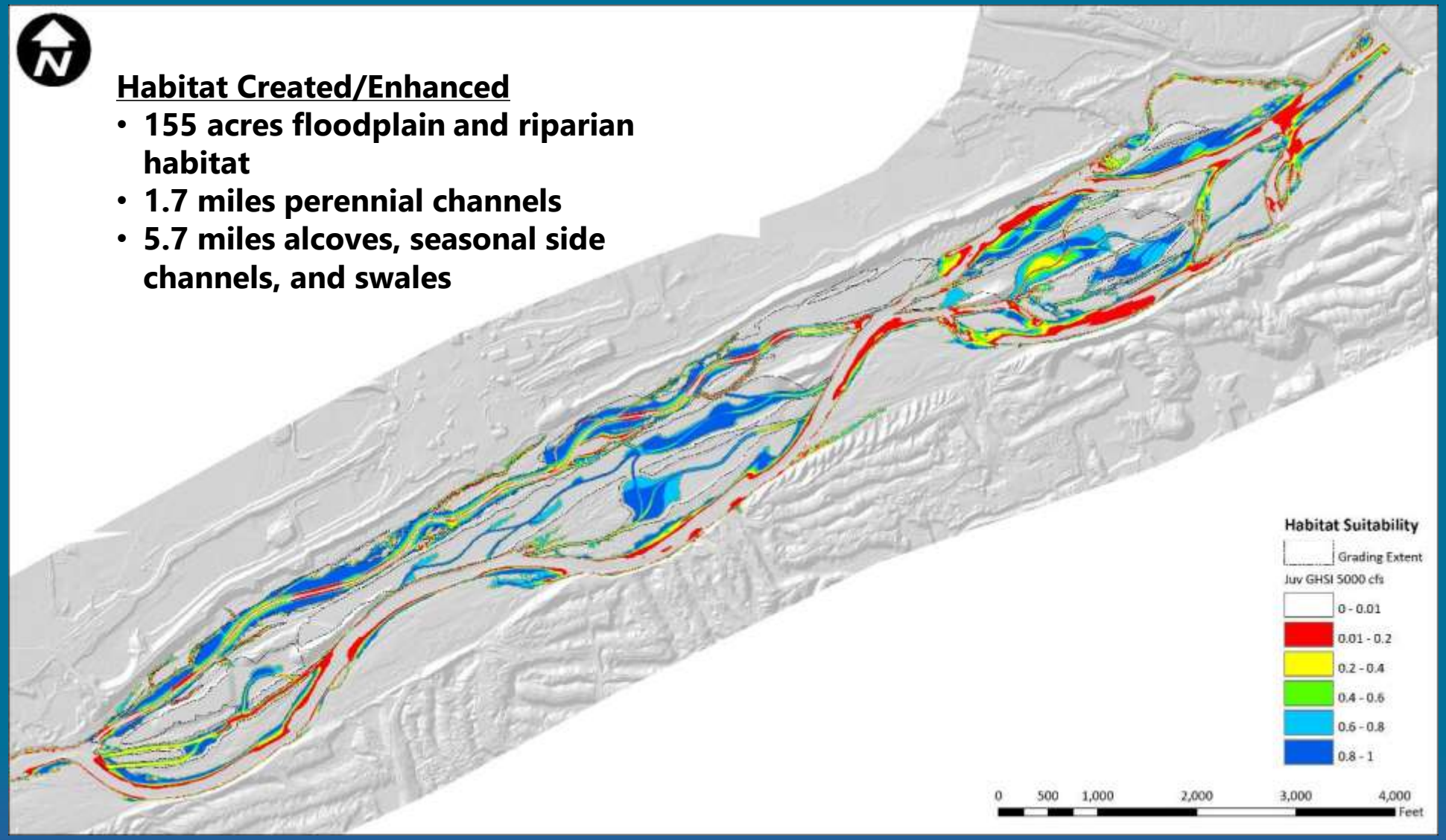


NAIP (2014), RMT LiDAR (2014), cbec survey (2017)

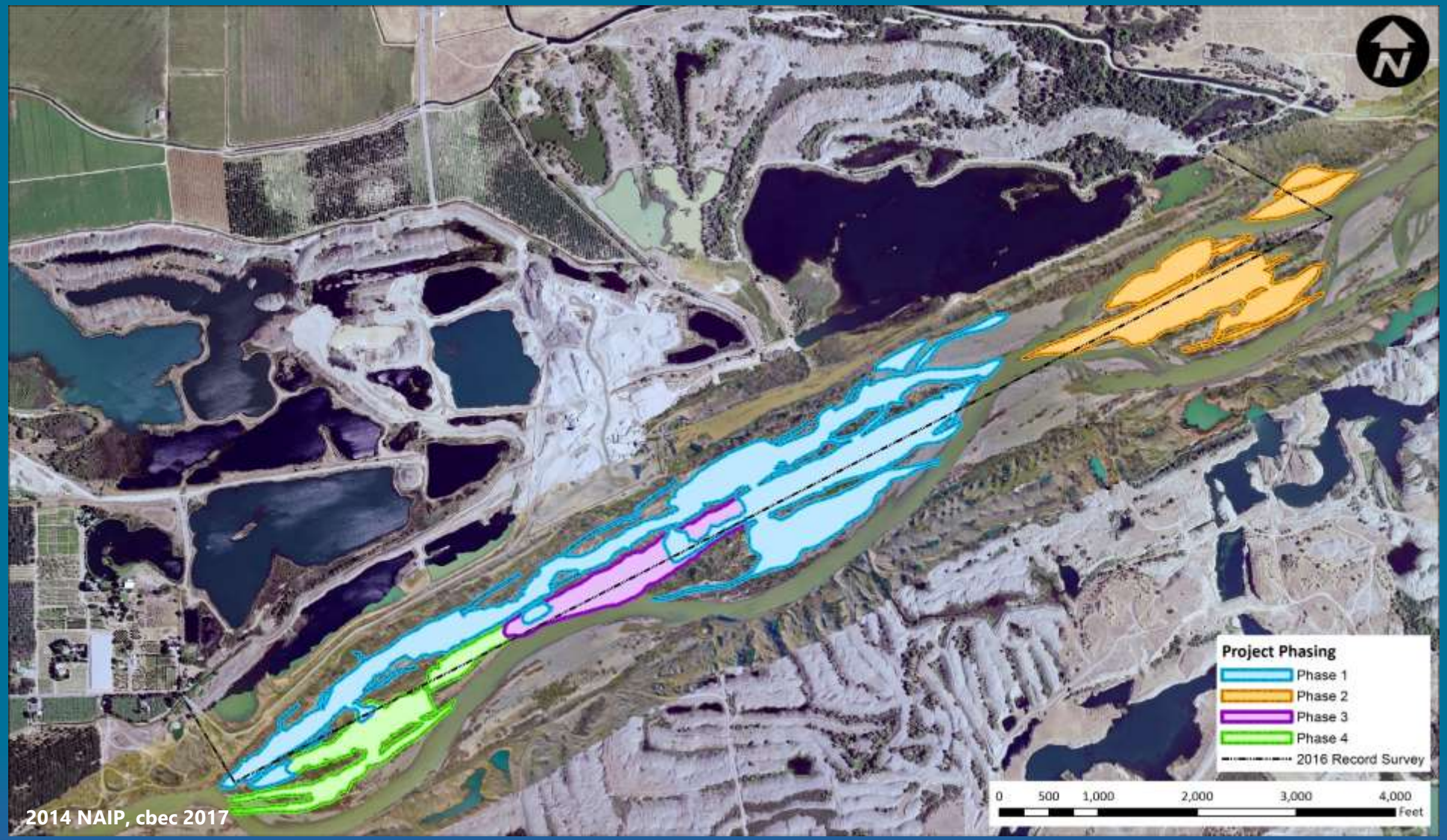
Full Project Grading



Habitat Enhancements



Construction Phasing – 5 Years to Move 3.2 Million CY of Sediment



Moving 3.2 Million CY of Sediment

Project Funding Via Public-Private Partnership

Agency	Project
US Fish & Wildlife Service (CVPIA via USBR)	$ 3,823,000
California Natural Resources Agency (Prop 68)	$ 2,875,000
Wildlife Conservation Board (Prop 1)	$ 1,985,000
Yuba Water Agency	$ 3,205,000
Total	**$ 11,888,000**

- Original USFWS grant secured by cbec in 2013
- **Teichert in-kind contribution of ~$72,000,000** for full build out
  - Cost to truck haul 3,200,000 CY of aggregate to next nearest competitor 3 miles away
- Cost / acre ~ $75,700
  - Planning, permitting, design, implementation, pre- and post-project effectiveness and validation biological monitoring (2 years pre- and 4 years post-)

Phase 1 Rough Grading

Increased Lateral Connectivity – October 2021 Event

Phase 1 – Upper Site

Before Fine Grading (May 2020)

After Fine Grading (Dec 2020)

Time Lapse of Phase 2 Earthwork

Phase 2 Before-After

Before Grading (March 2021)

Completed Grading (December 2021)

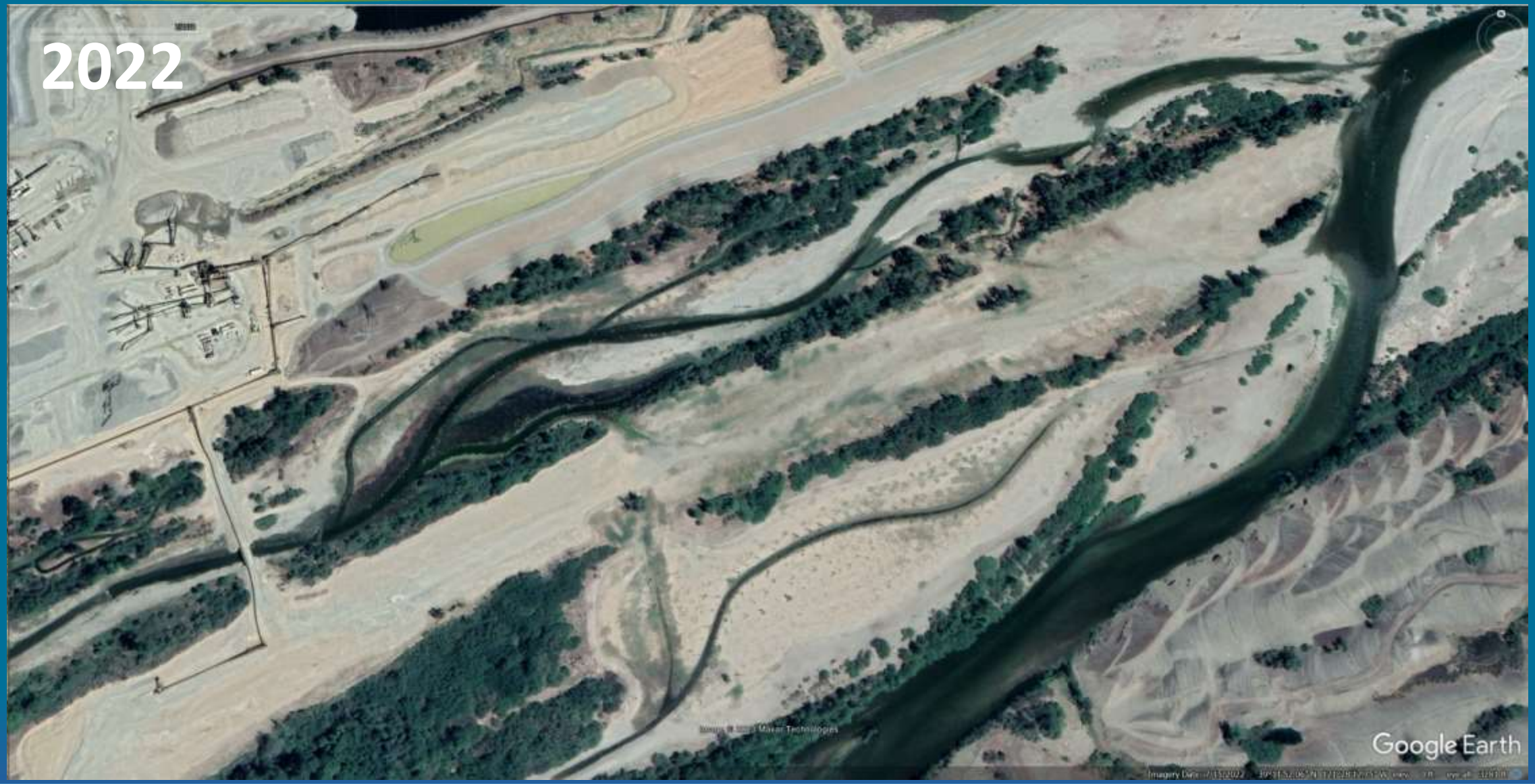
Phase 2 Flyover

Aerial Comparison – Point Bar

Aerial Comparison – Point Bar

Aerial Comparison – Point Bar

Aerial Comparison – Point Bar



Aerial Comparison – Point Bar

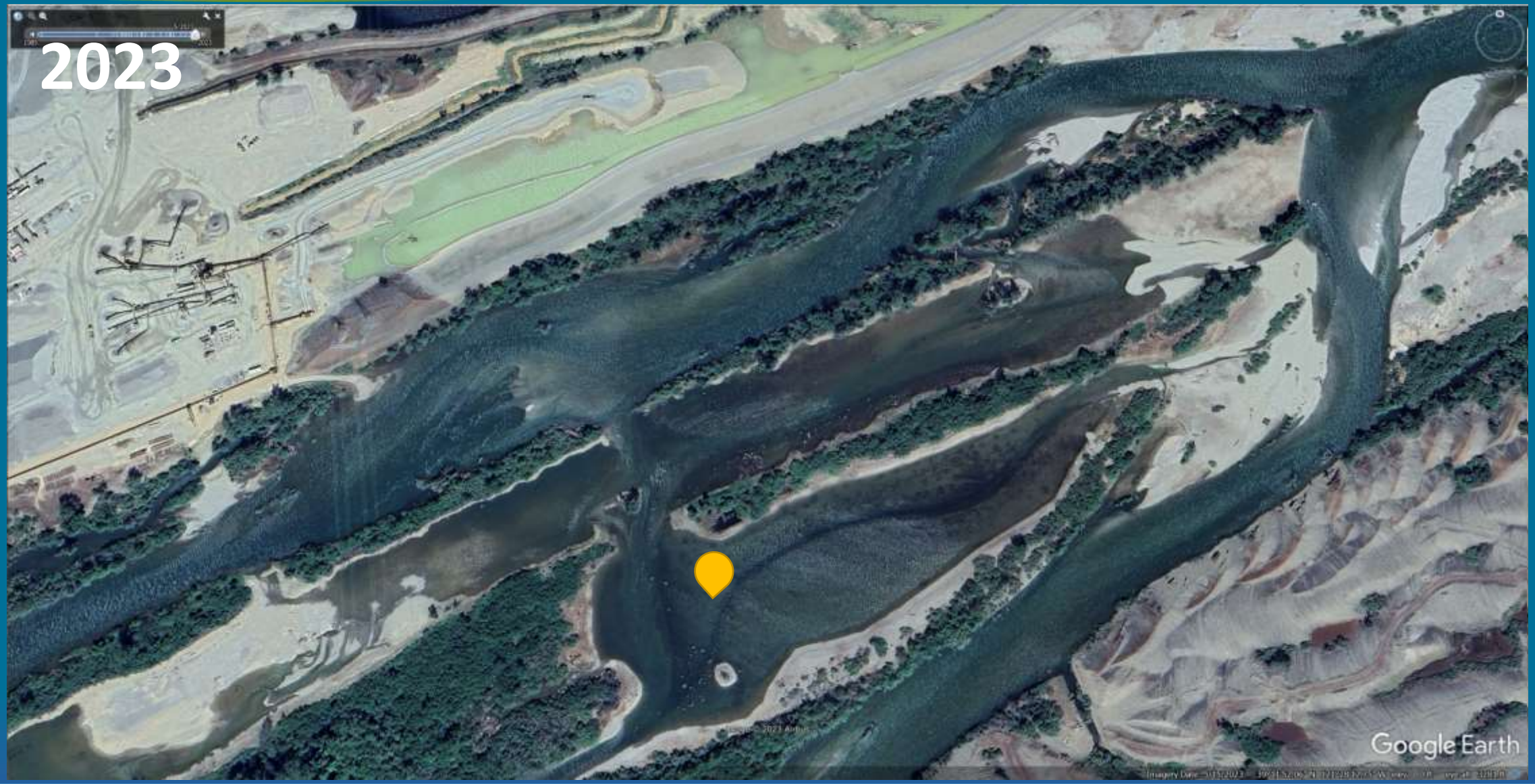


Photo Comparison – Upper Perennial Channel

Photo Comparison – Upper Perennial Channel

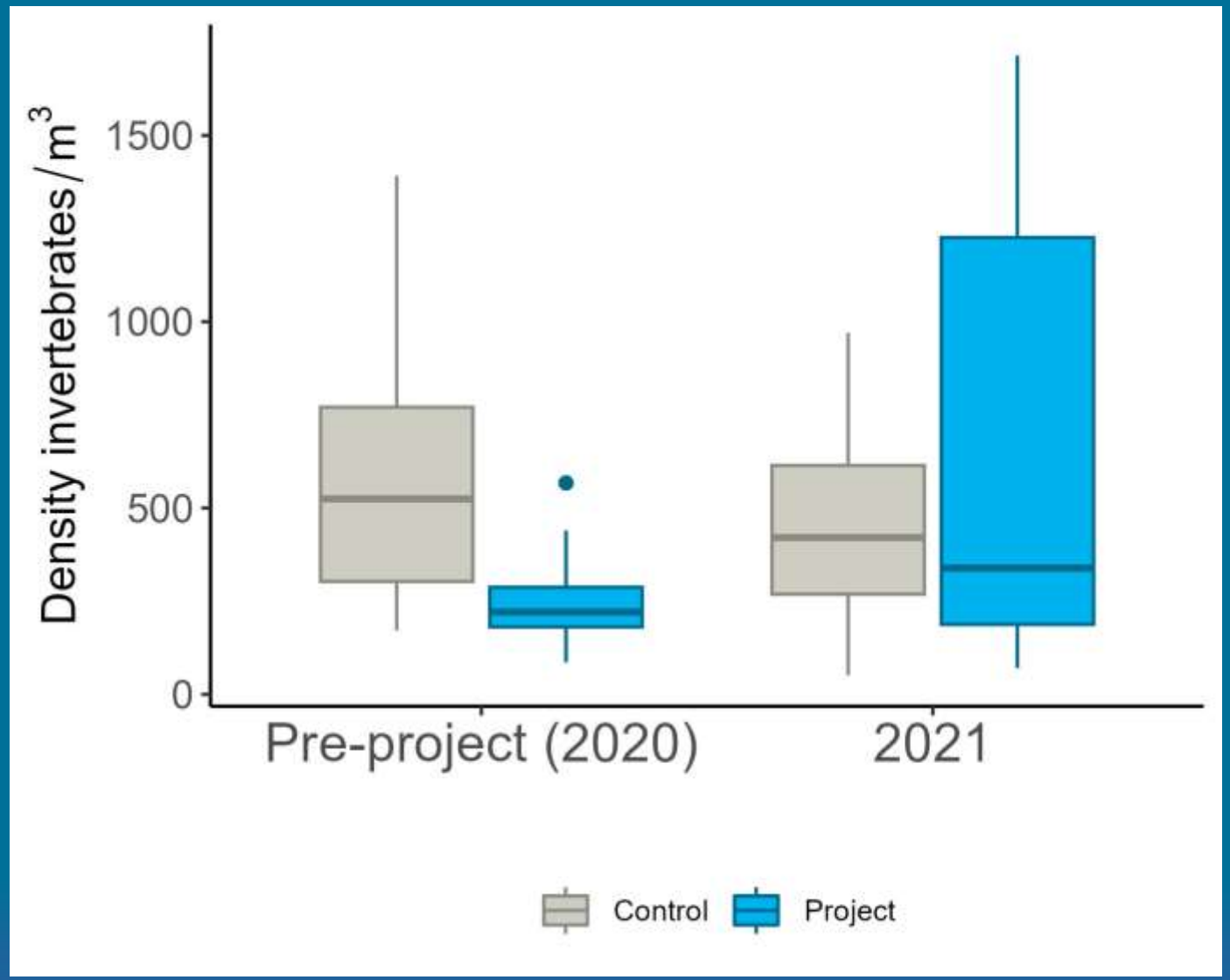
Photo Comparison – Seasonal Alcove

Photo Comparison - Seasonal Alcove

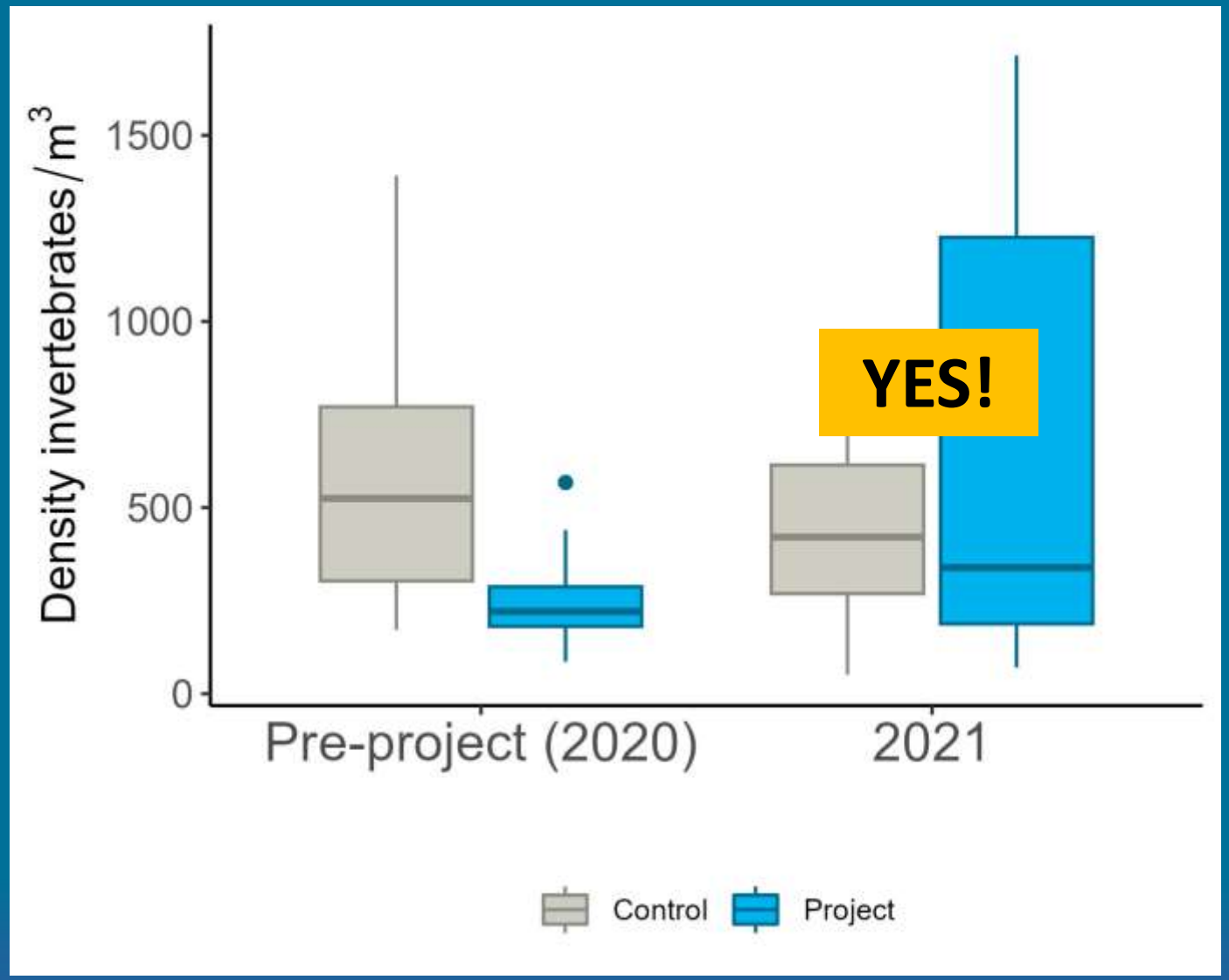
Hallwood Effectiveness Monitoring – Key Questions

- **Fish communities**
  - Will salmonid abundance increase?
  - Will non-native fish abundance decrease?
- **Predator/prey dynamics**
  - Will predator fish densities decrease?
  - Will predation on juvenile salmonids decrease?
  - Will prey abundance increase?
- **Riparian trees**
  - Will riparian trees recruit and survive within restored habitat features?

Did prey abundance increase?



Did prey abundance increase?



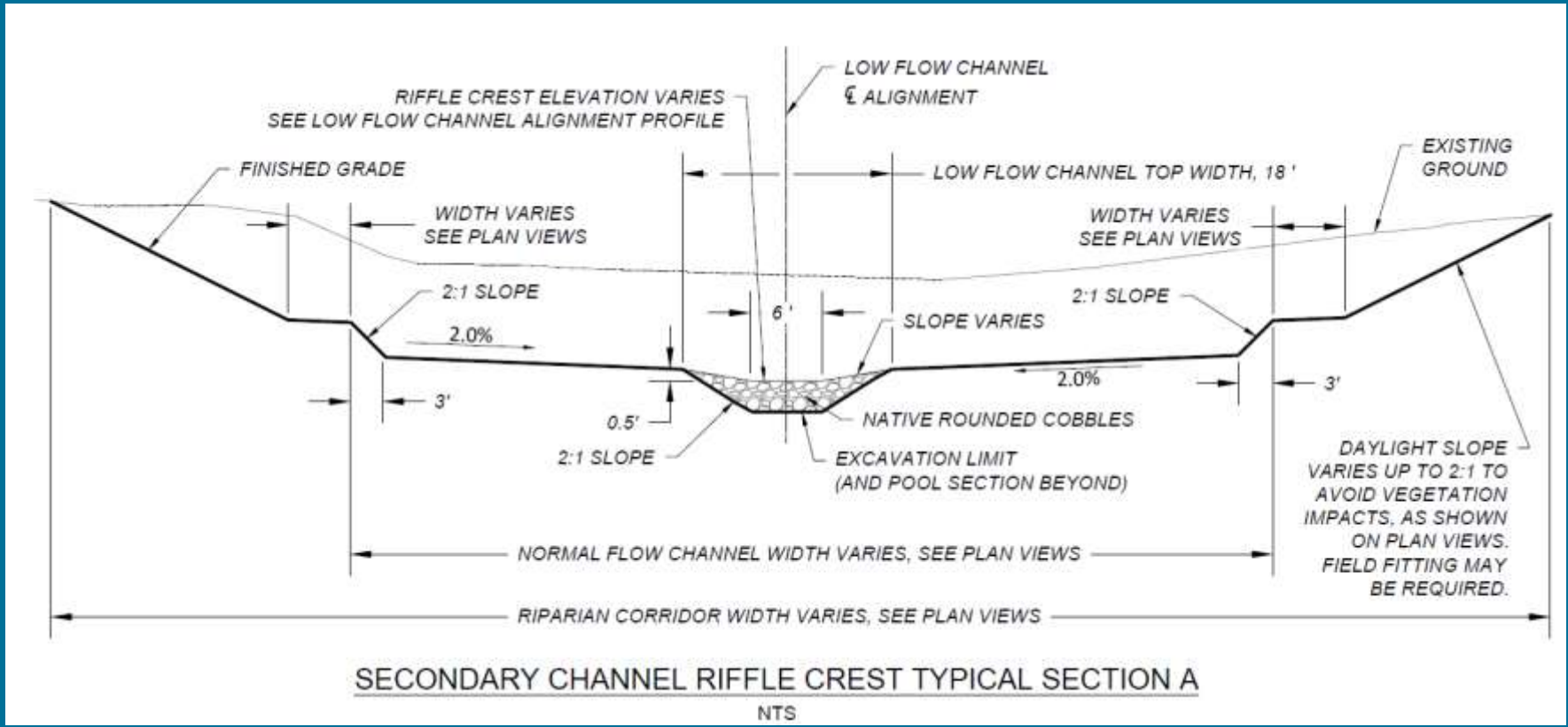
Following Restoration at Hallwood, 1 year Post

- Higher juvenile (and adult) salmon abundance
- More food for salmonids, fuller stomachs, and enhanced growth for salmon rearing > 1 week in the side channel
- Reduced predatory and non-native fish
- No evidence of predation at Hallwood (extensive predation at control site)
- Native riparian trees recruited, even in a drought year

A Multi-Benefit Project

- Flood benefit (up to 3 ft WSE reduction for 100-year event)
- Projected benefits to local economy, including recreational fishery
- Educational benefits, community involvement, scientific research

Perennial Channel Typical Sections



- Sequence of 14 riffles and pool
- At baseflow ~500 cfs, channel ~0.5-6 ft deep and 18 – 40 ft wide, perennially connected to groundwater upstream and laterally

Methods

- **Fyke trapping**

Methods

- Fyke trapping
- **PIT tagging and predator seining**

Methods

- Fyke trapping
- PIT tagging and predator seining
- **Drift invertebrate sampling**

Hallwood

Control

OR