Salmon Through Time

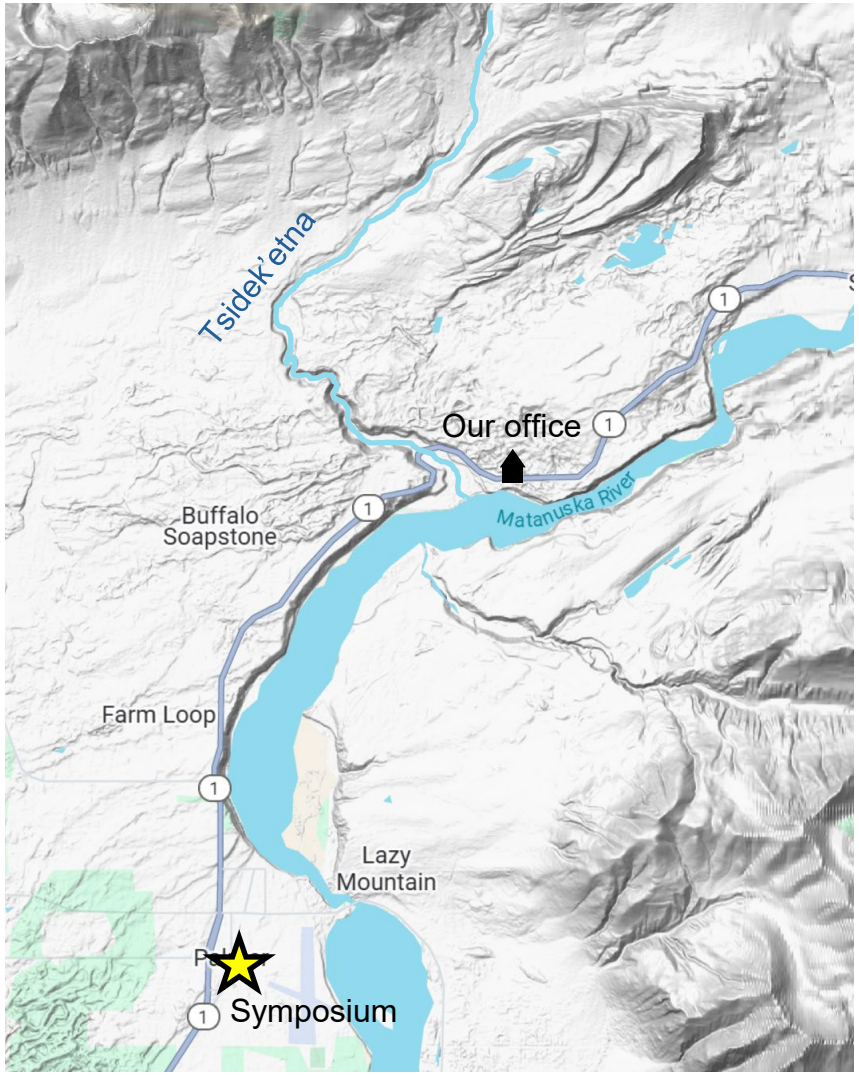
Chickaloon Native Village Research in the Matanuska Watershed

Ben Americus, PhD

Mat-Su Salmon Science and Conservation Symposium

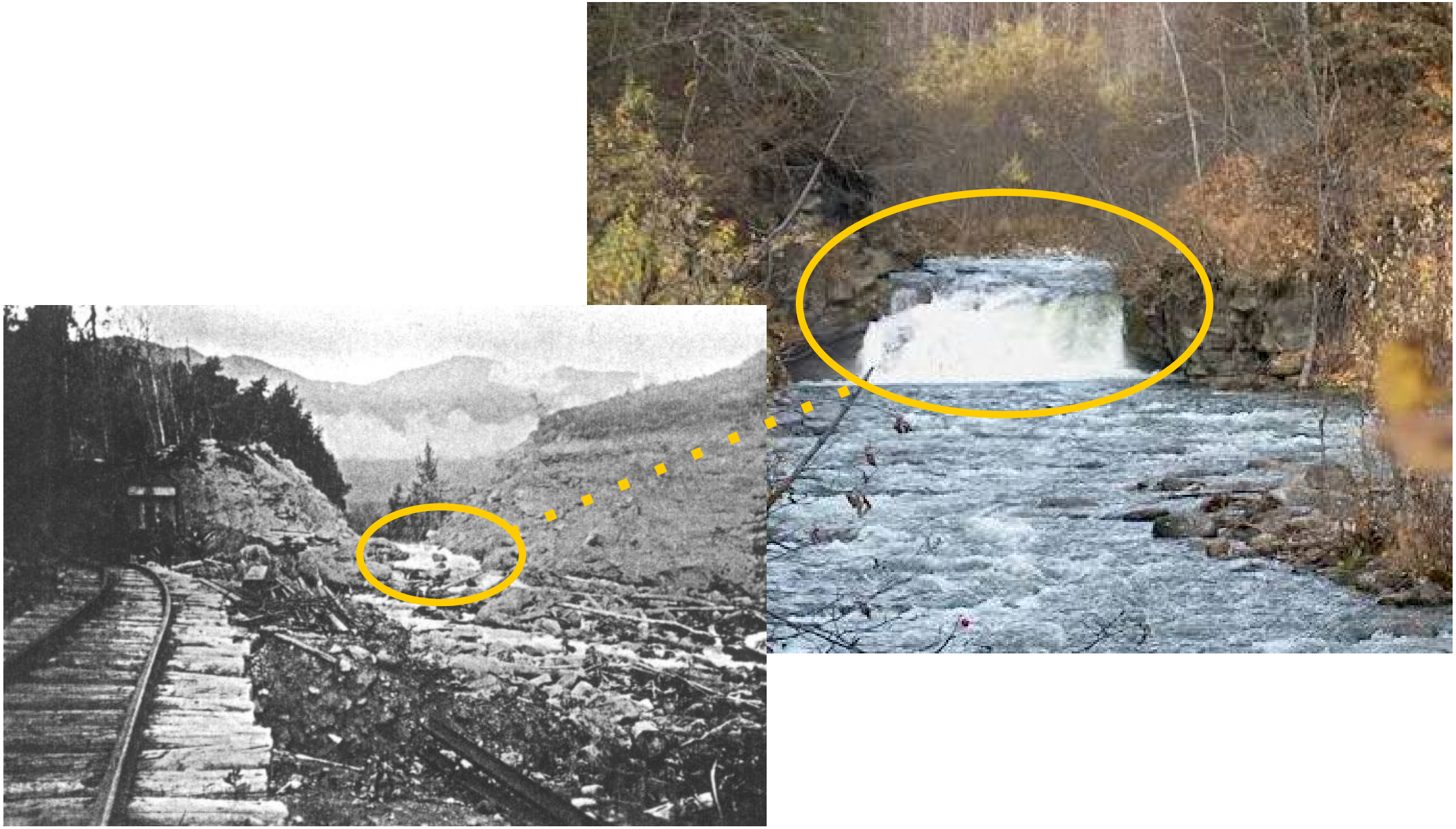
November 17th, 2024

I will describe two projects at Tsidek’etna (Moose Creek)

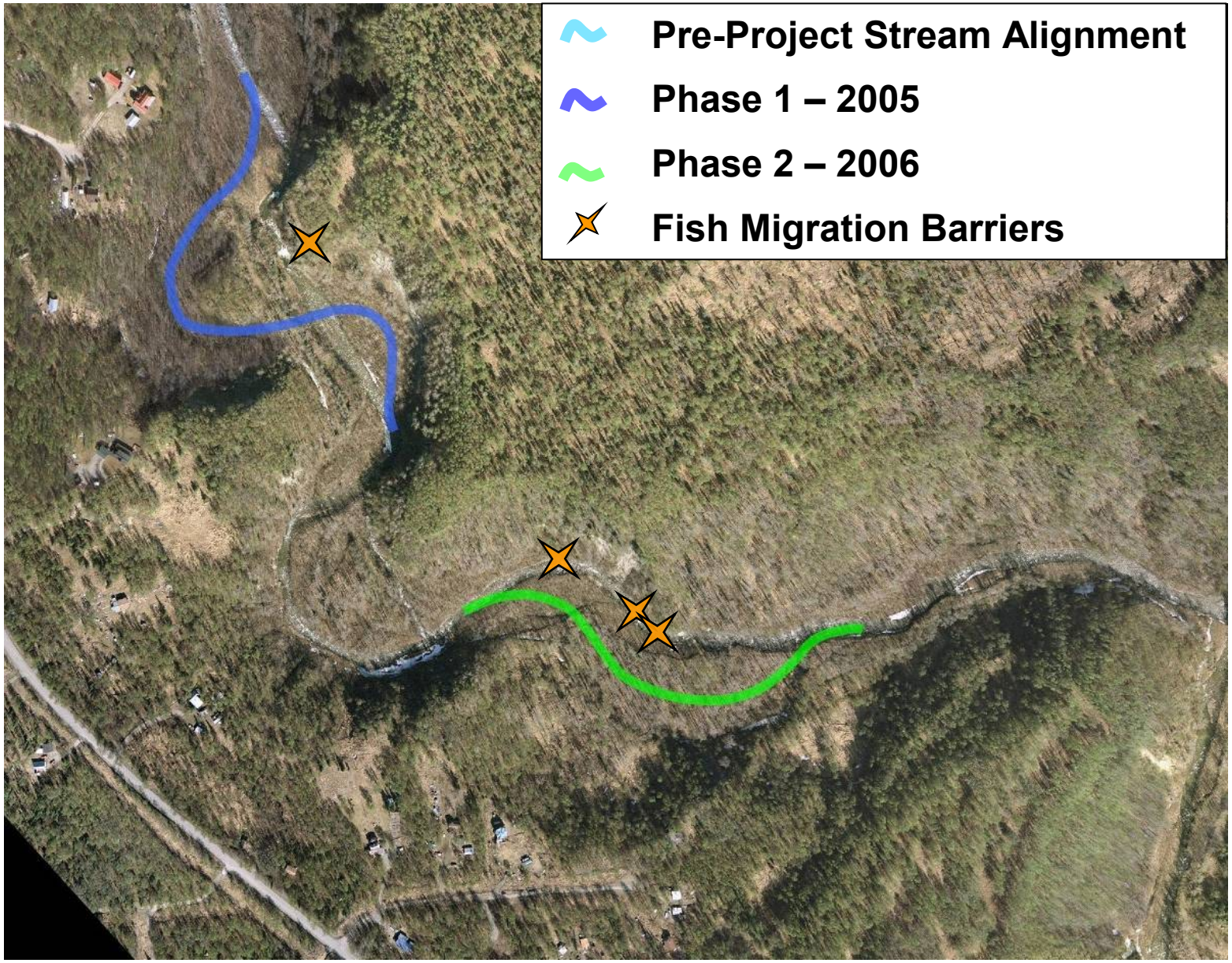


The first salmon of 2024. Photo by C. Henrikson.

Railroad development in the early 1900s impacted fish passage

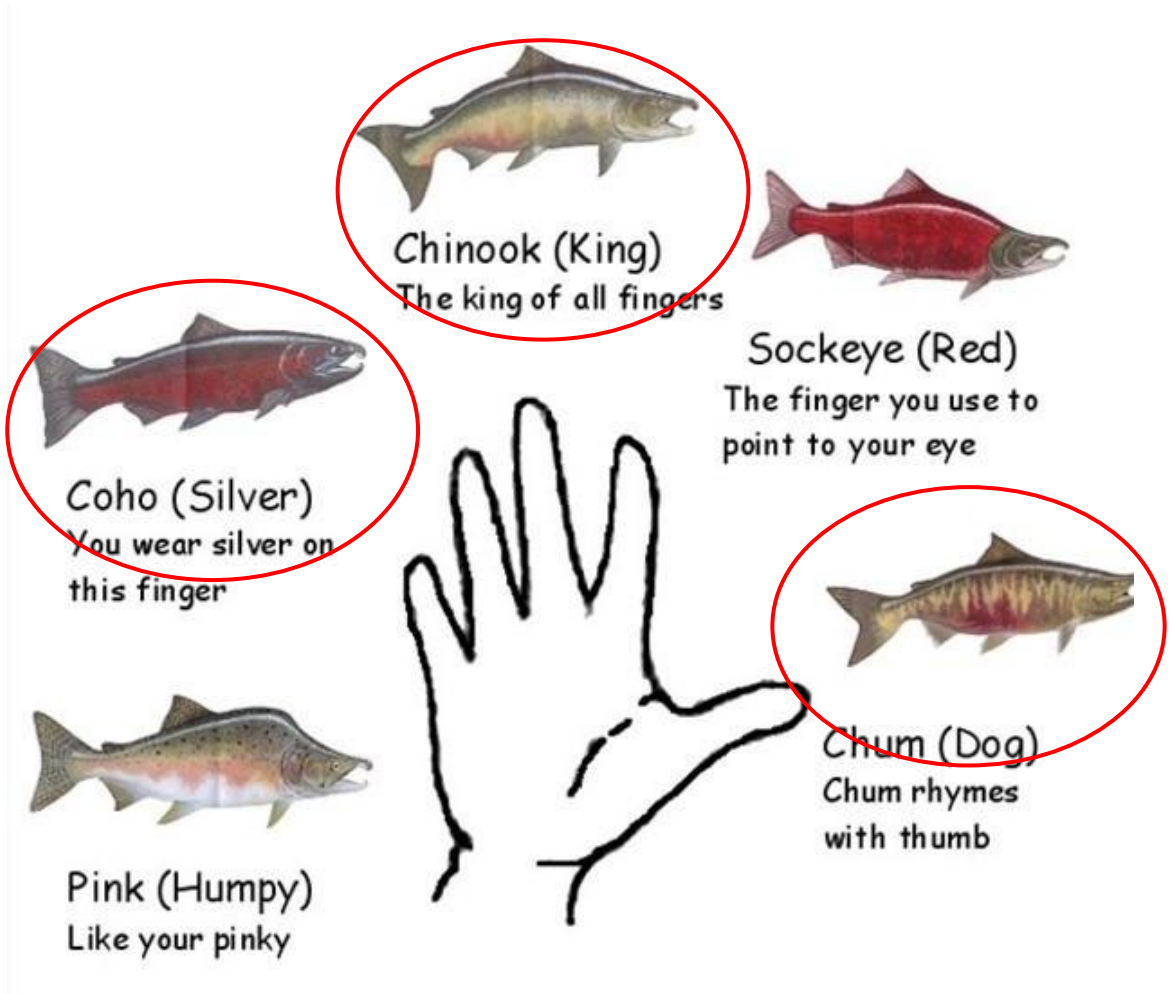


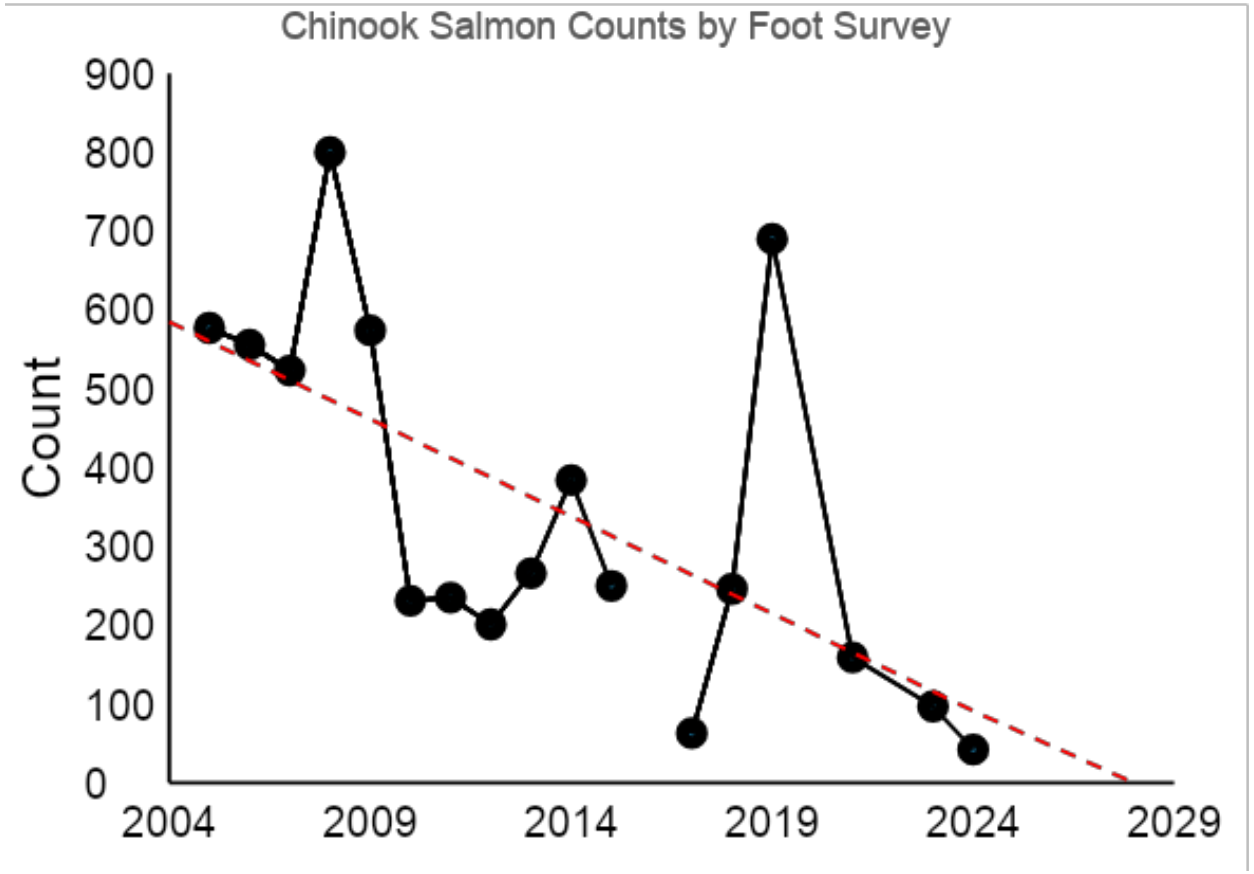
Fish passage barriers were removed in 2005, 2006



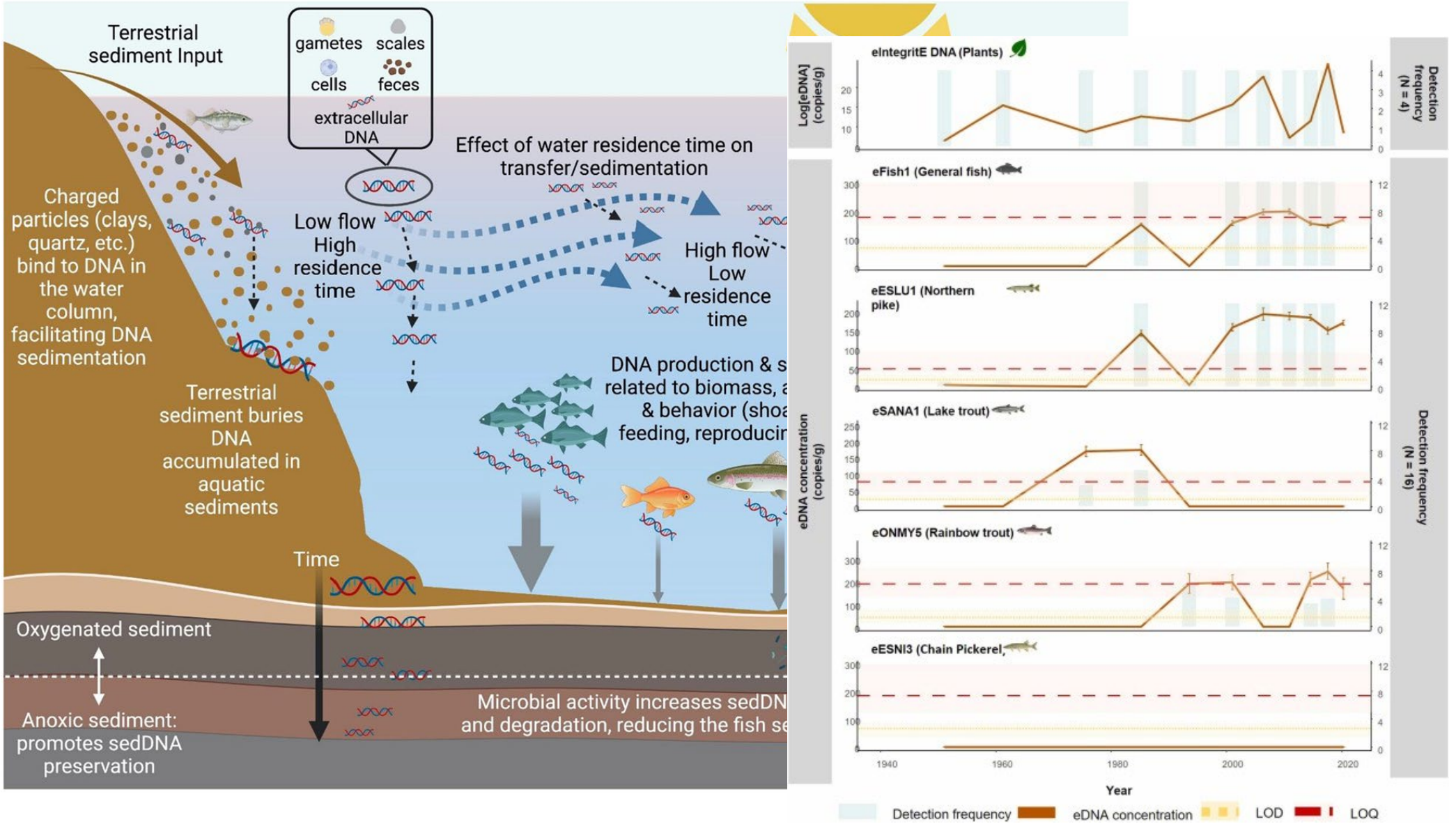
Salmon upstream of restoration in 2005

Historical knowledge tells of all five species of salmon in Tsidek’etna





Project 1: We are using sedDNA to look back in time



Project 1: Historical Salmon DNA

Lopez et al., 2024

We sample biologically/culturally relevant sites for salmon DNA

Former fish passage barrier

Archaeological site

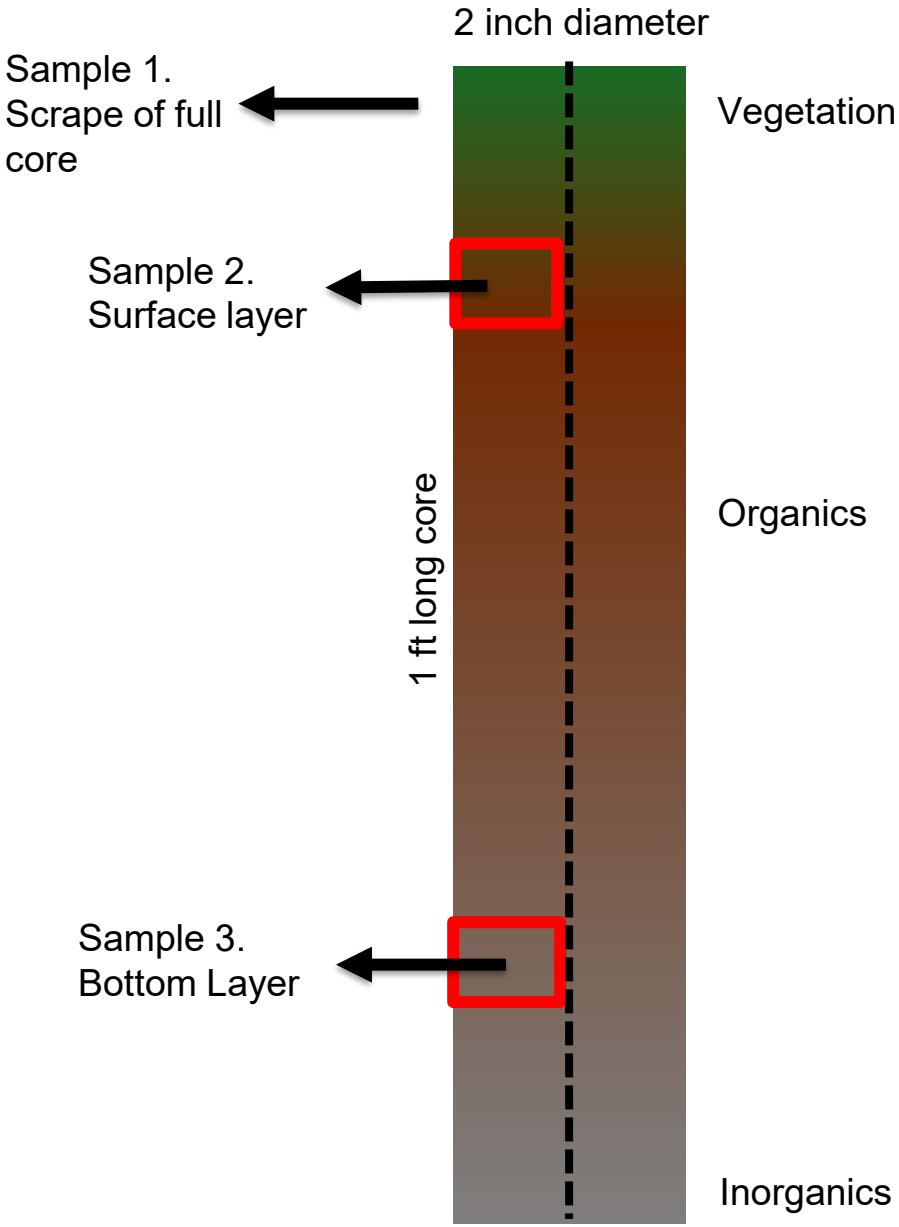
Tatondan Lake

Project 1: Historical Salmon DNA

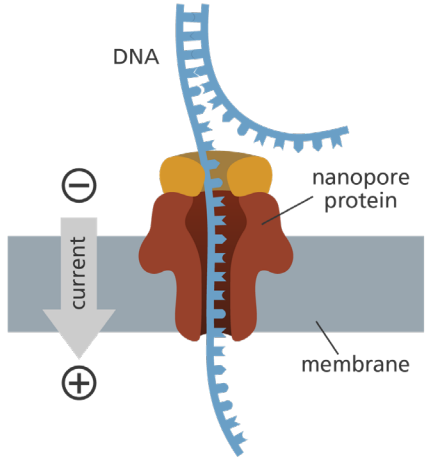
We collect soil from fishy, swampy, anaerobic areas

Project 1: Historical Salmon DNA

We are using direct DNA sequencing to identify species of interest



Oxford Nanopore PromethION



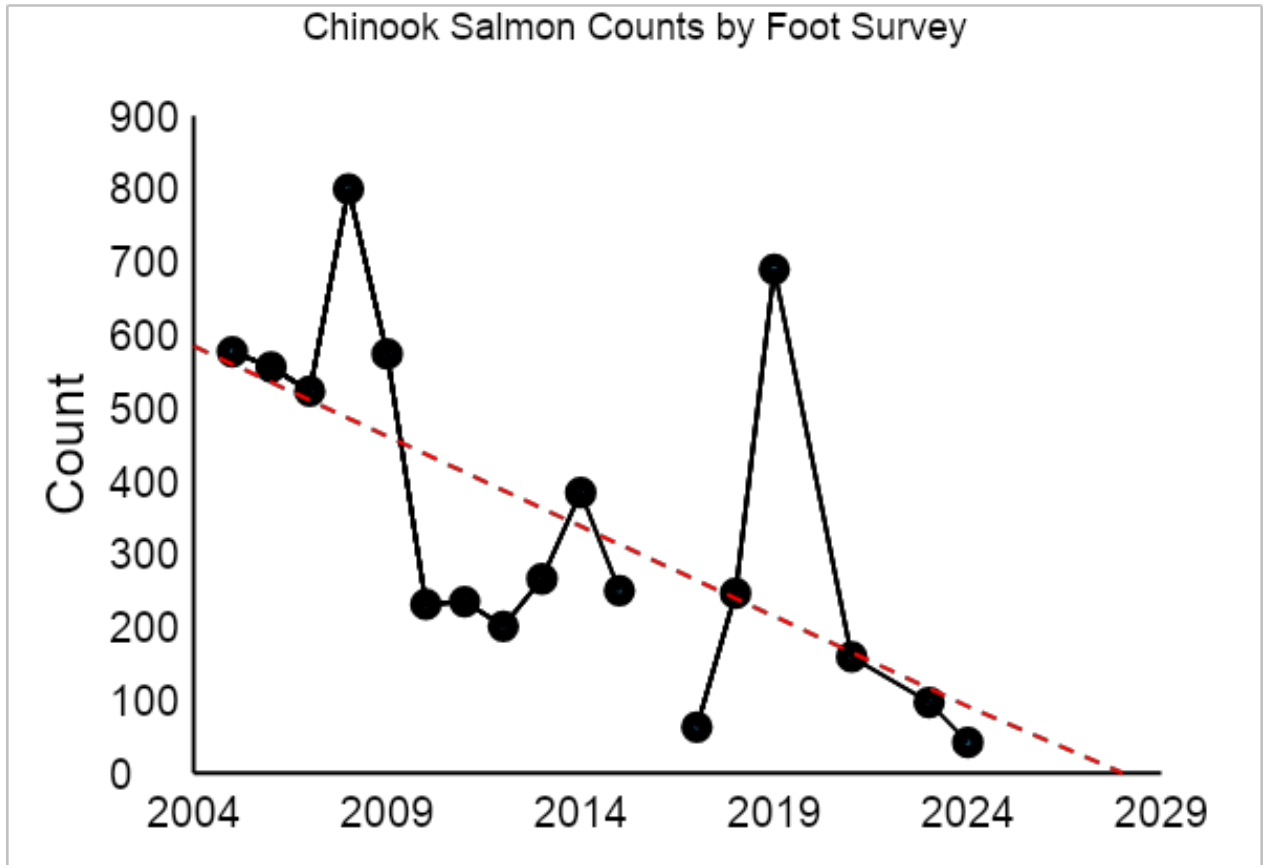
We are looking for presence and absence:

- five species of salmon
- rainbow trout, dolly varden, lamprey
- beaver, caribou

What other species are you interested in?

Project 1: Historical Salmon DNA

Project 2: Quantifying stream function at Tsidek’etna

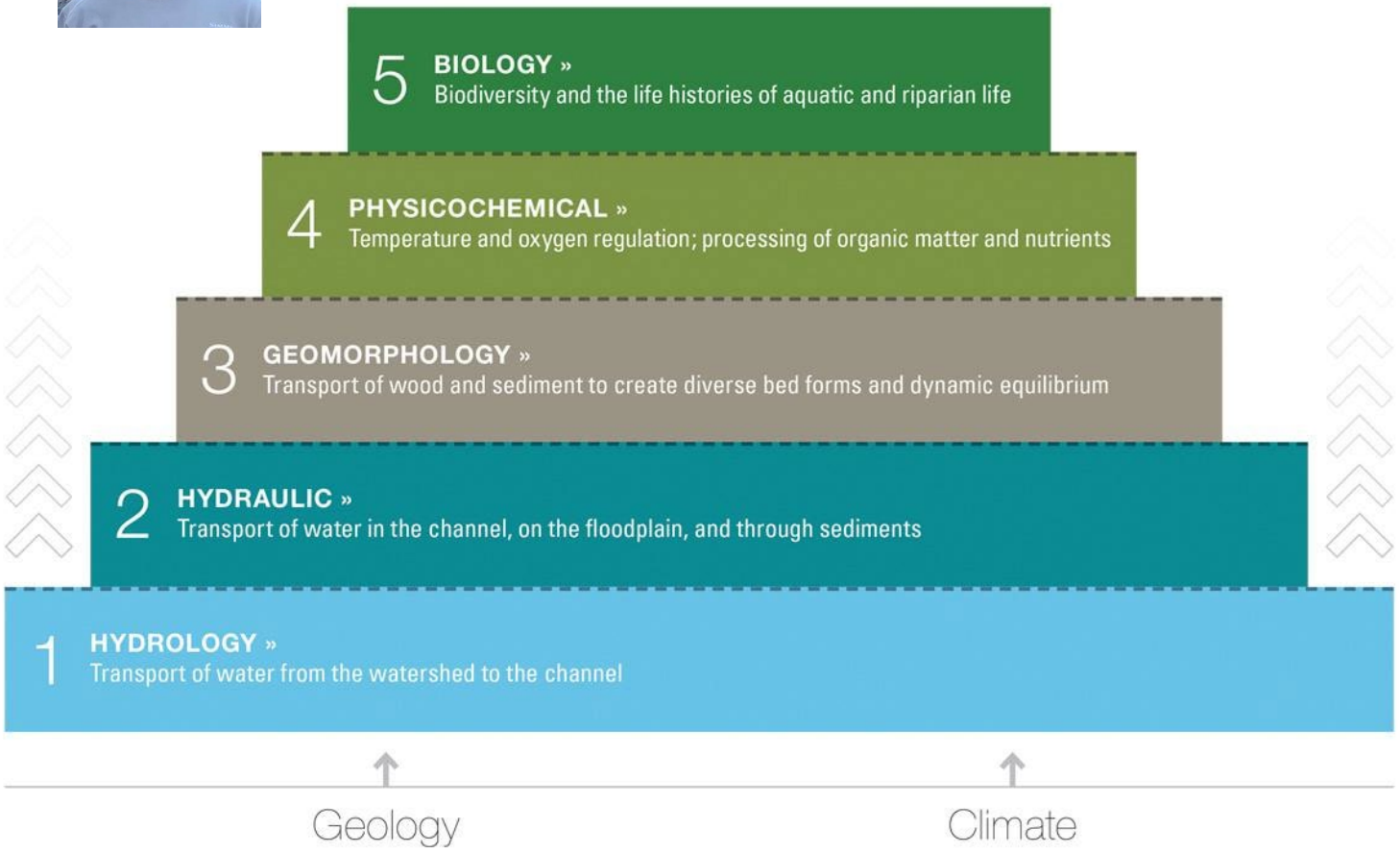


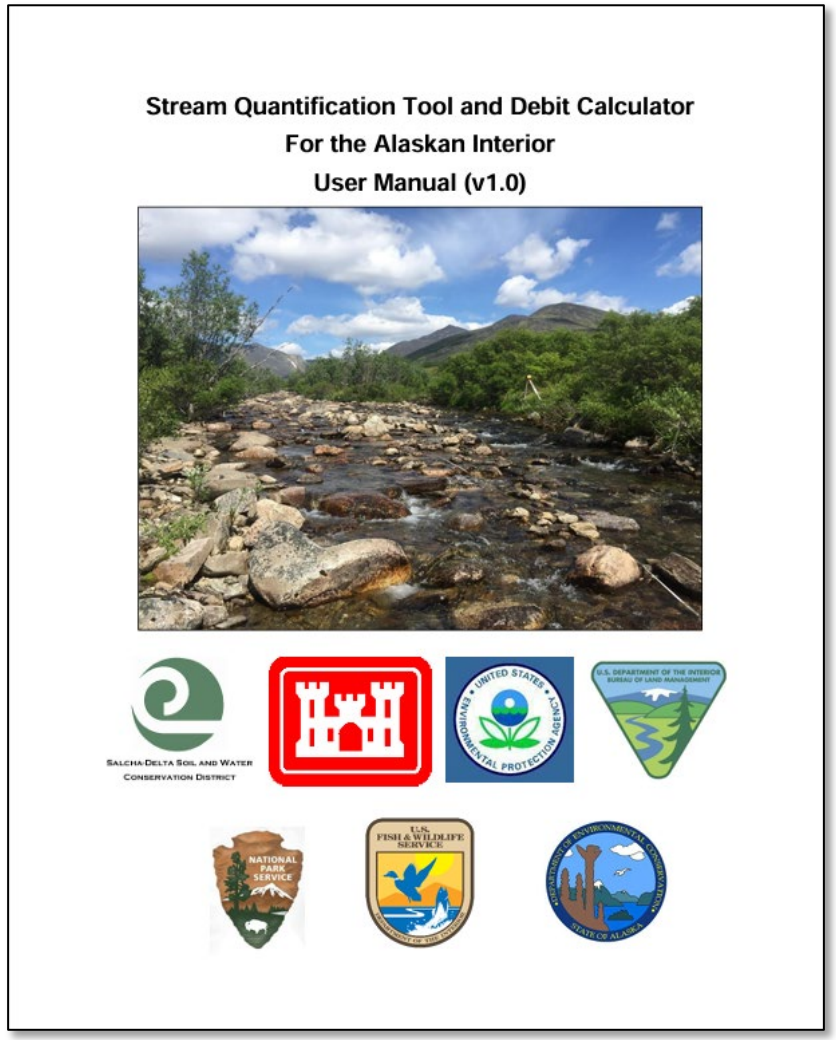
Is this good for fish? Does it need to be restored?

Project 2: Stream Quantification Tool

We use the SQT to quantify stream function before restoration

Will Harman's Stream Function Pyramid




Stream Quantification Tool and Debit Calculator
For the Alaskan Interior
User Manual (v1.0)

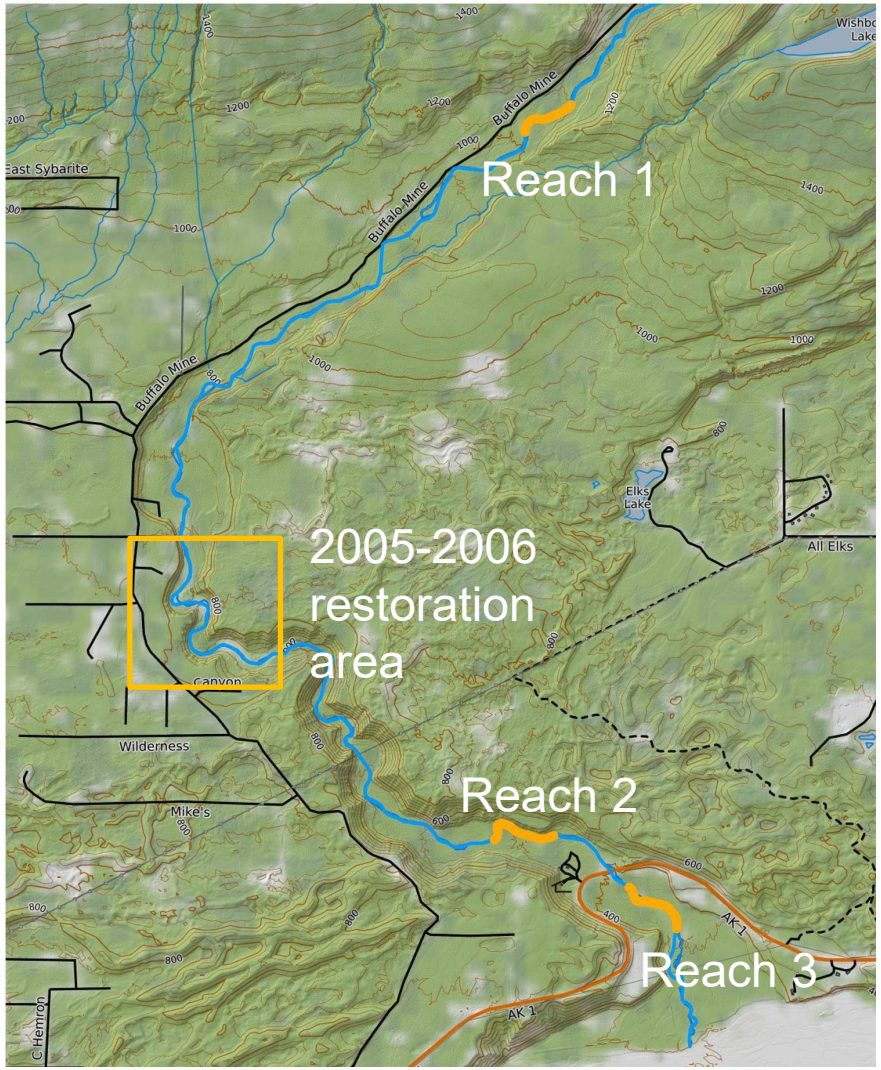
Project 2: Stream Quantification Tool

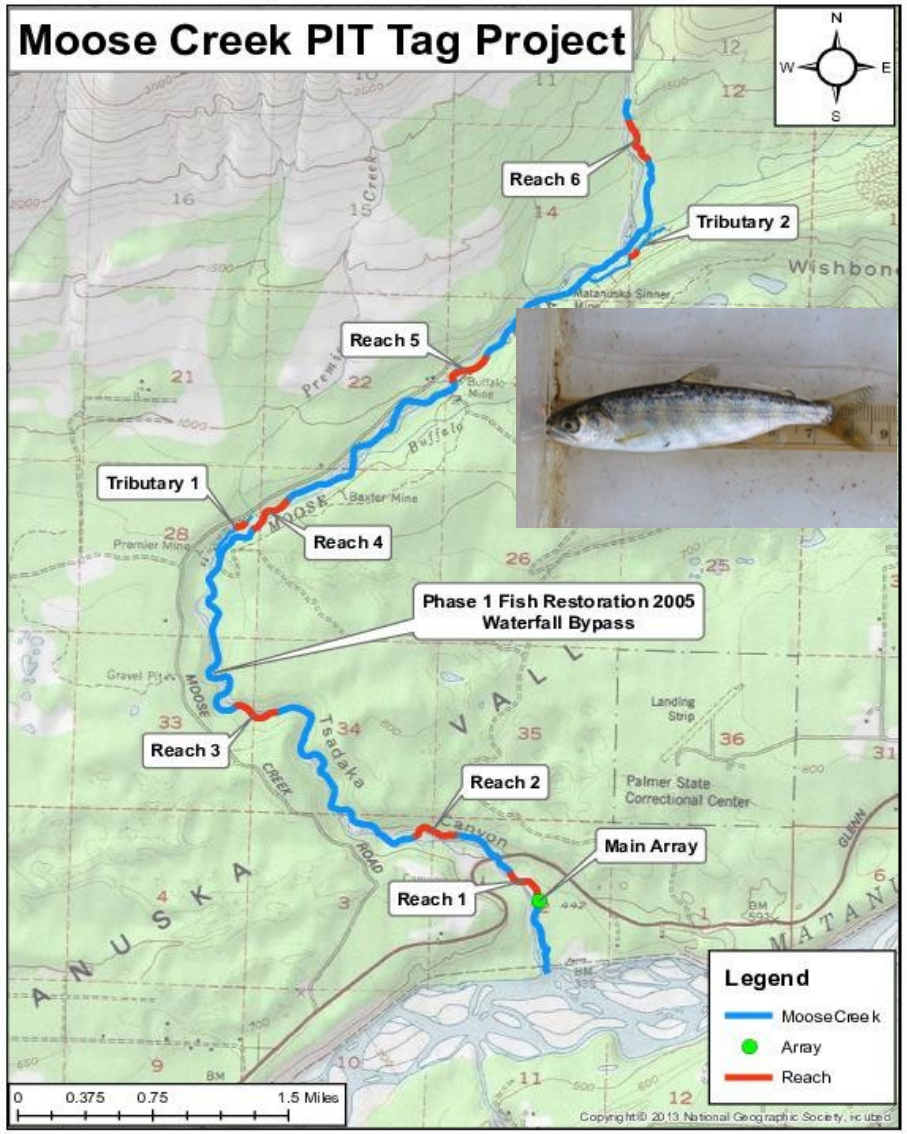
We measure parameters that are important to Tsidek'etna

All SQT Parameters

Functional Category	Function-Based Parameters	Metric
Hydrology	Catchment Hydrology	Land Use Coefficient
		Impervious Cover (%)
		Anthropogenic Land Cover (%)
	Reach Runoff	Land Use Coefficient
		Impervious Cover (%)
		Anthropogenic Land Cover (%)
		Concentrated Flow Points (#/1,000ft)
Hydraulics	Floodplain Connectivity	Bank Height Ratio (ft/ft)
		Entrenchment Ratio (ft/ft)
	Flow Dynamics	Width/Depth Ratio (% of Expected)
Geomorphology	Large Woody Debris	LWD Frequency (#/100m)
	Lateral Migration	Dominant BEHI/NBS
		Percent Streambank Erosion (%)
		Percent Streambank Armoring (%)
	Bed Material	Percent Fines < 2mm (%)
	Bed Form Diversity	Pool Spacing Ratio (ft/ft)
		Pool Depth Ratio (ft/ft)
		Percent Riffle (%)
	Riparian Vegetation	Riparian Extent (% of Expected)
		Vegetative Complexity
		Native Cover (%)
Physicochemical	Temperature	Daily Maximum Temperature (O/E)
	Turbidity	Daily Average Turbidity (O/E)
	Diatoms	Diatom Index
Biology	Macroinvertebrates	Alaskan Interior MMI
	Fish	Fish Species Richness (% Expected)
		Relative Abundance (O/E)
		Species Biomass (O/E)

We chose three study reaches that reflect whole river





Project 2: Stream Quantification Tool

The SQT says the three reaches are… different

		Reach 1	Reach 2	Reach 3
Hydraulics	Floodplain Connectivity	0.86	0.86	0.93
	Flow Dynamics	1	1	1
Geomorphology	Large Woody Debris	1	1	1
	Lateral Migration	0.883333	0.4	0.4
	Bed Material Characterization	1	0	0
	Bed Form Diversity	0.905	0.68	0.666667
	Riparian Vegetation	1	1	0.996667

Reaches 2 and 3 (more downstream)
1. More erosion
2. More sand

Is this what juvenile fish need?

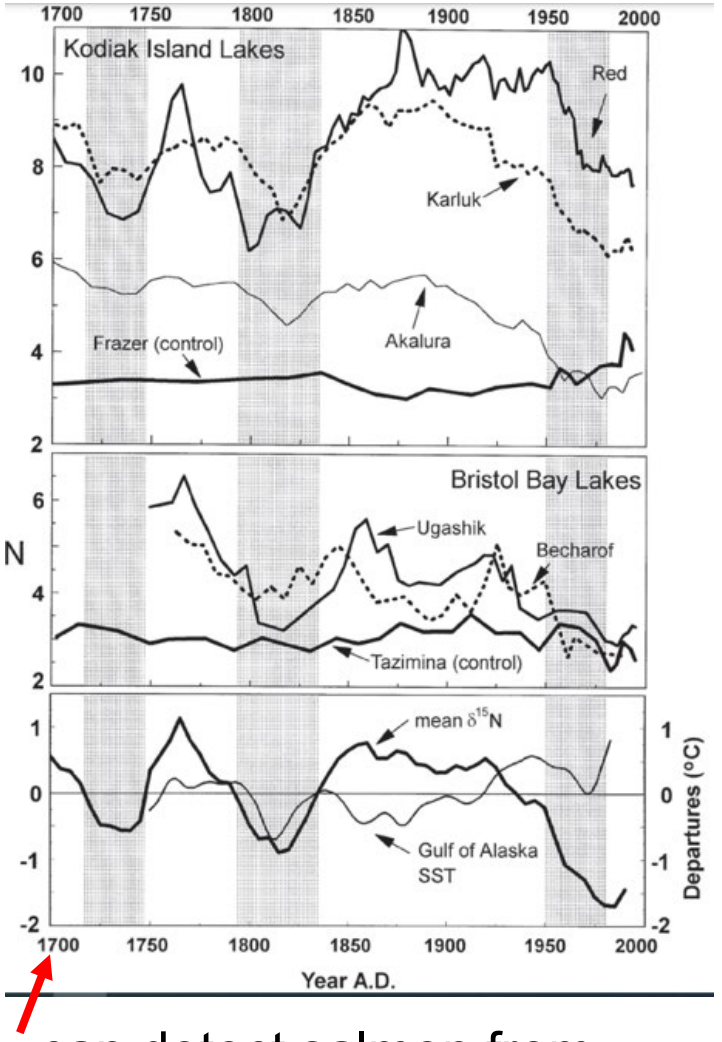
More juvenile salmon here

Our dreams for the future…

1. Detection of marine-derived nitrogen in soil cores

2. Moist Air Incubation for Moose Creek Chinook

3. Collaboration with you!



can detect salmon from 300 years ago!

Tsin’aen! (thank you)

Tribal Wildlife Grant

Contact: beamericus@chickaloon-nsn.gov

Collaborators

Damien Menning (USGS)

Will Harman (Stream Mechanics)