



Coastal Streams and Embayments Prioritization along Puget Sound Shores with a Railroad

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Project Funding

- **Near-term Action of Puget Sound Partnership**
 - Funded by EPA under assistance agreement PC-01J22301 through WDFW
- **In-Kind services of Tulalip Tribes**

Presentation Outline

- Overview of the Issue and Project Objectives
- Data Compilation and Field Data Collection
- Prioritization Analysis
- Recommended Next Steps for Implementation

Overview of the Issue

- Railroad on the eastern shore of Puget Sound was constructed in the late 1800's



Property of Shoreline Historical Museum



*Chuckanut Drive
near Bellingham, Wash.
Jukes, photo.*

Overview of the Issue

- Today, there are 52 miles with railroad on shoreline
- Another 73 miles with railroad within 200 feet of shoreline



Impacts to Stream Mouths



- Bisects and truncates estuaries
- Restricts fish access
- Impedes delivery of sediments to nearshore
- Impedes delivery of large wood to nearshore...and more

Creates and/or Impacts Embayments



- In some cases, connection of historic embayments to Puget Sound are altered by the railroad
- In other areas, the railroad cut straight across a complex part of shoreline and formed embayment
- Limits or entirely restricts connectivity to Puget Sound

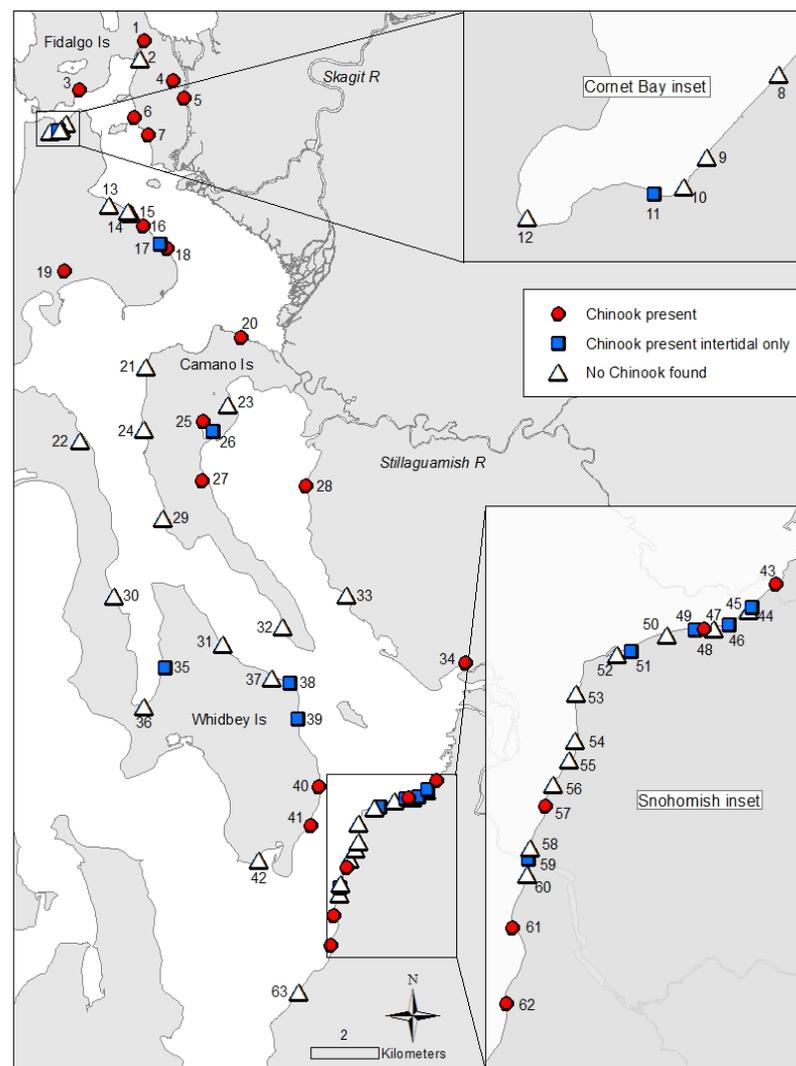
Overview of the Issue

- 196 culverts at stream mouths
- 13 embayments



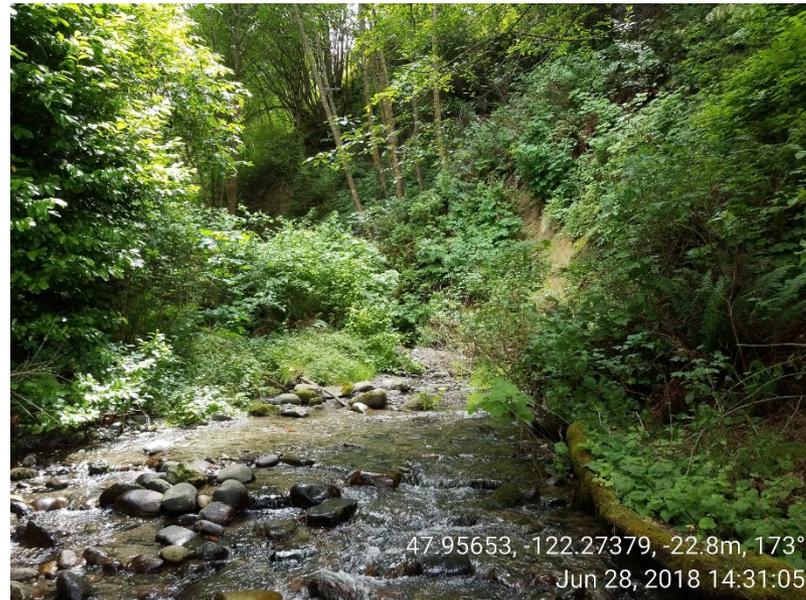
Presence of Juvenile Chinook in Small Streams

- Beamer et al. (2013)
- 32 of 63 streams shocked had juvenile Chinook
- Factors influencing juvenile presence:
 - Distance to nearest Chinook-bearing river (<20 km)
 - Watershed size (>111 acres)
 - Channel slope (< 6.5 %)
 - Stream access (no culvert at mouth)



Project Goal

- Develop prioritization of coastal stream mouths and embayments impacted by railroad crossings based on potential ecological benefits



Project Approach

- Convene Advisory Group of Experts familiar with issues of the railroad on the shoreline
- Compile Existing and Collect New Data for all sites
- Develop and Apply Prioritization Framework

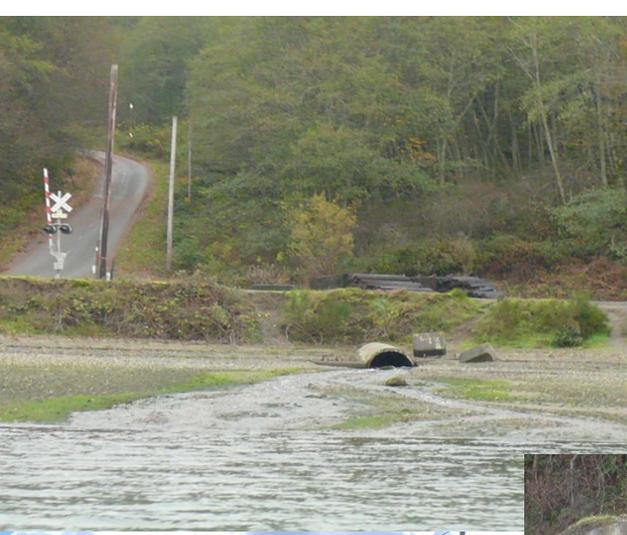
Advisory Group

- Dava Kaitala, BNSF
- Courtney Wallace, BNSF
- Hugh Shipman, Ecology
- Doris Small, WDFW
- Pad Smith, WDFW
- Jay Krienitz, WDFW ESRP
- Tish Conway-Cranos, WDFW ESRP
- Kathleen Pozarycki, Snohomish Co.
- Kristin Williamson, South Puget Sound Salmon Enhancement Group



Field Data Collection

Site information		
<ul style="list-style-type: none">• GPS location• Time of visit		
Downstream habitat	Crossing Characteristics	Upstream Habitat
<ul style="list-style-type: none">• Distance to Salish Sea• Slope• Stream bankfull width• Notable features	<ul style="list-style-type: none">• Type of structure• Size of structure• Presence of streambed materials• Inlet and outlet water depth• Outlet tidal elevation	<ul style="list-style-type: none">• Stream bankfull width• Stream slope (200')• Riparian habitat• LWD• Alignment relative to RR• Open channel or piped• Notable features



47.97052, -122.23082, 22.1m, 154°
Jun 28, 2018 09:29:23

47.97055, -122.23082, 15.1m, 154°
Jun 28, 2018 09:24:18

What we saw: recently culvert fixes



What we saw: a few failing culverts...



What we saw: Other uses Culverts



What we saw: Other uses Culverts



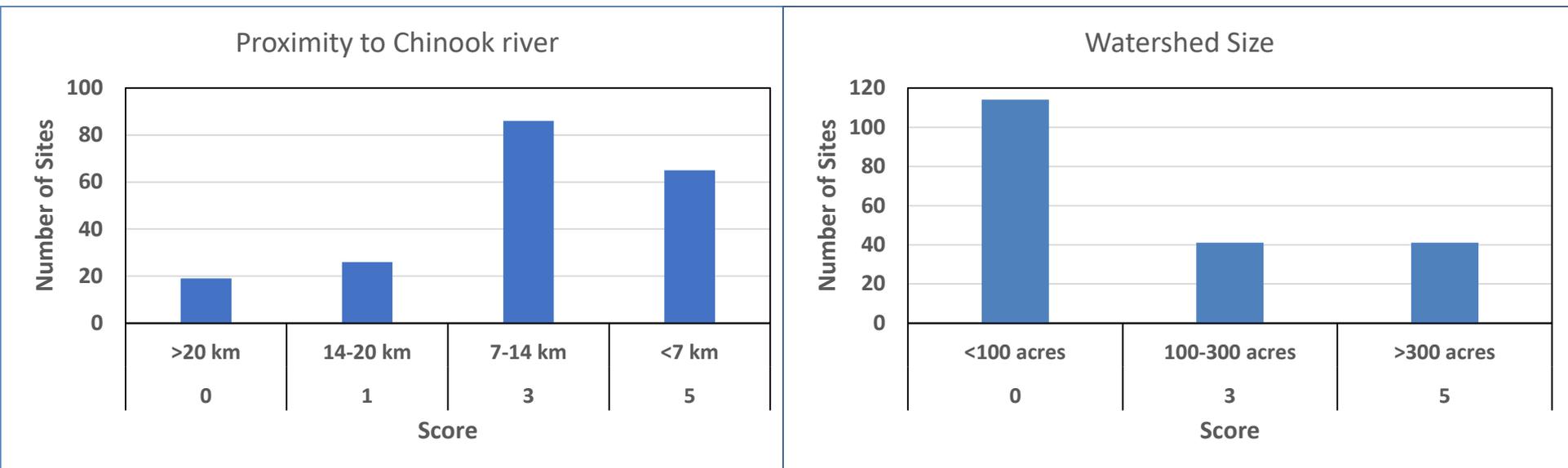
Prioritization Framework

- Framework had two components
 - Likelihood of use by juvenile chinook salmon
 - Informed by Beamer et al. (2013)
 - e.g., proximity to major chinook river, presence of pocket estuary/delta
 - Upstream habitat
 - e.g., length of accessible stream, water quality, habitat conditions
- Points assigned to parameters characterizing each component

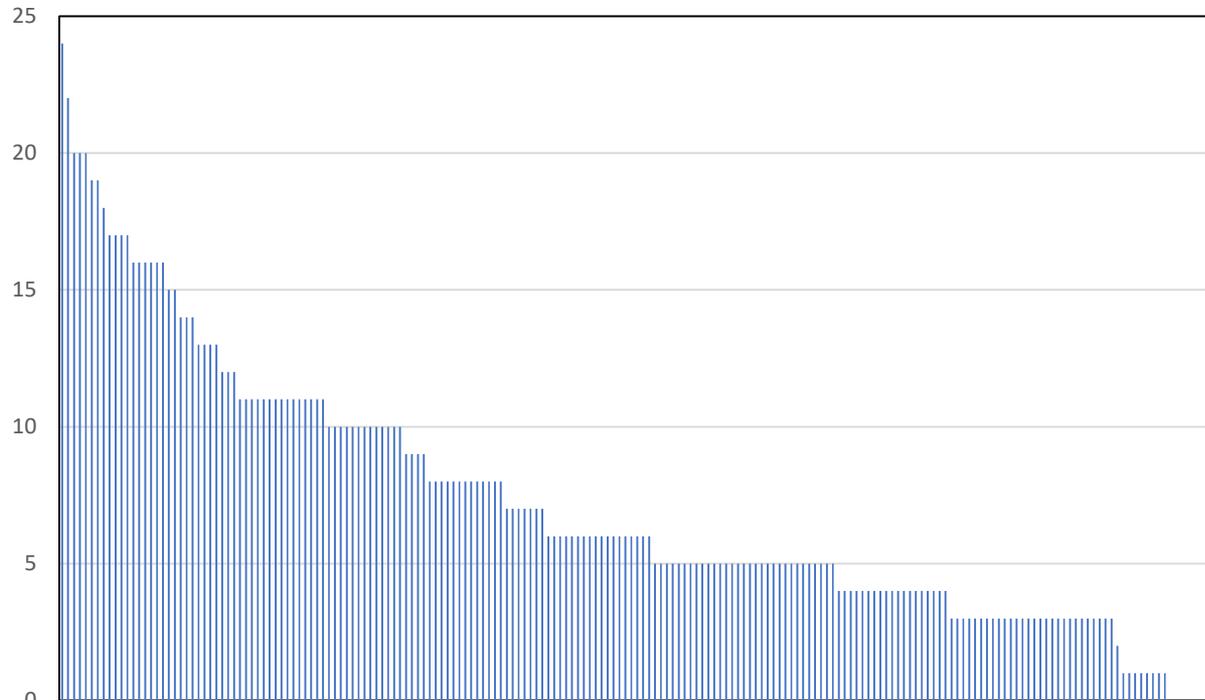
Parameters to Characterize Likelihood of Stream Use by Juvenile Chinook

Likelihood of Use
Proximity to major chinook river
Presence of pocket estuary, stream delta, or from PSNERP (barrier beach [BAB] or barrier estuary [BE])
Watershed size
Documented salmon spawning or intrinsic potential
Stream gradient
Tidal inundation extends upstream of culvert (i.e., culvert backwaters)

Example Results Coastal Streams - Likelihood of Stream Use by Juvenile Chinook

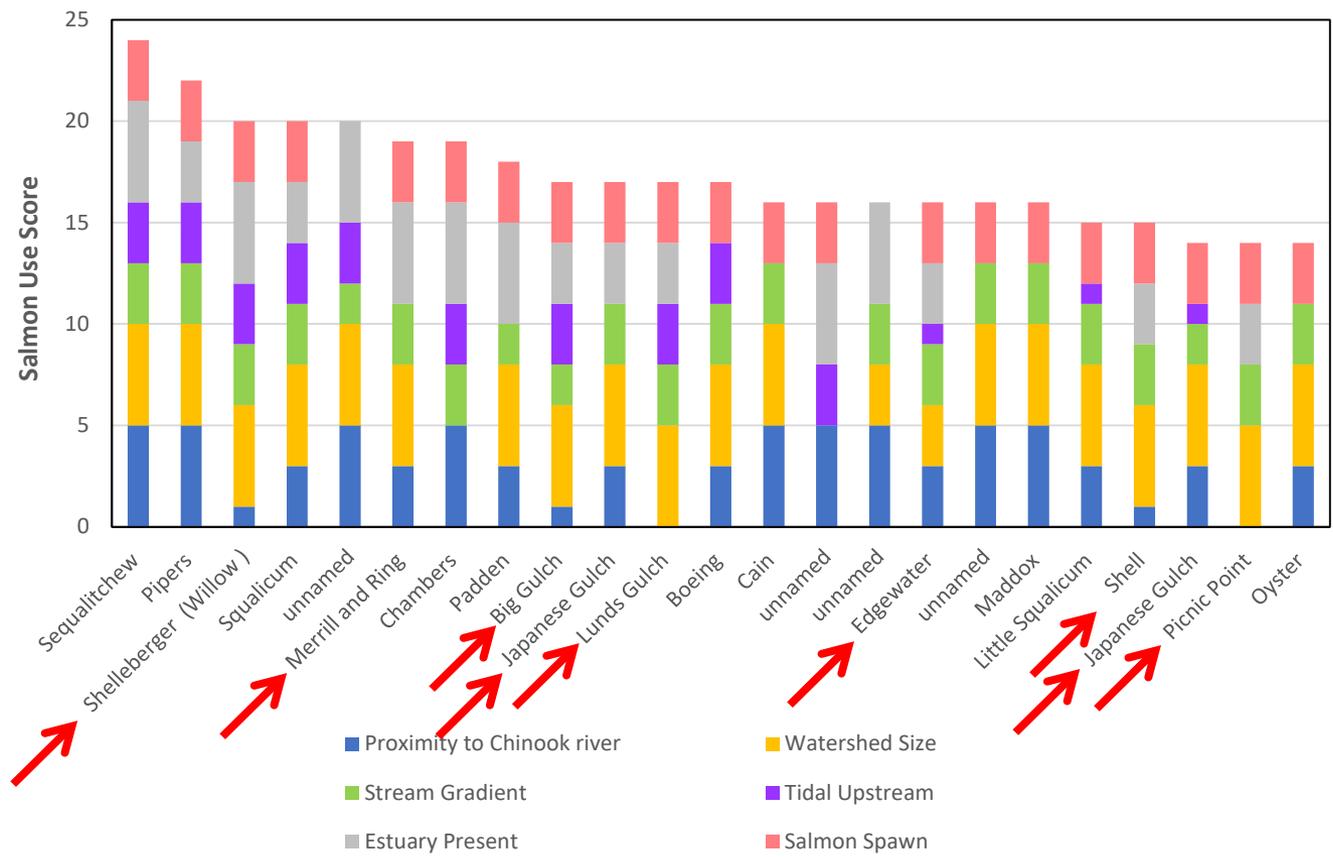


Likelihood of Stream Use by Juvenile Chinook Salmon



- Range 0-24
- Mean = 7.2
- Median = 6.0

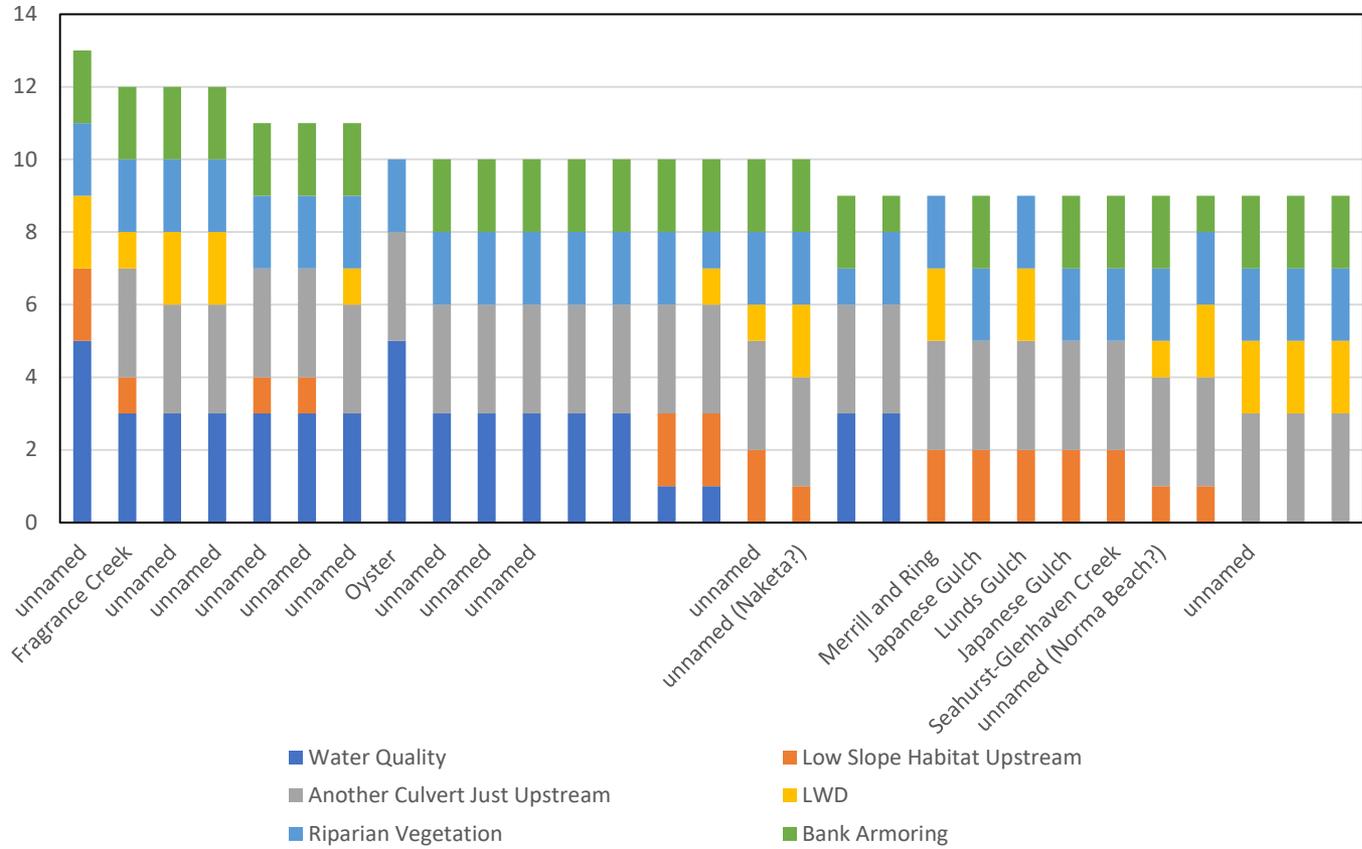
Likelihood of Stream Use by Juvenile Chinook Salmon



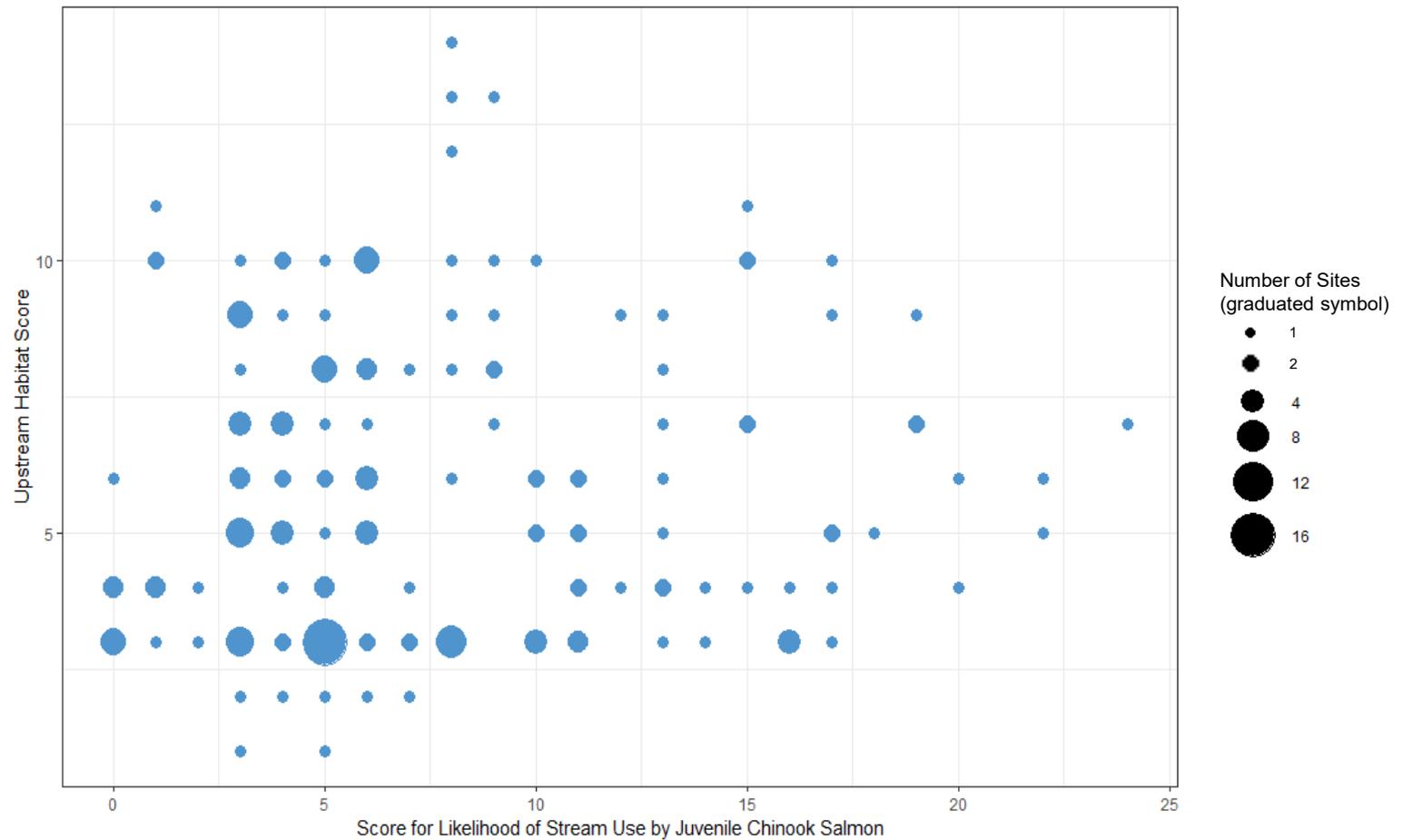
Parameters to Characterize Upstream Access & Habitat Quality

Upstream Habitat
Water quality
Presence of another culvert or modification affecting access
Riparian vegetation
Large wood
Bank armoring

Upstream Habitat Access & Quality

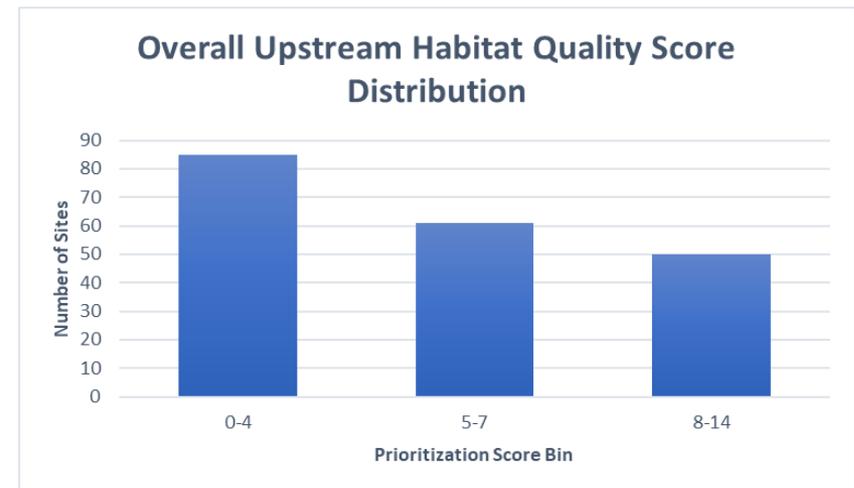
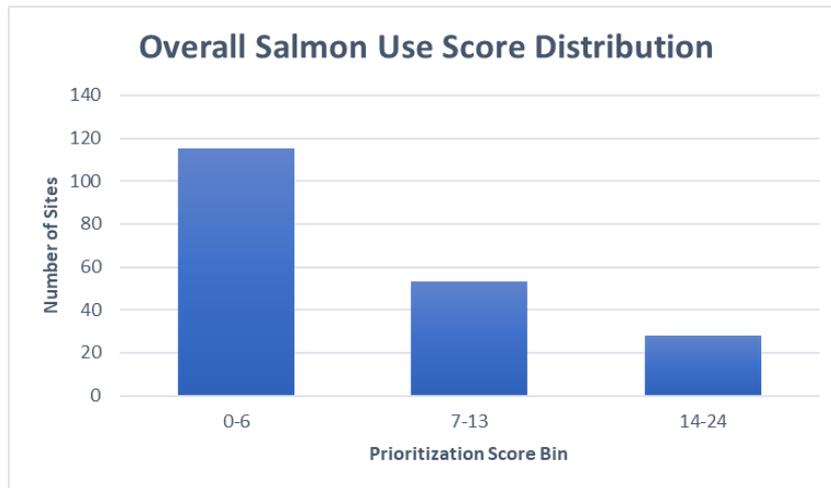


Coastal Stream Scoring Results



Prioritization Framework

- Step 2. Bin component scores into high, moderate, low categories
- Step 3. Evaluate bins to assign prioritization category based on expected benefit to juvenile chinook salmon

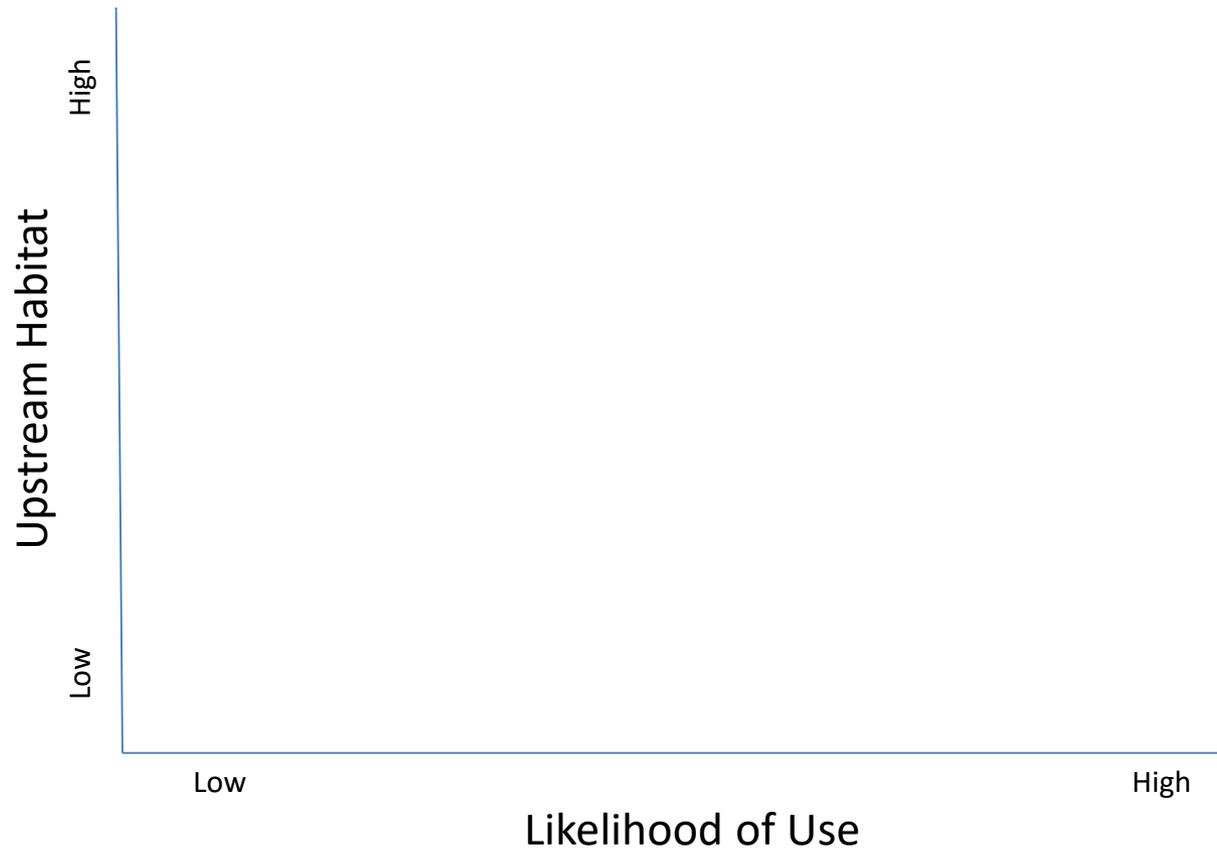


Prioritization Framework

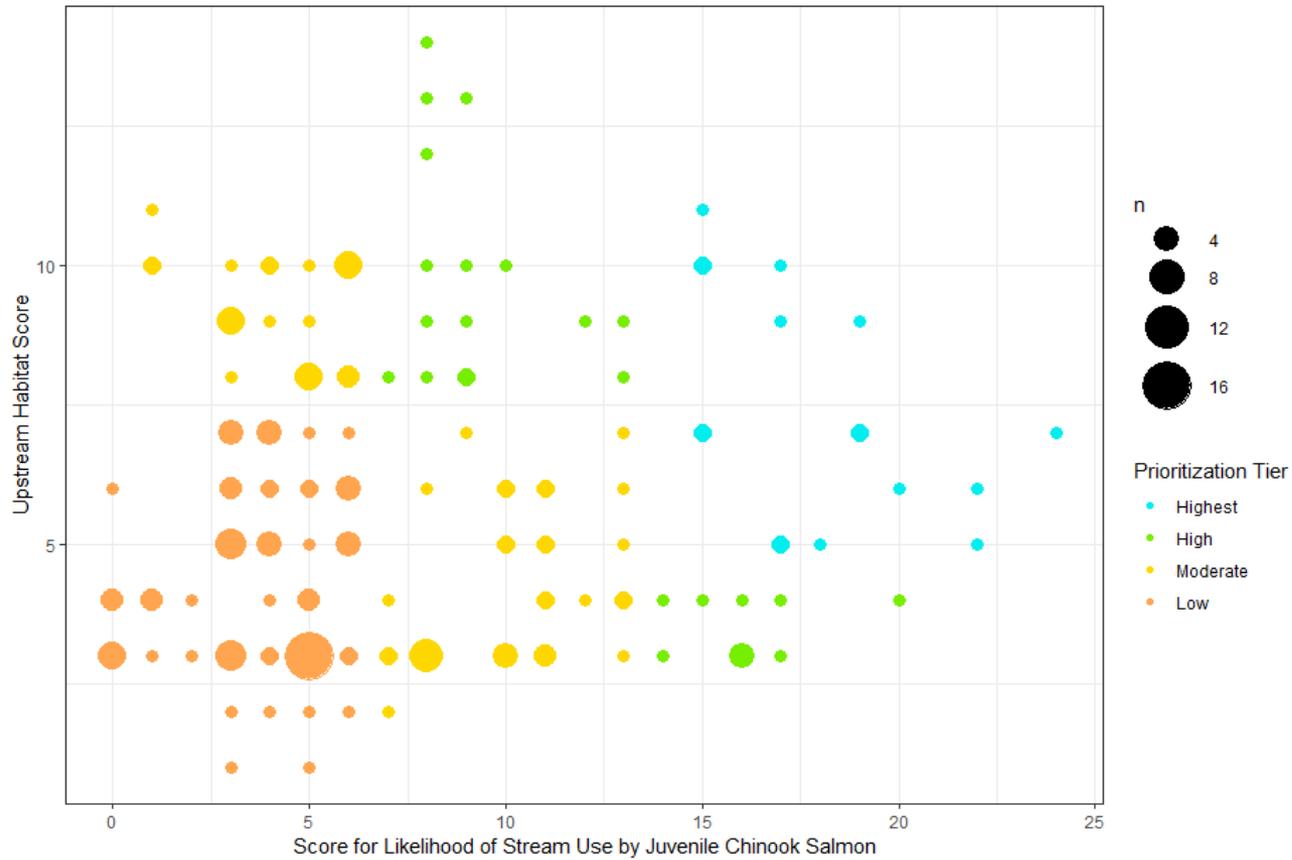
- Step 3. Evaluate bins to assign prioritization category based on expected benefit to juvenile chinook salmon

		Likelihood of Stream Use by Juvenile Chinook		
		Low (0-6)	Moderate (7-13)	High (14-24)
Upstream Habitat Access and Quality	High (8-14)	Moderate	High	Highest
	Moderate (5-7)	Low	Moderate	Highest
	Low (0-4)	Low	Moderate	High

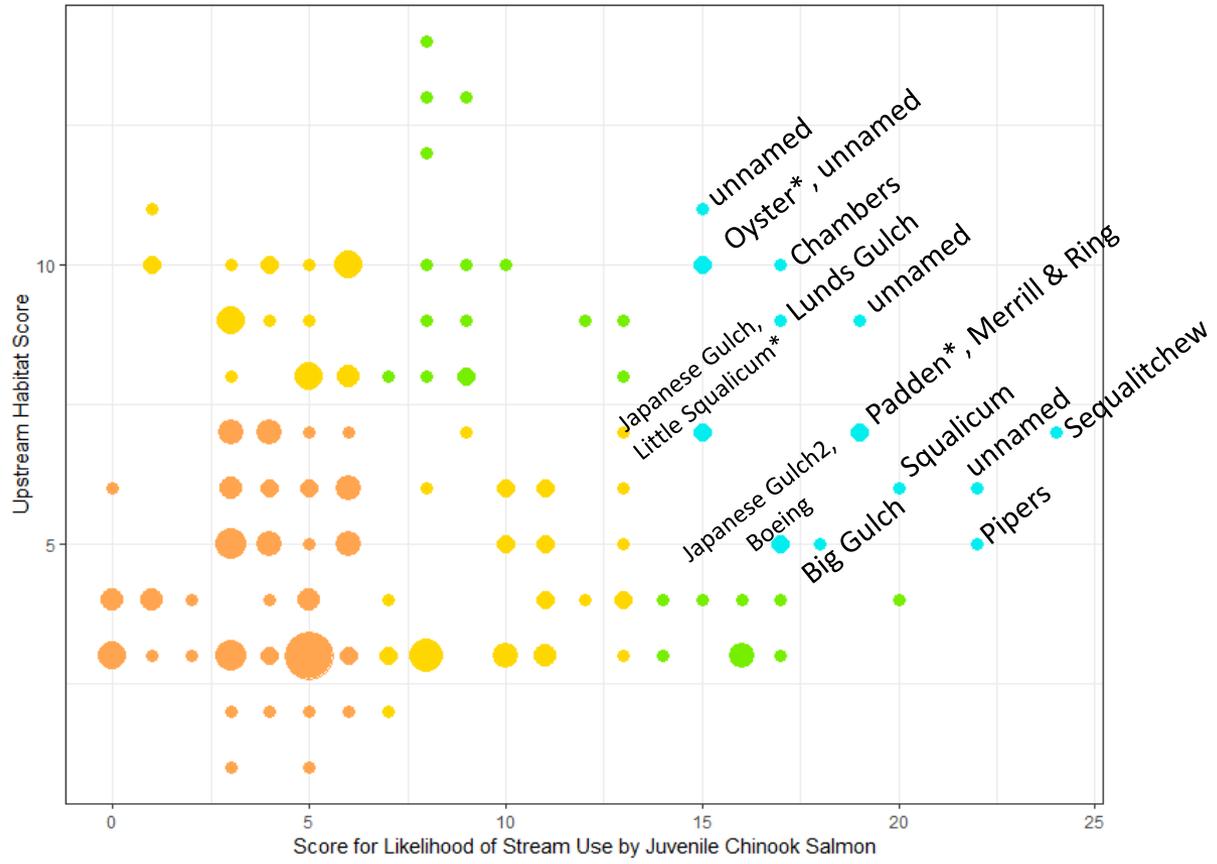
Coastal Stream Scoring Results



Coastal Stream Prioritization Tiers

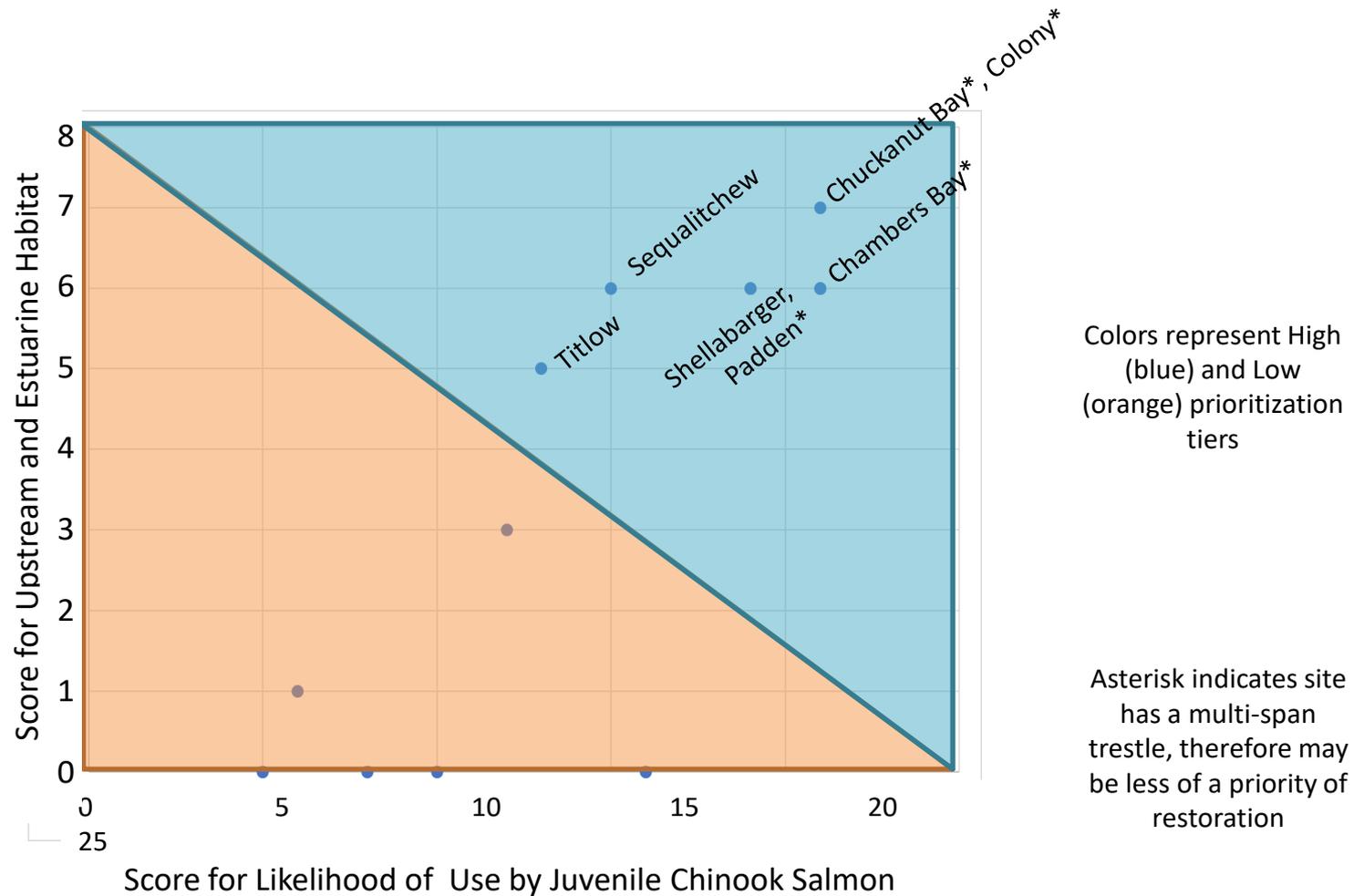


Coastal Stream Prioritization Tiers

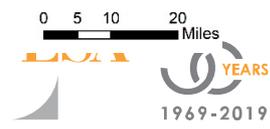
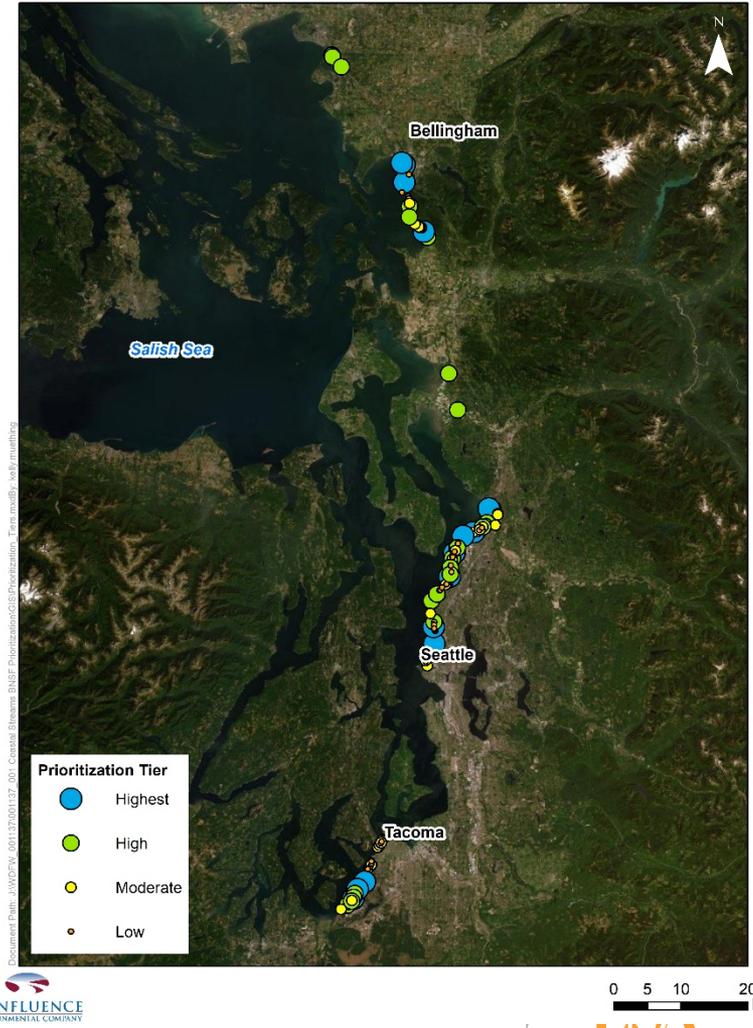
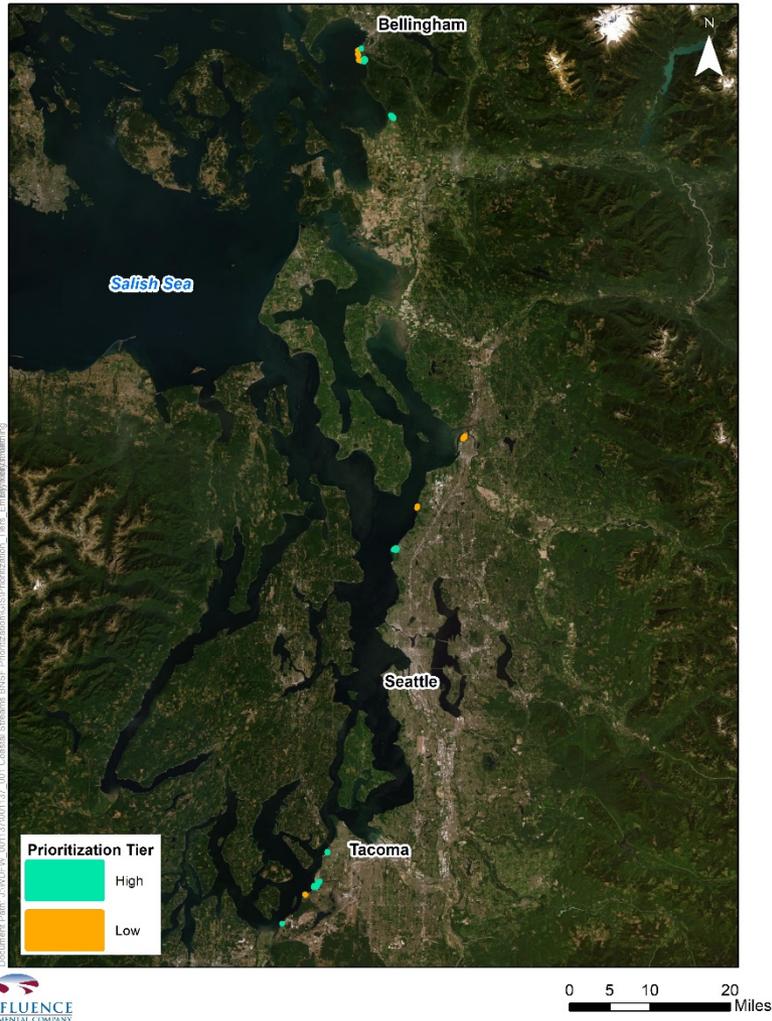


Asterisk indicates site has a multi-span trestle, therefore may be less of a priority of restoration

Embayments Results



Restoration Site Priorities



Potential Avenues to Implementation

- Restoration
- Improvements incorporated into BNSF maintenance activities
- Mitigation for BNSF or others

Implementation Planning Getting Underway!

- NEP grant awarded for 2018 NTA for Phase 2
- Communication and Engagement Plan
- Develop up to 4 types of Conceptual Restoration Approaches
- Restoration Planning at up to 3 of Highest Priority Sites
- Advance Regional Dialogue for habitat restoration along railroad

Thank you!

- USEPA for Funding
- Tulalip Tribes for In-Kind funding
- Jennifer Griffiths, WDFW, for managing
- Advisory Team for great input
 - Dava Kaitala, BNSF
 - Courtney Wallace, BNSF
 - Hugh Shipman, Ecology
 - Doris Small, WDFW
 - Pad Smith, WDFW
 - Jay Krienitz, WDFW ESRP
 - Tish Conway-Cranos, WDFW ESRP
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