Working with Citizen Scientist:

A Study of Shoreline Restoration Effectiveness in the Salish Sea

Northwest Straits FOUNDATION

Jason Morgan, Marine Projects Manager, Northwest Straits Foundation

Goals

- Pre-project conditions
- Assess project implementation
- Long-term results
- Status and trends
- Outreach and education

Northwest Straits FOUNDATION

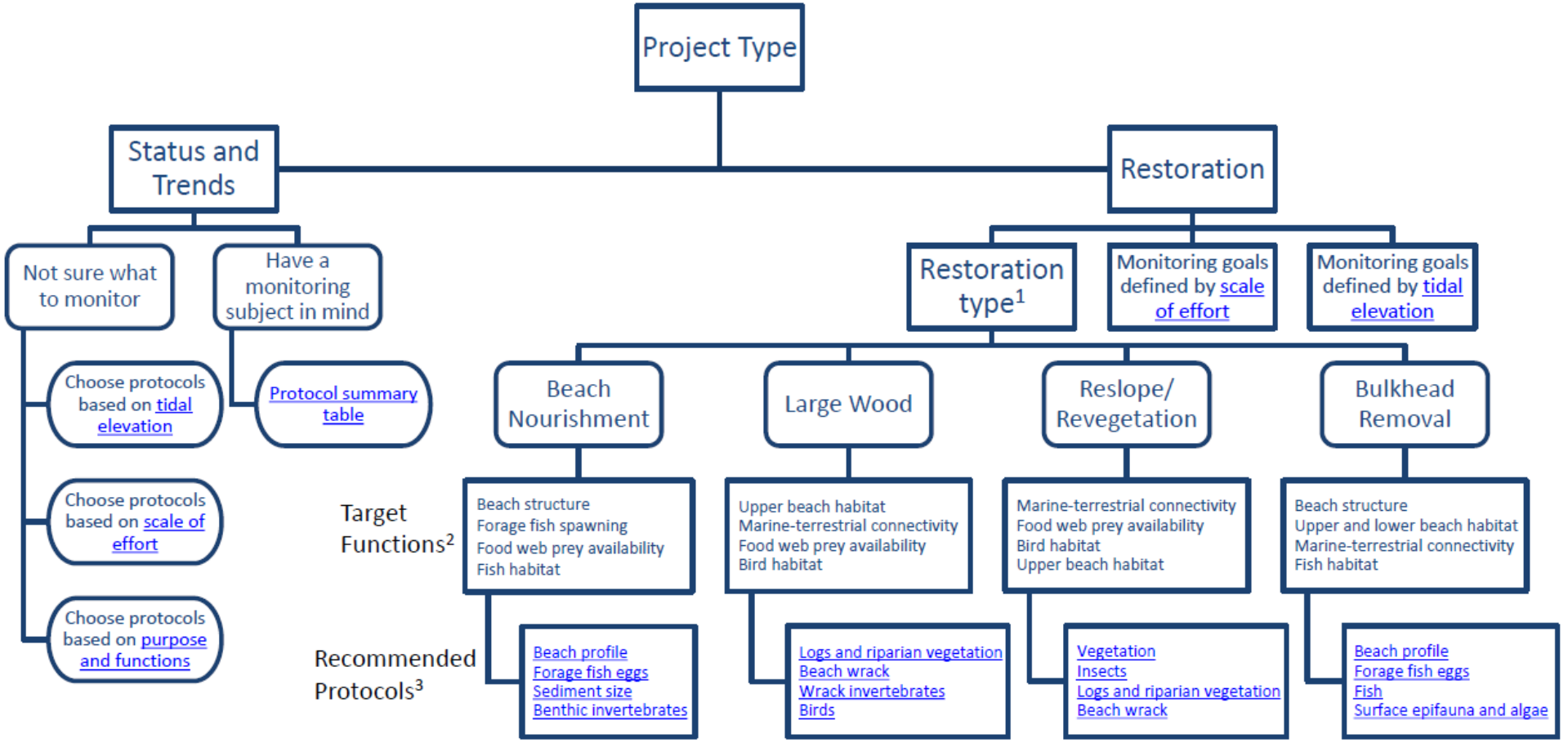
Welcome to the Shoreline Monitoring Database.

A resource to upload data from standardized protocols for monitoring shorelines in Puget Sound, WA.

Sea Grant Washington

UNIVERSITY of WASHINGTON
COLLEGE OF THE ENVIRONMENT

Decision Tree: Protocols in the Shoreline Monitoring Toolbox



[1] Four common types of restoration/rehabilitation, described in Table 5-2 and Ch. 7 of the Marine Shoreline Design Guidelines.

[2] Four main functions or habitats targeted for improvement by the restoration type. Some restoration projects may have elements of more than one restoration type.

[3] Four protocols to prioritize based on the target functions of the restoration type, also see full protocol listing of purpose and functions. Photos points should be prioritized for all monitoring.

Protocols	Cost	People	Fieldwork Time	Processing Time	Technical Expertise
Physical					
Sediment size					
Beach profile					
Vegetation, Eelgrass, Logs					
Eelgrass					
Beach wrack					
Logs and riparian vegetation					
Vegetation					
Animals					
Birds					
Insects					
Wrack invertebrates					
Epibenthic invertebrates					
Surface epifauna and algae					
Benthic invertebrates					
Forage fish eggs					
Fish					
Habitat Conditions					
Photo points					

Legend:
low scale of effort
medium scale of effort
high scale of effort

* There is some flexibility in this gradient, as protocols detail aspects of high scale of efforts that may be alleviated with substitutions of less costly materials or lower level of processing and technical expertise.

Animals


Epibenthic invertebrates


Insects


Surface epifauna & algae


Benthic invertebrates


Birds


Fish


Forage fish eggs


Olympia Oysters


Wrack invertebrates

Vegetation and Logs


Beach wrack


Logs

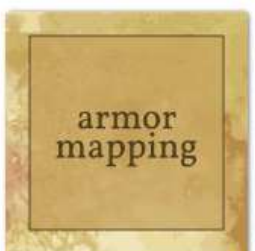

Riparian vegetation


Bull kelp


Eelgrass


Vegetation

Habitat



Armor mapping

Estuary extent & restoration

Photo points

Physical


Sediment size


Beach profile

Logs and riparian vegetation

Characterizing logs and riparian vegetation provides valuable information on the habitat of the upper beach and marine-terrestrial connectivity. Logs provide shelter for many invertebrates such as beach-hopper amphipods, and foraging habitat for shorebirds. Riparian vegetation provides habitat for terrestrial insects that are prey resources for juvenile salmon.

Materials

- Two 50 m measuring tapes, one for the transect and one for width of the log line

Sampling Summary

- 50 m transect parallel to shore
- N=5 random samples per transect
- Width of log line, and number of large and small logs (<> 2 m length)
- Total percent and type of riparian vegetation along the transect
- Total count of fallen trees along the transect

Scale of Effort

$ Cost – low, simple materials and data are all field-based

$ People – low, 2-3 people can establish transects and record quadrat data

$ Fieldwork time – low, 1 day, once a year in September when driftwood is exposed

$ Processing time – low, entering field data into computer format

$ Technical expertise – low, identification of major vegetation types

Additional Resources

Reports that have used this method:
Dethier et al. 2016
Toft et al. 2021

Also see Brennan 2007 for further information on riparian vegetation in Puget Sound

Suggested citation: Shoreline Monitoring Toolbox. Washington Sea Grant.
Website: shoremonitoring.org

Methods

At five random points along a 50 m transect parallel to shore, measure the width of the log line perpendicular to the transect as the distance from the seaward-most edge of logs to the landward-most edge of logs. Count the number of large and small logs (longer or shorter than 2 m) intersecting the perpendicular line, and categorize as "natural" log recruits or human-altered (e.g., cut poles, dock material). Note any other defining characteristics of the logs, such as if they have marine or terrestrial growth (e.g., barnacles, moss). Estimate total percent cover along the 50 m transect of vegetation overhanging the upper beach. Also estimate the percent of supratidal vegetation categories (e.g., dunegrass, blackberries) and backshore vegetation categories (e.g., trees, shrubs, lawn). Make a total count of fallen trees along the 50 m transect. Sample in September at the end of the vegetation growing season, on an ebbing tide when the upper beach +6' MLLW and above is exposed.

Data to record in the field

Date, time, site name, sample number, log and vegetation data. It is advisable to take a digital photo of the transect for documentation.

Processing

Enter the field data into computer spreadsheets. Calculate averages of width of the log line and number of logs. Log and vegetation data can be used as causal factors for other data types such as insects, beach wrack, and shorebirds.

Recruitment

- Fun & Engaging images
- Clearly defined opportunities
- Clearly defined expectations
- Local media and partners

Salish Sea Stewards Volunteer Training
2022

March 1 – May 24, 2022
Tuesdays 1:00-5:00 pm
Masks and proof of vaccination required
Registration form at **www.skagitmrc.org**
Deadline to register February 22, 2022

40 hours of free community science training, in-person classes and hands-on exploration. Participants return 40 hours of volunteer service in one year. Learn about the Salish Sea from local experts. Find out about volunteer opportunities that will help you make a difference in your community.

Direct questions to salishseastewards@gmail.com
For more information: www.skagitmrc.org

This project has been funded wholly or in part by the United States Environmental Protection Agency under Assistance Agreement (TBD) to Puget Sound Partnership. The contents of this document do not necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products consitute endorsement or recommendation for use.

Northwest Straits FOUNDATION

Training

- Who is your audience?
- Explain the “Why?”
- Practical exercises
- Utilize experienced volunteers

Northwest Straits FOUNDATION

Time to Work

- Take the lead
- Explain roles/tasks ahead of time
- Help them find their role
- QA/QC
- It should be rewarding and fun!

Northwest Straits FOUNDATION

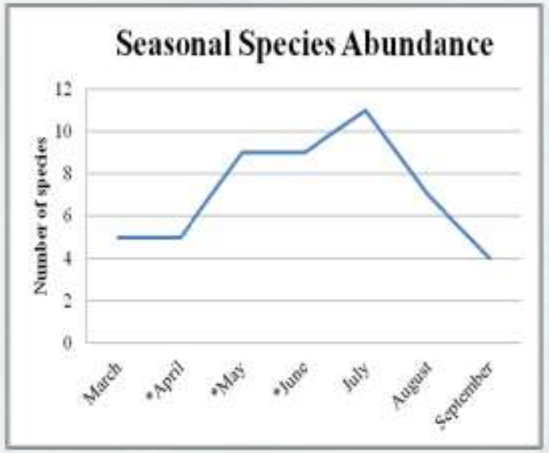
Volunteer Engagement

Bowman Bay Nearshore Fish Use

The Project

Bowman Bay is a pocket beach located on the southwest shore of Fidalgo Island, within Deception Pass State Park, Skagit County, WA. The Bowman Bay Restoration Project will remove rip rap armoring along 540 ft. of shoreline, and enhance nearshore sediments and riparian vegetation. Beach seine surveys are being conducted to monitor nearshore fish use, a component of the monitoring plan to evaluate the environmental responses to the restoration project. Survey site locations shown on the map above include an unmodified beach south of the project area (BB1), three site locations within the project area (BB2, BB3, and BB4), and an unmodified beach north of the project area (BB5).

Species Diversity



Preliminary Results

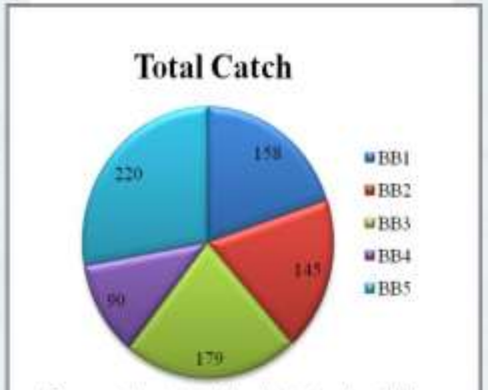
Seining was conducted twice a month April – June 2015, and once a month during March, and July – September 2015 for a total of 44 sets completed. Six sets were not competed during April – June surveys due to high volume of marine algae. Seining efforts were completed with the assistance of 23 volunteers contributing 206 hours of volunteer service. 1,824 individuals were captured representing 21 species including sub-yearling Chinook salmon, coho salmon, chum salmon, sockeye salmon, and post-larval surf smelt.

*Data from 4/23/2015, 5/28/2015, and 6/12/2015 surveys is not included in Seasonal Species Abundance graph and Total Catch pie chart due to not all sites being surveyed.

Volunteers in Action

Total Catch

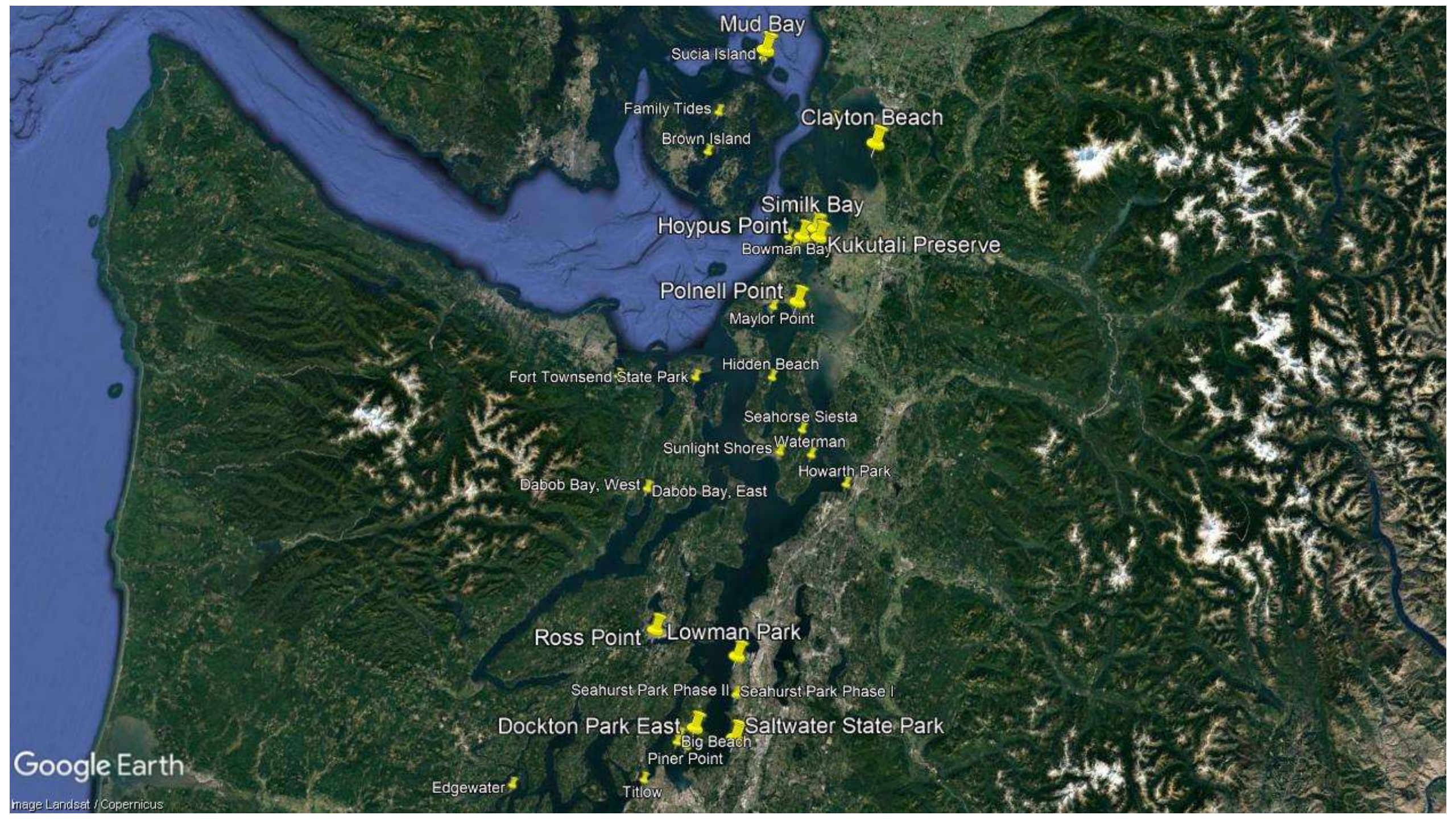
Grouping	Taxonomic group	Genus species	Common name	Total catch	Catch per set	Frequency in catch
Flatfish	Pleuronectidae	Parophrys vetulus	English Sole	59	1.34	38.2%
		Platichthys stellatus	Starry Flounder	6	0.14	11.4%
Forage fish	Osmeridae	Hypomesus pretiosus	Surf smelt	189	4.30	13.6%
Greenlings/ lingcods	Hexagrammidae	Hexagrammos stelleri	Whitespotted greenling	1	0.02	2.3%
Gunnels and Pricklebacks	Pholidae	Pholis laeta	Crescent gunnel	4	0.09	4.5%
		Pholis ornata	Saddleback gunnel	47	1.07	36.4%
		Apodichthys flavidus	Penpoint gunnel	9	0.20	13.6%
	Stichaeidae	Lumpenus sagitta	Snake prickleback	49	1.11	11.4%
Other marine	Syngnathidae	Syngnathus griseolineatus	Bay pipefish	5	0.11	4.5%
Pacific salmon	Salmonidae	Oncorhynchus tshawytscha	Chinook salmon	6	0.14	13.6%
		Oncorhynchus kisutch	Coho salmon	1	0.02	2.3%
		Oncorhynchus keta	Chum salmon	24	0.55	11.4%
		Oncorhynchus nerka	Sockeye salmon	1	0.02	2.3%
Sculpin	Cottidae	Enophrys bison	Buffalo sculpin	1	0.02	2.3%
		Leptocottus armatus	Pacific staghorn sculpin	190	4.32	87.7%
		Artedius harringtoni	Scalyhead sculpin	3	0.07	2.3%
		Clinocottus acuticeps	Sharpnose sculpin	4	0.09	4.5%
		Blepsias cirrhosus	Silverspotted sculpin	1	0.02	2.3%
		Oligocottus maculosus	Tidepool sculpin	1	0.02	2.3%
Sea perches	Embiotocidae	Cymatogaster aggregata	Shiner perch	1160	26.36	81.8%
Sticklebacks	Gasterosteidae	Gasterosteus aculeatus	Three spined stickleback	82	1.86	22.7%



*Bowman Bay seining March - September 2015

Donuts!!!

Photo Credit: Gordon Marvin


Mud Bay
Sucia Island
Family Tides
Brown Island
Clayton Beach
Similk Bay
Hoypus Point
Bowman Bay
Kukutali Preserve
Polnell Point
Maylor Point
Hidden Beach
Fort Townsend State Park
Seahorse Siesta
Waterman
Sunlight Shores
Howarth Park
Dabob Bay, West
Dabob Bay, East
Ross Point
Lowman Park
Seahurst Park Phase II
Seahurst Park Phase I
Dockton Park East
Saltwater State Park
Big Beach
Piner Point
Edgewater
Titlow
Google Earth
Image Landsat / Copernicus

Forage fish spawning

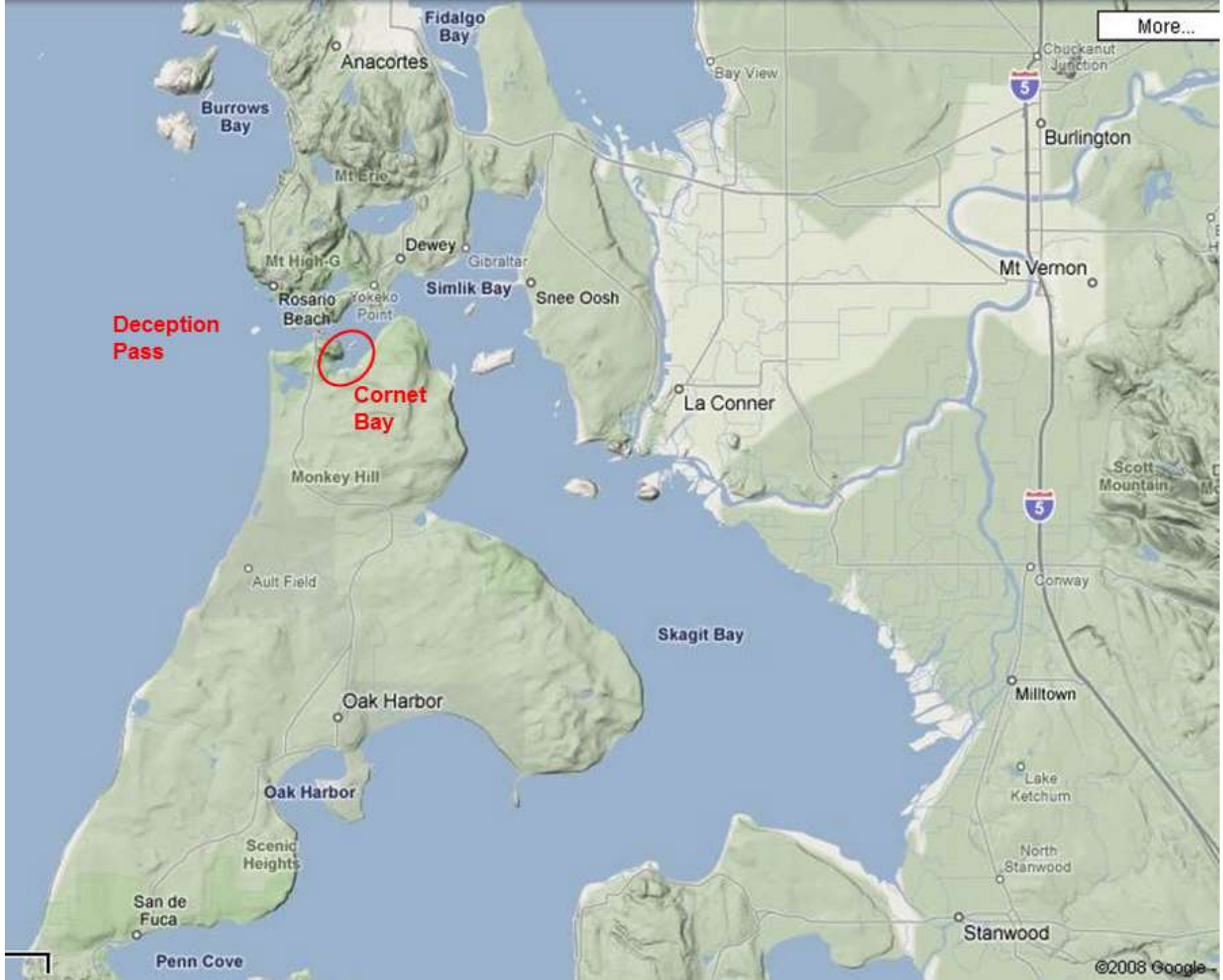
Beach profile

Beach seining

Surface epifauna & algae

Logs & beach wrack

10 years of seining at Cornet Bay!


More...
Fidalgo Bay
Anacortes
Burrows Bay
Mt Erie
Bay View
Chuckanut Junction
Burlington
Dewey
Gibraltar
Mt High-G
Rosario Beach
Yokeko Point
Simlik Bay
Snee Oosh
Mt Vernon
Deception Pass
Cornet Bay
La Conner
Monkey Hill
Scott Mountain
Ault Field
Conway
Skagit Bay
Oak Harbor
Milltown
Oak Harbor
Lake Ketchum
Scenic Heights
North Stanwood
San de Fuca
Stanwood
Penn Cove
©2008 Google

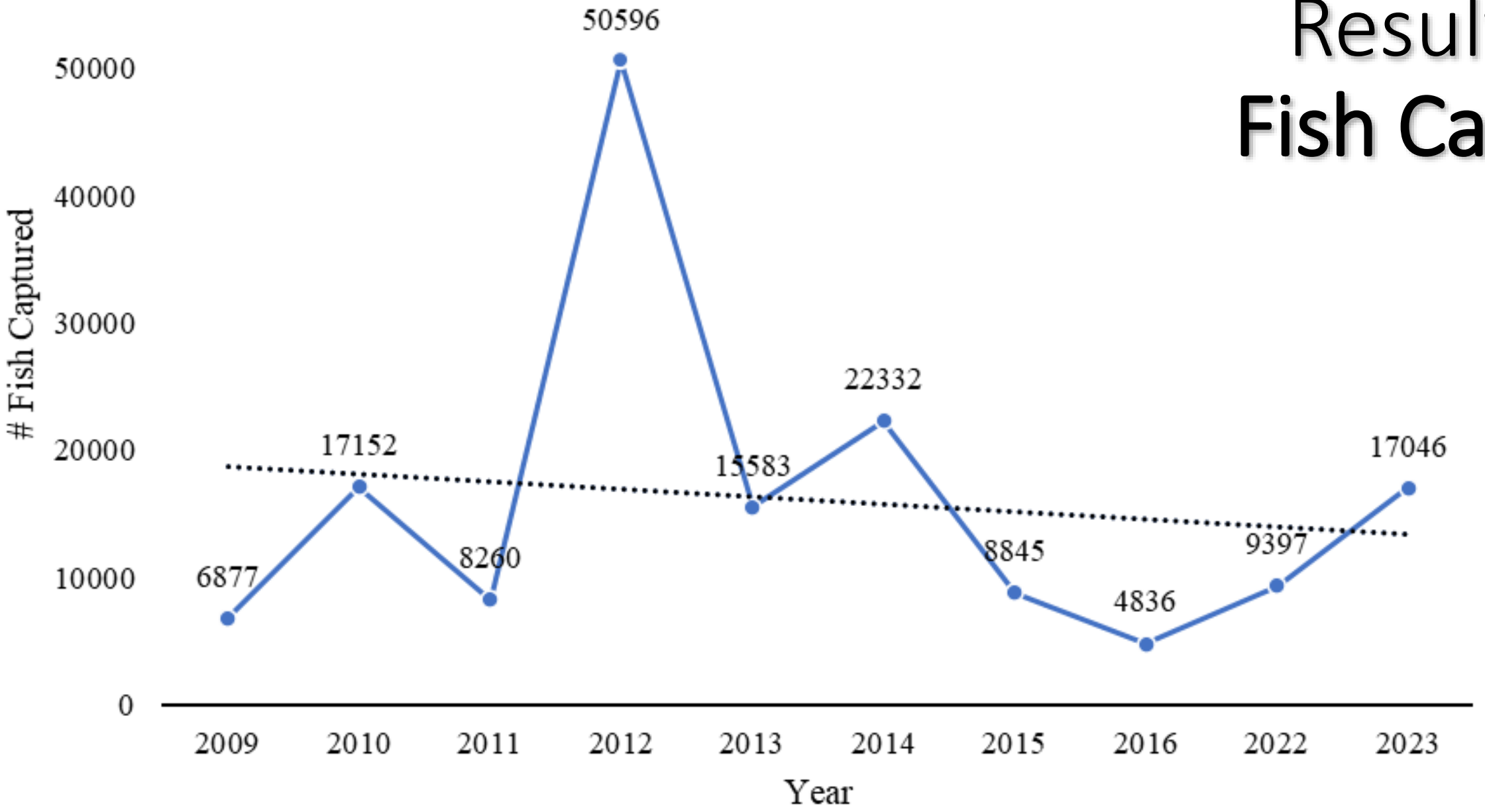
Restoration Actions

- Removal of 65 tons of creosote wood from a 750-foot-long bulkhead
- Removal of over 79 tons of contaminated fill
- Placement of over 1,200 tons of beach spawning gravel
- Native vegetation planting
- Expansion of a small salt marsh area


Before


After

Results
Fish Catch

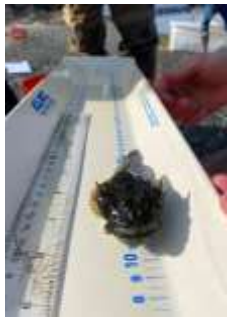


Salmonids accounted for 93% of catch


1


1


4

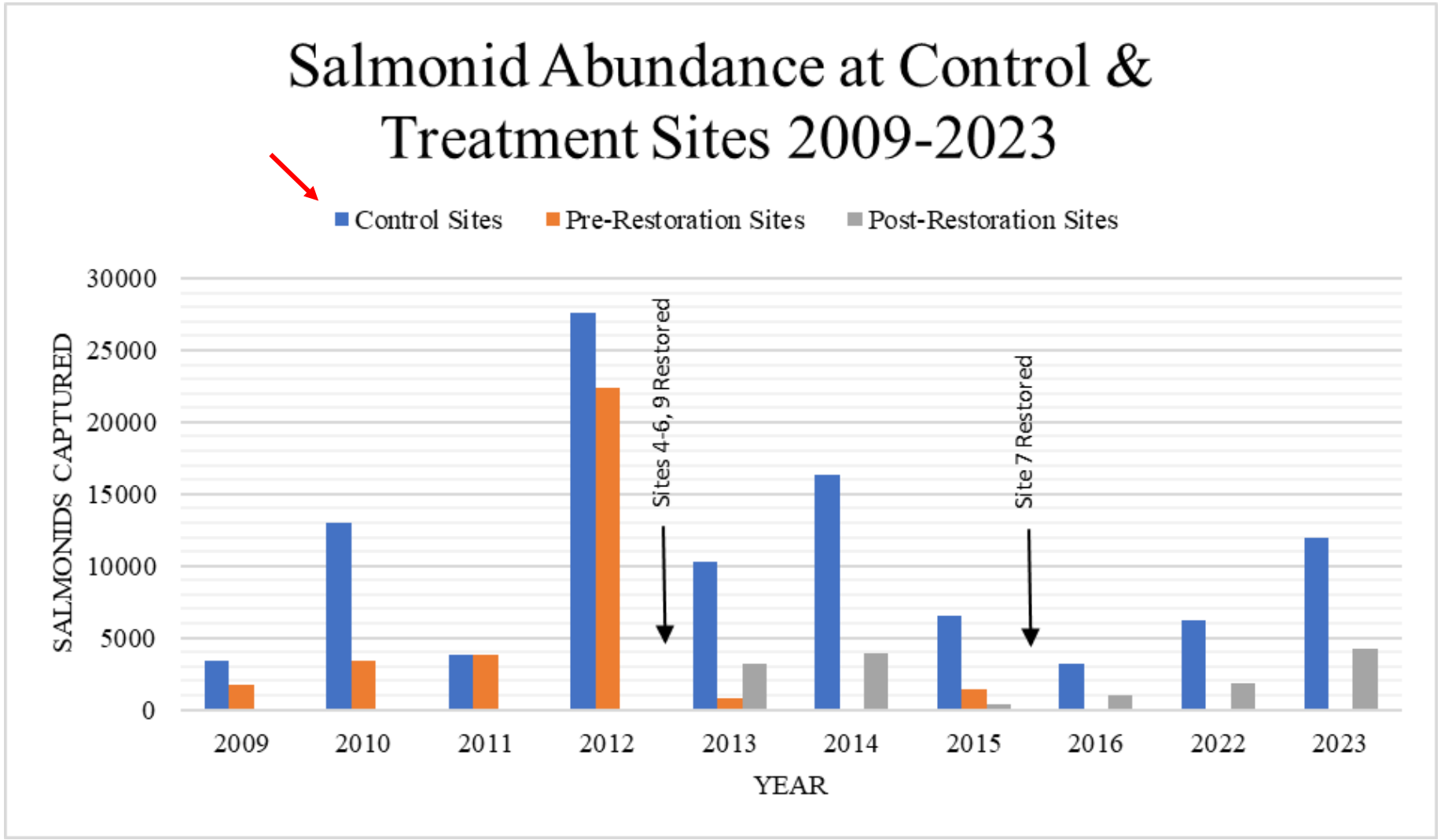



3
Centimeter
1 2 3 4
9 10 11 12 13

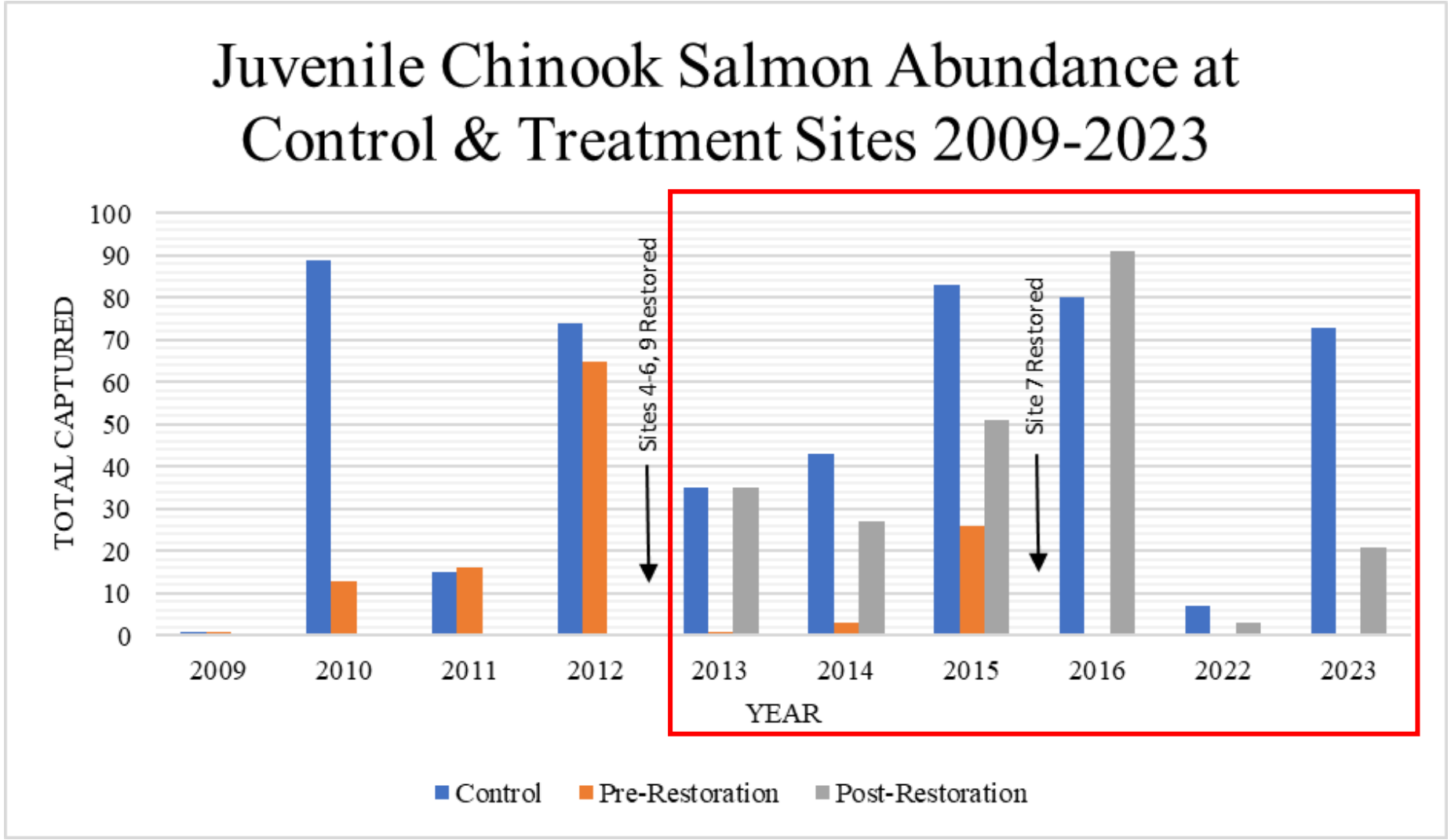

3
10 20 30 40 50 60 70 80 90

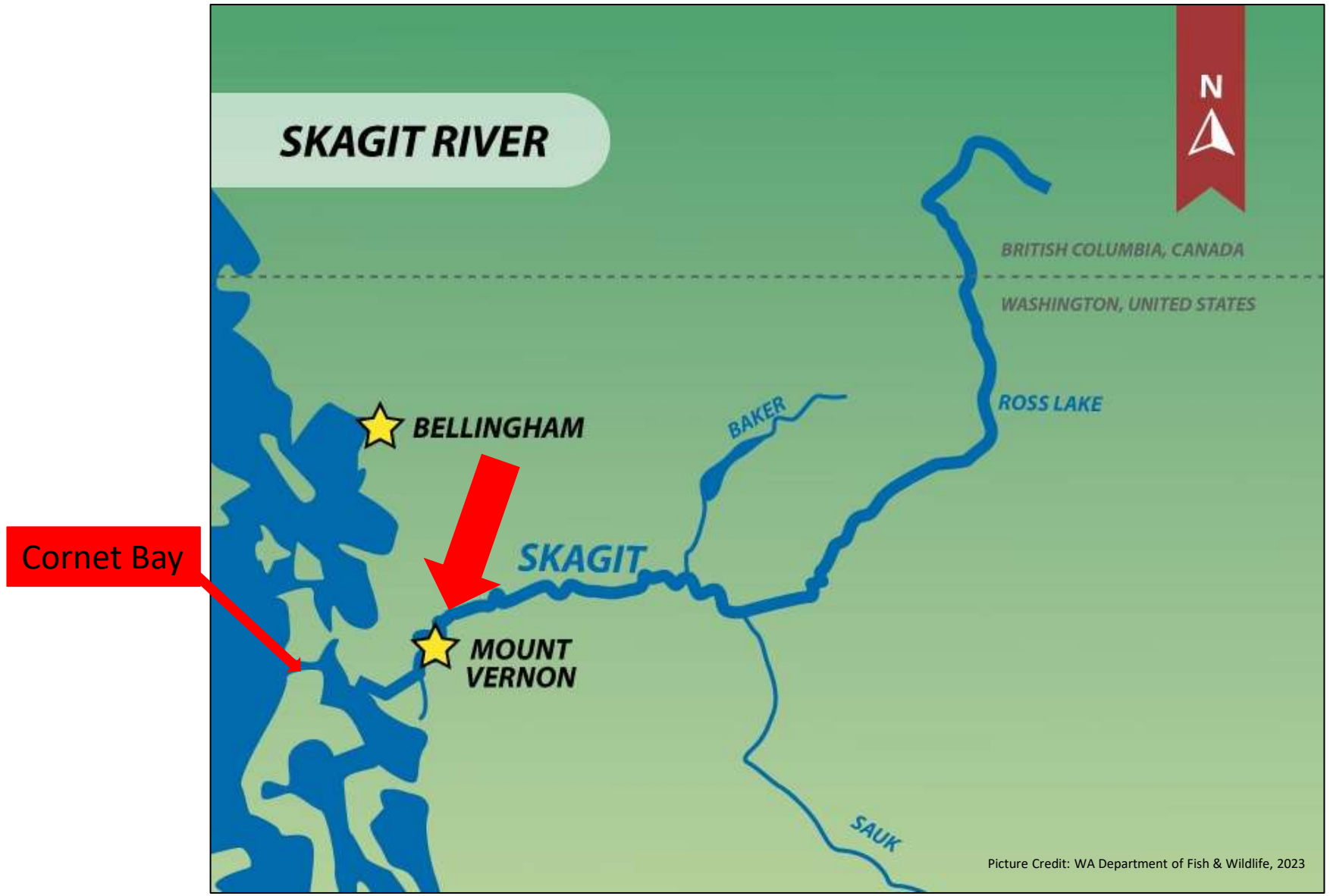

10 20 30 40 50 60

Results - **Site Utilization**

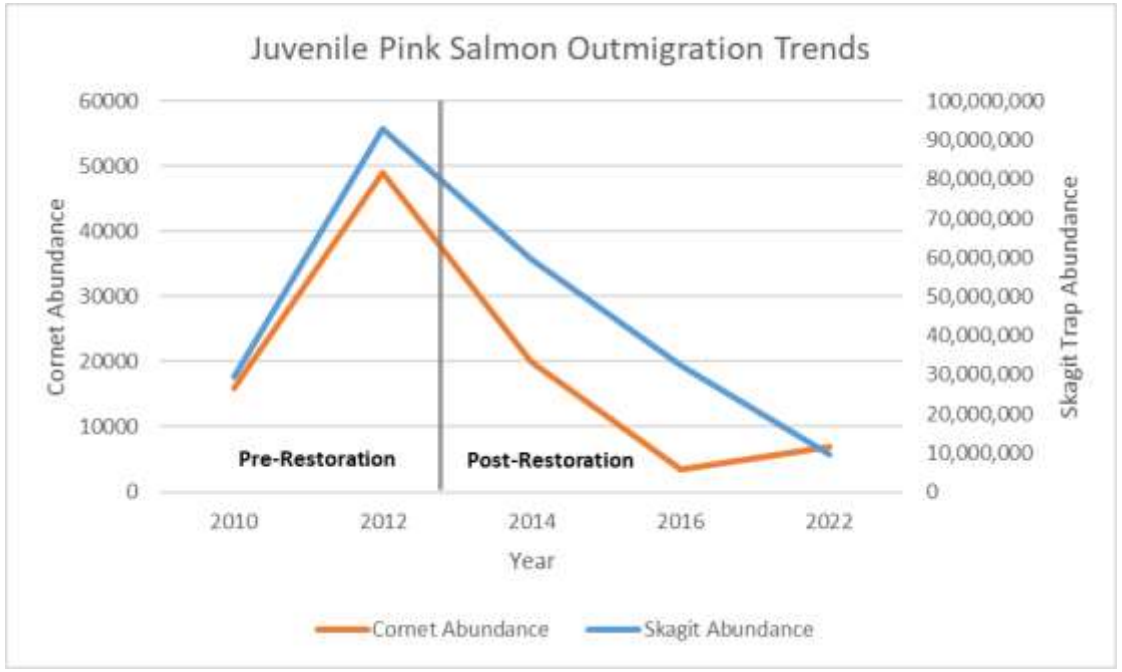


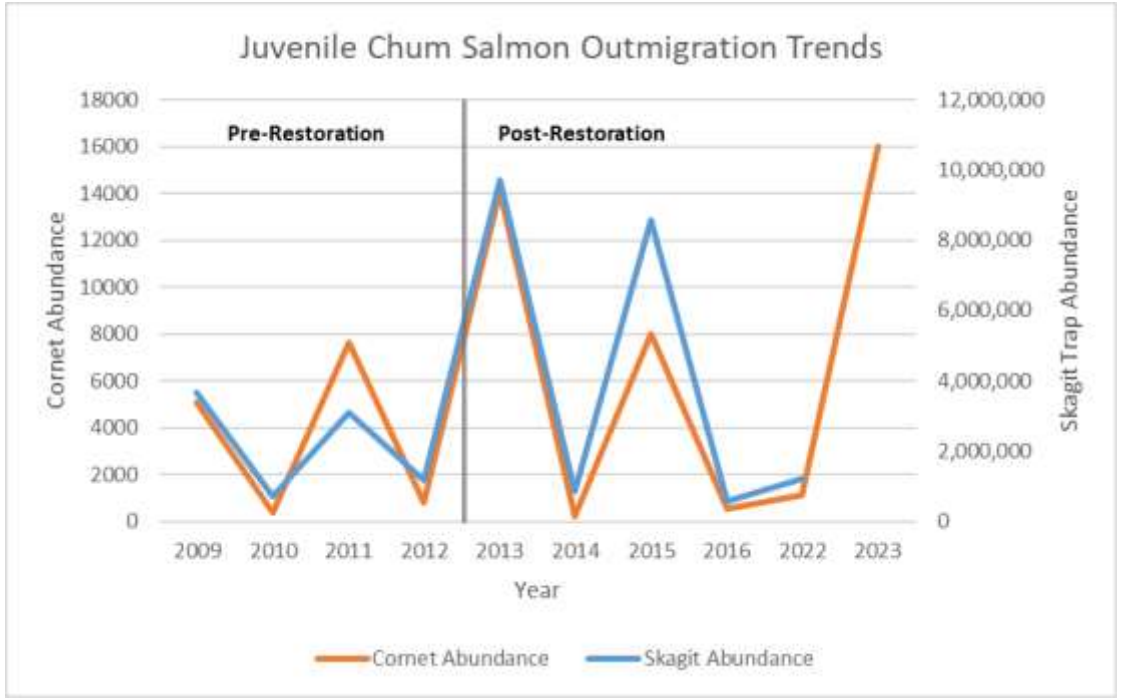
Results - **Site Utilization**



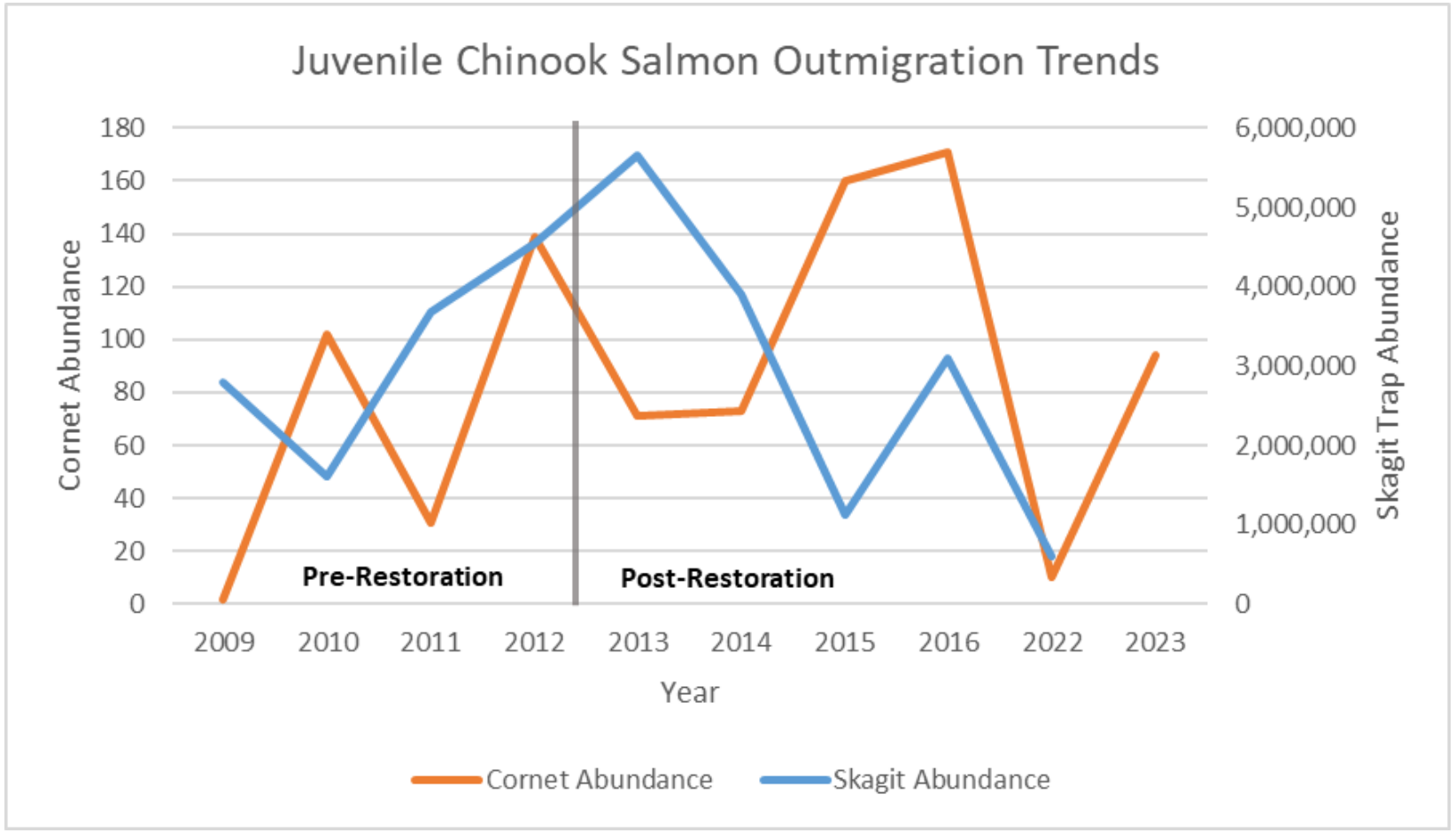

SKAGIT RIVER
N
BRITISH COLUMBIA, CANADA
WASHINGTON, UNITED STATES
BELLINGHAM
BAKER
ROSS LAKE
SKAGIT
MOUNT VERNON
SAUK
Cornet Bay
Picture Credit: WA Department of Fish & Wildlife, 2023

Results - **Outmigration Trends**





Results
Outmigration Trends



TAKEAWAYS

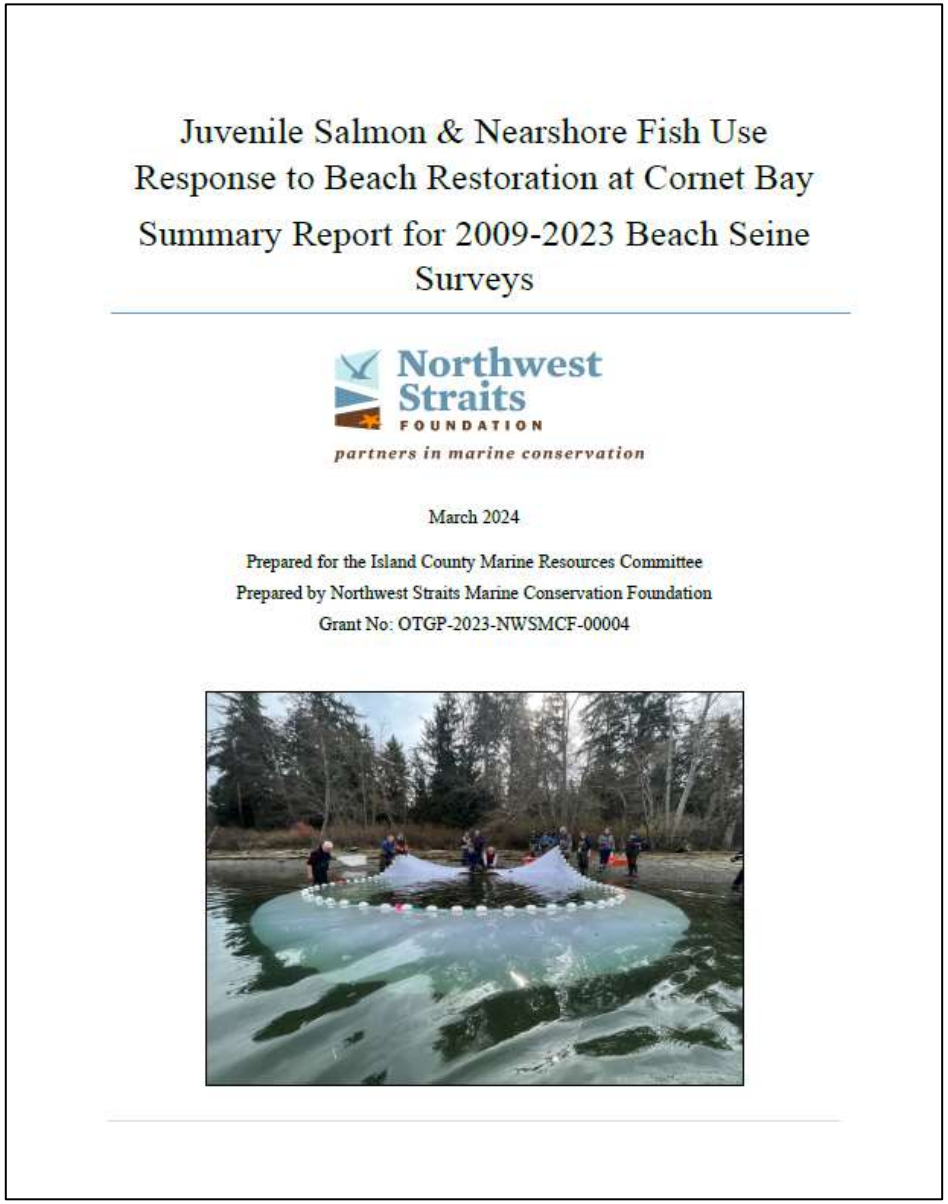
Juvenile salmonids predominantly utilized control sites, suggesting a preference for natural, unarmored shorelines

Highlights the importance of overhanging vegetation to provide optimal shade conditions and terrestrial insect drop

This provides us with insight for future restoration projects so we can ensure native trees are planted and cared for in the years to come

Report is online!

https://nwstraitsfoundation.org/about/resource-library/



Juvenile Salmon & Nearshore Fish Use Response to Beach Restoration at Cornet Bay

Summary Report for 2009-2023 Beach Seine Surveys

Northwest Straits FOUNDATION

partners in marine conservation

March 2024

Prepared for the Island County Marine Resources Committee

Prepared by Northwest Straits Marine Conservation Foundation

Grant No: OTGP-2023-NWSMCF-00004

Thank You!

Jason Morgan, Northwest Straits Foundation
morgan@nwstraitsfoundation.org
360-733-1725

Photo: Florian Graner