Juvenile Chinook salmon origin and non-natal use of small streams in the Whidbey Basin

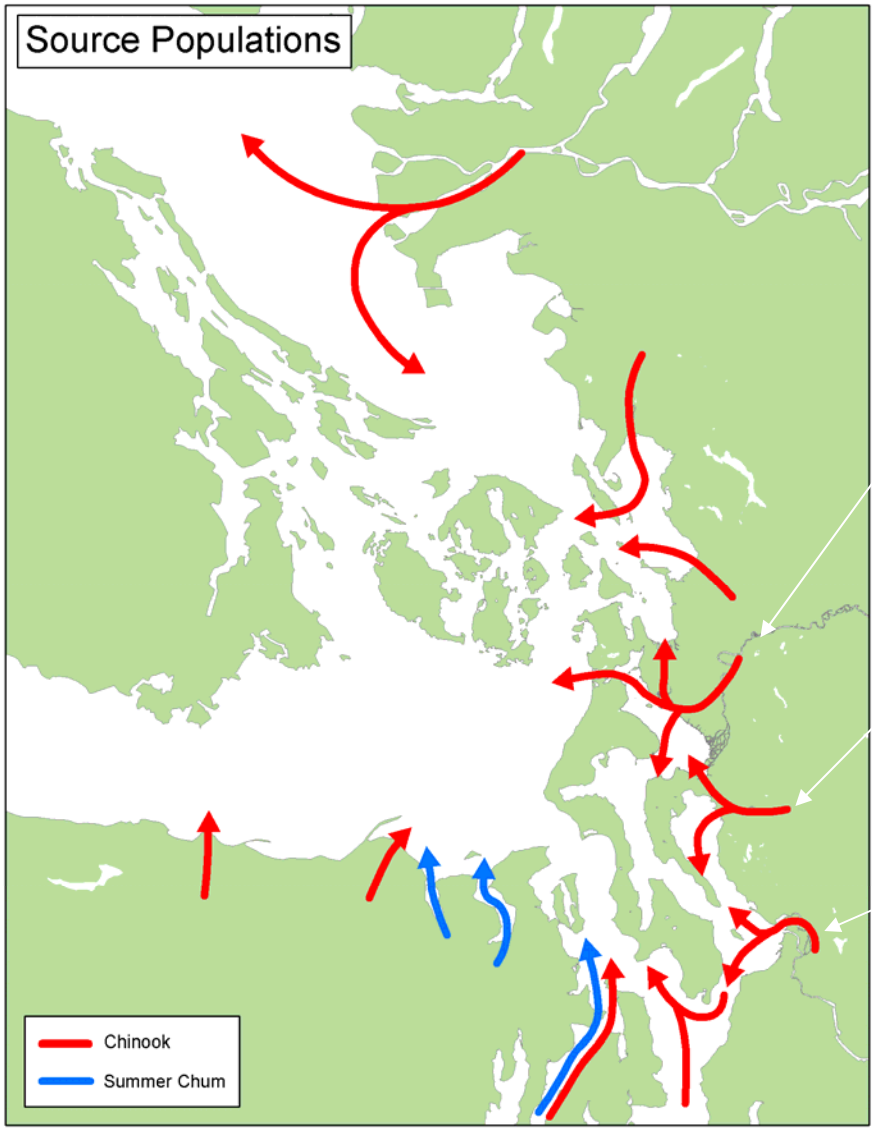
November 2010

Eric M. Beamer, Rich Henderson, and Karen Wolf,
Skagit River System Cooperative

Todd Zackey and Derek Marks, Tulalip Tribes

David Teel, NOAA Fisheries

What is meant by "non-natal" estuary?



- Skagit River

  (up to 7 million wild juvenile Chinook per year)

- Stillaguamish River

  (up to 400,000 wild juvenile Chinook per year)

- Snohomish River

  (usually < 1 million wild juvenile Chinook per year)

Background:
How did we get here?

Lone Tree Point, northern Skagit Bay

Conclusions from the Skagit Bay study

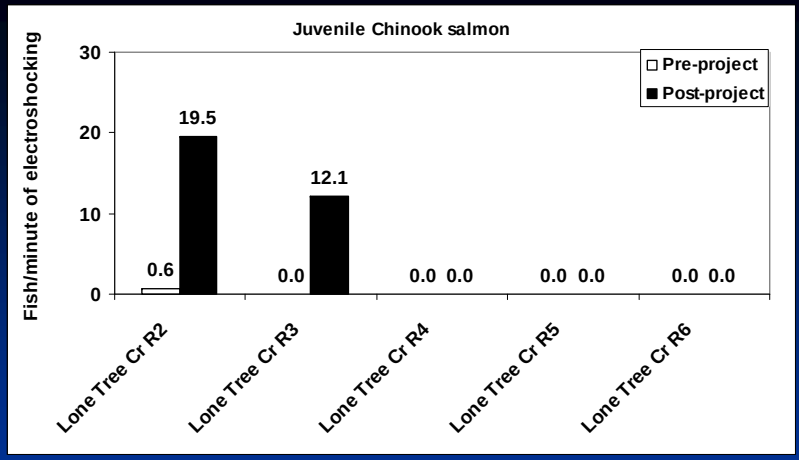
- Wild Chinook fry are accumulating in pocket estuary habitat (from February through May, over 20 times more wild Chinook salmon occupy pocket estuary habitat than adjacent nearshore areas)
- Pocket estuaries provide a faster growing environment than adjacent nearshore or offshore areas (pocket estuary fish are larger; water temperatures warm earlier; detritus retention is higher)
- Pocket estuaries are a safer environment for fry sized Chinook salmon than adjacent nearshore or offshore waters (very few predatory fish in pocket estuaries are able to prey on wild Chinook salmon – the predators are too small)

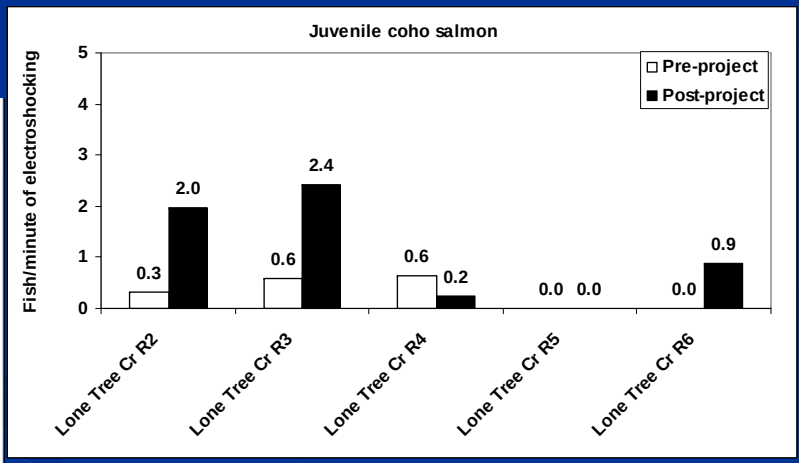
From:

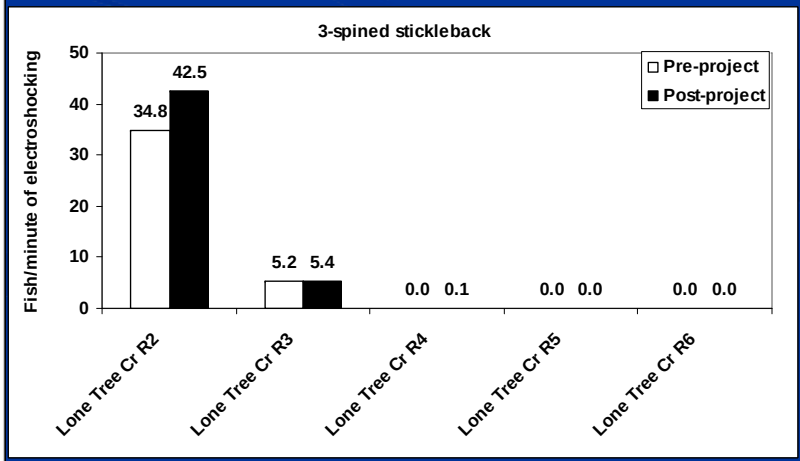
Beamer, EM, A McBride, R Henderson, and K Wolf. 2003. The importance of non-natal pocket estuaries in Skagit Bay to wild Chinook salmon: an emerging priority for restoration. Skagit River System Cooperative, LaConner, WA. Available at www.skagitcoop.org.

Restoration at Lone Tree Lagoon and Creek

Change in fish distribution within Lone Tree Creek after restoration

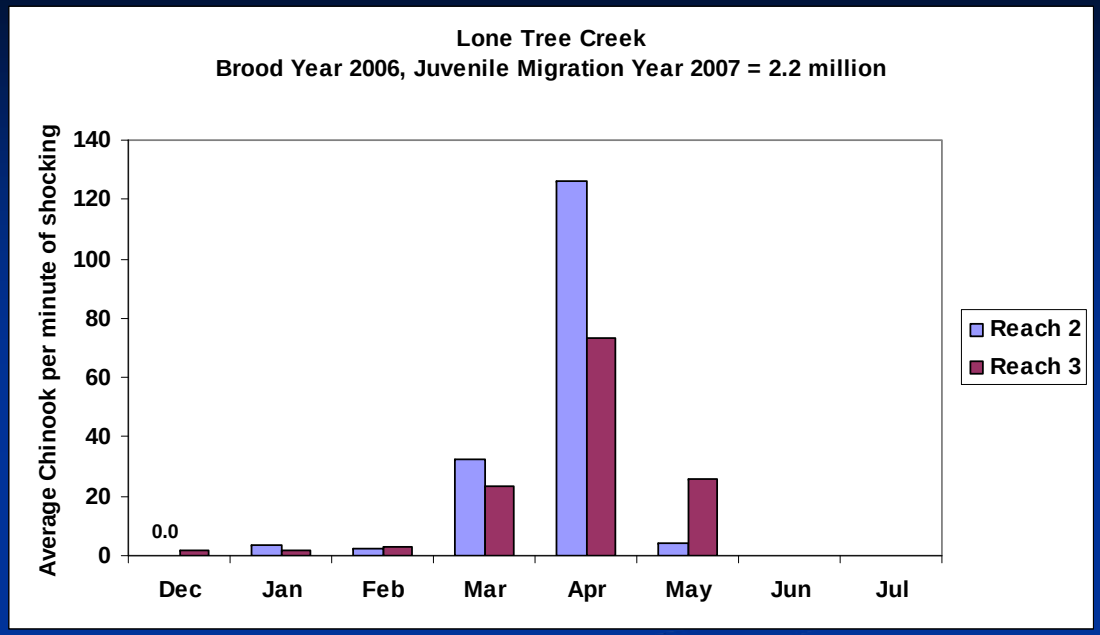


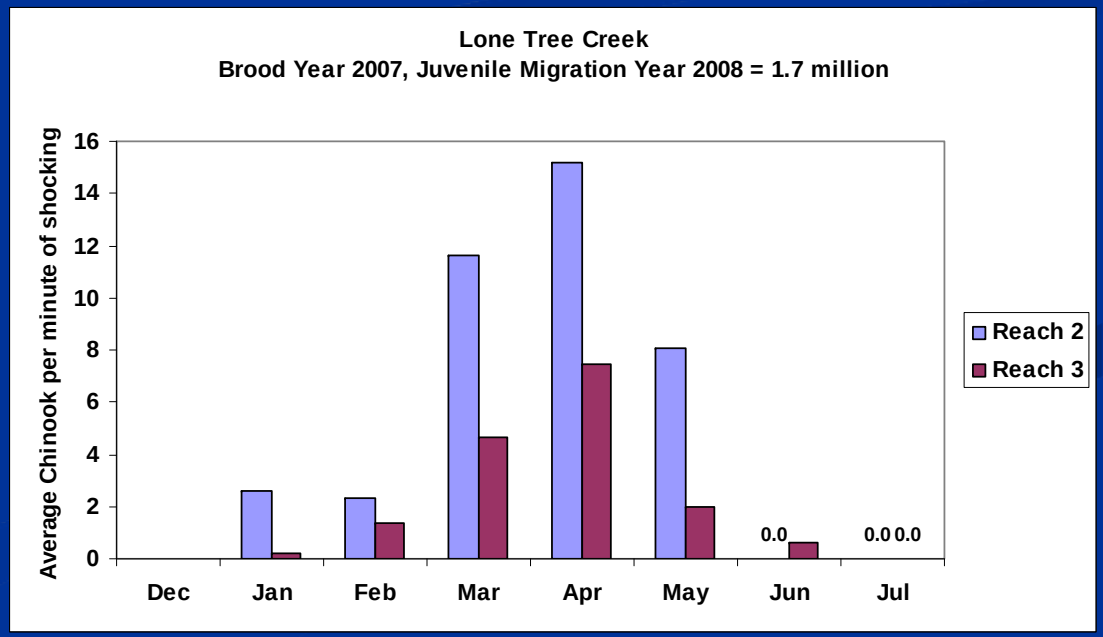




Timing and abundance

- Early arriving, peaking in April
- Leaving by June or July
- Different fish density by year (population size and timing of Skagit River flows)





Conclusions from Lone Tree and next steps

- Findings from the Lone Tree experience:
  - Juvenile Chinook are consistently present in the creek.
  - Juvenile Chinook timing is similar to pocket estuaries (early in the year).
  - The fish appear to be rearing (staying in the creek for days to weeks).
  - After restoration, more Chinook moved into the creek suggesting preference for low salinity or freshwater habitat, at least early in the year.
- Next steps/questions:
  - Are the same patterns true for other small streams within the Whidbey Basin?
  - What is the residence and growth of individual Chinook salmon?
  - Are small streams draining directly into non-natal estuaries or the nearshore important for Skagit (and Puget Sound) Chinook recovery?

Results to date from “next steps”

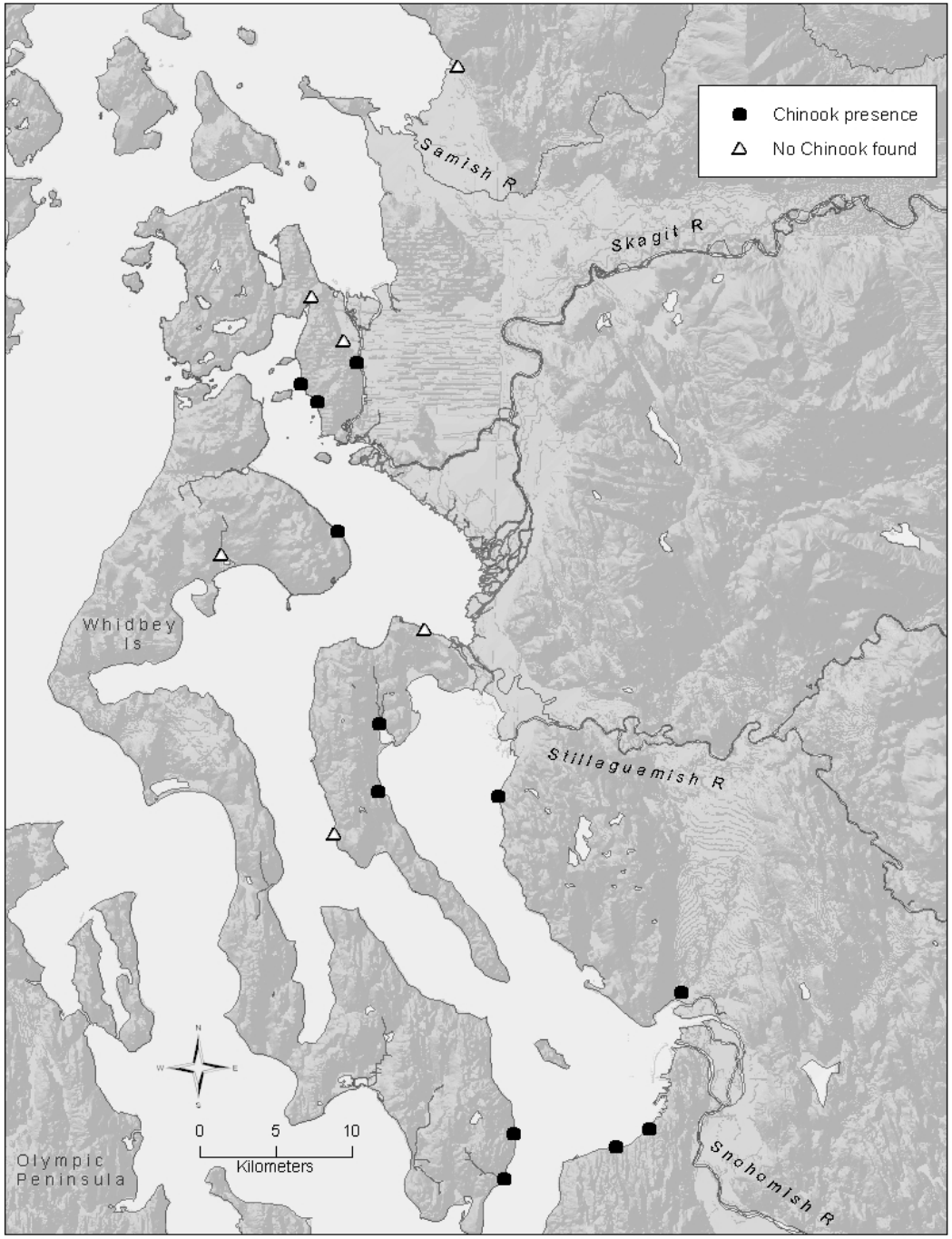
- Juvenile Chinook salmon:
  - Patterns of presence
  - Origin of juvenile Chinook where present
  - Residence period and growth within streams

Presence of juvenile Chinook in small streams

- 12 of 18 streams shocked had juvenile Chinook in 2009 and 2010 (so far)
- Why not presence in some areas?

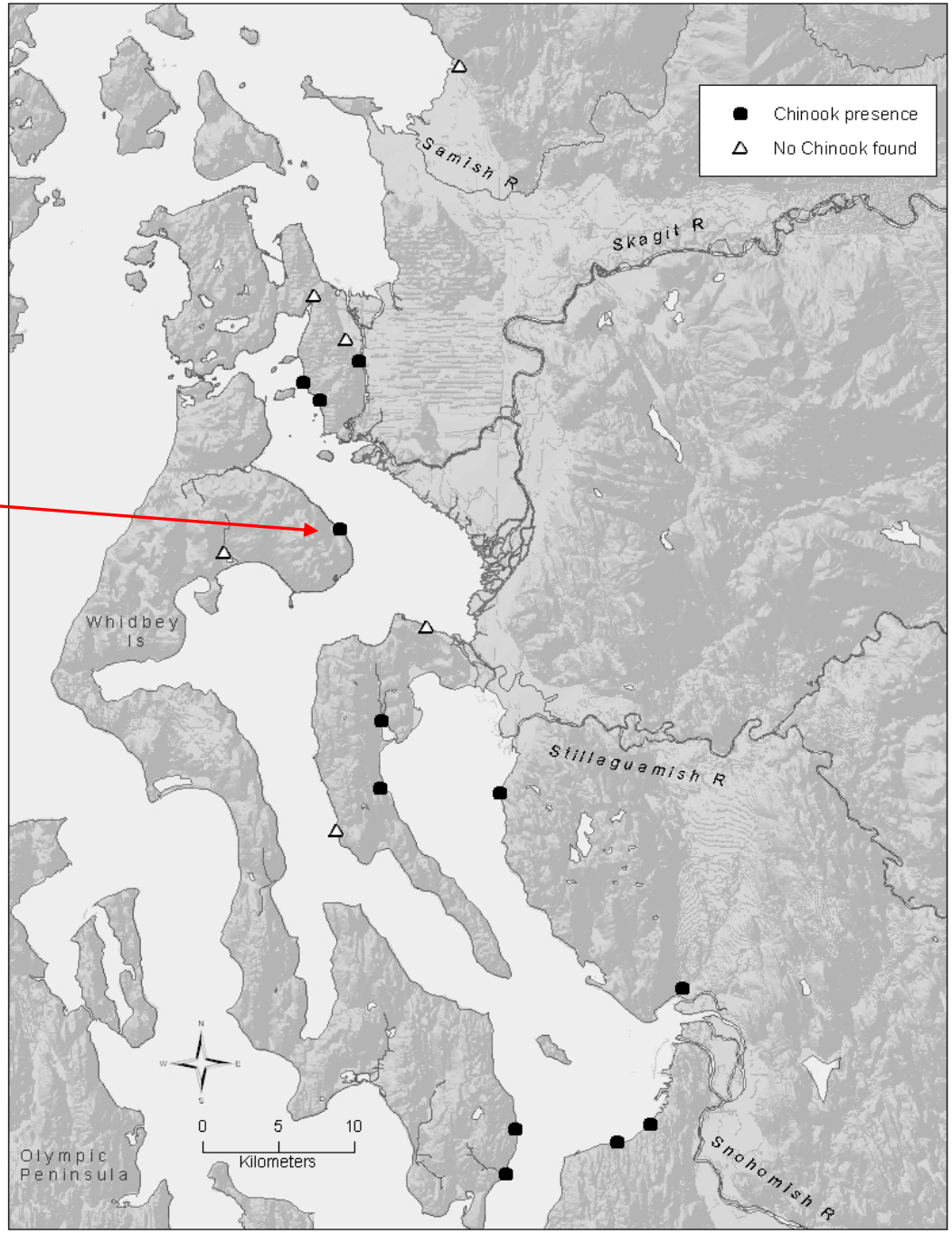
Hypotheses:

- Watershed size (~300 acre or > for Chinook presence)
- Pathways to habitat
  - ***local*** -within lagoons or tidal estuaries, SRTs, Dike breach
  - ***landscape*** – distance from source Chinook populations



What these streams look like?

- Strawberry Pt Creek
  - 1-2 meters bankfull width
  - Length used by Chinook fry = ~50 meters
  - Pool depths up to 0.35 meters

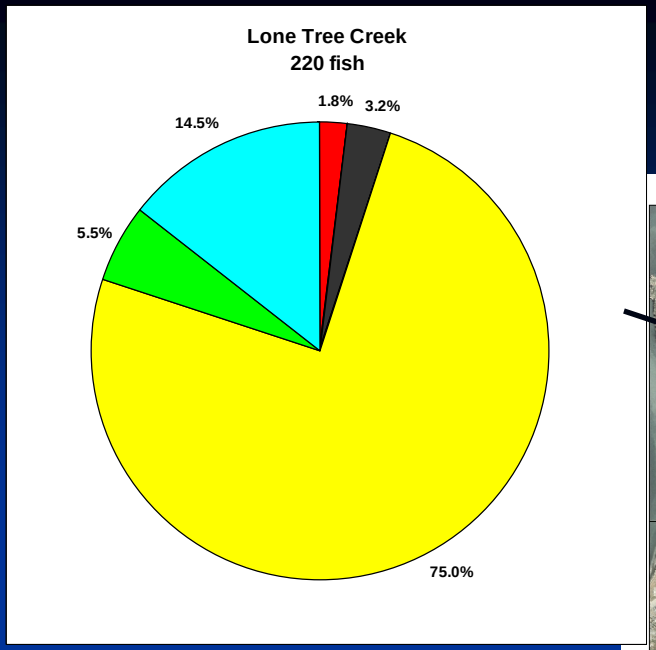


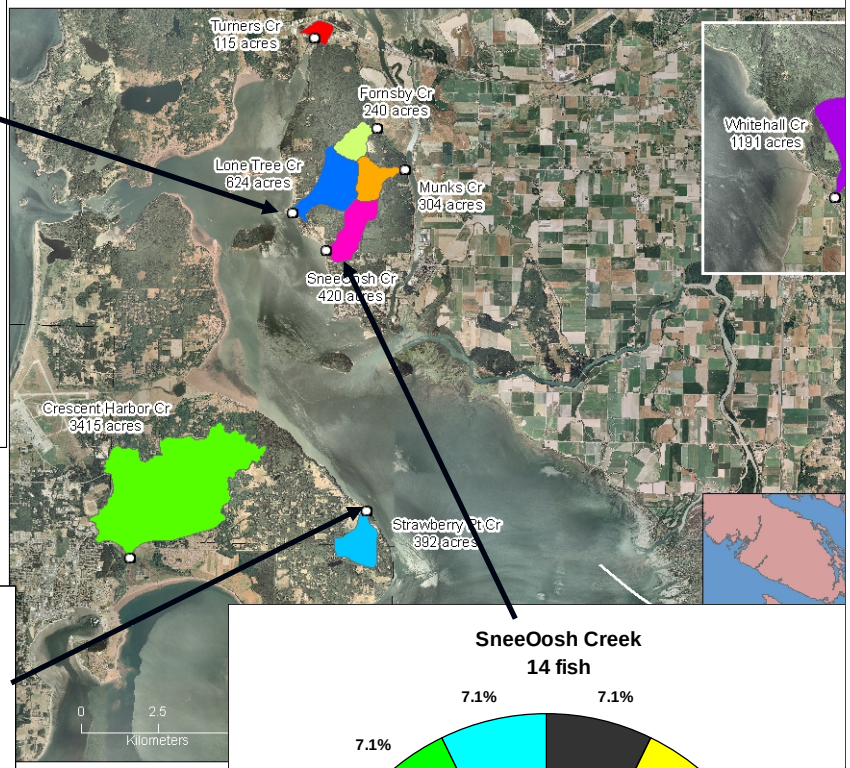

View from mouth

Just upstream of bridge

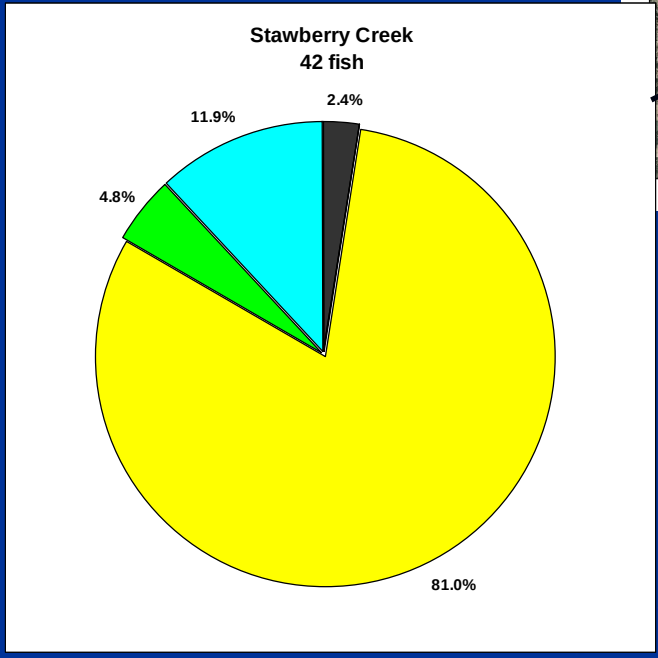

The upstream Chinook salmon fry barrier (0.37 meter drop)

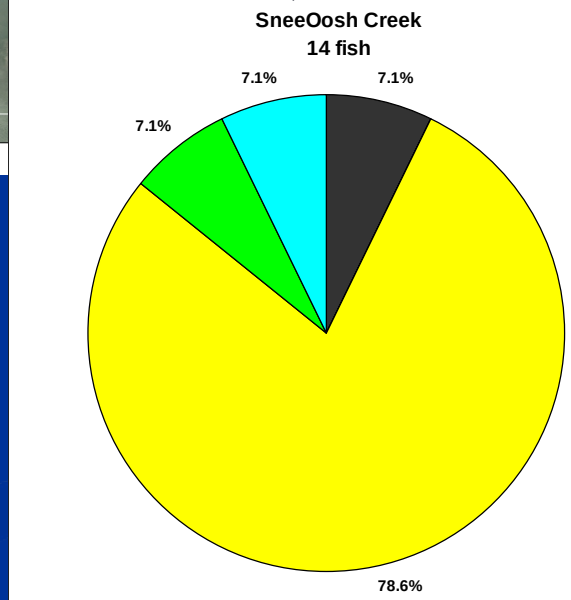
Wild juvenile Chinook Origin

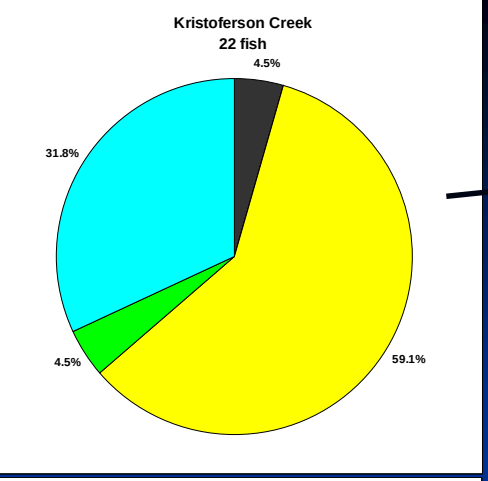


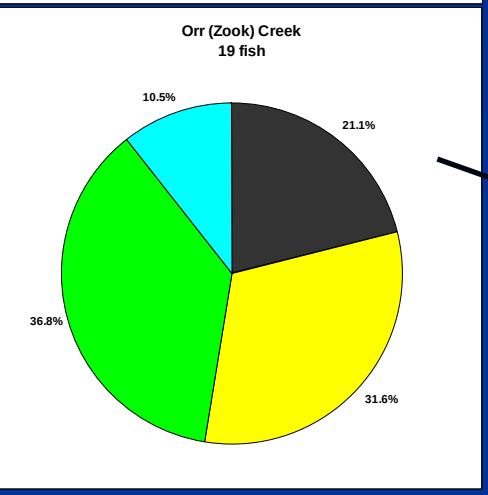


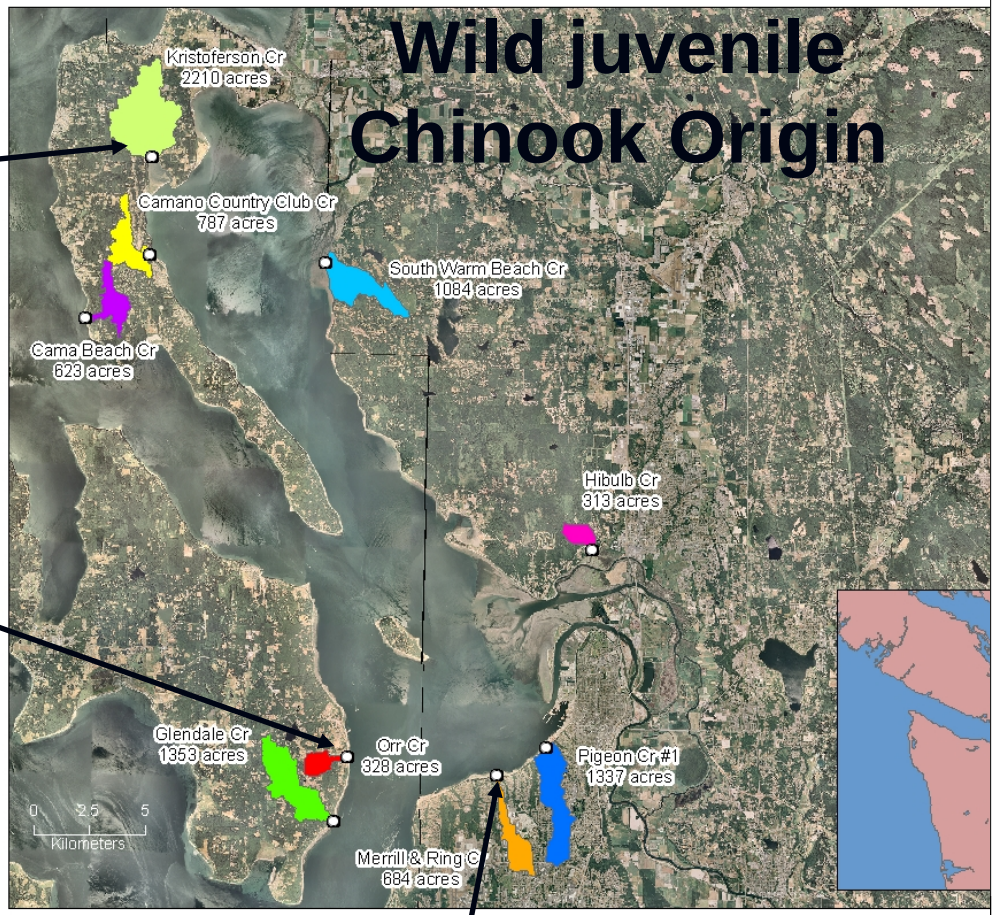
- Canada
- Washington Coast
- Strait of Juan de Fuca
- South Sound Falls / Hood Canal
- South Sound Springs
- Nooksack Springs
- Skagit
- Skykomish
- Stillaguamish

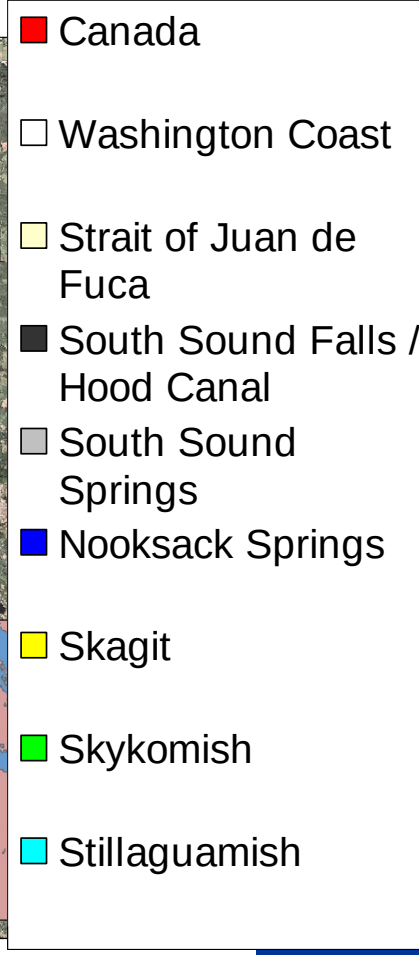


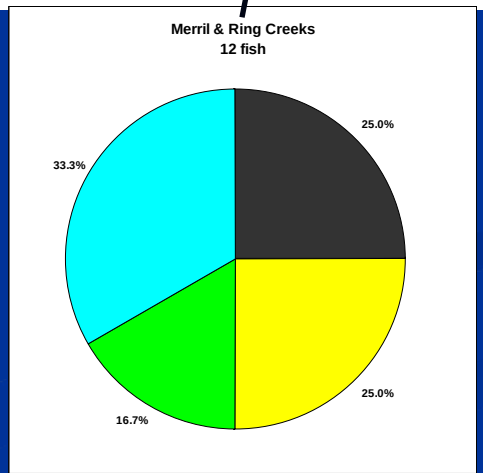



Kristoferson Creek
22 fish
4.5%
31.8%
4.5%
59.1%


Orr (Zook) Creek
19 fish
10.5%
21.1%
36.8%
31.6%


Wild juvenile Chinook Origin
Kristoferson Cr
2210 acres
Camano Country Club Cr
787 acres
South Warm Beach Cr
1084 acres
Cama Beach Cr
623 acres
Hibulb Cr
313 acres
Glendale Cr
1353 acres
Orr Cr
328 acres
Pigeon Cr #1
1337 acres
Merrill & Ring C
684 acres
0 2.5 5
Kilometers


Canada
Washington Coast
Strait of Juan de Fuca
South Sound Falls / Hood Canal
South Sound Springs
Nooksack Springs
Skagit
Skykomish
Stillaguamish


Merril & Ring Creeks
12 fish
25.0%
33.3%
25.0%
16.7%

Residence and growth of individual Chinook salmon

- Opportunistic results from 2009
  - Some fish appear to rear in the same streams for months
    - Two fish lived in one creek for 112 days each
  - Growth rates were:
    - 0.25 mm/day in Feb through April
    - 0.43 mm/day in May
    - 0.57 mm/day in June
- Collecting data in 2010
  - High recapture rate suggest high degree of residency
  - DNA analysis on individuals for growth, movement, residency

So what?

- Are we protecting small streams and their watersheds as Chinook habitat?
  - They are easy to man handle (disturb)
  - Regulations adequate?
  - Are our tools adequate (mapping)?