Skagit Salmon Management 101

February 23, 2022

Presentation to Skagit Watershed Council Skagit Salmon Science Series

Skagit River Co-managers

Key questions

1. What are the Skagit salmon populations and their basic ecological differences which influence their status and how they are managed by humans?

2. How do laws and geography define how Skagit salmon populations are managed?

Outline

- Skagit salmon population summary
- Management framework
- Geographic and legal jurisdictions
- Data Collection
- Skagit Chinook example
- Summary

Chinook salmon life cycle

Redd

Eggs

Freshwater

Emergent Fry

Spawning Adults

Estuary

Juveniles

Adults

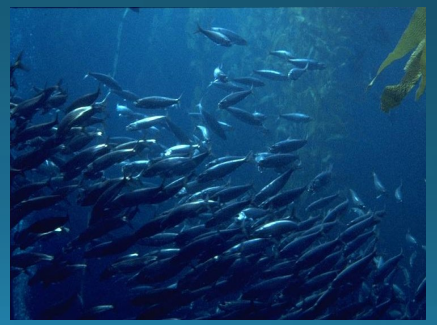
Nearshore

Juveniles

Adults

Ocean

Adults



Complex, multi-jurisdictional processes

Skagit salmon population summary

Species/management group	General juvenile rearing ecology and outmigration; maturation	Harvest Management strategy	Geographic/legal jurisdiction
Baker River Sockeye	Lakes, yearling smolts, adult maturation ages 3 – 5	Hatchery production allows for directed fishery	North of Falcon, terminal area management
Coho	River, floodplains, creeks; yearling smolts; age 3 maturation	Aggregate hatchery/natural origin management strategy;	North of Falcon, Pacific Salmon Treaty
Chinook (6 distinct populations)	River, floodplains, estuary; sub-yearling and yearling smolts;	Aggregate hatchery/natural origin management strategy; ESA constraints	ESA, North of Falcon, Pacific Salmon Treaty
Steelhead	River, floodplains; yearling smolts; adult maturation ages 3 – 8; repeat spawning	Limited directed fishery; ESA constraints	ESA, North of Falcon
Chum	River, floodplains; sub-yearling smolts; adult maturation ages 3 – 5	Directed fishery based on abundance	North of Falcon, Pacific Salmon Treaty
Pink	River, floodplains; yearling smolts; adult maturation age 2	Directed fishery based on abundance	North of Falcon, Pacific Salmon Treaty

Skagit salmon population Status

Species/management group	Recent smolt production range	Recent adult return range
Baker River Sockeye	Mostly hatchery production; 200,000 to over 1,000,000	20,000 – 50,000
Coho	Hatchery: 200,000 – 500,000 Wild: 660,000 – 1.2 million	Hatchery: 1,000 – 20,000 Wild: 10,000 – 120,000
Chinook (6 distinct populations)	Hatchery: 250,000 – 830,000 Wild: 1.1 – 5.5 million	Hatchery: 2,500 – 6,000 Wild: 900 – 3,000 (Spring); 8,000 – 21,000 (Summer/Fall)
Steelhead	NA	3,000 – 9,000
Chum	484,000 – 9.7 million	3,300 – 64,000
Pink	NA	84,000 – 1.5 million

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Annual Fishery Planning

Annual monitoring / data collection

- Monitor numbers impacted by fisheries and numbers returning to spawning grounds
- Ages – scales and otoliths
- Determine stock of origin (Coded-wire tags, genetics)

Impacts of all fisheries from Alaska to California accounted for during pre-season planning

- 100's of stocks monitored to ensure conservation goals are met
- ESA-listing of population groups in the Columbia and Puget Sound → stricter limitations on fisheries to protect depressed populations

North of Falcon Process

- Planning process that runs concurrently with Pacific Fishery Management Council (PFMC) process
- Started process to move towards cooperative state-tribal management in the mid-1980's – Co-management

What do we do at NOF?

Washington state and tribal co-managers plan fisheries that meet conservation objectives for each stock when linked with PST and PFMC fisheries

Goal - provide sustainable recreational, commercial, and treaty fishing opportunities in a manner that does not jeopardize the recovery of salmon or other species listed under the ESA

North of Falcon Process Cont.

1. Forecast the abundance of each stock
2. Determine if there is a harvestable surplus
3. State/ Tribes propose fisheries - predict harvest
4. Model fisheries to determine which stocks are of conservation concern

FRAM – Fisheries Regulation Assessment Model

- Inputs – Stock abundance forecasts & fishery impacts (harvest)
- Predicts exploitation rate (# of fish caught/impacted) on stocks to compare to conservation objectives
- Chinook and Coho only – other fisheries 'impacts' included

North of Falcon Process Cont.

5. State and tribes negotiate sharing of catch and modify fisheries plans to meet conservation objectives

6. Final agreed-to State and Tribal salmon fisheries (ocean, Puget Sound) are described in the List of Agreed Fisheries document (LOAF)

Endangered Species Act (ESA)

ESA-listed species in Puget Sound

- PS Chinook – 1999
- PS Bull trout – 1999
- Hood Canal Summer Chum - 1999
- PS Steelhead - 2007
- Southern resident Orcas - 2005
- PS bocaccio, canary and yelloweye rockfish – 2010

- NOAA must approve state and tribal salmon fisheries – ESA permit to impact listed chinook salmon
- Biological opinion (BiOp) – annual salmon fisheries plan cannot jeopardize the species

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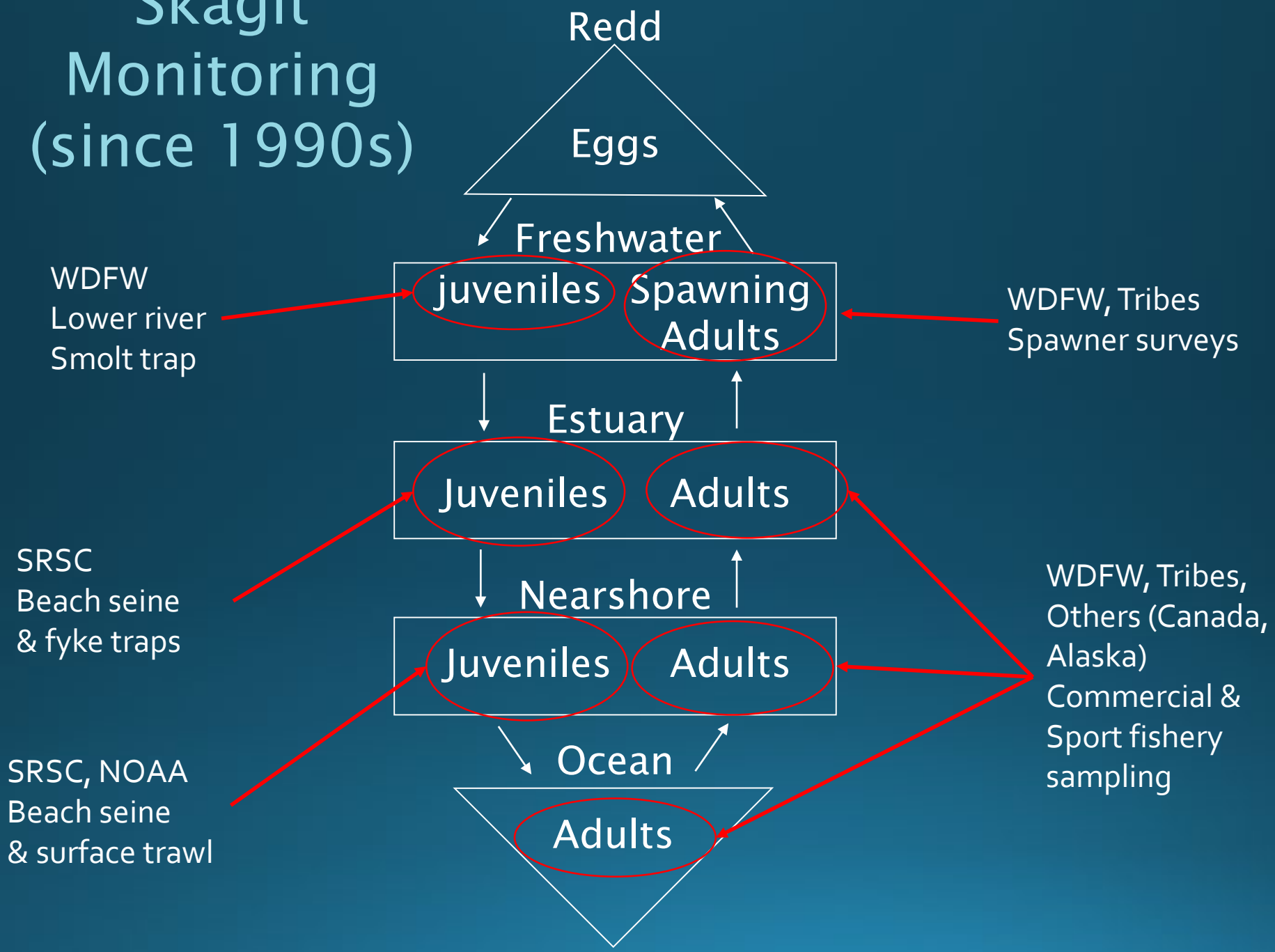
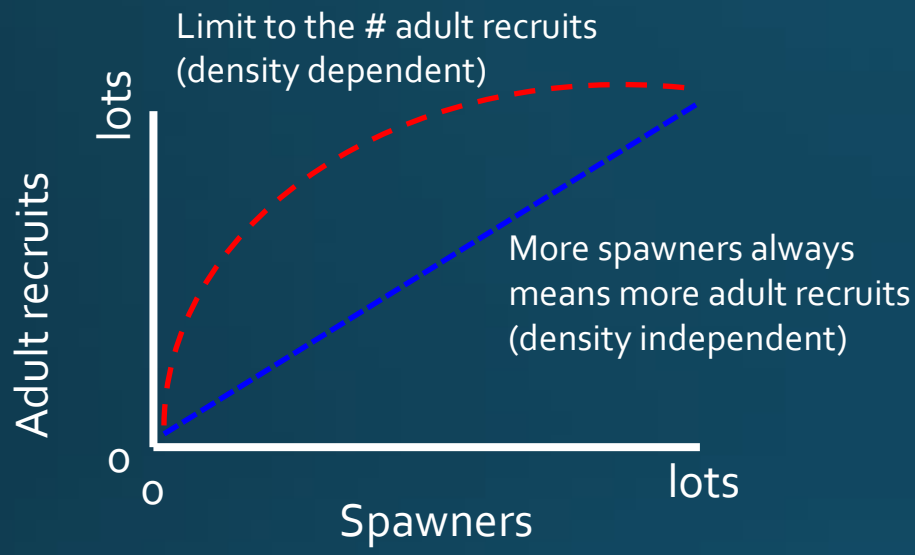
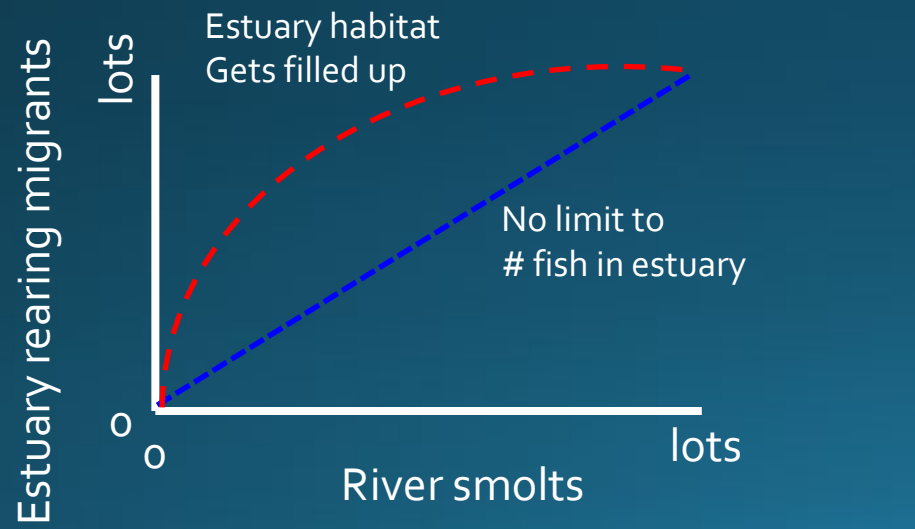
Skagit Monitoring (since 1990s)



Stock>recruit analysis concepts





Full life cycle analysis:

- Spawner to next generation adult recruits (spawners + fish caught in fisheries)

Life stage analysis:

- Smolts outmigrating the river to fish rearing in the estuary

Data Collection

Annual Data Needs

- Escapement – fish that "escape fisheries" to spawn
- Catch/impacts
- Ages – scales/otoliths
- Stock origin – Coded wire tags (CWTs) and genetics
- Test fisheries – predict runsize from known relationships with catch

Data Sharing

- Comanagers share data in-season – needed for management decisions
  - Fishery Dependent – treaty and commercial harvest ready in day(s) – recreational fishery harvest range from weeks to > 1 year

Data Collection – In-river Sport

Creel surveys

- Recreational fishery samplers collect catch and effort information throughout the fishing season
  - Rely on anglers to provide truthful recounting of catch/bycatch
- Used to create catch estimates of target and non-target species
  - EG. In-river sockeye creel – enumerating all bycatch and sockeye catch estimate

Data collection – Skagit Fisheries

- Cooperative test fisheries are conducted to collect data on timing, species and age composition, and abundance
- Tribal and State managers monitor the fisheries in ways that allow comparison of observations with pre-season expectations
- Data are collected from each fishery and the landings, for use in subsequent evaluation and analysis
- In-season fisheries are modified to ensure conservation/harvest goals are met

Data Collection – Marine Mark-selective Fisheries (MSF)

Management Criteria for MSFs – 4 categories of fish tracked

- Legal Marked – >22" min. size, no adipose fin
- Legal Unmarked – >22" min. size, intact adipose fin
- Sublegal Marked – <22" min. size, no adipose fin
- Sublegal Unmarked – <22" min. size, intact adipose fin

- Not all "encountered" fish are legal to retain – apply size-specific release mortality rate
  - We estimate 15% of released adult Chinook salmon and 20% of sublegal Chinook will die after being released from hook and line fishery.

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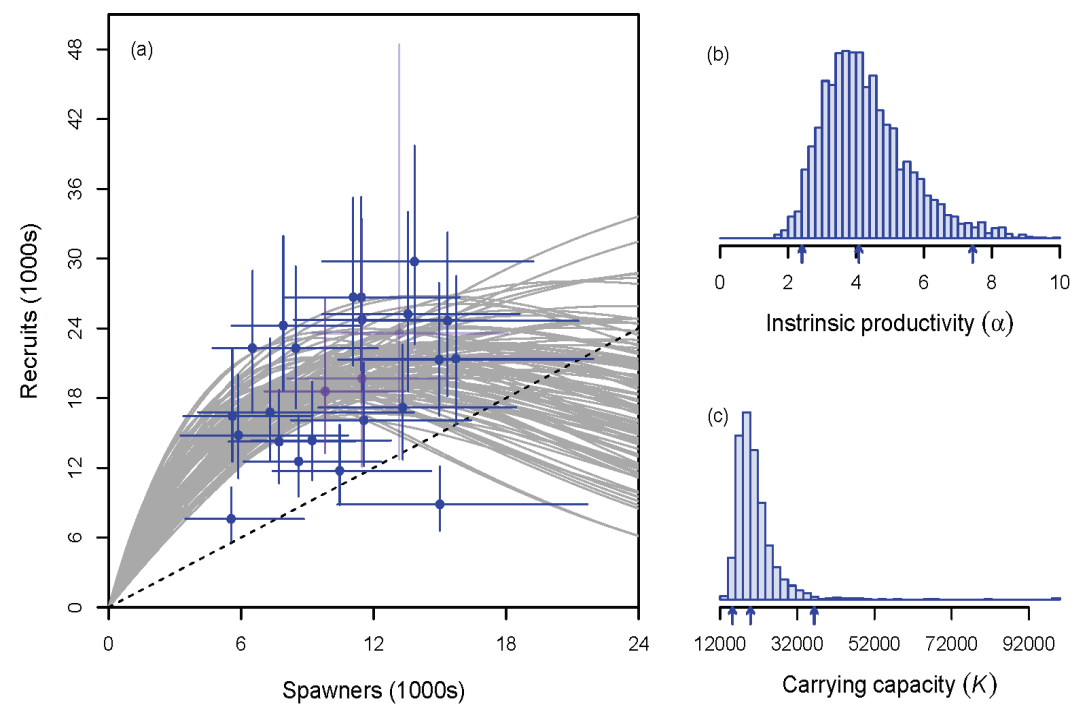
Skagit Chinook – Management Objectives



Skagit Chinook – Management Objectives

Management Unit	Low Abundance Threshold (LAT)	Exploitation Rate Ceiling (ERC)
Skagit Spring	1,024	36%
Skagit Summer/Fall	7,844	52%

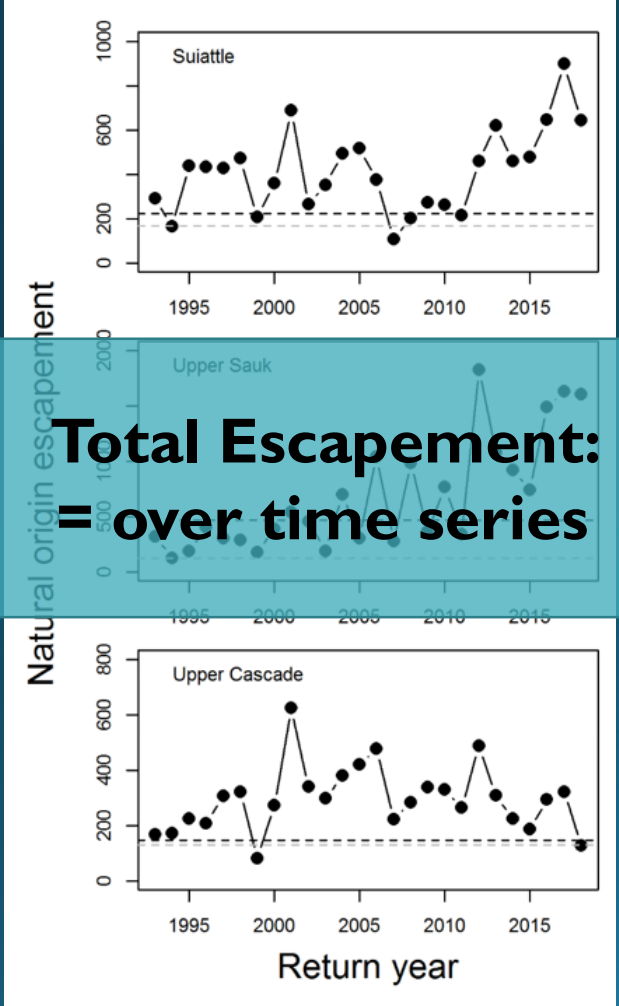
- Low Abundance Threshold (LAT) – triggers additional conservation measures in fisheries. Methods to derive LAT vary across management units (MU's). Provide increased responsiveness in fisheries to reduce risk to population

- Exploitation Rate – Percent of total mortality (i.e., in fisheries and on spawning grounds) that occurs in fisheries, including landed and non-landed fishery mortality components
  - Exploitation Rate ceiling – maximum allowable exploitation rate for management unit

Skagit Summer/Fall Example:
Preseason forecast: 13,825
> LAT (9100): up to 52% total allowable ER

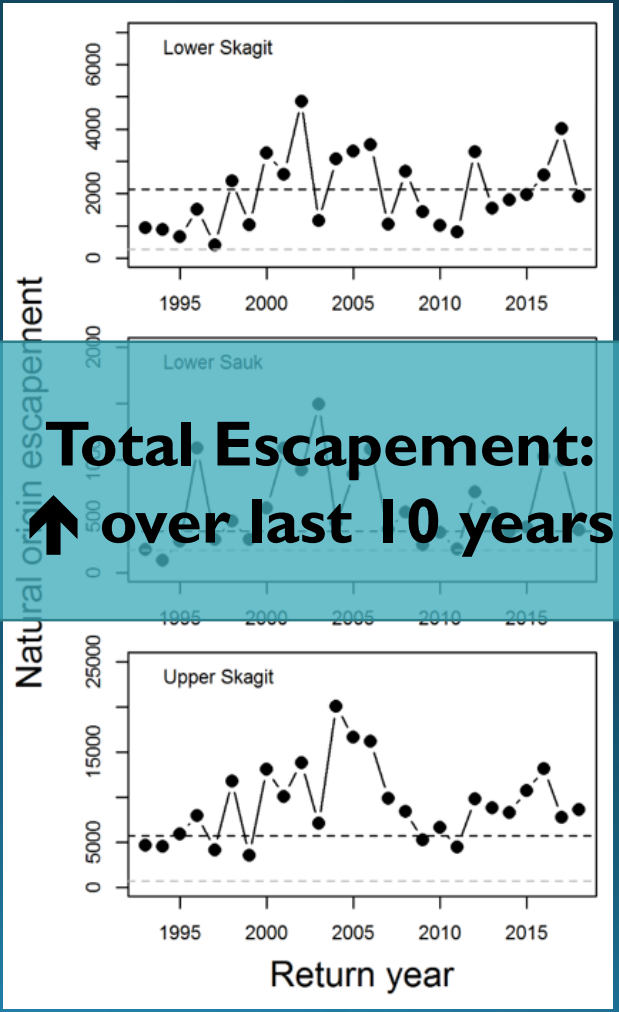
Skagit Chinook Escapement Trends

Spring Chinook



Total Escapement: = over time series

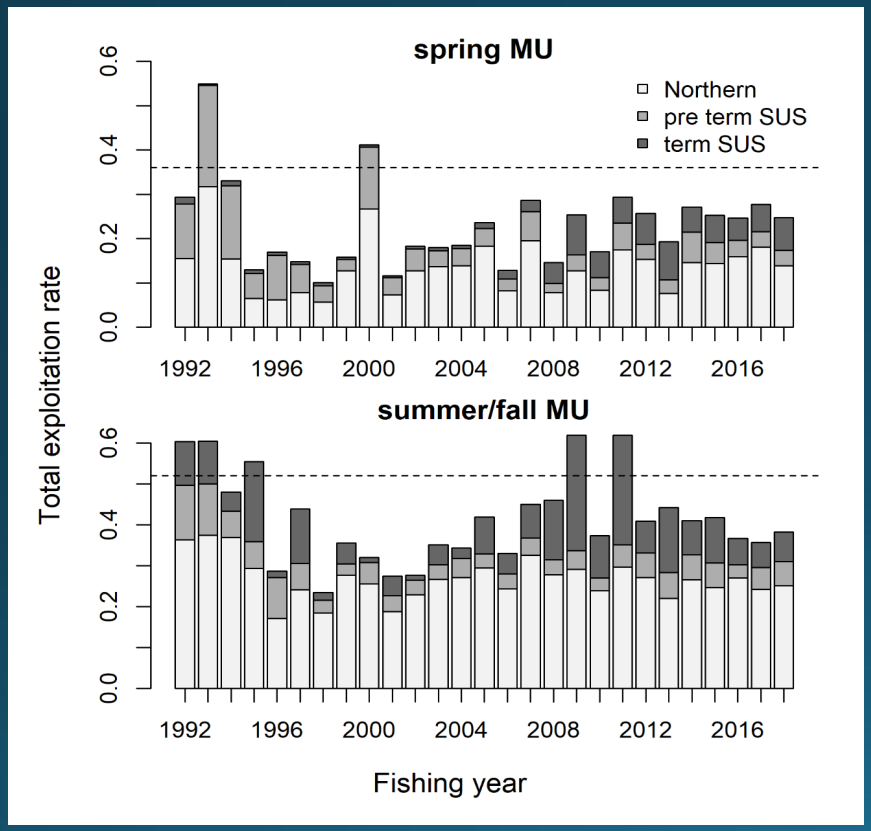
Summer/Fall Chinook



Total Escapement: ↑ over last 10 years

Skagit Chinook Exploitation Rates (ER)

Dashed lines – Exploitation Rate Ceiling



Spring ER

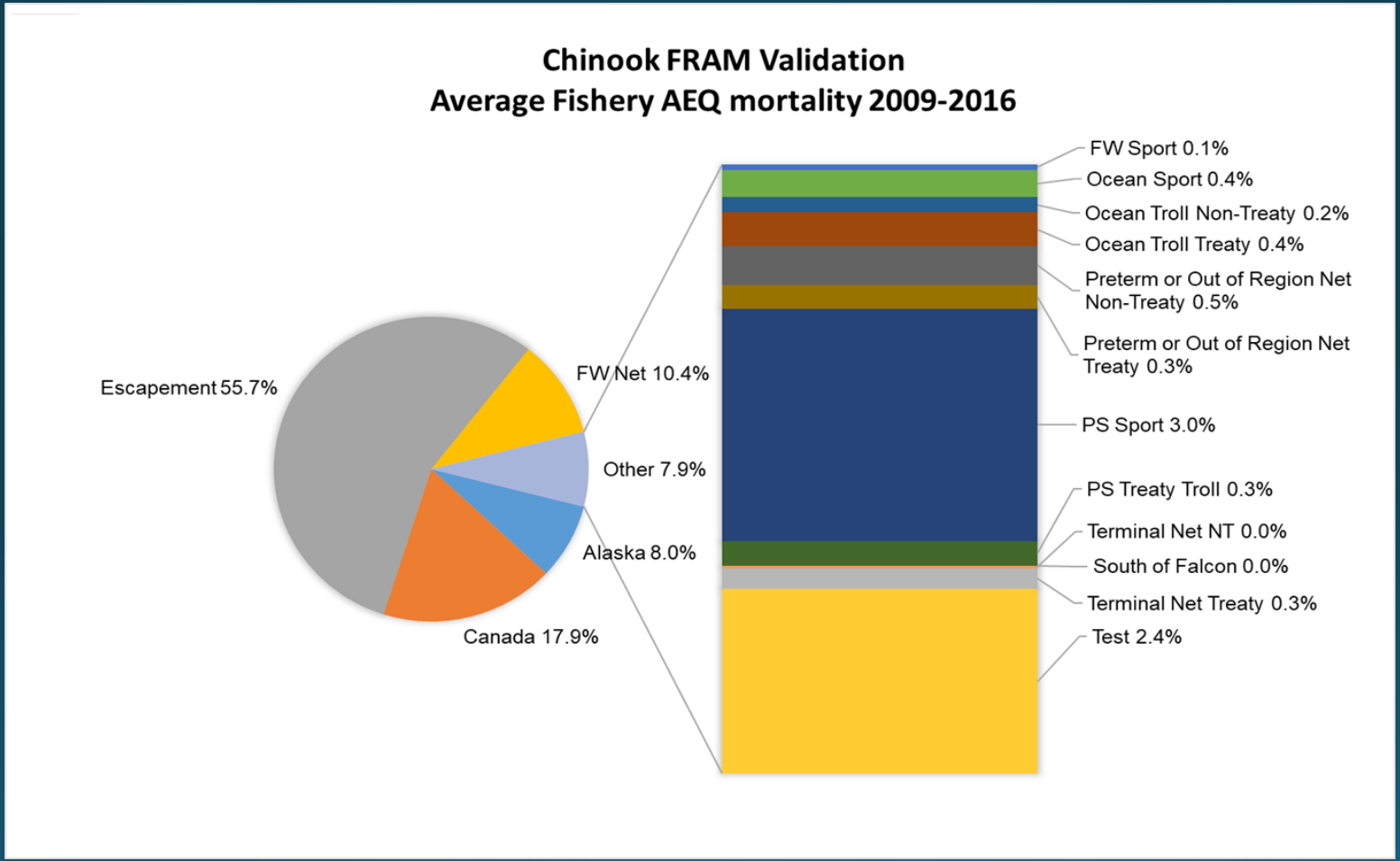
- Northern (Alaska/Canada) and Southern US (WA/OR) ER's similar (2007-16)
- On avg. 21% of return impacted by fisheries (ERC 37.5%

Summer/Fall ER

- Northern fisheries avg. 27%, SUS 18%
- On avg. 45% of return impacted by fisheries

Fisheries management successful in achieving conservation objectives

Skagit ER's Cont. – Who's catching what?



AEQ – adult equivalents – immature fish are also impacted by fisheries but not all of these fish would have returned to spawn – apply natural mortality rates

Summary

Harvest Management

- Management of coast-wide fisheries coordinated by multiple federal and state entities and treaty tribes
- NOF - Annual pre-season harvest planning must stay under exploitation rate ceilings
- ESA – fisheries package approved by NOAA (BiOp) – fisheries not likely to jeopardize ESA-listed species

Data collection is crucial to successful fisheries management

- Fisheries monitored for harvest and harvest-associated impacts (eg release mortality in MSF)
- In-season management actions taken to ensure conservation objectives are met

Summary

- The Skagit has multiple populations of managed salmonids.
- Salmon populations vary in their migration and age structures so not all species/populations are encountered in the same way by fishers.
- Salmon also pass through many different jurisdictions (national, state/provincial and tribal) who share in the management.
- There is no phase of management that has a 'free pass' on harvest of Skagit populations within any geographic jurisdiction.
- There are robust fishery planning, implementation, and monitoring efforts across all fisheries and populations.
- The harvest management process across jurisdictions has a predictable and legally binding way to do its business, including ways to resolve disagreements and adaptively manage (do a better job).
- Salmon population productivity and capacity are related to habitat conditions and are limiting fishing opportunities for some Skagit populations.