

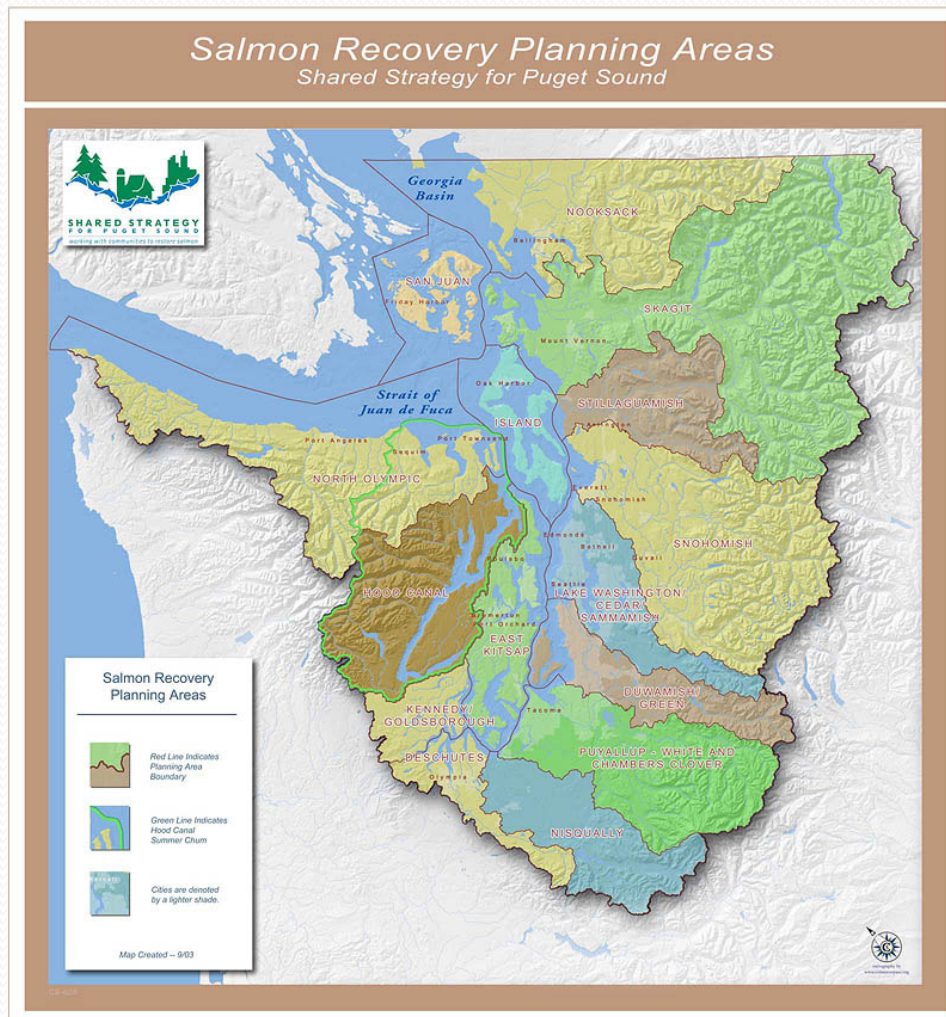
Coordination of Harvest, Hatchery, and Habitat Management for Salmon Recovery



Kit Rawson
Tulalip Tribes
Tulalip, Washington, USA
February 4, 2009

Puget Sound Chinook salmon

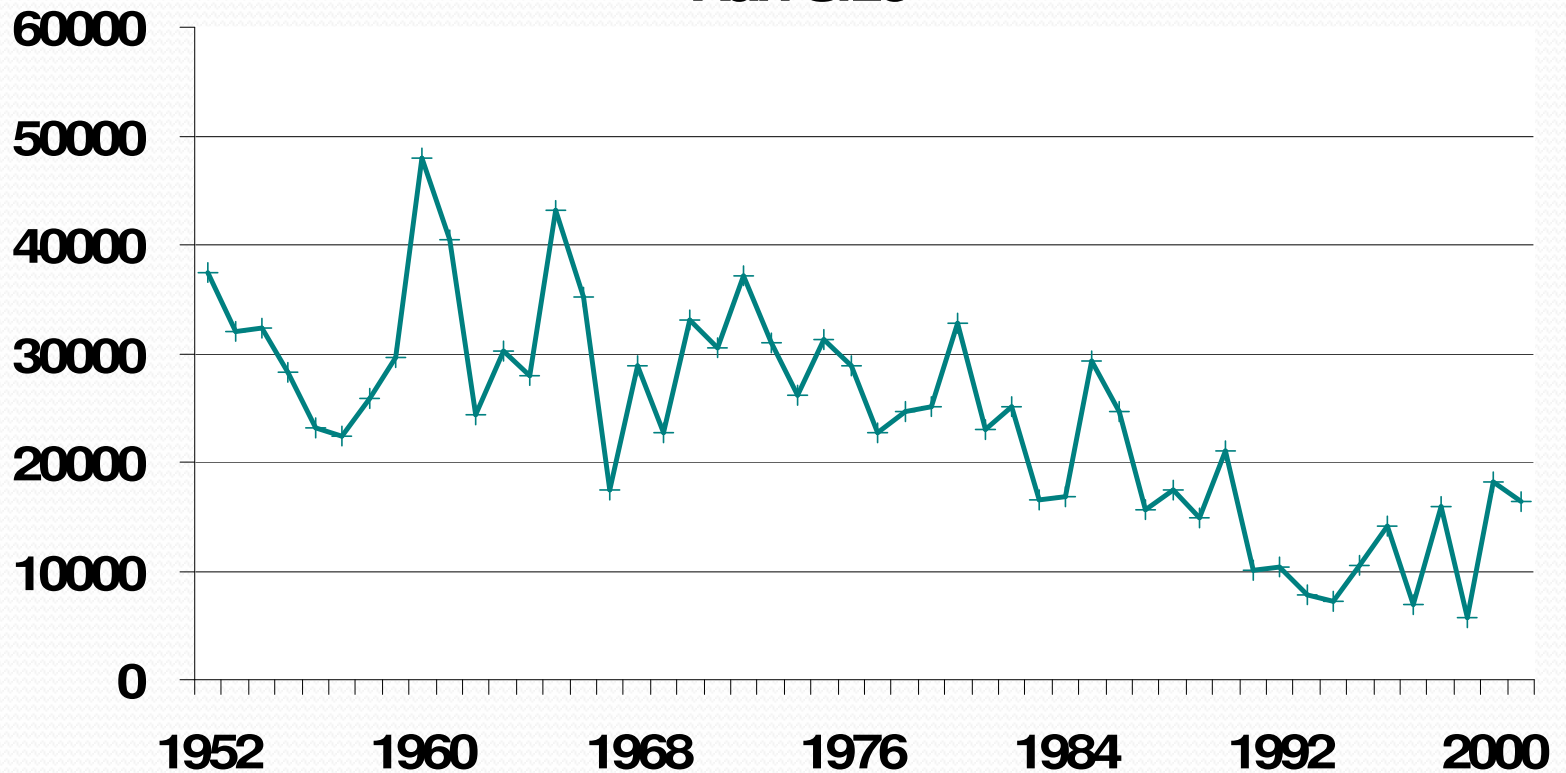
(Oncorhynchus tshawytscha)



- 14 watersheds
- 22 populations
- Recovery plan adopted Jan. 2007

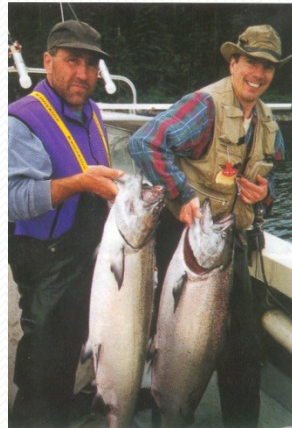
Skagit Chinook, 1952 -2002

**Skagit Spring + Summer/Fall Chinook Terminal
Run Size**



Causes of the decline

- Harvest



- Hatcheries

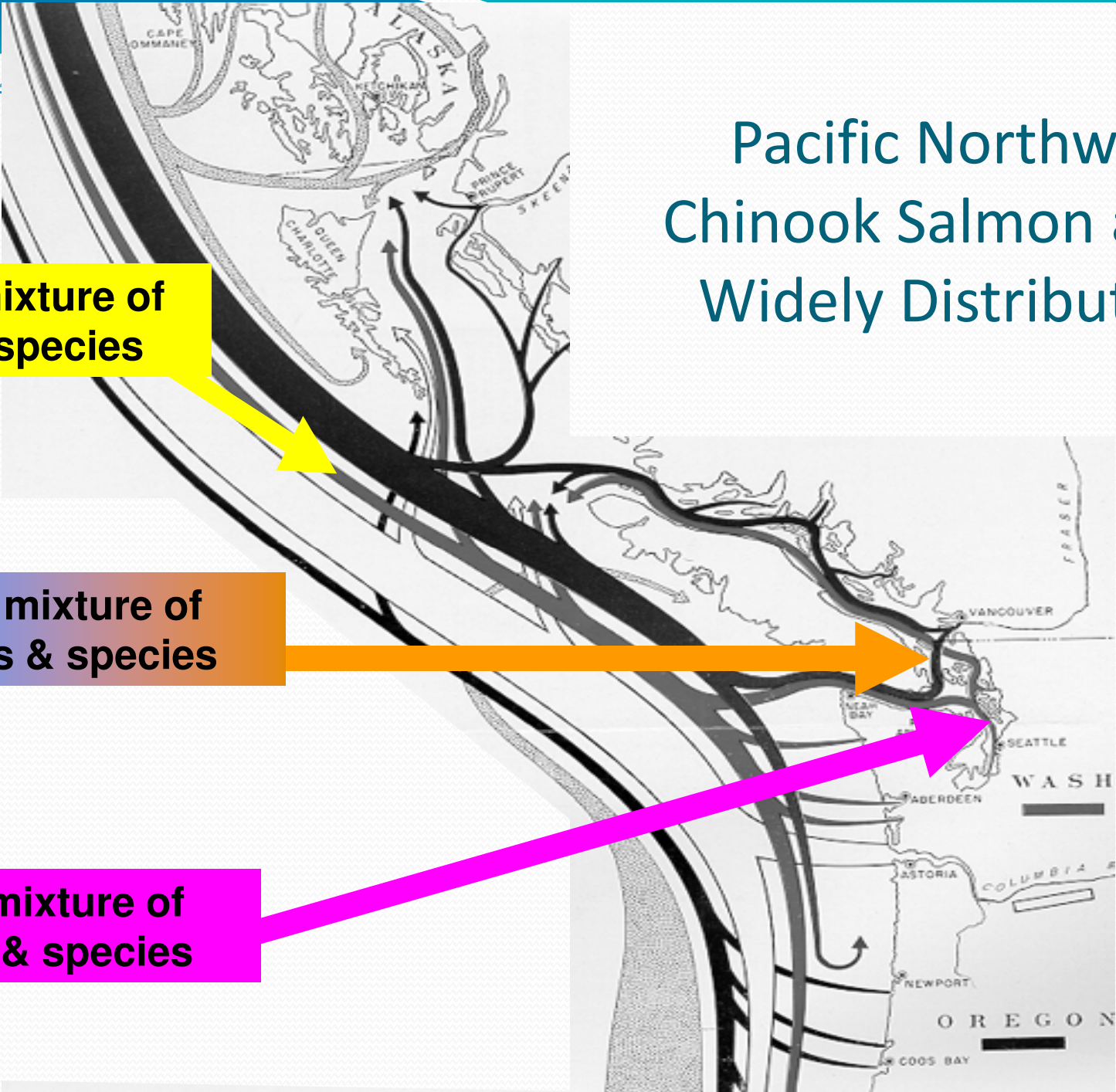
- Habitat

Pacific Northwest Chinook Salmon are Widely Distributed

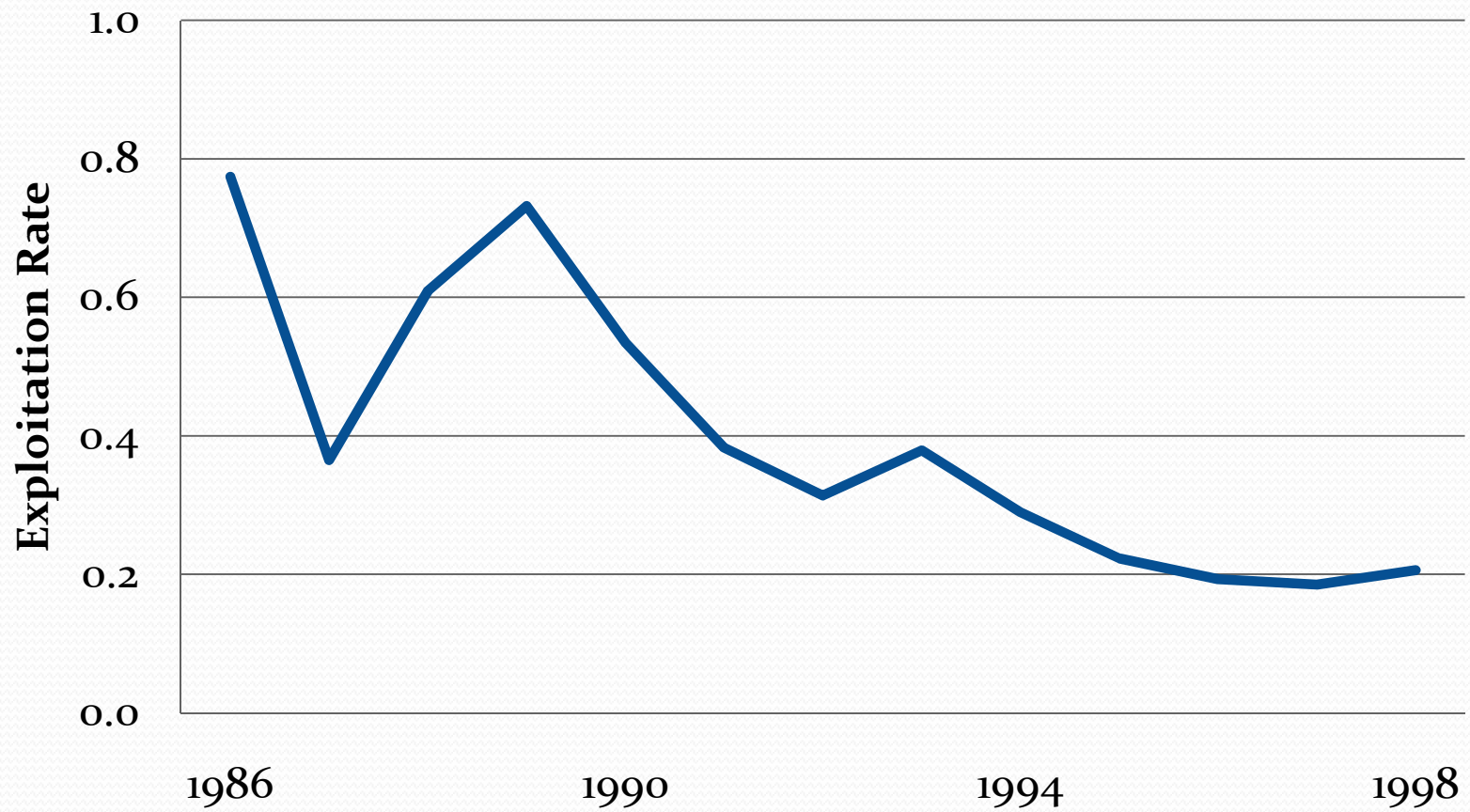
Greatest mixture of
stocks & species

Less mixture of
stocks & species

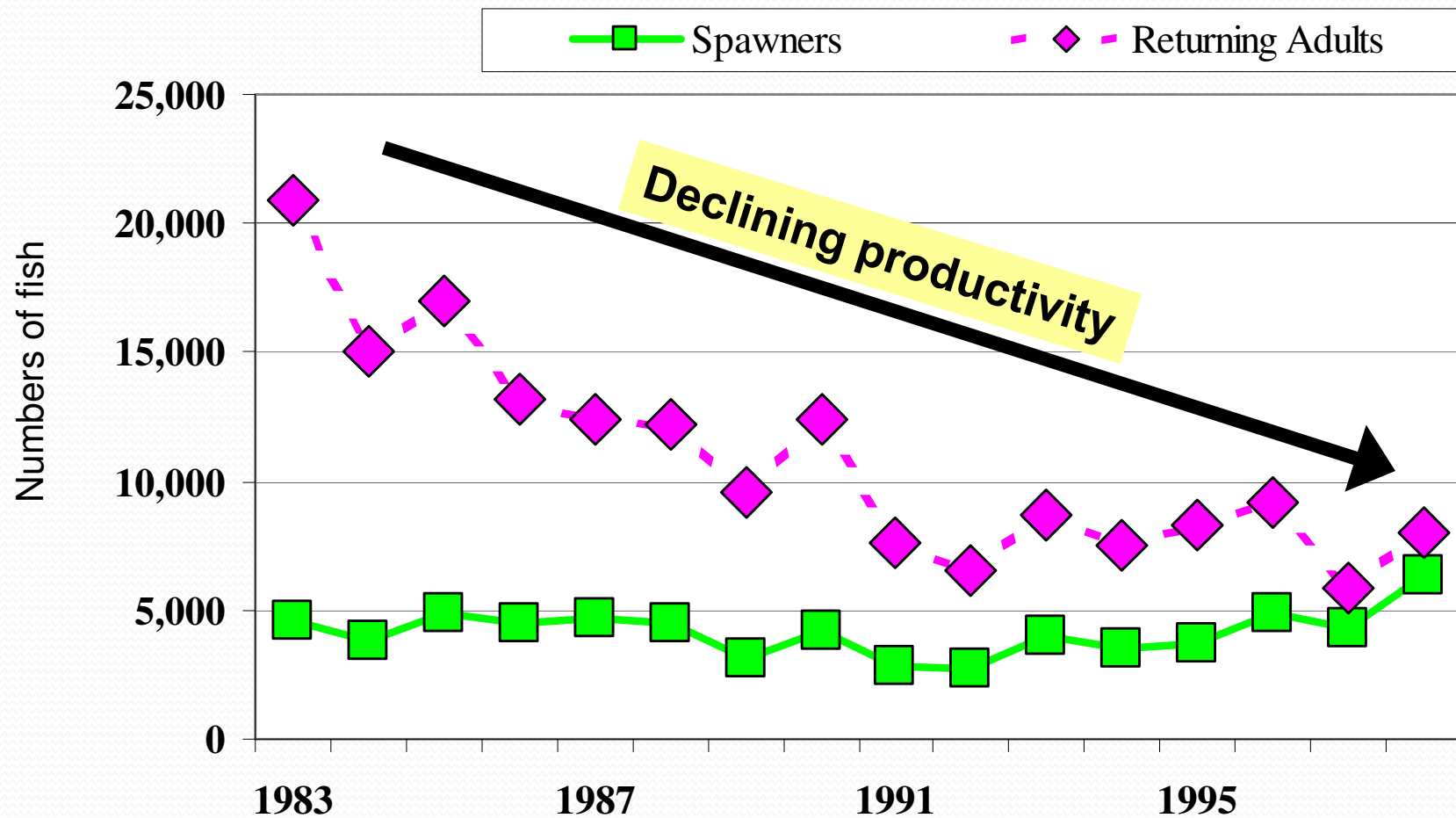
Least mixture of
stocks & species



Stillaguamish chinook salmon exploitation rate



Total abundance of Snohomish chinook has declined despite stable spawner numbers



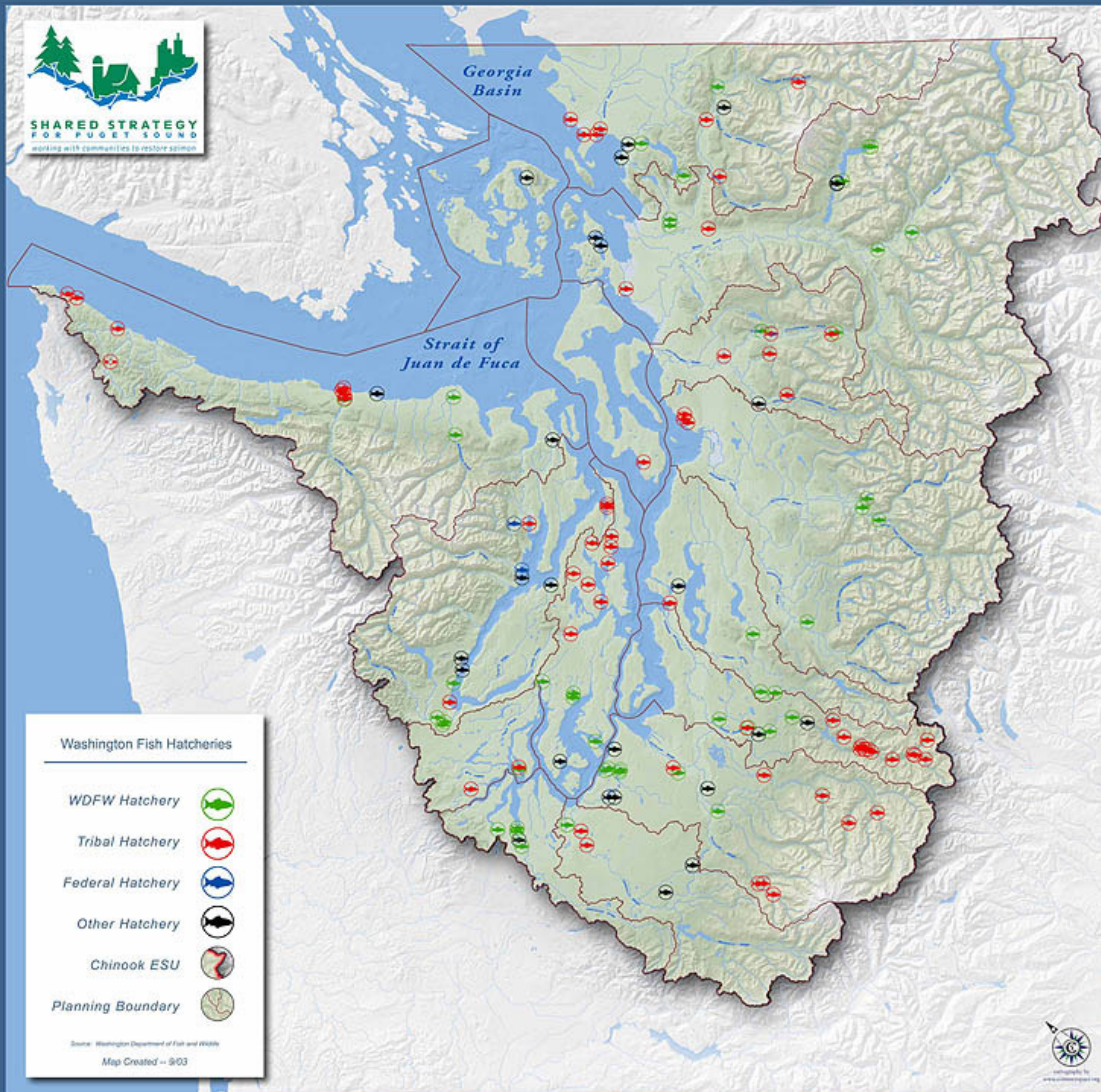
Source: Comprehensive Chinook Management Plan DRAFT Dec. 2000

Causes of the decline

- Harvest
- Hatcheries
- Habitat



Hatchery Locations in the Shared Strategy Planning Area





Risks and Benefits of Hatchery Production

- (-) Genetic interactions
- (-) Ecological interactions
- (-) Disease amplification
- (-) Abundant hatchery fish can lead to overharvest of wild stocks

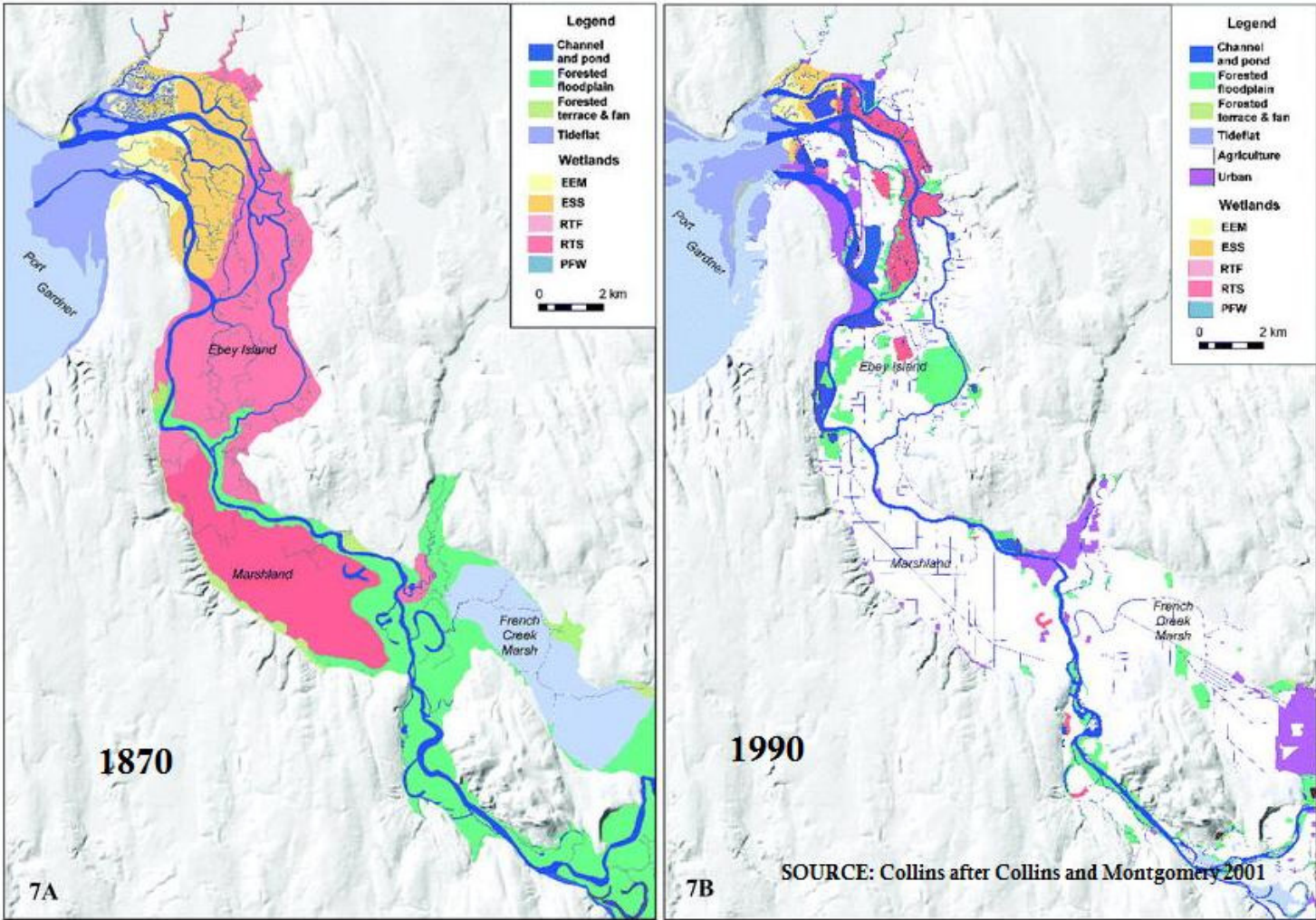
- (+) Hatchery fish provide harvest opportunities
- (+) Hatcheries can supplement low wild populations

Causes of the decline

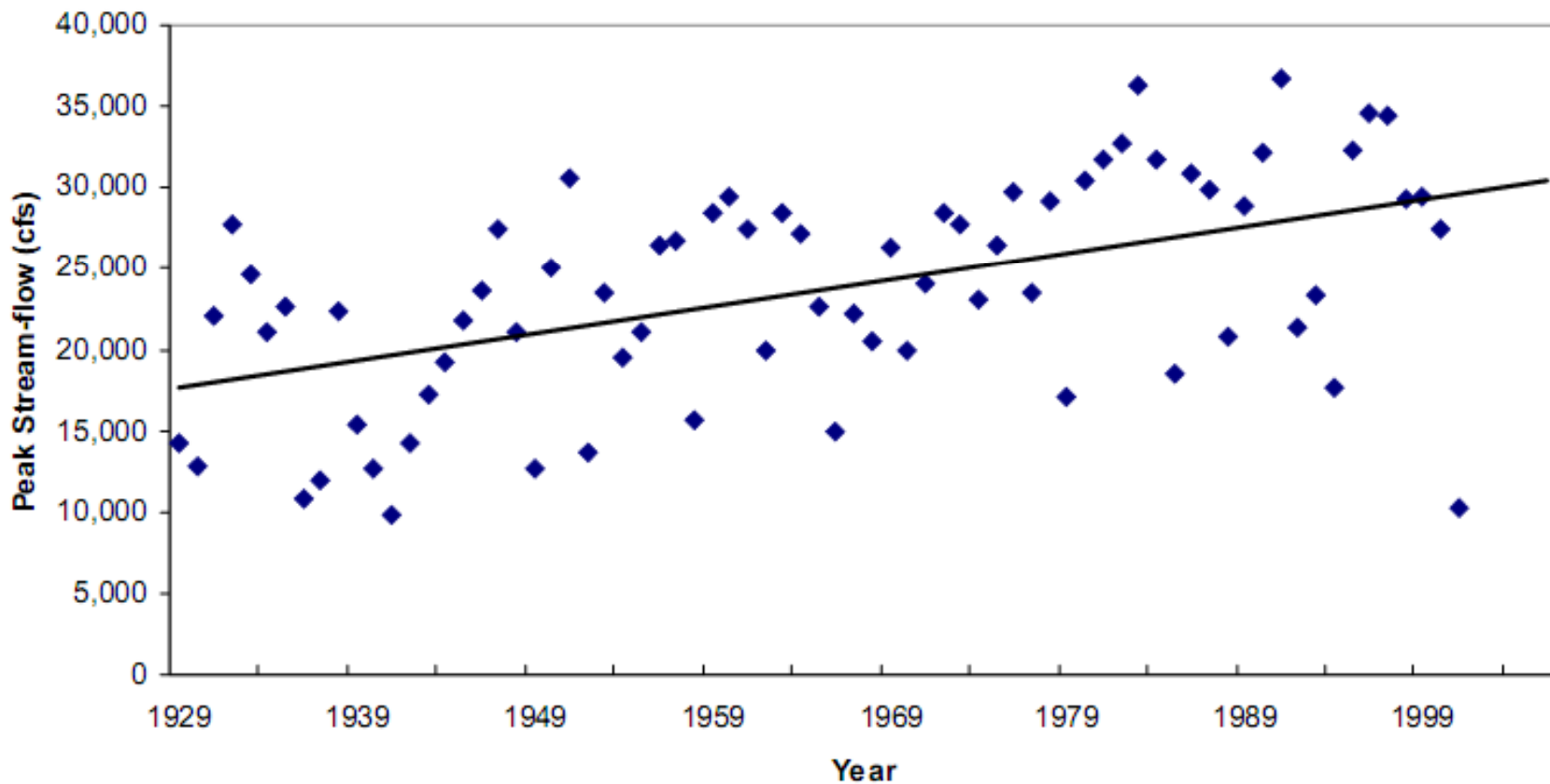
- Harvest
- Hatcheries
- Habitat



Loss of habitat

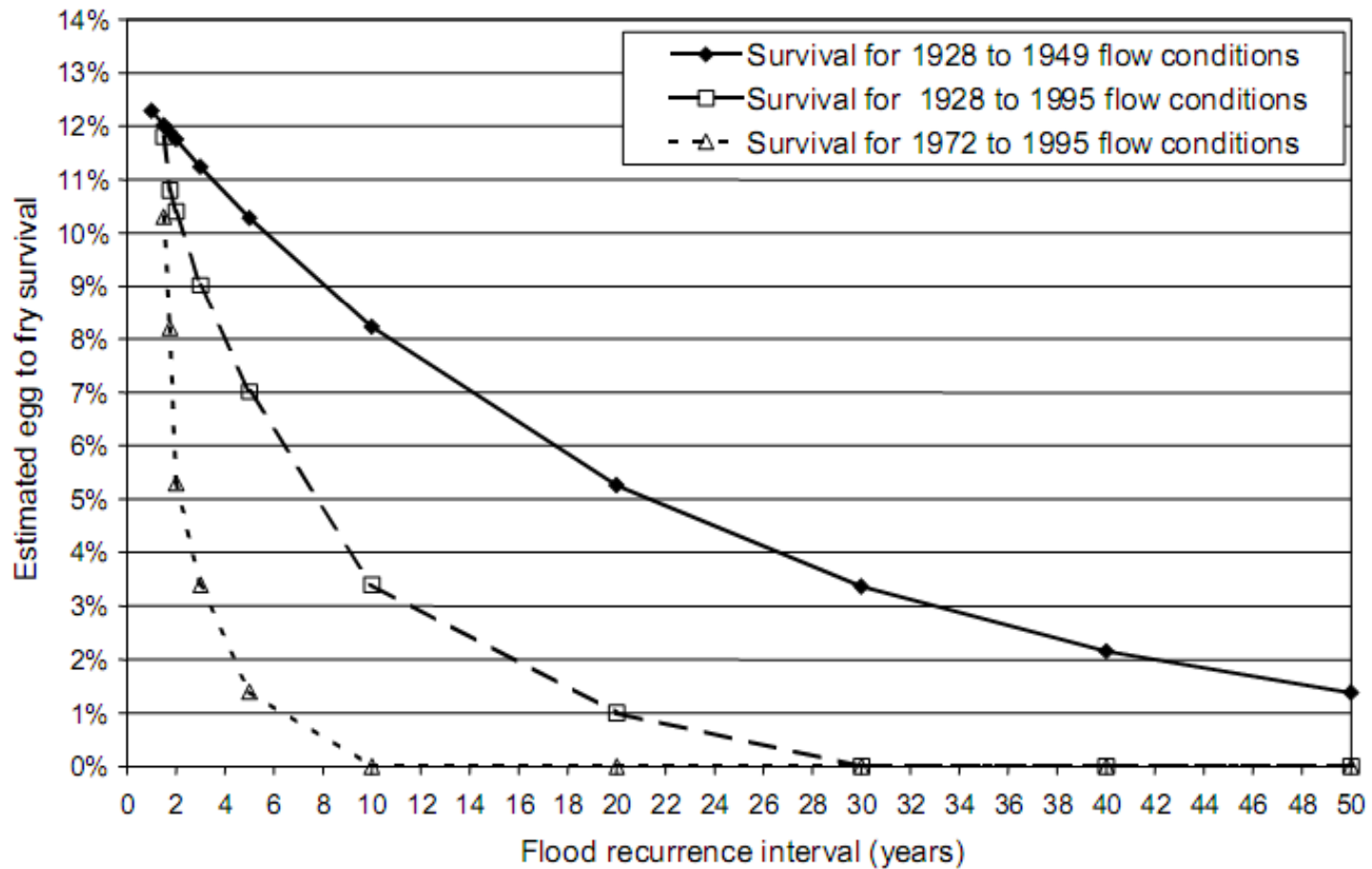


Increase in peak flows ...



SOURCE: Stillaguamish Chinook Salmon Recovery Plan

... leading to reduced egg survival



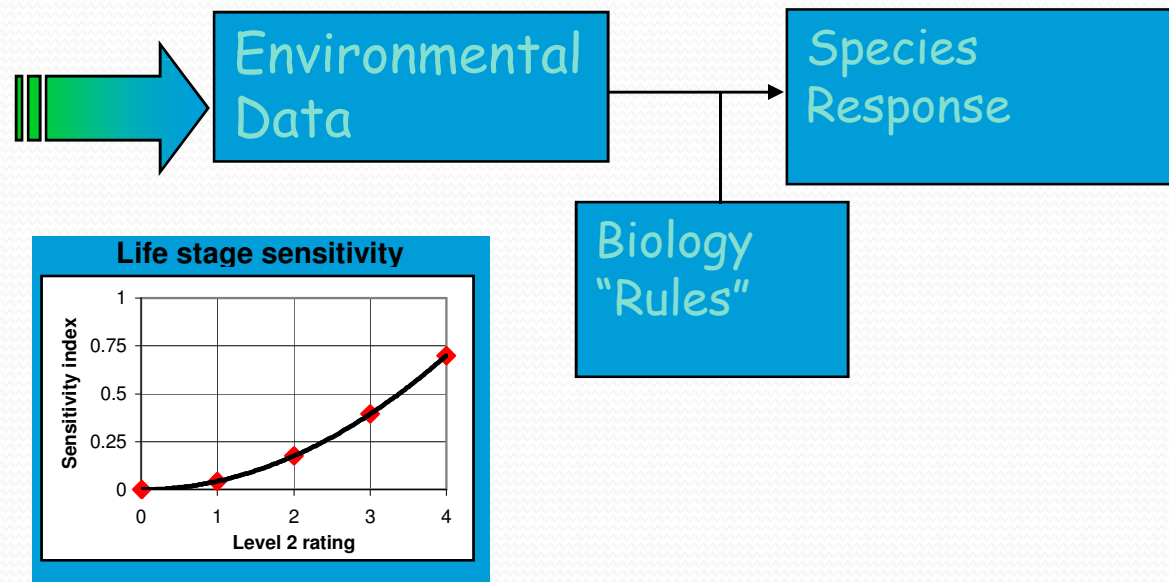
SOURCE: Eric Beamer and George Pess 1999

Ecosystem Diagnosis and Treatment (EDT) Model

The Ecosystem



Working Hypothesis



Environmental Attributes

CHANNEL LENGTH AND WIDTH

Channel length
Channel month Maximum width (ft)
Channel month Minimum width (ft)

FLOW RELATED

Flow - change in interannual variability in high flows
Flow - changes in interannual variability in low flows
Flow - Intra daily (diel) variation
Flow - intra-annual flow pattern
Hydrologic regime - natural
Hydrologic regime - regulated
Water withdrawals

TEMPERATURE

Temperature - daily maximum (by month)
Temperature - daily minimum (by month)
Temperature - spatial variation

CHANNEL/HABITAT CHARACTERISTICS

Bed scour
Confinement - Hydromodifications
Confinement - natural
Embeddedness
Fine sediment
Gradient
Hatchery fish outplants
Icing
Obstructions to fish migration
Riparian function
Turbidity
Wood

MISC. WATER QUALITY/BIOTIC QUALITIES

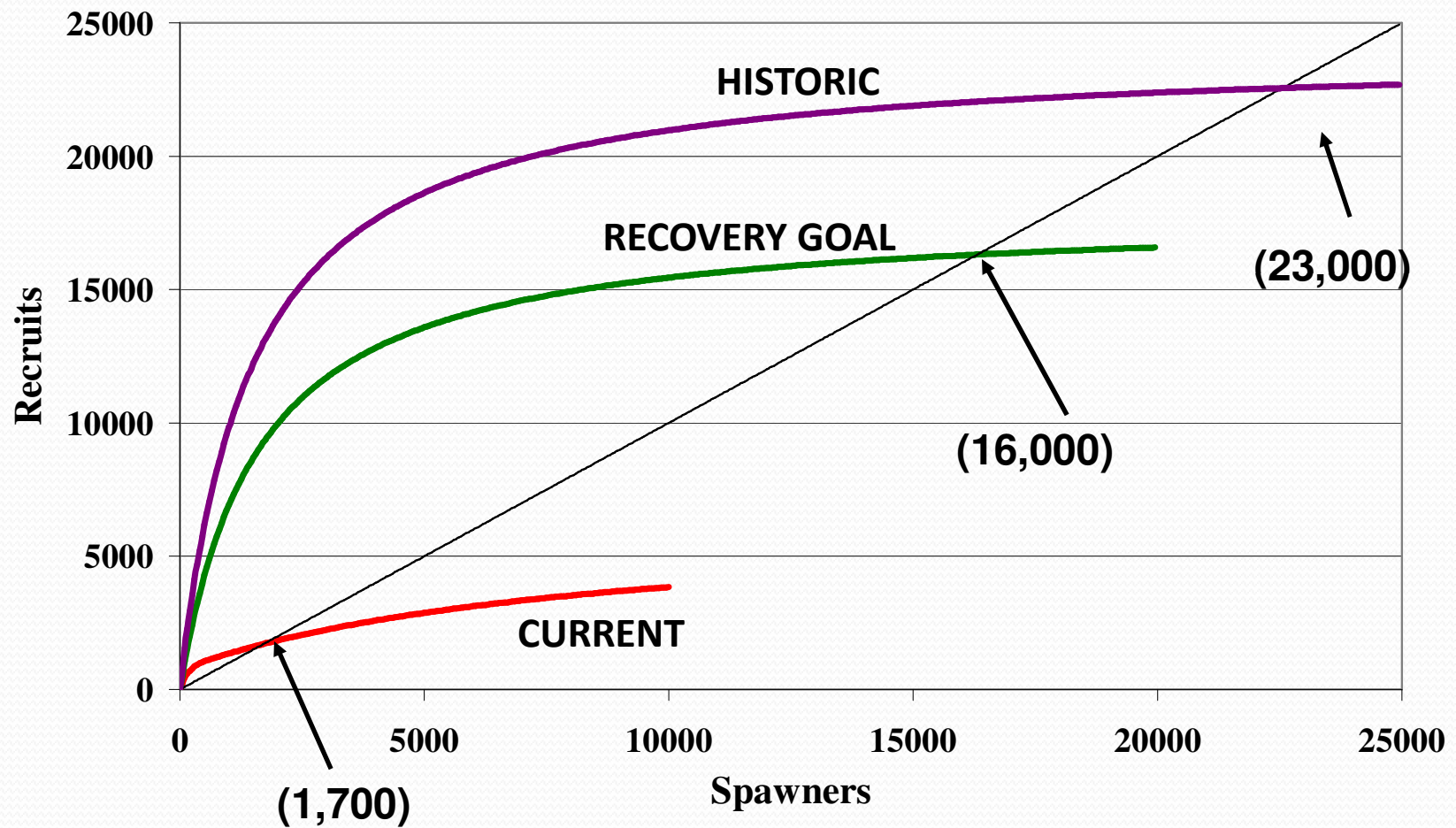
Alkalinity
Benthos diversity and production
Dissolved oxygen
Fish community richness
Fish pathogens
Fish species introductions
Harassment
Metals - in water column
Metals/Pollutants - in sediments/soils
Miscellaneous toxic pollutants - water column
Nutrient enrichment
Predation risk
Salmon carcasses

CHANNEL/HABITAT CHARACTERISTICS

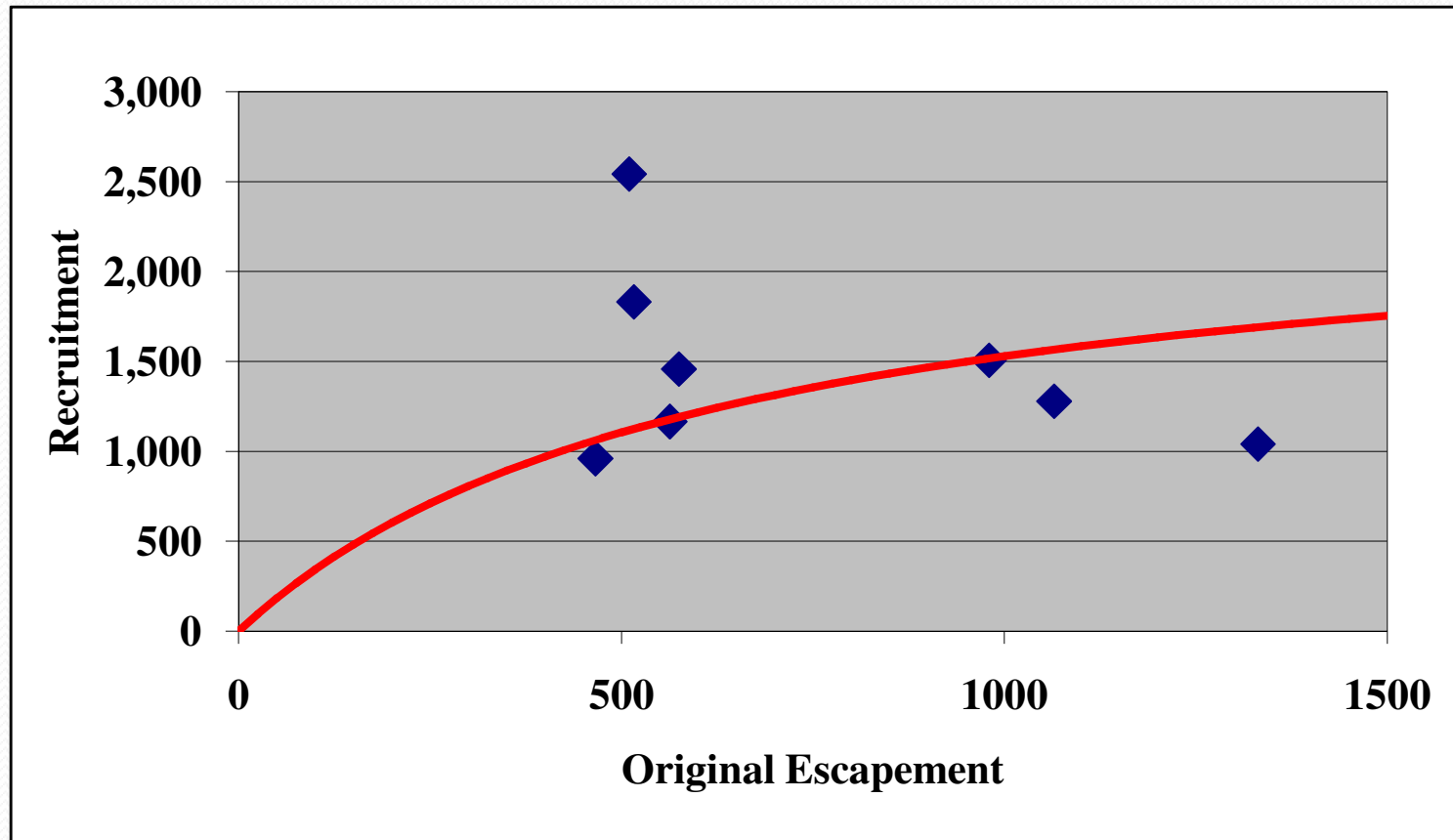
Habitat type - backwater pools
Habitat type - beaver ponds
Habitat type - glides
Habitat type - large cobble/boulder riffles
Habitat type - off-channel habitat factor
Habitat type - pool tailouts
Habitat type - primary pools
Habitat type - small cobble/gravel riffles



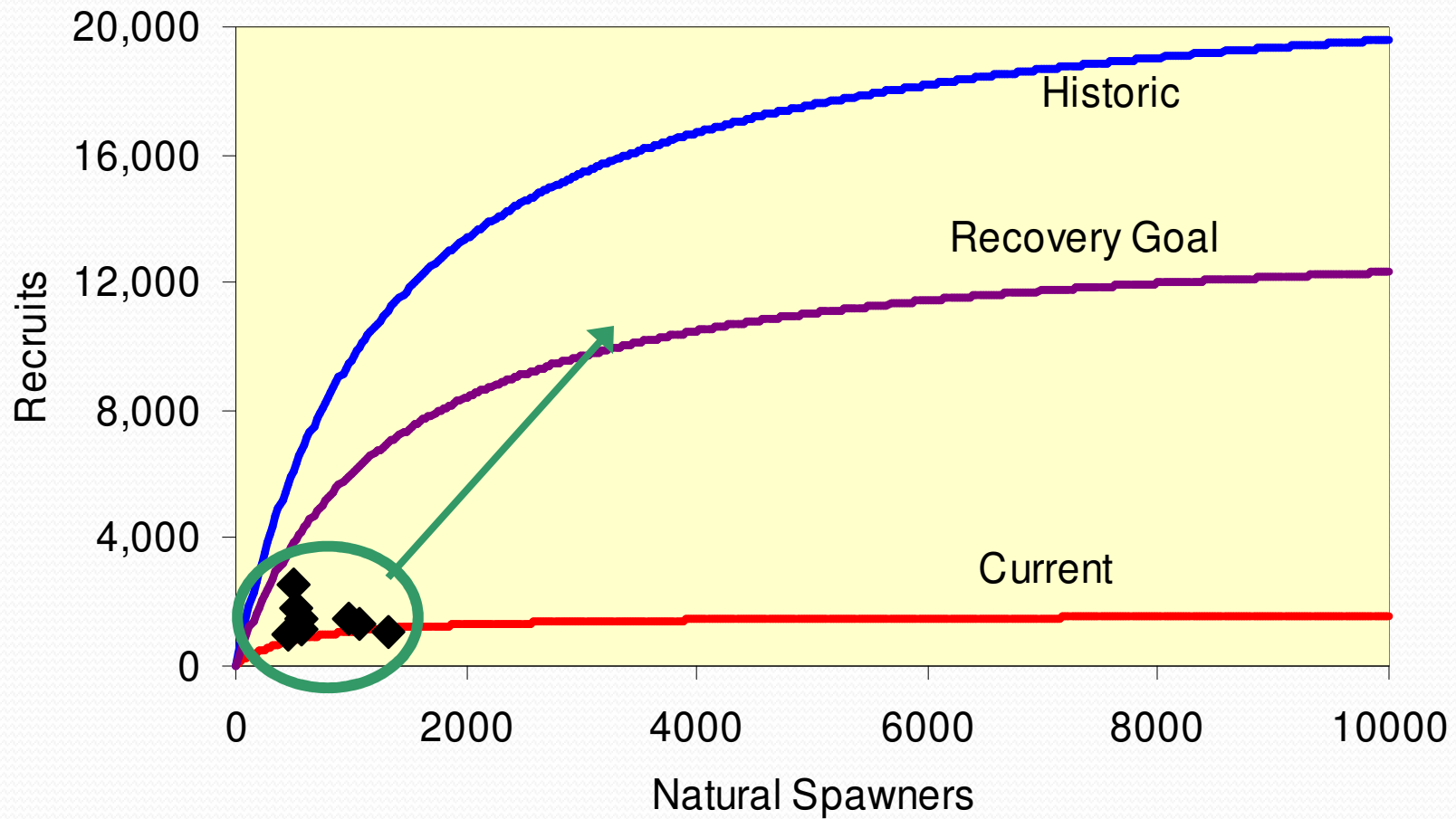
North Fork Stillaguamish



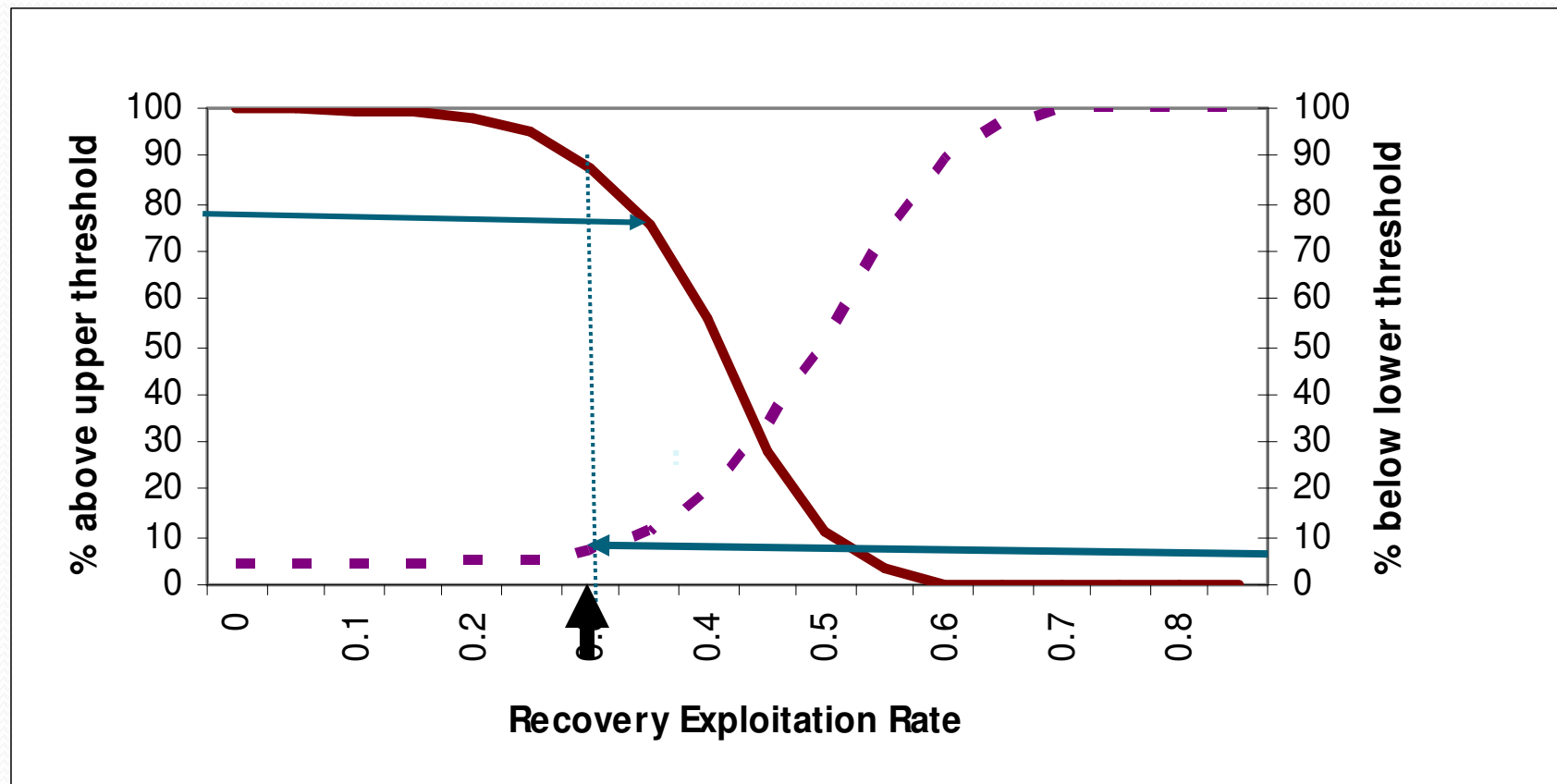
Current Conditions – North Fork Stillaguamish: Predicted and Observed



North Fork Stillaguamish



Harvest: Rebuilding Exploitation Rates (RER)



SOURCE: Susan Bishop, NOAA Fisheries



Hatcheries

- “Hatchery Reform”
 - Reviewed all programs in Washington State
 - Address risks
- Snohomish system: Memorandum of Understanding, 2005
 - Convert to indigenous broodstock
 - Mass marking and selective fisheries
- Stillaguamish system: Hatchery supplements low wild population



Habitat

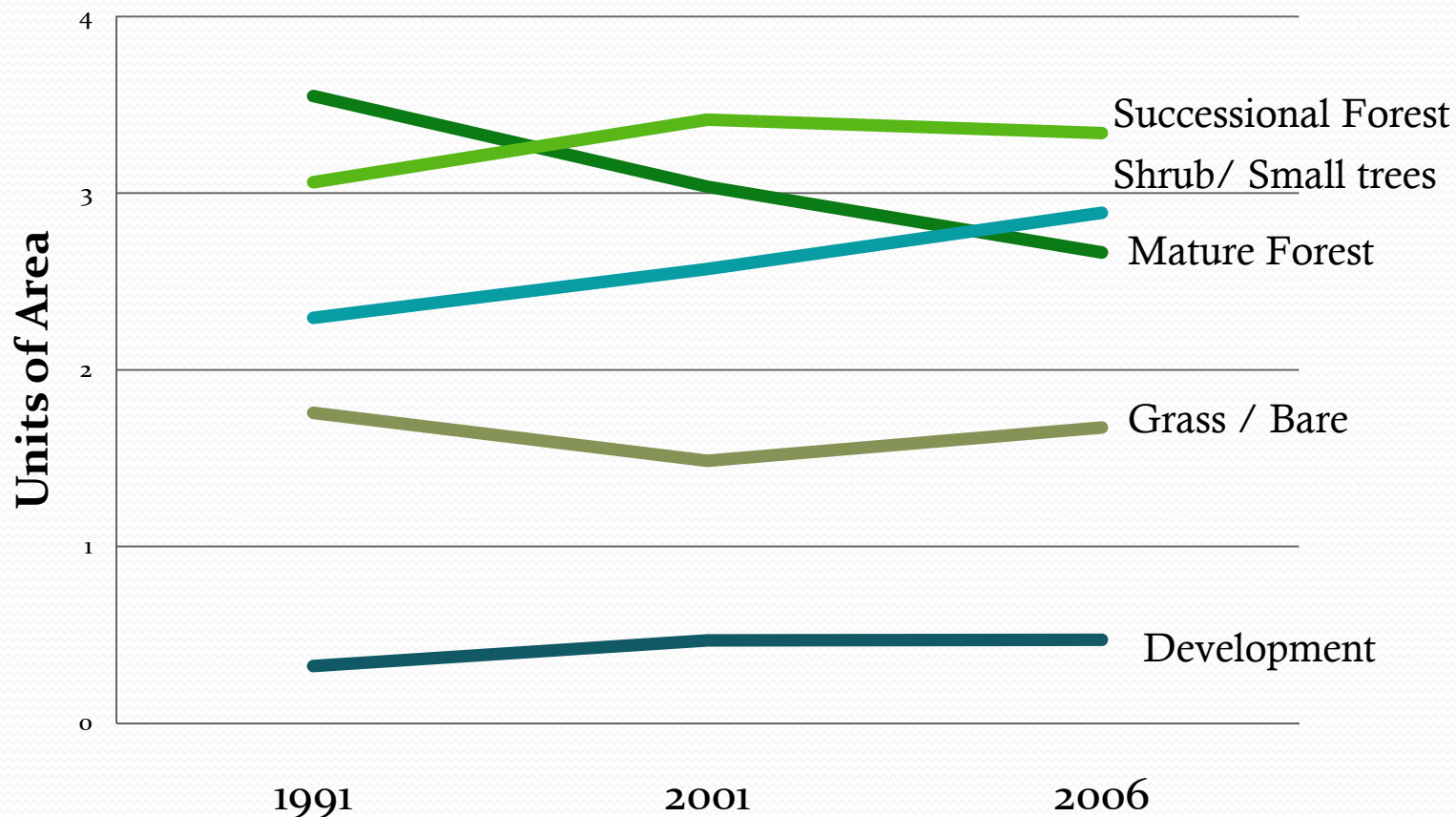
- Restoration:

- Detailed plans in 14 watersheds
- \$\$ to restoration projects keyed to system needs
- Annual proposals, reviews, and grant awards

- Protection:

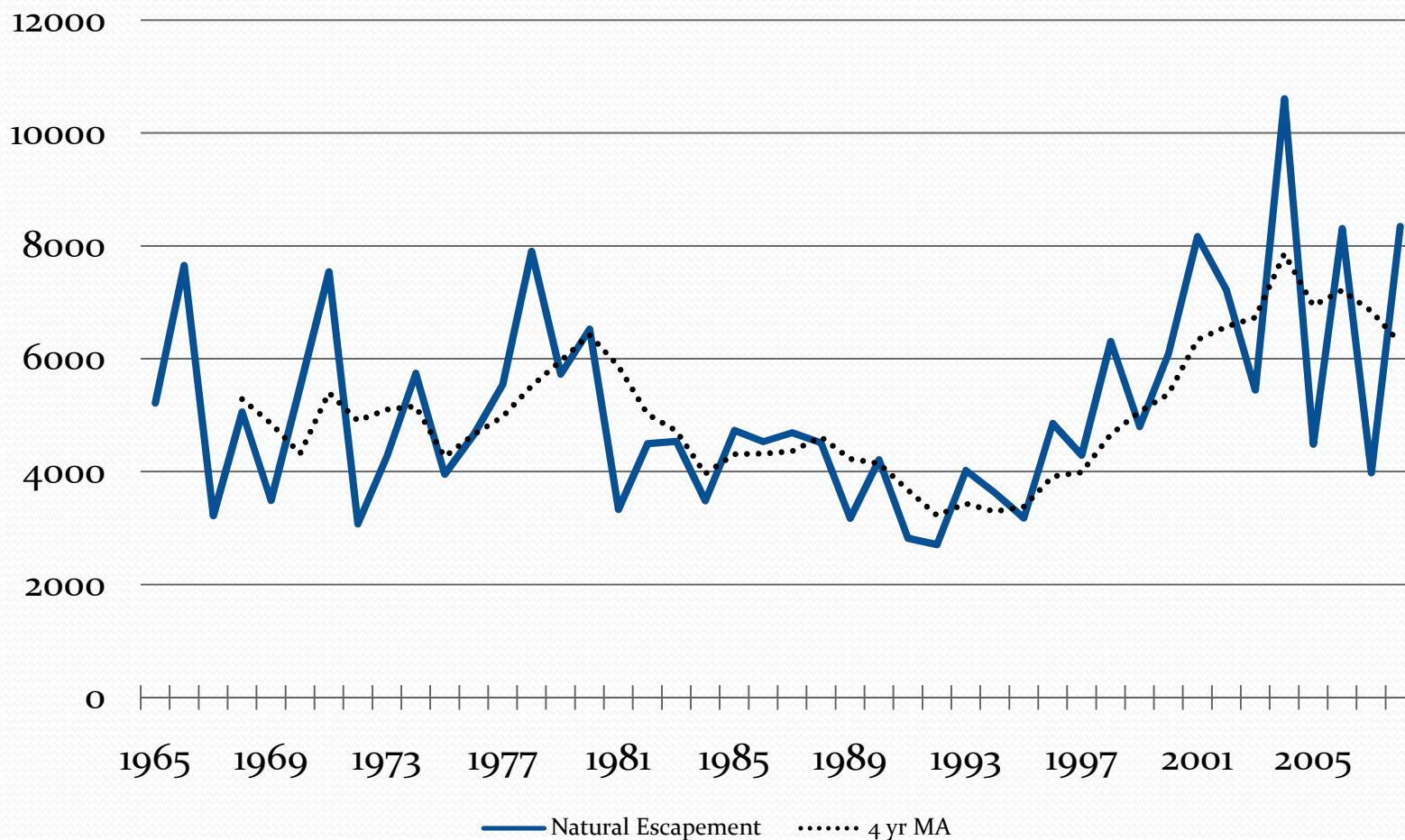
- Myriad agencies with varied and overlapping authorities
- Little public confidence in process
- Habitat degradation continues

Habitat Protection: Snohomish County Land Use Trends

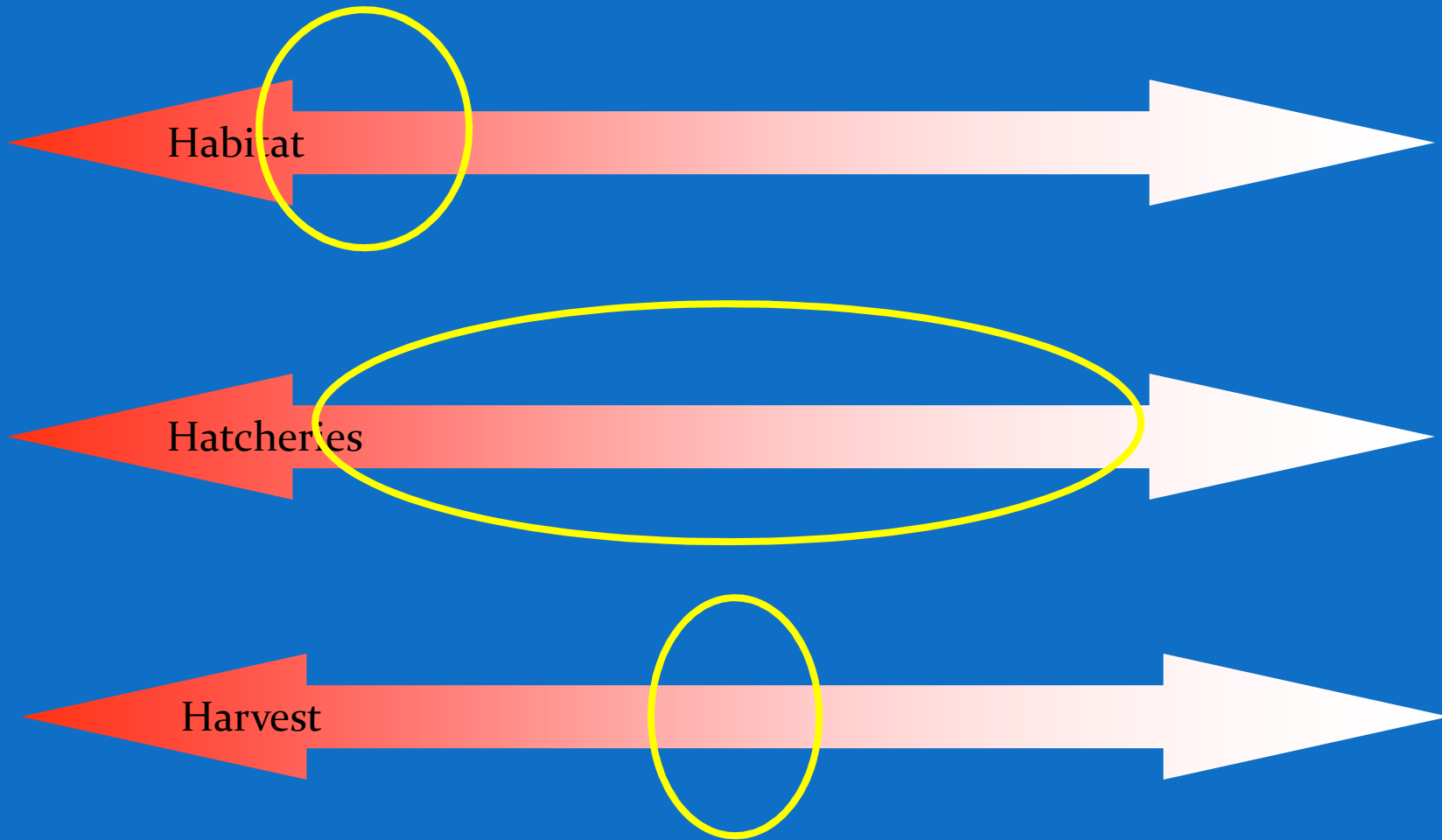


SOURCE of data: Michael Purser, Snohomish County SWM

Snohomish chinook escapement, 1965 - 2008



Where are we now ?



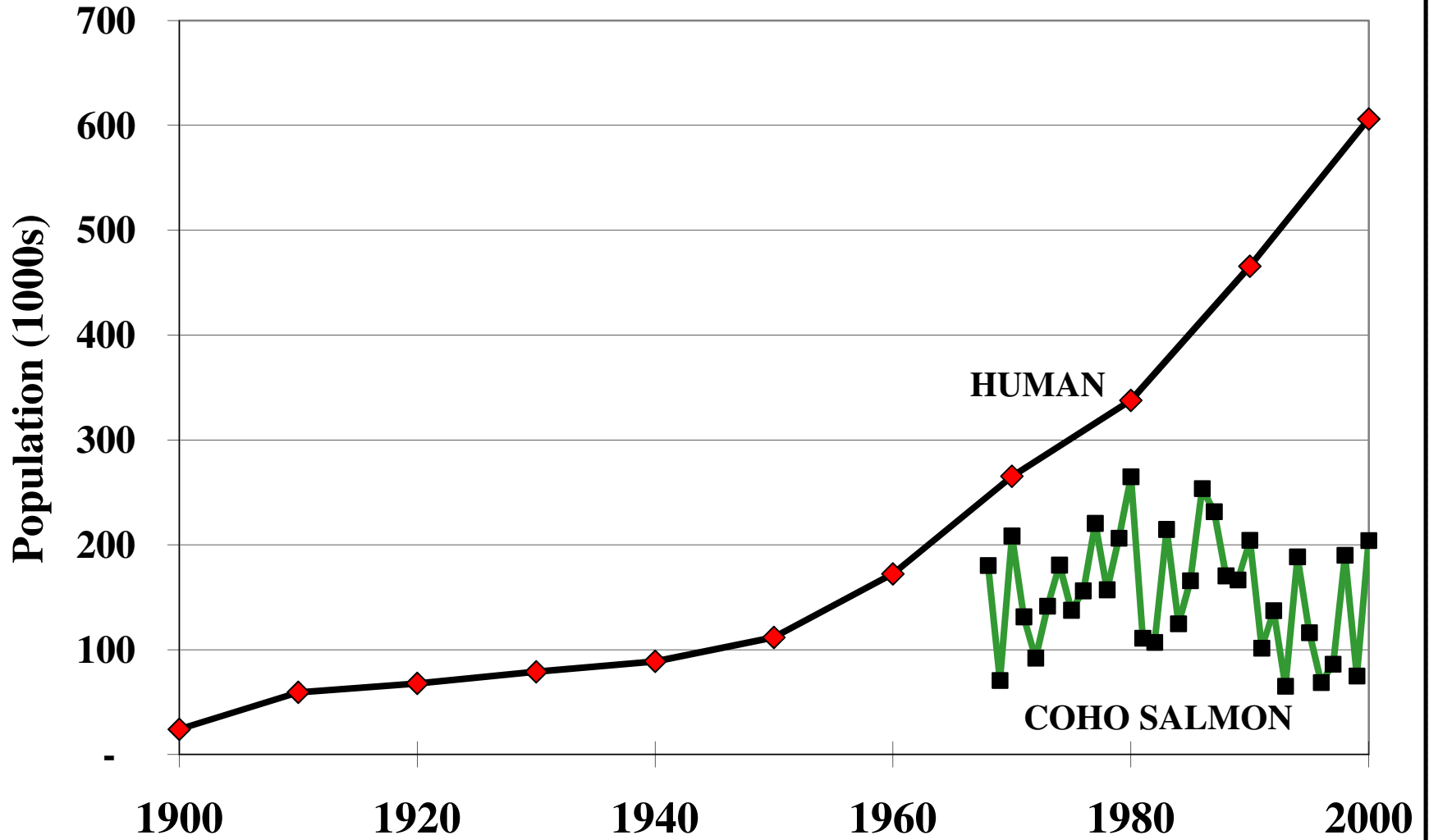
SOURCE: Janne Kaje, Snohomish Basin Technical Committee



Summary/ Recommendations

- We have made progress, but ...
- We must improve in all H's
- Habitat protection must
 - Contribute more to the solution and
 - Be better integrated with the other H's
- How about Habitat Protection Reform?

Population of Snohomish County, Wa





Pogo, April 20, 1970

We don't know enough to manage any species or ecosystem. All we can hope to do is to manage ourselves.

David Suzuki, Vancouver, 3 February 2009



Thank you!
спасибо!

ありがとうございました
감사합니다