Tribal Contributions Improving Hatchery Management, Science and Salmon Recovery: Why We Need a Joint Co-Manager's Hatchery Policy

Tulalip Tribes Presentation

WA Fish and Wildlife Commission

August 18, 2023

TULALIP TRIBES ©

Snohomish Region Hatchery Programs

Purpose and Justification

This presentation is by the Tulalip Tribes but represents and references other co-managed hatchery programs

- Harvest of hatchery fish afforded by valuable co-managed hatchery programs is part of Tribal Treaty Rights as supreme law of the land (Article VI US Constitution)
- The Treaty Right to fish is a property right of the Tribes protected under the Fifth Amendment of the U.S. Constitution, the Treaties, and the U.S. Supreme Court
- The joint State-Tribal Snohomish hatchery program is essential to sustain our Treaty Rights and is subject to provisions under United States v. WA. and sub-proceedings, e.g. Puget Sound Salmon Management Plan
- The joint State-Tribal Snohomish hatchery program mitigates for lost natural production by producing salmon to support our Treaty-reserved fishing Rights and four basic values recognized by the Federal courts:
  (1) conservation of the resource, (2) ceremonial, religious, and spiritual values,
  (3) subsistence values, and (4) commercial values

Snohomish Hatchery Programs

Purpose and Justification

- The joint State-Tribal Snohomish hatchery program provides harvest in local recreational and Tribal commercial, ceremonial and subsistence fisheries and contributes to harvest in SE AK, BC, WA coast and Puget Sound
- The joint State-Tribal Snohomish hatchery program provides a multitude of ecosystem services – e.g. harvest allocations guaranteed through treaties, Southern Resident Killer Whale (SRKW) support, marine nutrient provision, supporting thousands of species
- Joint State-Tribal hatchery plans (HGMPs) are essential components of watershed management plans that support natural resource management responsibilities in sustaining Treaty Rights
- Co-Manager hatchery plans are integrated into Watershed Recovery Plans that are in turn integrated into the Regional Recovery Plans for ESA-listed species in Puget Sound

Snohomish Hatchery Programs

Purpose and Justification

- State-Tribal Co-Management of hatcheries and harvest is required under existing law (The Puget Sound Salmon Management Plan)
- State and Tribal hatchery programs are VERY CLOSELY coordinated in all of our operations and management, research, monitoring, and joint resource management plans
- Our joint State-Tribal Snohomish Hatchery Program is a model for Co-Management and is indispensable to Tulalip
- Tulalip Tribes cannot meaningfully exercise our Treaty fishing Rights without it - we take our Co-Management responsibilities <u>very seriously</u>

"As long as habitat can't sustain salmon to carry out the promises of the Treaties fully, these hatchery programs will be 'indispensable for Tulalip Tribes' salmon management"

- Jason Gobin, Director of Natural and Cultural Resources, Tulalip Tribes July 2023

Snohomish Hatchery Programs

Purpose and Justification:
Why We Need a Joint Co-Manager's Hatchery Policy

- We strongly desire to continue forward as a great example of successful Co-Management

- But, we are unwilling to fall back into endless conflict and disagreement that resulted from "external "guidelines" in previous policies that we never agreed to.

- In our perspective, going backwards without the Tribes and Co-Management will almost certainly end in litigation

- Working cooperatively is much better in every way

"This new Co-Manager Hatchery Policy allows us to move forward together"
"We are better together than either of us is separately"
– Jason Gobin, Tulalip Tribes August 2023

Why We Need this Comanager Hatchery Policy

- Substantial Co-Manager Contributions Significantly Improve All Aspects of Hatchery Co-Management, Use of Best Available Science and Integration of Co-Manager Hatchery Programs with Recovery Efforts

- We require this overdue joint policy to continue all of these benefits by Co-Managing these programs cooperatively together

- It is legally required and it is called for and required in C-3624

- Finalizing the Policy will codify the existing Co-Manager relationship

- Policy requires very close coordination between Co-Managers - which brings the sum of both party’s strengths together in support of the programs

Comanager Hatchery Policy: Addressing Concerns:

"Science is Lacking in the Policy"
"The policy will be a step backward from Recovery"
"The HGMPs are insufficient for recovery" or
"The HGMPs have a lower bar to simply minimize jeopardy"
Some have asked: *"Why should we move away from Recovery?"*

- We take great pride in our diligent work and have poured a HUGE sustained effort into these programs for many years to improve BAS and integrate them with recovery efforts and share a completely different perspective

- It is our direct experience developing, implementing and evaluating these plans together as Co-Managers that we have made big steps TOWARD BAS AND RECOVERY, *NOT BACKWARDS*

  - and we strongly feel we must continue to do so under the new Policy

Comanager Hatchery Policy: Addressing Concerns
Perspectives on State-Tribal Co-Management

Concern: "*Science is Lacking in the Policy*"

1) First: It's critical to understand that the Policy was intentionally written in very general terms i.e. general Purpose, Principles and Policy Positions necessary to get State-wide agreement
   - with different hatchery programs operating in different regions
   - involving numerous parties, different Tribes and Treaties
   - different mgmt. agreements, legal decisions and case law

2) Second, though purposely left general, the Policy defers to the detailed watershed plans (HGMPs) co-developed and implemented jointly by State and Tribes
   (this which is where tons of good science can be found)

Comanager Hatchery Policy: Addressing Concerns
Perspectives on State-Tribal Co-Management

Concern: *"Science is Lacking in the Policy"*

- Following, we provide numerous examples of improvements in B.A.S., Hatchery Mgmt., Monitoring, Research, Adaptive Mgmt., Compliance Reporting and Integration of Co-Manager Hatchery Programs with Recovery Efforts- Q&A to follow

- Again, while we speak directly to the Snohomish, these examples represent the types of hatchery-related science, monitoring, management, and reporting typical of Tribal contributions to ALL Co-Managed salmon hatcheries in the State of WA

➢ By adopting this overdue Co-Manager Hatchery Policy, the following contributions and improvements in Co-Management will be recognized and codified

Comanager Hatchery Policy: Addressing Concerns
Contributions to Best Available Science:

Juvenile and adult fish monitoring for genetic and ecological interactions between hatchery- wild fish- GREATLY increased due to extensive sustained Tribal contributions over the last 20 years:

This has resulted in **Significantly Increased and Improved*:***

- **Field Sampling** (areas covered, effort/frequency, geographic locations),
- **Laboratory Sample Analysis, Data Analysis** (1,000s more samples collected and analyzed each year),

- **Improved Data Management** (creation of regional **Stock Assessment Database and Data Archive-** all data since 1965 agreed-to between Tribe and State:
- This has greatly improved the accuracy and precision of our estimates, improving data and management

Comanager Hatchery Policy: Addressing Concerns
Contributions to Best Available Science:

Creation of the Tulalip Stock Assessment Laboratory (TSAL) and Program

- Lab and Program specifically created to monitor all aspects of hatchery production for the joint program
- Staffed with 4-7 FTE Fisheries Technicians; several biologists oversee the Stock Assessment Program and regional hatchery program

Increased Manpower:

- Tribe Quadrupled Manpower over last 15 years from 2 - 9 FTE Fisheries Technicians, PLUS added several biologists

Significantly Increased Adult Fish Monitoring:

- Staff increased (0 to 4 FTE) to assist WDFW in intensively sampling adult salmon returns in **fisheries, hatcheries, and natural escapements**:
- - Overall effort ~300 surveys/year covering ~800 miles
- 1,000s of additional samples collected and analyzed from natural escapement
- Tribe increased 4FTE to monitor 100% of regional hatchery returns, sampling 1,000s of additional fish <u>at State and Tribal hatcheries</u>
- Another 2 FTE sample Tribal fisheries, which is not new, but we now analyze all of the regional <u>State and Tribal fisheries samples</u>

Comanager Hatchery Policy: Addressing Concerns
Contributions to Best Available Science:

Increased Adult Fish Monitoring

We sample thousands of Chinook from the spawning grounds, regional hatcheries and fisheries and thousands more from juvenile fish in smolt traps, the estuary, nearshore and offshore marine annually for:

- ✓ adipose fin clip, coded-wire tag and otolith “mark” status to determine hatchery/wild origins,
- ✓ fin tissues for DNA analysis for gene flow and stock composition,
- ✓ scales and otolith ring analysis for age and growth analyses,
- ✓ stomach contents for diet analysis
- ✓ sex, length for growth etc

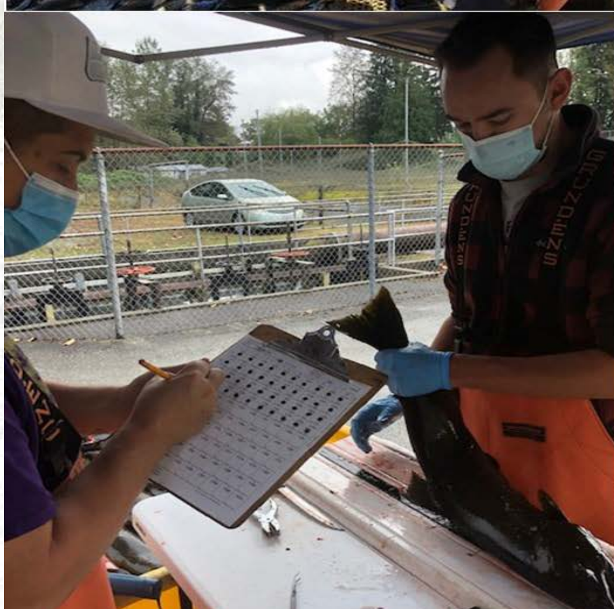
Comanager Hatchery Policy: Addressing Concerns
Contributions to Best Available Science:

Adult Fish Monitoring: Escapement Sampling

Comanager Hatchery Policy: Addressing Concerns
Contributions to Best Available Science:

Adult Fish Monitoring: Hatchery Sampling

Upper Left: State and Tribal hatchery staff capture broodstock for spawning
Lower Left: Collecting fin tissue on parchment paper for DNA analysis
Right: "Wanding" a Chinook with metal detector for metallic coded-wire tag



Comanager Hatchery Policy: Addressing Concerns
Contributions to Best Available Science:

Significantly Increased Adult Fish Sample Analysis:

- Nearly all samples collected from hatchery- and natural-origin salmon in Snohomish region fisheries, hatcheries and escapements are analyzed at TSAL

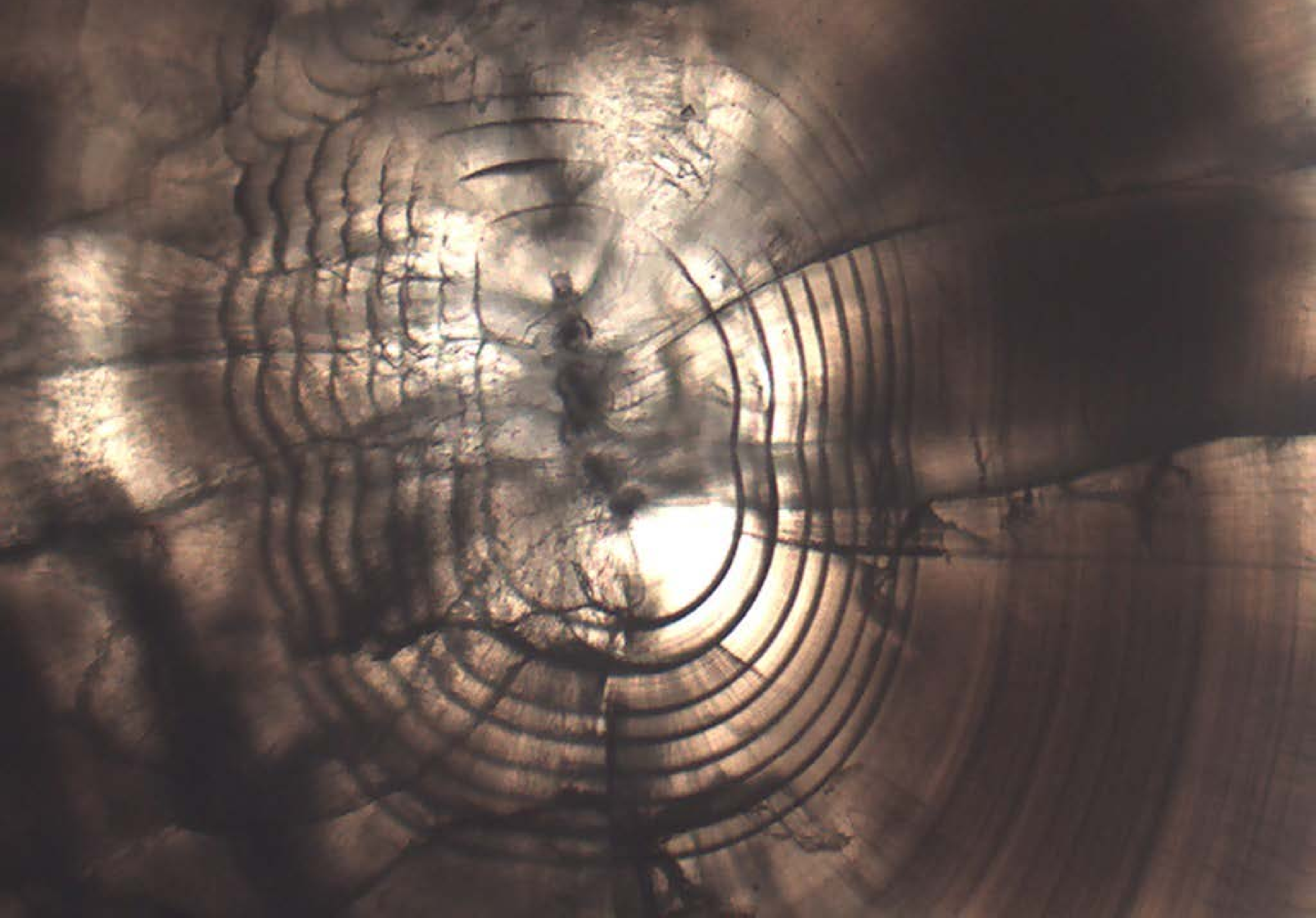
- This has increased numbers and types of assays and analyses, timeliness of sample and data analyses and results available for management

- We have added new and different types of sample collections and analyses methods (which is ongoing): Significant improvements in broodstock integration and genetic and demographic assessments of hatchery influence that advance B.A.S.

Comanager Hatchery Policy: Contributions to Best Available Science:

Significantly Increased Adult Salmon Sample Analysis:

Otolith Pattern: WWWWWWW = Broodyear 2012 Tulalip Chinook



Comanager Hatchery Policy: Addressing Concerns
Contributions to Best Available Science:

Significantly Increased Juvenile Fish Monitoring

Tribe is conducting **experimental rearing and release studies** and **intensive post-release monitoring** for ecological interactions in the Snohomish basin

- 4FTE Tribal stock assessment staff monitors hatchery vs wild juvenile fish interactions for the joint program in Snohomish estuary and nearshore marine

- We monitor co-occurring, specially-tagged and otolith-marked experimental hatchery rearing and release groups
- We sample 1,000s of hatchery and wild juvenile Chinook per year
- Assessing relative abundances, diets, growth, environmental conditions

Comanager Hatchery Policy: Addressing Concerns
Contributions to Best Available Science:
Significantly Increased Juvenile Fish Monitoring

Intensified Estuary and Nearshore Sampling

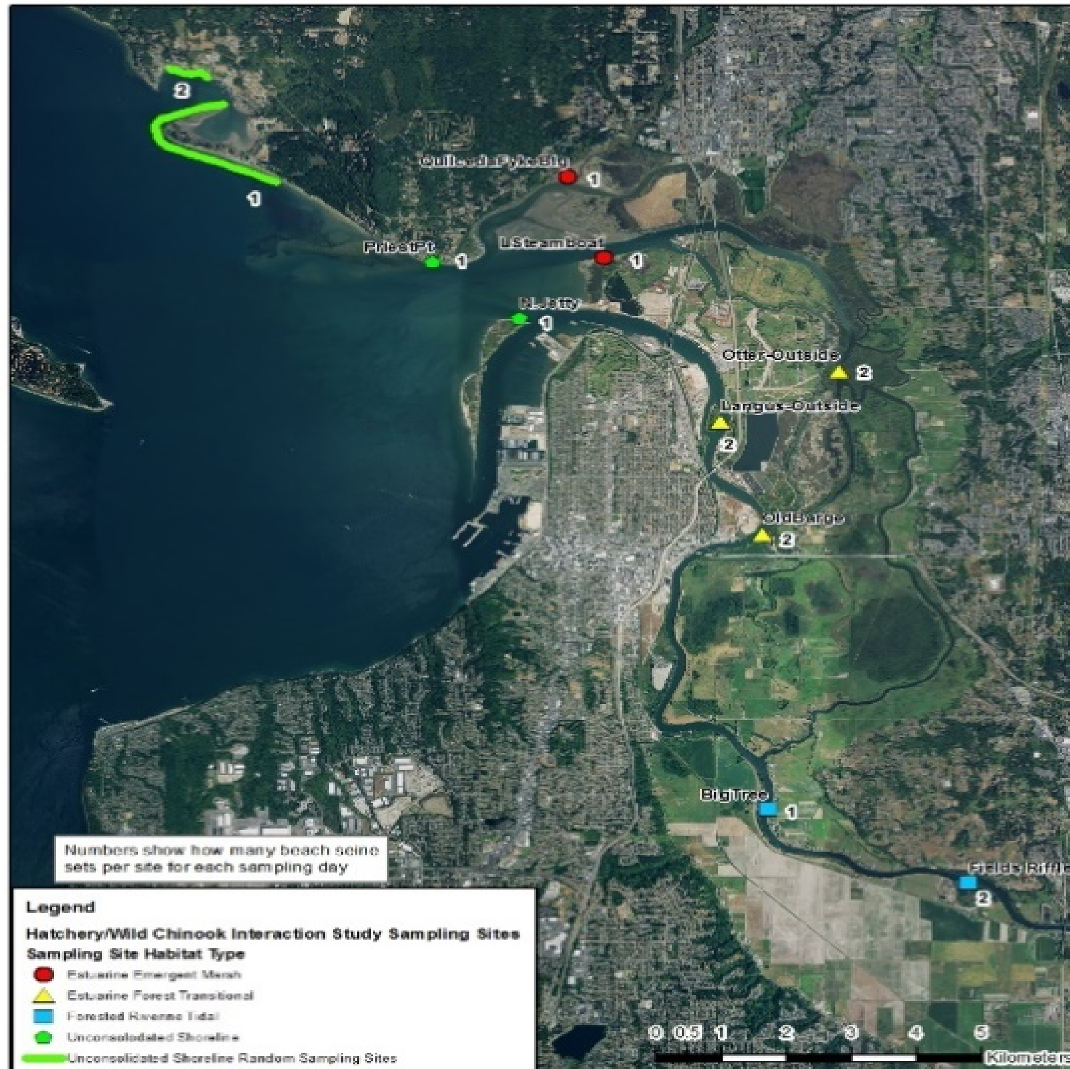
By **Intensive Monitoring**, we mean:

- Sampling requires 4 FTE **4 days/week over 8-9 months** from Feb/March through October, annually to conduct extensive beach seining:
- **at 8 different estuary sites PLUS 3 additional nearshore marine sites,**
- each sampled before & after 6 experimental releases (3 State, 3 Tribal)

Comanager Hatchery Policy: Addressing Concerns
Contributions to Best Available Science:
Significantly Increased Juvenile Fish Monitoring

Juvenile Fish Monitoring: Intensified Sampling in the Estuary and Nearshore:

- providing monitoring for the Snohomish Co-Manager Hatchery Program
- benefitting B.A.S and knowledge base for all watersheds and Co-Managed hatchery programs



Comanager Hatchery Policy: Contributions to Best Available Science:
Significantly Increased Juvenile Fish Monitoring

Intensified Estuary and Nearshore Monitoring

This is laborsome work:

- Nets set by boats are retrieved by hand- nearshore sites require larger net

Yet, sampling goals have been exceeded every year:

- Completing ~ 700-800 net sets/year
- We've been doing this intensive post-release sampling annually since 2018 (5 years completed to date)
- Tribe prepares annual proposals to acquire funding for State and Tribal hatchery programs
- provides labor for intensive monitoring effort: 960 hours X 4 employees
- Tribe provides 400,000 tags (~$40K annually) for the experimental releases at both State and Tribal hatcheries, AND
- Tribe covers lab analyses contracts and costs (growth, diets, etc)

Comanager Hatchery Policy: Contributions to Best Available Science:
Significantly Increased Juvenile Fish Monitoring

Estuary Monitoring

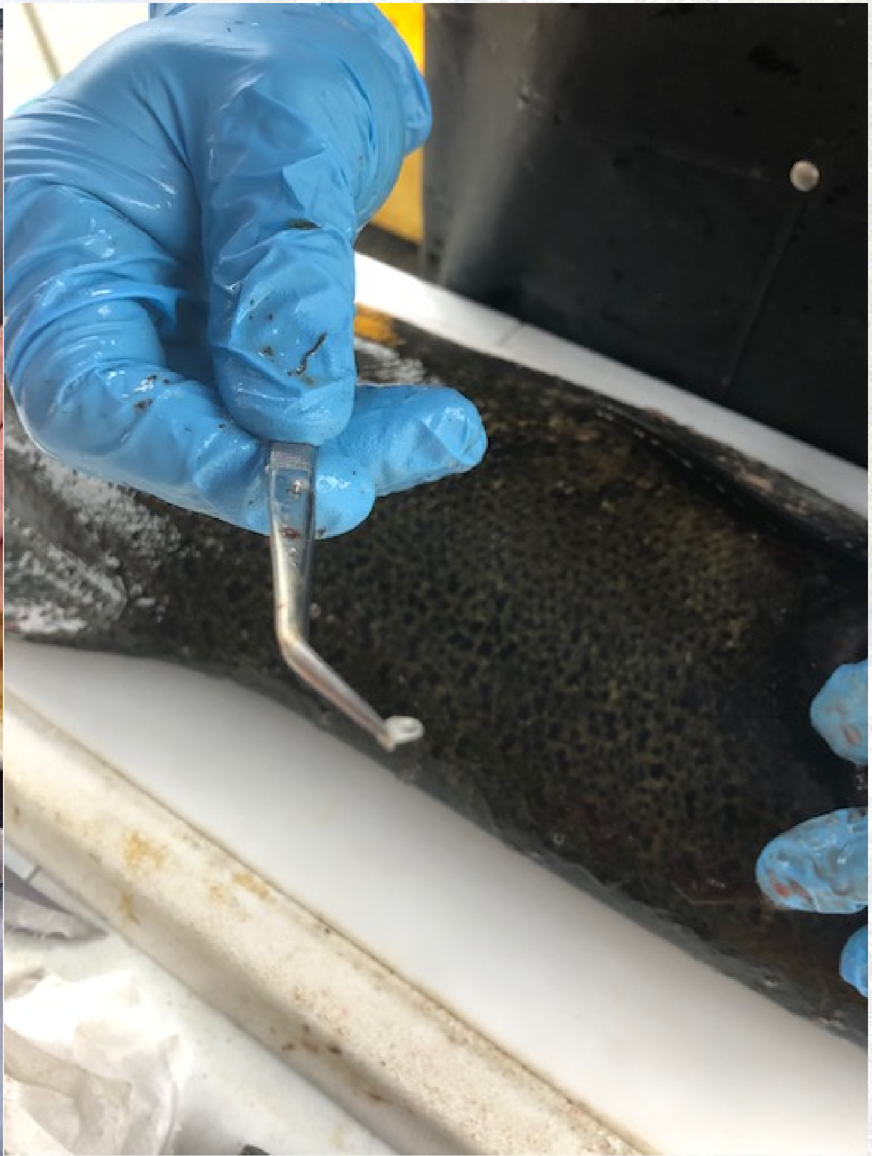
Comanager Hatchery Policy: Addressing Concerns
Contributions to Best Available Science:

Estuary and Nearshore Juvenile Fish Monitoring

- This is needed to monitor ecological interactions to assess any impacts of the increased production objectives for the joint Co-Manager hatchery program

Comanager Hatchery Policy: Addressing Concerns
Contributions to Best Available Science:

Significantly Increased Juvenile Fish Analysis:



Comanager Hatchery Policy: Addressing Concerns
Contributions to Best Available Science:

- All of these monitoring improvements that assess interactions between hatchery releases and other fish are essential for Co-Manager hatchery programs to remain in compliance with ESA Terms and Conditions in the HGMP permits

- Tribe takes lead in compliance reporting for the 8 State and Tribal salmon HGMPs in the Snohomish region
- essential to fulfill mandatory annual reporting requirements for so-called "*non-discretionary*" **Terms and Conditions** in 3 ESA Biological Opinions

Comanager Hatchery Policy: Addressing Concerns
Contributions to Best Available Science:

Monitoring/Reporting on these Terms and Conditions is **Extensive**

- There are 18+ just in the Biological Opinion for the Co-Manager salmon hatcheries
- There is another 20+ Terms and Conditions for the regional steelhead programs (reporting led by WDFW)

IN SUMMARY:

ALL aspects of B.A.S. Have Significantly Improved

- in numerous dimensions of scope and scale

- This has greatly improved rigor of our joint M, E & A; strengthening Co-Manager hatchery programs
- These sustained Tribal contributions and close collaborations with WDFW over the last 20 years will finally be validated under this Co-Manager Policy

Comanager Hatchery Policy: Addressing Concerns
Contributions to Best Available Science:

Offshore Marine Monitoring

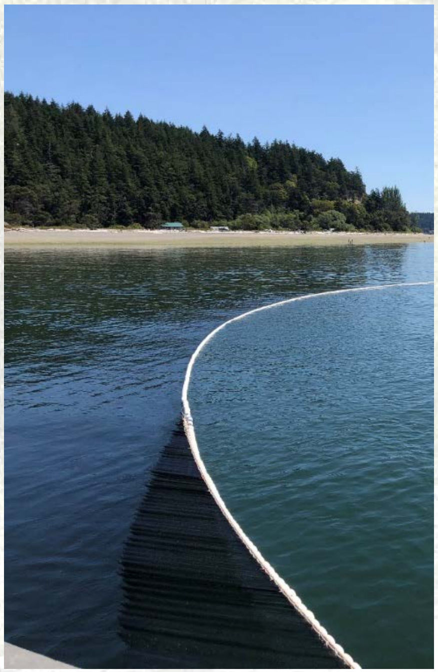
Tulalip Tribes also lead Puget **Sound-wide offshore marine juvenile fish monitoring**

- Providing 8 FTE (purse seine boat and crew of 4 plus science crew of 4) to conduct offshore juvenile fish sampling throughout Puget Sound including Hood Canal, which must be done annually in late-July

- This provides snapshot of early marine growth after juvenile Chinook/coho have resided within Puget Sound for 1-2 months while they can still be captured before larger fish begin moving further offshore

- This project assesses what is believed to be the primary driver of declining marine survival that I will show you later
- This provides BAS for all watersheds and Co-Managed hatchery programs

Comanager Hatchery Policy: Addressing Concerns
Contributions to Best Available Science: Offshore Marine Monitoring



TULALIP TRIBES

LONG LIVE THE KINGS

USGS
science for a changing world

Comanager Hatchery Policy: Addressing Concerns

Contributions to Best Available Science:

Significantly Increased Juvenile Fish Monitoring:

Offshore Marine Monitoring

- Project identified as **top science priority** under the US-Canada Salish Sea Marine Survival Project https://marinesurvivalproject.com/

- An ongoing international effort of scientists from 60 tribal, provincial federal, state, county, and NGOs in both countries
  - to investigate the decline in salmon marine survival in the Salish Sea

- Tulalip Tribes currently administer the project in collaboration with Long Live the Kings, USGS Western Fishery Research Center, NOAA Fisheries, University of WA., WDFW (18 supporters/collaborators)

Puget Sound Salmon and Herring Offshore Monitoring Project

Tulalip Tribes

Long Live the Kings

USGS science for a changing world

Comanager Hatchery Policy: Addressing Concerns
Contributions to Best Available Science:

Offshore Marine Monitoring Juvenile Fish Monitoring:

- Goal is to institutionalize and secure long-term funding for a **Puget Sound Offshore Marine Juvenile Salmon and Herring Monitoring Program**

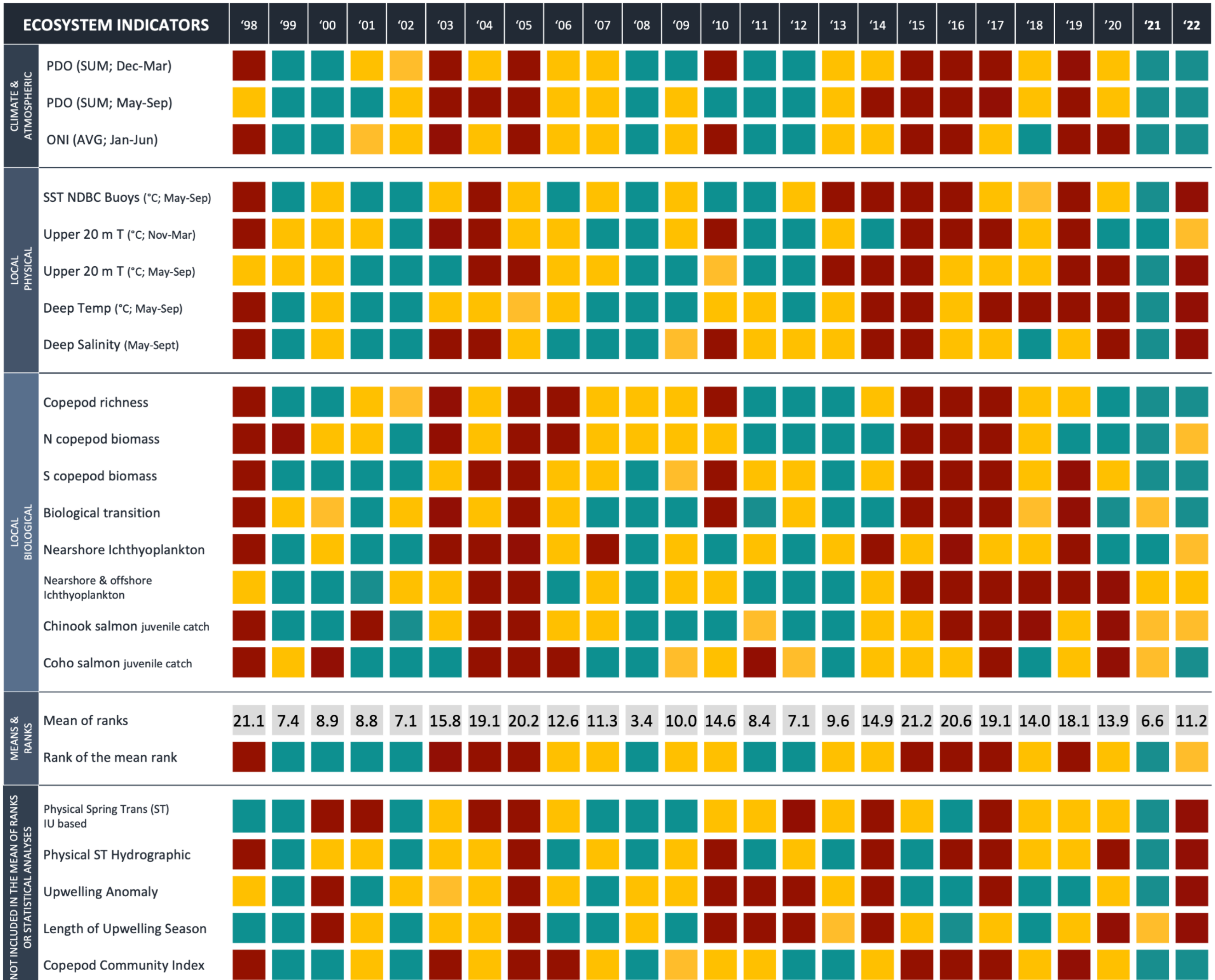
- as the Tribe did when we helped to successfully institute the **Puget Sound Offshore Marine Zooplankton Monitoring Program**

- Which, along with juvenile salmon sampling, was the other top priority and unmet need identified under the Salish Sea Marine Survival Project

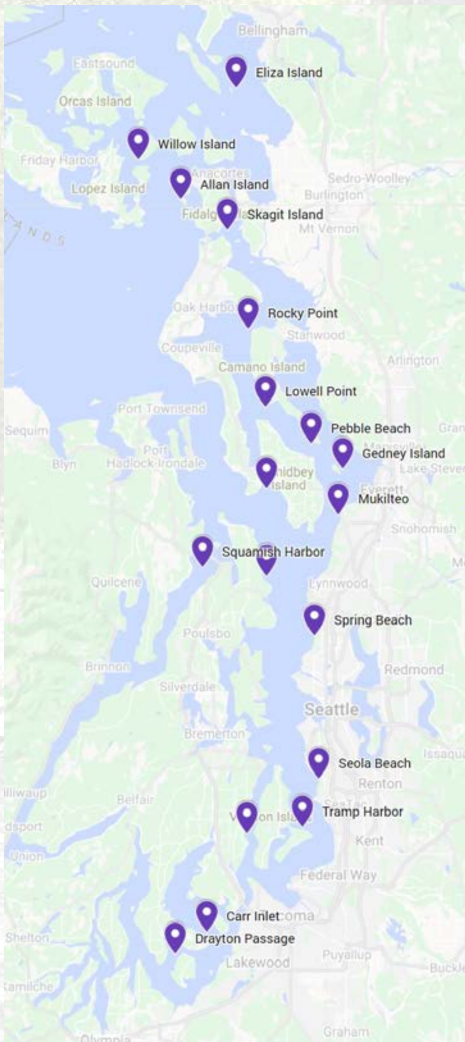
- Needed as main indicators of Puget Sound Ecosystem Health and salmon forecasting in a **Puget Sound Ecosystems Indicators Program**

- similar to NOAA's Ocean Conditions Indicators Program Red Light/Green Light ("Stoplight") Table that ranks and color codes the indicators: https://www.fisheries.noaa.gov/west-coast/science-data/ocean-conditions-indicators-trendswhereeach
- based on whether they are "good", "bad", or "neutral" for juvenile salmon growth and survival

NOAA Ocean Ecosystem Indicators “Stoplight” (Red/Green) Chart



Tulalip Tribes' Offshore Survey



Purse Seine Surveys (2021-2023)

- Late July (~2 weeks)
- 9 watersheds
- Catch is mostly juvenile salmon and herring
- Zooplankton
- Water quality sampling

- Purse Seiner is Canadian boat
- Science crew: Tulalip Tribes, LLTK, other partners

Comanager Hatchery Policy: Addressing Concerns
Contributions to Best Available Science:

Offshore Marine Monitoring Juvenile Fish Monitoring:

Why this matters: Local winds drive currents and cause upwelling affecting water quality, entire foodwebs and salmon surivial

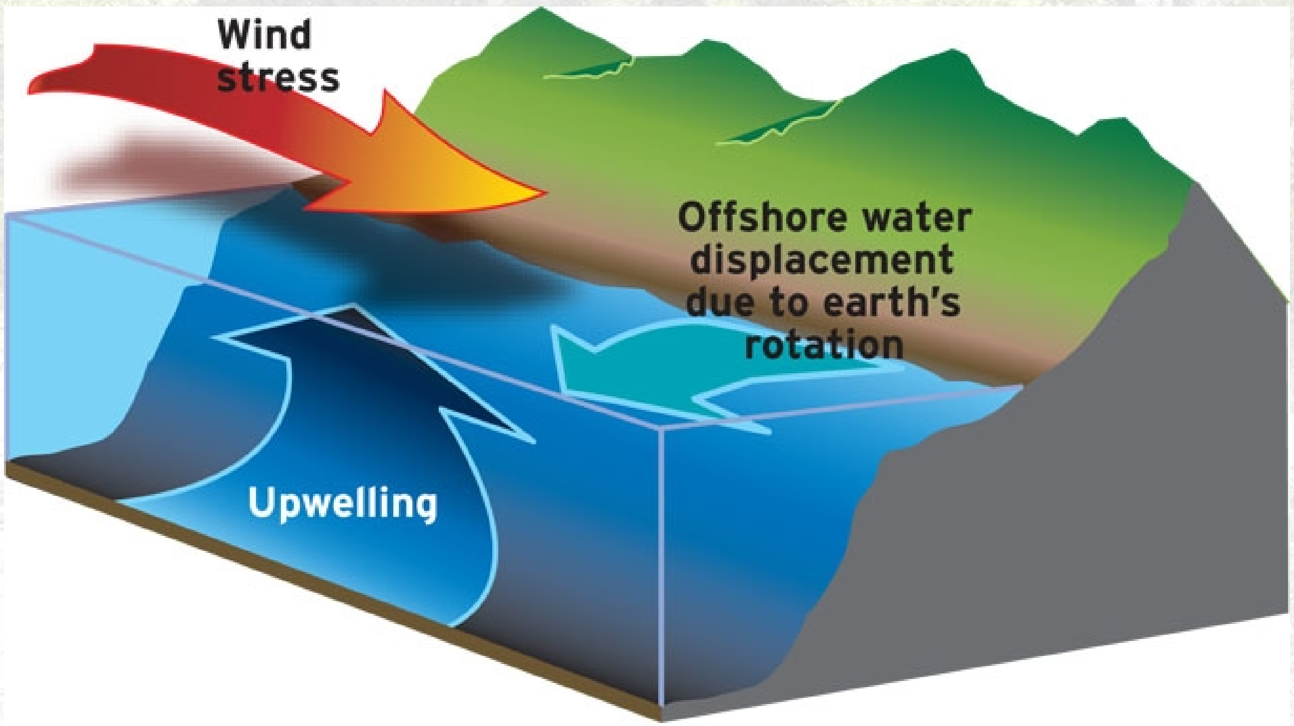


Figure is taken from: B. Peterson, NOAA Fisheries, Newport, OR. 2011 Presentation to Pacific States Marine Fisheries Commission Annual Mtg.

Comanager Hatchery Policy: Addressing Concerns Contributions to Best Available Science:

Monitoring Climate Effects on Offshore Marine Foodweb

	High Survival	Low Survival (El Nino, the Blob)
PDO, SST	Negative	Positive
Water types off coast	Cold/salty	Warm/fresh
Spring transition	Early	Late
Upwelling season	Long	Short
Zooplankton species	Cold species	Warm species
Food Chain	Lipid-rich	Lipid-deplete
Forage Fish	Many	Few
Juvenile salmonids	Many	Few
Predators	Few	Many

From: B. Peterson, NOAA Fisheries, Newport, OR. 2011 Presentation to Pacific States Marine Fisheries Commission Annual Mtg.

Comanager Hatchery Policy: Addressing Concerns
Contributions to Best Available Science:

Monitoring Climate Effects on Offshore Marine Foodweb

Comparing Pre Size and Energy Content

- **Warm-water taxa**

  - **small** in size and have limited energy

- **Cold-water taxa**

  – **large** in size and higher in energy

Therefore, significantly different foodwebs may result from climate shifts

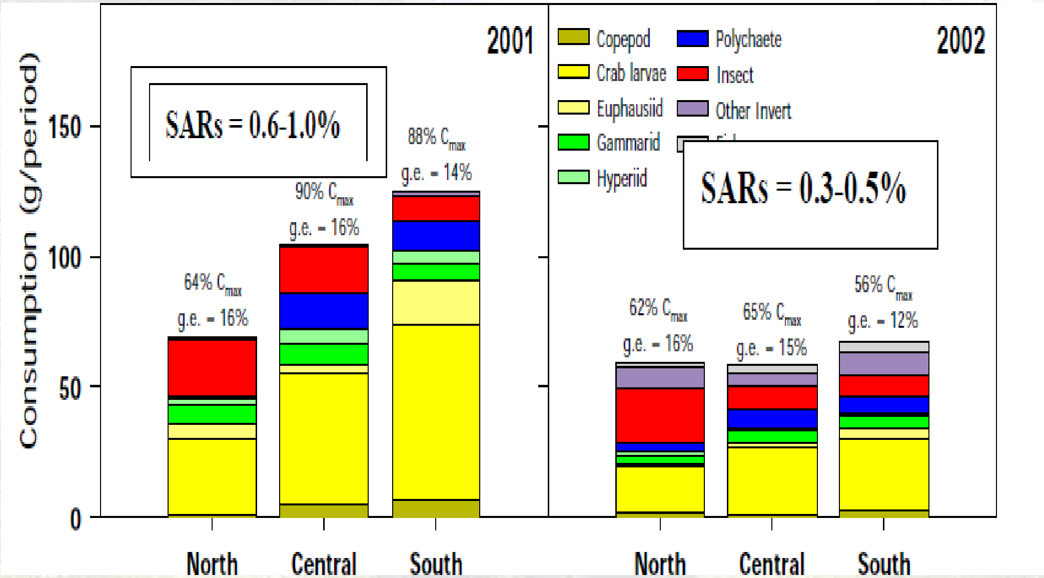
From: Bill Peterson, NOAA Fisheries, Newport Oregon. 2011. Presentation to Pacific States Marine Fisheries Commission 2011 Annual Mtg.

Comanager Hatchery Policy: Addressing Concerns Contributions to Best Available Science:

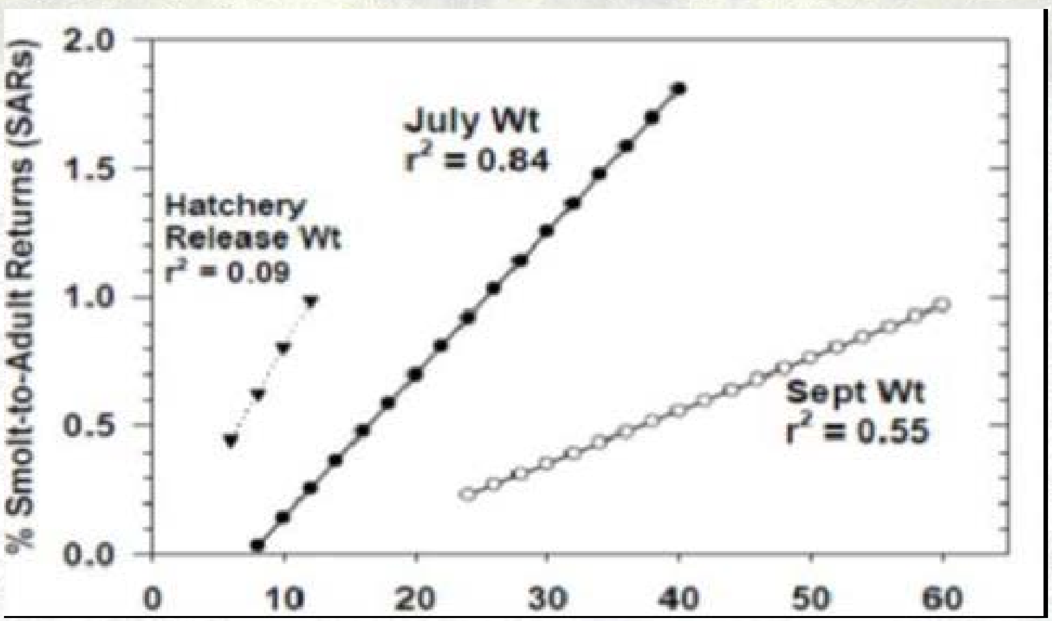
- **However, Climate Effects on the Puget Sound Marine Foodweb Differ from Factors Operating on Coast**

- and are not well understood
- Therefore a similar program specific to Puget Sound is needed

Comanager Hatchery Policy: Addressing Concerns
Contributions to Best Available Science:



Previous findings show juvenile Chinook prey consumption and growth is strongly related to adult survival

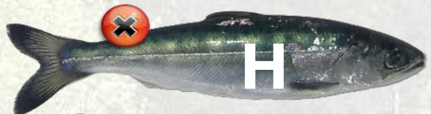


There is Strong evidence Chinook size achieved by July affects survival

From: Duffy (2009), Duffy et al. (2010), Beauchamp and Duffy (2011)

TULALIP TRIBES' OFFSHORE SURVEY

ORIGIN



- Hatchery
  - Ad-clipped
  - CWT, Otolith mark
- Wild
- Genetics

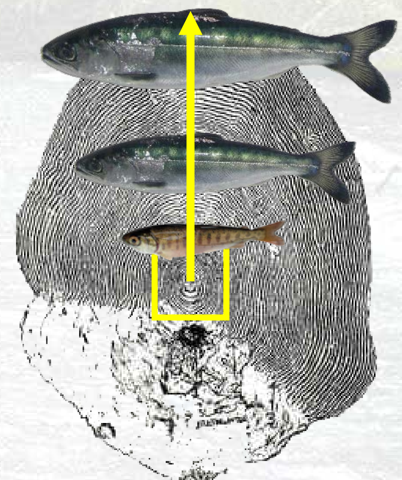
DIET

- Gastric Lavage
- Dissect stomachs

SIZE & AGE

- Fork lengths
- Wet weights
- Age classes

GROWTH



- IGF-1
- Scales
- Otoliths

Comanager Hatchery Policy: Addressing Concerns
Contributions to Best Available Science:

Offshore Marine Zooplankton Monitoring:

SAME IDEA: Changing climate conditions are altering “prey availability” for salmon, which adversely affects their growth and survival

Comanager Hatchery Policy: Addressing Concerns
Contributions to Recovery:

"The HGMPs are insufficient for recovery"
"The draft policy has a decided absence of priorities or principles related to recovery of at-risk natural-origin populations"
"Why should we move away from Recovery?"
"The draft policy has a decided absence of priorities or principles related to the recovery of at-risk natural-origin populations."

- The Watershed Plans (HGMPs) are superior in all regards to C-3624 or any previous WFWC policies

- They are superior in monitoring genetic and ecological risks that are very specific to each watershed and cannot be expressed in a one-size-fits-all policy

- They are superior in applying adaptive management and integrating management with Recovery Plans

- We completely disagree that they are "*insufficient for recovery*" or have a "*lower bar to simply minimize jeopardy*"

Comanager Hatchery Policy: Addressing Concerns
Contributions to Recovery:

Concern: **"*HGMPs are insufficient for recovery*"**
"The policy will be a step backward from Recovery…"

- The HGMPs are not themselves Recovery Plans, they are one of the essential "H" component legs of the Plans

- HOWEVER, it is our <u>direct experience </u>integrating these plans with Watershed and Regional Recovery Plans that we have made BIG STEPS TOWARD RECOVERY TOGETHER, NOT BACKWARDS

- The Co-Manager Hatchery Policy AND the HGMPs require hatchery plans to be coordinated with Watershed and Regional Recovery Plans, over and over

Comanager Hatchery Policy: Addressing Concerns
Contributions to Recovery:

Concern: *"**The HGMPs have a lower bar to simply minimize jeopardy**"*
- This is not consistent with any written documents

As NOAA Fisheries explains in their BiOps:

*"Compliance with 4(d) rule criteria in the Biological Opinions Terms and Conditions help ensure the HGMPs as permitted **conserve and protect** ESA-listed salmon and steelhead that increases their prospects for **recovery and return to a viable status**"*

- Therefore, their jeopardy analysis **considers both survival and recovery of species**

- The HGMPS and their associated BiOps are the plans that will serve Principal 4 in the draft Policy re: *"operating in accordance with hatchery program plans in Puget Sound"*

- Integration with Recovery Plans and BAS is referred to throughout the HGMP's and the BiOp's that approve them and are the basis for these plans and their evaluation:

Comanager Hatchery Policy: Addressing Concerns Contributions to Recovery:

As pointed out by WDFW in their response to SEPA comments:

"The federal process defines "jeopardize the continued existence" as:

*"… actions that reduce "**both the survival and recovery** of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR Part 402.02).* **Indeed, recovery is a concern for the Section 7 consultation** process used to evaluate the HGMPs

Under this Policy, HGMPs will continue to be evaluated under extensive Federal ESA Section 7 and NEPA environmental consultation review processes that are much more robust than this policy or any previous WFWC policy or SEPA review

Comanager Hatchery Policy: Addressing Concerns Contributions to Recovery:

- Every HGMP incorporates rigorous monitoring and research that contribute to **Recovery**

- **Recovery** is repeatedly referred to in the all of the HGMP's and in the ESA and NEPA consultations

- For example, in **Section 3.4 in** the Snohomish Chinook HGMP **"Relationship to habitat protection and recovery strategies"**, it states:

"*The purpose of this joint state-tribal hatchery program is to provide harvest opportunity while remaining consistent with the Co-Manager's primary management strategy and recovery objectives for local natural salmonid populations as reflected in the integrated recovery plan. This HGMP was designed to be consistent with the strategies and actions specified in the Snohomish Basin Salmon Conservation Plan."*

Comanager Hatchery Policy: Addressing Concerns
Contributions to Recovery:

Concern: "*HGMPs are insufficient for recovery*"
"The policy will be a step backward from Recovery…"

- We count **18 sections** where Recovery is addressed in our HGMP's and ESA and NEPA consultations

- In the HGMP consultations, NOAA Fisheries assesses:
- The status of the species and critical habitat (BiOp Section 2.2), the environmental baseline (Section 2.3), the effects of the Proposed Action (Section 2.4), and cumulative effects (Section 2.5)
-
- All of these are integrated and synthesized "*…to assess the effects of the Proposed Action **on the survival and recovery of the species in the wild and on the conservation value of designated critical habitat***"

Comanager Hatchery Policy: Addressing Concerns
Contributions to Recovery:

Concern: “*HGMPs are insufficient for recovery*”

- State and Tribes closely develop hatchery plans together and provide a second layer of scrutiny, review and revision of each other’s Plans to arrive at required Co-Manager consensus agreed-to documents
- Every modification to existing plans must be agreed-to by the Co-Managers, which gives each party the opportunity to require a robust scientific review and perspective
- after which, NOAA Fisheries and US Fish and Wildlife Service provide third and fourth layers of intensive reviews

Comanager Hatchery Policy: Addressing Concerns
Contributions to Recovery:

- We do have a specific *Snohomish Recovery Plan Implementation Approach* for our regional hatchery programs that we have carefully worked on for 20 years called the *"Snohomish Chinook Recovery Plan: Phases of Recovery and Integrated Adaptive Management Strategy"*

- We have a publication in prep. for later this year related to this effort

- This approach is referred to repeatedly in the consultation documents, e.g. see: *Relationship to Other Plans, Regulations, Agreements, Laws, Secretarial Orders, and Executive Orders"* in 2017, 2021 Biological Opinions

,

- This is the Tribes' approach for integrating hatchery, habitat and harvest management in implementing the watershed recovery plan

Comanager Hatchery Policy: Addressing Concerns
Contributions to Recovery:

Snohomish Chinook Recovery Plan: Phases of Recovery and Integrated Adaptive Management Strategy

NMFS refers to this approach numerous times in their evaluations of the effects of proposed hatchery management actions **relative to habitat condition and resulting status of natural population viability (recovery goals)**

The approach is referenced in the 2017 Biological Opinion in **Section 2.3.5** under the Environmental Baseline "*Integration of "All H" Environmental Baseline Factors*", **Section 2.6** *"Integration and Synthesis"* and in **Sections 1.6.13 and 5.1.3** under Cumulative Effects in the NEPA Environmental Assessment, and among a number of other sections in all three NEPA and ESA consultations, e.g. 2022 BiOp **Sections 1.6.12 and 2.5**, etc.

Comanager Hatchery Policy: Addressing Concerns
Contributions to Recovery:

Snohomish Chinook Recovery Plan: Phases of Recovery and Integrated Adaptive Management Strategy

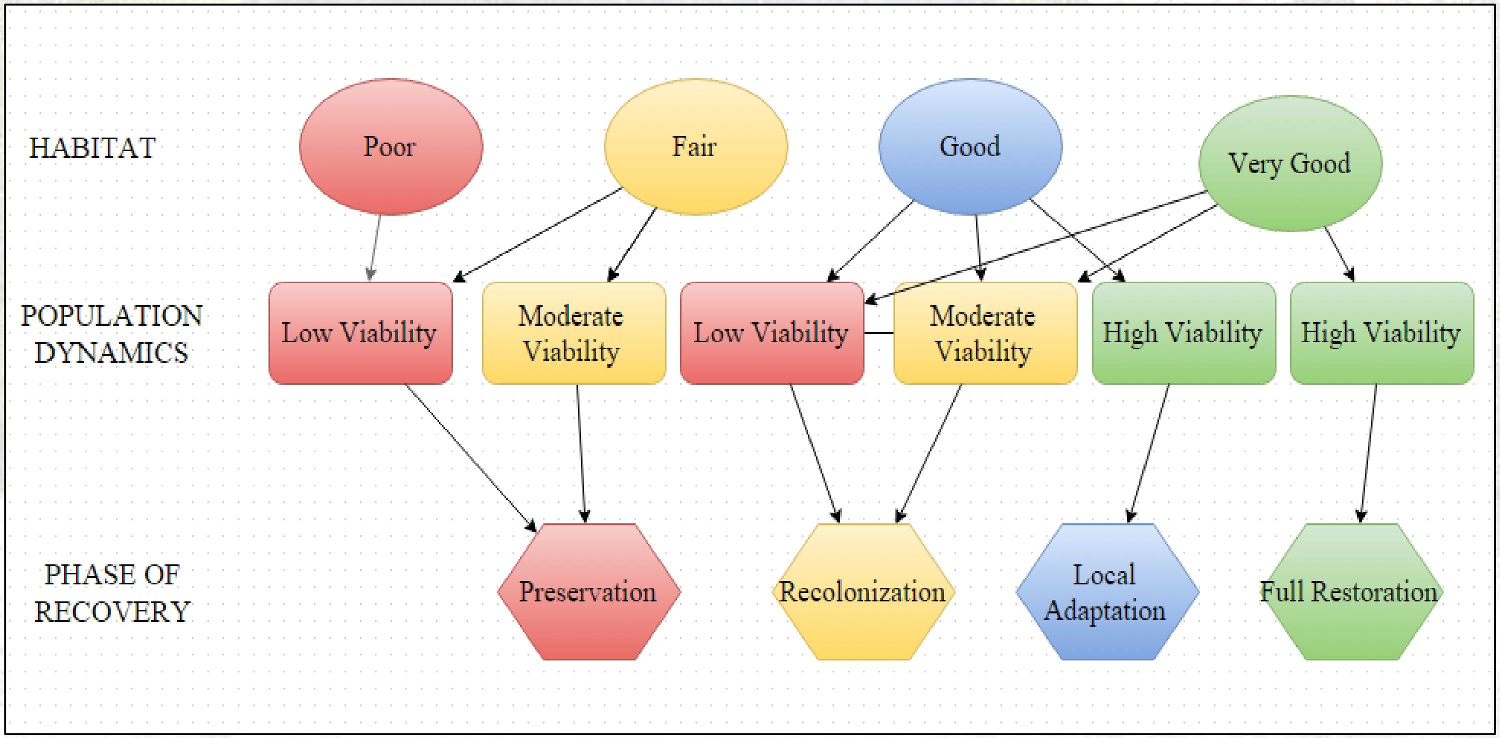
- The whole *premise* of the Snohomish Basin Chinook Recovery Plan is that **restoration & protection of habitat to properly functioning conditions will result in Recovery**

- During the period of **recovery**, harvest and hatchery management will provide vital ecosystem services and not impede the ability of the populations to respond to improved habitat conditions

- Monitoring of progress toward **recovery**, therefore, must include assessment of both the condition of habitat and assessment of population viability status in terms of Recover Goal Parameters (**Abundance, Productivity, Spatial Distribution, and Diversity**)

Comanager Hatchery Policy: Addressing Concerns
Contributions to Recovery:

Snohomish Chinook Recovery Plan: Phases of Recovery and Integrated Adaptive Management Strategy



Adaptive management framework diagram showing how the phase of recovery is determined by both the status of habitat and the population dynamics (abundance and productivity)

Comanager Hatchery Policy: Addressing Concerns
Contributions to Recovery:

Snohomish Chinook Recovery Plan: Phases of Recovery and Integrated Adaptive Management Strategy

H-Integration is Critical: Because the outcome of salmon recovery efforts depends on the combined and cumulative effects of **H**atchery, **H**abitat, **H**arvest and **H**ydro management, the effectiveness of actions in one of these areas cannot be evaluated without knowing the status of actions in the other areas

Therefore, we revised the HSRG’s approach to improve our assessment of population viability status and added habitat condition in determining the Phase of Recovery

Simple Example: Effectiveness of a harvest management action depends critically on the state of habitat. If habitat is generally good, then the failure of the stock to respond to a harvest reduction might mean that the harvest rate reduction was not sufficient to allow recovery

.

Comanager Hatchery Policy: Addressing Concerns
Contributions to Recovery:

Snohomish Chinook Recovery Plan: Phases of Recovery and Integrated Adaptive Management Strategy

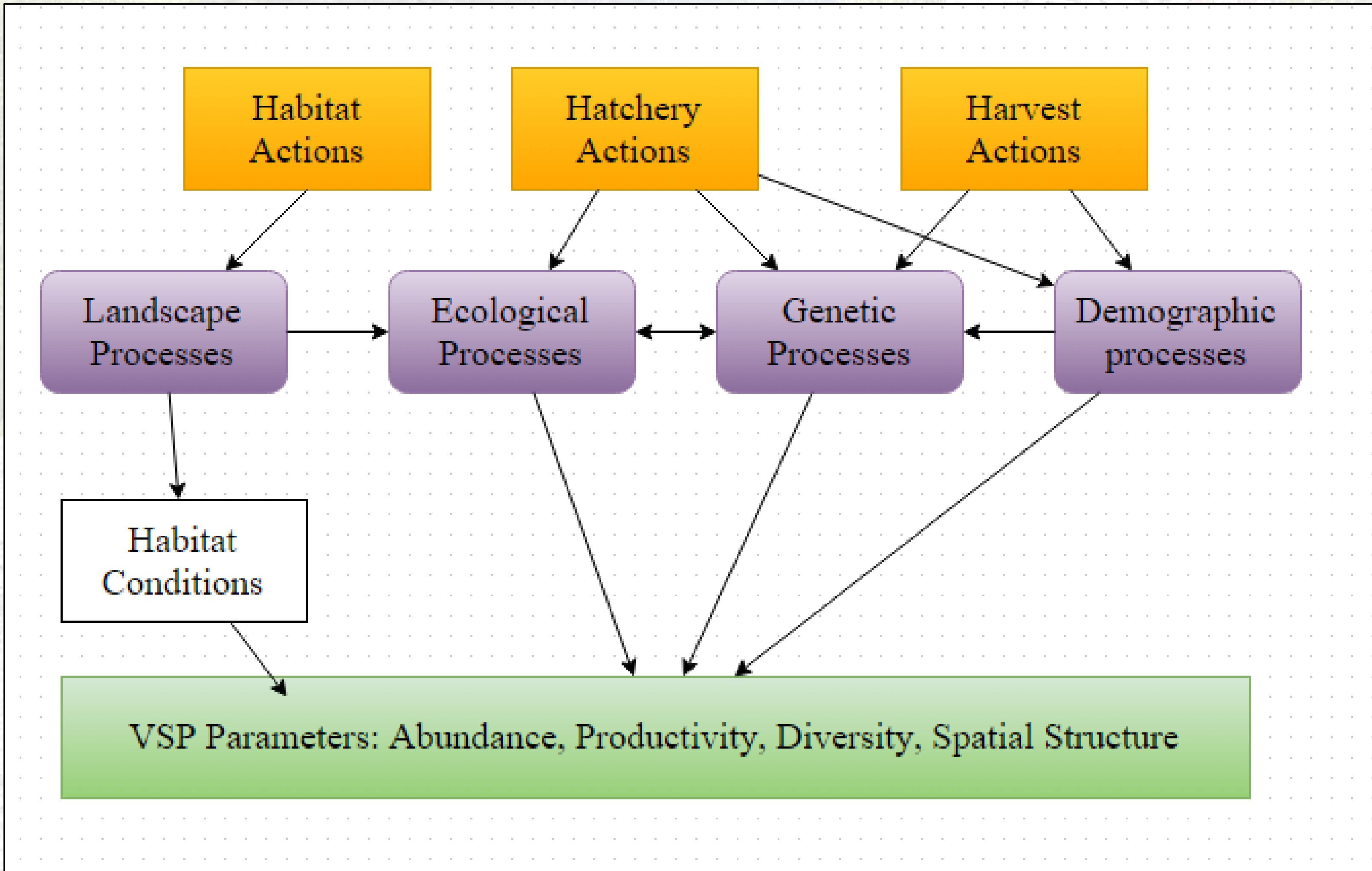
- On the other hand, if the habitat supporting a stock is significantly lost and degraded, then the failure of that stock to respond to a harvest rate reduction cannot most likely be addressed through further harvest rate reductions alone

- Lost habitat must be restored and degraded habitat must be upgraded for harvest management to be effective.   The same is true for hatchery management actions

- Based on the ongoing decline in Properly Functioning Habitat Conditions, Key Ecological Attributes, and Primary Constituent Elements, the overall current condition of habitat remains in **poor** condition in the Snohomish basin

Comanager Hatchery Policy: Addressing Concerns
Contributions to Recovery:

Snohomish Chinook Recovery Plan: Phases of Recovery and Integrated Adaptive Management Strategy



Comanager Hatchery Policy: Addressing Concerns Contributions to Recovery:

Snohomish Chinook Recovery Plan: Phases of Recovery and Integrated Adaptive Management Strategy

To assess the status of populations needed for our Stages of Recovery approach, we developed a viability model to estimate the number of years to extinction based on observed **Abundances AND Productivity Rates** for natural-origin spawners

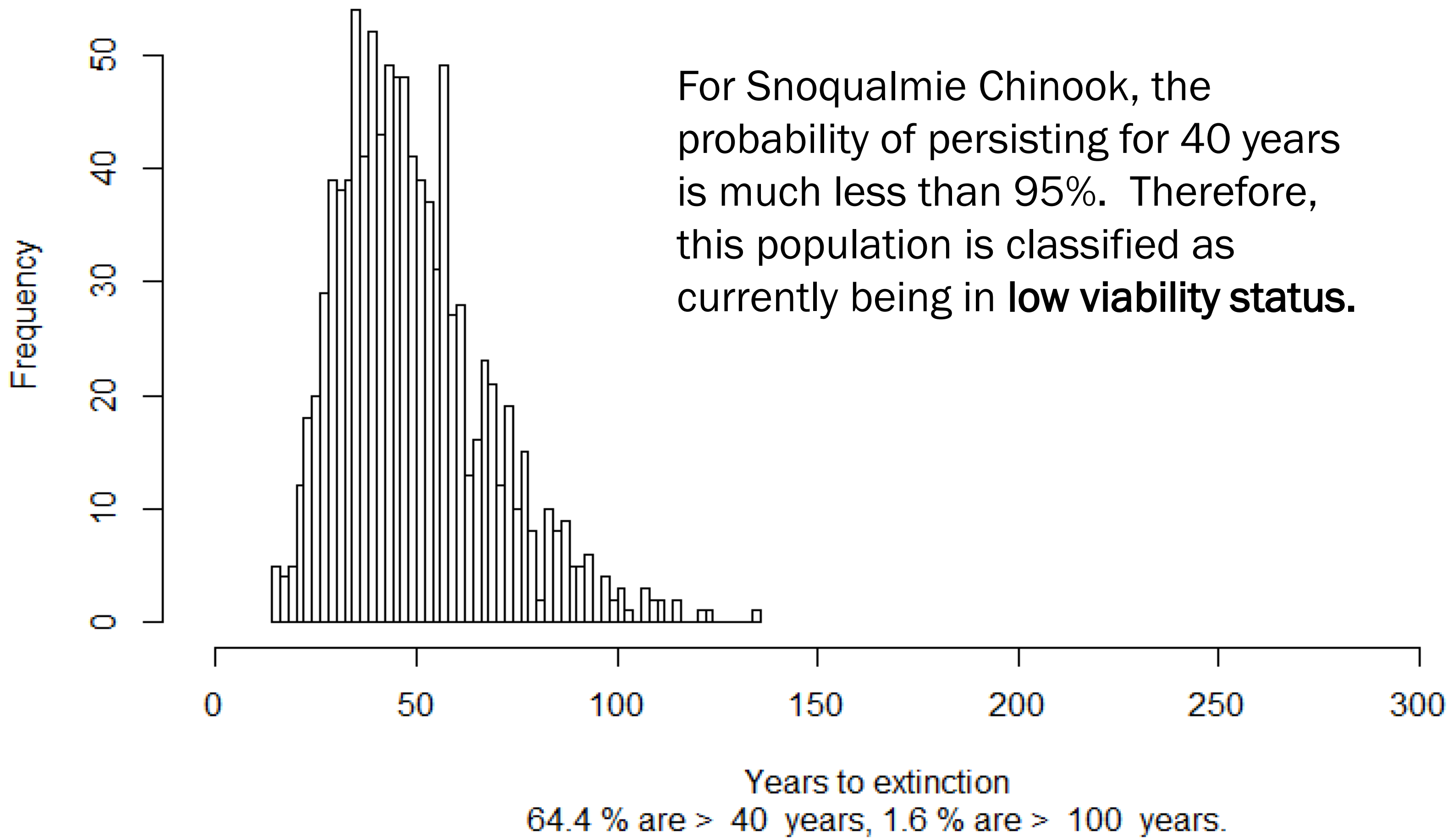
- this was a big improvement over the HSRG's approach that only looked at viability parameters individually such as abundance breakpoints

We use the viability simulation results to classify population viability status as follows:
High viability = commonly used in Puget Sound Chinook salmon recovery planning, i.e. a probability of 95% or greater of persisting for more than 100 years
Moderate viability = 40-year persistence probability of 95% or higher, and
Low viability = any population that fell below this standard.

Comanager Hatchery Policy: Addressing Concerns
Contributions to Recovery:

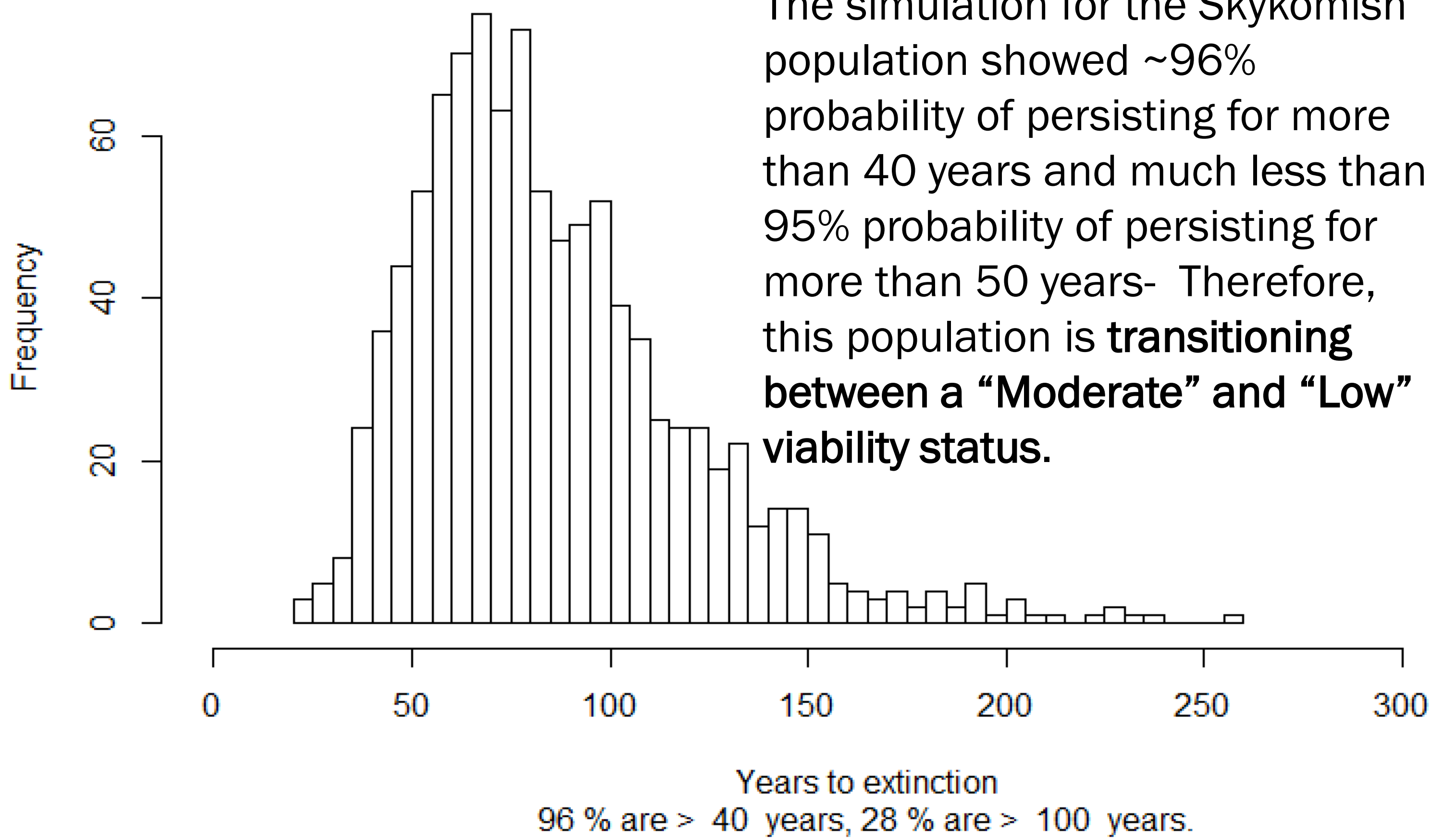
Snohomish Chinook Recovery Plan Phases of Recovery and Integrated Adaptive Management Strategy: Determining Population Status

For Snoqualmie Chinook, the probability of persisting for 40 years is much less than 95%. Therefore, this population is classified as currently being in **low viability status.**



Comanager Hatchery Policy: Addressing Concerns
Contributions to Recovery:

Snohomish Chinook Recovery Plan Phases of Recovery and Integrated Adaptive Management Strategy: Determining Population Status



The simulation for the Skykomish population showed ~96% probability of persisting for more than 40 years and much less than 95% probability of persisting for more than 50 years- Therefore, this population is **transitioning between a "Moderate" and "Low" viability status.**

Comanager Hatchery Policy: Addressing Concerns
Contributions to Recovery: RECOVERY GOALS

ALL Snohomish basin hatchery programs provide CRITICALLY important research and monitoring **for ALL 4 Viability Parameters, <u>also referred to as the "RECOVERY GOALS</u>":**

1. Abundance, 2. Productivity, 3. Spatial Distribution, and 4. Genetic and Life History Diversity

- It occurs to me that another source of major indigestion with the criticism that signing onto the Co-Manager Policy with the Tribes "… *would be a step away from recovery…"*- is that we monitor **ALL** of the Recovery Goals under the HGMPs and hatchery consultations that are needed by so many others
- So, while concerns are raised that signing onto the Co-Manager Policy with the Tribes will take us away from recovery, we are doing **ALL** of the recovery goal (**Abundance, Productivity, Distribution, and Diversity** monitoring - next slide)

Comanager Hatchery Policy: Addressing Concerns
Contributions to Recovery: RECOVERY GOALS

- **Abundance:** State and Tribes assess H/W abundances together during annual joint spawning ground surveys; this is in the HGMPS and BiOps
  [**Abundance** of hatchery AND natural fish is declining]

- **Productivity:** Tulalip assesses this annually; thid is in the HGMP and BiOps, done for wild fish
  [**Productivity** is declining in the absence of harvest and despite major hatchery improvements]

- **Spatial Distribution:** Redds are GPSed and counted with live fish by State and Tribes for 12 spawning aggregations
  [**Distribution** is truncated and declining]

- **Diversity** (genetic and life history diversity): HGMP monitoring proposals have covered all of the assessments of genetic diversity (15,000+ samples analyzed) and Tulalip analyzes life history diversity
- [**Life history diversity is severely declining**]

Comanager Hatchery Policy: Addressing Concerns
Contributions to Recovery: RECOVERY GOALS (Abundance)

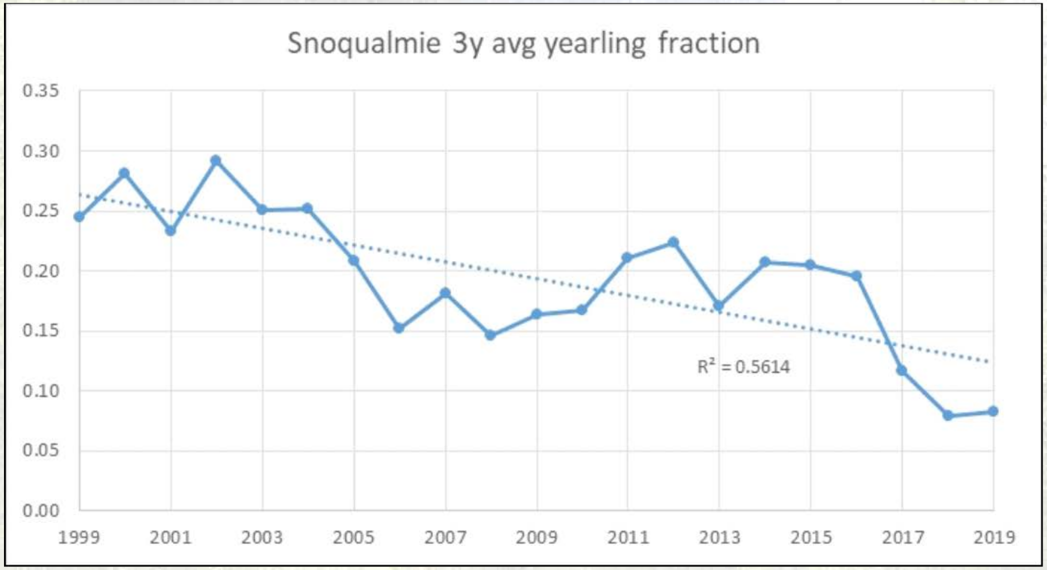
Abundance: 2019 Escapement Failure:

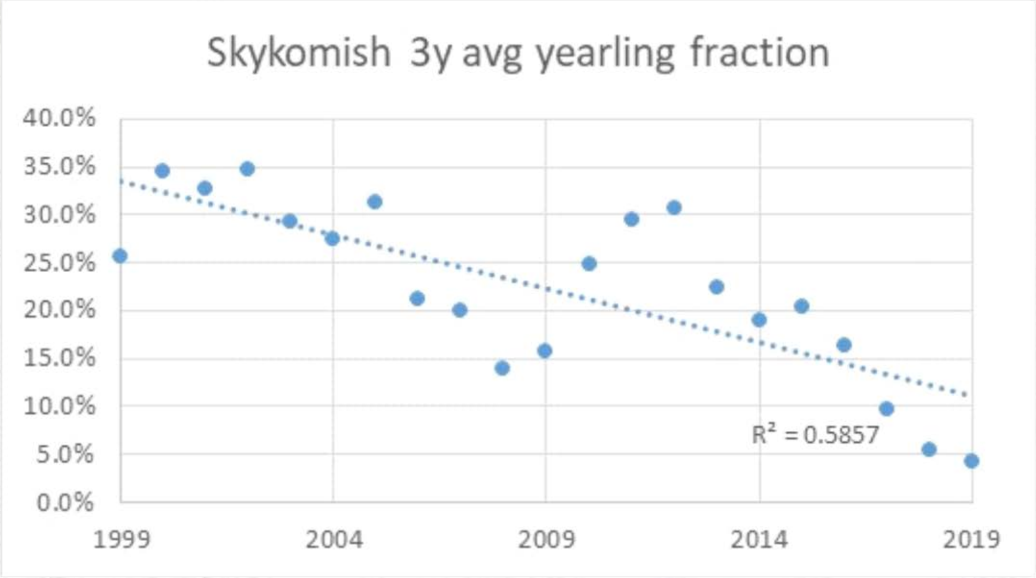
- In 2019, ALL 19 spawning aggregations were below average (only 32% collectively)
- The 9 MAIN AGGREGATIONS each had escapements that were 5 times < average
- Collectively, the losses were 3,483 fish (~70%) below average
- Mainstems alone accounted for half of shortfall, which were hit hardest by the floods

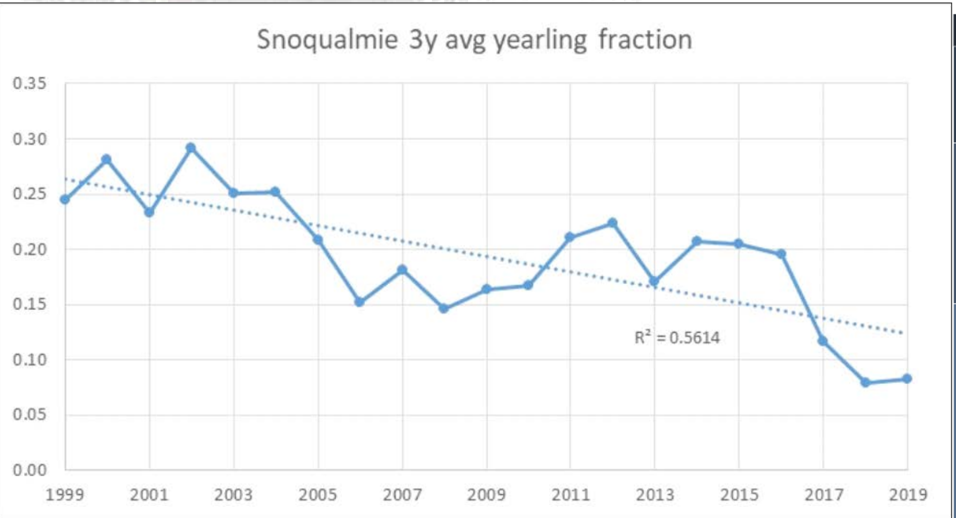
Location	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2004-2018 AVG	2019 % AVG	No. Fish <AVG
Snoh-Sky (Mainstems)	2,103	750	1,013	565	1,899	672	802	358	1,215	945	1,085	1,080	1,488	2,213	1,623	270	1,156	23.4%	886
NF Skykomish River	170	248	145	25	43	38	116	45	408	153	355	155	198	428	275	105	181	58.2%	76
SF Sky (Sunset Falls)	716	523	710	706	776	342	331	277	346	157	344	479	310	213	97	273	445	61.3%	172
Pilchuck River	225	98	178	28	515	120	80	148	175	178	68	53	98	210	73	50	155	32.2%	105
Woods Creek							23	0	0	5	5	3	10	3	10	13	6		
Elwell Creek	28	33	50	18	63	0	28	10	8	13	0	0	0	10	5	8	19	42.9%	11
Sultan River	938	298	548	325	896	133	352	50	975	460	365	390	687	457	585	85	491	17.3%	406
Wallace River (Lower)	2,148	600	2,360	550	850	65	130	140	343	180	410	378	315	340	303	85	629	13.5%	544
Wallace River (Upper)	700	600	388	255	285	35	368	128	163	220	315	300	545	388	10	50	335	14.9%	285
Olney Creek	243		228	0	60	0	33	10	13	4	8	8	0	15	0	3	48	6.3%	45
Proctor Creek							30	0	13	5	0	13	13	10	3	23	11		
Bridal Veil Creek	345	53	178	193	428	10	220	15	85	35	108	175	121	87	64	1	147	0.7%	146
Skykomish Population Total	**7,616**	**3,203**	**5,798**	**2,665**	**5,815**	**1,415**	**2,513**	**1,181**	**3,744**	**2,355**	**3,063**	**3,034**	**3,785**	**4,374**	**3,048**	**966**	**3,612**	**26.7%**	**2,646**
Snoqualmie River (Lower)	715	230	488	220	473	43	455	33	290	70	98	133	193	280	175	50	266	18.8%	216
Snoqualmie River (Upper)	913	550	983	550	1,360	578	810	370	618	335	330	383	278	425	315	103	606	17.0%	503
Cherry Creek							8	0	0	5	5	5	5	5	5	3	4	72.7%	1
Tolt River (Lower)	240	143	568	75	443	105	128	65	205	130	130	118	153	355	238	115	204	56.3%	89
Tolt River (Upper)	79	47	187	25	65	50	118	18	48	25	13	23	58	108	93	30	62	48.6%	32
NF Tolt River										20	10	18	48	90	78	25	37	67.2%	12
SF Tolt River	72	42	40	43	53	43	68	50	45	35	20	45	25	43	18	15	45	33.7%	30
Raging River	428	138	178	308	33	33	143	98	95	113	98	40	228	123	85	145	147	98.7%	2
Raging River Upper									-	103	89	36	206	111	76	131	109	120.2%	-22
Tokul Creek (Lower)	538	123	168	103	135	45	60	68	78	53	45	28	174	190	69	48	129	37.2%	81
Tokul Creek (Upper)	5	8	5	10	0	0	0	0	0	0	0	0	0	15	10	13	3		
Snoqualmie Population Total	**2,990**	**1,281**	**2,617**	**1,334**	**2,562**	**897**	**1,790**	**702**	**1,379**	**889**	**838**	**829**	**1,368**	**1,745**	**1,162**	**678**	**1,516**	**44.7%**	**838**
Basin Total	**10,606**	**4,484**	**8,415**	**3,999**	**8,377**	**2,312**	**4,303**	**1,883**	**5,123**	**3,244**	**3,901**	**3,863**	**5,153**	**6,119**	**4,210**	**1,644**	**5,127**	**32.1%**	**3,483**

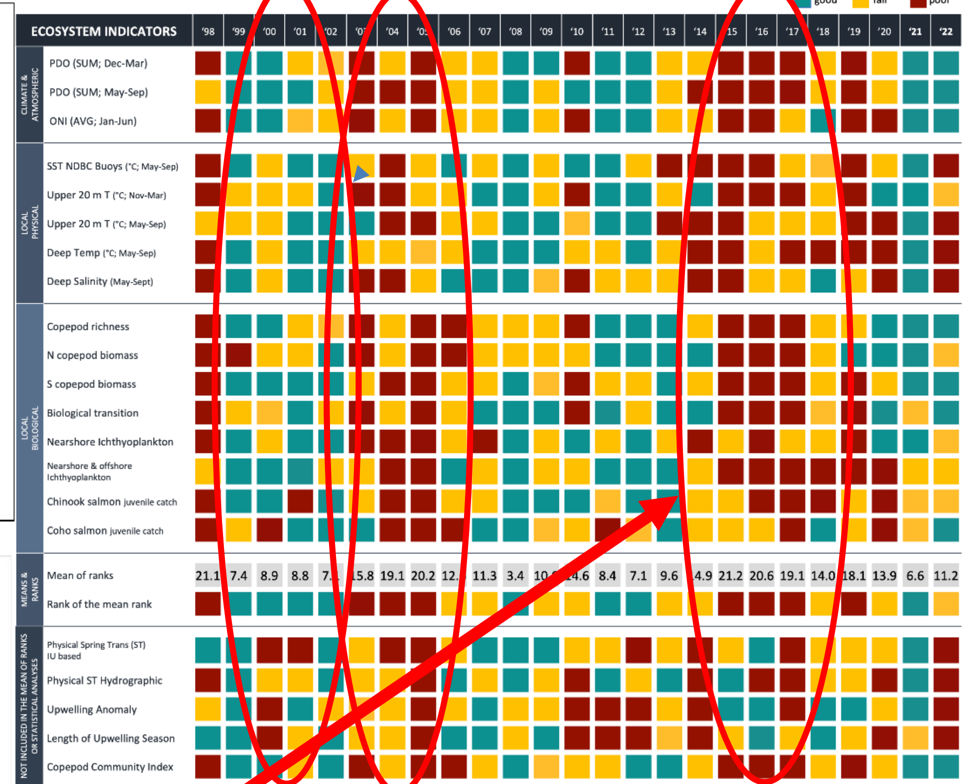
Diversity: Drastic decline in yearling fraction in the Snohomish system from 25-35% in both main basins to <10% Snoqualmie and <5% Skykomish (~75% declines)

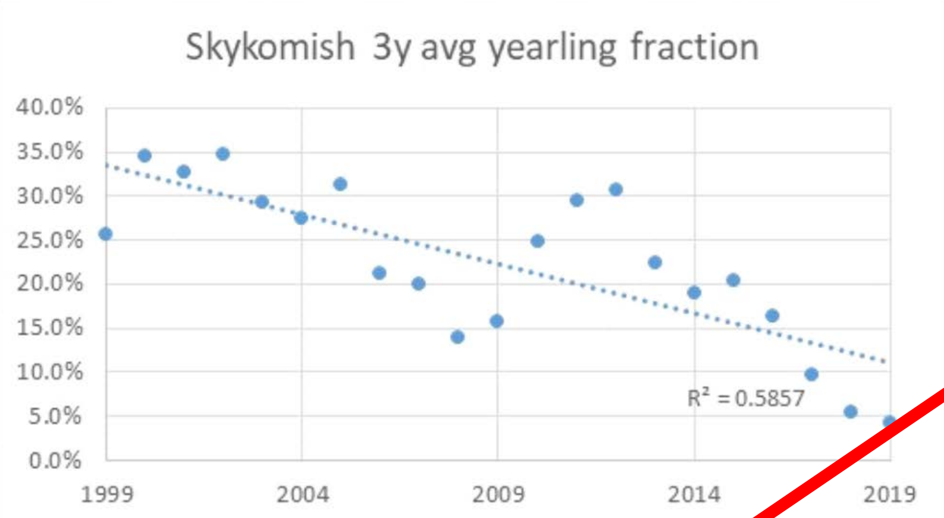
HGMP Monitoring











A 4-year sustained La Nina of anomalously cool temperatures ending in the early 2000s produced these high yearling fractions

- Cool period ending in early-2000s was followed by a series of El Niño's, a documented climate regime shift during which the yearling life history in both basins <u>declined by >50%</u>

- Following the 2015 Blob, yearling % crashed further to <10% in the Snoqualmie and <5% in the Skykomish- 60-85% below their average only 20 years earlier

Comanager Hatchery Policy: Addressing Concerns
Contributions to Recovery: RECOVERY GOALS (Diversity)

- **1 Big Reason Why this Matters:** Diversity affects survival and abundance

- Loss of yearling fish matters **because they get 4 times higher marine survival** than subyearling Chinook

- At bottom in red, shows major swings in marine survival (4- to 16-fold)

SUBYEARLING Chinook Marine Survival	
Average	**0.19%**
Standard Error	0.03%
Median	0.16%
Standard Deviation	0.10%
Sample Variance	0.00%
Range	0.32%
Minimum	0.10%
Maximum	0.42%
Count	12
Confidence Level (95.0%)	0.06%

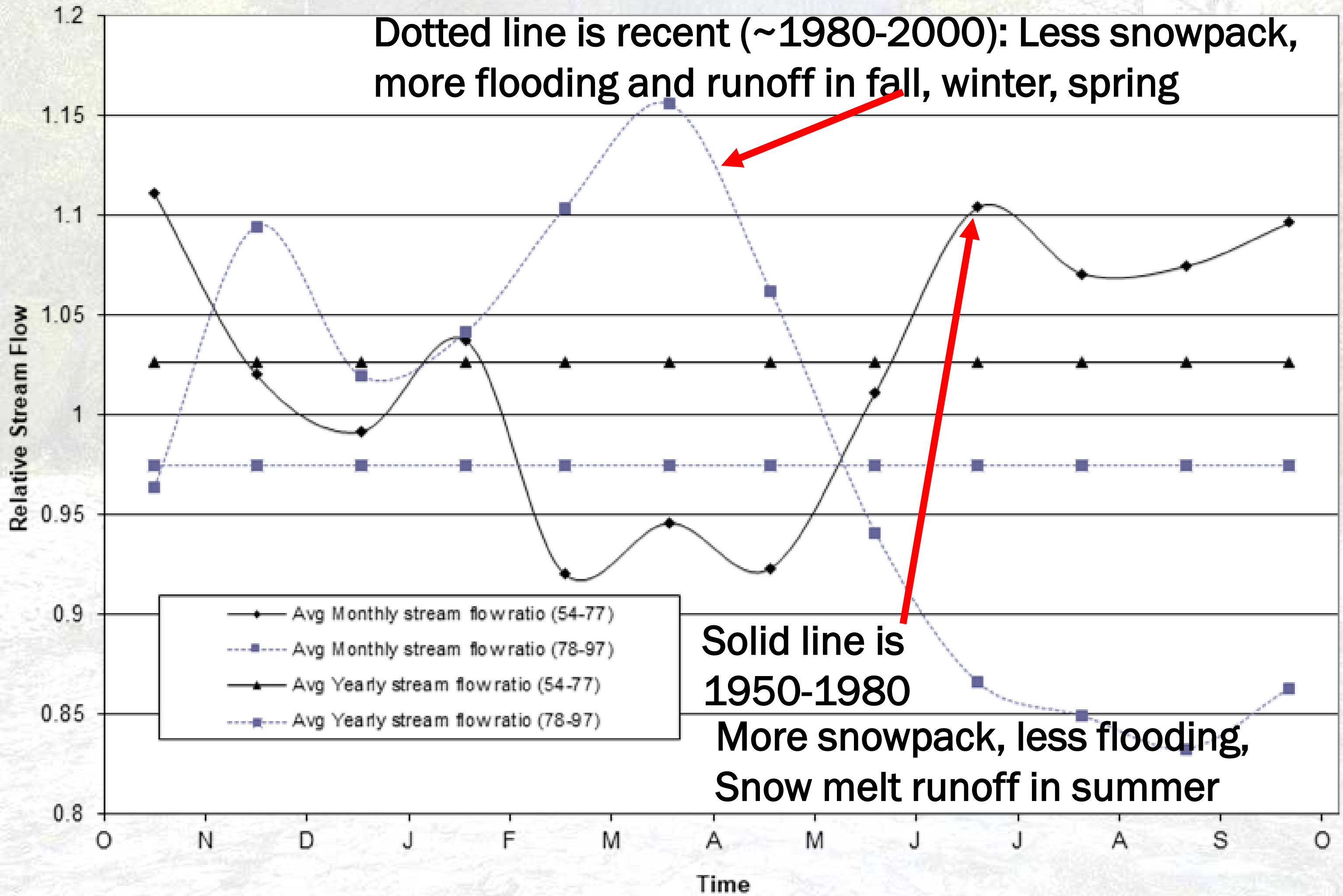
4.3-fold swings in survival ("430%")

YEARLING Chinook Marine Survival	
Average	**0.80%**
Standard Error	0.24%
Median	0.57%
Standard Deviation	0.68%
Sample Variance	0.00%
Range	1.91%
Minimum	0.12%
Maximum	2.03%
Count	8
Confidence Level (95.0%)	0.57%

16-fold swings in survival ("1,600%")

So What's Really Affecting the Fish?

Seasonal stream flow patterns are reversed



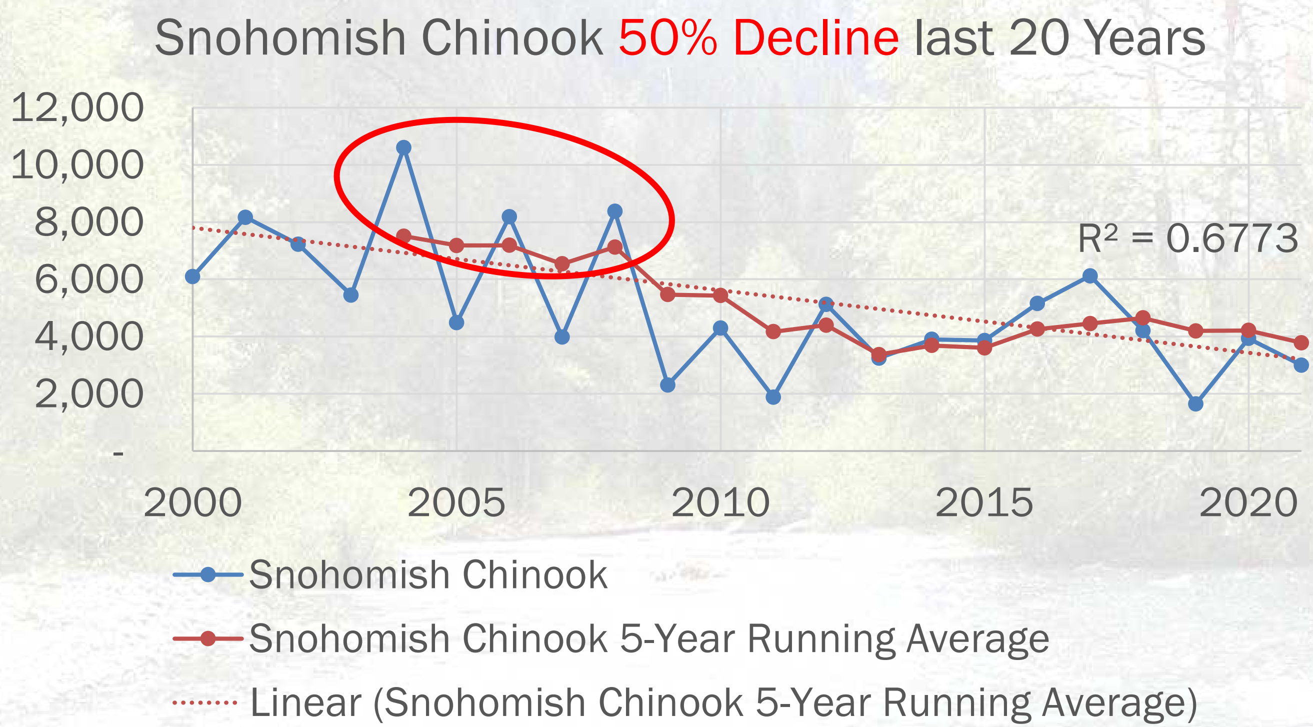
Comanager Hatchery Policy: Addressing Concerns
Contributions to Recovery: RECOVERY GOALS

- The sustained La Nina from 1998-2001 that produced the high yearling fractions also produced the highest abundances for all species in the Snohomish basin

- After the cool period (circled in the following graphs), the anomalously warm conditions that followed (when yearling fractions crashed by 75%) ALSO caused MAJOR declines in Chinook, coho, chum and steelhead that averaged 50%, 70%, 75%, and 90% below their averages only 20 years ago

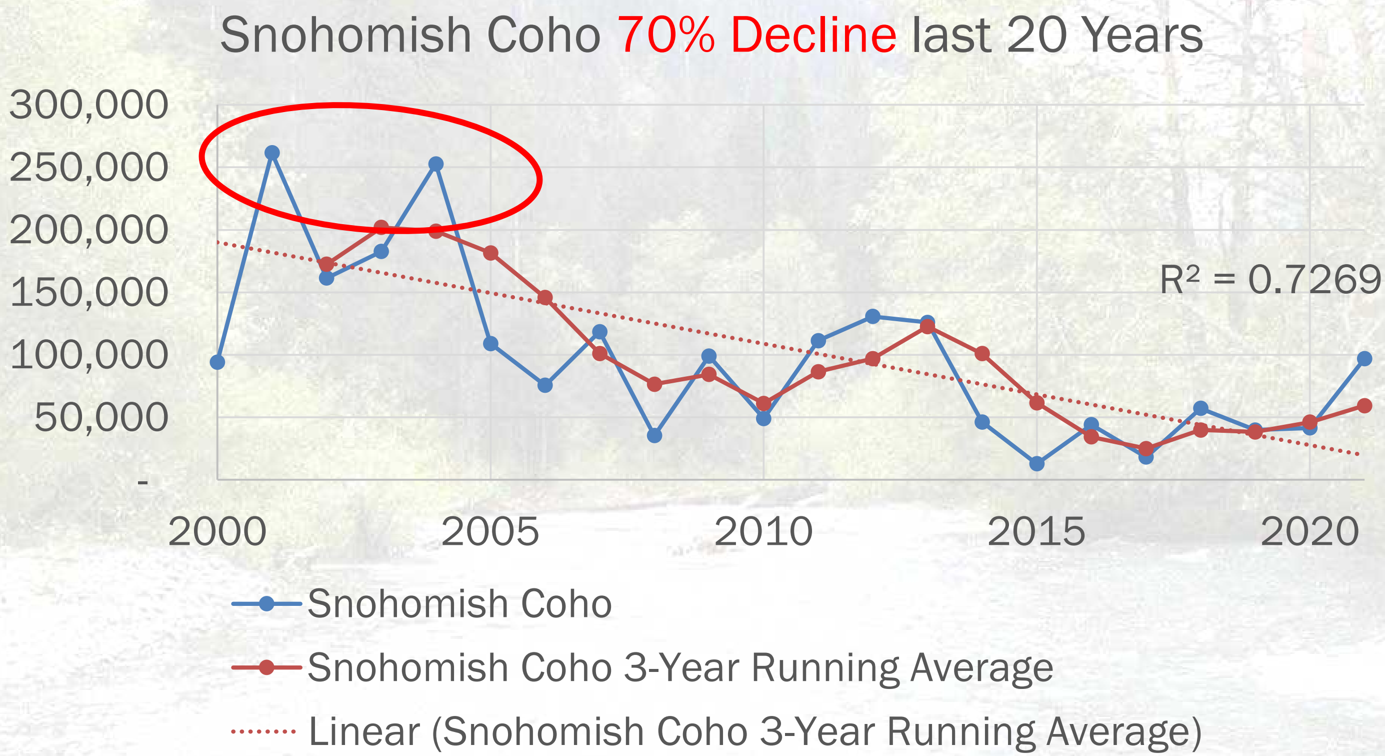
- These are the sharpest recent declines of any Puget Sound watershed we are aware of
- where the Snohomish went from a Chinook and coho stronghold to approaching extinction at the current rate of decline

Period of **high Chinook returns in early 2000s followed a sustained, four-year (1998 through 2001) La Niña event** that produced well-documented favorable conditions in the eastern Pacific ocean for juvenile salmon in the California Current (https://www.nwfsc.noaa.gov/research/divisions/fe/estuarine/oeip/index.cfm).



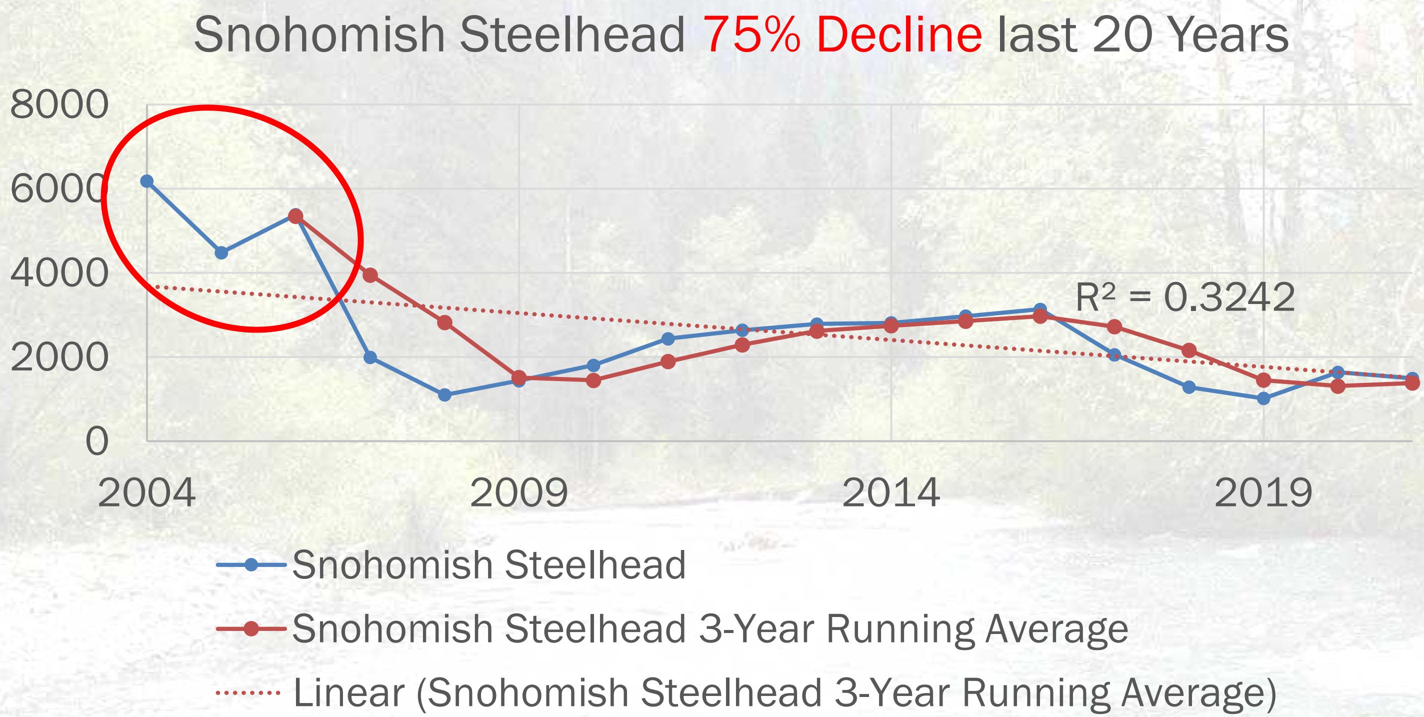
- Sharp Basin-Wide Chinook Decline from 20 years ago when runs averaged more than double and exceeded 10,000 Chinook spawners in the Snohomish (recently below 1,000)

Recent period of **record returns followed sustained, four-year (1998 through 2001) La Niña event** that produced well-documented favorable conditions in the eastern Pacific ocean for juvenile salmon in the California Current (https://www.nwfsc.noaa.gov/research/divisions/fe/estuarine/oeip/index.cfm).



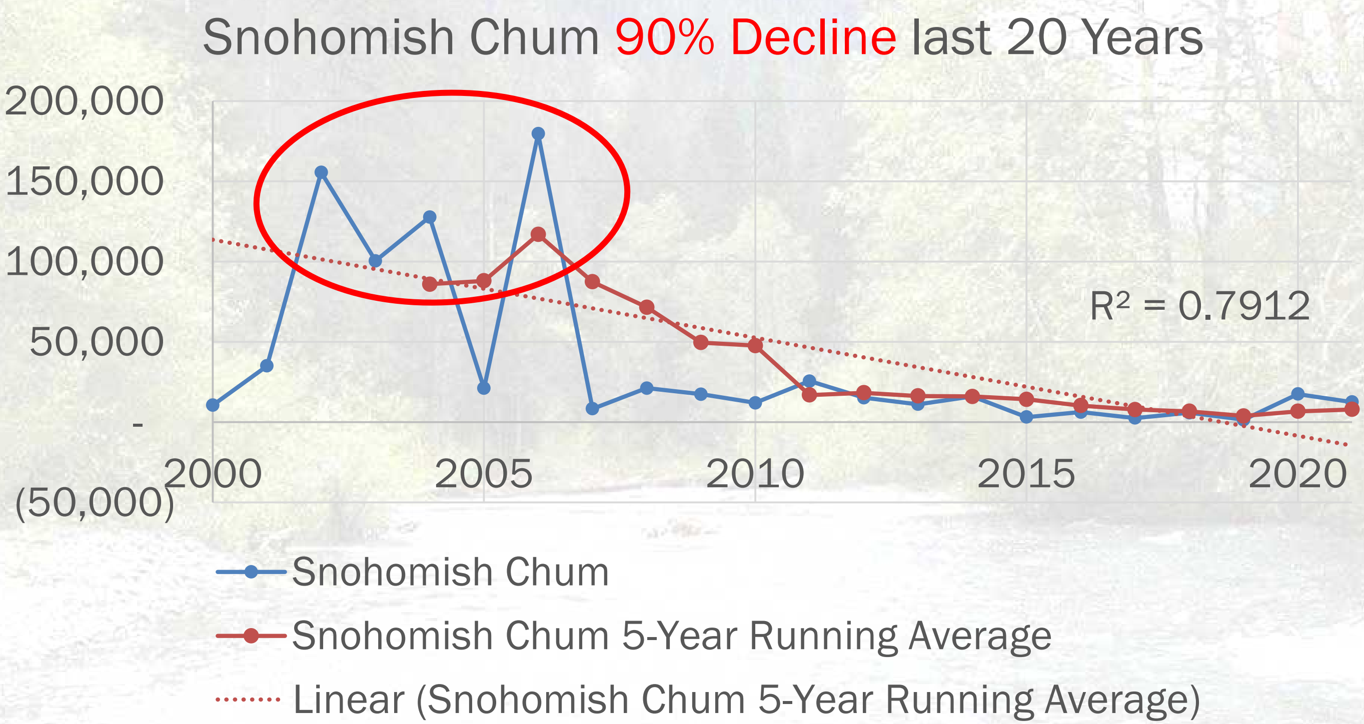
- Sharp Basin-Wide Coho Decline from 20 years ago when runs averaged three times higher, and escapements exceeded 250,000 in two years during this earlier period (records in recent times)

Recent period of **record returns followed a sustained, four-year (1998 through 2001) La Niña event** that produced well-documented favorable conditions in the eastern Pacific ocean for juvenile salmon in the California Current: (https://www.nwfsc.noaa.gov/research/divisions/fe/estuarine/oeip/index.cfm).



- ➢Sharp Basin-Wide Steelhead Decline from 20 years ago when runs averaged 4 times higher

Recent period of **record returns followed sustained, four-year (1998-2001) La Niña event** that produced well-documented favorable conditions in the eastern Pacific ocean for juvenile salmon in the California Current (https://www.nwfsc.noaa.gov/research/divisions/fe/estuarine/oeip/index.cfm).



- Sharp Basin-Wide Chum Decline from 20 years ago when runs averaged 10 times higher but flatlining since 2007

Comanager Hatchery Policy
Harvest Concerns

They even say:

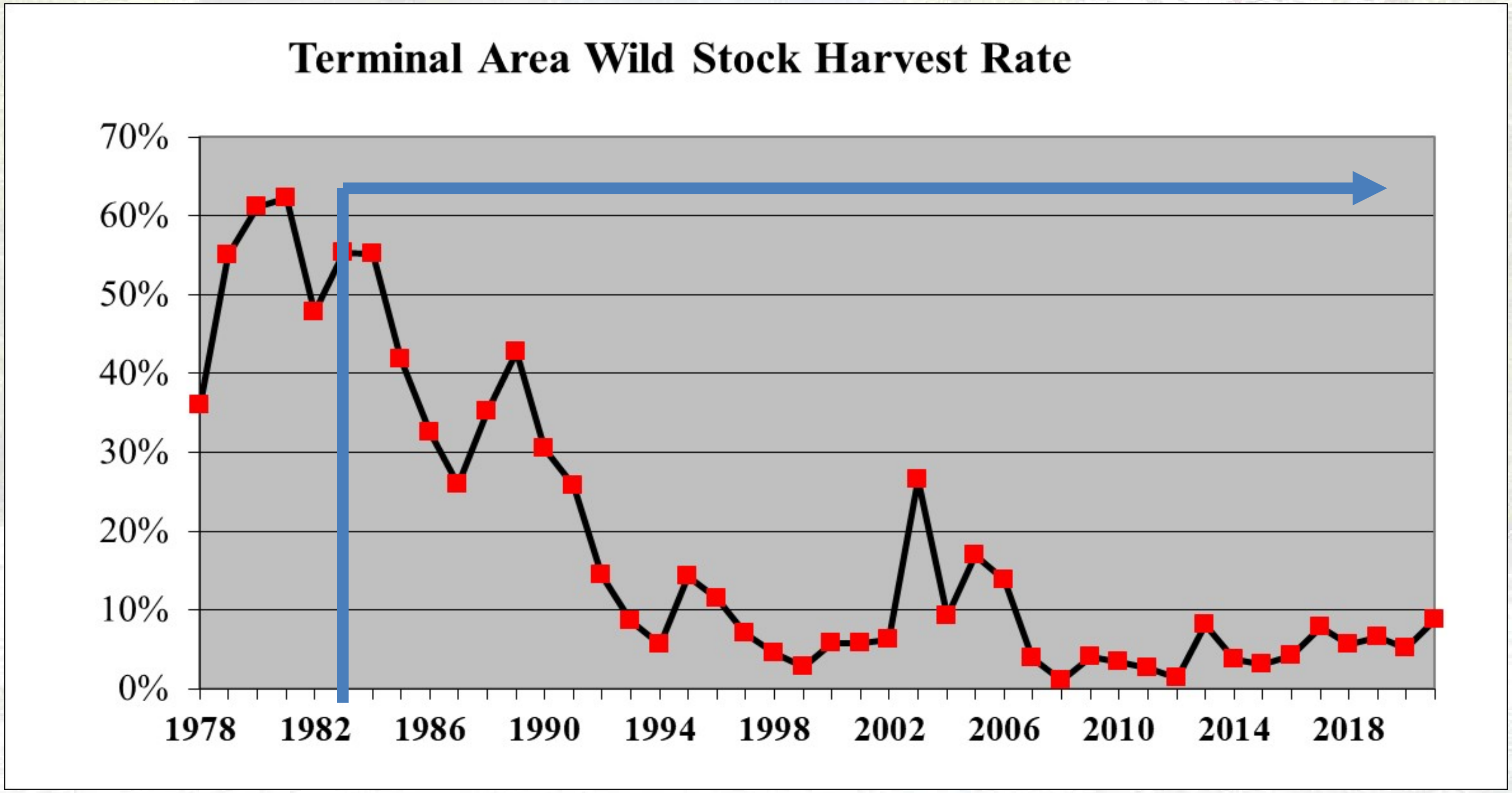
“Why can't we just stop harvest for 3 years?”

“Do we have to be able to harvest ***Every Year***?”

“What if we just stopped producing hatchery fish ***because we have evidence they are impeding wild fish****?”*

Comanager Hatchery Policy
Harvest Management Benefitting Recovery

- Reduction in Tulalip Wild Stock Harvest Rate Since Advent of Tulalip Hatchery Program in 1983 from averaging ~50% to 5% (All Wild Chinook Stocks Combined)
- **This remains a MAJOR contribution to regional salmon recovery**

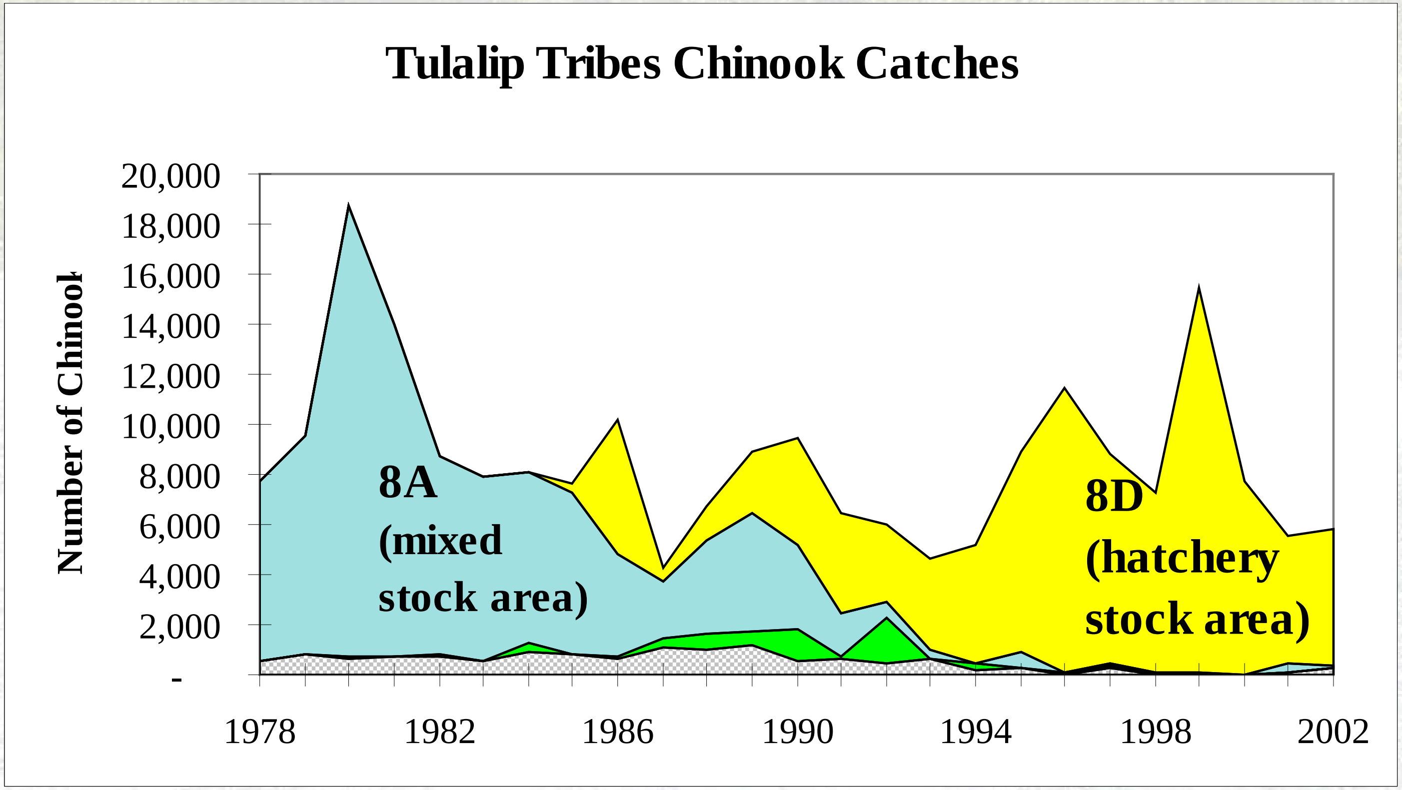


- 1978-1983 average: 53.3%, 1985-2006 : 17.7%, 2007-2021 average: 4.6%

- Demonstrating harvest continues to principally target hatchery production with low impacts on natural stocks

Comanager Hatchery Policy
Harvest Management Benefitting Recovery

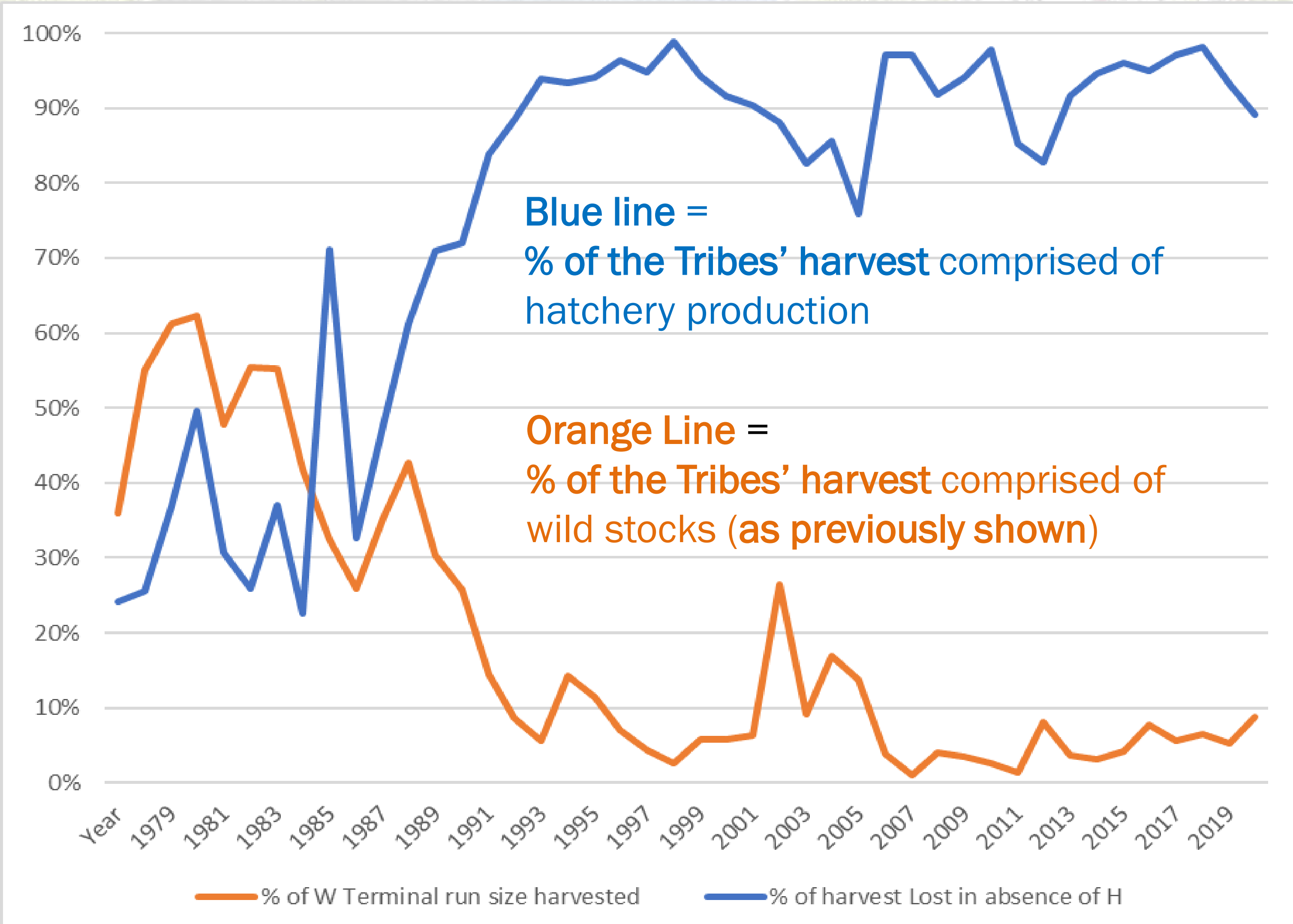
- How did we reduce the wild stock harvest rate?
  - Hatchery production in Tulalip Bay enabled shift in harvest from the mixed stock area (Area 8A) to extreme terminal area (in Tulalip Bay) that is largely devoid of natural stocks where hatchery production can be efficiently targeted



Comanager Hatchery Policy

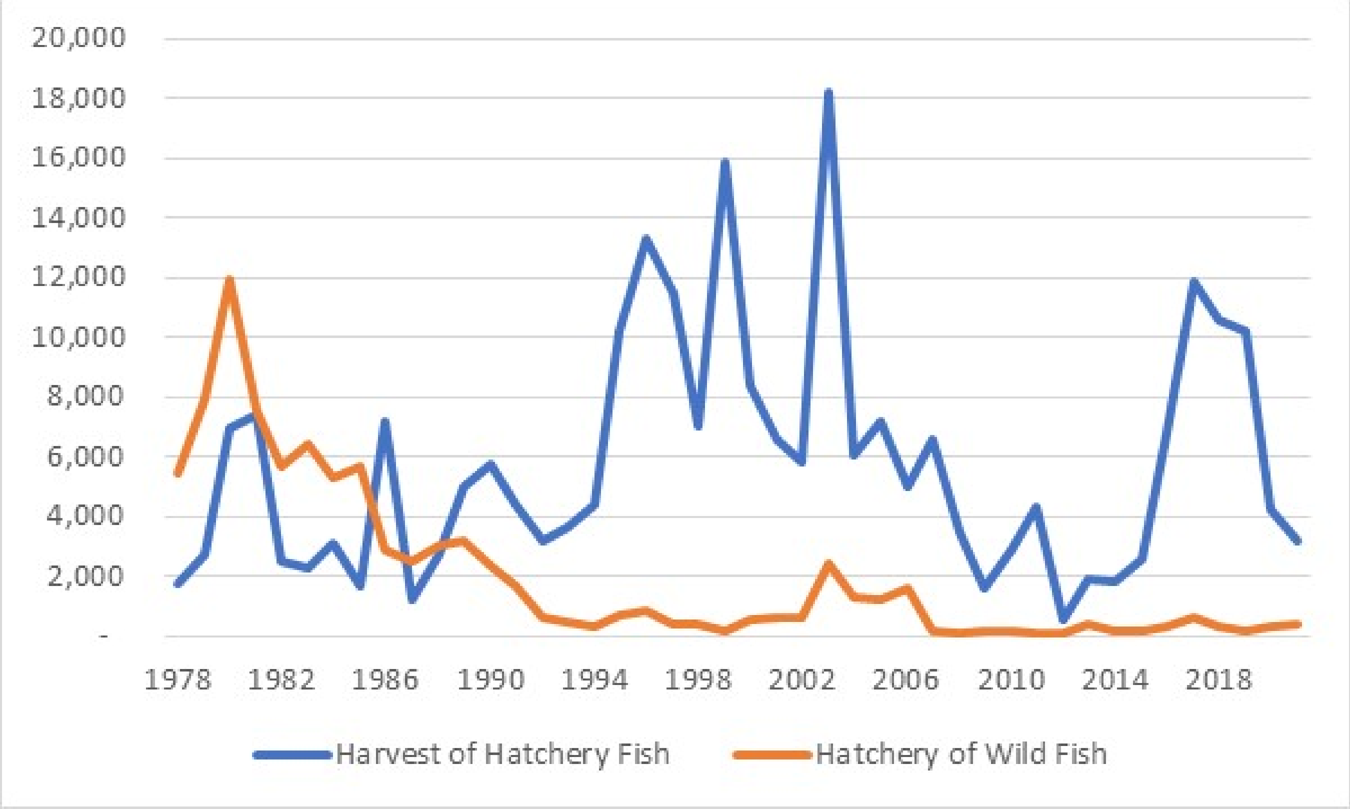
Harvest Concerns: Actual fish produced by fish hatcheries

While hatchery risks are largely uncertain and theoretical, *actual fish* are not



Comanager Hatchery Policy
Harvest Concerns: Actual fish produced by fish hatcheries

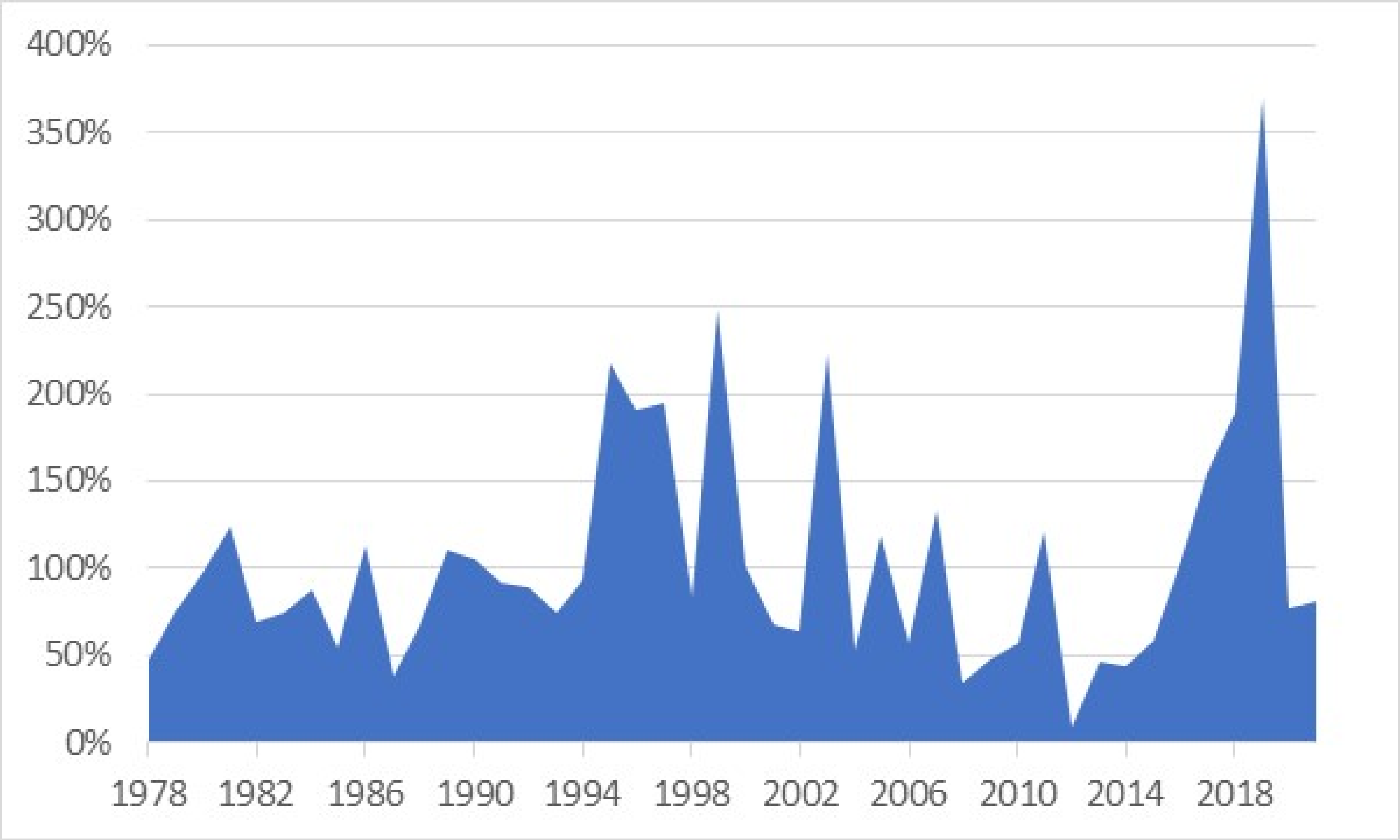
- **Numbers** of hatchery (**blue line**) and wild (**orange line**) Chinook **harvested** by the Tulalip Tribes 1979 – 2021
- During this period, a total of 253,910 hatchery-origin Chinook were harvested by the Tribe
- Suggesting that this production could be eliminated or curtailed is suggesting that the Tulalip Tribes no longer exercise their Treaty Right to harvest Chinook salmon, which is a non-starter



Comanager Hatchery Policy

Harvest Concerns: Actual fish produced by fish hatcheries

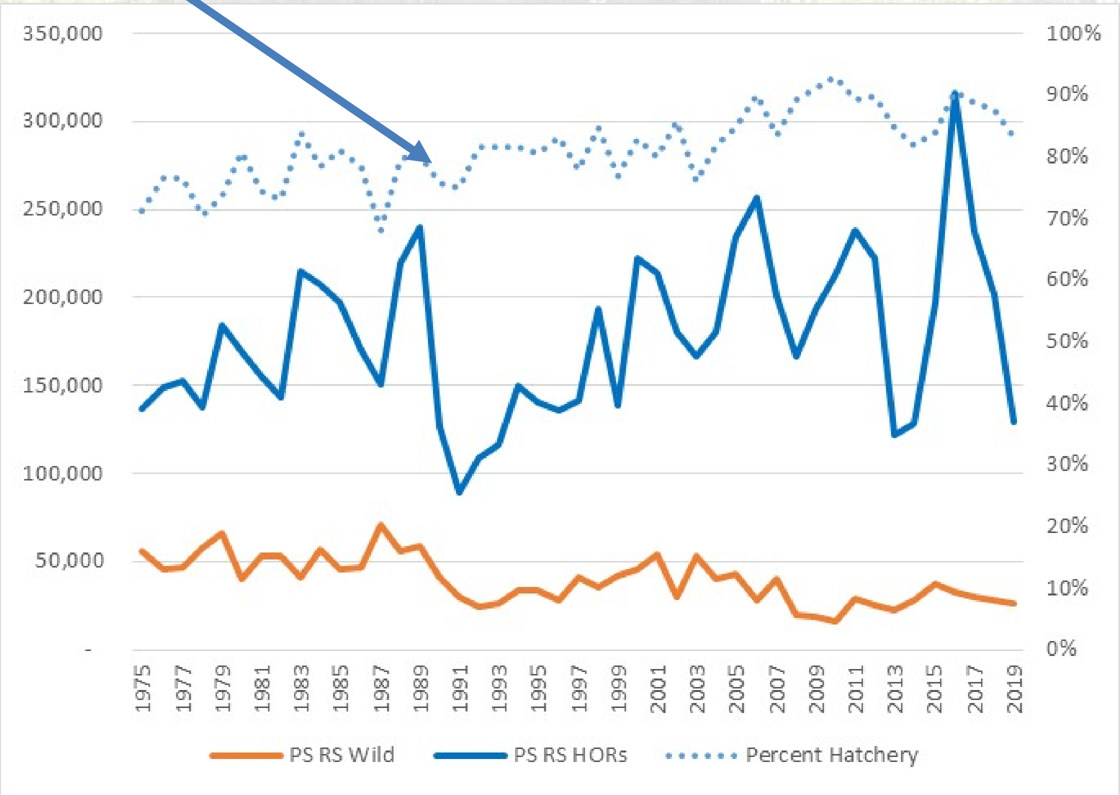
- For Tulalip to have had the same harvest we had from 1979 to present without the hatchery, on average, ***ALL of the wild fish*** **(104% avg.) would have had to be harvested**



Proportion of run harvested 1979-2021 without hatchery production

Comanager Hatchery Policy
Harvest Concerns: Actual fish produced by fish hatcheries

- Shown below are numbers of hatchery (**blue solid line**) and wild (**orange line**) Chinook that returned to Puget Sound from 1975 to 2020
- In real numbers, **8.1 million hatchery Chinook** returned to Puget Sound from 1975 to 2020
- % hatchery is shown by the blue dotted line and right axis: **Averaging 83% over 50 years - These are actual fish-** Wild returns were a small % of total returns



PS Run Size comes from RR, file name PS CK TRR Summary with FW spt 2022 Feb 2

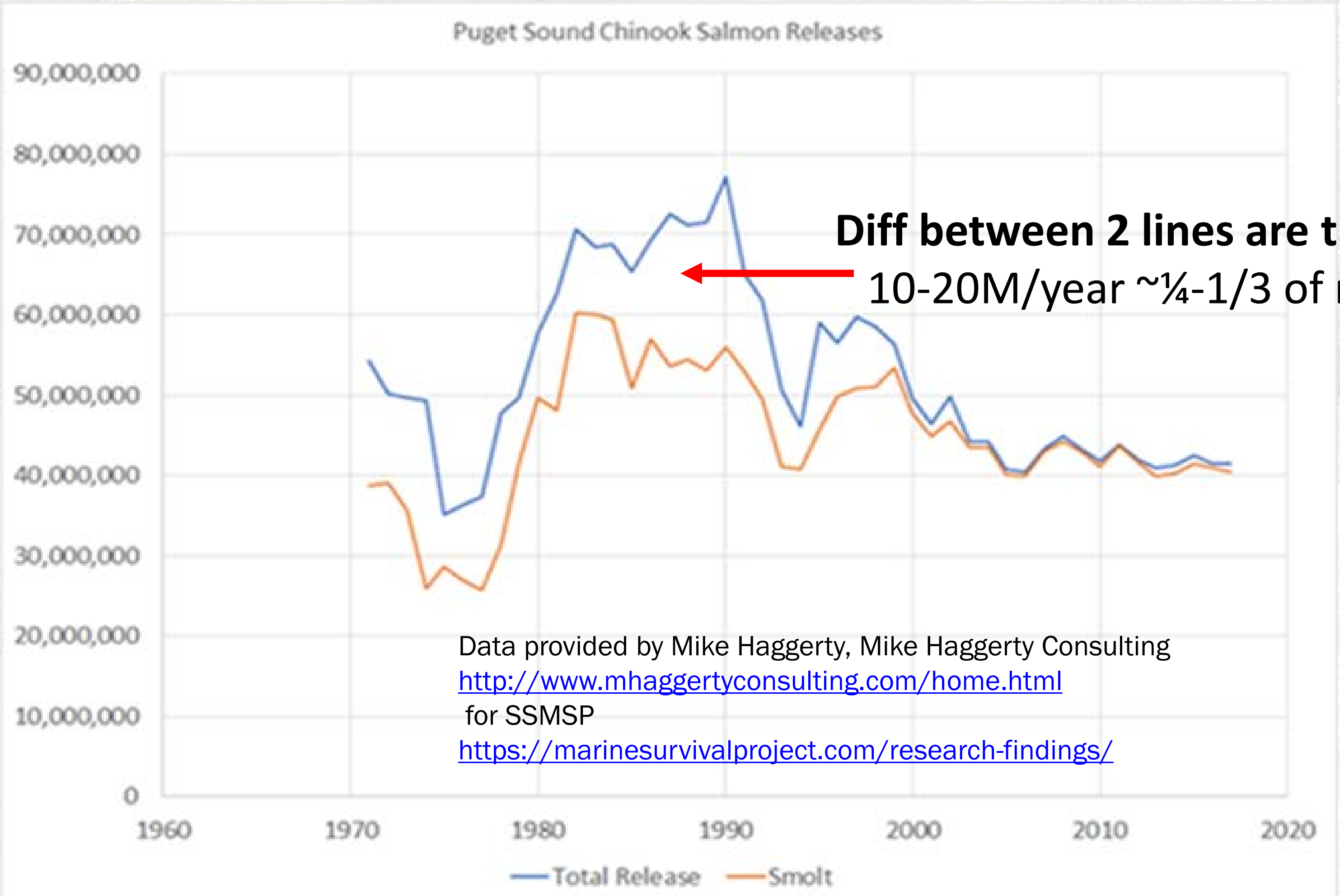
Comanager Hatchery Policy
Concern: Large Releases in 1980s

- **We have heard a recurring concern that the demise of salmon across the Salish Sea and Pacific NW Coast that occurred in the 1980s was due to:**
  - *"large hatchery Chinook releases numbers"* that may have caused the declines of wild fish across multiple species
  - because : "*there were no listed salmon species then, but then there were after, by the late-90's*"
  - *"Was there an evaluation of what the implication of this very large production in the 80s is?'*
  - *"What are the long-term effects of putting out that much hatchery production over that period of time?"*
  - *"If there are long term effects of that very high hatchery production, and those effects are still here, are those taken into account with current hatchery production increases?"*
  - *"I had no idea that we had so much production in the 80s!"*

Comanager Hatchery Policy
Concern: Large Releases in 1980s

First of all, ~ **1/3 of the releases in the 1980s were tiny fry** that never made it to saltwater
- as many as 10->20M+ fish per year

- This was discontinued because fry didn't survive
- Also, fry stayed longer in the rivers causing ecological interactions



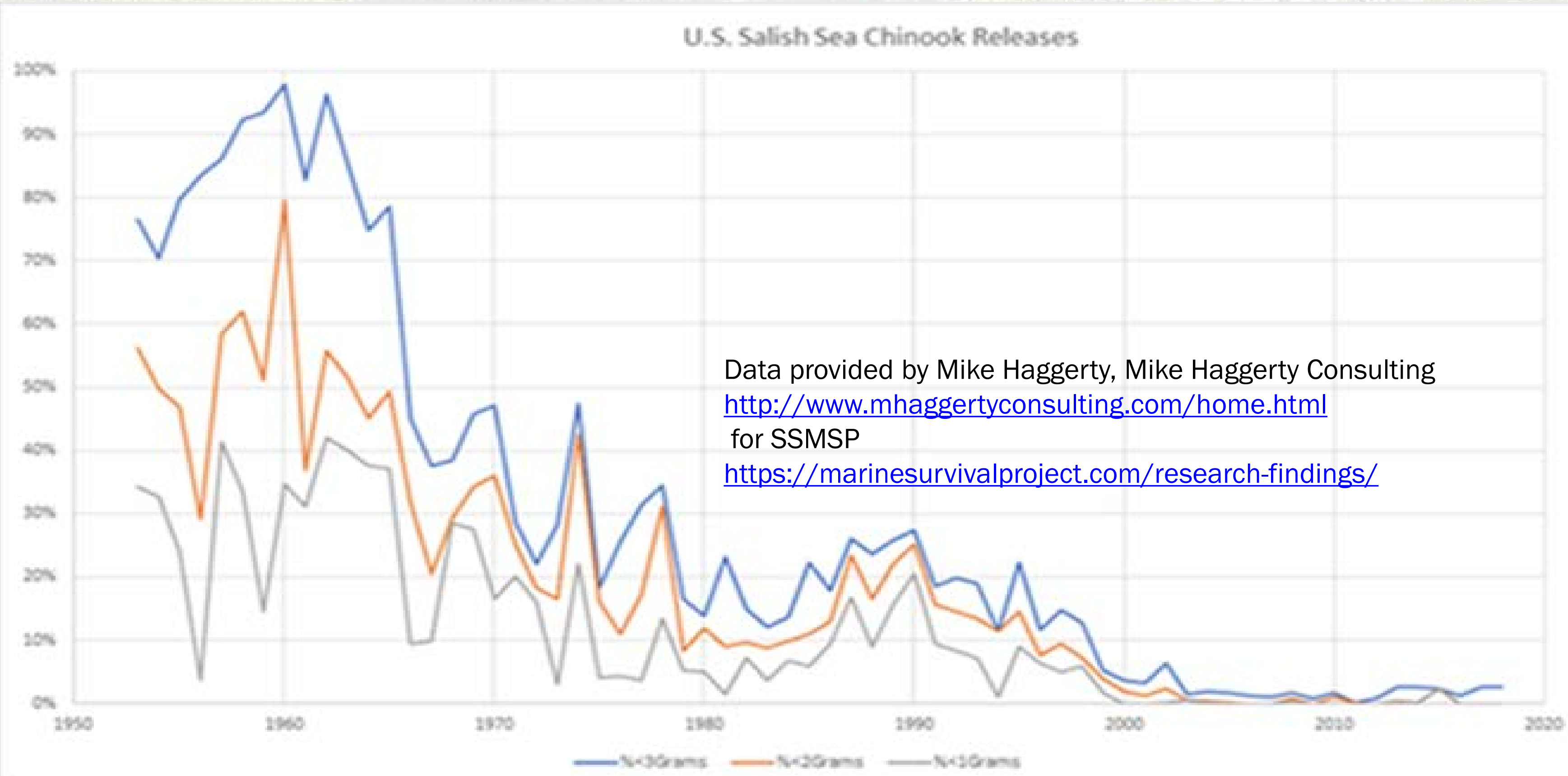
Diff between 2 lines are tiny fry releases
10-20M/year ~¼-1/3 of releases

Data provided by Mike Haggerty, Mike Haggerty Consulting
http://www.mhaggertyconsulting.com/home.html
for SSMSP
https://marinesurvivalproject.com/research-findings/

So What About Those Gigantic Releases in the 1980s?

What no one has mentioned to the WFWC yet:

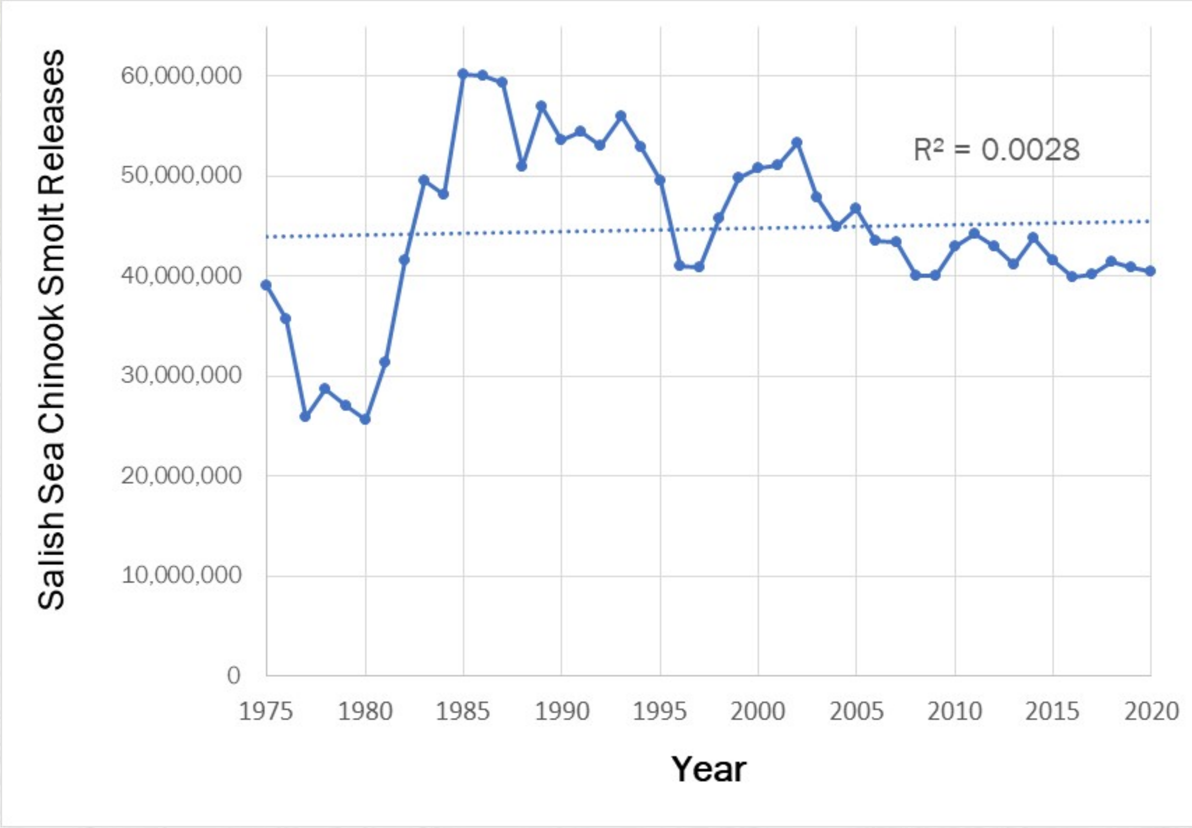
- Most earlier hatchery releases **were fry releases** Less than 1-3 grams
- The most fry released was in the 60s when they were >90% of the fish released in some years:



Proportion of fry releases < 3 grams/fish (blue), < 2 grams/fish (orange), < 1 gram fish (grey)

Comanager Hatchery Policy
Concerns About Hatchery Production Levels

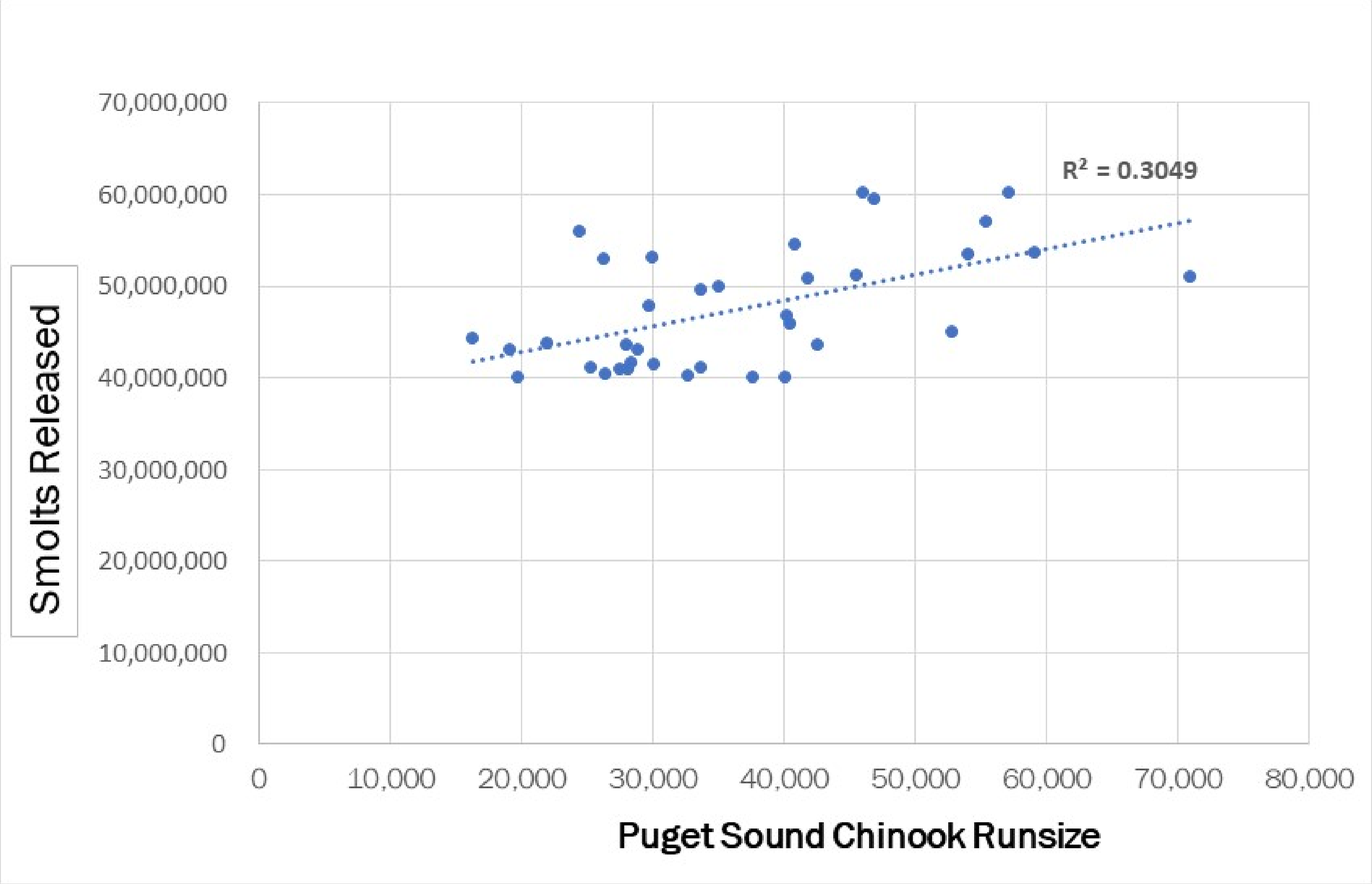
- Whereas, smolt production hasn't changed much over the years
- This Policy does not set production levels
- This policy requires Co-Manager agreement, NOAA review and authorization in order to change production levels
- Salish Sea Chinook SMOLT releases have been consistent



Comanager Hatchery Policy
Concerns About Hatchery Production Levels

"Was there an evaluation of what the implication of this very large production in the 80s is?"

✓ Hatchery Chinook Releases Positively Related to Puget Sound Run Size



So What’s Really Affecting the Fish?
I will talk about Marine Survival then Freshwater Survival

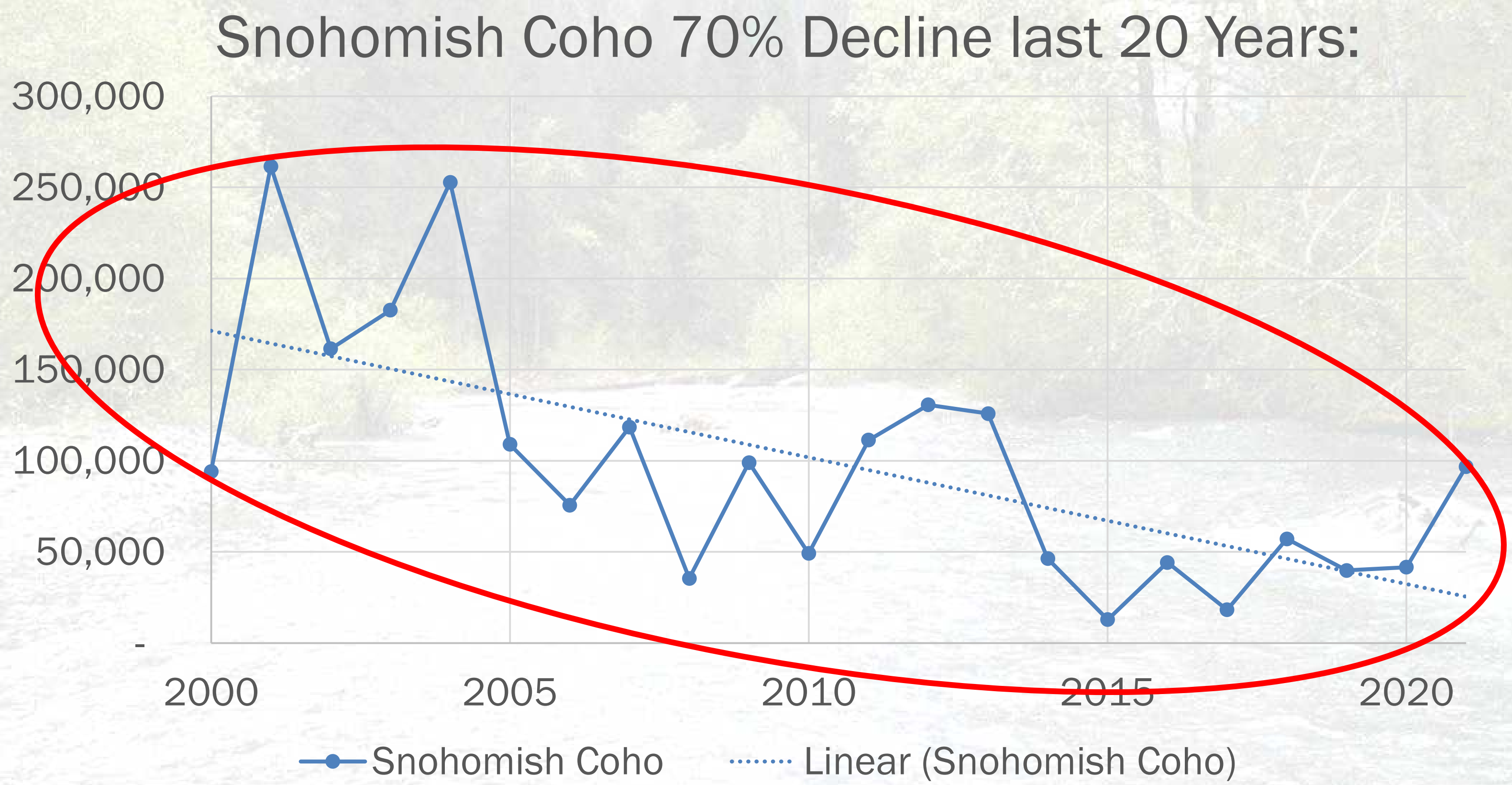
- **Declining Marine Survival:** Marine Survival (smolt-to adult) averages only 1-2%, the largest source of fish mortality (98-99%)

- I will discuss this first

So What's Really Affecting the Fish?

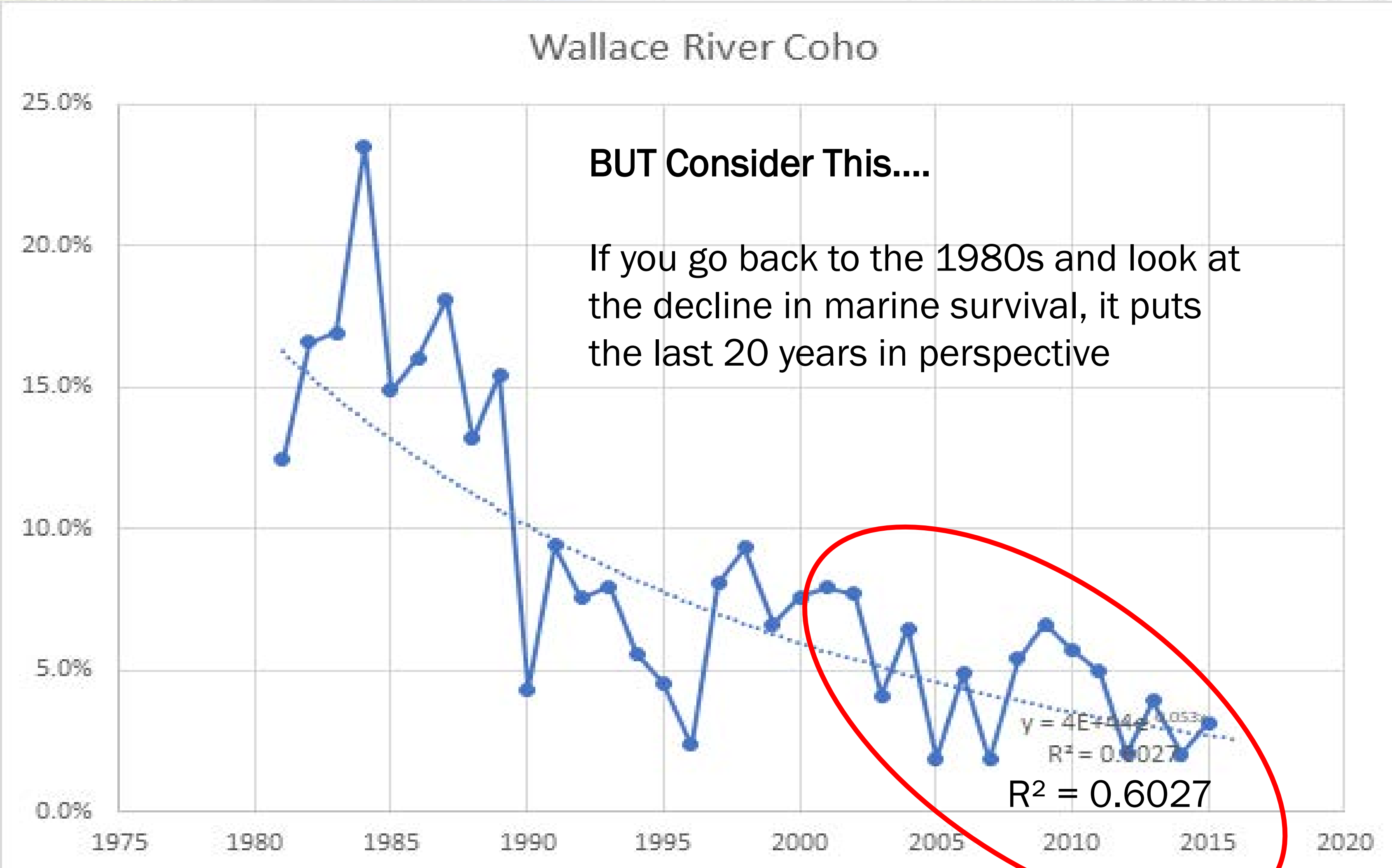
Remember the bad 70% decline in Snohomish coho over the last 20 years?

- plummeting from >250,000 in the early 2000s to only ~12,000 in 2015 Blob
- Pretty bad



➢ Sharp Coho Decline from 20 years ago when runs averaged three times higher

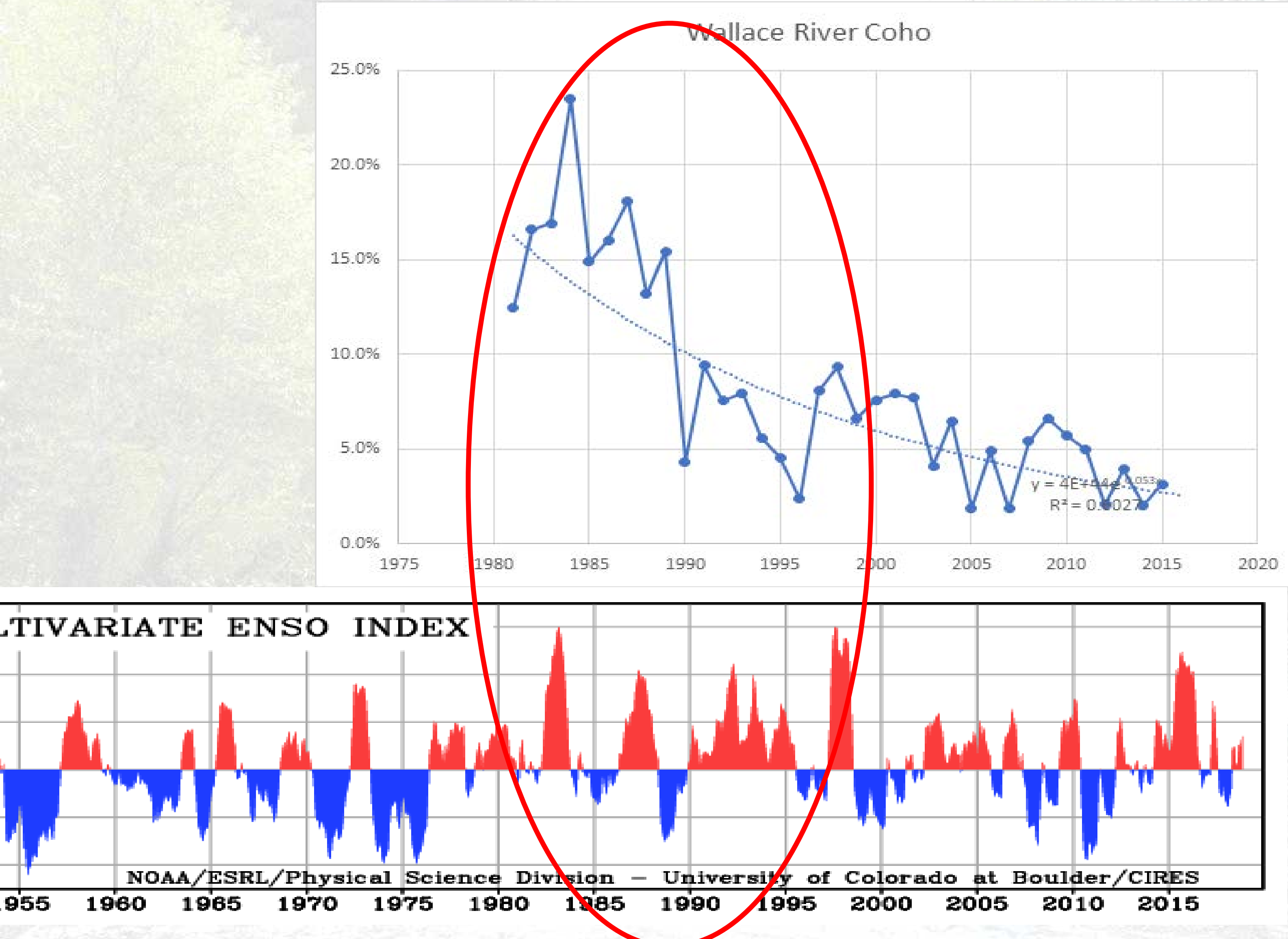
So What's Really Affecting the Fish?



BUT Consider This....

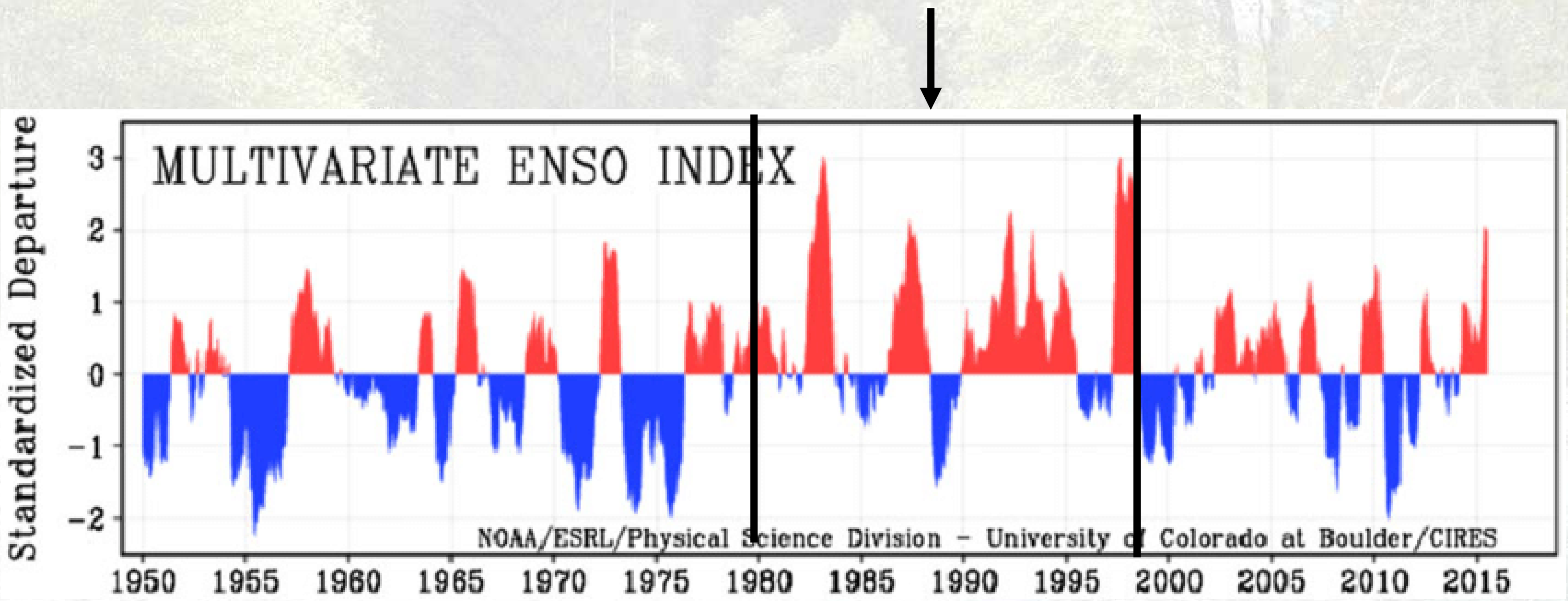
If you go back to the 1980s and look at the decline in marine survival, it puts the last 20 years in perspective

So What's Really Affecting the Fish?



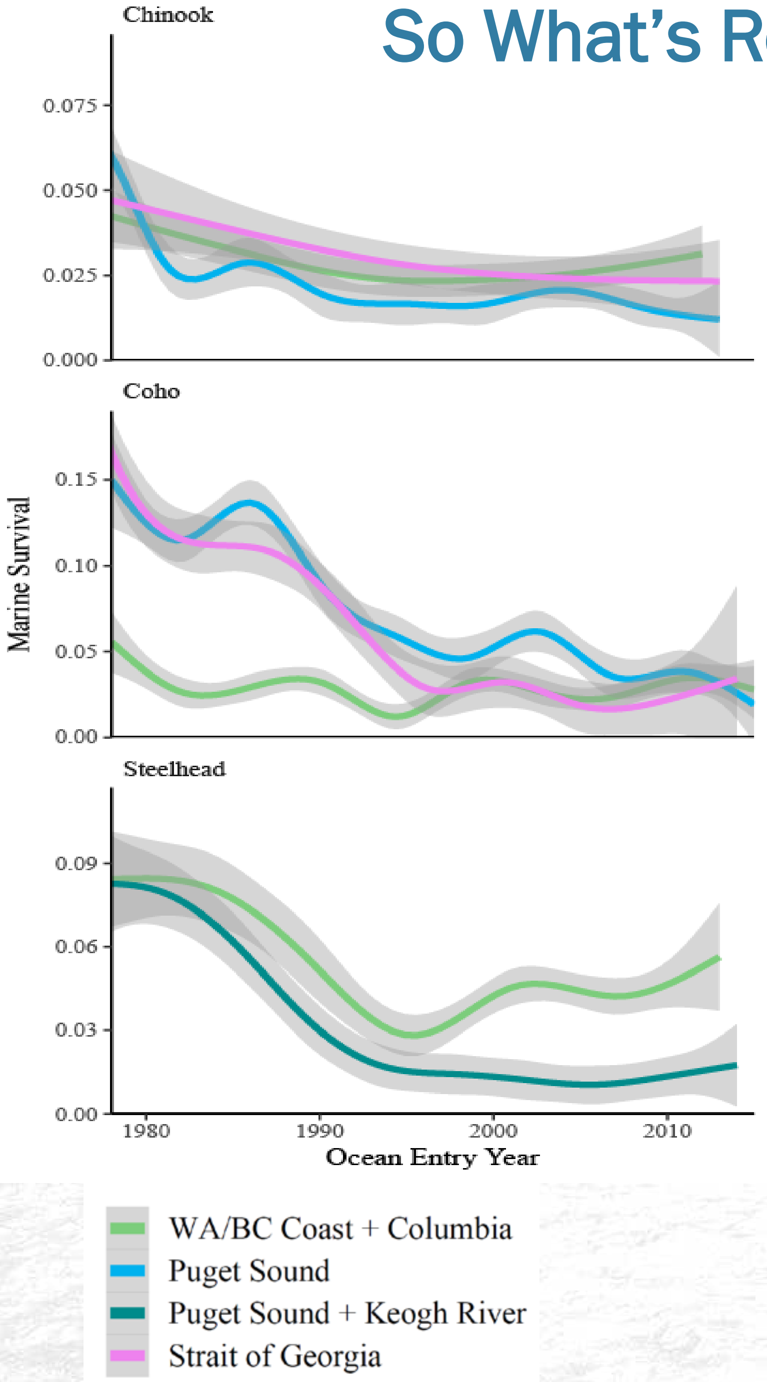
Regional marine survival rates and abundances may track marine conditions

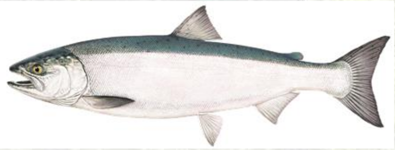
Regime shift in 1980s-1990s corresponded to one of the biggest El Niño events on record (1982–1983; Wolter and Timlin 1998) and several subsequent relatively frequent El Niño events (Wolter and Timlin 1998)



SOURCE: https://www.researchgate.net/figure/The-Multivariate-ENSO-Index-MEI-in-the-form-of-a-graph-Source_fig2_315327565

So What's Really Affecting the Fish?





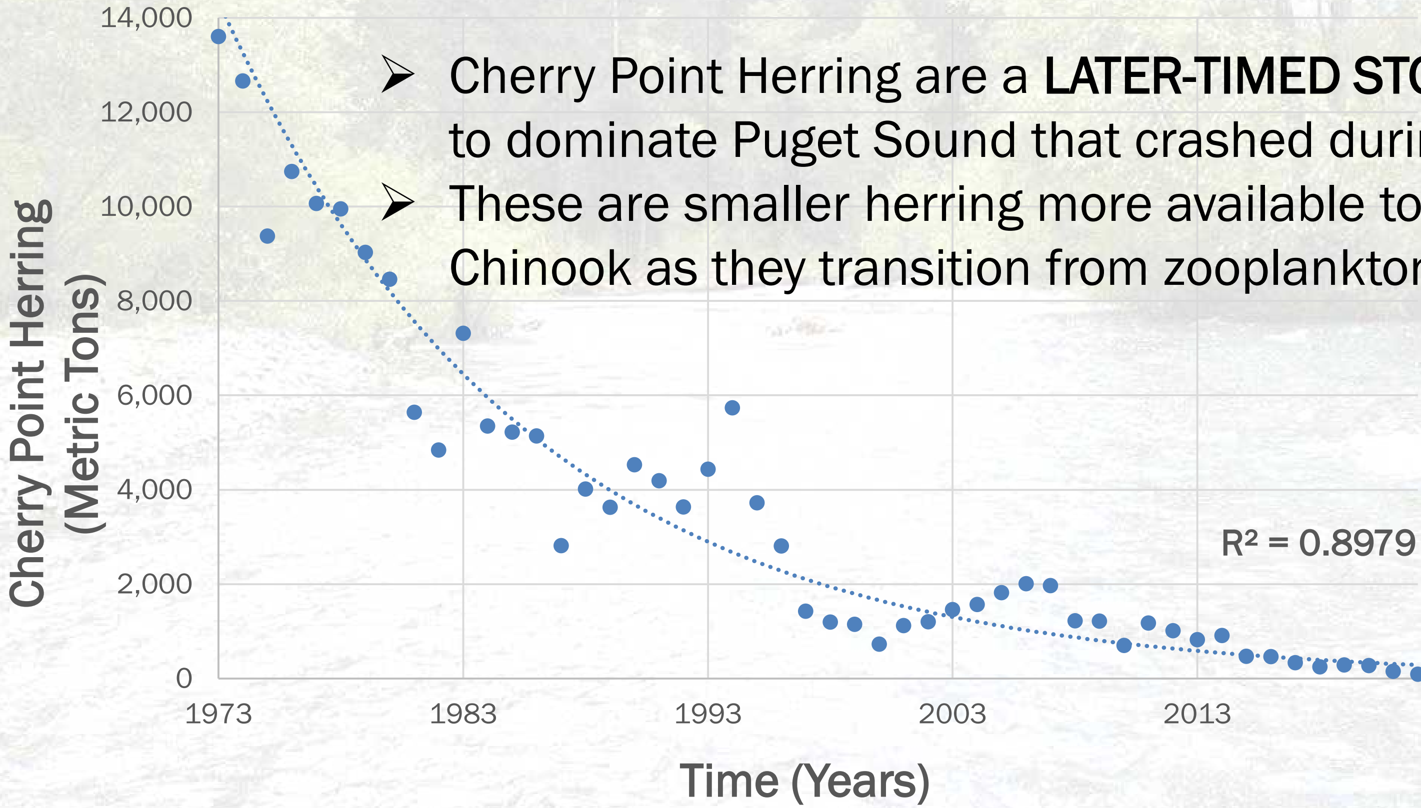
UP TO A 10X DECLINE IN MARINE SURVIVAL RATES STARTING IN 1980S

So What's Really Affecting the Fish?

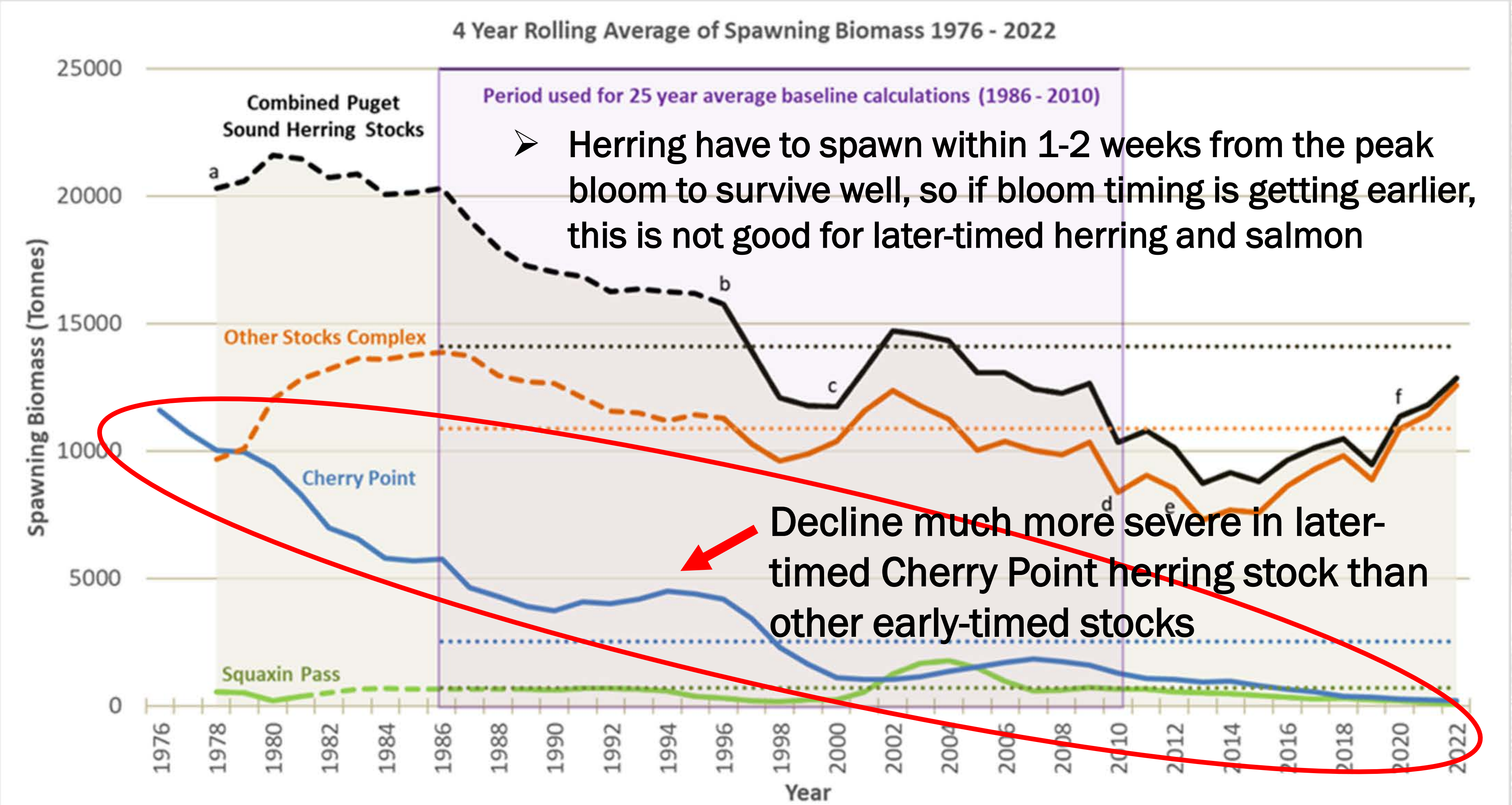
Phytoplankton bloom timing has gotten earlier

Also documented changes in: **duration, abundance and biomass, community composition, size** and **caloric content** (lipids) **of zooplankton** - changing with environmental conditions

- ➢ Cherry Point Herring are a **LATER-TIMED STOCK** that used to dominate Puget Sound that crashed during this period
- ➢ These are smaller herring more available to subyearling Chinook as they transition from zooplankton to fish diets



So What's Really Affecting the Fish?

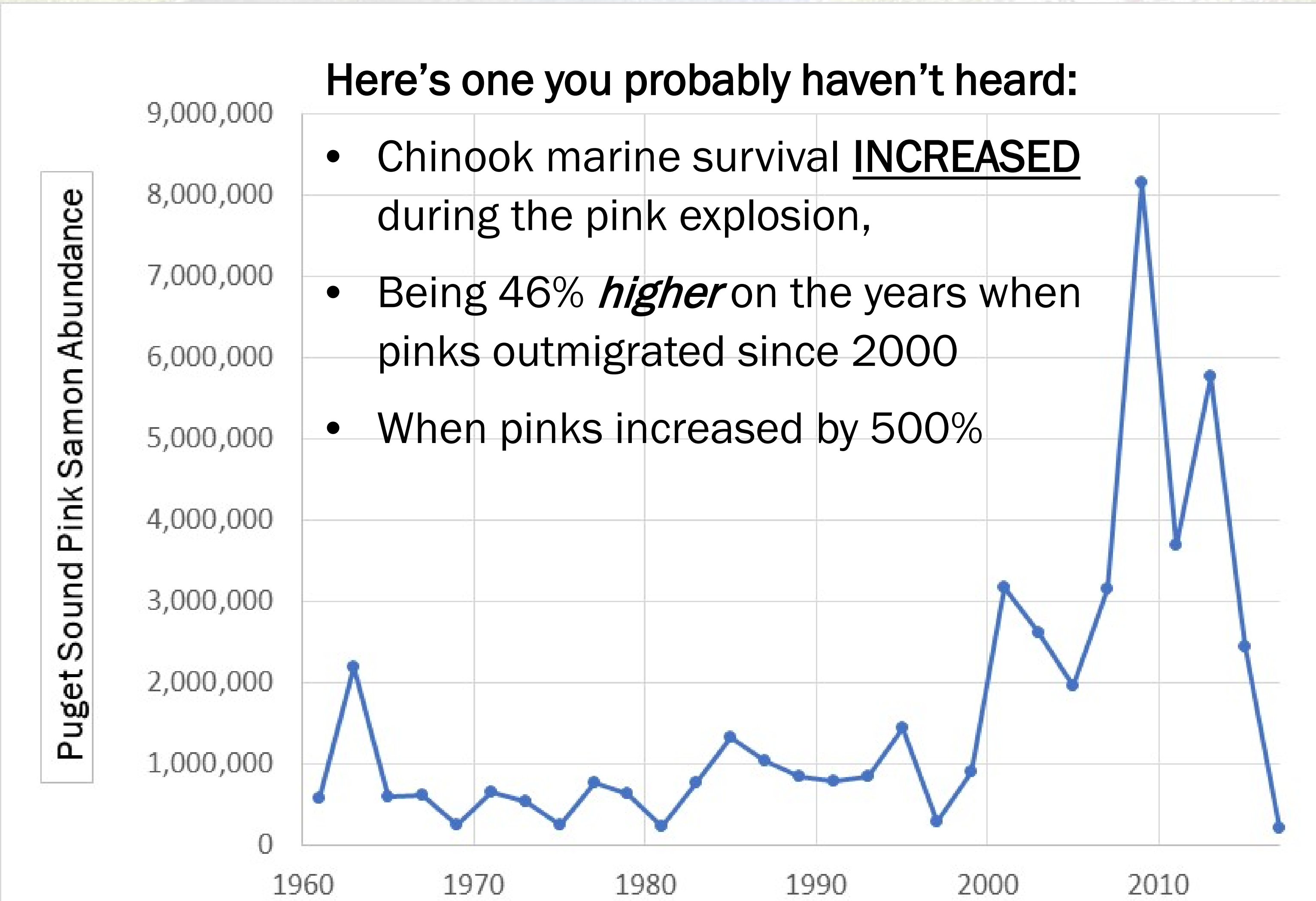


So What's Really Affecting the Fish?

- Earlier bloom timing would help explain the recent explosion of pink salmon in Puget Sound:

Here's one you probably haven't heard:

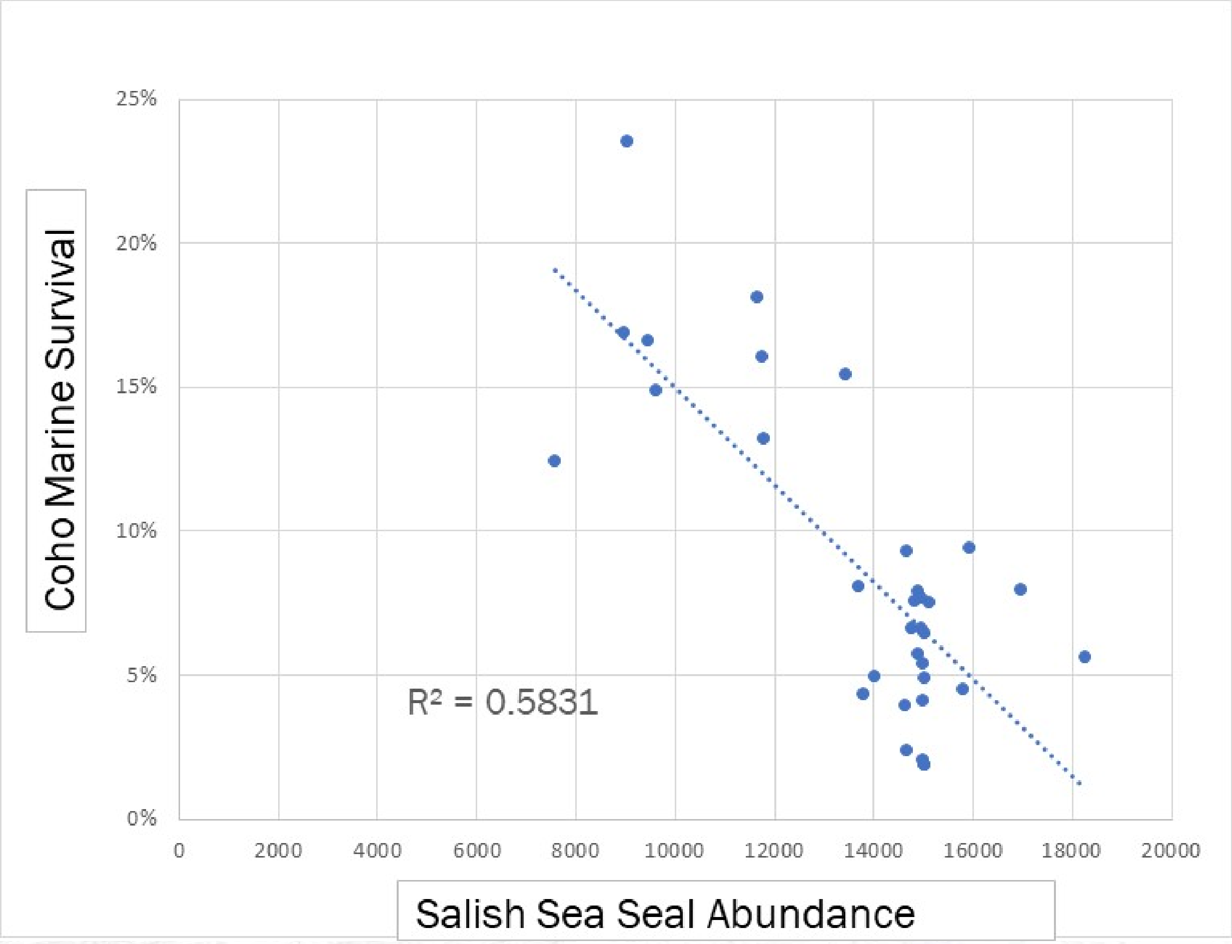
- Chinook marine survival <u>**INCREASED**</u> during the pink explosion,
- Being 46% ***higher*** on the years when pinks outmigrated since 2000
- When pinks increased by 500%



So What's Really Affecting the Fish?

Wallace River (Snohomish) Coho Survival **vs. SS Seal Abundance**

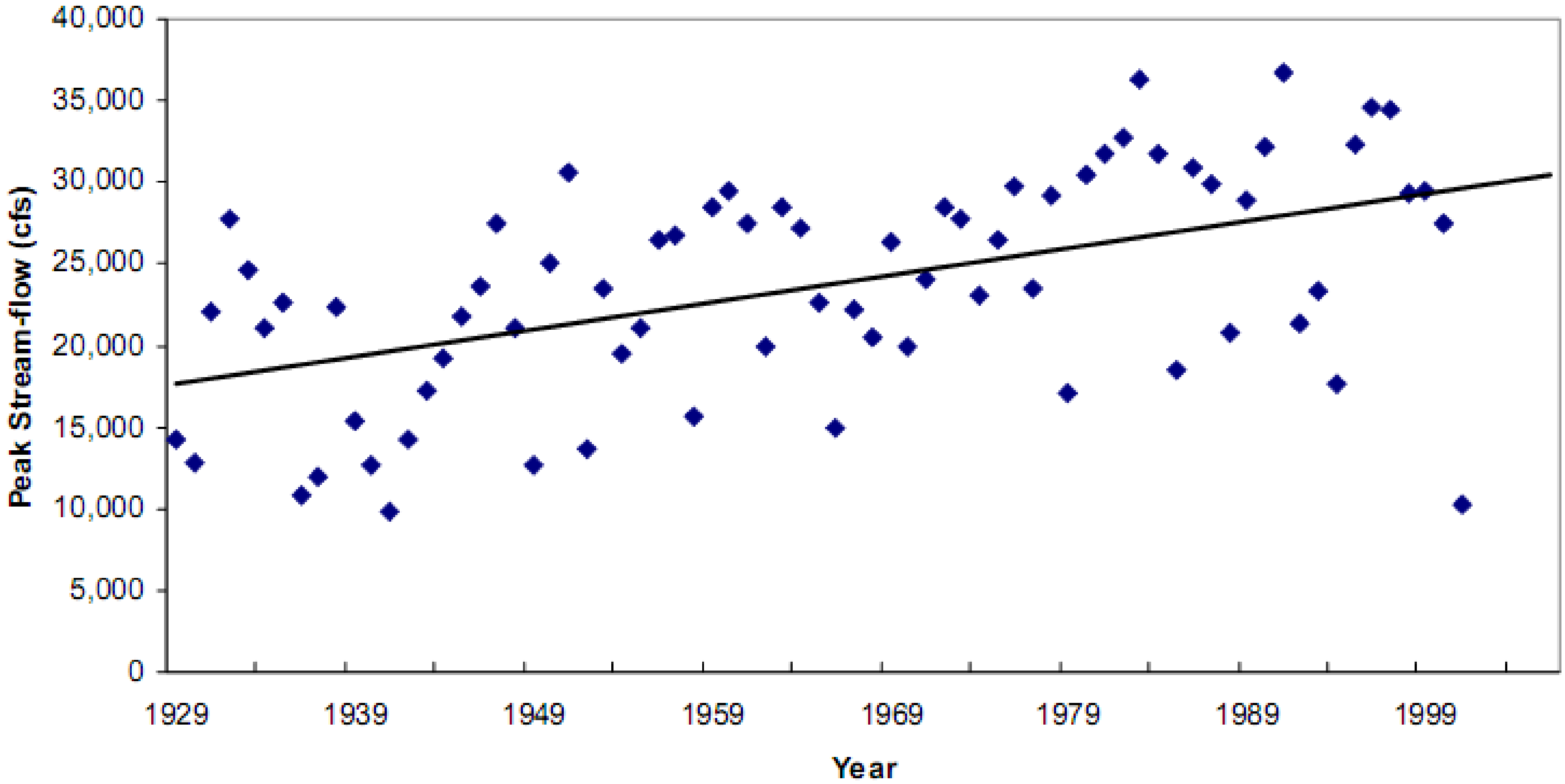
- ***Strong Evidence*** seals are impacting declining marine survival
- Shifting distributions of predators and prey, from phytoplankton to higher trophic levels of opportunistic predators



So What's Really Affecting the Fish?
Freshwater Survival

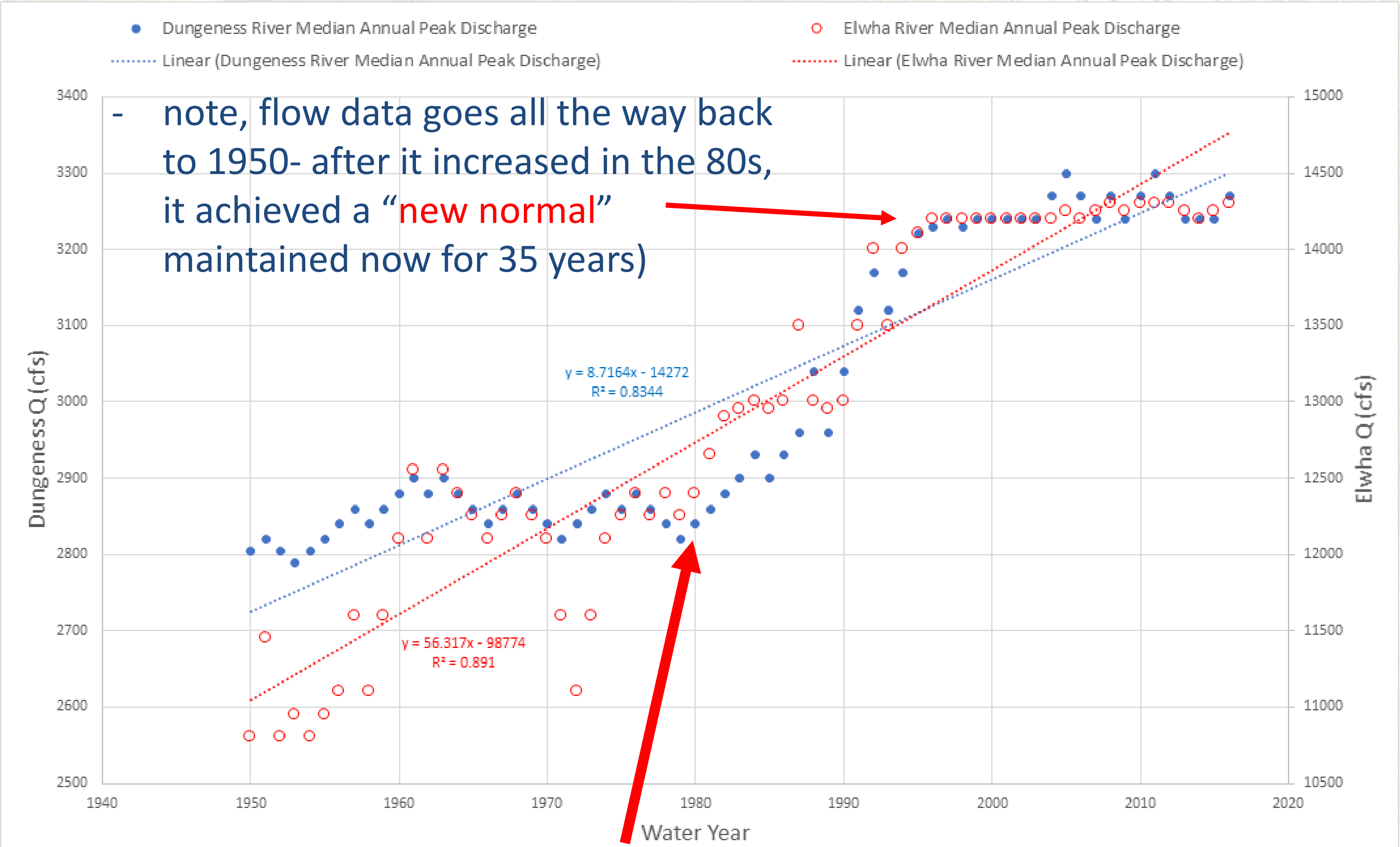
- **Declining Freshwater Survival**: Flooding is the largest source of freshwater mortality (eggs)

Increasing in Winter Peak Flows …



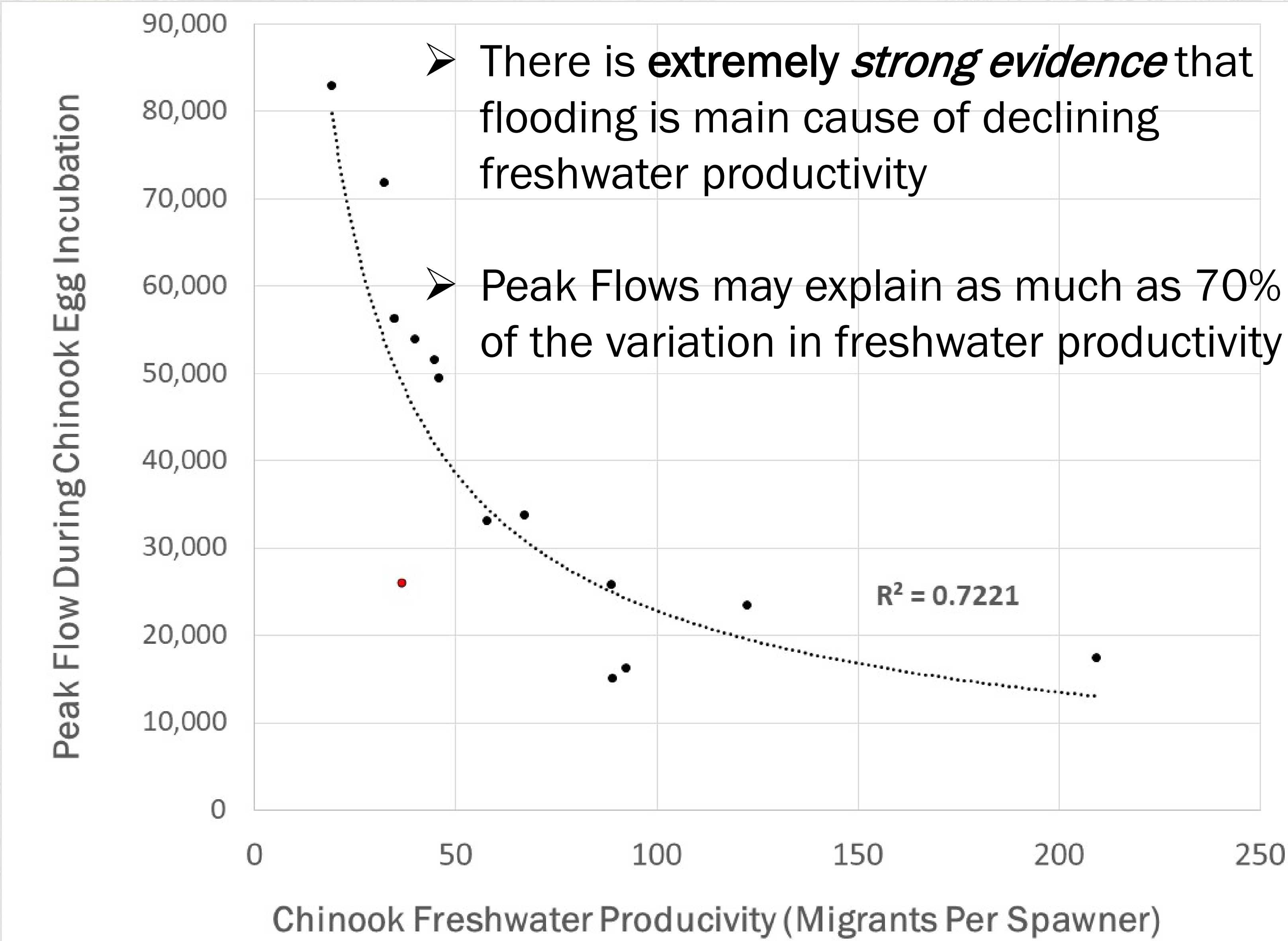
SOURCE: Stillaguamish Chinook Salmon Recovery Plan

So What's Really Affecting the Fish?



Evidence for a major Climate Signal and Regime Shift in the 1980s

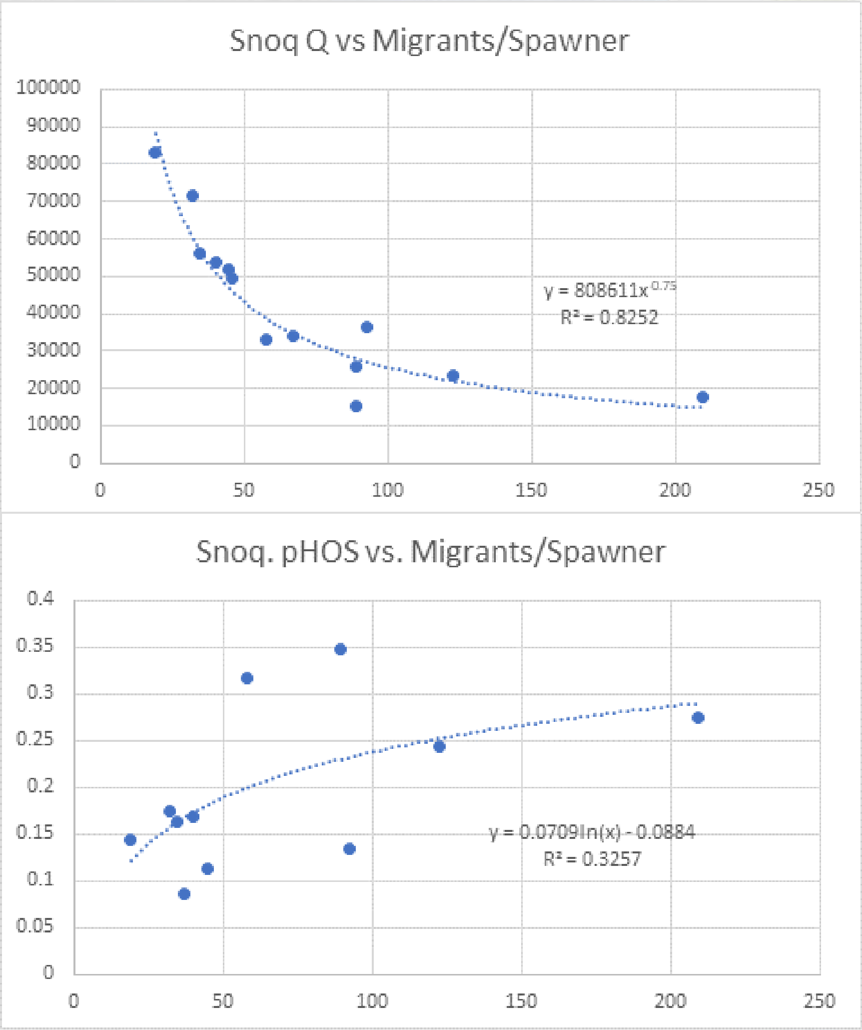
So What's Really Affecting the Fish? Problems in Freshwater



- There is **extremely *strong evidence*** that flooding is main cause of declining freshwater productivity
- Peak Flows may explain as much as 70% of the variation in freshwater productivity

So What's Really Affecting the Fish?

How does hatchery fish on spawning grounds compare to risks from other impacts (e.g. flooding)?

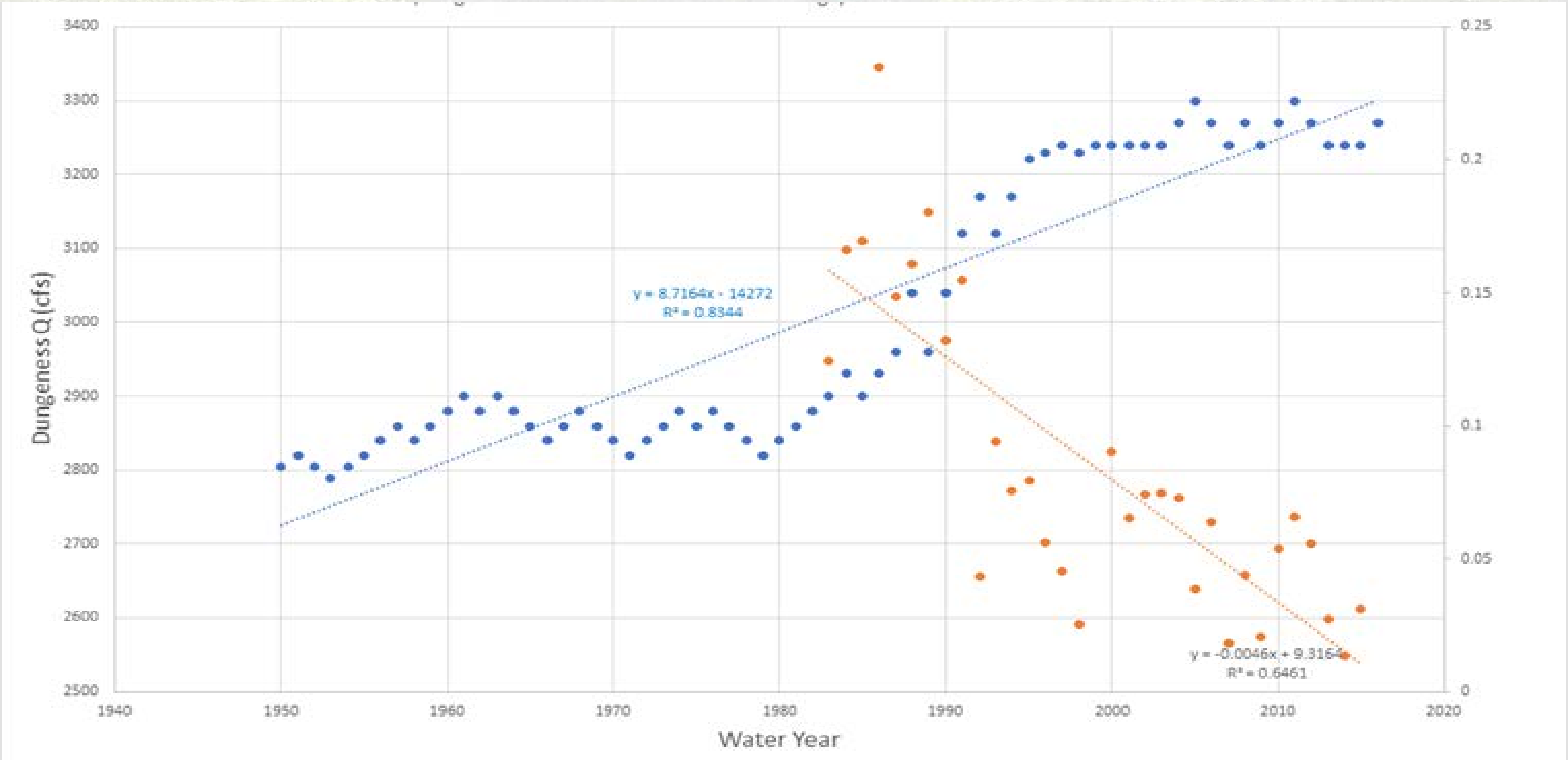


Peak flow (Q) negatively correlated, pHOS positively correlated, with number of migrants per spawner: Snoqualmie Chinook

So What's Really Affecting the Fish?

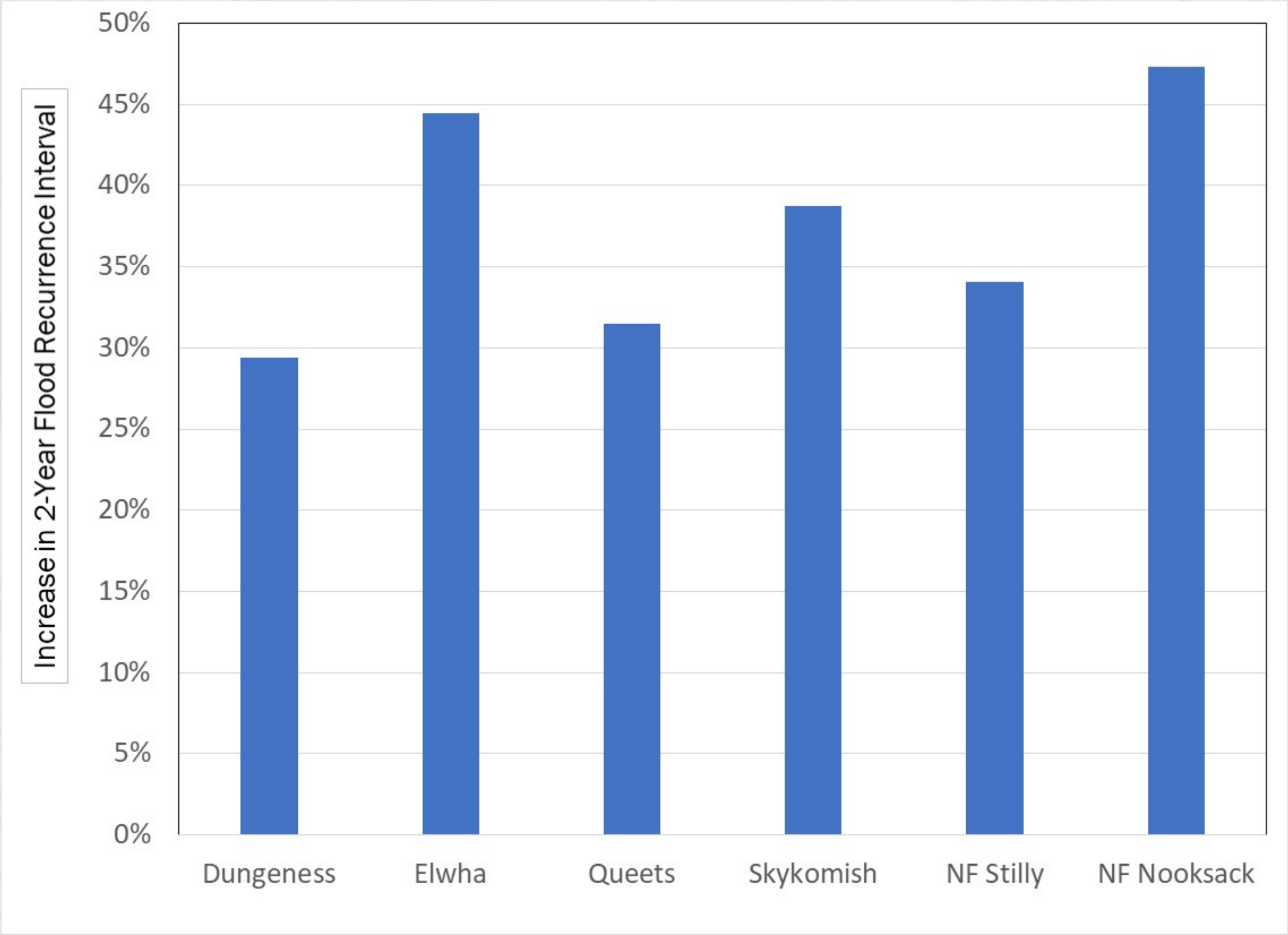
Evidence for major Climate Signal and Regime Shift in 1980s

The decline in coho marine survival shown earlier (orange line here) coincided with a significant increase in frequency and intensity of flooding during the same time - indicating large-scale processes affecting the Pacific Ocean and Pac. NW rivers



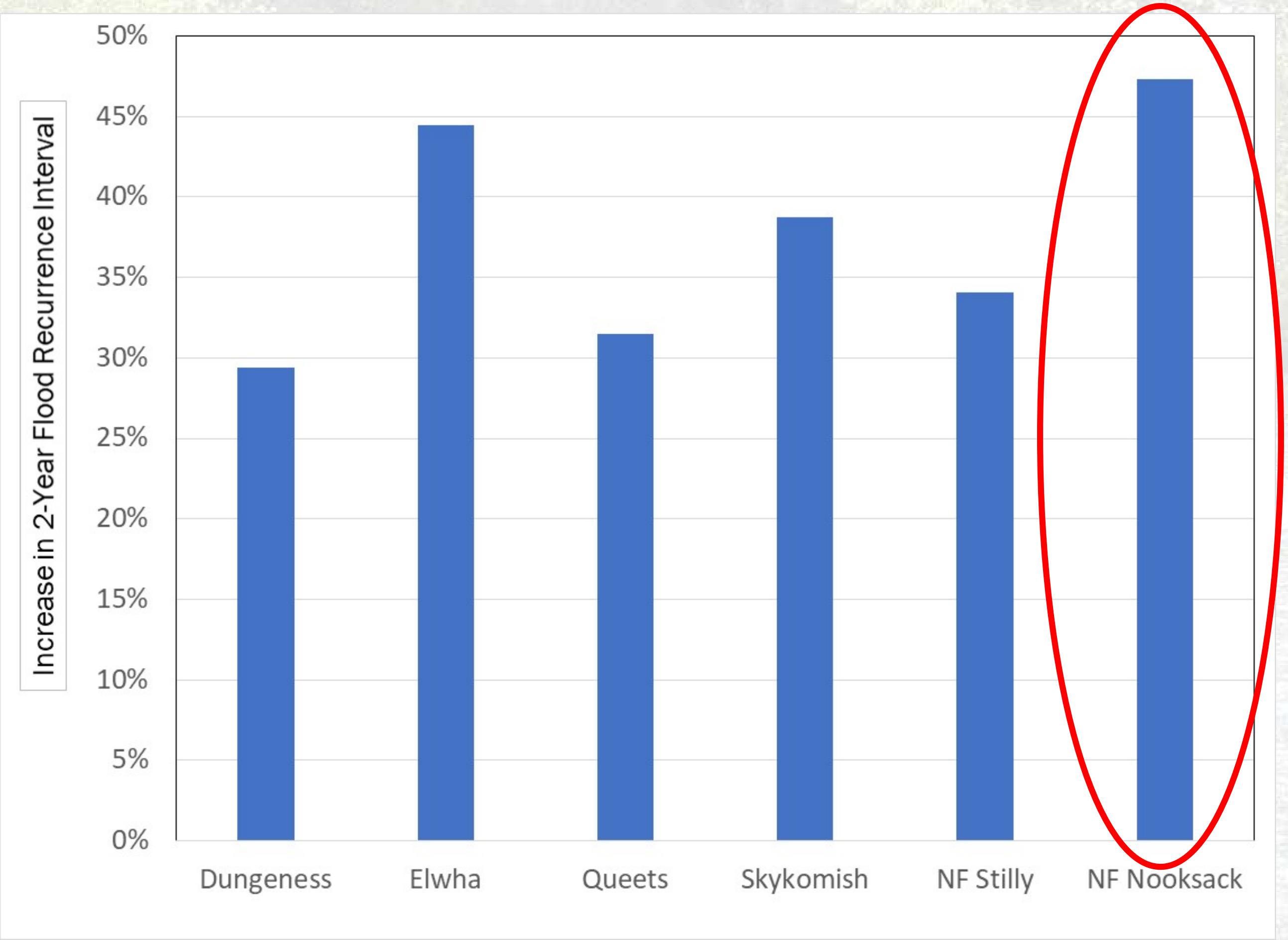
So What's Really Affecting the Fish?

- Here we see the same flow increase in the Queets, Skykomish, Stillaguamish, Nooksack, everywhere we've looked:
  - this is the increase in the 2-year flood recurrence interval since 1980
  - compared to flow data going way back to the period of record ~1950



So What's Really Affecting the Fish?

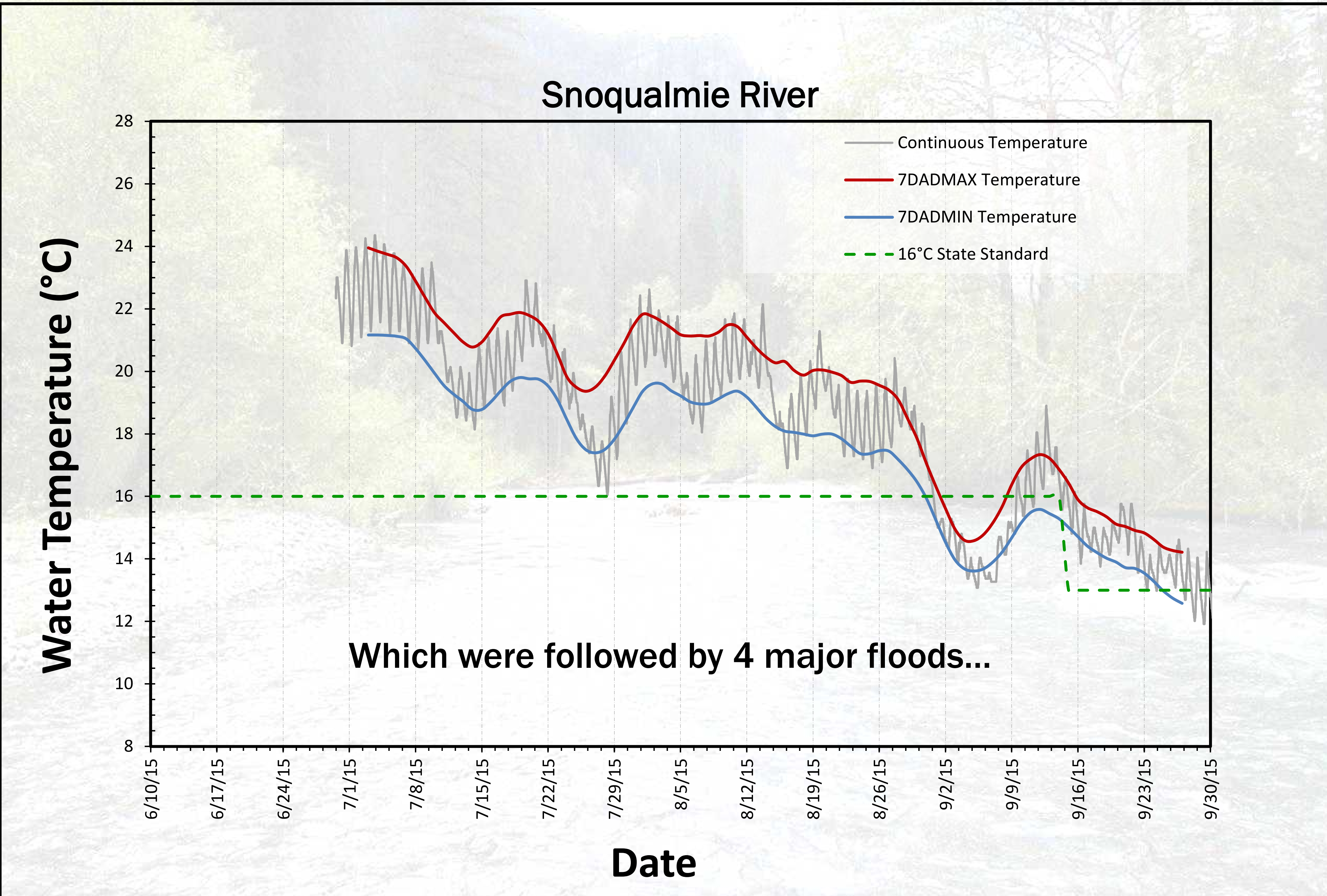
- This is a big reason why we have Chinook conservation programs in the NF Nooksack, Dungeness, Stillaguamish, etc.
- Also, why nearly every Chinook hatchery program in Puget Sound propagates listed fish



So What's Really Affecting the Fish?
Freshwater Survival

Record high water temperatures and low flows are also increasingly harming earlier-returning **adults** (spring and summer Chinook) **AND yearling fish** that have to reside all summer in the rivers under water temps that regularly exceed State Standards

And record high water temperatures
- above state standards and above lethal threshold for Chinook salmon



- More precipitation falling as rain vs snow
- Leading to record low summertime flows

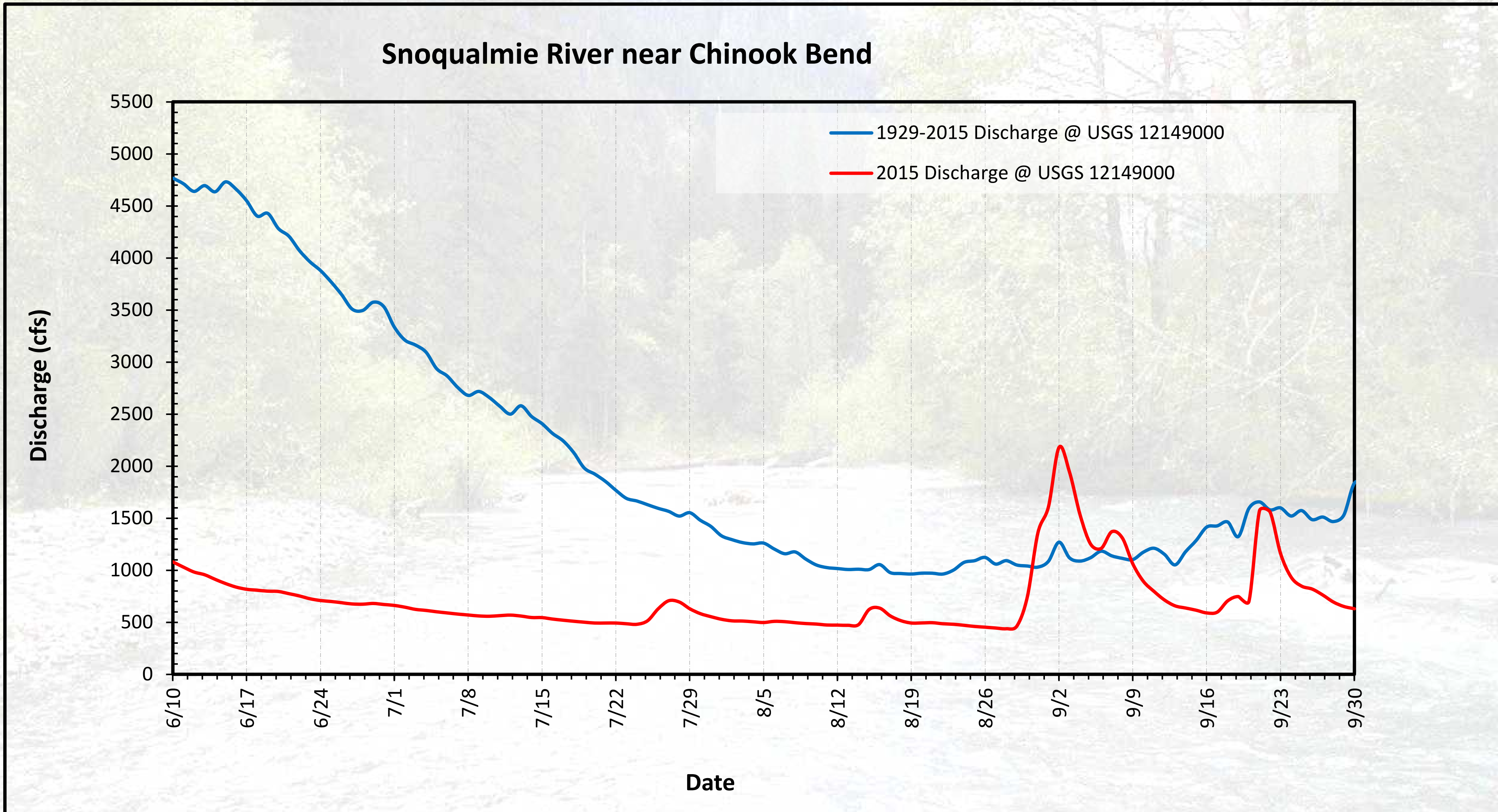


Figure provided by Joshua Kubo, King County, and the Snoqualmie River Watershed 2015 Water Temperature Study

Comanager Hatchery Policy: Addressing Concerns
Contributions to Recovery:
Concerns over the impact of hatchery fish on recovering wild fish

There are numerous examples of wild stocks that have gone extinct or are declining in the absence of hatchery production, which is never mentioned

There are numerous examples of hatchery programs preserving natural stocks from extinction, which is never mentioned

There are dozens of examples that demonstrate benefits of hatchery supplementation and reintroduction:

- **Successful introductions and reintroductions of hatchery fish to unused habitats:**

Washington State:

Lake Ozette sockeye, Lake Washington sockeye, Jimmycomelately, Lilliwaup and Chimacum Creeks, Big/Little Quilcene and Tahuya River summer chum, Samish River Chinook

There are dozens of examples that demonstrate benefits of hatchery supplementation and reintroduction:

In other parts of the world (e.g. South America, Great Lakes, New Zealand);

- New Zealand Chinook introductions dating back to 1901 have been successful

- Introductions of Chinook and coho salmon and steelhead trout into the Great Lakes from the Pacific Northwest resulted in big sport fisheries in Lake Superior and the other lakes.

- Chinook (UW Chinook stock) introduced to South America, have resulted in what has been referred to as “spectacular” sport fisheries in Chili and Argentina, while rapidly expanding their abundance and distribution, crossing the cape and populating streams in the Atlantic.

Numerous populations saved from extinction by hatchery intervention
(e.g., Redfish Lake and Lake Ozette Sockeye, White, Elwha, Dungeness, Tsoo-Yess, and Hoko River Chinook, SF Nooksack River spring/summer Chinook) to name a few

Numerous populations extirpated or functionally extinct in the absence of hatchery intervention

(e.g. Dungeness River summer chum, Morse Creek, Lake Ozette, Sekiu, Pysht, Duckabush, Hamma Hamma, and Dosewallips River Chinook, Skokomish spring Chinook, North Lake Washington and Cedar River steelhead)

Comanager Hatchery Policy
Harvest Concerns:

- Negative hatchery effects on natural populations are often discussed as if they are certain but are in most cases theoretical and where measurable, are of low significance

From hatchery effects workshop:

*"Relationships between PNI, pHOS, pNOB, and fitness **is based on models**"*

*"Risk is **uncertain**, because relative consequences of the hazard are also **uncertain** –does low PNI and high pHOS affect the abundance and viability of natural spawning populations?"*

*"Most studies include only the first-generation HOS spawners, so it is **uncertain** if lower relative RS is genetic (heritable)"*

*"Numerical magnitude of hatchery production suggests competition likely but consequences are **uncertain**"*

*"High **uncertainty** of context-dependent consequences for natural populations"*

Comanager Hatchery Policy: Addressing Concerns
Best Available Science vs Scientifically-Sound and Defensible:

Problems with Scientific Integrity, Ethics, and Supporting Sustainable Fisheries Mandate

- We have observed clearly-biased, scientifically unbalanced papers and processes lacking objectivity and inclusion of Tribal input that subverts Tribal Co-Management authority, sovereignty and contributions to BAS and undermines the importance of Tribal hatcheries in an unethical manner
- These include: intentional and unintentional omissions and alterations of data and scientific findings, repeated omissions of fact and opposing viewpoints, lack of transparency, sources of data, caveats and context of uncertainties; that call into question whether conclusions are impartial
- We have observed numerous examples of distorting or selectively releasing scientific analyses or data for public communication that do not follow basic ethical guidelines such as **Administrative Order 202-735D.2, titled "*Scientific Integrity*"**

IN SUMMARY: We can agree to state:

"Hatcheries are to be designed and operated using Best Available Science in a Scientifically-Sound and Defensible Manner"

Comanager Hatchery Policy: Addressing Concerns
Best Available Science vs Scientifically-Sound and Defensible:

You probably have not heard:

- Fitness loss between hatchery and natural Chinook salmon has not been shown to be heritable
- Studies show reduced productivity of hatchery fish in some natural settings but do not show heritable effects
- Studies that follow natural production from hatchery Chinook show that subsequent generations have the same productivity as fish without hatchery grandparents

Comanager Hatchery Policy: Addressing Concerns
Best Available Science vs Scientifically-Sound and Defensible:

You probably have not heard:

- Studies have shown that hatchery fish that do not return to the hatchery may not return to optimal spawning habitat
- So reduced productivity of hatchery fish may be due to poor spawning site selection or lack of available habitat
- Natural progeny of hatchery fish tend not to spawn in the poor sites that their parents chose, and rather migrate to different sites used by natural-origin fish
- At that point their productivity becomes equivalent, regardless of ancestry

Comanager Hatchery Policy: Addressing Concerns
Best Available Science vs Scientifically-Sound and Defensible:

Problems with Scientific Integrity, Ethics, and Supporting Sustainable Fisheries Mandate

Elwha Coho Example:

- **During and after dam breaching, hatchery coho were relocated to tributaries**
  - These reintroductions led to immediate spawning and good survival with smolts/mile comparable to other healthy coho populations
  - This is *strong evidence* that a population heavily influenced by a hatchery for several decades is very capable of recolonizing new habits and reproducing at high rates
  - 2023 Forecast: 3,666 HOR and 3638 NOR
- These are entirely a result of the hatchery reintroductions and are a positive story not being mentioned in the rebuilding of Elwha salmon with hatchery fish

Comanager Hatchery Policy: Addressing Concerns
MORE on Contributions to Best Available Science:

Problems with Scientific Integrity, Ethics, and Supporting Sustainable Fisheries Mandate

This should be an important success story that should be published

- Unfortunately on the Elwha (and in general), some scientists prefer to spend their time on the minutiae of theoretical harm that could be caused by hatchery fish

- Rather than real world examples of success that challenge assertions

- And we continue to see hatcheries wrongly implicated in the decline of natural-origin salmon and steelhead populations

IN SUMMARY: We can agree to state:
"Hatcheries are to be designed and operated using Best Available Science in a Scientifically-Sound and Defensible Manner"

Comanager Hatchery Policy: Addressing Concerns
Finally, no more on Contributions to Best Available Science:

Scientists Slowly Reintroducing Small Group Of Normal, Well-Adjusted Humans Into Society

NEWS
March 25, 2016

VOL 52 ISSUE 11

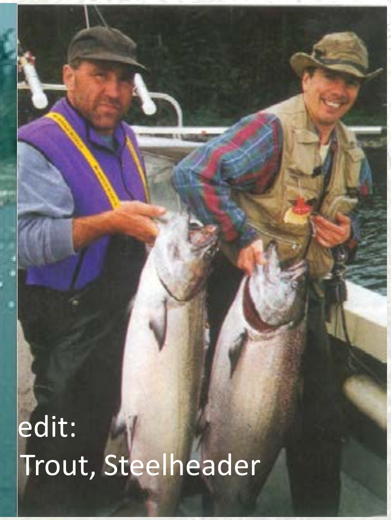
Science & Technology · Science · People

A member of the endangered subtype of human, who possesses the unusual abilities to calmly reflect on situations and view the world from others' perspectives, is reintroduced into the population.

"Even if this small group of humans able to deal with their negative emotions in a nondestructive manner manages to flourish, there's still no telling whether the next generation will be able to survive."

Co-Management

It's Better, and, it's the Law- So, let's do it together !




THE END