Conserving Wetlands for ESA Listed West Coast Salmon


Photo credit: Mary Kentula

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NOAA Fisheries
West Coast Region

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Outline

- Status of ESA listed West Coast salmon and steelhead (salmon)
- Complexity of the ESA Recovery Challenge
- Challenges and Opportunities
  - Regulatory - section 7 example
  - Restoration -

Listed Species

Endangered Species Act (ESA) Purpose

Provide a means whereby the ecosystems upon which endangered and threatened species depend may be conserved

Conserve

To use and the use of all methods and procedures which are necessary to the point at which…species can be “delisted”

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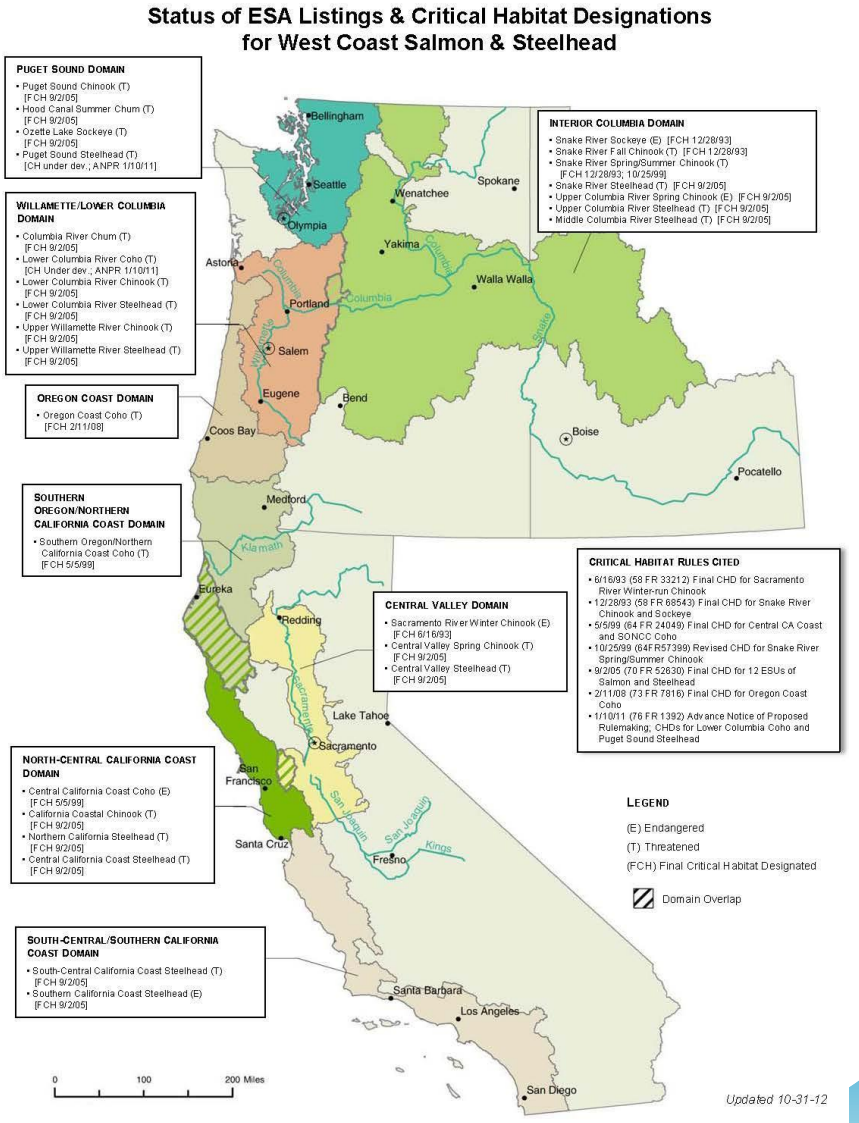
ESA Recovery Domains

28 ESA listed salmonid species – ESUs and DPS

SPECIES
Chinook
·Spring
·Summer
·Fall
Sockeye
Coho
Chum
Steelhead



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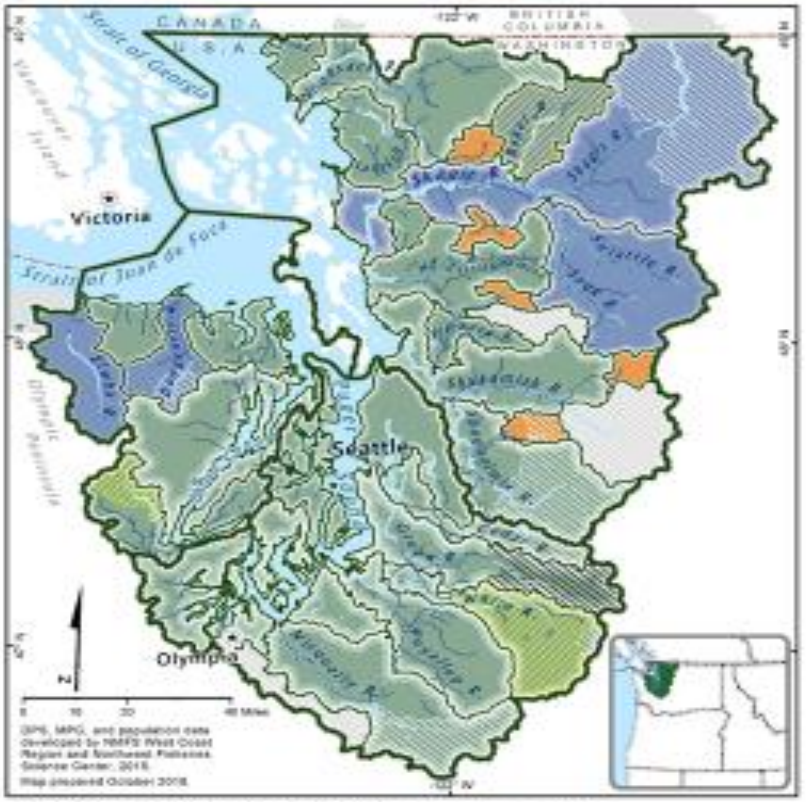
Puget Sound Steelhead Demographics



- 1 Distinct Population Segment (DPS)
- 3 Major Population Groups (MPGs)
- 32 Demographically Independent Populations (DIPs)
- 5 Summer-run DIPs**
- 27 Winter-run DIPs
- Non-listed resident life histories

- Current abundance is <5% of historic
- Some populations nearing extinction (e.g., Cedar R.)
- Most populations have continued to decline since the mid-80s and before, but some may be stabilizing
- Some optimism (e.g., Elwha R.)

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Factors Affecting Salmon and Steelhead Viability

Habitat - freshwater/estuary/nearshore

- Dams
- water withdrawal
- Channel/floodplain modifications
- urbanization
- Timber
- Agricultural

Hatcheries

Harvest

Predators

Early marine mortality

Ocean conditions

Climate Change









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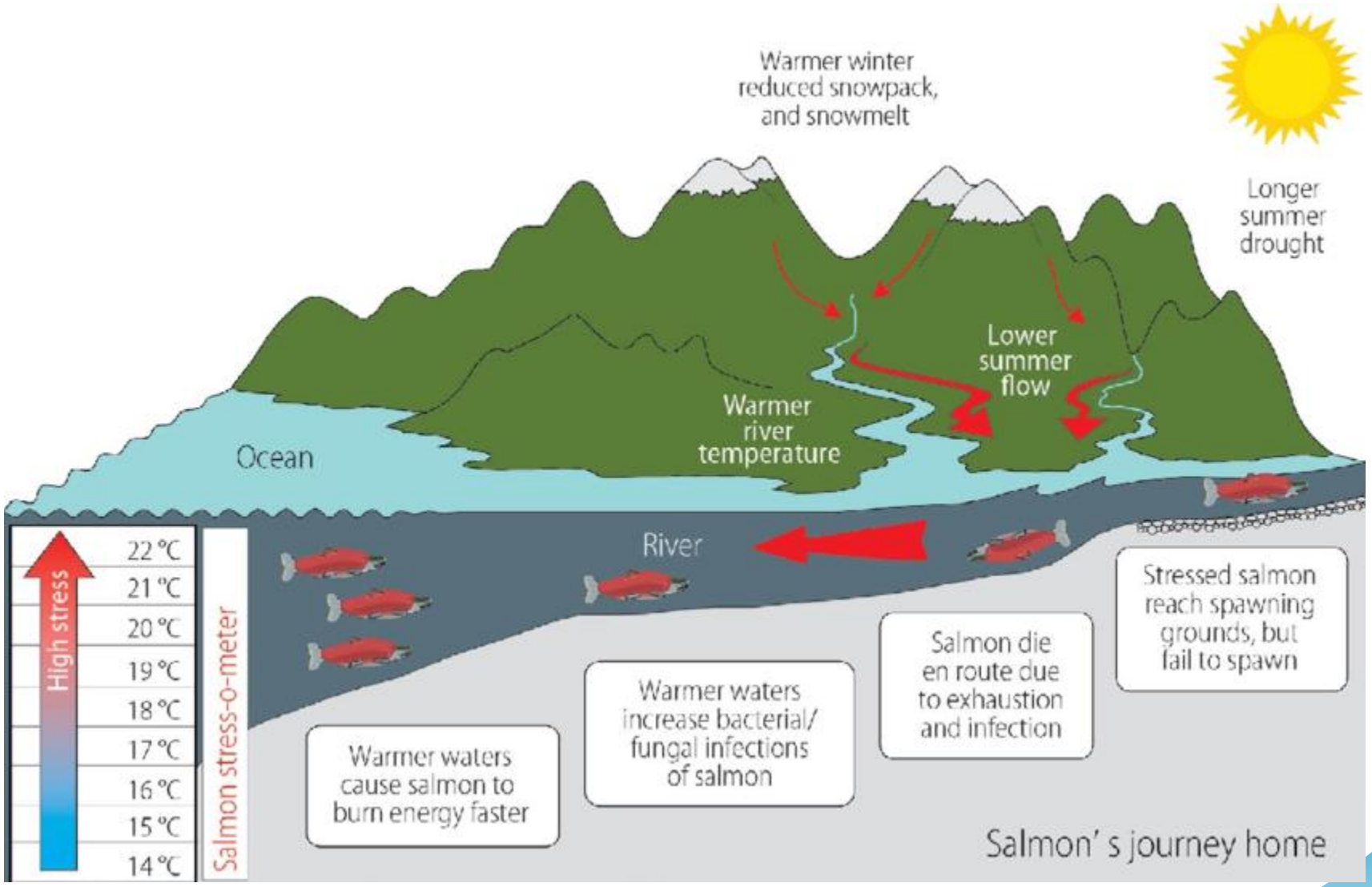

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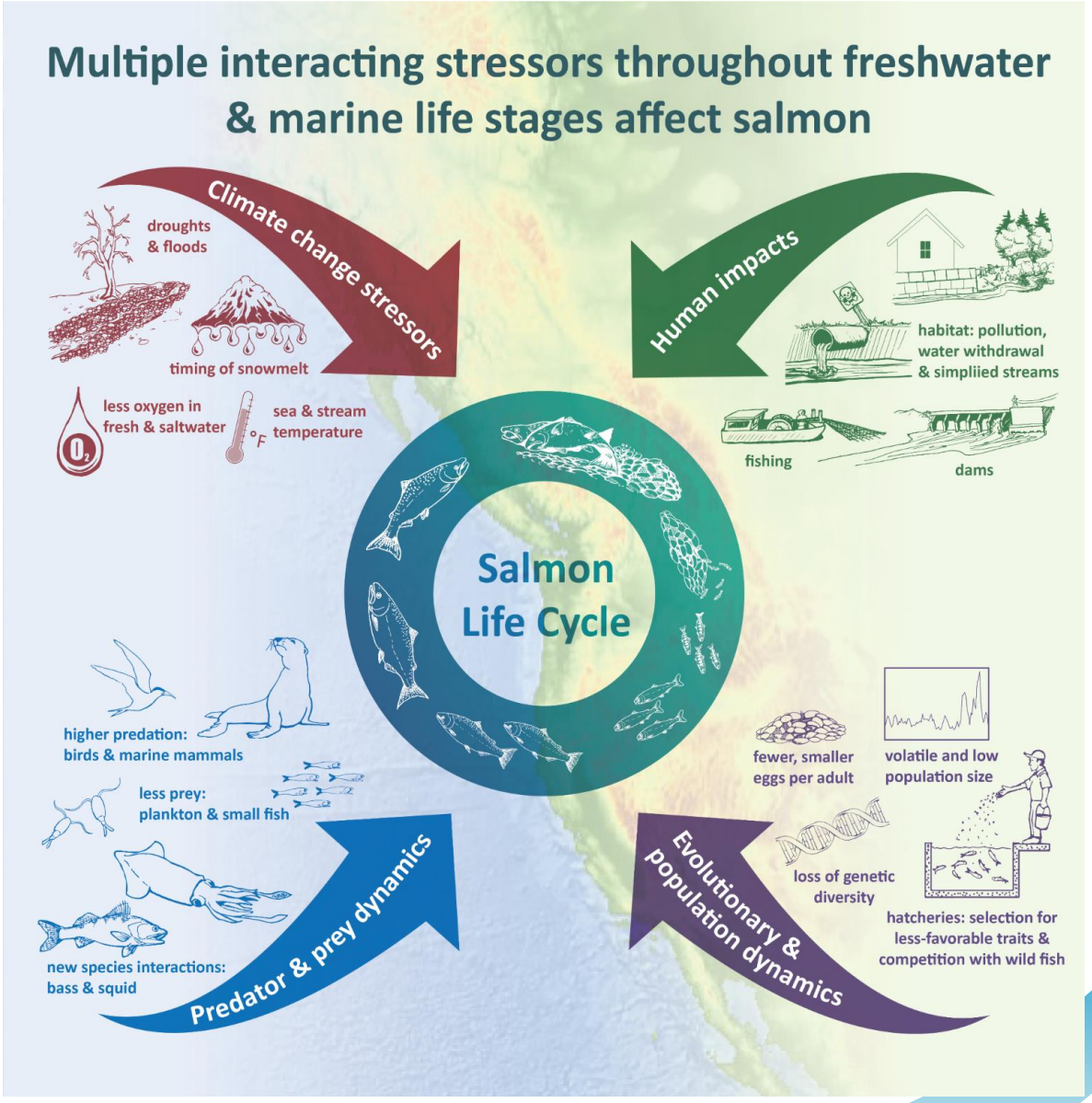
Life Cycle Stressors & Climate Change



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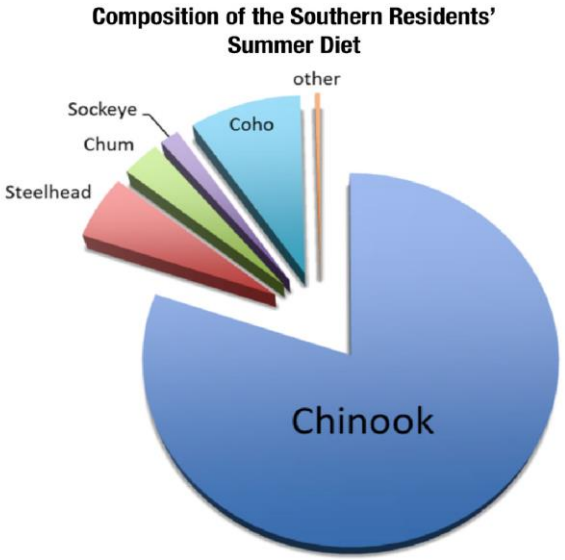
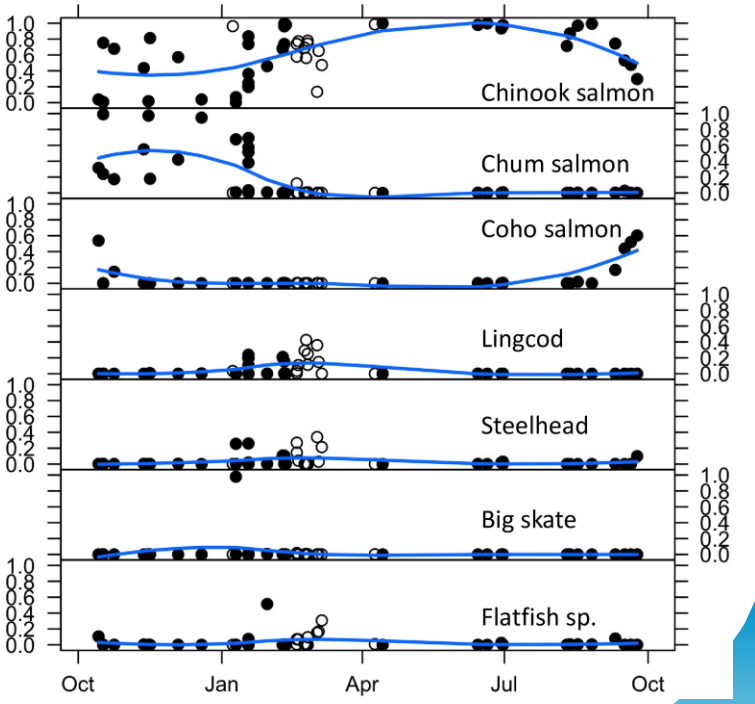
Southern Resident Killer Whales primary prey: Chinook salmon



Salish summer prey - From Hanson et al. 2010

Seasonal diet – Hanson et al. 2021. Open circles = outer coast, solid = Salish



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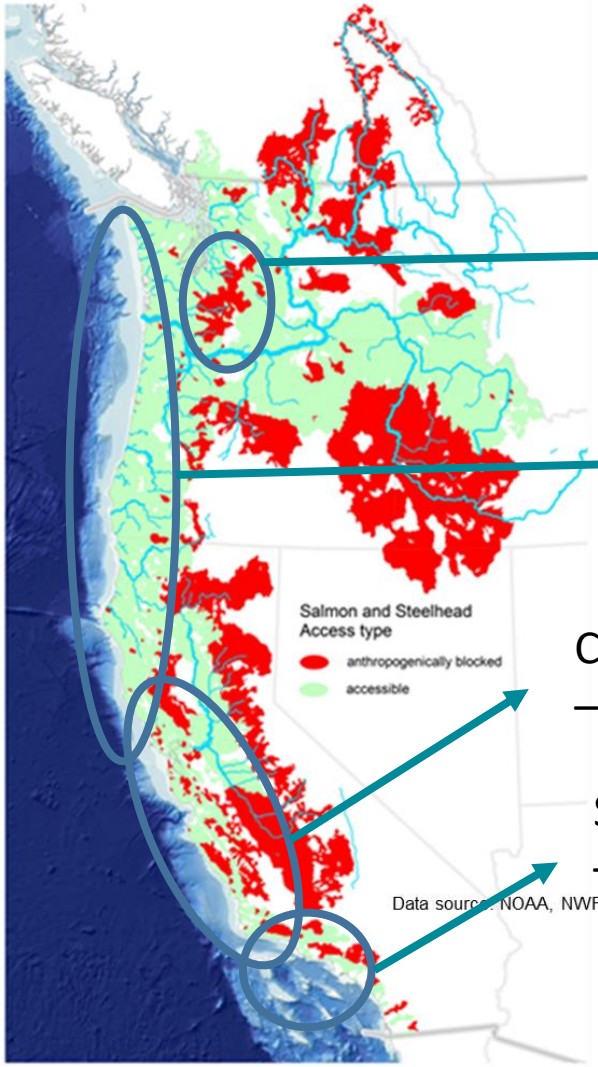
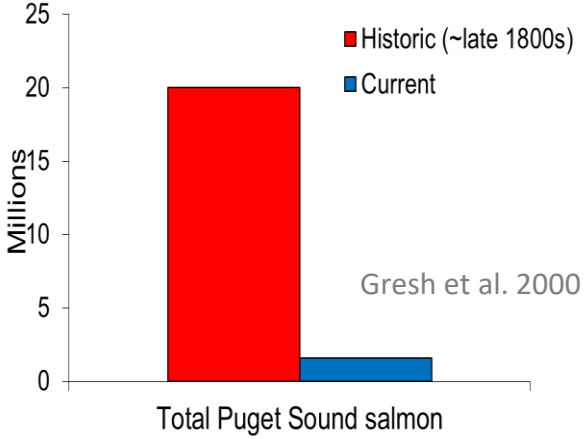
Decline of wetlands and salmon



Salish sea
– 85% wetland loss
Brophy et al. 2019

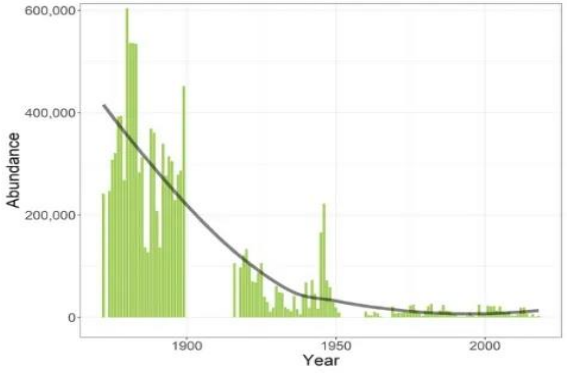


Gresh et al. 2000

WA, OR, NO CA Coast
– 68% wetland loss

Spring Run Chinook salmon Sacramento Valley

Central CA
– 92% wetland loss



Southern CA
– 59% wetland loss

https://californiawaterblog.com/2021/12/05/science-of-an-underdog-the-improbable-comeback-of-spring-run-chinook-salmon-in-the-san-joaquin-river/

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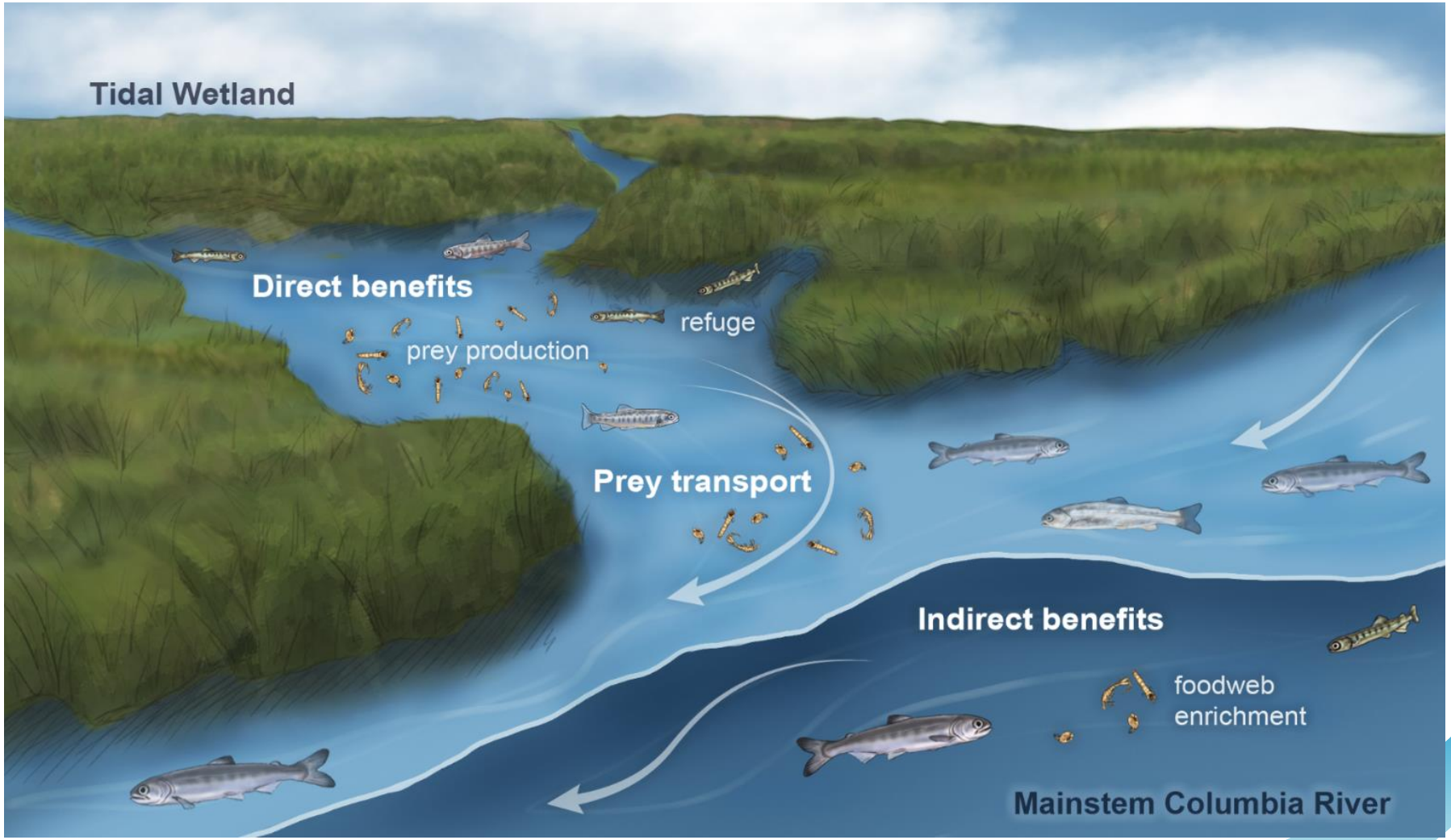
Conceptual model of salmon use of tidal wetlands.



PNNL and NMFS 2020

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Key Threats: Central Valley example

Dams: Block passage; 95% loss of spawning habitat for Central Valley salmonids

Water Diversions: Juvenile entrainment and flow modifications

In-river Predation: Contributes to low juvenile survival rates

Climate: Recent coastal upwelling conditions, long-term precipitation patterns

Habitat Loss and Fragmentation: 98% loss of floodplain and riparian habitat

Fishery Effects: Ocean harvest estimated at ~20% for winter-run*

Water Quality: Impaired water quality in the lower river systems and the Delta

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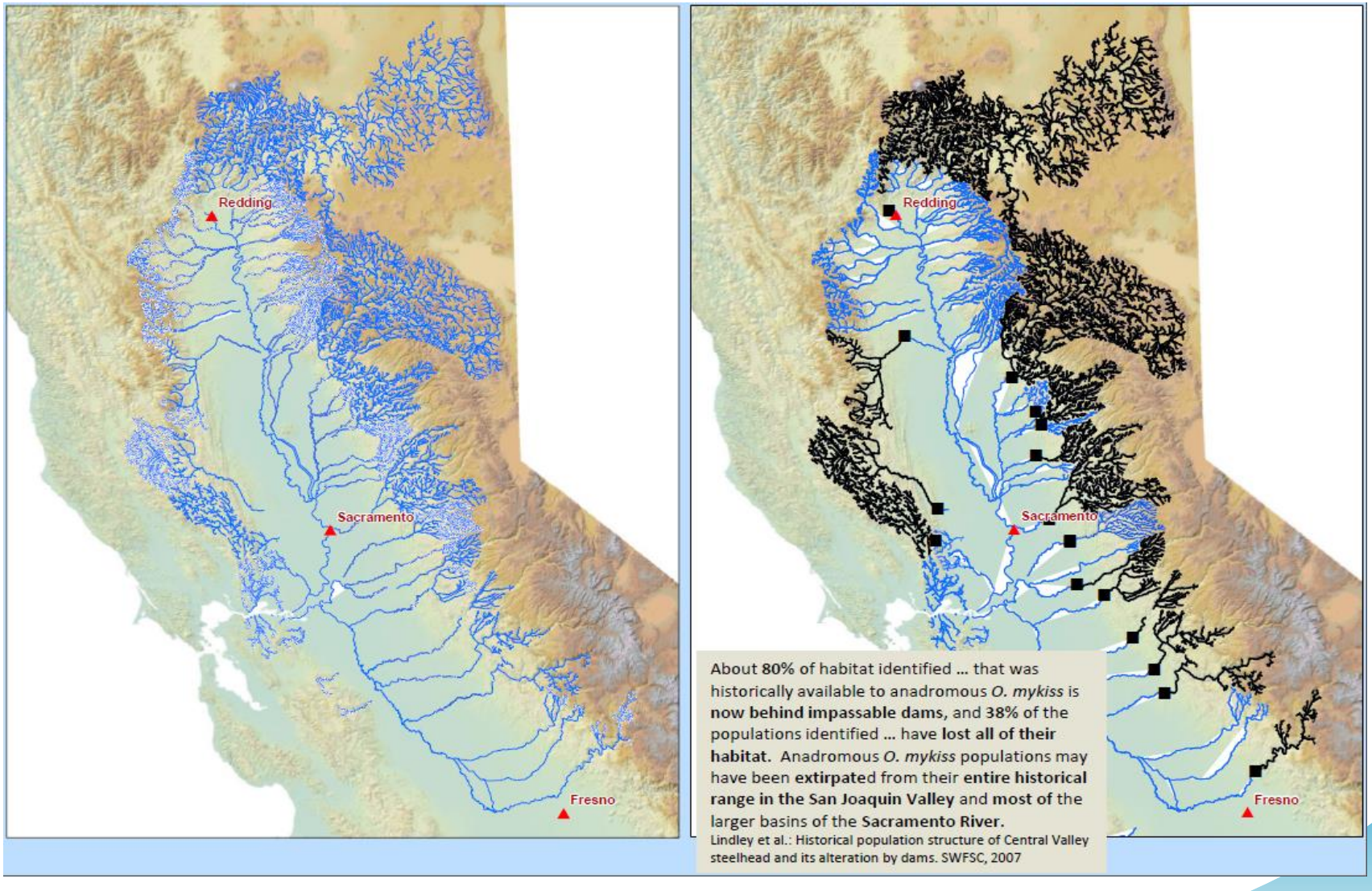
Then

Now



About **80%** of habitat identified … that was historically available to anadromous *O. mykiss* is **now behind impassable dams**, and **38%** of the populations identified … have **lost all of their habitat.** Anadromous *O. mykiss* populations may have been **extirpated** from their **entire historical range in the San Joaquin Valley** and **most of** the larger basins of the **Sacramento River.**

Lindley et al.: Historical population structure of Central Valley steelhead and its alteration by dams. SWFSC, 2007

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Challenges & Opportunities

Regulatory – Using our suite of authorities to recommend or require mitigation to the maximum extent of our authorities, seek optimal conservation outcomes

Restoration – Using opportunities through grants and partnerships to improve ecological conditions – provide true lift from current conditions

Our ESA section 7 work: Species conservation & recovery

"The **purposes of this Act** are to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be **conserved**…"

~ 400 opportunities each year to help protect listed species

Upfront investment is key to conservation gains!

- Work with action agencies to develop conservation measures to avoid, minimize, or offset impacts

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Challenges & Opportunities - Regulatory

Regulatory Mitigation - Optimize conservation outcomes

- NMFS-NOAA Mitigation Policy 2023
  - Avoid impacts to high value habitats
  - Minimize impacts
  - Compensation that is proportional to impacts and offsets impacts to the full extent of authorities
  - Apply a holistic landscape and/or seascape approach (e.g., Use recovery plans, think riverscapes)

Evaluating Habitat Impacts for ESA species

- How determine compensation that is proportional to impacts? Can we agree on how ecological value is determined?

- How do we work and negotiate effectively with partners in permitting, industry, conservation, and academia to collaborate on how ecological value is determined?

- Improving Habitat Evaluation for the Conservation and Management of Nearshore Habitats
  https://marinesanctuary.org/sav-valuation/

Challenges & Opportunities - Restoration

- Protecting what remains and restoring what is meaningful
- Abundant grants, programs and accomplishments for habitat restoration, e.g., PCSRF, Bipartisan Infrastructure Law
- Ecologically and Socially Complex habitat priorities remain e.g., floodplain restoration, reconnecting wetlands, dam removals, restoring riverscape processes, conserving beavers

Restoration - Rediscovering, reevaluating, and restoration lost river-wetland corridors

Wohl et al. 2021 - Frontiers in Earth Science

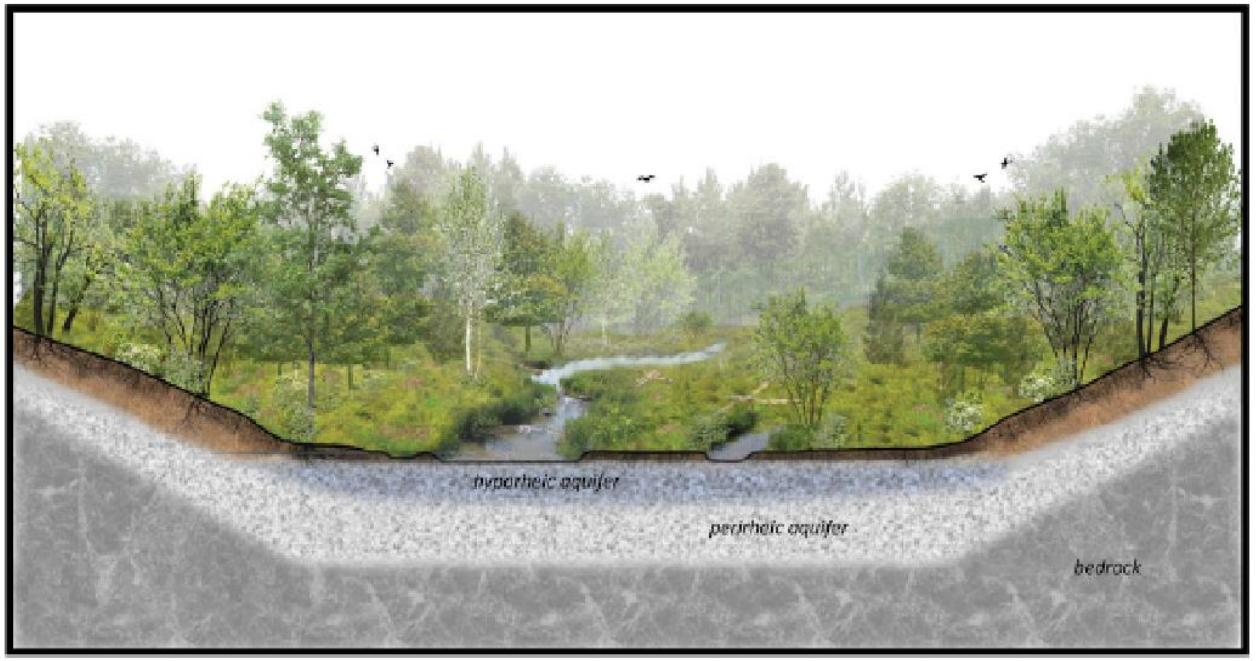

FIGURE 6 | Schematic representation of a fully connected stream corridor where biogeomorphic processes (e.g. large wood, beaver, vegetation) and river-wetland attributes (e.g. valley geometry, channel planforms, channel migration, hyporheic and regional aquifers) interact in complex ways, via multiple, nested feedback loops. Original illustration provided by LandStudies, Inc., Pennsylvania (with permission from Land Studies, 2021).

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Historical to Current Wetlands River Connection

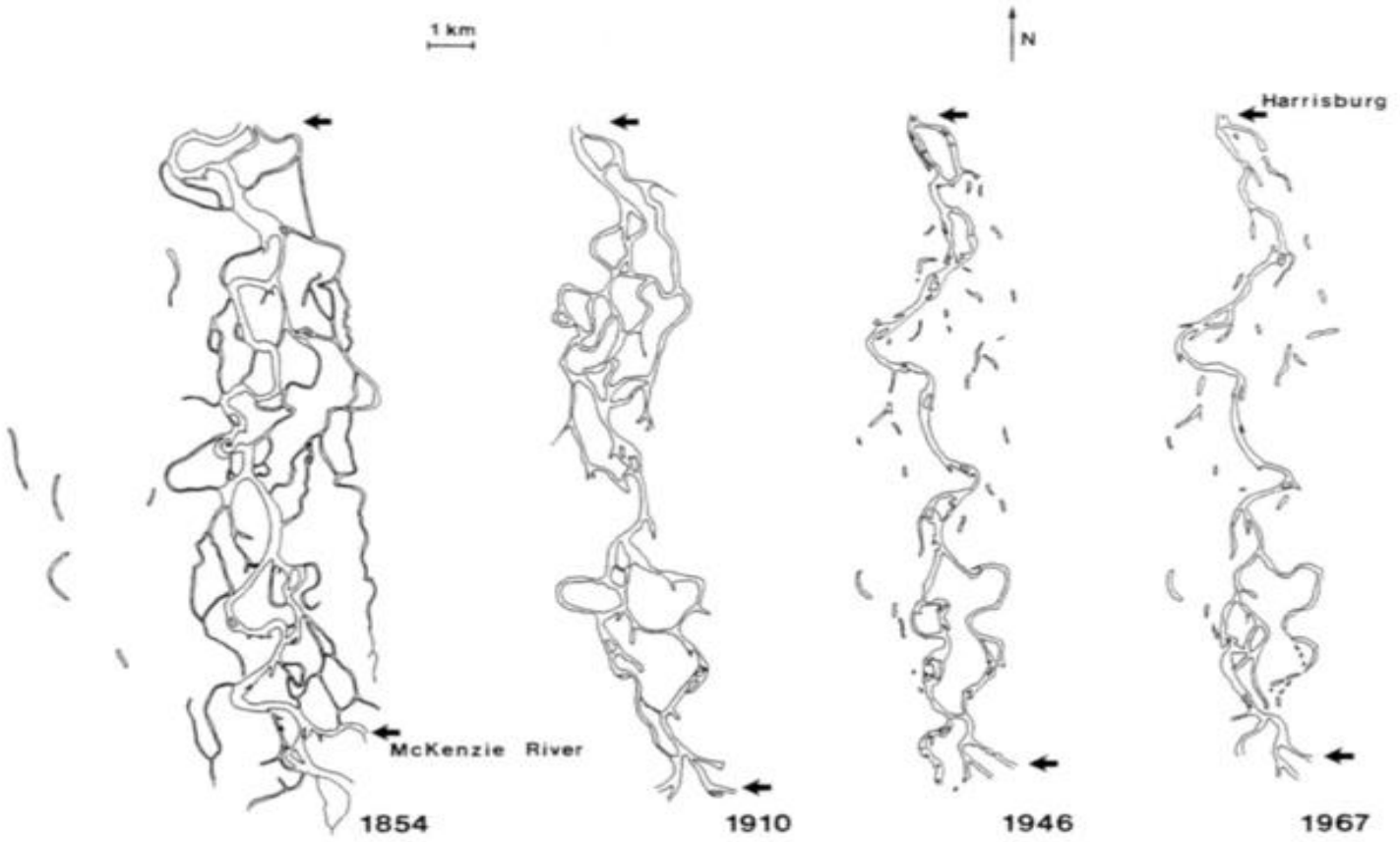

Fig. 2. The Willamette River from the McKenzie River confluence to Harrisburg, showing reduction of multiple channels and loss of shoreline 1854—1967.

Sedell and Froggatt 1984 ~440 citations

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Wetlands Restoration for Salmon

- Historically, salmon ecosystems included interconnected river-wetlands systems that did not distinguish between fluvial and wetlands systems.
- Ecologically, there is no distinction between rivers and wetlands, they are connected.
- To protect and restore listed salmon (and SRKW!) ecosystems, we need to manage wetlands as part of riverscapes.

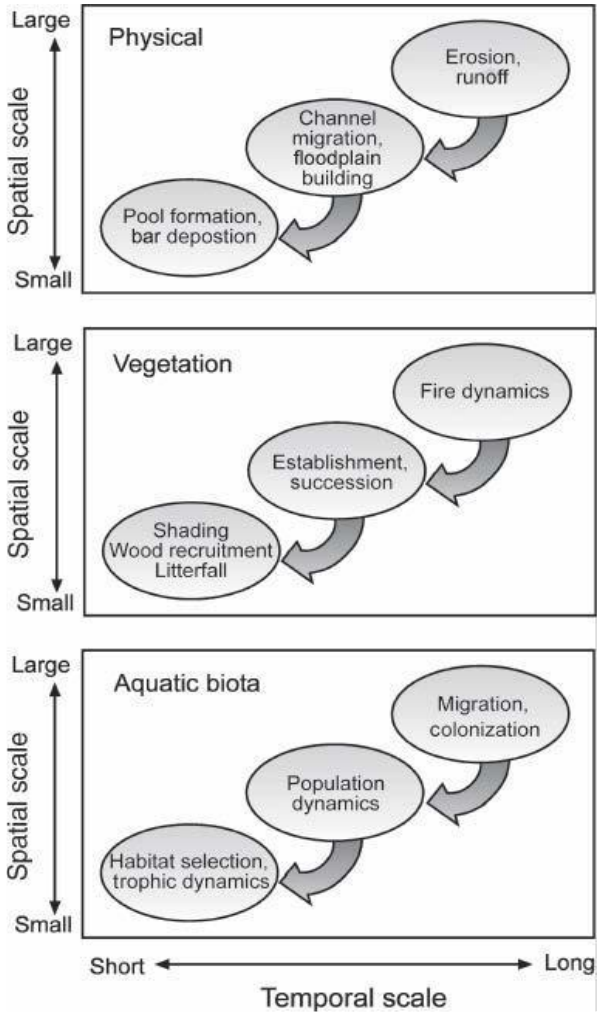
What is process-based watershed restoration?

Restoration that attempts to;

- reestablish normative rates & magnitudes of physical, chemical, and biological processes
- in order to create and sustain river & floodplain ecosystems.

The focus is on processes;

- which are measured as rates, and
- involve the movement of or changes to ecosystem parts and features



Beechie et al. 2010 Processes-based principles for restoring river ecosystems. Bioscience ~450 citations

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Actions should have clearly articulated expected outcomes and recovery times for ecosystem dynamics

As built

Increase in the number of obstructions using post-assisted log structures (PALS) & beaver dam analogs (BDAs)

1 to 4 years

Increase in the number of side channels after several bankfull events

5 to 10 years

Increase in-channel and floodplain complexity after flow events > 2 times bankfull

Weber & Wheaton. 2019
Upper Deschutes Watershed Council presentation

How does process-based watershed restoration help guide on-the-ground actions?

Wychus Creek pre-restoration

How does process-based watershed restoration help guide on-the-ground actions?

Wychus Creek post-restoration

Restoration actions increase habitat diversity, population resilience, and help recover salmon

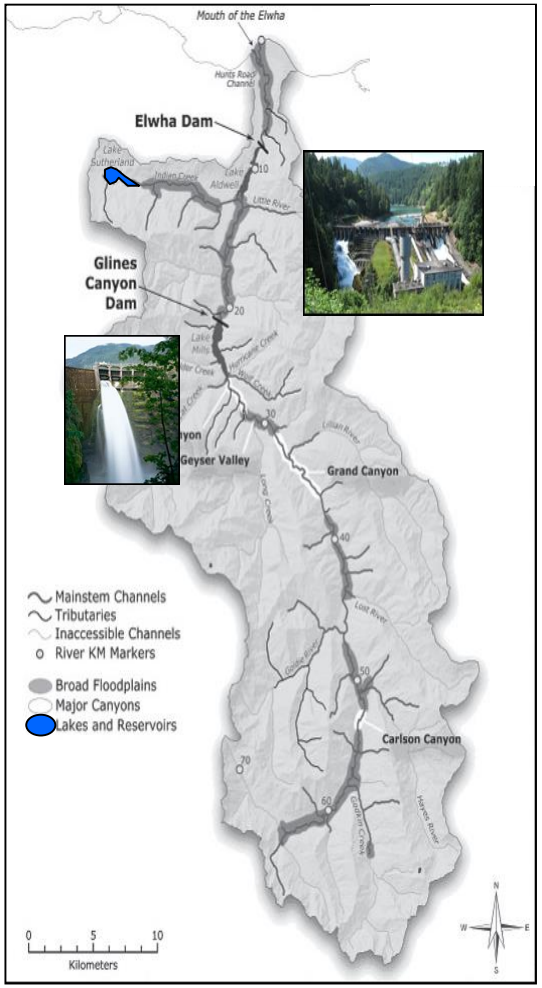
Two dams removed from the Elwha River, Washington State opened over 100km of habitat (Duda et al, 2021)

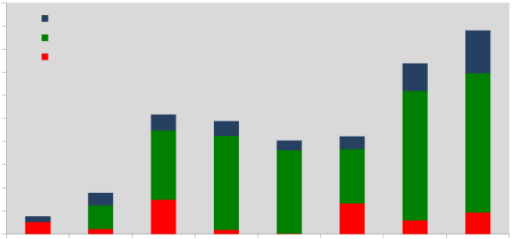
A dramatic increase in sediment resulted in the creation of a river delta/estuary (diverse habitat) (Ritchie et al, 2018)

Adult salmon making it above former dams and spawning in the hundreds to thousands (Pess et al, in review)

Pacific lamprey have had a 12-fold increase in the three years following dam removal (Hess et al, 2021)

'Re-awakening' of summer steelhead, likely owing to the harboring of alleles for run timing in up-river populations (Fraik et al. 2019)





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Additional Info & Opportunities

Restoring Riverscapes

https://www.restoringriverscapes.org/

Improving Habitat Evaluation for the Conservation and Management of Nearshore Habitats

https://marinesanctuary.org/sav-valuation/

Attend one of our informational webinars: May 22 & May 25

Send us an email (westcoast.nearshore.sav@noaa.gov)

NMFS WCR Mitigation Website

https://www.fisheries.noaa.gov/west-coast/habitat-conservation/mitigation-banks-conservation-banks-and-lieu-fee-programs-west

Extra slides

Wohl et al. 2021 - Frontiers in Earth Science Rediscovering, reevaluating, and restoration lost river-wetland corridors

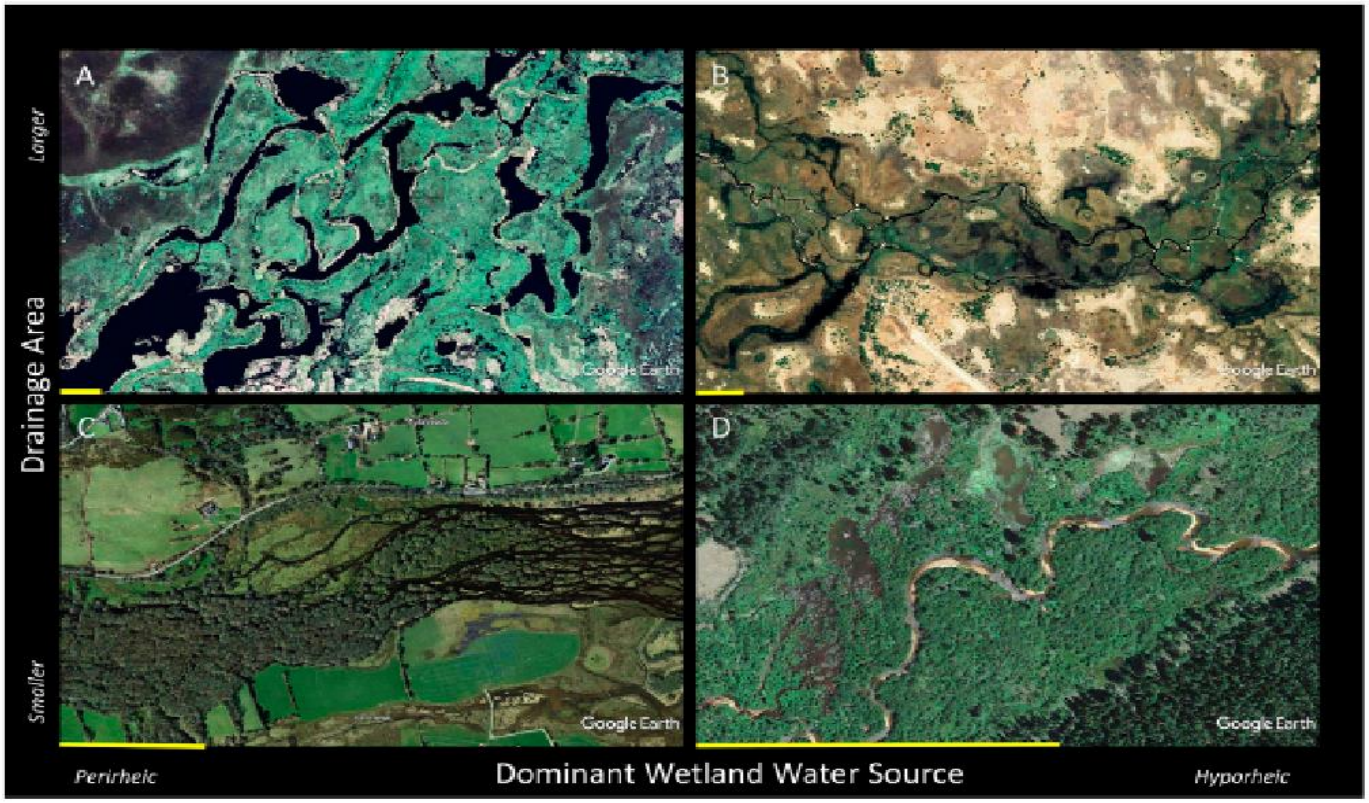

FIGURE 1 | Examples of "contemporary remnants" in which fully functional river-wetland corridors still exist: **(A)** Pantanal, River Paraguay, Brazil; **(B)** Okavango Delta, Okavango River, Botswana; **(C)** The Gearagh, River Lee, Ireland; **(D)** North St. Vrain Creek, Colorado, United States. Each scale bar is approximately 300 m long.

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