ESRs in other regions: NWFSC & SWFSC

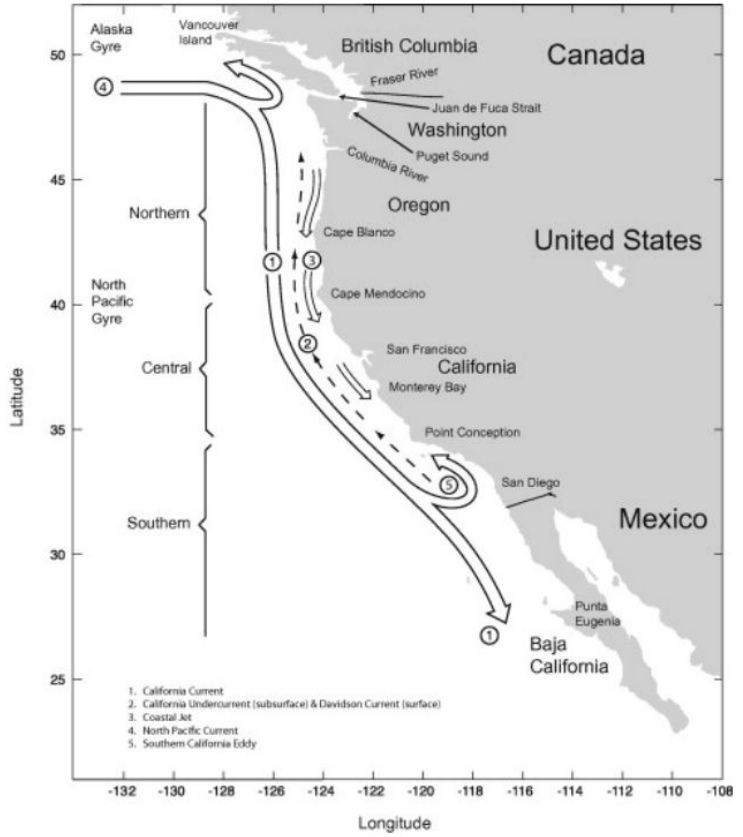
The California Current ecosystem status report

Chris Harvey, NOAA Fisheries Northwest Fisheries Science Center

CIE Review of Alaska ESRs, February 28, 2023

The California Current Large Marine Ecosystem

- Eastern boundary current upwelling system
- Influenced by many basin-scale physical processes
- Rich species diversity, including anadromous stocks
- Productive fisheries across many interacting jurisdictions (federal, state, indigenous, transboundary)

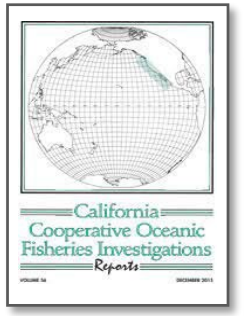


California Current ESR

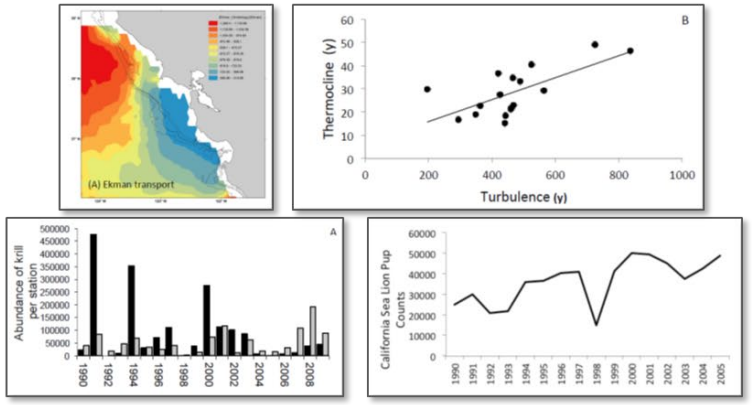
- Jointly produced each year by the Northwest & Southwest Fisheries Science Centers
- Target audience: Pacific Fishery Management Council (PFMC)
- Presented annually each March since 2014

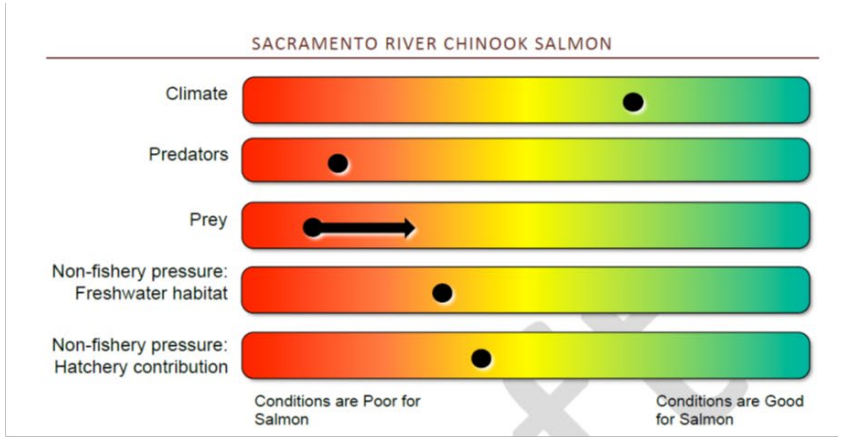
Origins

- Building blocks
  - "State of the ecosystem" papers in *CalCOFI Reports* starting in 1994
  - PFMC building toward first Fishery Ecosystem Plan (FEP) since 2006 and esp since 2009
  - California Current Integrated Ecosystem Assessment (CCIEA) program began in 2010

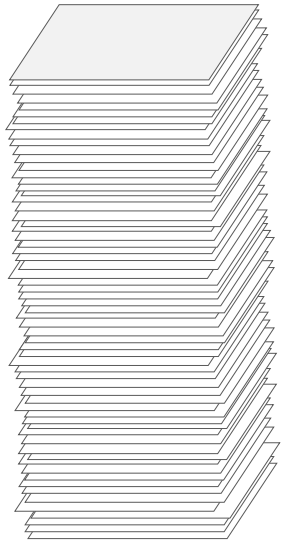


- CCIEA, partnering w/ 2 PFMC committees, produced pilot ESR in 2011
  - In-depth ecosystem considerations for four key groundfish and one salmon stock





2011 Report:
319 pages!



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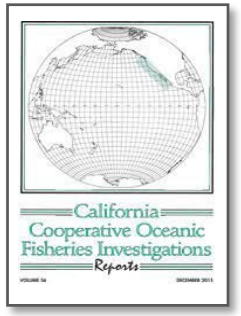

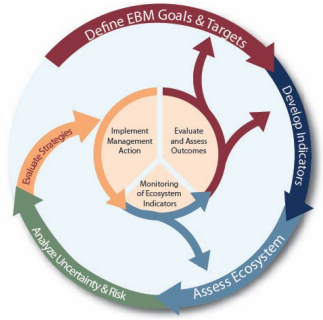

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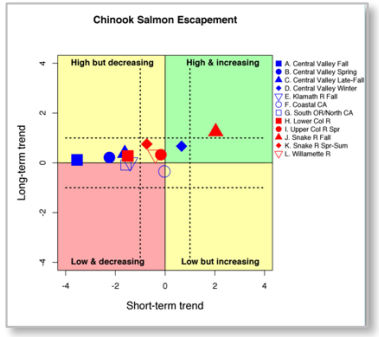
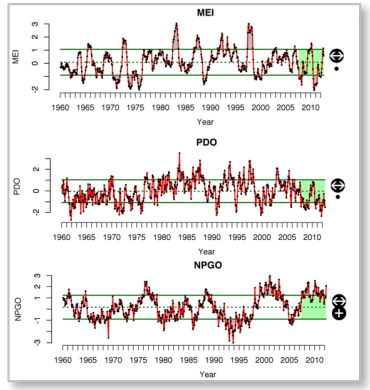
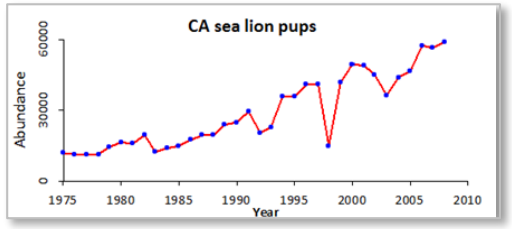
- PFMC asked for something more concise in 2012
  - Indicators related to general ecosystem status







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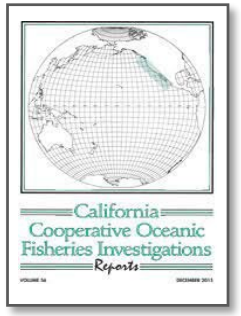

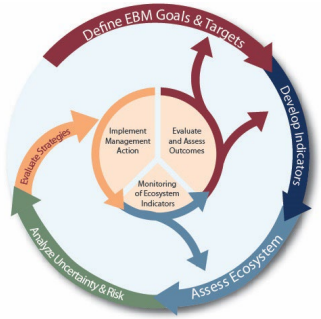

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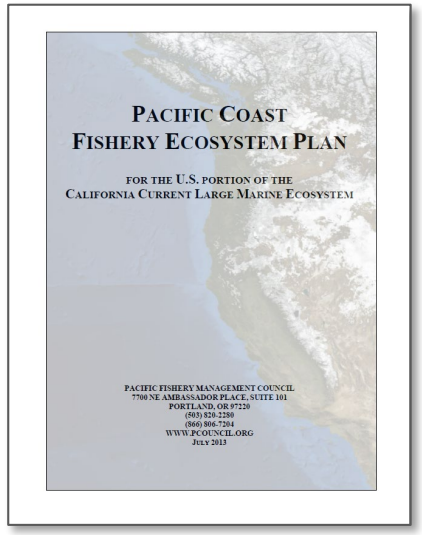
- 2013 FEP (rev. 2022) established specifics of ESR (2014-present)
  - ~20 pages, general ecosystem status, useful but not perfect information
  - ***"not tied to any specific management measures or targets"***

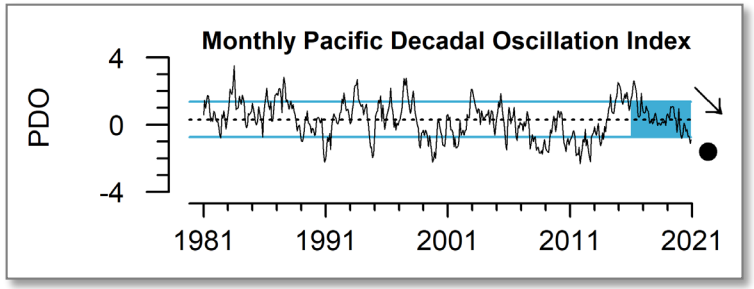


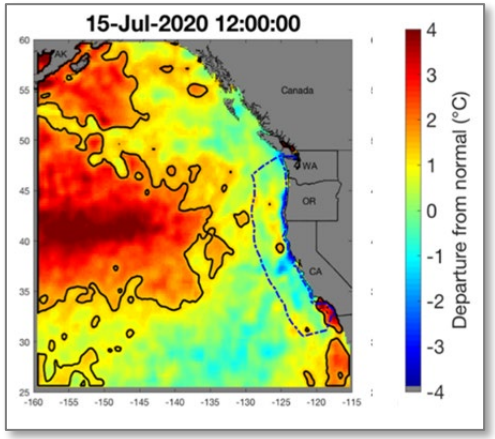
~20 pages!
(plus appendices)

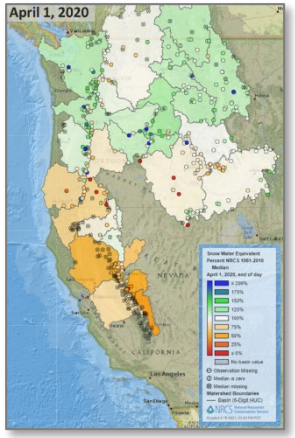
California Current ESR Content

Ecological, economic and social indicators and model outputs

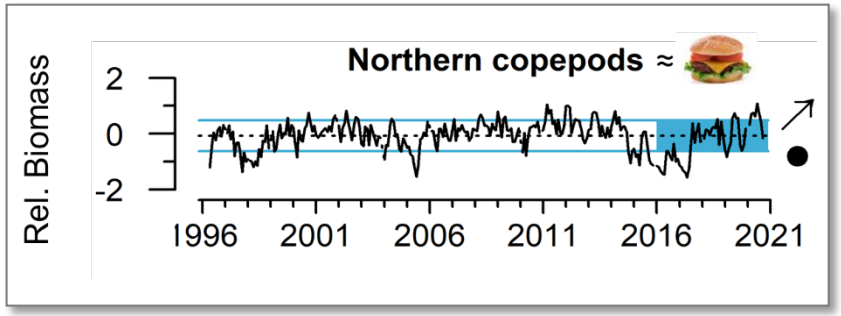
Climate and physics







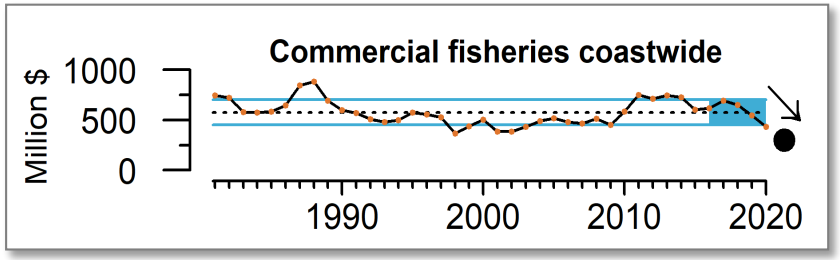
Status and condition of important species groups

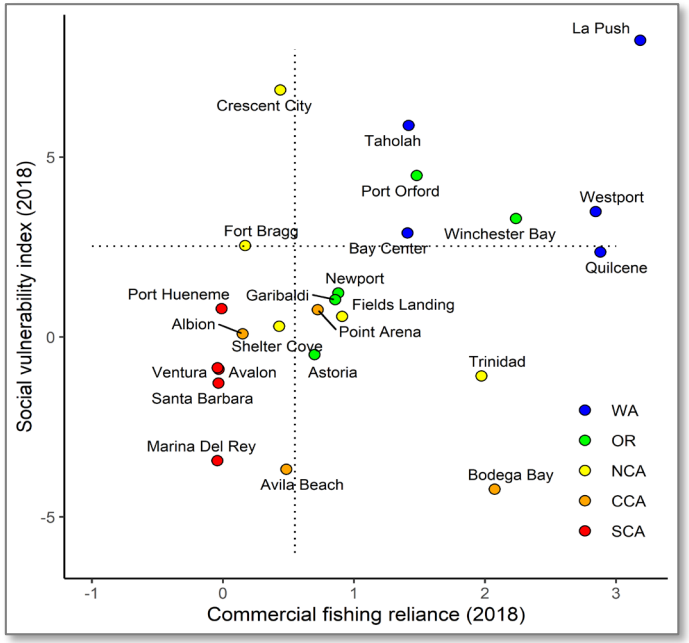


Salmon "stoplight" table

Scale of indicators	Smolt year 2017	2018	2019	2020	Adult return outlook Coho, 2021	Chinook, 2021
Basin-scale						
PDO (May-Sept)	■	■	◆	■	■	◆
ONI (Jan-Jun)	■	●	◆	◆	◆	◆
Local and regional						
SST anomalies	■	■	◆	■	■	◆
Deep water temp	◆	◆	◆	◆	◆	◆
Deep water salinity	■	●	■	◆	◆	■
Copepod biodiversity	◆	■	■	●	●	■
Northern copepod anomaly	◆	■	●	●	●	●
Biological spring transition	◆	◆	■	●	●	■
Winter ichthyoplankton biomass	■	■	◆	●	●	◆
Winter ichthyoplankton community	◆	◆	◆	■	■	◆
Juvenile Chinook catch (Jun)	◆	■	■	■	■	■
Juvenile coho catch (Jun)	◆	●	■	■	■	■

Fisheries, human activities, and coastal community wellbeing

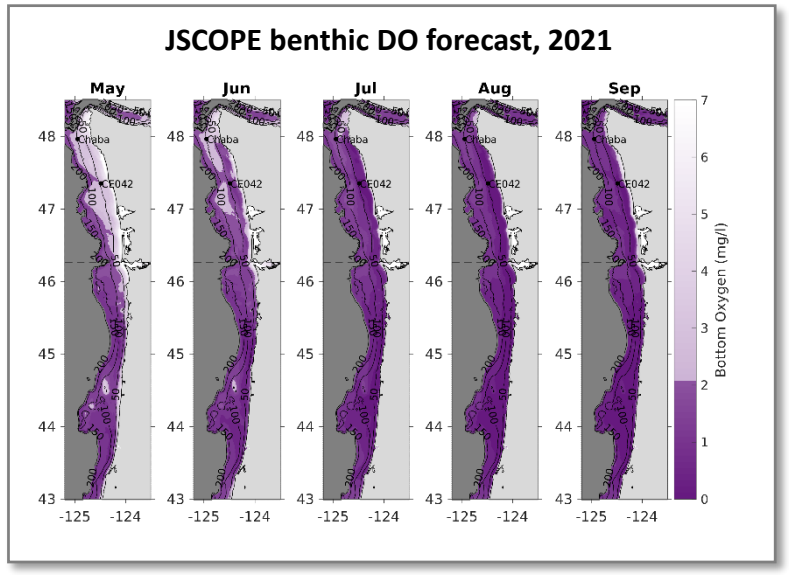




California Current ESR Content

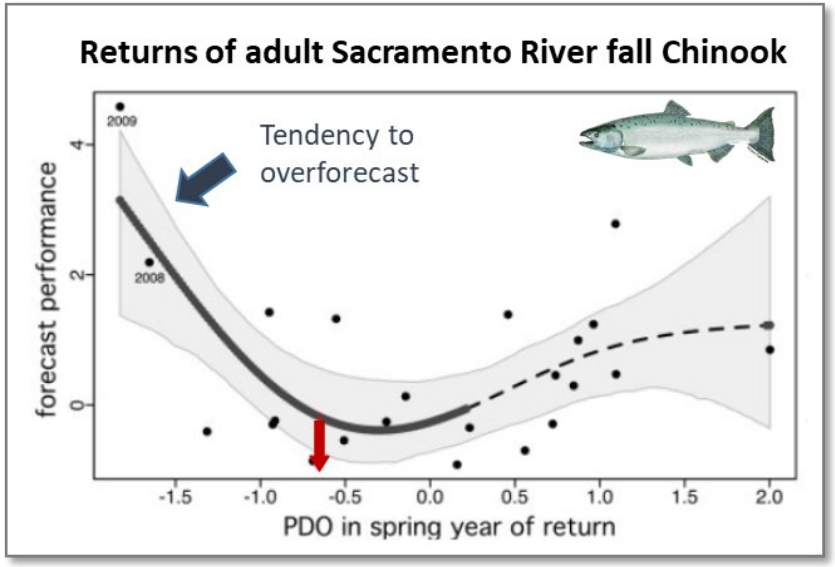
Short-term forecasts and advanced analyses

Seasonal forecasts of climate/ ocean conditions



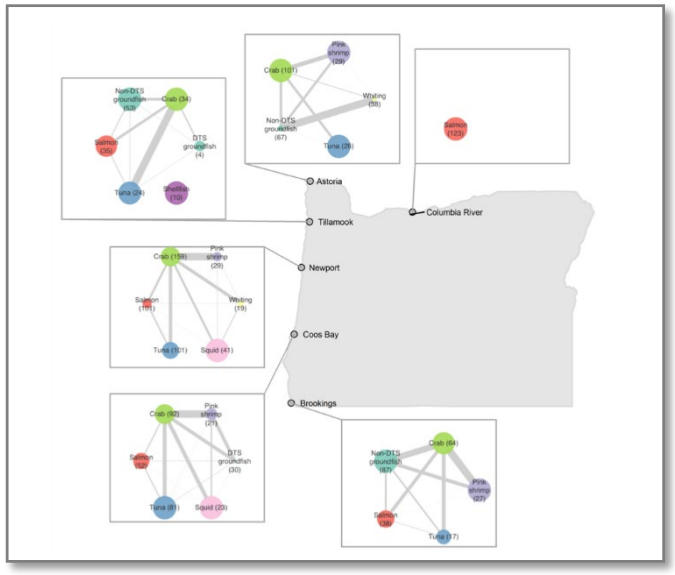
courtesy of Dr. Samantha Siedlecki, Univ. Connecticut

Detecting threshold relationships between drivers and responses



Satterthwaite et al. 2020

Characterizing coastal community fishing portfolios



courtesy of Dr. Jameal Samhouri, NMFS NWFSC

Summary

Key takeaways from 2022:

Basin-scale climate patterns started out encouragingly

Partly offset later in the year by local dynamics and a major marine heatwave

Food web exhibited resilience, including ongoing anchovy production in the south

Unfavorable conditions and risk factors

Major marine heatwave, with coastal influence

Dry spring in 2022 contributed to ongoing drought

Uptick in HABs in late 2022 in the north

Fishing portfolios continued to be less diversified

Potential constraints of offshore wind energy on fishing & surveys coming into focus

Mixed Ecological Signals

Base of food web and forage productive in central and south, mixed in the north

Mixed signals for Chinook salmon returns in different regions

Good production of predators in central and south

A strong new year class of sablefish?

California Current ESR content

Spatial information (example: effort and revenue in wind energy “call areas” off Oregon)

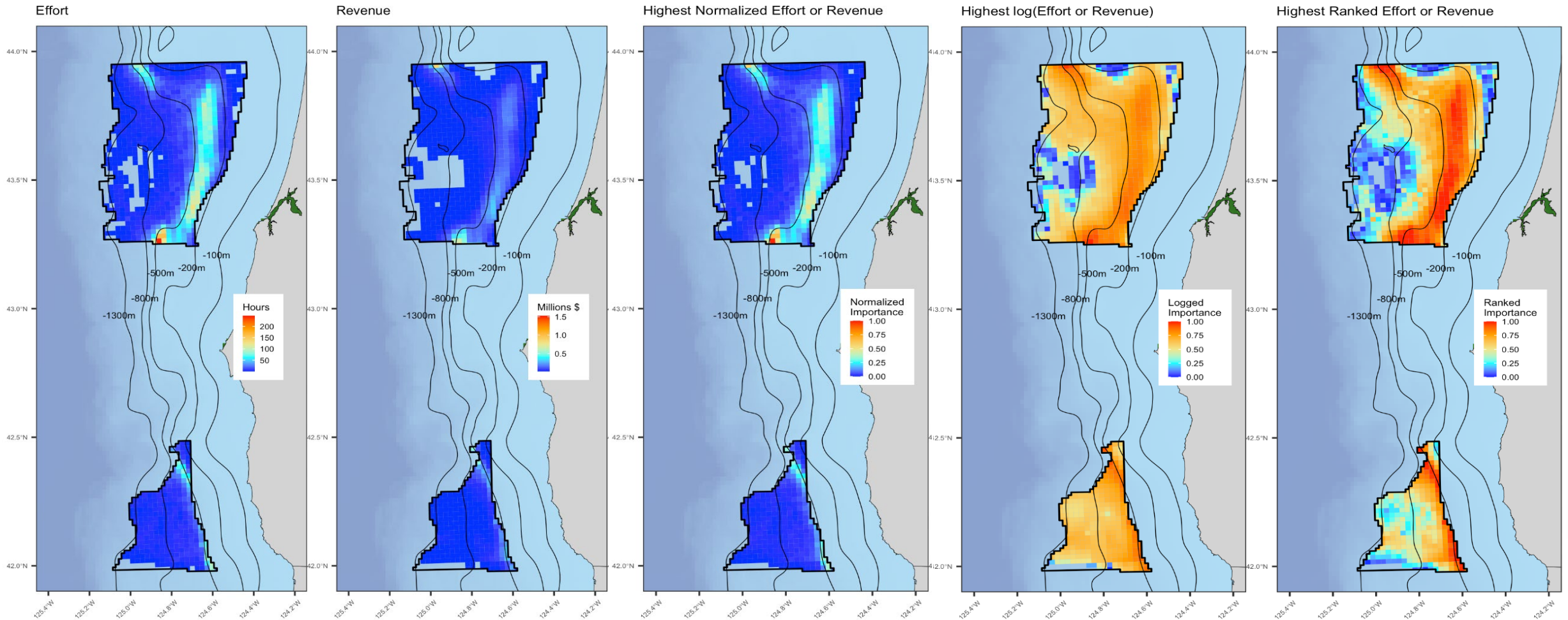
Raw effort data

Raw revenue data

Effort + revenue, normalized

Effort + revenue, log-transformed

Effort + revenue, rank transformed

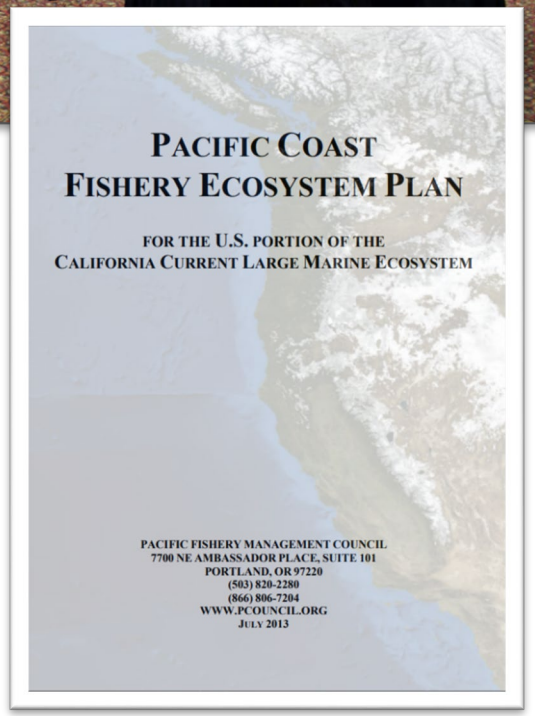


PFMC engagement

ESR team and PFMC have evolved to a "co-developers" relationship

- Scheduled regular annual meetings and review opportunities with multiple advisory bodies

- Multiple FEP "initiatives" have directly connected to ESR
  - 2015-2016: *Coordinated Ecosystem Indicator Review*
  - 2017-2020: *Climate and Communities Initiative*
  - 2022-202x: *Ecosystem and Climate Information for Species, Fisheries and FMPs*

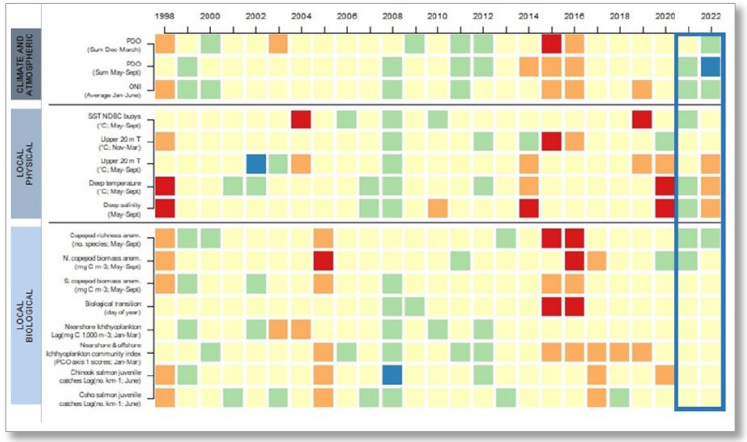


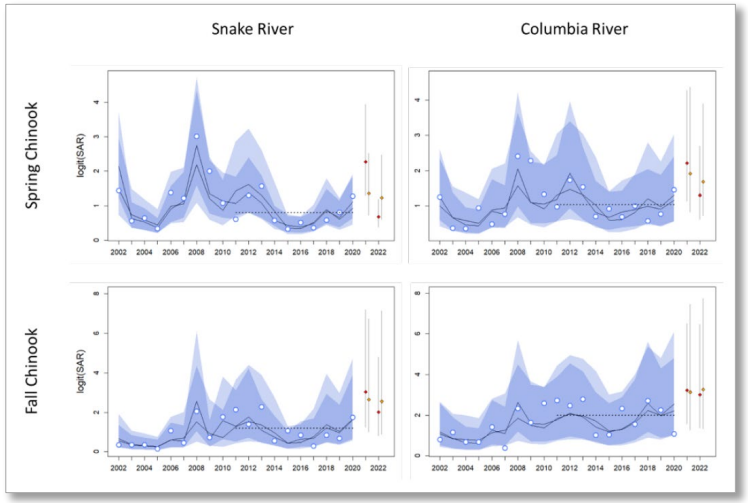
www.pcouncil.org/fishery-ecosystem-plan/

Fishery Ecosystem Plan initiatives

Ecosystem and Climate Information for Species, Fisheries and FMPs

Stoplight tables and related survival forecast models for Columbia Basin Chinook salmon





"Risk Table" derived from Dorn and Zador (2020)

Information sources

Concern Level

	Assessment-related	Population dynamics	Ecosystem	Fishery Performance
Level 1: Normal	Typical to moderately increased uncertainty/minor unresolved issues in assessment	Stock trends are typical for the stock; recer recruitment is within normal range.	No apparent environmental and/or ecosystem concerns relevant to the stock	lo apparent fishery/resource-use erformance and/or behavior oncerns
Level 2: Substantially increased concerns	Substantially increased assessment uncertainty/ unresolved issues.	Stock trends are unusual; abundance increasing or decreasing faster than has been seen recently, or recruitment pattern is atypical.	Some indicators showing adverse signals for the stock, but the pattern is not consistent across all indicators.	ome indicators showing adverse ignals but the pattern is not onsistent across all indicators.
Level 3: Major Concern	Major problems with the stock assessment, very poor fits to data, high level of uncertainty, strong retrospective bias.	Stock trends are highly unusual; very rapid changes in stock abundance, or highly atypical recruitment patterns.	Multiple indicators showing consistent adverse signals a) across the same trophic level as the stock, and/or b) up or down trophic levels from the stock	Multiple indicators showing onsistent adverse signals a) across ifferent sectors, and/or b) different ear types
Level 4: Extreme concern	Severe problems with the stock assessment, severe retrospective bias. Assessment considered unreliable.	Stock trends are unprecedented. More rapi changes in stock abundance than ever seer previously, or very long stretch of poor recruitment compared to previous patterns	Extreme anomalies in multiple ecosystem indicators that are highly likely to impact the stock. Potential for cascading effects on other ecosystem components	xtreme anomalies in multiple erformance indicators that are ighly likely to impact the stock.

Thank you!

Chris.Harvey@noaa.gov