**Climate & Salmon:**

**Assessing the Impact of Critical Habitat Designation and Sea Surface Temperature on Smolt-to-Adult Return Rates for Ocean-Run Chinook Salmon in Upper Columbia River Basin**

**Team Nexus:**

Paul J. Anderson

Rachel Hughes

CS 512, Winter 2025

Oregon State University

**Abstract:**

Decreases in fish stocks have social, economic, and environmental impacts throughout the western United States. Tracking changes in fish stocks provides vital data for conservation and protection of this declining resource. As part of the management of fish stocks, various agencies at the state and federal level monitors oceanic and river conditions to determine the catch limits. The National Oceanic and Atmospheric Administration (NOAA) cites eight ocean indicators critical to monitoring the health of salmon fish stocks along the western United States (NOAA 2024). This study takes one of those ocean indicators, the sea surface temperatures (SST), and the smolt-to-adult return ratio (SAR) for Upper Columbia spring-run Chinook salmon to look for links that may help explain changes in the SAR. Results may then be used by federal and state agencies to set sustainable catch limits. Two time periods encompassing neutral to mild La Niña activity are studied, from 2002-2004 and 2020-2024.

**Obtain**:

**Climate Data:**

The climate data was obtained from the National Centers for Environmental Information, a sub agency of NOAA. The retrieved SST were interpolated to a 5 km grid from measured SST from buoys and satellite data.

Data were retrieved using the Environmental Research Division Data Access Program (ERDDAP) to generate a url to access the specified data. The data was available in a variety of formats to include comma-separated values (.csv) and JavaScript Object Notation (JSON). The .csv format was chosen for initial access.

Access link for climate data: <https://coastwatch.pfeg.noaa.gov/erddap/griddap/NOAA_DHW.html>

Data from 01/01/2020 to 12/31/2022 from 25N to 50N, -124W to -120W, sampled every 5 days, with SST reported at 12Z: <https://coastwatch.pfeg.noaa.gov/erddap/griddap/NOAA_DHW.csv?CRW_SST%5B(2020-01-01T12:00:00Z):5:(2022-12-30T12:00:00Z)%5D%5B(25):1:(50)%5D%5B(-124):1:(-120)%5D>

Data from 01/01/2002 to 12/31/2004 from 25N to 50N, -124W to -120W, sampled every 5 days, with SST reported at 12Z: <https://coastwatch.pfeg.noaa.gov/erddap/griddap/NOAA_DHW.csv?CRW_SST%5B(2002-01-01T12:00:00Z):5:(2004-12-30T12:00:00Z)%5D%5B(25):1:(50)%5D%5B(-124):1:(-120)%5D>

**Fish Returns Data:**

**Estimate of Points Complexity:**

Non-standard dataset: +3

Multiple files to start: +1

>1 type of related data: +1

Accessed beyond database or file download: +1

**Scrub:**

Climate Data were analyzed to remove missing gridded observations. SST were averaged

**Explore:**

The average SST

**Model:**

The model step in the OSEMN framework does not apply to this portion of the study.

**Interpret:**

The interpretation step in the OSEMN framework does not apply to this portion of the study.

**Sources:**

NOAA Fisheries. (2024, August 23). *Upper Columbia River Spring-run Chinook Salmon*. Endangered Species Conservation, NOAA Fisheries. Accessed 24 January 2025. <https://tinyurl.com/y3rnr7kh>

NOAA Fisheries. (2024, October 28). *Salmon and Steelhead Research in the Pacific Northwest.* Science & Data, NOAA Fisheries. Accessed 24 January 2025. <https://tinyurl.com/y4jhxrzp>

NOAA Fisheries. (2024, December 6). *2024 Summary of Ocean Ecosystem Indicators.* Science & Data, NOAA Fisheries. Accessed 24 January 2025. <https://tinyurl.com/29wjp8za>

NOAA Fisheries. (2024, March 19). Oceanography of the Northern California Current Study Area. West Coast, NOAA Fisheries. Accessed 24 January 2025. <https://tinyurl.com/yw6pj5tx>