Cowlitz, Kalama, and Lewis River
Spring Chinook Fact Sheet
January 2023

2023 Spring Chinook Forecasts to Columbia River Mouth

- Cowlitz River= 8,972 adult spring Chinook
- Kalama River= 2,405 adult spring Chinook
- Lewis River= 4,708 adult spring Chinook

Spring Chinook forecasts are commonly based on average brood year relationships, where: age-3 fish (jacks) predict age-4 fish, age-4 fish predict age-5 fish.

The above forecasts are developed by using a suite of sibling regression, cohort ratio, and average return models to estimate runsize.

Hatchery Releases

- Hatchery spring Chinook releases from Cowlitz, Kalama, and Lewis facilities for 2011-2021 are shown in Table 1.
- Adults (age 4-6) returning in 2023 were released in 2018-2021.
- Cowlitz release goals increased in 2013-2014 as a result of changes in release strategies.
- Cowlitz releases in 2014-2020 were near or above goal.
- Cowlitz 2019 included an additional June release of 118,000 subyearling smolts as a result of surplus production.
- Kalama releases in 2011-2021 have been near or above goal.

Table 1. Spring Chinook hatchery releases from Cowlitz, Kalama, and Lewis facilities in 2011-2021. Highlighted rows correspond to releases contributing to the 2023 adult return.

	COWLITZ			KALAMA			LEWIS		
Release Year	Goal	Plant	% Of Goal	Goal	Plant	% Of Goal	Goal	Plant	% Of Goal
2011	1,260,226	1,076,945	85%	500,000	501,556	100%	1,050,000	1,057,833	101%
2012	942,369	881,337	94%	500,000	559,575	112%	1,350,000	1,410,270	104%
2013	1,464,849	1,601,472	109%	500,000	521,462	104%	1,250,000	1,286,170	103%
2014	1,797,115	2,051,598	114%	500,000	515,038	103%	1,675,000	1,516,940	91%
2015	1,793,529	1,958,471	109%	500,000	549,558	110%	1,925,000	1,814,469	94%
2016	1,793,529	1,874,482	105%	500,000	481,624	96%	1,250,000	717,742	57%
2017	1,741,899	1,852,960	106%	500,000	533,954	107%	1,250,000	402,224	32%
2018	1,741,899	1,844,162	106%	500,000	509,425	102%	1,250,000	710,708	57%
2019	1,741,899	2,011,018	115%	500,000	509,909	102%	1,350,000	2,294,425	170%
2020	1,741,899	1,968,336	113%	500,000	479,961	96%	1,350,000	1,760,485	130%
2021	1,741,899	1,290,014	74%	500,000	496,431	99%	1,350,000	1,739,959	129%

- Lewis releases in 2014-2018 were below goal due to a combination of reduced in-hatchery survival and subsequent low adult returns for use as hatchery broodstock.
- Changes in release size and timing strategies have been made at Lewis Hatchery to address the challenges with in-hatchery survival that have occurred in recent years. A program has been implemented to evaluate this change, including subyearling smolt

releases in June and October. The release goals and release numbers in Table 1 include all strategies.
- 2019-2021 Lewis releases included additional subyearling smolts released in June to supplement forage for Southern Resident Killer Whales.

Hatchery Escapement Goals

- Hatchery escapement needs for Cowlitz, Kalama, and Lewis rivers are shown in Table 2.
- The on-station escapement needs at each hatchery in Table 2 are the number of adults needed to meet broodstock needs for the in-basin hatchery release goals and harvest programs.
- On-station hatchery escapement needs for the Cowlitz and Lewis are defined in the *U.S. v. Oregon* Biological Opinion (BIOP) issued by NOAA Fisheries. Available at: https://media.fisheries.noaa.gov/dam-migration/s7-_usvoregon_2018-2027_mgmagmnt__final_signed.pdf
- Based on preseason forecasts for 2023, the Cowlitz, Kalama, and Lewis River spring Chinook fisheries will begin under the permanent rules outlined in the 2022-2023 Sport Fishing Rules pamphlet. Fishery managers will closely monitor in-season return information and notify anglers through emergency rule making procedures in the event that changes are warranted.
- ESA obligations (MA Biological Opinion) guide hatchery-origin adult escapement goals so that conservation objectives can be met to continue efforts to re-introduce fish into the upper basins in the Cowlitz and Lewis rivers.

Table 2. Cowlitz, Kalama, and Lewis River spring Chinook run-size forecasts for 2023 and hatchery escapement needs. Actual annual hatchery escapement needs may vary slightly to account for changes in fecundity, sex ratios, pre-spawn loss, etc.

2023 Expectations			
Details	**Cowlitz**	**Kalama**	**Lewis**
Forecasted return to Col. R. Mouth	**8,972**	**2,405**	**4,708**
Expected CR mainstem harvest for 2023	261	72	141
Forecasted return to tributary mouth	8,711	2,333	4,567
Avg. % natural-origin return	12.2%	4.6%	5.1%
Natural-origin return	1,062	107	233
Hatchery-origin return	7,649	2,226	4,334
Hatchery-origin escapement need to trib. mouth*	**1,949**	**710**	**1,648**
Est. lower river hatchery-origin spawners	612	110	268
Total Broodstock need at hatchery (from MA BIOP when applicable)	1,337	600	1,380
Upstream	TBD**	NA	TBD**
Harvestable hatchery-origin surplus	**5,700**	**1,516**	**2,686**

*Includes fish spawning in the wild outside the hatchery

**Fish above hatchery program needs are transported and released above dams for population recovery; exact numbers 'To Be Determined' (TBD) through in-season management

Ocean Conditions

- Ocean conditions have been identified as a leading contributor to adult salmon returns along the Pacific coast of the U.S. and Canada.
- Table 3 presents NOAA's Northwest Fisheries Science Center "stoplight" chart of ocean ecosystem indicators that are measured and collectively provide a gauge of the "ocean conditions" experienced by some salmonids during their marine residence.

Table 3. NOAA Fisheries – Northwest Fisheries Science Center Ecosystem Indicator "Stoplight" chart, available at: https://www.fisheries.noaa.gov/west-coast/science-data/ocean-conditions-indicators-trends

	Year																								
Ecosystem Indicators	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	*2021*	*2022*
PDO (Sum Dec-March)	22	8	4	16	9	24	15	20	17	12	6	1	19	5	3	10	13	25	23	21	14	18	11	7	2
PDO (Sum May-Sept)	13	6	8	7	14	20	19	21	15	17	3	12	9	5	2	10	23	25	24	18	16	22	11	4	1
ONI (Average Jan-June)	24	1	1	9	16	18	17	20	10	14	3	13	21	6	8	10	12	22	25	15	7	23	19	5	4
SST NDBC buoys (°C; May-Sept)	20	7	9	5	6	13	25	14	2	16	1	12	3	8	10	18	23	22	21	15	17	24	11	4	19
Upper 20 m T (°C; Nov-Mar)	24	13	10	12	7	18	19	16	15	6	1	11	21	5	4	9	3	25	23	22	17	20	2	8	14
Upper 20 m T (°C; May-Sept)	16	11	13	5	1	3	25	20	9	10	2	6	17	8	7	18	23	19	14	12	15	24	22	4	21
Deep temperature (°C; May-Sept)	24	7	9	5	1	11	13	17	12	6	2	8	15	10	4	16	23	21	14	19	20	18	25	3	22
Deep salinity (May-Sept)	24	4	12	5	6	19	20	13	8	2	3	17	22	15	16	14	25	18	10	9	7	11	23	1	21
Copepod richness anom. (no. species; May-Sept)	23	3	1	10	9	18	17	22	19	13	11	12	21	6	8	4	14	24	25	20	16	15	7	5	2
N. copepod biomass anom. (mg C m^{-3}; May-Sept)	23	18	13	14	6	20	17	24	19	15	9	12	11	3	5	7	8	21	25	22	10	4	2	1	16
S. copepod biomass anom. (mg C m^{-3}; May-Sept)	25	2	7	4	3	17	19	24	16	13	1	9	20	12	10	8	14	22	23	21	15	18	11	5	6
Biological transition (day of year)	22	14	9	3	12	18	15	23	17	4	1	2	20	5	13	7	7	24	24	21	16	18	9	11	6
Nearshore Ichthyoplankton Log(mg C 1,000 m^{-3}; Jan-Mar)	20	4	13	7	1	24	25	19	10	21	3	16	2	9	5	12	22	17	18	15	11	23	8	6	14
Nearshore & offshore Ichthyoplankton community index (PCO axis 1 scores; Jan-Mar)	11	6	5	8	10	13	19	23	1	16	3	12	17	4	2	7	9	21	24	25	20	22	18	15	14
Chinook salmon juvenile catches Log(no. km^{-1}; June)	22	2	7	19	6	10	18	24	14	12	1	8	5	16	3	4	9	17	21	25	20	15	23	13	11
Coho salmon juvenile catches Log(no. km^{-1}; June)	23	12	20	5	7	6	22	24	18	2	4	9	10	19	14	1	11	17	16	25	3	15	21	13	8
Mean of ranks	21.0	7.4	8.8	8.4	7.1	15.8	19.1	20.3	12.6	11.2	3.4	10.0	14.6	8.5	7.1	9.7	14.9	21.3	20.6	19.1	14.0	18.1	13.9	6.6	11.3
Rank of the mean rank	24	5	8	6	3	18	20	22	13	11	1	10	16	7	3	9	17	25	23	20	15	19	14	2	12
Ecosystem Indicators not included in the mean of ranks or statistical analyses																									
Physical Spring Trans. UI based (day of year)	4	8	23	20	5	15	18	24	15	1	7	3	10	13	21	11	22	12	6	19	13	15	9	2	25
Physical Spring Trans. Hydrographic (day of year)	24	4	14	9	6	13	16	25	7	10	1	10	20	4	12	2	18	8	19	23	16	15	21	2	21
Upwelling Anomaly (April-May)	12	4	20	8	11	17	15	24	12	6	9	10	18	20	18	14	22	1	3	23	7	5	15	2	25
Length of Upwelling Season UI based (days)	6	2	22	14	1	16	12	25	5	3	9	3	18	21	18	17	23	13	8	15	7	10	20	10	23
Copepod Community Index (MDS axis 1 scores; May-Sept)	24	5	7	10	4	19	17	23	20	12	1	9	16	11	8	6	14	22	25	21	15	18	13	3	2

- Ocean conditions deteriorated in 2014, leading to 2015 ranking as the worst year during the period of record; the subsequent years of 2016 and 2017 also ranked among the worst.
- Adult spring Chinook returns are primarily composed of age-4 and 5 adults that encountered ocean conditions as juveniles and sub-adults during the preceding two to three years.
- The likely impact of poor ocean conditions from 2015 through 2017, is reflected in lower returns of adult spring Chinook to lower Columbia River tributaries in subsequent years (Figure 1).
- The majority of spring Chinook returning to these rivers in 2023 have experienced the suite of ocean conditions documented from 2020 through 2022. During these years, ocean conditions ranged between moderate to good, with 2021 ranking among the best years during the 25 years of study.

- The 2023 forecast returns of spring Chinook to the Cowlitz, Kalama, and Lewis Rivers are improved over recent years, likely due to some improvement in ocean conditions between 2020 and 2022.

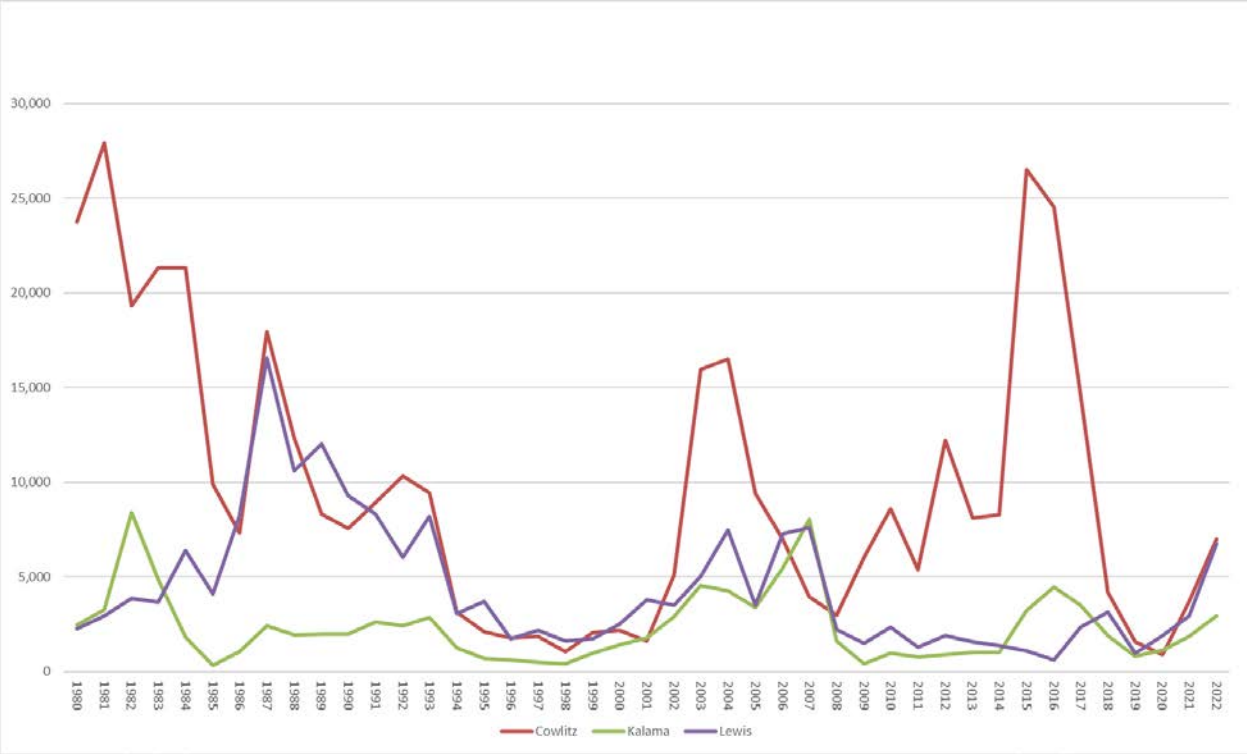

Figure 1. Adult spring Chinook returns to the Cowlitz, Kalama, and Lewis rivers by return year.