

**Cowlitz, Kalama, and Lewis River
Spring Chinook Fact Sheet
January 2022**

2022 Spring Chinook Forecasts to Columbia River Mouth

- Cowlitz River= 4,079 adult spring Chinook
- Kalama River= 2,016 adult spring Chinook
- Lewis River= 2,358 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

- Spring Chinook hatchery releases from Cowlitz, Kalama, and Lewis hatchery facilities for 2010-2020 are shown in Table 1.
- Returning adults (age 4-6) in 2022 are from releases in 2017-2020.
- Cowlitz release goals increased in 2013-2014 as a result of changes in release strategies.
- Cowlitz and Kalama releases in 2014-2020 were near or above goal.
- Cowlitz 2019 releases included an additional 118,000 subyearling smolts in June as a result of surplus production.

Table 1. Spring Chinook hatchery releases from Cowlitz, Kalama and Lewis facilities in 2010-2020. Highlighted area corresponds with releases contributing to this year’s adult return.

Release Year	COWLITZ			KALAMA			LEWIS		
	Goal	Plant	% of goal	Goal	Plant	% of goal	Goal	Plant	% of goal
2010	1,262,539	1,280,347	101%	500,000	352,924	71%	1,050,000	1,110,755	106%
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%

- 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 Lewis Hatchery releases included an additional 900,000 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 2022, the Cowlitz, Kalama, and Lewis rivers are projected to have sufficient hatchery-origin adults available in excess of broodstock needs to provide for tributary sport fisheries.

Table 2. Cowlitz, Kalama, and Lewis River spring Chinook run-size forecasts for 2022 and hatchery escapement needs. Actual annual hatchery escapement needs may vary slightly to account for changes in fecundity, sex ratios, pre-spawn loss, etc.

2022 Expectations			
Details	Cowlitz	Kalama	Lewis
Forecasted return to Col. R. Mouth	4,079	2,016	2,358
Expected CR mainstem harvest for 2022	122	60	71
Forecasted return to tributary mouth	3,957	1,956	2,287
Avg. % natural-origin return	5.5%	2.88%	1.6%
Natural-origin return	218	56	37
Hatchery-origin return	3,742	1,900	2,250
Hatchery-origin escapement need to trib. mouth*	1,518	683	1,578
Est. lower river hatchery-origin spawners	181	83	198
Broodstock need at hatchery (from MA BIOP when applicable)	1,337	400	1,380
Upstream**	if available	NA	if available
SAFE Deep River Net Pen off-channel program		200	
Total hatchery-origin broodstock needs	1,337	600	1,380
Harvestable hatchery-origin surplus	2,221	1,300	743

*Includes fish spawning in the wild outside the hatchery

**Fish are trucked and released above dams for population recovery

- 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.

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://media.fisheries.noaa.gov/2021-12/Ocean%20Condition%20Indicators%20Trend%20no%20numbers%20DEC2021.png>

Ecosystem Indicators	Year																							
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
PDO (Sum Dec-March)	21	7	3	15	8	23	14	19	16	11	5	1	18	4	2	9	12	24	22	20	13	17	10	6
PDO (Sum May-Sept)	12	5	7	6	13	19	18	20	14	16	2	11	8	4	1	9	22	24	23	17	15	21	10	3
ONI (Average Jan-June)	23	1	1	8	15	17	16	19	9	13	3	12	20	5	7	9	11	21	24	14	6	22	18	4
SST NDBC buoys (°C; May-Sept)	19	7	9	5	6	13	24	14	2	16	1	12	3	8	10	18	22	21	20	15	17	23	11	4
Upper 20 m T (°C; Nov-Mar)	23	13	10	12	7	17	18	15	14	6	1	11	20	5	4	9	3	24	22	21	16	19	2	8
Upper 20 m T (°C; May-Sept)	16	11	13	4	1	3	24	20	9	10	2	6	17	8	7	18	22	19	14	12	15	23	21	5
Deep temperature (°C; May-Sept)	23	7	9	5	1	11	13	17	12	6	2	8	15	10	4	16	22	21	14	19	20	18	24	3
Deep salinity (May-Sept)	23	4	12	5	6	19	20	13	8	2	3	17	21	15	16	14	24	18	10	9	7	11	22	1
Copepod richness anom. (no. species; May-Sept)	22	2	1	9	8	17	16	21	18	12	10	11	20	5	7	3	13	23	24	19	15	14	6	4
N. copepod biomass anom. (mg C m ⁻³ ; May-Sept)	22	17	13	14	6	19	16	23	18	15	9	12	11	3	5	7	8	20	24	21	10	4	2	1
S. copepod biomass anom. (mg C m ⁻³ ; May-Sept)	24	2	6	5	3	16	18	23	15	12	1	8	19	11	9	7	13	21	22	20	14	17	10	4
Biological transition (day of year)	21	13	8	3	11	17	14	22	16	4	1	2	19	5	12	6	6	23	23	20	15	17	8	10
Nearshore Ichthyoplankton Log(mg C 1,000 m ⁻³ ; Jan-Mar)	19	3	13	7	1	23	24	17	10	19	3	15	2	9	5	12	21	16	17	14	11	22	8	6
Nearshore & offshore Ichthyoplankton community index (PCO axis 1 scores; Jan-Mar)	11	6	5	8	10	13	18	22	2	15	3	12	16	4	1	7	9	20	23	24	19	21	17	14
Chinook salmon juvenile catches Log(no. km ⁻² ; June)	21	3	7	19	6	10	17	23	14	12	1	8	5	15	2	4	9	16	20	24	18	13	22	11
Coho salmon juvenile catches Log(no. km ⁻² ; June)	22	11	19	5	7	6	21	23	17	2	4	8	9	18	13	1	10	16	15	24	3	14	20	12
Mean of ranks	20.1	7.0	8.5	8.1	6.8	15.2	18.2	19.4	12.1	10.7	3.2	9.6	13.9	8.1	6.6	9.3	14.2	20.4	19.8	18.3	13.4	17.3	13.2	6.0
Rank of the mean rank	23	5	8	7	4	17	19	21	12	11	1	10	15	6	3	9	16	24	22	20	14	18	13	2
<i>Ecosystem Indicators not included in the mean of ranks or statistical analyses</i>																								
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
Physical Spring Trans. Hydrographic (day of year)	23	4	14	9	6	13	16	24	7	10	1	10	20	4	12	2	18	8	19	21	16	15	21	2
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
Length of Upwelling Season UI based (days)	6	2	22	14	1	16	12	24	5	3	9	3	18	21	18	17	23	13	8	15	7	10	20	10
Copepod Community Index (MDS axis 1 scores; May-Sept)	23	2	6	9	4	18	16	22	19	11	1	8	15	10	7	5	13	21	24	20	14	17	12	3

- 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).

- Spring Chinook returning to these rivers in 2022 have experienced the suite of ocean conditions documented from 2019 through 2021. During these years, ocean conditions have ranged from poor to good; with general improvement since 2019 and 2021 ranking as the second best during the 24 years of study.
- While the forecast returns of spring Chinook to the Cowlitz, Kalama, and Lewis Rivers for 2022 are generally similar to previous years, recent improvements in ocean conditions may be a leading indicator of increased returns in future years.

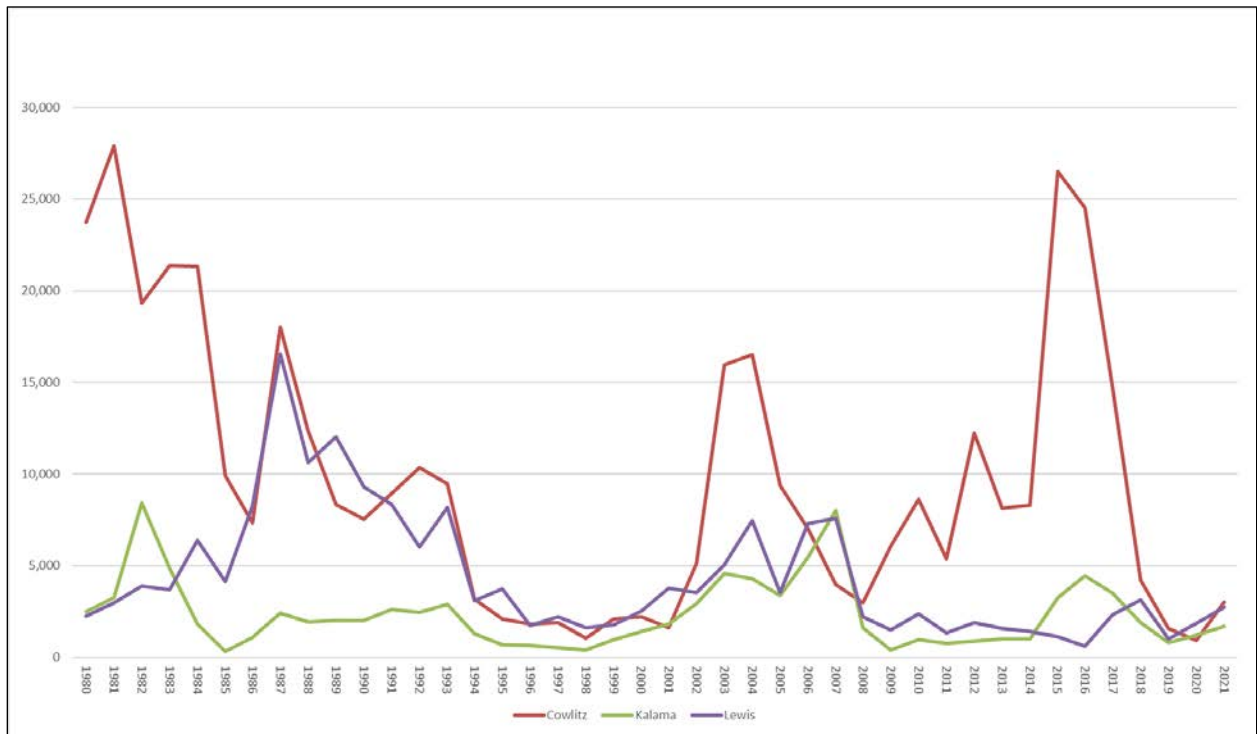


Figure 1. Adult spring Chinook returns to the Cowlitz, Kalama, and Lewis rivers by return year.