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Floodplain-Derived Food Subsidies Improve Growth of and Alter Movement of Outmigrating Chinook Salmon in a Modified River System

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Author

Loera, Adrian Eric

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Floodplain-Derived Food Subsidies Improve Growth of and Alter Movement of Outmigrating Chinook
Salmon in a Modified River System

By

ADRIAN LOERA
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Approved:

Robert A. Lusardi, Chair

Elizabeth Crone

Derrick Alcott

Committee in Charge

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Abstract:

Globally, river channelization and levee construction have substantially reduced river-floodplain connectivity, limiting access to ecologically important floodplain habitats, with far-reaching consequences for native fishes. This pattern is particularly pronounced in California's Central Valley, where approximately 95% of floodplain habitat has been disconnected. Previous research has shown that agriculture floodplains that are intentionally inundated can generate high zooplankton production and enhance juvenile Chinook Salmon growth relative to adjacent river reaches. More recently, conservation managers have explored the use of managed floodplain inundation (e.g., rice fields) to produce zooplankton and export these resources to food limited river habitats. Reconnecting floodplain foodscapes during winter and spring enhances juvenile salmon growth and phenotypic diversity, thereby supporting recovery of depleted runs. However, the effects of these managed floodplain subsidies on salmon growth and behavior during drainage events remain poorly understood. During the 2023 water year, we collaborated with landowners to pump water from managed experimental floodplains into the Sacramento River to evaluate the growth and movement responses of juvenile Chinook Salmon. We quantified food web export during pumping and used enclosure experiments to assess the effects of floodplain derived subsidies on fish growth within, above, and below the subsidy footprint. To examine behavioral responses, we deployed a high-resolution acoustic telemetry array in subsidized and unsubsidized reaches, enabling tracking of outmigrating juveniles. Zooplankton biomass at pump sites was approximately fourfold greater than at upstream, unsubsidized locations. Juveniles within the subsidy footprint exhibited growth rates up to fourfold higher than those immediately upstream. Movement responses were variable; however, telemetry data indicated delayed outmigration during active subsidy periods, suggesting fish remained to exploit elevated prey availability. These findings highlight the potential for managed floodplain reconnection to enhance food availability, alter migration behavior, and support recovery efforts for Central Valley Chinook Salmon by partially restoring historical floodplain processes.

Introduction

Freshwater ecosystems have been extensively altered by the expansion of human civilization. Flow regulation through dams and levees has fundamentally reshaped aquatic habitats and reduced the abundance and diversity of freshwater fishes (Reid et al. 2019). Levees, in particular, highly disrupt river-floodplain connectivity by truncating natural pathways for the exchange of water, nutrients, and organisms between river channels and adjacent floodplain habitats (Tockner and Stanford 2002).

Floodplain connectivity is critical to numerous life stages of freshwater fishes, particularly species exhibiting migratory life histories (Schicks & Lindley 2007, Brown & Hartman 1988, Fukushima et al. 2007). These connections allow river channels and floodplain habitats to remain ecologically linked, facilitating the movement of water, nutrients and organisms between them and providing access to shallow low velocity environments, increased primary productivity, and abundant food resources (Junk et al. 1989, Bayley 1991). Empirical studies have shown that floodplain habitats often support elevated densities of zooplankton and drift invertebrates relative to adjacent lotic habitats, creating productive foraging environments for fishes, including Central Valley Chinook Salmon (Sommer 2001, Müller-Solger, 2002, Katz et al. 2017, Corline et al. 2021). Floodplain invertebrate communities are frequently dominated by large-bodied cladocerans such as *Daphnia pulex*, which represent high-quality prey for juvenile salmonids (Katz et al. 2017, Corline et al. 2021).

Access to these productive habitats has been linked to enhanced prey availability and quality, and consequently increased growth rates of juvenile salmon (Katz et al. 2017). Consistent with optimal foraging theory (MacArthur & Pianka 1966), individuals are expected to adjust habitat use and behavior to maximize energetic intake while minimizing costs; in riverine systems, this suggests that juvenile salmon encountering spatially concentrated prey resources may delay downstream movement to exploit floodplain-derived subsidies. In contrast, channelized reaches of the Sacramento River within the Central Valley generally support lower invertebrate production and provide comparatively poor growth rates for juvenile salmon (Pace et al. 1992, Corline et al. 2021). Under such conditions outmigration is often accelerated during periods of low food availability unless resource pulses from ephemeral floodplain drainage or access to off-channel habitat are available (Rossi et al. 2024).

In California's Central Valley (CV) approximately 95% of historical floodplains have been eliminated by levees and dams and are no longer accessible to animals that evolved to use these habitats before migrating to the estuarine environment (Inamine et al. 2010). In part, this has contributed to precipitous declines of native and endemic Salmon populations throughout the CV. Historical records from the CV estimate that Chinook Salmon populations have been reduced by approximately 75% of historical population sizes, with some populations listed as threatened or endangered (Yoshiyama et al. 2000). Reductions in floodplain habitat represent a loss of a critical habitat component in the Chinook salmon life cycle.

In response, researchers have investigated whether managed agricultural floodplains can replicate ecological functions of lost historic floodplains. Evidence suggests that flooded rice fields can function as surrogate floodplains, providing high quality rearing habitat for juvenile Chinook Salmon (Katz et al. 2017). Building on this concept, California Trout developed the “Fish Food on Floodplain Farm Fields”

initiative, which incentivizes winter flooding of rice fields to enhance zooplankton production and export these resources to the Sacramento River as a food web subsidy. Experimental studies have demonstrated that such surrogate floodplains can generate high zooplankton densities and improve growth of juvenile Salmon rearing (Katz et al. 2017). However, key uncertainties remain regarding (i) how in-river prey availability changes in response to these subsidies, (ii) how juvenile Chinook growth differs between subsidized and non-subsidized reaches, and (iii), how advected resources influence juvenile Salmon out-migration behavior.

To address these gaps, we deployed a high-resolution network of acoustic receivers along the Sacramento River near a managed floodplain pumping site. We quantified zooplankton production and export, measured juvenile salmon growth in subsidized and non-subsidized reaches using in-situ enclosures, and evaluated movement behavior of acoustically tagged fish as they migrated through these zones. We hypothesized that (i) prey density would be highest within subsidized reaches, (ii) growth rates would be greatest nearest points of floodplain export, and (iii) outmigration rates would decrease during active subsidy periods. By integrating food web dynamics with growth and movement of Chinook salmon, this study provides insight into how managed floodplain inundation can function as a conservation tool for managing Chinook salmon and other native fishes.

Materials and Methods

Study Area

The Sacramento River is the largest river in California, draining a watershed of approximately 70,000 square kilometers and supplying nearly one-third of the state's surface water (NOAA, 2022). Originating in the spring-fed tributaries near Mt. Shasta, California, the river flows southward before discharging into the Sacramento-San Joaquin Delta. The river provides critical habitat for native fish species, including four distinct runs of Chinook salmon. Historically, adjacent floodplains were inundated during winter high flows and spring snowmelt. However, river flows are now highly regulated through an extensive network of levees, dams, weirs, and diversion infrastructure throughout the Central Valley, leaving only about 5% of prior floodplain habitat accessible to wildlife (Inamine et al. 2010).

The study reach encompasses a 13.18 river kilometer (rkm) segment of the Sacramento River, located approximately 48 kilometers northwest of Sacramento, just upstream of the town of Knights Landing (rkm 240-227; Figure 1). Bathymetric conditions within this segment range from deep, slow-moving pools to shallower areas characterized by increased flow velocities. The riverbed substrate consists primarily of sand and fine sediments with patches of aquatic vegetation present. In some sections, the riverbanks are reinforced with riprap.

Near the center of the study reach is the "Rough and Ready" agricultural water pump (38°51'45.4"N, 121°47'33.8"W) (Figure 1). The facility includes five large, submerged pumps that are manually operated, as well as one smaller pump controlled by a float switch. Collectively, the pumps can discharge water into the river at rates ranging from 80 to 955 cubic feet per second (California Trout, 2023). Water exported through this site originates from approximately 65,000 acres of farmland owned by Reclamation District 108, of which 12,744 acres are enrolled in California Trout's Fish Food Program. Under program guidelines, enrolled fields are intentionally inundated for a minimum of three weeks, allowing zooplankton densities to reach target thresholds before the water is released back into the river (California Ricelands Waterbird Foundation, 2020).

Spatial Zooplankton Production

Zooplankton density was sampled weekly along the study reach from 31 October 2022 through 8 May 2023. A total of 9 sampling sites were established. Of these, three sites were located upstream of the water pump, and two sites were directly at the outflow. The remaining sites were located downstream of the pump (Table 1). Zooplankton were sampled at each site using a 30 cm diameter zooplankton tow net fitted with a 150 μ m mesh and a built-in flowmeter to quantify the volume of water sampled. Collections consisted of four net tows, each approximately 5 m in length. Tows were conducted in a fanned pattern from a single point to encompass a broader cross-section of the sampling site. All collected samples were preserved in 95% ethanol and returned to the laboratory for processing. Zooplankton samples were examined under a dissecting microscope at 8x magnification, and individuals were counted and identified to the lowest taxonomic level possible. Samples were considered fully processed once 100 individuals of the most abundant taxon and an additional 100 individuals representing all remaining invertebrate taxa combined had been enumerated. Taxon specific dry carbon biomass values were obtained from published

values (Dumont et al. 1975) and applied to zooplankton counts to calculate biomass. Zooplankton biomass density was calculated as carbon biomass divided by the cubic meter of water sampled, which was estimate as the product of the tow distance and the cross-sectional area of the net mouth (Katz et al. 2017).

To identify periods of floodplain derived food subsidy within the acoustic array, mean zooplankton biomass was calculated from three upstream sites designated as control locations not influenced by subsidy inputs and compared to values observed at downstream sites (i.e., subsidized sites). A subsidy threshold was defined as one standard deviation above the mean of the control reach. Sampling sites along the study reach were classified as experiencing a food subsidy when this threshold value was met or exceeded; values below the threshold were considered representative of baseline zooplankton production.

Chinook Salmon Growth Rates

In-situ fish enclosures were deployed and collocated at each of the previously established zooplankton sampling sites (Table 1). At each site, three independent enclosures were installed to serve as site-level replicates. Each enclosure contained five hatchery-origin juvenile fall-run Chinook salmon, individually marked with a unique identifier (Biomark Mini HPT8 PIT Tag - 8mm; Biomark, Boise, Idaho, USA). Fish were obtained from Coleman National Fish Hatchery in Anderson, CA. Enclosures measured 60.96 cm wide x 121.92 cm long x 60.96 cm deep and were constructed using 2.54 cm inner diameter PVC pipe and a 0.25 cm aperture plastic mesh, allowing for the passive movement of drifting prey organisms. At each site, enclosures were arranged linearly and connected to one another, and flotation was maintained using three crab buoys per enclosure. Individual fish fork length and mass were measured weekly throughout the study period. Each week, fish were removed from enclosures, scanned to confirm identification, and measured for fork length using a specialized measuring board (Holmes & Jeffres 2021). Individuals were then photographed and weighed (g) using a portable electronic balance (OHAUS Scout Pro; precision = 0.01 g) before being returned to their respective enclosures. In cases of mortality, replacement fish were added to maintain constant fish density throughout the experiment (Cordoleani et al. 2022). Replacement individuals were of identical origin and kept at the UC Davis Center for Aquatic Biology and Aquaculture. Data from replacement fish were excluded from growth metrics analyses. Growth rates were quantified as the rate of change of fork length and mass over time, thereby standardizing for differences in initial size among individuals.

Chinook Movement Behavior

To characterize movement behavior of outmigrating CV Chinook salmon, a total of seven Teknologic acoustic telemetry receivers were deployed between 12 January 2023 and 30 June 2023 (Teknologic Engineering LLC, Edmonds, Washington, USA). Receivers were distributed across four spatial zones: one site upstream of the pump station, one immediately adjacent to the pump station, and two sites downstream of the pump (Figure 1). The locations delineated two functional regions within the study area: an upstream “unsubsidized zone” and a downstream “subsidized zone”. Receivers were deployed in paired configurations at each site to provide redundancy in the event of equipment failure or data loss. All units were secured along the river right bank by attachment to riparian trees. To minimize line entanglement, the upstream receiver in each pair was tethered with 30.5 m of 0.64 cm stainless steel

cable, whereas the downstream receiver was tethered with 61.0 m of the same material. Prior to deployment, each receiver was affixed to a 20.4 kg mooring. To supplement detections, two additional receivers located upstream within the portion of our array (TLSAC) were incorporated into the study. Detection data from these units were obtained from the NOAA NMFS ERRDAP database (www.ncei.noaa.gov).

We timed our study to coincide with the NOAA fisheries 2023 Seasonal Survival Hatchery Experiment (https://oceanview.pfeg.noaa.gov/CalFishTrack/pageSeasSurv_2023.html). Individual fish for this experiment originated from Livingston Stone National Fish Hatchery (winter-run Chinook). At the time of tagging, fish ranged from 80 mm to 160 mm in fork length and were surgically implanted with ATS SS300 acoustic transmitters with a 5 second pulse repetition interval (PRI). Following tagging, individuals were retained for 24 h to allow for recovery prior to transport. Fish were then transported to the release location in aerated coolers and released at the Red Bluff Diversion Dam Boat Ramp, approximately 140 rkm upstream of the study reach. Releases occurred on four dates (13 December 2022, 1 February 2023, 1 March 2023, and 15 March 2023), with 200 individuals released per event, for a total of 800 tagged fish over the study period (Liedtke et al. 2012). Tag lists, including individual transmitter IDs, tagging and release dates, and release group designations, were obtained from NOAA Fisheries and are provided in Supplementary Appendix A.

Fish Detection Processing

Receivers were recovered on three dates (15 May 2023, 18 May 2023, 30 June 2023) due to debris accumulation that limited access to moorings. Detection data were downloaded from all recovered units and subjected to a three-step filtering process to retain only high-quality detections. First, false detections were removed by excluding all tag codes not present in the list of valid transmitter IDs provided by NOAA Fisheries. Second, detection histories were screened to identify anomalous records by flagging individuals with a single detection event or with extreme temporal gaps (>8 days) between detections, based on the distribution of detection frequencies. Third, individual fish detection histories were visualized using waterfall plots to assess movement patterns and identify irregular behavior. Additional behavioral filters (i.e., predator filters; Gibson et al. 2015) were applied to flag individuals exhibiting atypical movement, such as extensive upstream travel inconsistent with expected outmigration behavior. All flagged individuals were subsequently examined on a case-by-case basis by plotting full detection histories from the release site to Benicia Bridge (Figure 4). Individuals travel patterns indicative of predation events, showing consistent upstream movement were excluded from further analysis. To compare movement between upstream (control) and downstream (experimental) zones, only individuals detected at three or more unique receiver locations were retained for analysis, since movement metrics could not be quantified with fewer detections.

Data Analysis

Zooplankton Biomass

Zooplankton density (g m^{-3}) within the study area was compared among three spatial zones: upstream unsubsidized ($n = 3$ sites), outfall export site ($n = 1$ site), and the downstream subsidized sites ($n = 5$). Sampling dates were categorized based on pump operation status as either active export (“pump on;” $n = 8$ sampling events) or inactive (“pump off”; $n = 16$ -20 sampling events, depending on field conditions and sampling schedule).

Differences in zooplankton biomass across spatial zones and pump operation status were evaluated using a Kruskal-Wallis rank sum tests, as data violated assumptions of normality (Shapiro-Wilk test, $p < 0.001$ in 5 of 6 groups) and variance (Levene's test: $F_{5,217} = 4.31$, $p < 0.001$). Individual tests were conducted for spatial zone, pump operation status, and their combination. Where significant main or interaction effects were detected, post hoc pairwise comparisons were conducted using Dunn's test with Bonferroni correction (Dunn 1964).

Fish Growth rates

Fish growth rates were calculated as the change in fork length (mm d^{-1}) and mass (g d^{-1}) over the duration of time individuals were held within enclosures. Growth rates were compared among three spatial zones: upstream unsubsidized ($n=3$ sites), outfall export ($n= 2$ sites), and downstream subsidized ($n = 4$ sites). Sampling periods were further categorized by water drainage status as either active (during pumping) or inactive (before and after events).

Differences in growth rates were analyzed using one-way multivariate analysis of variance (MANOVA) with spatial zone and drainage status (active vs. inactive) treated as separate predictors. Since both fork length and mass represent two metrics of overall growth, joint analysis was preferred to avoid type I error. Significant effects were followed up with univariate tests extracted from the MANOVA for each response variable. Post hoc pairwise comparisons were then conducted using a Tukey HSD test (Tukey 1949).

Fish Ground Speed

Fish average ground speed (km h^{-1}) was calculated for individual as the linear distance between sequential receiver locations divided by the elapsed time between detections at upstream and downstream receivers. For individuals with multiple detections, segment specific ground speeds were calculated and, where appropriate, summarized at the individual level. Differences in ground speed were evaluated using Wilcoxon rank-sum tests due to non-normality of residuals. Comparisons were conducted between (1) pump operation status (active vs. inactive) and (2) periods of peak zooplankton river abundance (25 February–15 March 2023) versus baseline conditions.

Fish Passage Modeling

Cox proportional hazards (CPH) models (Cox 1972) were used to evaluate factors influencing the rate of fish passage through the acoustic receiver array. Passage time was defined as the elapsed time between first detection at the outfall receiver and final detection at the most downstream receiver. All models were then compared using Akaike Information Criterion (AIC) to identify the most parsimonious representation of fish passage (Burnham and Anderson 2002).

Model covariates included river discharge (continuous), subsidy condition (categorical: upstream, transition, and within-subsidy), and pump operational status (active/inactive). The first model (M0) included only river discharge as a null reference. The next model (M1) included discharge plus subsidy condition as a categorical covariate with three levels (No subsidy; Transition to subsidy; and Within Subsidy), along with an interaction term between condition and discharge. The final model (M2) replaced subsidy condition with pump operational status (active/inactive) with an interaction with discharge. Both subsidy condition and pump status served as indicators of zooplankton subsidy availability. Subsidy condition is defined statistically as the period when zooplankton density was at least one standard deviation above control sites, with transition periods defined as the two days immediately before and after the active subsidy, along with periods without calculable subsidy. Pump status reflects active water transfer from the Rough and Ready pump into the river, which may also occur for flood control purposes.

Hazard ratios (HR) were calculated for each covariate as $\exp(\beta)$, where β represents the estimated regression coefficient. Hazard ratios >1 indicate an increased rate of passage (i.e., faster downstream movement), whereas values <1 indicate a decreased rate of passage.

Model fit was assessed using likelihood ratio tests and the proportional hazards assumption was evaluated using Schoenfeld residuals, where $p > 0.05$ indicates that the assumption was met for each covariate. For all other analyses, statistical significance was assessed at $\alpha = 0.05$ and were performed in R (version 4.4.1; R Core Team 2026).

Results

Hydrological Conditions of the Study Reach

Sacramento River discharge near our array at Wilkins Slough during the study period ranged from 6,190 to 27,500 cfs, with peak flows associated with winter precipitation events and reservoir releases (Figure 2). Between 12 January 2023 (receiver deployment) and April 19, 2023 (final fish detection) the Rough and Ready water pump was actively pumping water for 74 days and remained inactive for 24 days.

During the first drainage cycle (2 January–7 February 2023), approximately 9,152 acres of floodplain habitat were drained. Floodplain fields were subsequently re-flooded on 7 February 2023, followed by a second drainage period from 20 February to 13 March 2023. Zooplankton abundance within the study reach peaked between 25 February and 15 March 2023 (Figure 3), with a maximum mean density of 2515.84 individuals m^{-3} , coinciding with the latter drainage period.

Spatial Zooplankton Production

Zooplankton biomass differed significantly among the three spatial zones (upstream-unsubsidized, outfall-export site, and downstream-subsidized; Kruskal-Wallis: $\chi^2_2 = 7.25$, $p = 0.027$) and pump status periods ($\chi^2_1 = 8.08$, $p = 0.004$). Significant variation was also detected among site-by pump status combinations ($\chi^2_5 = 28.44$, $p < 0.001$) (Table 2).

During periods without active water subsidy exports ($n = 16$ sampling events), zooplankton biomass did not differ significantly between upstream and downstream sites ($p = 1.00$). In contrast, during active

export periods, zooplankton biomass was approximately four-fold higher at the outfall site and two-fold higher at downstream subsidized sites relative to upstream unsubsidized sites.

During active water exports, mean ($\pm$ SE) zooplankton biomass was $473 \pm 41.0 \text{ g m}^{-3}$ at upstream unsubsidized sites, $2,046 \pm 670.0 \text{ g m}^{-3}$ at the outfall site, and $960 \pm 87.3 \text{ g m}^{-3}$ at downstream subsidized sites. During non-export periods (before/after pumping), mean biomass was $863 \pm 141 \text{ g m}^{-3}$ at upstream sites, $1,569 \pm 506 \text{ g m}^{-3}$ at the outfall site, and $715 \pm 87.3 \text{ g m}^{-3}$ at downstream sites (Table 2).

Dunns Post hoc pairwise testing indicated that zooplankton biomass at the outfall site was significantly higher than downstream sites during non-export periods (mean difference = $1,331 \text{ g m}^{-3}$, approximately 2.9 times greater; $p = 0.007$) and upstream sites during active export ($p = 0.009$). Downstream biomass was also significantly higher during active exports than during non-export periods ($p = 0.001$) and compared to upstream sites during active export ($p = 0.011$).

Growth Rates of Caged Fish

Enclosure experiments were conducted from 10 February to 10 April 2023. Water export operations occurred from 17 February to 15 March, providing a one-week pre-export period for baseline comparisons of growth rates. At deployment, fish averaged 51.0 mm in length (SE = 0.130) and 1.37g in mass (SE = 0.015). By the end of the export period (March 13, 2023) all enclosure groups exhibited growth. The greatest increases were observed at the outflow site (mean length = $66.9 \text{ mm} \pm 1.01$, weight = $2.87 \text{ g} \pm 0.144$, $n = 7$), followed by downstream subsidized sites ($60.5 \text{ mm} \pm 0.467$ and weight of $2.11 \text{ g} \pm 0.064$, $n = 41$), and upstream unsubsidized sites ($58.8 \text{ mm} \pm 0.596$ and weighed $2.04 \text{ g} \pm 0.085$, $n = 21$).

Spatial Variation in Growth. Location of fish enclosures had a significant multivariate effect on growth (MANOVA: Pillai = 0.185, $F_{4,1490} = 37.88$ $p < 0.001$). Fork length and mass growth rates differed significantly among spatial zones (Figure 6; $F_{2,745} = 80.43$, $p < 0.001$) and (Figure 7; $F_{2,745} = 50.42$, $p < 0.001$), respectively. Growth rates were highest at the outfall (length: $0.340 \pm 0.021 \text{ mm d}^{-1}$, mass: $0.031 \pm 0.003 \text{ g d}^{-1}$), followed by downstream (length: $0.172 \pm 0.007 \text{ mm d}^{-1}$, mass: $0.014 \pm 0.001 \text{ g d}^{-1}$), and upstream sites (length: $0.131 \pm 0.007 \text{ mm d}^{-1}$, mass: $0.008 \pm 0.001 \text{ g d}^{-1}$). Tukey HSD tests indicated that growth at the outfall was significantly greater than at upstream and downstream sites (all $p < 0.001$). Downstream sites also had a significantly greater growth than upstream sites in both length ($p = 0.004$) and mass ($p = 0.010$).

Temporal Variation in Growth. Growth rates also differed across the export periods (MANOVA: Pillai = 0.255, $F_{4,1490} = 54.43$, $p < 0.001$), with effects confirmed for length (Figure 8; $F_{2,745} = 119.78$, $p < 0.001$) and mass (Figure 9; $F_{2,745} = 33.42$, $p < 0.001$). Growth rates were highest during the active export period (length: $0.312 \pm 0.012 \text{ mm d}^{-1}$, $n = 380$, mass: $0.028 \pm 0.002 \text{ g d}^{-1}$, $n = 373$), intermediate rates during the pre-export period (length: $0.215 \pm 0.010 \text{ mm d}^{-1}$, $n = 140$, mass: $0.012 \pm 0.001 \text{ g d}^{-1}$, $n = 139$), and lowest rates post-export (length: $0.091 \pm 0.006 \text{ mm d}^{-1}$, $n = 366$, mass: $0.008 \pm 0.001 \text{ g d}^{-1}$, $n = 360$). Tukey HSD tests confirmed that all periods differed significantly from one another in length (all $p < 0.001$). For mass, growth during active exports was higher than pre-export ($p < 0.001$) and post-export ($p < 0.001$), while post-export mass growth remained lower than pre-export ($p = 0.029$).

Fish Movement Behavior

Between 12 January and 30 June 2023, a total of 1196 filtered acoustic detections were recorded across the receiver array, including detections from the supplemental receivers. Of the 800 tagged fish released, 282 individuals were detected within the study reach. After applying predation filters and a minimum detection threshold, 245 individuals were retained for analysis (Figure 4).

Fish Passage Modeling (Cox Proportional Hazards). Cox proportional hazards models were used to evaluate the effects of discharge, subsidy condition, and pump operational status on fish passage through the study reach. The analysis included 2,787 detection records, representing 230 complete fish transits. Three models were compared using AIC: a discharge-only model (M0; AIC = 2039.2), a model including discharge and subsidy condition with their interaction (M1; AIC = 2043.4), and a model including discharge and pump operational status with their interaction being the best fit (M2; AIC = 2028.8).

River discharge was a significant predictor of fish passage rate (HR = 1.088, $p = 0.004$), indicating that higher discharge increased the rate of downstream movement (i.e., faster passage through the array). Subsidy condition alone was not a significant predictor of passage (transition to subsidy: HR = 4.02, $p = 0.199$; subsidy: HR = 3.44, $p = 0.090$).

Model fit was supported by a likelihood ratio test ($p = 0.008$, concordance = 0.553). Schoenfeld residuals indicated that proportional hazards assumptions were met for individual covariates (discharge: $p = 0.129$, Subsidy: $p = 0.829$, discharge x subsidy: $p = 0.977$), although a marginal violation was detected at the global level ($p = 0.04$).

Pump-modulated discharge effects. Pump operational status modified the effect of discharge on fish passage. When pumps were inactive, discharge significantly increased passage rate (HR = 1.104, $p < 0.001$), indicating faster downstream movement under higher discharge. In contrast, this relationship was weakened under active pumping conditions (HR = 0.935, $p = 0.014$), suggesting that pump operations dampened the positive influence of discharge on movement. Model fit was supported by a likelihood ratio test ($p < 0.001$, concordance = 0.584). Schoenfeld residuals indicated that proportional hazards assumptions were met for all covariates (discharge: $p = 0.129$, Pump Status: $p = 0.058$, discharge x Pump Status $p = 0.062$) and global test ($p = 0.185$).

Fish Ground Speeds. Fish average ground speed differed significantly between upstream and downstream reaches (Figure 5; ANOVA: $F_{1,30} = 4.945$, $p = 0.027$). In the upstream reach, 178 fish exhibited travel speeds ranging from 0.006 to 4.97 km h⁻¹ (mean = 2.36 km h⁻¹), whereas in the downstream reach, 245 fish exhibited speeds ranging from 0.006 to 4.78 km h⁻¹ (mean = 2.63 km h⁻¹).

Pump operational status (active vs. inactive) significantly influenced movement, with reduced travel speeds observed during active water exports. Median travel speed within the subsidy zone was 2.52 km h⁻¹ during active pumping and 2.86 km h⁻¹ during inactive periods (Wilcoxon test: $W = 6378$, $p = 0.006$), corresponding to a reduction of 0.34 km h⁻¹ under active operation. The reduction in speed results in an estimated 27.5 additional minutes spent within the reach during active export. Zooplankton density also influenced movement rates. During the peak subsidy period (25 February–15 March 2023), fish traveled more slowly (median = 2.56 km h⁻¹, $n = 71$) than during non-peak periods (median = 3.11 km h⁻¹, $n = 149$; Wilcoxon test: $W = 3400$, $p < 0.001$).

Discussion

Agricultural floodplain management is increasingly recognized as a means of generating large volumes of zooplankton pulses that can subsidize depleted riverine food webs and benefit outmigrating Chinook Salmon (Katz et al. 2017, Corline et al. 2021, Sturrock et al. 2022). Our results support this growing body of evidence. Planned floodplain water exports increased zooplankton densities fourfold at the primary outflow and twofold downstream of the pump, effectively reconnecting downstream habitats to high quality food resources. Consistent with this, in-situ enclosure experiments showed elevated growth rates during periods of subsidy, with juvenile salmon exhibiting growth rates nearly four times higher than those upstream of the subsidized reach. Acoustic telemetry data indicated a behavioral shift to reduced transit rates in migrating juvenile salmon that entered the study area during periods of subsidy, potentially due to increased foraging.

Zooplankton Export

Managing rice fields as surrogate floodplains increased zooplankton biomass in river stretches that are otherwise disconnected from floodplain-derived production. During periods of managed water exports from the Rough and Ready water pump, zooplankton densities in the Sacramento River were elevated several kilometers downstream. At the outflow, densities were on average fourfold higher than upstream, unsubsidized sites, and remained approximately two-fold higher at downstream locations over nine rkm downstream. These findings align with previous studies showing that zooplankton production in off-channel floodplains can exceed that of adjacent river channels by orders of magnitude (Gladden & Smock 1990). This influx of prey is particularly important during outmigration for Chinook salmon, when access to high-quality food resources can strongly influence growth. Floodplain derived exports are typically dominated by large-bodied cladocerans (Corline et al. 2021), in contrast to smaller copepods and rotifers that characterize mainstem river communities (Muller-Solger et al. 2002). This combination of greater prey density/abundance and higher energetic value likely creates localized foraging hotspots, enhancing growth potential during the critical life history transition prior to marine entry.

Chinook Salmon Growth

Growth metrics from enclosure experiments demonstrated clear bioenergetic benefits for fish exposed to floodplain-derived subsidies, extending from the main outfall to several kilometers downstream. During periods of active export, juvenile Chinook salmon held adjacent to the pump exhibited the highest growth rates, averaging 0.514 mm d^{-1} and 4.9 mg d^{-1} . Growth remained elevated at downstream sites (0.28 mm d^{-1} and 2.2 mg d^{-1}) relative to upstream, unsubsidized reaches (0.152 mm d^{-1} and 0.667 mg d^{-1}), indicating that subsidy effects persisted beyond the immediate outfall. Notably, these growth patterns closely tracked zooplankton pulses, with elevated growth rates observed only during active drainage events and no significant differences during non-export periods. This rapid response suggests that the floodplain-derived food subsidies were being converted to growth almost immediately, with a swift decline in growth once the food was removed.

These findings are consistent with previous studies showing that enhanced prey availability and quality can drive rapid growth of juvenile salmon (Sommer 2001, Jeffres et al. 2008, Katz et al. 2017, Lusardi et al. 2020). Access to abundant, energy-rich prey resources likely promotes faster growth and larger fish are

assumed to have improved migration survival. Larger body size can reduce predation risk, particularly from gape-limited predators, and increase resilience to environmental variability (Ward et al. 1989, Holtby et al. 1990, Sogard 1997). Although this study focused on a single segment of the Sacramento River corridor, the observed growth enhancements suggest this episodic exposure to floodplain-derived food subsidies may confer downstream survival advantages, potentially extending into early marine residence (Woodson et al. 2013, Duffy & Beauchamp 2011).

Movement Behavior of Chinook Salmon

While enclosure experiments quantified growth benefits associated with floodplain food subsidies, they do not capture behavioral responses under natural conditions, such as active foraging (Cook et al. 2013). According to optimal foraging theory, organisms are expected to maximize energy intake, while minimizing foraging costs (MacArthur & Pianka 1966). In riverine systems, this often manifests as reduced movement rates or increased residency in areas with elevated prey availability. Consistent with this framework, outmigrating Chinook may be expected to slow transit through reaches subsidized by high-density, energy-rich prey. Our acoustic telemetry data provides some support to this prediction. During periods of active floodplain export to the Sacramento River, juvenile salmon exhibited reduced movement rates, suggesting localized behavioral responses to increased prey availability. Similar patterns have been observed in other salmonid systems, where individuals preferentially occupy habitats that maximize invertebrate drift while minimizing energetic costs (Everest & Chapman 1972). Together, these results indicate that floodplain-derived food subsidies not only enhance growth potential but may also alter movement behavior, creating foraging hotspots during outmigration.

Study Limitations

Acoustic telemetry in freshwater systems presents several inherent limitations that can constrain inference about movement behavior. Tag size requirements restrict the ability to study small individuals, potentially biasing results toward larger, smolt-sized Chinook salmon. As a result, behavioral patterns observed in this study may not fully represent fry- to parr-sized fish, which are often reliant on localized food resources and may exhibit strong holding behavior. Size-dependent differences in migration have been well documented, with smaller individuals typically showing slower movement rates and greater site fidelity, while larger fish are more likely to maintain directional outmigration (Thorpe et al. 1998, Lingard et al. 2023).

Environmental conditions during the study period likely further constrained our ability to isolate behavioral responses to floodplain subsidies. The study coincided with an unusually high-flow water year, characterized by elevated discharge throughout the system. High flow conditions are known to enhance outmigration by increasing habitat availability, reducing predation risk, and accelerating downstream transport (Sommer et al. 2001, Michel 2015). Under such conditions, movement behavior may be dominated by flow-driven processes, potentially masking more subtle responses to localized food pulses. Given the magnitude of discharge observed, it is likely that hydrologic forcing outweighed the influence of prey subsidies on movement within the spatial scale of our acoustic array.

Despite these limitations, the study provides important insight into how managed floodplain export may influence both growth and behavior under natural conditions. Further advances in tagging technology and study design will help refine our understanding of how smaller individuals and varying hydrologic regimes mediate these responses.

Implications for Management in a Changing Climate

Within California's highly variable Mediterranean climate, the importance of reconnecting and actively managing floodplain resources is especially pronounced. This study was conducted during an unusually wet year, when elevated flows likely enhanced floodplain connectivity and increased background zooplankton production throughout the Central Valley (Sommer et al. 2001, Jeffres et al. 2008). Even under these favorable conditions, managed exports from over 12,000 acres of seasonally inundated agricultural lands generated substantial zooplankton subsidies detectable within our fine-scale array, representing just one of many potential food sources available to outmigrating Chinook.

In contrast, during drought years when floodplain inundation is limited, managed exports may play a more critical role by providing concentrated, predictable pulses of prey to otherwise resource-limited river systems. These subsidies are particularly relevant during outmigration for Chinook salmon, a life stage that aligns with the critical period hypothesis, wherein growth and nutritional condition can have lasting effects on survival and recruitment (Beamish & Mahnken 2001). Enhanced access to high-quality prey during this window may therefore influence not only immediate growth but downstream fitness and marine survival. Future research should extend this work by evaluating longer-term carryover effects on adult return rates, for example using otolith-based isotope microchemistry to link early-life exposure to floodplain-derived food subsidies with adult return success across different water type years (e.g., wet vs. drought conditions).

Projected increases in drought frequency and severity across California underscores the need for adaptable management strategies that can buffer ecological productivity under water-limited conditions. In this context, the rapid production and export of zooplankton from managed floodplains represents a promising and flexible conservation tool. Such approaches offer the potential to support outmigrating salmon while maintaining compatibility with agriculture land use and constrained water availability.

Conclusion

Managed agricultural floodplain reconnection can enhance growth conditions for outmigrating Chinook salmon in highly altered riverine systems. In this study, managed floodplain drainage events exported zooplankton subsidies that measurably increased prey availability within a reach of the Sacramento River. Even a limited number of export events were sufficient to generate detectable growth benefits in Chinook held within the subsidized reach. Furthermore, a behavioral shift was observed in migrating Chinook resulting in reduced migration rates through the study reach when the zooplankton subsidy was present.

While elevated discharge during the study period likely constrained our ability to detect broader population-level behavioral responses, physiological growth response to food subsidies remained clear. These results are particularly relevant during drought conditions, when natural floodplain connectivity is reduced and off-channel habitats are less accessible. Initiatives such as The Fish Food Program illustrate how partnerships between landowners and conservation organizations can restore key ecological functions in heavily modified river systems. More broadly, managed floodplain reconnection represents a practical tool to support Chinook salmon recovery.

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Tables

Table 1. Zooplankton sampling and Chinook enclosure locations. Site code is in reference to site names used in ERDDAP database.

Site code	Zone	Description	Latitude (°N)	Longitude (°W)	Zooplankton Sampling	In-Situ Fish cages
WLKSAC	Unsubsidized	Farthest upstream control site on the Sacramento River near Tisdale Weir	39.0213	121.8216	✓	✓
TLSAC	Unsubsidized	Upstream control site	38.8823	121.8177	✓	✓
RRSAC1	Unsubsidized	Upstream control site nearest to Rough and Ready pump	38.8661	121.7948	✓	✓
RRSAC2	Export	Rough and Ready pump outfall; Floodplain water export site (replicate cage sets 2A and 2C)	38.8629	121.7925	✓	✓
RRSAC4	Subsidized	Downstream subsidized site 1; closest to export site	38.8585	121.7846	✓	✓
RRSAC5	Subsidized	Downstream subsidized site 2	38.8614	121.7700	✓	✓
RRSAC6	Subsidized	Downstream subsidized site 3;	38.8706	121.7609	✓	

Site code	Zone	Description	Latitude (°N)	Longitude (°W)	Zooplankton Sampling	In-Situ Fish cages
		zooplankton sampling only				
RRSAC7	Subsidized	Downstream subsidized site 4	38.8710	121.7500	✓	✓
RRSAC8	Subsidized	Farthest downstream site	38.8525	121.7256	✓	✓

Table 2. Zooplankton biomass density during and before/after active floodplain water export at Rough and Ready water pump

Site Code	Pump Status	Samples Taken (n)	Mean	SD	SE
RRSAC1	Active Export	8	445.35	188.41	66.61
RRSAC1	Before/After	16	652.47	648.06	162.02
RRSAC2	Active Export	8	2046.41	1893.65	669.51
RRSAC2	Before/After	20	1568.54	2260.89	505.55
RRSAC4	Active Export	8	1006.06	628.77	222.30
RRSAC4	Before/After	16	768.62	737.89	184.47
RRSAC5	Active Export	8	919.56	397.89	140.68
RRSAC5	Before/After	16	691.73	738.86	184.71
RRSAC6	Active Export	7	945.23	496.05	187.49
RRSAC6	Before/After	16	577.64	550.27	137.57
RRSAC7	Active Export	8	976.49	510.83	180.61
RRSAC7	Before/After	16	602.72	556.49	139.12
RRSAC8	Active Export	8	949.28	488.94	172.87
RRSAC8	Before/After	20	891.05	1179.49	263.74
TLSAC	Active Export	8	537.29	240.67	85.09
TLSAC	Before/After	14	805.27	747.96	199.90
WLKSAC	Active Export	8	437.38	179.97	63.63
WLKSAC	Before/After	18	1100.94	1311.21	309.05

Figures



Figure 1. Aerial view of the study reach on the Sacramento River near Knights Landing, California. The functional zones delineated by the Rough and Ready agricultural water pump (Export Site; 38°51'45.4"N, 121°47'33.8"W). The Control Reach (upstream/unsubsidized) and Subsidized Reach (downstream) are separated at the pump outfall (dashed line). Acoustic receiver locations are labeled: one upstream control

receiver (Upstream Rec 1) and three receivers within the subsidized zone (Sub Zone Rec 1–3). River flow proceeds from north to south (top to bottom) along the yellow directional arrow.

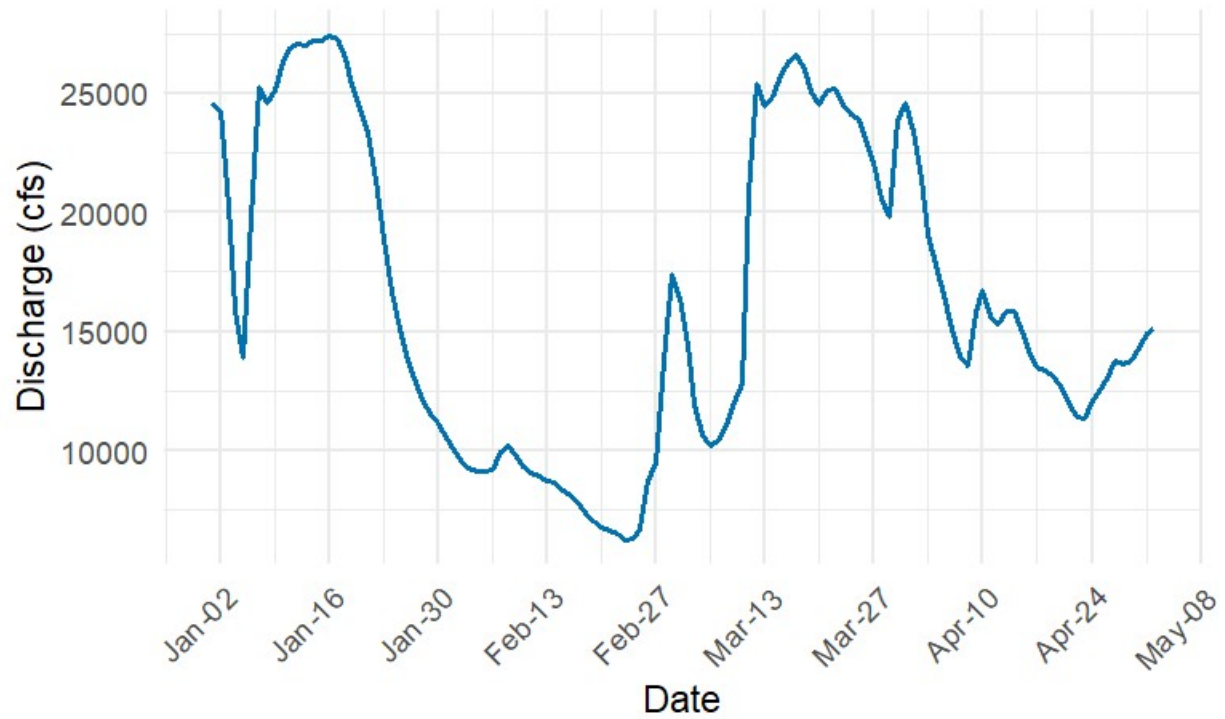


Figure 2. Daily mean river discharge in (cfs) recorded at USGS Station #11390500 on the Sacramento River from January through May 2023. River Gauge was located north of our array near the town of Grimes, California. The Rough and Ready water pump was operational for 74 days during this period, with active export events occurring in February and March.

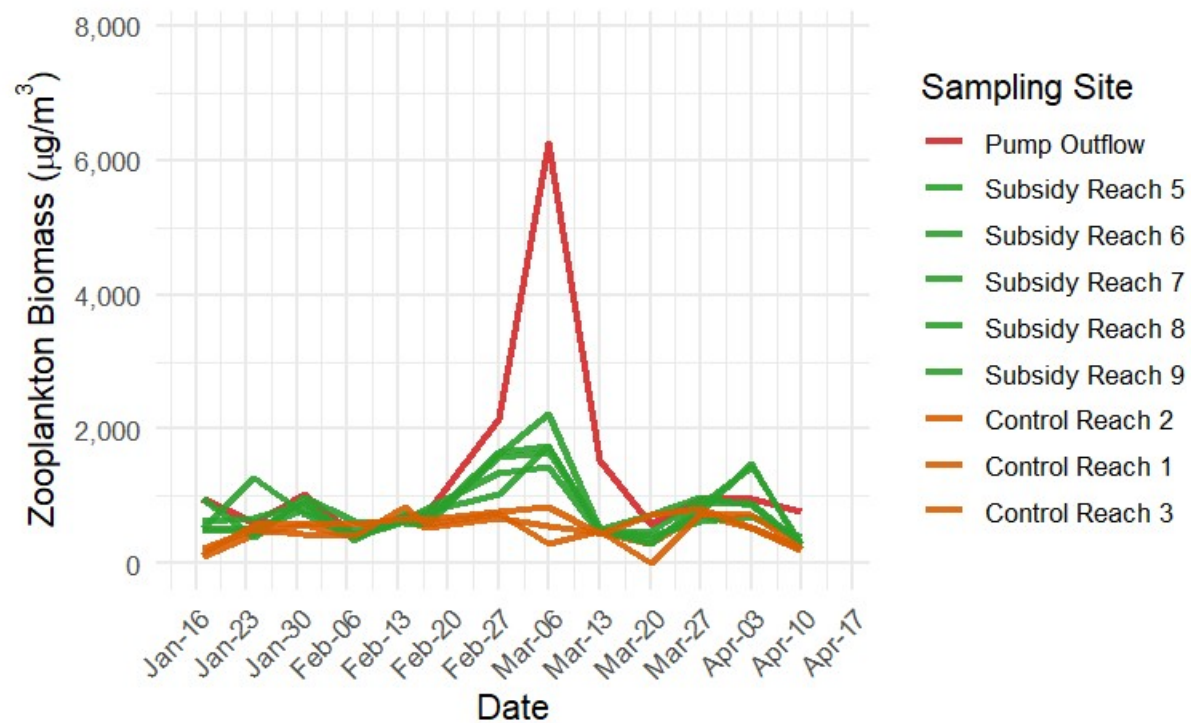


Figure 3. Zooplankton biomass in ($\mu\text{g}/\text{m}^3$) at nine sampling sites from 16 January 2023 to 10 April 2023. Upstream sites include (Control Reach 1-3), Downstream sites included (Subsidy reach 5-9), and the Rough and Ready water pump was located at Pump Outflow. Zooplankton sampling was conducted at each site weekly during the entirety of the experiment.

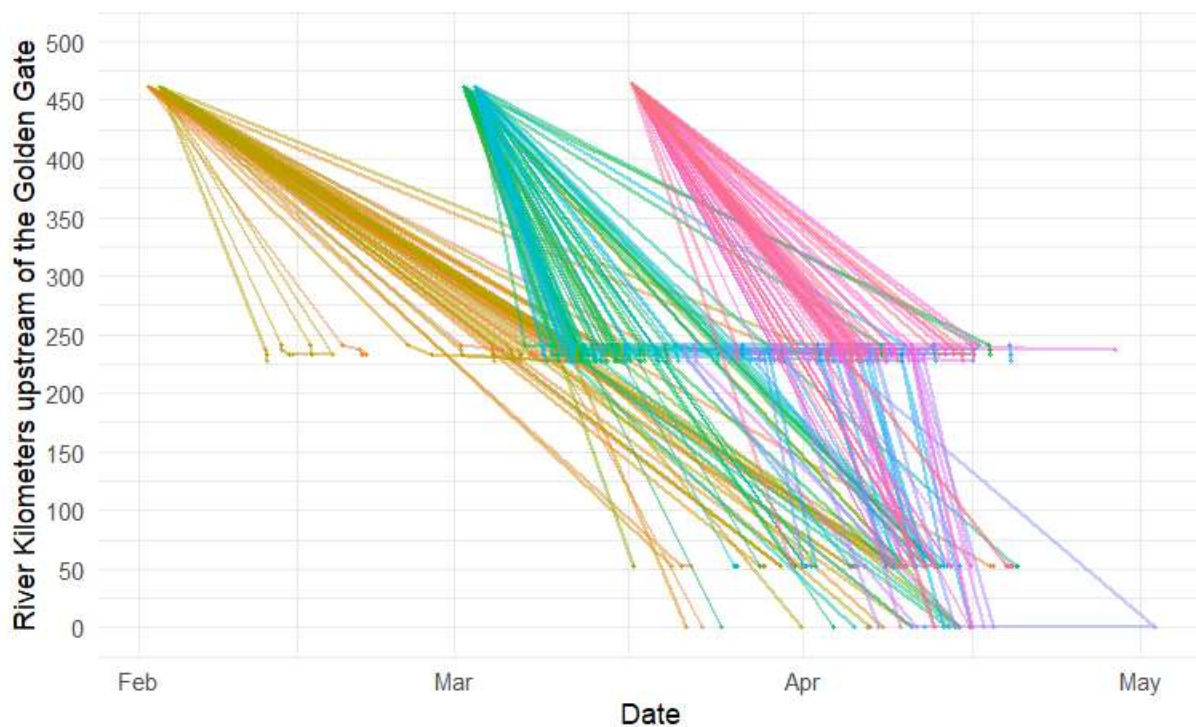


Figure 4. Waterfall plot depicting downstream movement trajectories of acoustically tagged juvenile Chinook salmon during the 2023 outmigration season (February–May). Each line represents an individual fish and colors correspond to fish release groups. Horizontal segments near rkm 230–240 indicate periods of holding or reduced movement within the subsidized reach.

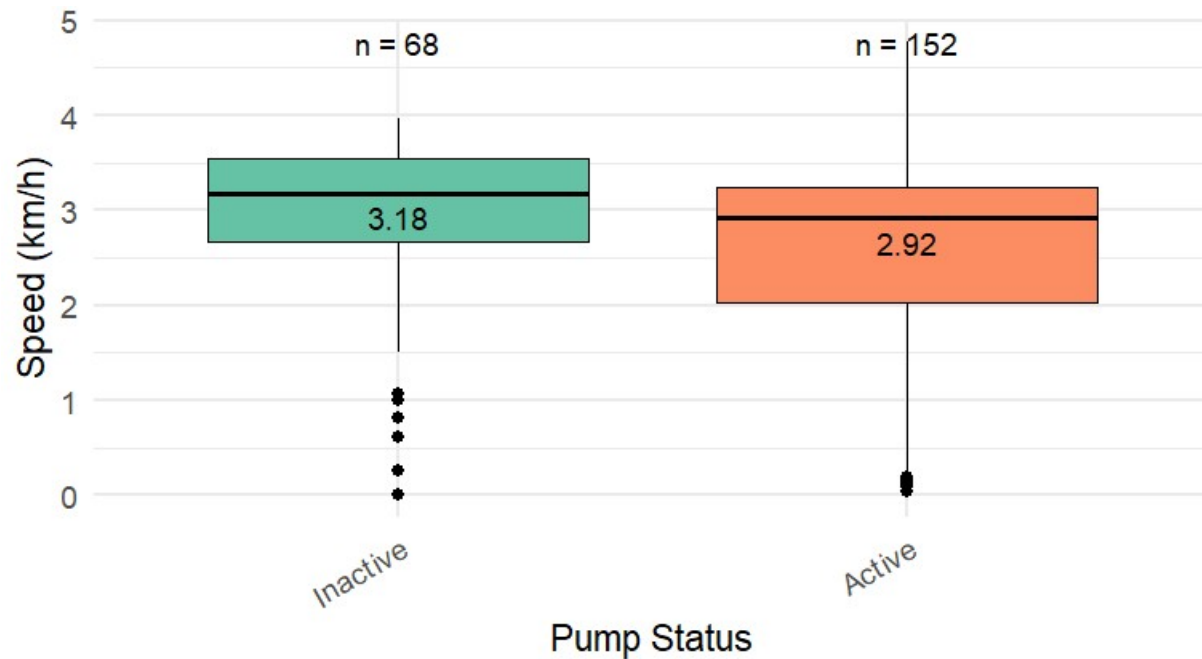


Figure 5. Boxplot of travel speed (km/h) of Chinook salmon through the subsidized reach of the acoustic array by pump operational status (Inactive vs. Active). Number in the middle of the box represents median ground speed.

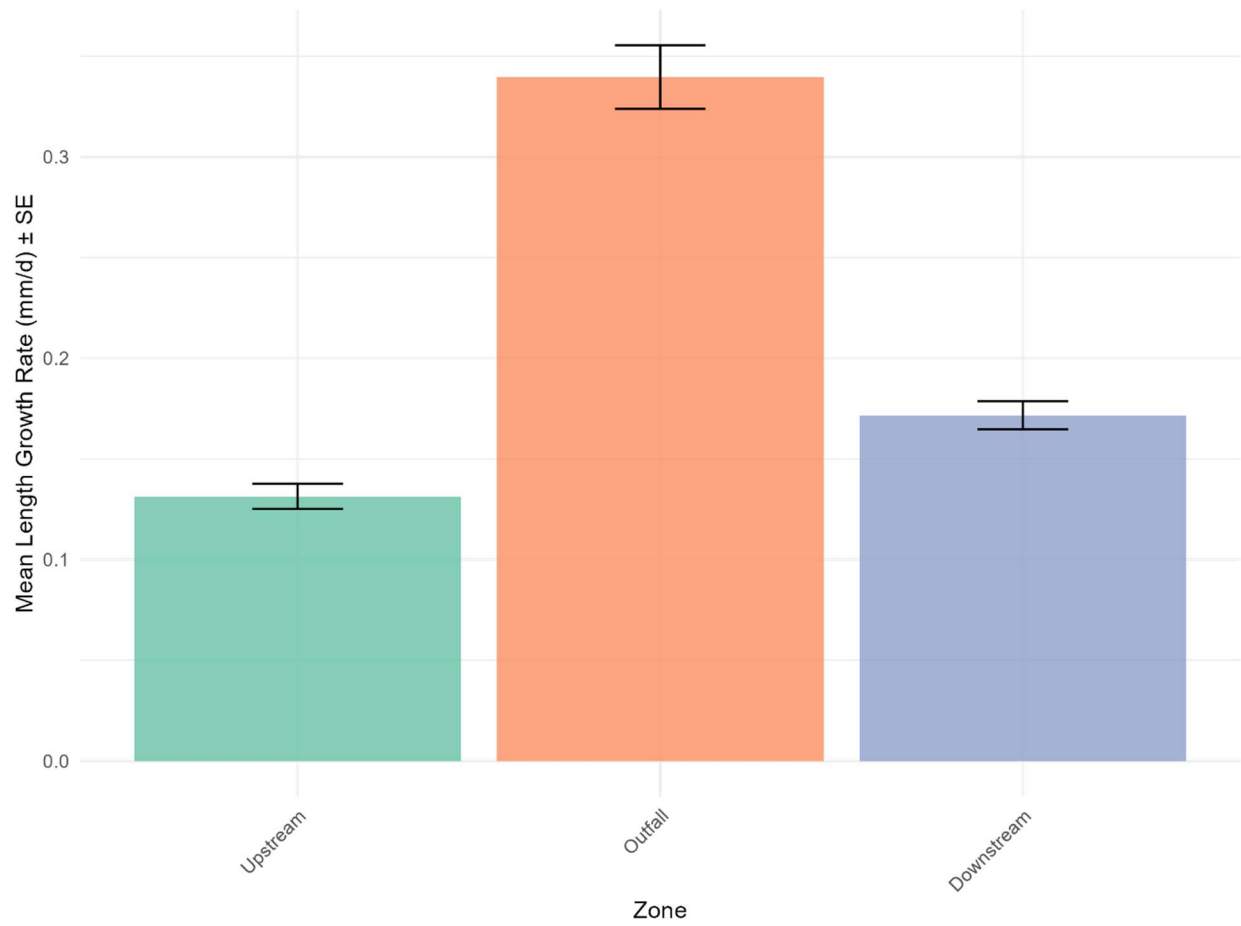


Figure 6. Mean fork length growth rate (mm/d $\pm$ SE) of juvenile Chinook salmon held in enclosures across three spatial zones: upstream unsubsidized, pump outfall, and downstream subsidized.

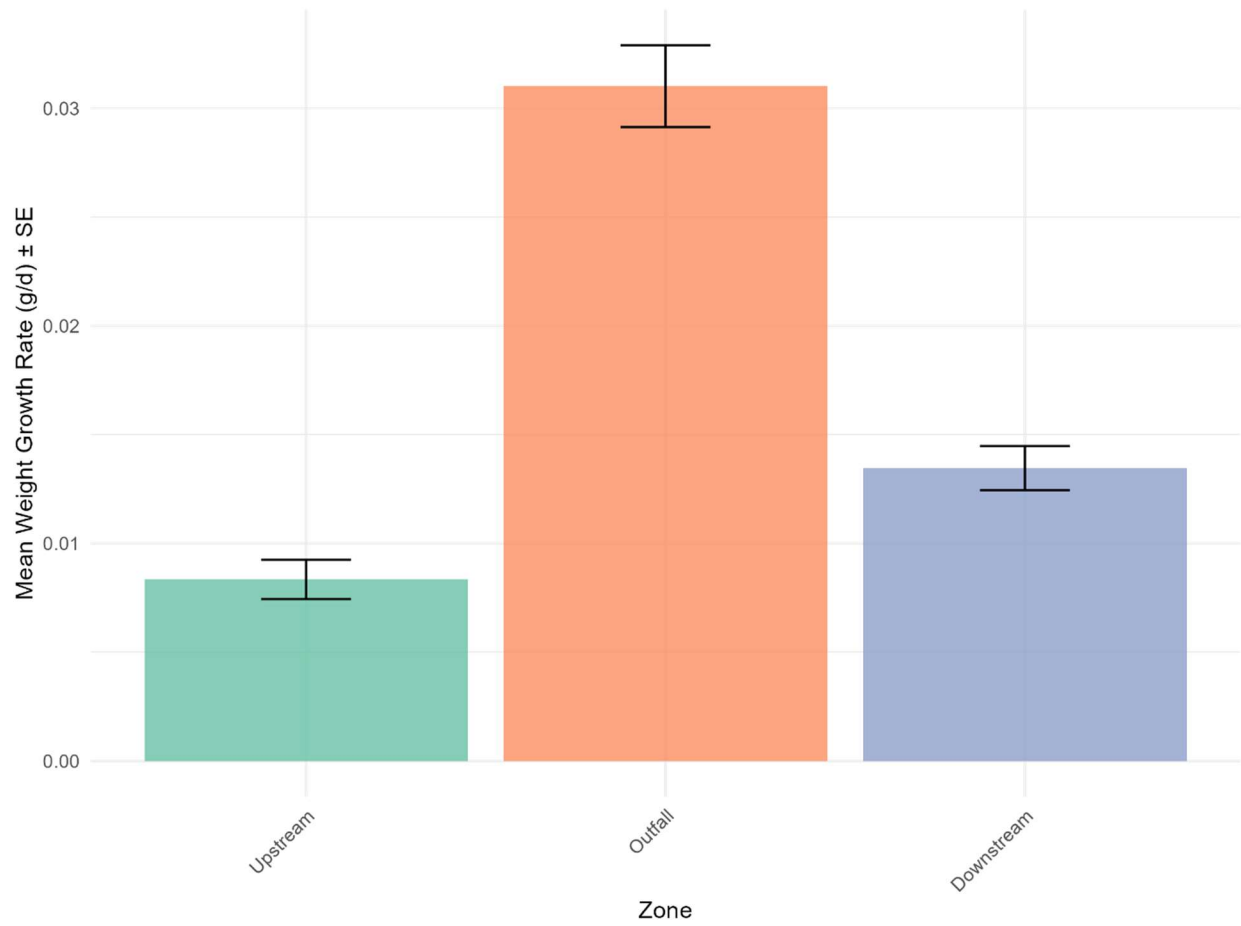


Figure 7. Mean mass growth rate ($\text{g/d} \pm \text{SE}$) of juvenile Chinook salmon held in enclosures across three spatial zones: upstream unsubsidized, pump outfall, and downstream subsidized.

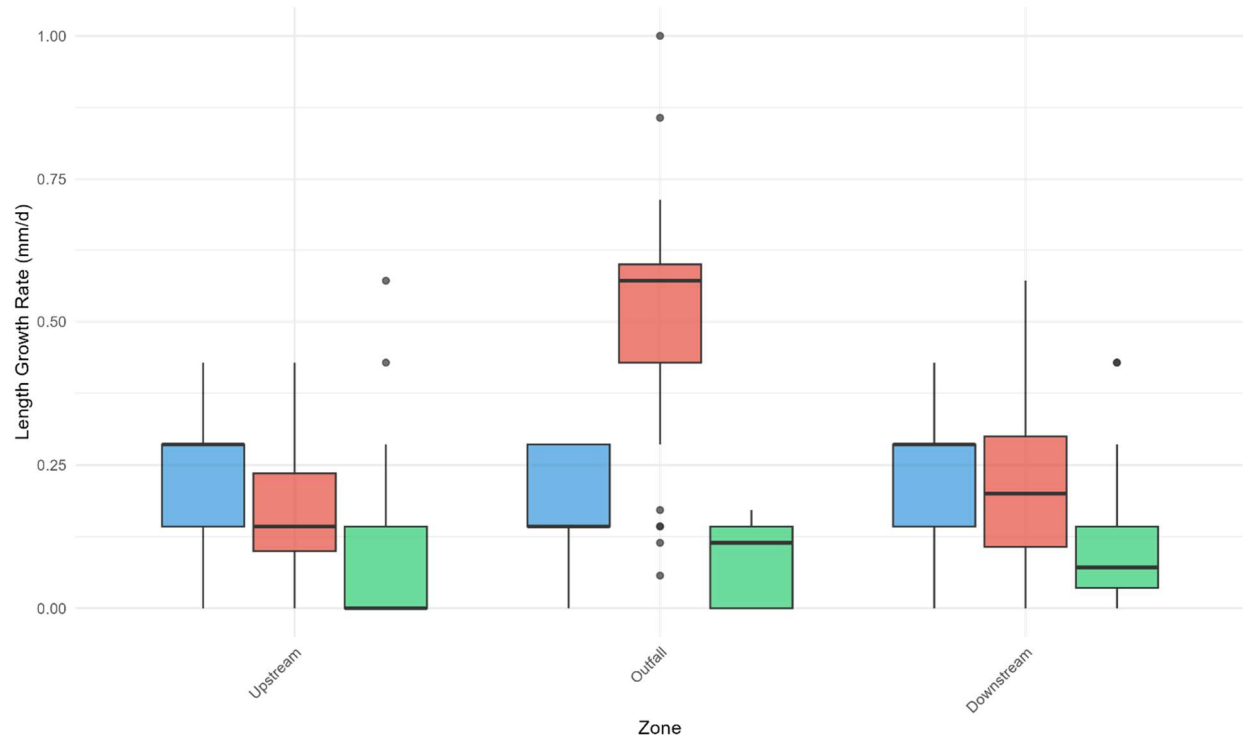


Figure 8. Fork length growth rate (mm/d) of Chinook salmon across spatial zones (upstream, outfall, downstream) and drainage periods. Colors represent drainage period: blue = pre-drain, red = during-drain, and green = post-drain

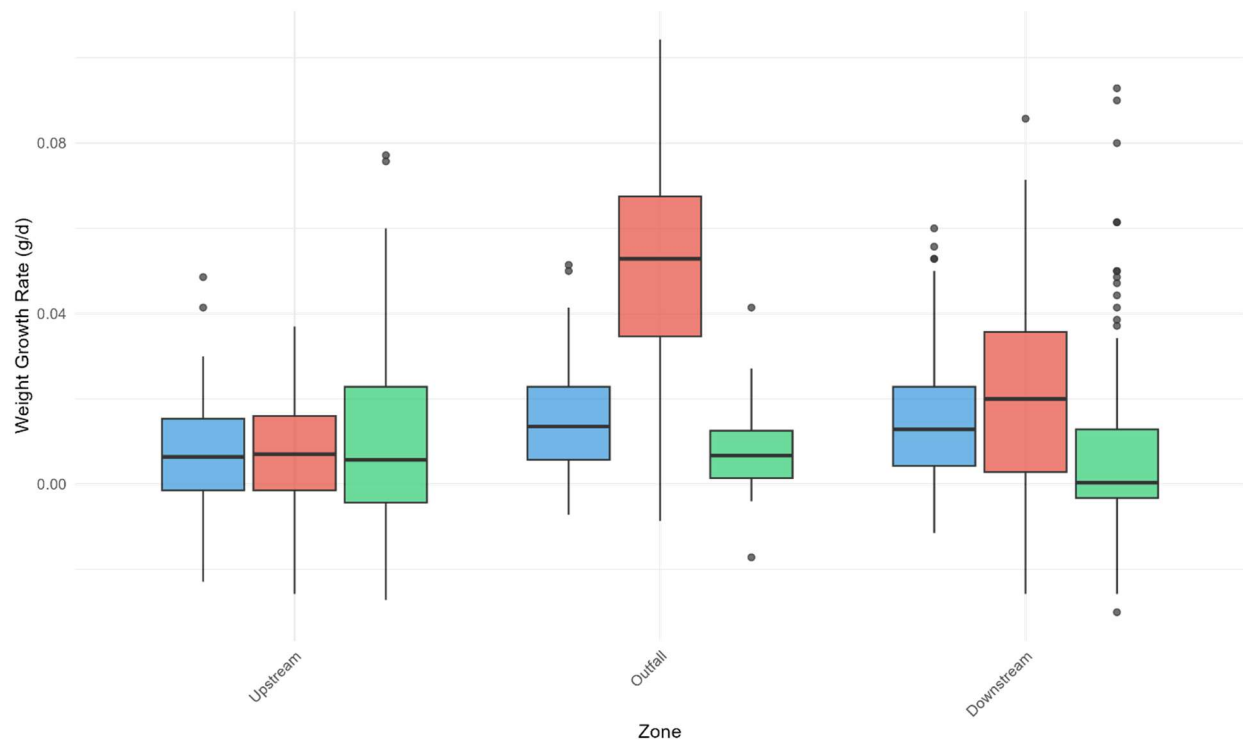


Figure 9. Mass growth rate (g/d) of Chinook salmon across spatial zones (upstream, outfall, downstream) and drainage periods. Colors represent drainage period: blue = pre-drain, red = during-drain, and green = post-drain.

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Appendix

Table A1. Metadata for acoustically tagged fish relevant to this study. Table includes unique fish ID, hexadecimal tag code, fish type, tag model, tag pulse rate interval, length, and weight.

Fish ID	Tag Hex ID	Fish Type	Tag Model	PRI	Fish Length	Fish Weight
SS_2023-001	6B9D	CNFH Late-fall Chinook	SS400	5	164	47.6
SS_2023-002	56F0	CNFH Late-fall Chinook	SS400	5	144	31.6
SS_2023-003	4DE8	CNFH Late-fall Chinook	SS400	5	151	36.2
SS_2023-004	57C5	CNFH Late-fall Chinook	SS400	5	149	37
SS_2023-005	5220	CNFH Late-fall Chinook	SS400	5	128	22.5
SS_2023-006	6C16	CNFH Late-fall Chinook	SS400	5	161	45.3
SS_2023-007	51B3	CNFH Late-fall Chinook	SS400	5	172	57.9
SS_2023-008	58D0	CNFH Late-fall Chinook	SS400	5	121	19

SS_2023-009	0550	CNFH Late-fall Chinook	SS400	5	131	24.9
SS_2023-010	4CE8	CNFH Late-fall Chinook	SS400	5	144	30.2
SS_2023-011	6B61	CNFH Late-fall Chinook	SS400	5	129	22.4
SS_2023-012	4C8E	CNFH Late-fall Chinook	SS400	5	167	50.3
SS_2023-013	5A86	CNFH Late-fall Chinook	SS400	5	146	32.7
SS_2023-014	4C64	CNFH Late-fall Chinook	SS400	5	173	65.4
SS_2023-015	4CDC	CNFH Late-fall Chinook	SS400	5	173	61.1
SS_2023-016	6C34	CNFH Late-fall Chinook	SS400	5	148	35.8
SS_2023-017	5905	CNFH Late-fall Chinook	SS400	5	159	45
SS_2023-018	51A8	CNFH Late-fall Chinook	SS400	5	138	28.8
SS_2023-019	6BAF	CNFH Late-fall Chinook	SS400	5	160	45.7
SS_2023-020	0154	CNFH Late-fall Chinook	SS400	5	141	31.3
SS_2023-021	5330	CNFH Late-fall Chinook	SS400	5	129	21.6
SS_2023-022	5BBE	CNFH Late-fall Chinook	SS400	5	144	35.8
SS_2023-023	6B91	CNFH Late-fall Chinook	SS400	5	165	47.9
SS_2023-024	5630	CNFH Late-fall Chinook	SS400	5	122	21
SS_2023-025	5A3E	CNFH Late-fall Chinook	SS400	5	145	32.4
SS_2023-026	5278	CNFH Late-fall Chinook	SS400	5	163	47.3
SS_2023-027	6BD8	CNFH Late-fall Chinook	SS400	5	178	62.3
SS_2023-028	6BCB	CNFH Late-fall Chinook	SS400	5	124	20.3
SS_2023-029	528F	CNFH Late-fall Chinook	SS400	5	171	53
SS_2023-030	50DE	CNFH Late-fall Chinook	SS400	5	114	15
SS_2023-031	6B36	CNFH Late-fall Chinook	SS400	5	132	26.2

SS_2023-032	510C	CNFH Late-fall Chinook	SS400	5	172	55.7
SS_2023-033	521A	CNFH Late-fall Chinook	SS400	5	162	36
SS_2023-034	5874	CNFH Late-fall Chinook	SS400	5	141	29.2
SS_2023-035	4D3C	CNFH Late-fall Chinook	SS400	5	139	25.7
SS_2023-036	6C42	CNFH Late-fall Chinook	SS400	5	144	31.2
SS_2023-037	4A80	CNFH Late-fall Chinook	SS400	5	155	39.5
SS_2023-038	6B69	CNFH Late-fall Chinook	SS400	5	155	41.1
SS_2023-039	5218	CNFH Late-fall Chinook	SS400	5	137	27.1
SS_2023-040	5064	CNFH Late-fall Chinook	SS400	5	124	19.2
SS_2023-041	6BA3	CNFH Late-fall Chinook	SS400	5	167	50.6
SS_2023-042	0452	CNFH Late-fall Chinook	SS400	5	134	23.9
SS_2023-043	5CF2	CNFH Late-fall Chinook	SS400	5	120	18
SS_2023-044	4F4E	CNFH Late-fall Chinook	SS400	5	126	20.5
SS_2023-045	6B34	CNFH Late-fall Chinook	SS400	5	161	44.7
SS_2023-046	5A7E	CNFH Late-fall Chinook	SS400	5	171	56.2
SS_2023-047	4C88	CNFH Late-fall Chinook	SS400	5	141	28
SS_2023-048	4D0C	CNFH Late-fall Chinook	SS400	5	132	24.3
SS_2023-049	58D9	CNFH Late-fall Chinook	SS400	5	189	73.3
SS_2023-050	6BE4	CNFH Late-fall Chinook	SS400	5	149	37.2
SS_2023-051	6BFA	CNFH Late-fall Chinook	SS400	5	135	25.1
SS_2023-052	5902	CNFH Late-fall Chinook	SS400	5	141	28.5
SS_2023-053	6C44	CNFH Late-fall Chinook	SS400	5	166	51
SS_2023-054	5A40	CNFH Late-fall Chinook	SS400	5	132	21.7

SS_2023-055	5044	CNFH Late-fall Chinook	SS400	5	174	55
SS_2023-056	4AE0	CNFH Late-fall Chinook	SS400	5	179	64.9
SS_2023-057	5868	CNFH Late-fall Chinook	SS400	5	166	44.8
SS_2023-058	5270	CNFH Late-fall Chinook	SS400	5	164	47.1
SS_2023-059	4CD0	CNFH Late-fall Chinook	SS400	5	166	49.7
SS_2023-060	50C6	CNFH Late-fall Chinook	SS400	5	150	32.1
SS_2023-061	59C8	CNFH Late-fall Chinook	SS400	5	159	43.3
SS_2023-062	5072	CNFH Late-fall Chinook	SS400	5	147	35.6
SS_2023-063	6C5B	CNFH Late-fall Chinook	SS400	5	158	42.5
SS_2023-064	0152	CNFH Late-fall Chinook	SS400	5	121	20.5
SS_2023-065	5D38	CNFH Late-fall Chinook	SS400	5	158	44.3
SS_2023-066	0536	CNFH Late-fall Chinook	SS400	5	165	47
SS_2023-067	504E	CNFH Late-fall Chinook	SS400	5	141	28.3
SS_2023-068	5CE4	CNFH Late-fall Chinook	SS400	5	141	28.7
SS_2023-069	0352	CNFH Late-fall Chinook	SS400	5	167	46.9
SS_2023-070	502C	CNFH Late-fall Chinook	SS400	5	170	55.5
SS_2023-071	6B48	CNFH Late-fall Chinook	SS400	5	166	49.3
SS_2023-072	5970	CNFH Late-fall Chinook	SS400	5	137	29
SS_2023-073	6B38	CNFH Late-fall Chinook	SS400	5	129	21.3
SS_2023-074	527A	CNFH Late-fall Chinook	SS400	5	126	18.6
SS_2023-075	6BBC	CNFH Late-fall Chinook	SS400	5	137	25.6
SS_2023-076	6B74	CNFH Late-fall Chinook	SS400	5	164	46.3
SS_2023-077	55A1	CNFH Late-fall Chinook	SS400	5	166	50.4

SS_2023-078	57B0	CNFH Late-fall Chinook	SS400	5	174	58.8
SS_2023-079	50F4	CNFH Late-fall Chinook	SS400	5	150	33.8
SS_2023-080	6B66	CNFH Late-fall Chinook	SS400	5	133	25.4
SS_2023-081	5082	CNFH Late-fall Chinook	SS400	5	140	30
SS_2023-082	58DC	CNFH Late-fall Chinook	SS400	5	131	23.4
SS_2023-083	5118	CNFH Late-fall Chinook	SS400	5	145	31.7
SS_2023-084	50C4	CNFH Late-fall Chinook	SS400	5	135	26
SS_2023-085	6BBE	CNFH Late-fall Chinook	SS400	5	181	69.4
SS_2023-086	6B6D	CNFH Late-fall Chinook	SS400	5	174	59.2
SS_2023-087	50DC	CNFH Late-fall Chinook	SS400	5	122	17.7
SS_2023-088	5108	CNFH Late-fall Chinook	SS400	5	130	21.5
SS_2023-089	5D98	CNFH Late-fall Chinook	SS400	5	169	51.5
SS_2023-090	4E5E	CNFH Late-fall Chinook	SS400	5	148	35.6
SS_2023-091	58F4	CNFH Late-fall Chinook	SS400	5	120	20.2
SS_2023-092	5D88	CNFH Late-fall Chinook	SS400	5	129	21.9
SS_2023-093	6C6B	CNFH Late-fall Chinook	SS400	5	146	32.3
SS_2023-094	6B4C	CNFH Late-fall Chinook	SS400	5	166	47.5
SS_2023-095	5320	CNFH Late-fall Chinook	SS400	5	135	25.6
SS_2023-096	6B97	CNFH Late-fall Chinook	SS400	5	125	19.4
SS_2023-097	6C59	CNFH Late-fall Chinook	SS400	5	119	17.3
SS_2023-098	6B3B	CNFH Late-fall Chinook	SS400	5	123	19.4
SS_2023-099	5888	CNFH Late-fall Chinook	SS400	5	151	33.3
SS_2023-100	6BB6	CNFH Late-fall Chinook	SS400	5	146	33.9

SS_2023-101	57BB	CNFH Late-fall Chinook	SS400	5	131	23.6
SS_2023-102	6C5D	CNFH Late-fall Chinook	SS400	5	159	42.1
SS_2023-103	528E	CNFH Late-fall Chinook	SS400	5	158	42.2
SS_2023-104	6B4B	CNFH Late-fall Chinook	SS400	5	167	51.7
SS_2023-105	5AC0	CNFH Late-fall Chinook	SS400	5	121	18.4
SS_2023-106	6BC2	CNFH Late-fall Chinook	SS400	5	147	33.7
SS_2023-107	6BCA	CNFH Late-fall Chinook	SS400	5	163	43.9
SS_2023-108	6B57	CNFH Late-fall Chinook	SS400	5	124	19.2
SS_2023-109	6B4D	CNFH Late-fall Chinook	SS400	5	160	44
SS_2023-110	6C5C	CNFH Late-fall Chinook	SS400	5	129	21.8
SS_2023-111	5D06	CNFH Late-fall Chinook	SS400	5	176	58.8
SS_2023-112	5D08	CNFH Late-fall Chinook	SS400	5	148	32.6
SS_2023-113	6BC6	CNFH Late-fall Chinook	SS400	5	147	34.4
SS_2023-114	547E	CNFH Late-fall Chinook	SS400	5	163	48.8
SS_2023-115	5BC4	CNFH Late-fall Chinook	SS400	5	129	23.1
SS_2023-116	52F0	CNFH Late-fall Chinook	SS400	5	162	43.3
SS_2023-117	5284	CNFH Late-fall Chinook	SS400	5	117	15.2
SS_2023-118	6B42	CNFH Late-fall Chinook	SS400	5	166	51.1
SS_2023-119	5C8E	CNFH Late-fall Chinook	SS400	5	157	35.2
SS_2023-120	6B7B	CNFH Late-fall Chinook	SS400	5	175	60.7
SS_2023-121	6BB0	CNFH Late-fall Chinook	SS400	5	145	29.4
SS_2023-122	6B96	CNFH Late-fall Chinook	SS400	5	161	44.8
SS_2023-123	6B76	CNFH Late-fall Chinook	SS400	5	139	24.6

SS_2023-124	56E0	CNFH Late-fall Chinook	SS400	5	139	27.4
SS_2023-125	6B8C	CNFH Late-fall Chinook	SS400	5	121	17.5
SS_2023-126	6B24	CNFH Late-fall Chinook	SS400	5	165	50.9
SS_2023-127	5228	CNFH Late-fall Chinook	SS400	5	160	42.7
SS_2023-128	6B3D	CNFH Late-fall Chinook	SS400	5	143	31.7
SS_2023-129	5BCC	CNFH Late-fall Chinook	SS400	5	110	12
SS_2023-130	5721	CNFH Late-fall Chinook	SS400	5	170	50.9
SS_2023-131	5328	CNFH Late-fall Chinook	SS400	5	171	56.4
SS_2023-132	6B58	CNFH Late-fall Chinook	SS400	5	144	30.9
SS_2023-133	59C6	CNFH Late-fall Chinook	SS400	5	158	41.2
SS_2023-134	6B77	CNFH Late-fall Chinook	SS400	5	175	57.1
SS_2023-135	6C6D	CNFH Late-fall Chinook	SS400	5	140	29.2
SS_2023-136	4F1A	CNFH Late-fall Chinook	SS400	5	162	40.5
SS_2023-137	5B3C	CNFH Late-fall Chinook	SS400	5	156	40.5
SS_2023-138	508C	CNFH Late-fall Chinook	SS400	5	172	58.3
SS_2023-139	5290	CNFH Late-fall Chinook	SS400	5	135	24.3
SS_2023-140	5196	CNFH Late-fall Chinook	SS400	5	136	26.5
SS_2023-141	4A82	CNFH Late-fall Chinook	SS400	5	126	22.6
SS_2023-142	5D10	CNFH Late-fall Chinook	SS400	5	173	54
SS_2023-143	6B94	CNFH Late-fall Chinook	SS400	5	125	19.5
SS_2023-144	5260	CNFH Late-fall Chinook	SS400	5	164	42.7
SS_2023-145	5B88	CNFH Late-fall Chinook	SS400	5	142	29
SS_2023-146	5CE2	CNFH Late-fall Chinook	SS400	5	164	45.7

SS_2023-147	59EC	CNFH Late-fall Chinook	SS400	5	135	25.1
SS_2023-148	5908	CNFH Late-fall Chinook	SS400	5	139	29.2
SS_2023-149	5A83	CNFH Late-fall Chinook	SS400	5	131	23.4
SS_2023-150	6C51	CNFH Late-fall Chinook	SS400	5	129	21.6
SS_2023-151	6B5F	CNFH Late-fall Chinook	SS400	5	174	54.8
SS_2023-152	4F24	CNFH Late-fall Chinook	SS400	5	132	22
SS_2023-153	5271	CNFH Late-fall Chinook	SS400	5	145	32.8
SS_2023-154	58E4	CNFH Late-fall Chinook	SS400	5	117	17
SS_2023-155	503A	CNFH Late-fall Chinook	SS400	5	148	33.3
SS_2023-156	5084	CNFH Late-fall Chinook	SS400	5	164	47.1
SS_2023-157	527C	CNFH Late-fall Chinook	SS400	5	145	32.5
SS_2023-158	6BD0	CNFH Late-fall Chinook	SS400	5	169	57
SS_2023-159	5BD0	CNFH Late-fall Chinook	SS400	5	133	23.9
SS_2023-160	4BC8	CNFH Late-fall Chinook	SS400	5	141	26.5
SS_2023-161	5906	CNFH Late-fall Chinook	SS400	5	181	42.9
SS_2023-162	502E	CNFH Late-fall Chinook	SS400	5	147	31.8
SS_2023-163	52E8	CNFH Late-fall Chinook	SS400	5	137	23.6
SS_2023-164	5186	CNFH Late-fall Chinook	SS400	5	126	18.4
SS_2023-165	04A8	CNFH Late-fall Chinook	SS400	5	129	22
SS_2023-166	51EC	CNFH Late-fall Chinook	SS400	5	139	27.5
SS_2023-167	4EBC	CNFH Late-fall Chinook	SS400	5	151	36
SS_2023-168	51A6	CNFH Late-fall Chinook	SS400	5	128	21.7
SS_2023-169	4EE6	CNFH Late-fall Chinook	SS400	5	122	18.6

SS_2023-170	5D99	CNFH Late-fall Chinook	SS400	5	164	57.5
SS_2023-171	5272	CNFH Late-fall Chinook	SS400	5	132	25.4
SS_2023-172	6BB8	CNFH Late-fall Chinook	SS400	5	170	54
SS_2023-173	51EB	CNFH Late-fall Chinook	SS400	5	130	21.8
SS_2023-174	4F5E	CNFH Late-fall Chinook	SS400	5	179	63.1
SS_2023-175	505E	CNFH Late-fall Chinook	SS400	5	176	58.6
SS_2023-176	6BF5	CNFH Late-fall Chinook	SS400	5	155	39.3
SS_2023-177	6C68	CNFH Late-fall Chinook	SS400	5	172	53.4
SS_2023-178	5982	CNFH Late-fall Chinook	SS400	5	141	25.7
SS_2023-179	6B2C	CNFH Late-fall Chinook	SS400	5	157	41.6
SS_2023-180	02B6	CNFH Late-fall Chinook	SS400	5	165	45
SS_2023-181	4D06	CNFH Late-fall Chinook	SS400	5	175	62.8
SS_2023-182	034A	CNFH Late-fall Chinook	SS400	5	120	19.4
SS_2023-183	51A0	CNFH Late-fall Chinook	SS400	5	156	39.5
SS_2023-184	517A	CNFH Late-fall Chinook	SS400	5	166	51.6
SS_2023-185	4DF2	CNFH Late-fall Chinook	SS400	5	114	14.1
SS_2023-186	4D86	CNFH Late-fall Chinook	SS400	5	131	21.6
SS_2023-187	0532	CNFH Late-fall Chinook	SS400	5	140	27.3
SS_2023-188	0548	CNFH Late-fall Chinook	SS400	5	140	28.4
SS_2023-189	4CF2	CNFH Late-fall Chinook	SS400	5	137	26.3
SS_2023-190	04AC	CNFH Late-fall Chinook	SS400	5	129	20.8
SS_2023-191	4E6E	CNFH Late-fall Chinook	SS400	5	119	15.8
SS_2023-192	4D02	CNFH Late-fall Chinook	SS400	5	145	31

SS_2023-193	6BAC	CNFH Late-fall Chinook	SS400	5	163	48.6
SS_2023-194	6C56	CNFH Late-fall Chinook	SS400	5	140	30.1
SS_2023-195	5978	CNFH Late-fall Chinook	SS400	5	123	18.3
SS_2023-196	6B64	CNFH Late-fall Chinook	SS400	5	159	42.1
SS_2023-197	4F26	CNFH Late-fall Chinook	SS400	5	157	40.7
SS_2023-198	519B	CNFH Late-fall Chinook	SS400	5	118	16.6
SS_2023-199	4C72	CNFH Late-fall Chinook	SS400	5	147	31.4
SS_2023-200	02B4	CNFH Late-fall Chinook	SS400	5	156	41.3
SS_2023-201	6C6C	LSNFH Winter Chinook	SS400	5	87	8.4
SS_2023-202	4F16	LSNFH Winter Chinook	SS400	5	88	7.3
SS_2023-203	5580	LSNFH Winter Chinook	SS400	5	92	7.8
SS_2023-204	5282	LSNFH Winter Chinook	SS400	5	94	9.2
SS_2023-205	4F76	LSNFH Winter Chinook	SS400	5	80	5.7
SS_2023-206	5862	LSNFH Winter Chinook	SS400	5	92	7.3
SS_2023-207	523C	LSNFH Winter Chinook	SS400	5	86	6.9
SS_2023-208	6B3E	LSNFH Winter Chinook	SS400	5	90	8.2
SS_2023-209	4FDA	LSNFH Winter Chinook	SS400	5	93	8.5
SS_2023-210	58EC	LSNFH Winter Chinook	SS400	5	91	7.8
SS_2023-211	056C	LSNFH Winter Chinook	SS400	5	85	6.9
SS_2023-212	6B88	LSNFH Winter Chinook	SS400	5	85	6.5
SS_2023-213	4EDE	LSNFH Winter Chinook	SS400	5	82	5.7
SS_2023-214	588E	LSNFH Winter Chinook	SS400	5	89	7.1
SS_2023-215	044A	LSNFH Winter Chinook	SS400	5	87	6.5

SS_2023-216	5C91	LSNFH Winter Chinook	SS400	5	87	7.1
SS_2023-217	5288	LSNFH Winter Chinook	SS400	5	89	7.2
SS_2023-218	6C12	LSNFH Winter Chinook	SS400	5	84	6.3
SS_2023-219	5C76	LSNFH Winter Chinook	SS400	5	85	7.1
SS_2023-220	527E	LSNFH Winter Chinook	SS400	5	88	7.4
SS_2023-221	5798	LSNFH Winter Chinook	SS400	5	87	6.7
SS_2023-222	054E	LSNFH Winter Chinook	SS400	5	85	6.2
SS_2023-223	6B29	LSNFH Winter Chinook	SS400	5	77	7.2
SS_2023-224	5911	LSNFH Winter Chinook	SS400	5	85	6.6
SS_2023-225	53EE	LSNFH Winter Chinook	SS400	5	88	6.8
SS_2023-226	6C54	LSNFH Winter Chinook	SS400	5	86	7
SS_2023-227	5910	LSNFH Winter Chinook	SS400	5	88	6.9
SS_2023-228	6B31	LSNFH Winter Chinook	SS400	5	90	7.5
SS_2023-229	5998	LSNFH Winter Chinook	SS400	5	84	6
SS_2023-230	4E74	LSNFH Winter Chinook	SS400	5	81	5.4
SS_2023-231	6B27	LSNFH Winter Chinook	SS400	5	84	6.5
SS_2023-232	53E6	LSNFH Winter Chinook	SS400	5	89	7.3
SS_2023-233	521C	LSNFH Winter Chinook	SS400	5	84	6
SS_2023-234	590C	LSNFH Winter Chinook	SS400	5	85	6.4
SS_2023-235	5AF0	LSNFH Winter Chinook	SS400	5	88	7.6
SS_2023-236	5240	LSNFH Winter Chinook	SS400	5	91	7.9
SS_2023-237	59BC	LSNFH Winter Chinook	SS400	5	88	6.7
SS_2023-238	5730	LSNFH Winter Chinook	SS400	5	87	6.7

SS_2023-239	58F2	LSNFH Winter Chinook	SS400	5	89	7.5
SS_2023-240	6B8D	LSNFH Winter Chinook	SS400	5	94	8.8
SS_2023-241	5298	LSNFH Winter Chinook	SS400	5	94	8.8
SS_2023-242	6BA5	LSNFH Winter Chinook	SS400	5	84	6.4
SS_2023-243	5990	LSNFH Winter Chinook	SS400	5	87	7
SS_2023-244	56E8	LSNFH Winter Chinook	SS400	5	89	7.5
SS_2023-245	588C	LSNFH Winter Chinook	SS400	5	88	7.7
SS_2023-246	4C74	LSNFH Winter Chinook	SS400	5	87	6.7
SS_2023-247	5729	LSNFH Winter Chinook	SS400	5	86	7
SS_2023-248	4F68	LSNFH Winter Chinook	SS400	5	80	5
SS_2023-249	58B0	LSNFH Winter Chinook	SS400	5	90	8.3
SS_2023-250	4EEC	LSNFH Winter Chinook	SS400	5	84	6
SS_2023-251	525F	LSNFH Winter Chinook	SS400	5	86	6.7
SS_2023-252	5788	LSNFH Winter Chinook	SS400	5	88	7.5
SS_2023-253	543C	LSNFH Winter Chinook	SS400	5	84	6.6
SS_2023-254	4F66	LSNFH Winter Chinook	SS400	5	84	6.2
SS_2023-255	6B59	LSNFH Winter Chinook	SS400	5	85	6.7
SS_2023-256	4CE6	LSNFH Winter Chinook	SS400	5	84	5.6
SS_2023-257	6BA7	LSNFH Winter Chinook	SS400	5	86	6.6
SS_2023-258	51D8	LSNFH Winter Chinook	SS400	5	84	5.8
SS_2023-259	6C25	LSNFH Winter Chinook	SS400	5	84	6.2
SS_2023-260	4C8C	LSNFH Winter Chinook	SS400	5	88	7.1
SS_2023-261	50B8	LSNFH Winter Chinook	SS400	5	86	6.7

SS_2023-262	5D44	LSNFH Winter Chinook	SS400	5	90	7.3
SS_2023-263	4BEC	LSNFH Winter Chinook	SS400	5	90	7.8
SS_2023-264	6BB3	LSNFH Winter Chinook	SS400	5	89	7.5
SS_2023-265	4C90	LSNFH Winter Chinook	SS400	5	89	7.7
SS_2023-266	6B43	LSNFH Winter Chinook	SS400	5	89	7.4
SS_2023-267	4E66	LSNFH Winter Chinook	SS400	5	92	8.7
SS_2023-268	527B	LSNFH Winter Chinook	SS400	5	96	9.1
SS_2023-269	506C	LSNFH Winter Chinook	SS400	5	80	5.5
SS_2023-270	59E4	LSNFH Winter Chinook	SS400	5	92	8.4
SS_2023-271	51A4	LSNFH Winter Chinook	SS400	5	86	6.9
SS_2023-272	6BE2	LSNFH Winter Chinook	SS400	5	95	8.5
SS_2023-273	5194	LSNFH Winter Chinook	SS400	5	85	6.4
SS_2023-274	4F5C	LSNFH Winter Chinook	SS400	5	87	7
SS_2023-275	51B4	LSNFH Winter Chinook	SS400	5	88	7.3
SS_2023-276	51AC	LSNFH Winter Chinook	SS400	5	86	6.8
SS_2023-277	4CF4	LSNFH Winter Chinook	SS400	5	82	5.5
SS_2023-278	5032	LSNFH Winter Chinook	SS400	5	87	6.6
SS_2023-279	4CE2	LSNFH Winter Chinook	SS400	5	85	6.1
SS_2023-280	4DEE	LSNFH Winter Chinook	SS400	5	91	8
SS_2023-281	50F2	LSNFH Winter Chinook	SS400	5	88	7.2
SS_2023-282	51E4	LSNFH Winter Chinook	SS400	5	84	6.4
SS_2023-283	0256	LSNFH Winter Chinook	SS400	5	89	7.3
SS_2023-284	4CEC	LSNFH Winter Chinook	SS400	5	86	6.5

SS_2023-285	51E9	LSNFH Winter Chinook	SS400	5	93	8.4
SS_2023-286	51C4	LSNFH Winter Chinook	SS400	5	87	7
SS_2023-287	02AE	LSNFH Winter Chinook	SS400	5	95	9
SS_2023-288	517B	LSNFH Winter Chinook	SS400	5	84	5.6
SS_2023-289	4F36	LSNFH Winter Chinook	SS400	5	85	6
SS_2023-290	5076	LSNFH Winter Chinook	SS400	5	89	7.4
SS_2023-291	5185	LSNFH Winter Chinook	SS400	5	87	6.7
SS_2023-292	5110	LSNFH Winter Chinook	SS400	5	91	8
SS_2023-293	4F12	LSNFH Winter Chinook	SS400	5	88	6.9
SS_2023-294	4EB3	LSNFH Winter Chinook	SS400	5	88	6.7
SS_2023-295	51C6	LSNFH Winter Chinook	SS400	5	85	6.6
SS_2023-296	0456	LSNFH Winter Chinook	SS400	5	87	6.7
SS_2023-297	5170	LSNFH Winter Chinook	SS400	5	81	5.4
SS_2023-298	4DC2	LSNFH Winter Chinook	SS400	5	87	6.3
SS_2023-299	016A	LSNFH Winter Chinook	SS400	5	88	7.2
SS_2023-300	04A2	LSNFH Winter Chinook	SS400	5	90	7.5
SS_2023-301	0356	LSNFH Winter Chinook	SS400	5	89	7.4
SS_2023-302	5074	LSNFH Winter Chinook	SS400	5	88	7.1
SS_2023-303	4EDC	LSNFH Winter Chinook	SS400	5	84	6.7
SS_2023-304	0156	LSNFH Winter Chinook	SS400	5	84	5.6
SS_2023-305	521E	LSNFH Winter Chinook	SS400	5	86	6.8
SS_2023-306	4DEC	LSNFH Winter Chinook	SS400	5	85	7.1
SS_2023-307	4ECE	LSNFH Winter Chinook	SS400	5	87	7.5

SS_2023-308	4D08	LSNFH Winter Chinook	SS400	5	86	7.4
SS_2023-309	51A3	LSNFH Winter Chinook	SS400	5	80	5.8
SS_2023-310	4C62	LSNFH Winter Chinook	SS400	5	85	6.1
SS_2023-311	4CE4	LSNFH Winter Chinook	SS400	5	89	7.9
SS_2023-312	51A7	LSNFH Winter Chinook	SS400	5	93	7.9
SS_2023-313	0496	LSNFH Winter Chinook	SS400	5	89	8
SS_2023-314	4D9E	LSNFH Winter Chinook	SS400	5	87	6.8
SS_2023-315	4E36	LSNFH Winter Chinook	SS400	5	86	7.1
SS_2023-316	4D7E	LSNFH Winter Chinook	SS400	5	86	6.3
SS_2023-317	4CBC	LSNFH Winter Chinook	SS400	5	89	7.1
SS_2023-318	4DB0	LSNFH Winter Chinook	SS400	5	88	7.4
SS_2023-319	51BC	LSNFH Winter Chinook	SS400	5	87	7.2
SS_2023-320	4AF0	LSNFH Winter Chinook	SS400	5	84	6.6
SS_2023-321	50D8	LSNFH Winter Chinook	SS400	5	88	7.1
SS_2023-322	4BB2	LSNFH Winter Chinook	SS400	5	85	6.5
SS_2023-323	4EE8	LSNFH Winter Chinook	SS400	5	87	7.1
SS_2023-324	5178	LSNFH Winter Chinook	SS400	5	89	7.3
SS_2023-325	4D38	LSNFH Winter Chinook	SS400	5	85	6.3
SS_2023-326	02CA	LSNFH Winter Chinook	SS400	5	91	7.7
SS_2023-327	513C	LSNFH Winter Chinook	SS400	5	86	6.2
SS_2023-328	4F9A	LSNFH Winter Chinook	SS400	5	88	7.4
SS_2023-329	4B30	LSNFH Winter Chinook	SS400	5	89	7.9
SS_2023-330	51C8	LSNFH Winter Chinook	SS400	5	86	7.1

SS_2023-331	5197	LSNFH Winter Chinook	SS400	5	87	6.8
SS_2023-332	5198	LSNFH Winter Chinook	SS400	5	87	7.6
SS_2023-333	4CE5	LSNFH Winter Chinook	SS400	5	87	7.2
SS_2023-334	055C	LSNFH Winter Chinook	SS400	5	86	6.1
SS_2023-335	5182	LSNFH Winter Chinook	SS400	5	88	7
SS_2023-336	5190	LSNFH Winter Chinook	SS400	5	87	7
SS_2023-337	50BC	LSNFH Winter Chinook	SS400	5	87	7.1
SS_2023-338	4D18	LSNFH Winter Chinook	SS400	5	85	6.7
SS_2023-339	4CB0	LSNFH Winter Chinook	SS400	5	88	7.8
SS_2023-340	5BC8	LSNFH Winter Chinook	SS400	5	80	5.3
SS_2023-341	6B95	LSNFH Winter Chinook	SS400	5	87	7.2
SS_2023-342	55C2	LSNFH Winter Chinook	SS400	5	85	6.8
SS_2023-343	6BB1	LSNFH Winter Chinook	SS400	5	91	8.3
SS_2023-344	5261	LSNFH Winter Chinook	SS400	5	85	6.7
SS_2023-345	5864	LSNFH Winter Chinook	SS400	5	89	7.8
SS_2023-346	6B9C	LSNFH Winter Chinook	SS400	5	86	7.3
SS_2023-347	5D9C	LSNFH Winter Chinook	SS400	5	84	6.6
SS_2023-348	6B6C	LSNFH Winter Chinook	SS400	5	88	7.6
SS_2023-349	5D7C	LSNFH Winter Chinook	SS400	5	84	6.5
SS_2023-350	6BA0	LSNFH Winter Chinook	SS400	5	82	6
SS_2023-351	5BEC	LSNFH Winter Chinook	SS400	5	85	6.4
SS_2023-352	6B86	LSNFH Winter Chinook	SS400	5	93	8.7
SS_2023-353	58BC	LSNFH Winter Chinook	SS400	5	85	6.5

SS_2023-354	6B40	LSNFH Winter Chinook	SS400	5	80	5
SS_2023-355	5B98	LSNFH Winter Chinook	SS400	5	85	6.4
SS_2023-356	6C0A	LSNFH Winter Chinook	SS400	5	88	6.5
SS_2023-357	5BC9	LSNFH Winter Chinook	SS400	5	87	7.2
SS_2023-358	5A73	LSNFH Winter Chinook	SS400	5	89	6.3
SS_2023-359	519A	LSNFH Winter Chinook	SS400	5	88	7
SS_2023-360	51A2	LSNFH Winter Chinook	SS400	5	89	6.9
SS_2023-361	04A6	LSNFH Winter Chinook	SS400	5	85	6.6
SS_2023-362	6BEB	LSNFH Winter Chinook	SS400	5	86	7
SS_2023-363	6B23	LSNFH Winter Chinook	SS400	5	90	7.4
SS_2023-364	6B6B	LSNFH Winter Chinook	SS400	5	85	5.9
SS_2023-365	5BD1	LSNFH Winter Chinook	SS400	5	85	5.8
SS_2023-366	58E6	LSNFH Winter Chinook	SS400	5	86	6.7
SS_2023-367	6C49	LSNFH Winter Chinook	SS400	5	84	6
SS_2023-368	6C2B	LSNFH Winter Chinook	SS400	5	89	7.4
SS_2023-369	5238	LSNFH Winter Chinook	SS400	5	85	5.9
SS_2023-370	6B5C	LSNFH Winter Chinook	SS400	5	85	6.9
SS_2023-371	6C2E	LSNFH Winter Chinook	SS400	5	90	7
SS_2023-372	6C55	LSNFH Winter Chinook	SS400	5	86	6.6
SS_2023-373	5CDC	LSNFH Winter Chinook	SS400	5	87	6.7
SS_2023-374	6BEE	LSNFH Winter Chinook	SS400	5	91	7.7
SS_2023-375	6C50	LSNFH Winter Chinook	SS400	5	87	7
SS_2023-376	6B41	LSNFH Winter Chinook	SS400	5	84	6.1

SS_2023-377	5C42	LSNFH Winter Chinook	SS400	5	89	7.5
SS_2023-378	5C62	LSNFH Winter Chinook	SS400	5	88	7
SS_2023-379	5CD0	LSNFH Winter Chinook	SS400	5	86	7
SS_2023-380	5CEC	LSNFH Winter Chinook	SS400	5	91	7.7
SS_2023-381	6B98	LSNFH Winter Chinook	SS400	5	86	6.7
SS_2023-382	5CE6	LSNFH Winter Chinook	SS400	5	86	6.7
SS_2023-383	6B84	LSNFH Winter Chinook	SS400	5	93	8.8
SS_2023-384	5890	LSNFH Winter Chinook	SS400	5	87	6.9
SS_2023-385	6B6F	LSNFH Winter Chinook	SS400	5	85	6.5
SS_2023-386	6BDA	LSNFH Winter Chinook	SS400	5	94	8.6
SS_2023-387	6B67	LSNFH Winter Chinook	SS400	5	92	8.5
SS_2023-388	5438	LSNFH Winter Chinook	SS400	5	87	6.9
SS_2023-389	5986	LSNFH Winter Chinook	SS400	5	85	6.6
SS_2023-390	6B82	LSNFH Winter Chinook	SS400	5	86	6.7
SS_2023-391	55C6	LSNFH Winter Chinook	SS400	5	86	6.2
SS_2023-392	6B32	LSNFH Winter Chinook	SS400	5	94	8.7
SS_2023-393	5237	LSNFH Winter Chinook	SS400	5	87	6.3
SS_2023-394	5CBC	LSNFH Winter Chinook	SS400	5	92	7.8
SS_2023-395	6C45	LSNFH Winter Chinook	SS400	5	87	7.2
SS_2023-396	5C66	LSNFH Winter Chinook	SS400	5	94	8.7
SS_2023-397	5B38	LSNFH Winter Chinook	SS400	5	82	5.7
SS_2023-398	5280	LSNFH Winter Chinook	SS400	5	92	7.8
SS_2023-399	57C6	LSNFH Winter Chinook	SS400	5	86	6.7

SS_2023-400	6C24	LSNFH Winter Chinook	SS400	5	85	6.2
SS_2023-401	50E6	LSNFH Winter Chinook	SS400	5	96	9.7
SS_2023-402	6B9B	LSNFH Winter Chinook	SS400	5	94	9
SS_2023-403	5BC2	LSNFH Winter Chinook	SS400	5	93	9
SS_2023-404	5918	LSNFH Winter Chinook	SS400	5	91	7.4
SS_2023-405	57B2	LSNFH Winter Chinook	SS400	5	94	8.9
SS_2023-406	5283	LSNFH Winter Chinook	SS400	5	97	10.2
SS_2023-407	6B71	LSNFH Winter Chinook	SS400	5	98	10.6
SS_2023-408	6C3A	LSNFH Winter Chinook	SS400	5	97	9.8
SS_2023-409	6B51	LSNFH Winter Chinook	SS400	5	94	8.6
SS_2023-410	57E8	LSNFH Winter Chinook	SS400	5	93	8.7
SS_2023-411	53BE	LSNFH Winter Chinook	SS400	5	94	8.4
SS_2023-412	53C6	LSNFH Winter Chinook	SS400	5	93	8.9
SS_2023-413	5BCA	LSNFH Winter Chinook	SS400	5	93	8.9
SS_2023-414	52E0	LSNFH Winter Chinook	SS400	5	95	8.8
SS_2023-415	6C1A	LSNFH Winter Chinook	SS400	5	98	10.6
SS_2023-416	6C29	LSNFH Winter Chinook	SS400	5	93	8.6
SS_2023-417	59A3	LSNFH Winter Chinook	SS400	5	95	8.6
SS_2023-418	5B22	LSNFH Winter Chinook	SS400	5	87	7.3
SS_2023-419	6C4A	LSNFH Winter Chinook	SS400	5	95	8.8
SS_2023-420	6BD2	LSNFH Winter Chinook	SS400	5	101	11.5
SS_2023-421	6BE8	LSNFH Winter Chinook	SS400	5	94	7.9
SS_2023-422	58E8	LSNFH Winter Chinook	SS400	5	102	11.4

SS_2023-423	59A0	LSNFH Winter Chinook	SS400	5	100	11.3
SS_2023-424	5310	LSNFH Winter Chinook	SS400	5	95	8.7
SS_2023-425	58E2	LSNFH Winter Chinook	SS400	5	92	8.5
SS_2023-426	6BD1	LSNFH Winter Chinook	SS400	5	103	12.1
SS_2023-427	5A38	LSNFH Winter Chinook	SS400	5	94	8.8
SS_2023-428	6C35	LSNFH Winter Chinook	SS400	5	90	8.1
SS_2023-429	5D18	LSNFH Winter Chinook	SS400	5	93	8.1
SS_2023-430	2FB6	LSNFH Winter Chinook	SS400	5	94	9.1
SS_2023-431	4494	LSNFH Winter Chinook	SS400	5	95	9.1
SS_2023-432	ACDF	LSNFH Winter Chinook	SS400	5	94	8.6
SS_2023-433	445C	LSNFH Winter Chinook	SS400	5	92	7.9
SS_2023-434	429B	LSNFH Winter Chinook	SS400	5	100	11.3
SS_2023-435	4499	LSNFH Winter Chinook	SS400	5	92	8.5
SS_2023-436	436E	LSNFH Winter Chinook	SS400	5	98	10
SS_2023-437	42A7	LSNFH Winter Chinook	SS400	5	92	8.8
SS_2023-438	AC6D	LSNFH Winter Chinook	SS400	5	99	10.3
SS_2023-439	AC58	LSNFH Winter Chinook	SS400	5	99	10.8
SS_2023-440	2E4D	LSNFH Winter Chinook	SS400	5	90	7.1
SS_2023-441	2F32	LSNFH Winter Chinook	SS400	5	92	8.5
SS_2023-442	2E9E	LSNFH Winter Chinook	SS400	5	91	8.7
SS_2023-443	4450	LSNFH Winter Chinook	SS400	5	102	11.4
SS_2023-444	04DA	LSNFH Winter Chinook	SS400	5	96	9.2
SS_2023-445	2E5B	LSNFH Winter Chinook	SS400	5	97	10.6

SS_2023-446	43EA	LSNFH Winter Chinook	SS400	5	94	8.5
SS_2023-447	302A	LSNFH Winter Chinook	SS400	5	93	8.4
SS_2023-448	0A9A	LSNFH Winter Chinook	SS400	5	93	9.2
SS_2023-449	6C8C	LSNFH Winter Chinook	SS400	5	94	8.6
SS_2023-450	ACC1	LSNFH Winter Chinook	SS400	5	91	8.1
SS_2023-451	41AA	LSNFH Winter Chinook	SS400	5	89	7.5
SS_2023-452	2E58	LSNFH Winter Chinook	SS400	5	97	9.7
SS_2023-453	AC66	LSNFH Winter Chinook	SS400	5	97	9.7
SS_2023-454	2F9A	LSNFH Winter Chinook	SS400	5	92	8.2
SS_2023-455	42A2	LSNFH Winter Chinook	SS400	5	94	8.5
SS_2023-456	4162	LSNFH Winter Chinook	SS400	5	92	8.2
SS_2023-457	AC82	LSNFH Winter Chinook	SS400	5	96	10.3
SS_2023-458	2FA4	LSNFH Winter Chinook	SS400	5	93	8.7
SS_2023-459	2F72	LSNFH Winter Chinook	SS400	5	104	11.8
SS_2023-460	4448	LSNFH Winter Chinook	SS400	5	91	8.1
SS_2023-461	2E99	LSNFH Winter Chinook	SS400	5	89	7.5
SS_2023-462	ACB7	LSNFH Winter Chinook	SS400	5	92	8.1
SS_2023-463	2EB1	LSNFH Winter Chinook	SS400	5	89	7.4
SS_2023-464	0A51	LSNFH Winter Chinook	SS400	5	92	8.3
SS_2023-465	2F65	LSNFH Winter Chinook	SS400	5	90	7.5
SS_2023-466	AC99	LSNFH Winter Chinook	SS400	5	99	11.2
SS_2023-467	2FDA	LSNFH Winter Chinook	SS400	5	92	8.2
SS_2023-468	43A9	LSNFH Winter Chinook	SS400	5	96	9

SS_2023-469	04B6	LSNFH Winter Chinook	SS400	5	102	11.9
SS_2023-470	0512	LSNFH Winter Chinook	SS400	5	98	10
SS_2023-471	2E84	LSNFH Winter Chinook	SS400	5	90	8.2
SS_2023-472	2F25	LSNFH Winter Chinook	SS400	5	91	8.7
SS_2023-473	ACD1	LSNFH Winter Chinook	SS400	5	91	7.9
SS_2023-474	306A	LSNFH Winter Chinook	SS400	5	97	10.5
SS_2023-475	432D	LSNFH Winter Chinook	SS400	5	94	8.9
SS_2023-476	AC76	LSNFH Winter Chinook	SS400	5	93	8.6
SS_2023-477	4334	LSNFH Winter Chinook	SS400	5	93	8.3
SS_2023-478	42F2	LSNFH Winter Chinook	SS400	5	96	9.7
SS_2023-479	0A6A	LSNFH Winter Chinook	SS400	5	99	10
SS_2023-480	AC64	LSNFH Winter Chinook	SS400	5	100	11.4
SS_2023-481	AC72	LSNFH Winter Chinook	SS400	5	92	7.6
SS_2023-482	4468	LSNFH Winter Chinook	SS400	5	102	11.4
SS_2023-483	3094	LSNFH Winter Chinook	SS400	5	98	10.1
SS_2023-484	2E8B	LSNFH Winter Chinook	SS400	5	96	9.8
SS_2023-485	2ED3	LSNFH Winter Chinook	SS400	5	96	10.2
SS_2023-486	428A	LSNFH Winter Chinook	SS400	5	96	8.9
SS_2023-487	2ECA	LSNFH Winter Chinook	SS400	5	98	8.3
SS_2023-488	42EA	LSNFH Winter Chinook	SS400	5	102	13
SS_2023-489	2F22	LSNFH Winter Chinook	SS400	5	92	8.2
SS_2023-490	2E57	LSNFH Winter Chinook	SS400	5	94	8.7
SS_2023-491	AC73	LSNFH Winter Chinook	SS400	5	94	8.9

SS_2023-492	2F2A	LSNFH Winter Chinook	SS400	5	89	7.9
SS_2023-493	2EAD	LSNFH Winter Chinook	SS400	5	95	9.8
SS_2023-494	42D8	LSNFH Winter Chinook	SS400	5	88	7.3
SS_2023-495	43D2	LSNFH Winter Chinook	SS400	5	93	8.2
SS_2023-496	2E6E	LSNFH Winter Chinook	SS400	5	98	10.6
SS_2023-497	2E76	LSNFH Winter Chinook	SS400	5	92	8.9
SS_2023-498	2FD4	LSNFH Winter Chinook	SS400	5	91	8.6
SS_2023-499	43D5	LSNFH Winter Chinook	SS400	5	87	6.8
SS_2023-500	0A89	LSNFH Winter Chinook	SS400	5	97	9.4
SS_2023-501	ACCE	LSNFH Winter Chinook	SS400	5	100	10.7
SS_2023-502	0A91	LSNFH Winter Chinook	SS400	5	94	9.6
SS_2023-503	04BA	LSNFH Winter Chinook	SS400	5	102	12
SS_2023-504	4175	LSNFH Winter Chinook	SS400	5	95	9.4
SS_2023-505	AC5B	LSNFH Winter Chinook	SS400	5	95	9.3
SS_2023-506	2E5A	LSNFH Winter Chinook	SS400	5	99	11.3
SS_2023-507	ACAD	LSNFH Winter Chinook	SS400	5	92	8.3
SS_2023-508	AC62	LSNFH Winter Chinook	SS400	5	93	7.9
SS_2023-509	42D0	LSNFH Winter Chinook	SS400	5	96	9.9
SS_2023-510	4298	LSNFH Winter Chinook	SS400	5	91	8.4
SS_2023-511	2E9A	LSNFH Winter Chinook	SS400	5	88	6.7
SS_2023-512	41BA	LSNFH Winter Chinook	SS400	5	95	9.2
SS_2023-513	4345	LSNFH Winter Chinook	SS400	5	94	8.1
SS_2023-514	446E	LSNFH Winter Chinook	SS400	5	100	10.9

SS_2023-515	AC59	LSNFH Winter Chinook	SS400	5	93	8.3
SS_2023-516	4449	LSNFH Winter Chinook	SS400	5	96	9.2
SS_2023-517	2E34	LSNFH Winter Chinook	SS400	5	96	9.1
SS_2023-518	4395	LSNFH Winter Chinook	SS400	5	90	8.3
SS_2023-519	2EE2	LSNFH Winter Chinook	SS400	5	92	8.2
SS_2023-520	444A	LSNFH Winter Chinook	SS400	5	91	8.3
SS_2023-521	0A45	LSNFH Winter Chinook	SS400	5	94	8.5
SS_2023-522	444B	LSNFH Winter Chinook	SS400	5	97	8.8
SS_2023-523	2EA0	LSNFH Winter Chinook	SS400	5	95	9.7
SS_2023-524	2E46	LSNFH Winter Chinook	SS400	5	100	10.4
SS_2023-525	2FBA	LSNFH Winter Chinook	SS400	5	94	8.1
SS_2023-526	4285	LSNFH Winter Chinook	SS400	5	95	9
SS_2023-528	2E88	LSNFH Winter Chinook	SS400	5	95	8.7
SS_2023-529	0A99	LSNFH Winter Chinook	SS400	5	102	10.5
SS_2023-530	2E90	LSNFH Winter Chinook	SS400	5	94	8.2
SS_2023-531	AC98	LSNFH Winter Chinook	SS400	5	94	9
SS_2023-532	2F62	LSNFH Winter Chinook	SS400	5	97	9.1
SS_2023-533	AC97	LSNFH Winter Chinook	SS400	5	104	12
SS_2023-534	2F1A	LSNFH Winter Chinook	SS400	5	96	9.5
SS_2023-535	2E52	LSNFH Winter Chinook	SS400	5	93	8.1
SS_2023-536	6C88	LSNFH Winter Chinook	SS400	5	91	7.8
SS_2023-537	4314	LSNFH Winter Chinook	SS400	5	100	11.4
SS_2023-538	AC4B	LSNFH Winter Chinook	SS400	5	94	8.9

SS_2023-539	42A9	LSNFH Winter Chinook	SS400	5	96	9.3
SS_2023-540	AC6C	LSNFH Winter Chinook	SS400	5	94	8.4
SS_2023-541	4442	LSNFH Winter Chinook	SS400	5	97	9.3
SS_2023-542	2E51	LSNFH Winter Chinook	SS400	5	93	8.5
SS_2023-543	4462	LSNFH Winter Chinook	SS400	5	100	10.5
SS_2023-544	0516	LSNFH Winter Chinook	SS400	5	95	10
SS_2023-545	2E49	LSNFH Winter Chinook	SS400	5	84	6.2
SS_2023-546	6C86	LSNFH Winter Chinook	SS400	5	94	8.1
SS_2023-547	0A96	LSNFH Winter Chinook	SS400	5	98	10.2
SS_2023-548	44A5	LSNFH Winter Chinook	SS400	5	89	7.9
SS_2023-549	2E91	LSNFH Winter Chinook	SS400	5	98	9.6
SS_2023-550	4497	LSNFH Winter Chinook	SS400	5	90	6.8
SS_2023-551	437A	LSNFH Winter Chinook	SS400	5	100	11.8
SS_2023-552	2FAB	LSNFH Winter Chinook	SS400	5	93	8.9
SS_2023-553	ACB8	LSNFH Winter Chinook	SS400	5	97	10.6
SS_2023-554	AC53	LSNFH Winter Chinook	SS400	5	98	9.8
SS_2023-555	2EA2	LSNFH Winter Chinook	SS400	5	90	7.2
SS_2023-556	2EB6	LSNFH Winter Chinook	SS400	5	91	7.8
SS_2023-557	2E94	LSNFH Winter Chinook	SS400	5	94	9
SS_2023-558	42D1	LSNFH Winter Chinook	SS400	5	97	9
SS_2023-559	4412	LSNFH Winter Chinook	SS400	5	91	8
SS_2023-560	0A95	LSNFH Winter Chinook	SS400	5	101	11.2
SS_2023-561	0A75	LSNFH Winter Chinook	SS400	5	92	8.1

SS_2023-562	0A8A	LSNFH Winter Chinook	SS400	5	90	7.5
SS_2023-563	43B5	LSNFH Winter Chinook	SS400	5	104	10.8
SS_2023-564	4242	LSNFH Winter Chinook	SS400	5	94	9.2
SS_2023-565	42A4	LSNFH Winter Chinook	SS400	5	96	9.4
SS_2023-566	448A	LSNFH Winter Chinook	SS400	5	91	8.4
SS_2023-567	2FAC	LSNFH Winter Chinook	SS400	5	100	11.1
SS_2023-568	0A4A	LSNFH Winter Chinook	SS400	5	96	9
SS_2023-569	42A3	LSNFH Winter Chinook	SS400	5	95	9.2
SS_2023-570	42B4	LSNFH Winter Chinook	SS400	5	94	8.8
SS_2023-571	2EEA	LSNFH Winter Chinook	SS400	5	91	7.9
SS_2023-572	0A93	LSNFH Winter Chinook	SS400	5	97	10.3
SS_2023-573	ACDE	LSNFH Winter Chinook	SS400	5	95	9
SS_2023-574	4329	LSNFH Winter Chinook	SS400	5	96	9.2
SS_2023-575	2FA8	LSNFH Winter Chinook	SS400	5	98	9.6
SS_2023-576	2E8C	LSNFH Winter Chinook	SS400	5	94	9
SS_2023-577	0A59	LSNFH Winter Chinook	SS400	5	94	9.6
SS_2023-578	ACEE	LSNFH Winter Chinook	SS400	5	99	10.4
SS_2023-579	415B	LSNFH Winter Chinook	SS400	5	94	8.5
SS_2023-580	2EB3	LSNFH Winter Chinook	SS400	5	91	8.2
SS_2023-581	4486	LSNFH Winter Chinook	SS400	5	98	10.4
SS_2023-582	441A	LSNFH Winter Chinook	SS400	5	92	7.7
SS_2023-583	AC52	LSNFH Winter Chinook	SS400	5	96	9.7
SS_2023-584	44A4	LSNFH Winter Chinook	SS400	5	108	14.2

SS_2023-585	43A4	LSNFH Winter Chinook	SS400	5	96	9.8
SS_2023-586	2E89	LSNFH Winter Chinook	SS400	5	101	11
SS_2023-587	0A8B	LSNFH Winter Chinook	SS400	5	96	9.6
SS_2023-588	42A1	LSNFH Winter Chinook	SS400	5	102	11.1
SS_2023-589	42B6	LSNFH Winter Chinook	SS400	5	92	8
SS_2023-590	AC69	LSNFH Winter Chinook	SS400	5	96	10.4
SS_2023-591	AC5F	LSNFH Winter Chinook	SS400	5	96	9.1
SS_2023-592	6C8A	LSNFH Winter Chinook	SS400	5	98	9.8
SS_2023-593	2EDE	LSNFH Winter Chinook	SS400	5	97	9.9
SS_2023-594	41EA	LSNFH Winter Chinook	SS400	5	90	8.1
SS_2023-595	6C82	LSNFH Winter Chinook	SS400	5	110	13.9
SS_2023-596	2FA5	LSNFH Winter Chinook	SS400	5	92	8.8
SS_2023-597	4297	LSNFH Winter Chinook	SS400	5	96	8.7
SS_2023-598	448E	LSNFH Winter Chinook	SS400	5	93	7.9
SS_2023-599	2E4C	LSNFH Winter Chinook	SS400	5	87	6.8
SS_2023-600	2F6A	LSNFH Winter Chinook	SS400	5	94	8.4
SS_2023-601	0AA2	LSNFH Winter Chinook	SS400	5	99	11
SS_2023-602	ACAA	LSNFH Winter Chinook	SS400	5	94	9.4
SS_2023-603	4436	LSNFH Winter Chinook	SS400	5	94	9.6
SS_2023-604	ACE8	LSNFH Winter Chinook	SS400	5	97	9.9
SS_2023-605	AC9C	LSNFH Winter Chinook	SS400	5	97	9.7
SS_2023-606	2E8D	LSNFH Winter Chinook	SS400	5	97	10.4
SS_2023-607	AC44	LSNFH Winter Chinook	SS400	5	94	9.3

SS_2023-608	0A54	LSNFH Winter Chinook	SS400	5	101	12.2
SS_2023-609	AC6B	LSNFH Winter Chinook	SS400	5	98	11.3
SS_2023-610	AC91	LSNFH Winter Chinook	SS400	5	99	11.6
SS_2023-611	444C	LSNFH Winter Chinook	SS400	5	95	9.7
SS_2023-612	42AC	LSNFH Winter Chinook	SS400	5	93	9.4
SS_2023-613	AC5C	LSNFH Winter Chinook	SS400	5	95	8.8
SS_2023-614	0A85	LSNFH Winter Chinook	SS400	5	98	10.4
SS_2023-615	2E92	LSNFH Winter Chinook	SS400	5	95	9.6
SS_2023-616	4394	LSNFH Winter Chinook	SS400	5	100	11.2
SS_2023-617	427A	LSNFH Winter Chinook	SS400	5	93	8.6
SS_2023-618	2F94	LSNFH Winter Chinook	SS400	5	97	10.6
SS_2023-619	AC9E	LSNFH Winter Chinook	SS400	5	100	11.9
SS_2023-620	2E4A	LSNFH Winter Chinook	SS400	5	99	10.8
SS_2023-621	447A	LSNFH Winter Chinook	SS400	5	99	10.9
SS_2023-622	425C	LSNFH Winter Chinook	SS400	5	94	9.3
SS_2023-623	430A	LSNFH Winter Chinook	SS400	5	102	11.6
SS_2023-624	04D2	LSNFH Winter Chinook	SS400	5	91	8.2
SS_2023-625	30A6	LSNFH Winter Chinook	SS400	5	97	10.1
SS_2023-626	2EE5	LSNFH Winter Chinook	SS400	5	95	9.3
SS_2023-627	6C84	LSNFH Winter Chinook	SS400	5	91	8.2
SS_2023-628	42DE	LSNFH Winter Chinook	SS400	5	93	8.1
SS_2023-629	2E35	LSNFH Winter Chinook	SS400	5	93	9
SS_2023-630	2ED1	LSNFH Winter Chinook	SS400	5	90	7.5

SS_2023-631	3056	LSNFH Winter Chinook	SS400	5	93	8.6
SS_2023-632	415E	LSNFH Winter Chinook	SS400	5	81	5.4
SS_2023-633	AC6F	LSNFH Winter Chinook	SS400	5	94	8.6
SS_2023-634	2E2D	LSNFH Winter Chinook	SS400	5	104	12.3
SS_2023-635	4255	LSNFH Winter Chinook	SS400	5	96	9.7
SS_2023-636	42B8	LSNFH Winter Chinook	SS400	5	98	11.1
SS_2023-637	ACBC	LSNFH Winter Chinook	SS400	5	95	9.6
SS_2023-638	0A5B	LSNFH Winter Chinook	SS400	5	96	9.5
SS_2023-639	44A0	LSNFH Winter Chinook	SS400	5	95	9.4
SS_2023-640	ACD3	LSNFH Winter Chinook	SS400	5	98	9.6
SS_2023-641	42FA	LSNFH Winter Chinook	SS400	5	100	11.7
SS_2023-642	4424	LSNFH Winter Chinook	SS400	5	101	11.4
SS_2023-643	4396	LSNFH Winter Chinook	SS400	5	97	10.4
SS_2023-644	439A	LSNFH Winter Chinook	SS400	5	98	10.3
SS_2023-645	42A0	LSNFH Winter Chinook	SS400	5	92	8.2
SS_2023-646	AC5D	LSNFH Winter Chinook	SS400	5	96	9.8
SS_2023-647	0A49	LSNFH Winter Chinook	SS400	5	99	11.2
SS_2023-648	44A1	LSNFH Winter Chinook	SS400	5	95	8.8
SS_2023-649	2E7A	LSNFH Winter Chinook	SS400	5	94	9.6
SS_2023-650	AC4C	LSNFH Winter Chinook	SS400	5	96	9
SS_2023-651	2EF4	LSNFH Winter Chinook	SS400	5	100	11.1
SS_2023-652	2EAF	LSNFH Winter Chinook	SS400	5	89	7.5
SS_2023-653	4416	LSNFH Winter Chinook	SS400	5	94	9.8

SS_2023-654	3055	LSNFH Winter Chinook	SS400	5	95	9.8
SS_2023-655	2FA2	LSNFH Winter Chinook	SS400	5	98	11.3
SS_2023-656	2E53	LSNFH Winter Chinook	SS400	5	97	9.9
SS_2023-657	3092	LSNFH Winter Chinook	SS400	5	100	10.7
SS_2023-658	4451	LSNFH Winter Chinook	SS400	5	92	8.2
SS_2023-659	ACDC	LSNFH Winter Chinook	SS400	5	95	10
SS_2023-660	0A9B	LSNFH Winter Chinook	SS400	5	97	10.2
SS_2023-661	ACBF	LSNFH Winter Chinook	SS400	5	96	10
SS_2023-662	4286	LSNFH Winter Chinook	SS400	5	95	10.1
SS_2023-663	42F6	LSNFH Winter Chinook	SS400	5	97	9.9
SS_2023-664	4454	LSNFH Winter Chinook	SS400	5	98	10.2
SS_2023-665	0A69	LSNFH Winter Chinook	SS400	5	94	9.2
SS_2023-666	4256	LSNFH Winter Chinook	SS400	5	100	10.8
SS_2023-667	2F52	LSNFH Winter Chinook	SS400	5	94	9.2
SS_2023-668	0A6D	LSNFH Winter Chinook	SS400	5	93	8.5
SS_2023-669	4415	LSNFH Winter Chinook	SS400	5	98	10.3
SS_2023-670	2E32	LSNFH Winter Chinook	SS400	5	94	9.1
SS_2023-671	419A	LSNFH Winter Chinook	SS400	5	93	9.5
SS_2023-672	4392	LSNFH Winter Chinook	SS400	5	95	9.6
SS_2023-673	2EAE	LSNFH Winter Chinook	SS400	5	90	8
SS_2023-674	2E56	LSNFH Winter Chinook	SS400	5	91	8
SS_2023-675	ACA3	LSNFH Winter Chinook	SS400	5	103	11.9
SS_2023-676	2F56	LSNFH Winter Chinook	SS400	5	89	7.2

SS_2023-677	2E9C	LSNFH Winter Chinook	SS400	5	90	8.6
SS_2023-678	2E9B	LSNFH Winter Chinook	SS400	5	98	10.2
SS_2023-679	AC67	LSNFH Winter Chinook	SS400	5	92	8
SS_2023-680	43CA	LSNFH Winter Chinook	SS400	5	108	15.6
SS_2023-681	2F4B	LSNFH Winter Chinook	SS400	5	93	8.5
SS_2023-682	4498	LSNFH Winter Chinook	SS400	5	93	9
SS_2023-683	AC8D	LSNFH Winter Chinook	SS400	5	103	12.5
SS_2023-684	AC49	LSNFH Winter Chinook	SS400	5	94	8.9
SS_2023-685	2ECC	LSNFH Winter Chinook	SS400	5	99	10.7
SS_2023-686	2E66	LSNFH Winter Chinook	SS400	5	97	10.2
SS_2023-687	4426	LSNFH Winter Chinook	SS400	5	94	8.9
SS_2023-688	4452	LSNFH Winter Chinook	SS400	5	100	10.8
SS_2023-689	2EC2	LSNFH Winter Chinook	SS400	5	93	8.9
SS_2023-690	4166	LSNFH Winter Chinook	SS400	5	97	9.6
SS_2023-691	444D	LSNFH Winter Chinook	SS400	5	95	9.6
SS_2023-692	AC51	LSNFH Winter Chinook	SS400	5	90	7.7
SS_2023-693	ACB3	LSNFH Winter Chinook	SS400	5	94	8.9
SS_2023-694	ACE1	LSNFH Winter Chinook	SS400	5	102	12.4
SS_2023-695	2EDA	LSNFH Winter Chinook	SS400	5	95	8.8
SS_2023-696	AC85	LSNFH Winter Chinook	SS400	5	92	8.6
SS_2023-697	6C72	LSNFH Winter Chinook	SS400	5	98	10.6
SS_2023-698	4294	LSNFH Winter Chinook	SS400	5	95	10
SS_2023-699	2EBE	LSNFH Winter Chinook	SS400	5	96	9.1

SS_2023-700	0A55	LSNFH Winter Chinook	SS400	5	95	10.5
SS_2023-701	2E8A	LSNFH Winter Chinook	SS400	5	94	8.6
SS_2023-702	428E	LSNFH Winter Chinook	SS400	5	97	10
SS_2023-703	4342	LSNFH Winter Chinook	SS400	5	95	9.3
SS_2023-704	04AE	LSNFH Winter Chinook	SS400	5	94	8.7
SS_2023-705	2F53	LSNFH Winter Chinook	SS400	5	102	12.2
SS_2023-706	6C7A	LSNFH Winter Chinook	SS400	5	103	13.1
SS_2023-707	0A65	LSNFH Winter Chinook	SS400	5	95	9.1
SS_2023-708	0AA1	LSNFH Winter Chinook	SS400	5	95	9.1
SS_2023-709	ACA0	LSNFH Winter Chinook	SS400	5	95	9.4
SS_2023-710	30AA	LSNFH Winter Chinook	SS400	5	98	10
SS_2023-711	42D4	LSNFH Winter Chinook	SS400	5	100	11
SS_2023-712	4434	LSNFH Winter Chinook	SS400	5	96	9.7
SS_2023-713	43B2	LSNFH Winter Chinook	SS400	5	92	8.5
SS_2023-714	42CC	LSNFH Winter Chinook	SS400	5	95	9
SS_2023-715	AC8C	LSNFH Winter Chinook	SS400	5	95	9.5
SS_2023-716	AC4E	LSNFH Winter Chinook	SS400	5	94	9.2
SS_2023-717	6C8B	LSNFH Winter Chinook	SS400	5	100	11.3
SS_2023-718	0A94	LSNFH Winter Chinook	SS400	5	92	8.1
SS_2023-719	2F8A	LSNFH Winter Chinook	SS400	5	95	8.6
SS_2023-720	43D6	LSNFH Winter Chinook	SS400	5	93	8.8
SS_2023-721	440A	LSNFH Winter Chinook	SS400	5	98	10.4
SS_2023-722	2E4E	LSNFH Winter Chinook	SS400	5	99	10.6

SS_2023-723	ACE7	LSNFH Winter Chinook	SS400	5	90	7.6
SS_2023-724	0A56	LSNFH Winter Chinook	SS400	5	91	9.1
SS_2023-725	2EC9	LSNFH Winter Chinook	SS400	5	92	8.1
SS_2023-726	AC4F	LSNFH Winter Chinook	SS400	5	101	11.2
SS_2023-727	4488	LSNFH Winter Chinook	SS400	5	100	10.8
SS_2023-728	2F7A	LSNFH Winter Chinook	SS400	5	95	9.2
SS_2023-729	4458	LSNFH Winter Chinook	SS400	5	94	8.9
SS_2023-730	42D2	LSNFH Winter Chinook	SS400	5	93	8.4
SS_2023-731	0A4B	LSNFH Winter Chinook	SS400	5	95	9.3
SS_2023-732	0A92	LSNFH Winter Chinook	SS400	5	97	9.9
SS_2023-733	3052	LSNFH Winter Chinook	SS400	5	96	10
SS_2023-734	2F42	LSNFH Winter Chinook	SS400	5	98	9.7
SS_2023-735	43D4	LSNFH Winter Chinook	SS400	5	94	8.8
SS_2023-736	43AC	LSNFH Winter Chinook	SS400	5	100	10.9
SS_2023-737	432C	LSNFH Winter Chinook	SS400	5	98	10.1
SS_2023-738	2E44	LSNFH Winter Chinook	SS400	5	96	9.9
SS_2023-739	0A4D	LSNFH Winter Chinook	SS400	5	101	11.4
SS_2023-740	AC5E	LSNFH Winter Chinook	SS400	5	97	10.3
SS_2023-741	2F51	LSNFH Winter Chinook	SS400	5	100	11.3
SS_2023-742	AC74	LSNFH Winter Chinook	SS400	5	91	8.2
SS_2023-743	ACD0	LSNFH Winter Chinook	SS400	5	96	9.5
SS_2023-744	AC50	LSNFH Winter Chinook	SS400	5	93	8.5
SS_2023-745	2EC5	LSNFH Winter Chinook	SS400	5	94	8.9

SS_2023-746	ACE6	LSNFH Winter Chinook	SS400	5	91	8.3
SS_2023-747	43B6	LSNFH Winter Chinook	SS400	5	98	10.5
SS_2023-748	2EAC	LSNFH Winter Chinook	SS400	5	96	9.9
SS_2023-749	42A5	LSNFH Winter Chinook	SS400	5	96	10.2
SS_2023-750	AC75	LSNFH Winter Chinook	SS400	5	101	10.9
SS_2023-751	04CA	LSNFH Winter Chinook	SS400	5	103	11.7
SS_2023-752	2F4E	LSNFH Winter Chinook	SS400	5	97	9.8
SS_2023-753	4344	LSNFH Winter Chinook	SS400	5	100	10.7
SS_2023-754	0A5A	LSNFH Winter Chinook	SS400	5	98	9.8
SS_2023-755	432E	LSNFH Winter Chinook	SS400	5	94	8.2
SS_2023-756	43BA	LSNFH Winter Chinook	SS400	5	97	9.9
SS_2023-757	2EA6	LSNFH Winter Chinook	SS400	5	95	9.4
SS_2023-758	ACAF	LSNFH Winter Chinook	SS400	5	96	9
SS_2023-759	445D	LSNFH Winter Chinook	SS400	5	98	10.4
SS_2023-760	2F49	LSNFH Winter Chinook	SS400	5	106	12.9
SS_2023-761	2F4A	LSNFH Winter Chinook	SS400	5	93	9.4
SS_2023-762	0A52	LSNFH Winter Chinook	SS400	5	97	10.7
SS_2023-763	2EA1	LSNFH Winter Chinook	SS400	5	99	10.6
SS_2023-764	43AD	LSNFH Winter Chinook	SS400	5	93	8.6
SS_2023-765	AC61	LSNFH Winter Chinook	SS400	5	100	11
SS_2023-766	0A97	LSNFH Winter Chinook	SS400	5	100	10.6
SS_2023-767	4251	LSNFH Winter Chinook	SS400	5	98	10.1
SS_2023-768	AC93	LSNFH Winter Chinook	SS400	5	104	12.1

SS_2023-769	2F5E	LSNFH Winter Chinook	SS400	5	98	10.4
SS_2023-770	4299	LSNFH Winter Chinook	SS400	5	96	9.6
SS_2023-771	2FD2	LSNFH Winter Chinook	SS400	5	94	8.9
SS_2023-772	ACE4	LSNFH Winter Chinook	SS400	5	102	12
SS_2023-773	2EA7	LSNFH Winter Chinook	SS400	5	101	12.3
SS_2023-774	AC9D	LSNFH Winter Chinook	SS400	5	97	10.1
SS_2023-775	AC7D	LSNFH Winter Chinook	SS400	5	96	9.9
SS_2023-776	43AE	LSNFH Winter Chinook	SS400	5	102	11.7
SS_2023-777	AC68	LSNFH Winter Chinook	SS400	5	97	10.2
SS_2023-778	4435	LSNFH Winter Chinook	SS400	5	93	8
SS_2023-779	2ECE	LSNFH Winter Chinook	SS400	5	104	12.6
SS_2023-780	ACEC	LSNFH Winter Chinook	SS400	5	96	9.5
SS_2023-781	2EA8	LSNFH Winter Chinook	SS400	5	91	7.8
SS_2023-782	436C	LSNFH Winter Chinook	SS400	5	95	8.8
SS_2023-783	2ED6	LSNFH Winter Chinook	SS400	5	101	12.2
SS_2023-784	2E98	LSNFH Winter Chinook	SS400	5	98	9.9
SS_2023-785	AC8E	LSNFH Winter Chinook	SS400	5	104	13.3
SS_2023-786	2EBA	LSNFH Winter Chinook	SS400	5	93	8.5
SS_2023-787	4156	LSNFH Winter Chinook	SS400	5	102	11.6
SS_2023-788	AC8F	LSNFH Winter Chinook	SS400	5	100	11.1
SS_2023-789	2E5E	LSNFH Winter Chinook	SS400	5	93	8.4
SS_2023-790	AC7A	LSNFH Winter Chinook	SS400	5	97	9.9
SS_2023-791	41B2	LSNFH Winter Chinook	SS400	5	95	9.5

SS_2023-792	43A5	LSNFH Winter Chinook	SS400	5	99	11.4
SS_2023-793	4288	LSNFH Winter Chinook	SS400	5	96	9.3
SS_2023-794	2E54	LSNFH Winter Chinook	SS400	5	92	7.8
SS_2023-795	AC9F	LSNFH Winter Chinook	SS400	5	99	11.2
SS_2023-796	0A57	LSNFH Winter Chinook	SS400	5	94	8.7
SS_2023-797	2E45	LSNFH Winter Chinook	SS400	5	95	9.1
SS_2023-798	2F45	LSNFH Winter Chinook	SS400	5	96	10.1
SS_2023-799	2ECB	LSNFH Winter Chinook	SS400	5	92	8.9
SS_2023-800	3054	LSNFH Winter Chinook	SS400	5	102	12