



South Coast Salmon Bulletin

November 17, 2023 Escapement Update #10

Chinook, Coho and Chum – Area 18 Cowichan River

Summary

This bulletin summarizes salmon stock assessment and research activities conducted in the Cowichan River watershed by a variety of organizations including Cowichan Tribes, DFO, contractors and academic institutions. Estimates reported here are preliminary and should be interpreted with caution. Finalized estimates will be made available following the escapement season.

2023 Pre-Season Expectations

Chinook: There are no formal forecasts for Chinook returns to the Cowichan River. Returns in 2022 surpassed 10,000 adult fish for the sixth year in a row. Expectations are for continued rebuilding with a moderate to strong possibility of reaching the target escapement for the system (6,500 naturally spawning adults). Informal forecasts through *Forecast-R* modelling and brood-year projections suggest a return of ~23,000 Natural Spawners including age-2 jacks, which is similar to recent years. Figure 1 shows recent and historic Chinook escapement in Cowichan River.

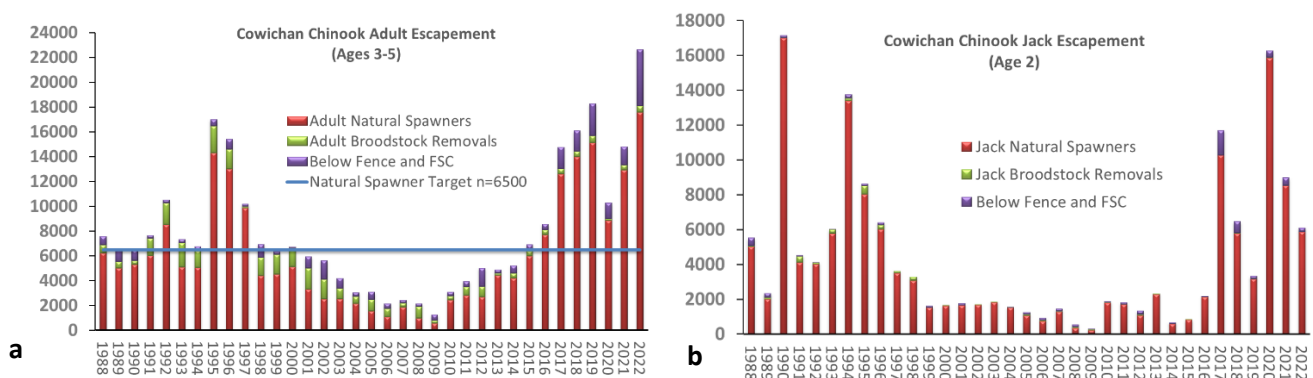


Figure 1: Cowichan Chinook escapement from the beginning of the indicator program to present (1988-2022). (a) Adult (age 3-5) returns are compared to the adult escapement target of 6500 and broken into natural spawners, broodstock removals and returns below the fence. (b) Jack (age-2) returns are also broken down to natural spawners and returns below the fence, with some broodstock removals.

Coho: Coho are expected to remain in a low productivity period throughout Southern BC. Marine survivals are forecast remain similar to 2022 levels at 2.8% for wild and 1.3-2.7% for hatchery indicators in the Georgia Basin. A new project to estimate Coho escapement and run timing for the Cowichan River was initiated in 2018 with the goal of building an annual data set. Preliminary data suggest Coho survival is higher than other Strait of Georgia systems and recent escapements (2019-2022) are in excess of 10,000 adults. Skutz Falls is the primary enumeration site for this species as the fence is typically removed before the peak of migration.

Pink: A small number of pinks (~100) are typically observed at the fence every fall.

Chum: Chum returns in 2023 are forecast to be lower than the escapement target of 160,000 for Cowichan at 126,400 based on contributing brood year escapement and normal survival values ("normal forecast"). However, if recent low survivals persist through 2023 ("like last year model") then we expect

to see around 69,100 chum return. Forecasts for chum are highly uncertain and will be revised in-season as returns are enumerated using a DIDSON. The peak of the run is expected to occur near November 1.

Sockeye: Although the Cowichan is not considered a Sockeye system a handful of fish are observed in most years but migration likely occurs before the fence is installed.

Environmental Conditions

Dry conditions throughout the spring and summer led to low storage levels in Lake Cowichan, resulting in reduced flow starting early June. On June 9th, flow was reduced below typical levels from 15 to 9 m³/s. By June 30th flow was reduced to 4.5 m³/s instead of the normal baseflow of 7 m³/s. On August 24th the lake reached a “zero storage” level and pumps were used to at the weir to sustain flow levels around 4.5 m³/s. Flows at the fence jumped from 6 m³/s to 24.8 m³/s on October 18th and the fence was removed. Recent rainfall increased lake storage and the weir has been off control since October 19th. Peak flows thus far at the fence site have reached 113 m³/s (Figure 2).

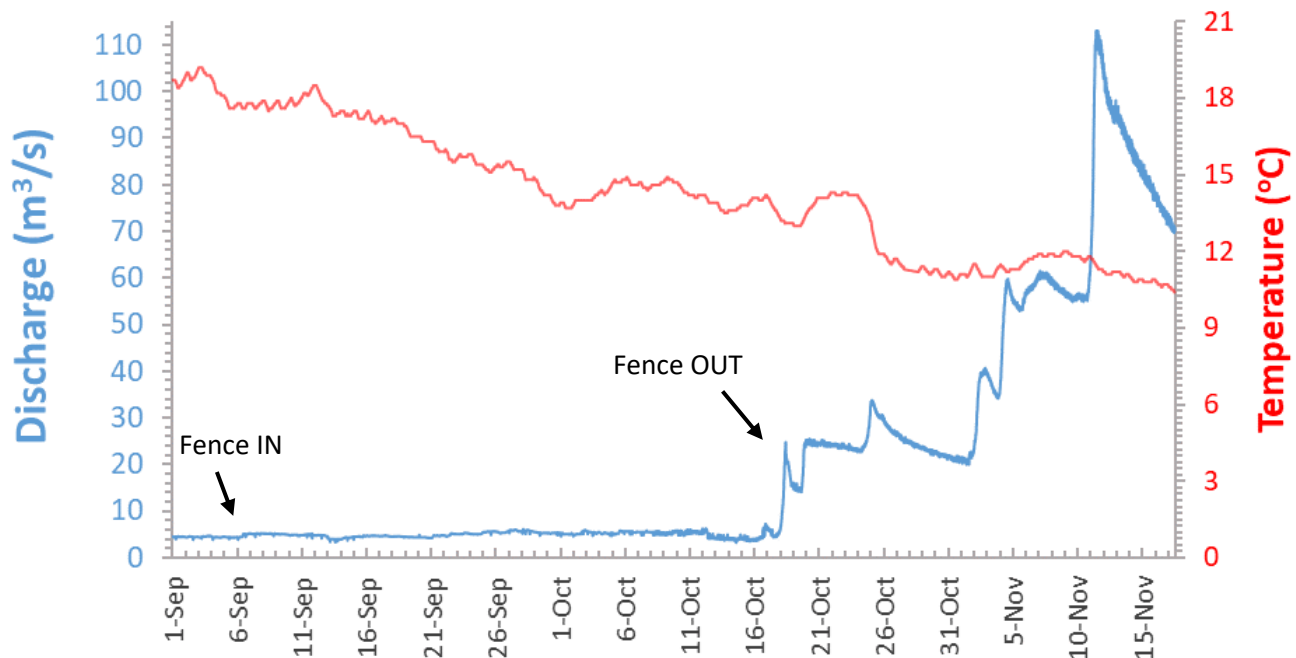


Figure 2: Discharge (m³/s) and Temperature (°C) at Water Survey of Canada Station 08HA011, Cowichan River in Duncan. Discharge levels when the salmon counting fence was installed and removed are indicated.

2023 Adult Enumeration

Counting Fence

Enumeration at the counting fence began on September 8th at 4:00 PM. Totals from video based counts are presented below and will be reviewed post season to produce a final escapement estimate for 2023. From October 5th to 10th the fence was closed to aid in brood stock collection for the Cowichan River Hatchery. On October 18th the fence was removed due to the significant increase in flows and turbidity.

Chinook

Chinook migrating past cameras at the counting fence are evaluated for size to determine if they are adults or jacks, and the presence of an adipose fin to determine if they are wild or hatchery origin. Counts up to October 18th at 8:00 AM are presented in Table 1.

Table 1: Cumulative totals for 2023 Chinook Migration past the fence by age and origin.

	Wild (unclipped)	Hatchery (clipped)	Unknown	Total
Adults	7,021	195	1,442	8,658
Jacks	2,722	157	1,087	3,966
Total	9,743	352	2,529	12,642

Adult Chinook in-season counts are compared to run-timing curves to determine if escapement is on track to meet the target of 6500, using early, normal and late run-timing based on historic escapement and flow conditions (Figure 3).

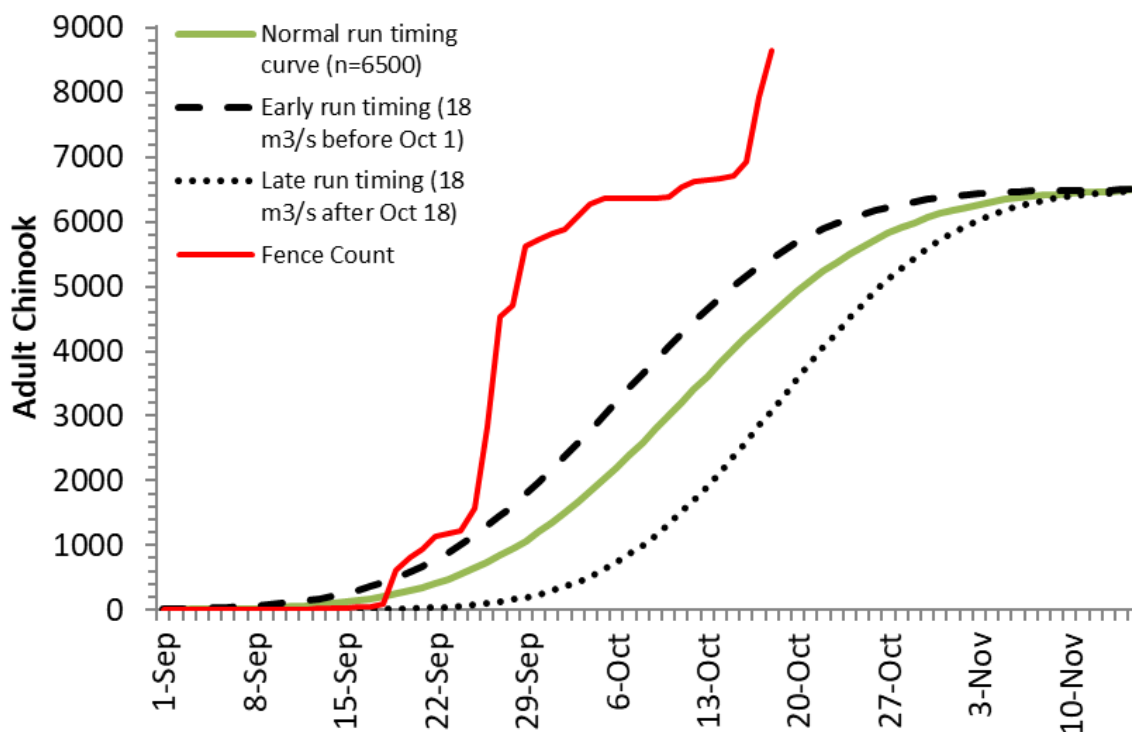


Figure 3: In-season adult Chinook counts compared to normal, early and late run-timing curves based on river conditions.

Coho, Chum and Pink

In addition to Chinook, all other salmon species are identified as they migrate past counting fence cameras. Counts for Coho, Chum and Pink up to October 18th at 8:00 AM are presented in Table 2.

Table 2: Cumulative totals for 2023 Coho, Chum and Pink migration past the fence, up to October 18th at 8:00 AM.

	Coho	Chum	Pink	Unknown
Adults	1,838	49	416	49
Jacks	373			
Total	2,211	49	416	49

PIT Tags

Passive Integrated Transponder (PIT) tags applied to juvenile or marine Chinook and Coho are detected when the tagged salmon return to Cowichan River. Detections are linked to a unique number that indicates the species and age at tagging. As of November 10th, **111 adult** and **123 jack Chinook** have passed the counting fence site, along with **133 adult Coho** (Figure 4).

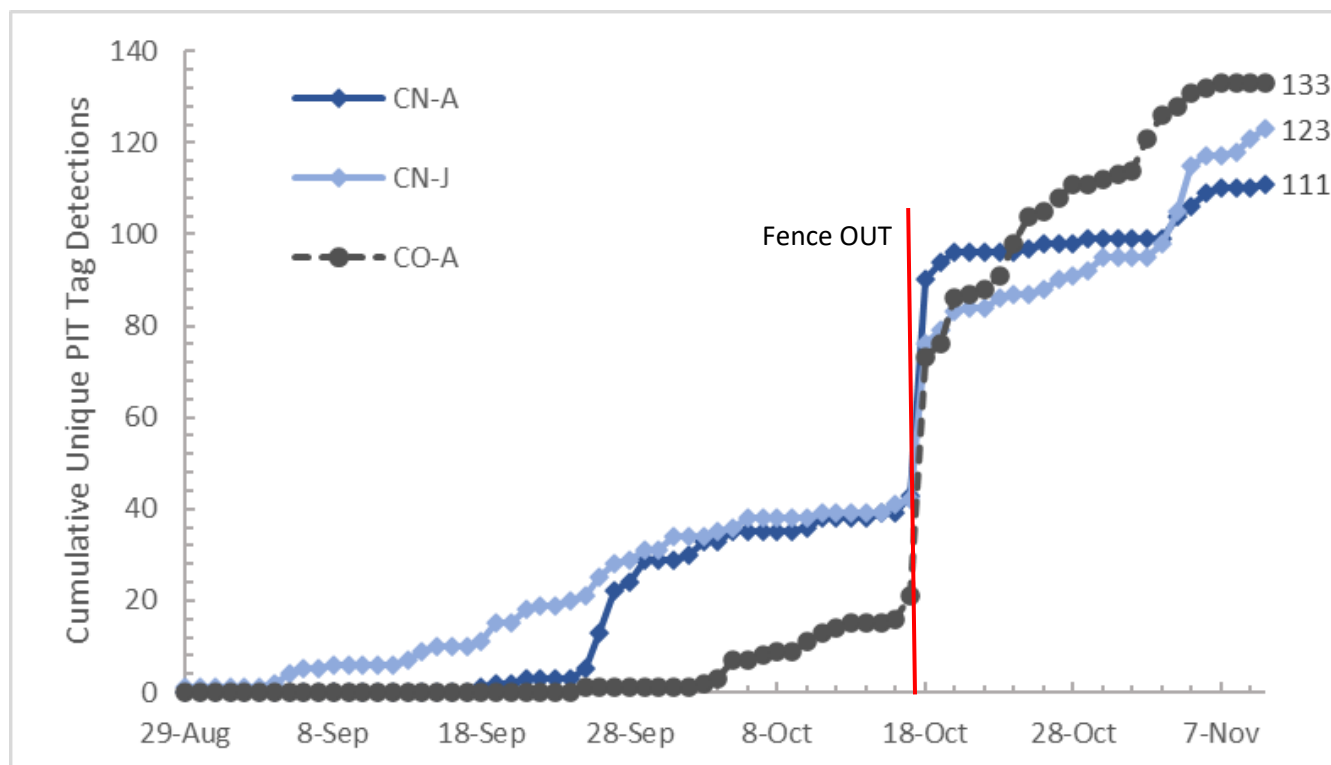


Figure 4: Passive Integrated Transponder (PIT) tags in Coho and Chinook (adults & jacks) detected at the salmon counting fence site in 2023.

Lower River DIDSON

A Dual-frequency Identification Sonar (DIDSON) was installed 5 km below the counting fence on October 12th as part of the annual Chum assessment program (since 2006). An in-season Chum escapement estimate is produced from on-site review by Cowichan Tribes Fisheries Staff. Data up to November 16th at 8:00 AM are presented relative to the run timing curves for the escapement target of 160,000 fish (Figure 5) and forecast models (Figure 6).

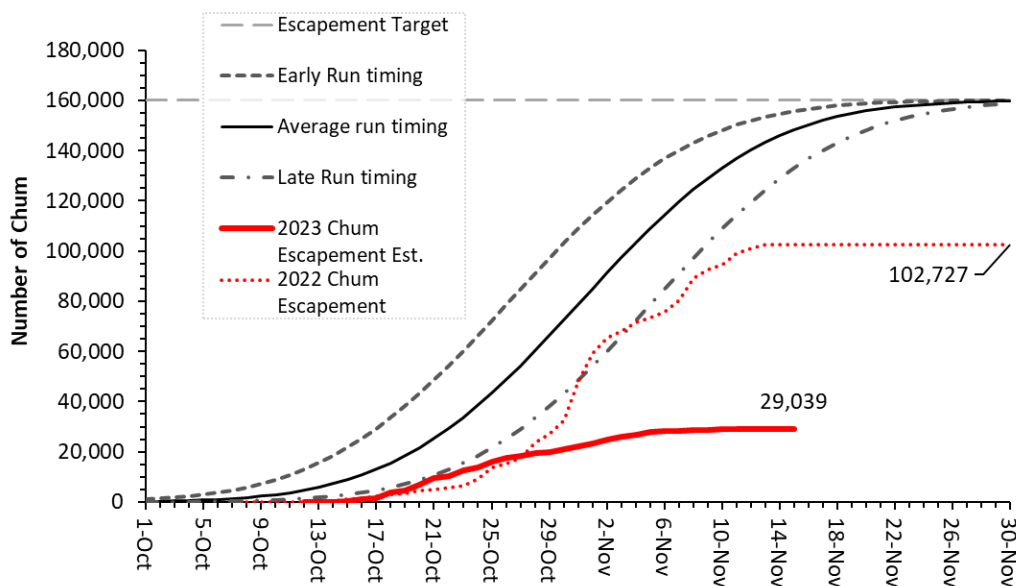


Figure 5: In-season Chum escapement estimates from DIDSON sonar data compared to 2022 escapement and run-timing curves for the escapement target of 160,000 Chum.

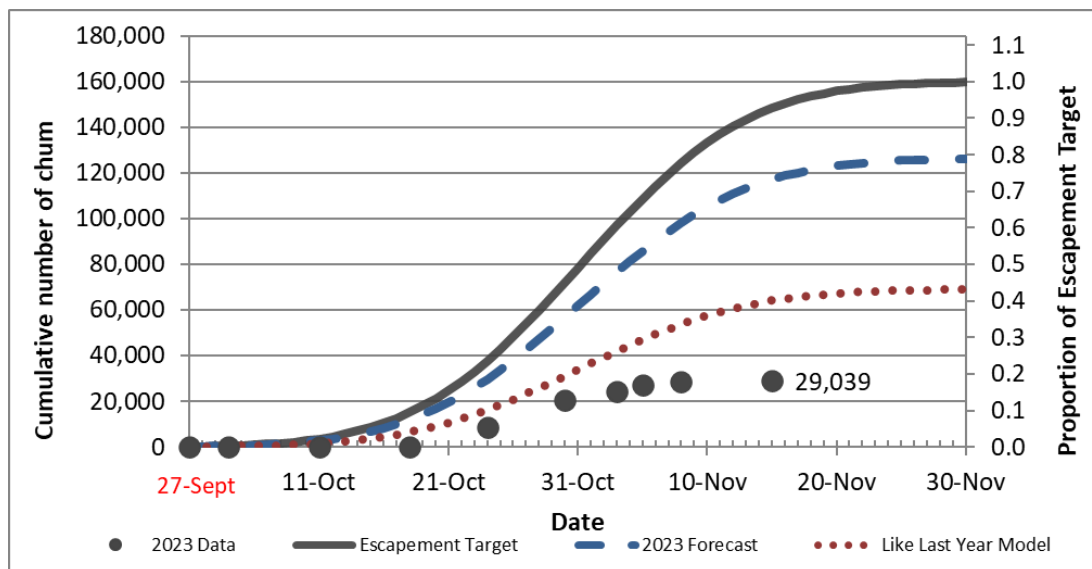


Figure 6: In-season cumulative Chum returns to Cowichan River and run-timing curves for the escapement target (160,000), 2023 Forecast and Like-Last-Year Forecast.

2023 Photos

Below are photos captured during stock assessment activities in the Cowichan River. Included are photos of Cowichan River Hatchery staff netting and spawning adult Chinook brood-stock (top left & right), DFO Stock Assessment sampling scales from Chinook, following hatchery spawning (bottom left), and a Chinook male before otolith extraction by DFO Stock Assessment Technician, Paul (bottom right) (Figure 7).



Figure 7: Photos captured during Stock Assessment activities in the Cowichan River in 2023.

2023 Operations

General operations at the counting fence in 2023 incorporate a new low-flow design at the start of the season to increase fish passage when discharge is below baseflow. The design involves four 8 ft passageways with underwater and overhead cameras in half the river, while the other side still utilizes the traditional fence panels. Once river flow increases the regular two-passage configuration will be installed, with one passageway located against the bulkhead and one mid-river (Figure 8).

Past upgrades at the enumeration fence include: new fence rail (2017), building with internet (2018), concrete bulkhead (2019), utilization of two passageways and wider openings (2019) and new Passive Integrated Transponder (PIT) in-river arrays (2020). Since 2019, the two-passage design replaced traditional camera boxes to improve fish migration. Each passageway is instrumented with two underwater cameras with motion detection capability as well as LED lights for night time operation. Results

from 2018-2022 indicate that fish strongly prefer the wider passages compared to the traditional camera tunnels. Delays below the fence have been reduced with the highest single day migration totals observed in 2019 for the 33 year program.



Figure 8: Two-passage counting fence configuration with wide passageways located mid-river and at the bulkhead, first piloted in 2019.

Escapement Monitoring Methods

Counting Fence

The counting fence is located 150 m downstream of the Allenby Road bridge crossing and is accessed via Church Road on Cowichan Tribes land. The fence funnels migrating fish through two passages where species, size and origin can be evaluated. Cameras are set to record each migration event based on a motion trigger such that periods of inactivity can be skipped efficiently. Crews are present at the fence 24 hours per day to enumerate fish as they move past the cameras as well as to clear debris and maintain equipment as required. The floating panels pivot based on water levels and are expected to remain operational through mid-October. The fence is not designed to withstand high flows and will be removed when the discharge exceeds 30 m³/s.

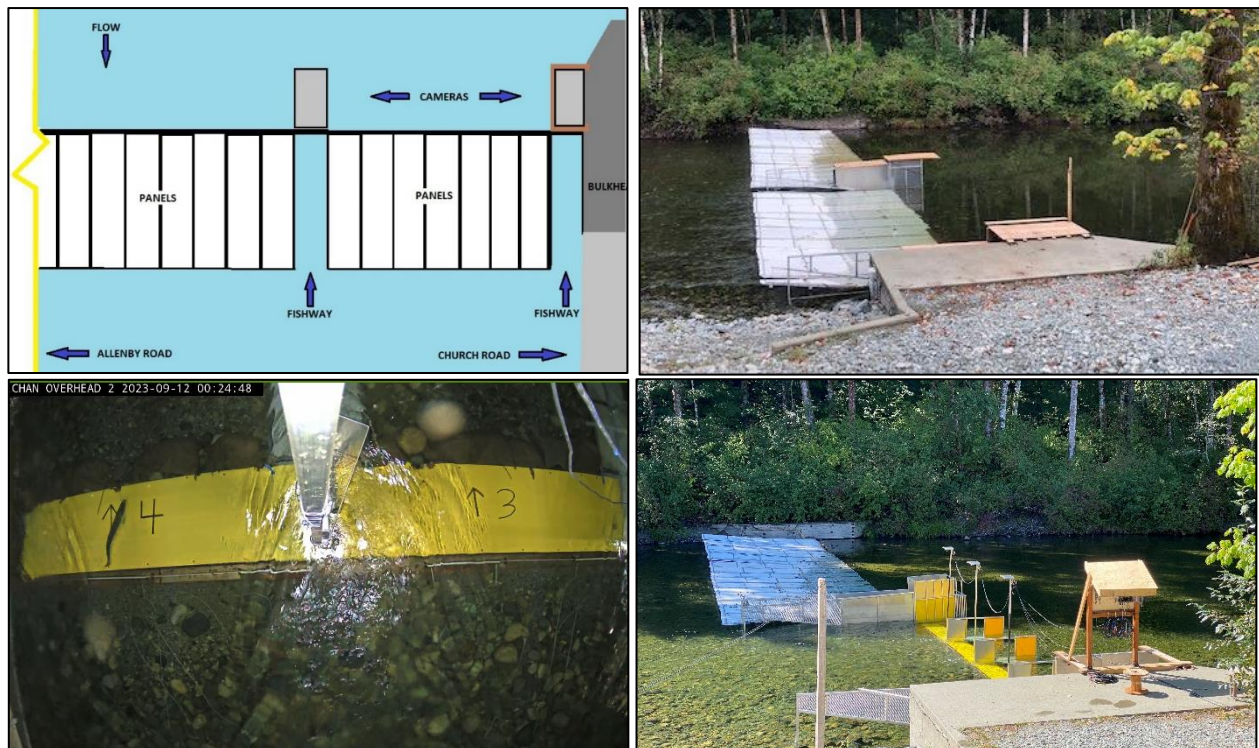


Figure 9: Traditional two-passage counting fence design used since 2019 (top) compared to the new low-flow design with four open passageways and overhead camera views (bottom).

PIT Tags

Returning chinook will also continue to be scanned for PIT tags using the in-river arrays at the counting fence and Skutz Falls, as well as during brood stock collection. Temporary arrays have also been installed in the south and north arm channels in order to better understand lower river migration behavior. Over 75,000 juveniles have been implanted with tags since 2014 with funding from the Pacific Salmon Foundation as part of the Salish Sea Marine Survival Project (2013-2018) and more recently the Pacific Salmon Commission. Due in part to the success of this tagging work, a new project has been funded through BCSRIF (BC Salmon Restoration and Innovation Fund) to investigate marine survival Bottlenecks through the first marine winter. PIT tag arrays and tag deployments have now occurred in other ECVI Chinook systems such as Nanaimo, Big Qualicum, Puntledge and Quinsam in addition to ongoing work in Cowichan.



Figure 10: (a) Locations of PIT antennas (red) along with other places of interest in the Cowichan River. (b) PIT tags and implantation needle compared to the size of a mechanical pencil. (c) Anatomy of a salmon smolt with tag location in red.

PIT tags operate on Radio Frequency Identification (RFID) technology and do not have a battery. They can be read at short distances (50-150 cm) with an antenna that both charges the tag with a magnetic field and listens for the response. Tag detections are linked to a tagging data base which provides information on the time, location, origin and size of each fish on the day it was tagged. The proportion of tags in the population passing through the fence and/or in brood sets can be used to expand the number of detections on the permanent arrays to a total run size. This can be particularly useful in years when the operation of the fence does not cover the entire run time (installed late or removed due to high water).

DIDSON

Dual-frequency Identification Sonar (DIDSON) technology uses high frequency sound waves to visualize and count fish in a wide range of stream conditions. DIDSONs are especially useful when water is turbid and traditional video cameras would not be able to capture a clear image. The images produced can tell us the size of fish, how many pass through and which direction they are going. This information, combined with species composition information, helps us count how many fish are moving upstream to spawn.

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