



## South Coast Salmon Bulletin

Nov 1, 2024 Escapement Update #8

### 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.

#### 2024 Pre-Season Expectations

**Chinook:** There are no formal forecasts for Chinook returns to the Cowichan River. Returns in 2023 surpassed 10,000 adult fish for the seventh year in a row. Expectations are for continued rebuilding with a strong possibility of reaching the target escapement for the system (6,500 naturally spawning adults). Informal forecasts for Natural Spawners (including age-2) through brood-year projections and *Forecast-R* modelling suggest a return of 30,085 and 27,219 respectively. Figure 1 shows recent and historic Chinook escapement in Cowichan River.

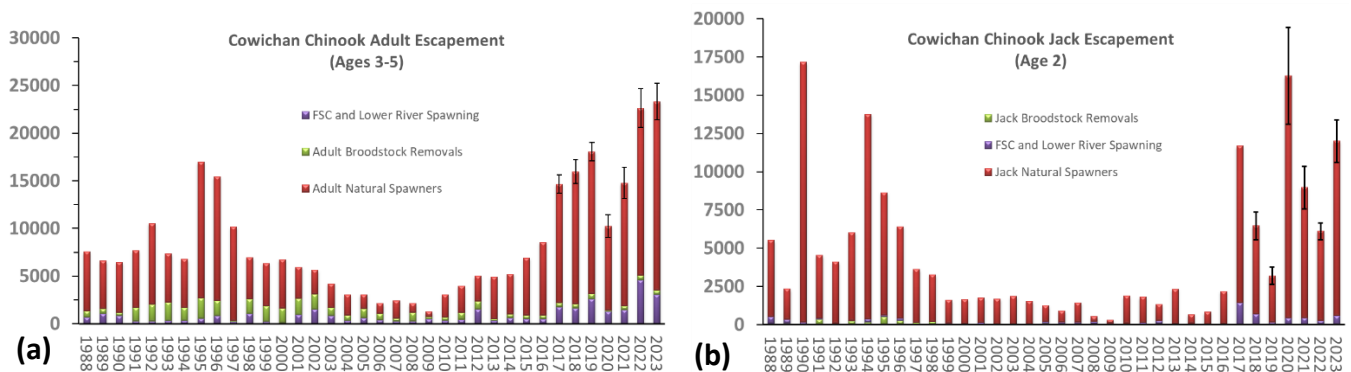


Figure 1: Cowichan Chinook escapement from the beginning of the indicator program to present (1988-2023). (a) Adult (age 3-5) returns are compared to the adult escapement target of 6500 and broken into natural spawners, broodstock removals and returns below the fence. (b) Jack (age-2) returns are also 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 2023 levels at 3.5% for wild and 1.8-2.6% 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 (2019-2023) 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 2024 are forecast to be lower than the escapement target of 160,000 for Cowichan at 133,600 based on contributing brood year escapement and normal survival values (“normal forecast”). However, if recent low survivals persist through 2024 then we expect to see around 30,700

chum return (“like last year model”). Forecasts for chum are highly uncertain and will be revised in-season as returns are enumerated using sonar enumeration. 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

In response to 2023 low-flow and fish health concerns, 2024 weir operation aimed to keep Cowichan Lake at full storage throughout the spring. This allowed baseflow conditions of 7 m<sup>3</sup>/s to be maintained during the summer and into the fall. From September 25<sup>th</sup> to October 1<sup>st</sup>, flow was increased to 10 m<sup>3</sup>/s to assist fish migration during rain events. Following a period of baseflow conditions, another pulse flow of around 10 m<sup>3</sup>/s was initiated on October 17<sup>th</sup> to help fish move upstream ahead of fence removal and the atmospheric river event over the weekend (Figure 2).

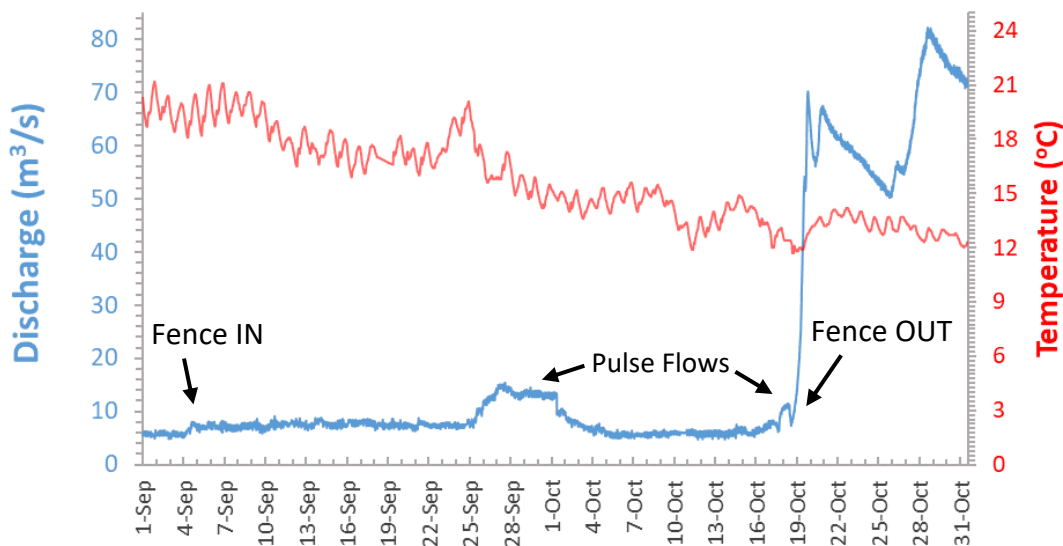


Figure 2: Discharge (m<sup>3</sup>/s) and Temperature (°C) at Water Survey of Canada Station 08HA011, Cowichan River in Duncan. Discharge levels when the salmon counting fence was installed are indicated.

### 2024 Adult Enumeration

#### Counting Fence

Enumeration at the counting fence began on September 6<sup>th</sup> 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 2024. On September 25<sup>th</sup> operations transitioned to the traditional two-passage setup. Due to heavy rainfall forecast for Southern BC, the fence was removed on October 18<sup>th</sup> at 12:00 PM.

#### 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 18<sup>th</sup> at 12:00 PM are presented in Table 1.

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

	Wild (unclipped)	Hatchery (clipped)	Unknown	Total
Adults	7,785	253	821	<b>8,859</b>
Jacks	4,837	123	1,183	<b>6,143</b>
<b>Total</b>	<b>12,622</b>	<b>376</b>	<b>2,004</b>	<b>15,002</b>

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 3a). Jack Chinook in-season counts are compared to jack-specific run-timing curves based on flow conditions to determine how escapement compares to the *Forecast-R 2024* forecast of 8,629 (Figure 3b).

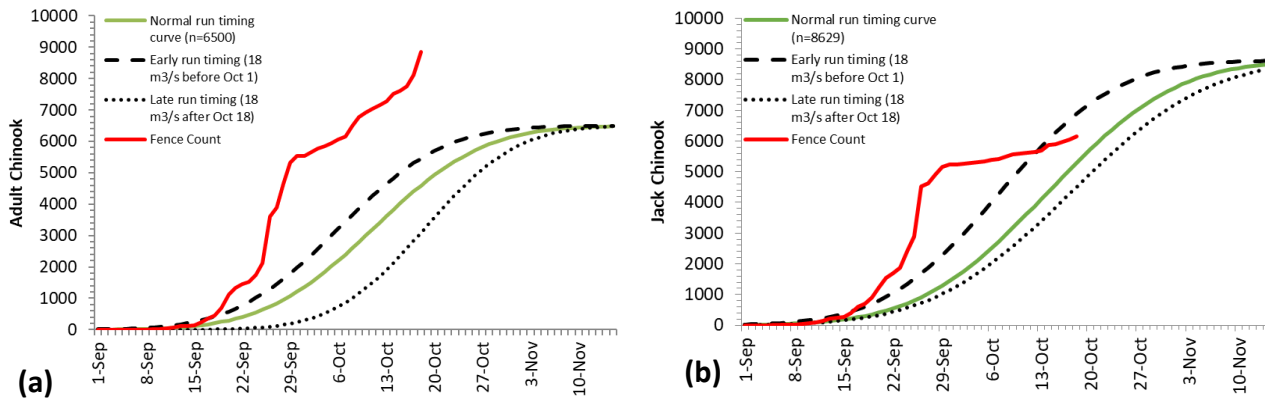


Figure 3: (a) In-season adult Chinook counts compared to normal, early and late run-timing curves based on river conditions, and (b) Jack Chinook in-season counts compared to run-timing curves set to the Forecast-R 2024 forecast value.

### 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 18<sup>th</sup> at 12:00 PM are presented in Table 2.

Table 2: Cumulative totals for Coho, Chum and Pink migration past the counting fence.

	Coho	Chum	Pink	Unknown
Adults	1,519	229	65	67
Jacks	351			
<b>Total</b>	<b>1,870</b>	<b>229</b>	<b>65</b>	<b>67</b>

## Lower River ARIS

Adaptive Resolution Imaging Sonar (ARIS) was installed 5 km below the counting fence on October 16<sup>th</sup> 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 October 31<sup>st</sup> at 24:00hrs are presented relative to the run timing curves for the escapement target of 160,000 fish (Figure 4) and forecast models (Figure 5).

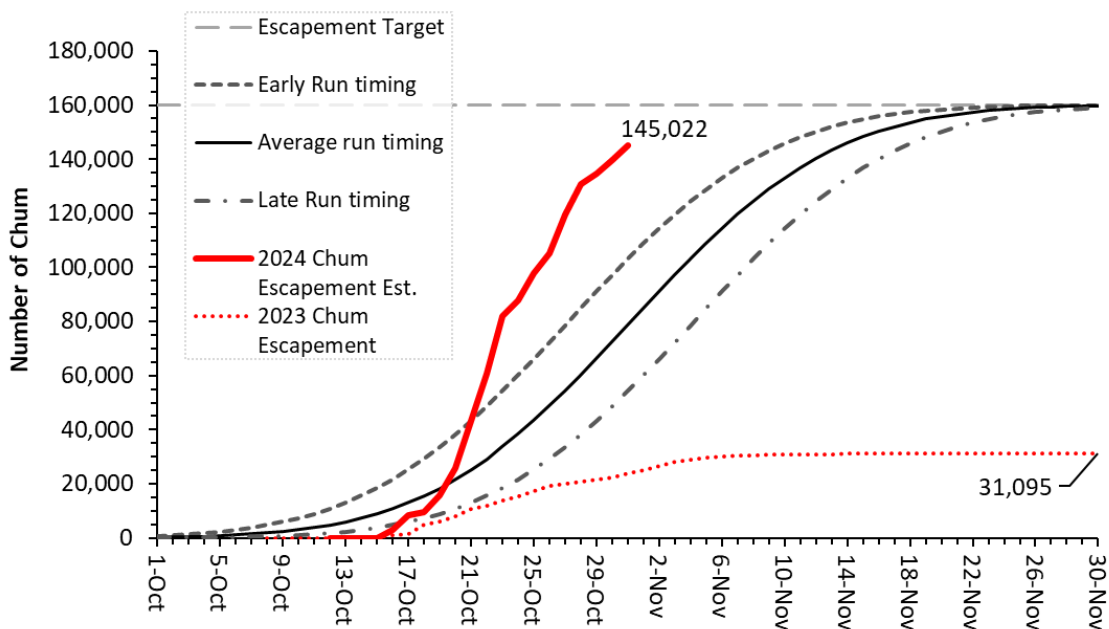


Figure 4: In-season Chum escapement estimates from ARIS data compared to 2023 escapement and run-timing curves for the escapement target of 160,000 Chum.

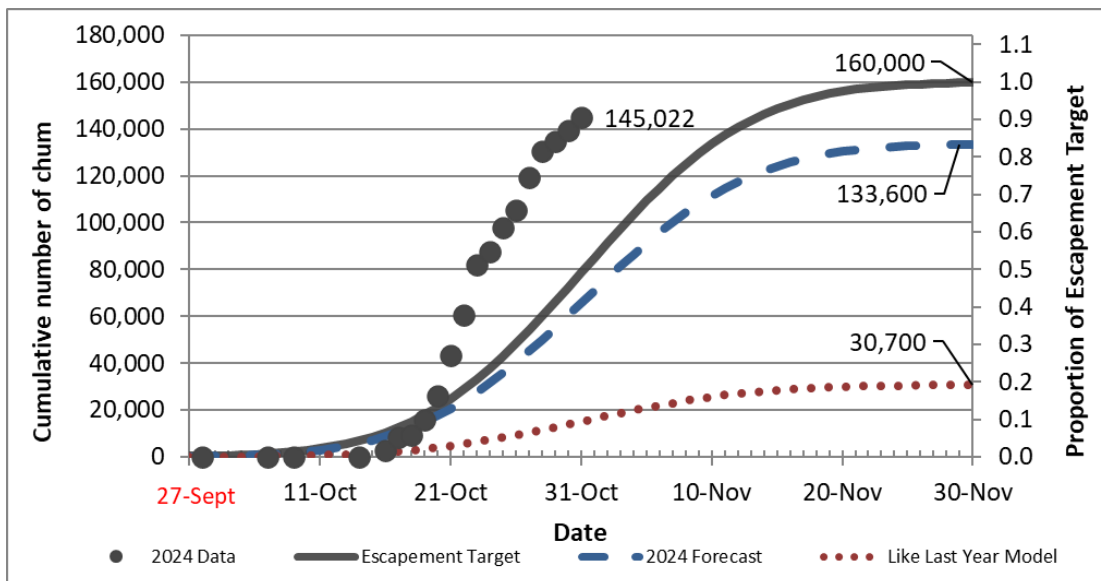


Figure 5: In-season cumulative Chum returns to Cowichan River and run-timing curves for the escapement target (160,000), 2024 Forecast and Like-Last-Year Forecast.

## 2024 Photos

Below are photos captured during stock assessment activities in the Cowichan River. Included are photos of a Chum (top left) and Coho (top right) swimming through the Skutz Falls fishway, river conditions at Skutz Falls (bottom left), and at the Fence site on November 1<sup>st</sup> (bottom right) (Figure 6).



*Figure 6: Photos captured during Stock Assessment activities in the Cowichan River in 2024.*

## 2024 Operations

General operations at the counting fence in 2024 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 7).

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 2018-2023 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 7: 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 in the traditional design and four open passages in the low-flow design (Figure 8). The species, size and origin are evaluated in these passageways. 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 m<sup>3</sup>/s.

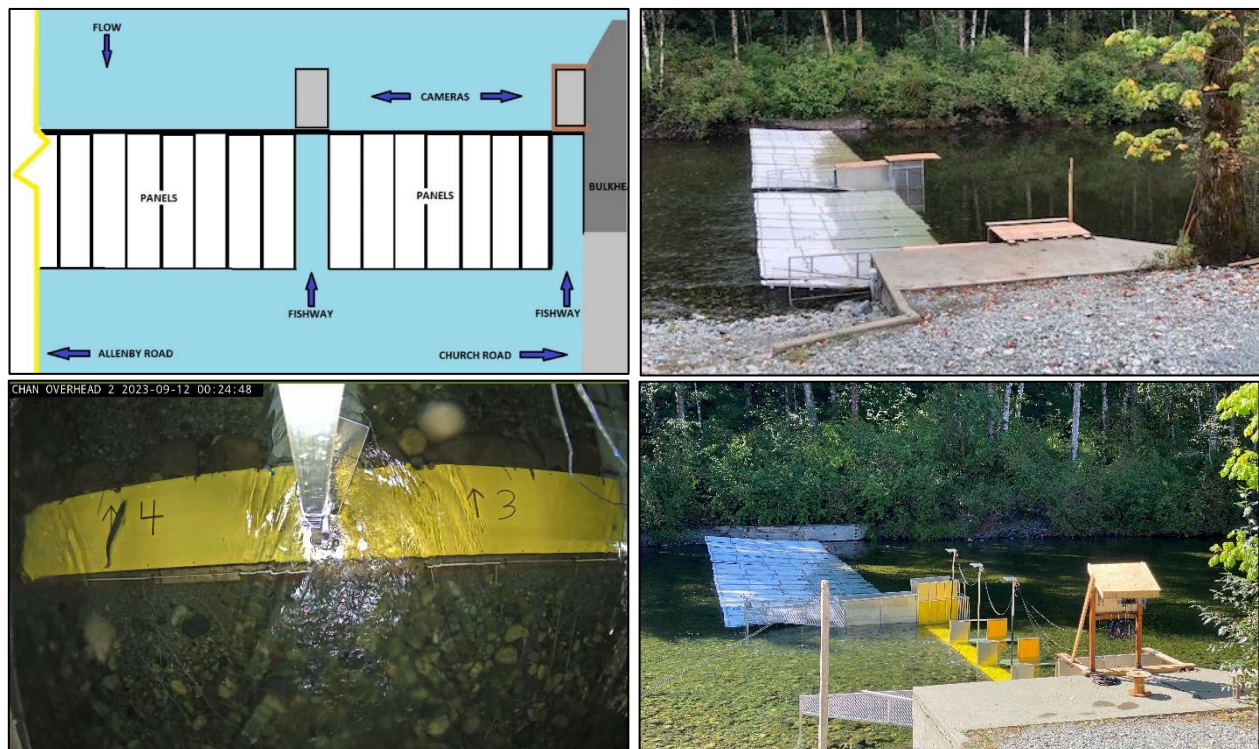


Figure 8: Traditional two-passage counting fence design used since 2019 (top) compared to the new low-flow design with four open passageways and overhead camera views (bottom).

## 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. A permanent array in the north arm and a temporary setup in the south arm channel have also been installed to better understand lower river migration behavior (Figure 10a). 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.

PIT tags operate on Radio Frequency Identification (RFID) technology and do not have a battery. The tags 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. The 12 mm tags are implanted into the abdomen of juveniles, slightly above the pelvic girdle (Figure 10). Tag detections in returning adults 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).

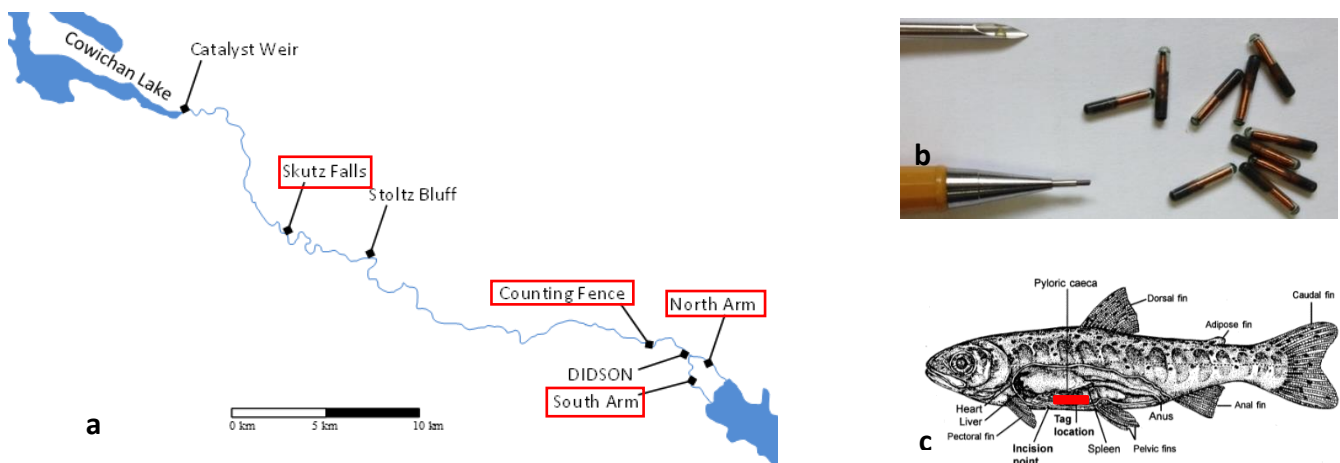


Figure 9: (a) Locations of PIT antennas (red) along with other places of interest in the Cowichan River. (b) PIT tags and implantation needle compared to the size of a mechanical pencil. (c) Anatomy of a salmon smolt with tag location in red.

## ARIS

Adaptive Resolution Imaging Sonar (ARIS), previously Dual-frequency Identification Sonar (DIDSON), uses high frequency sound waves to visualize and count fish in a wide range of stream conditions. ARIS 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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