



NOAA FISHERIES

Alaska Fisheries
Science Center

Core Personnel

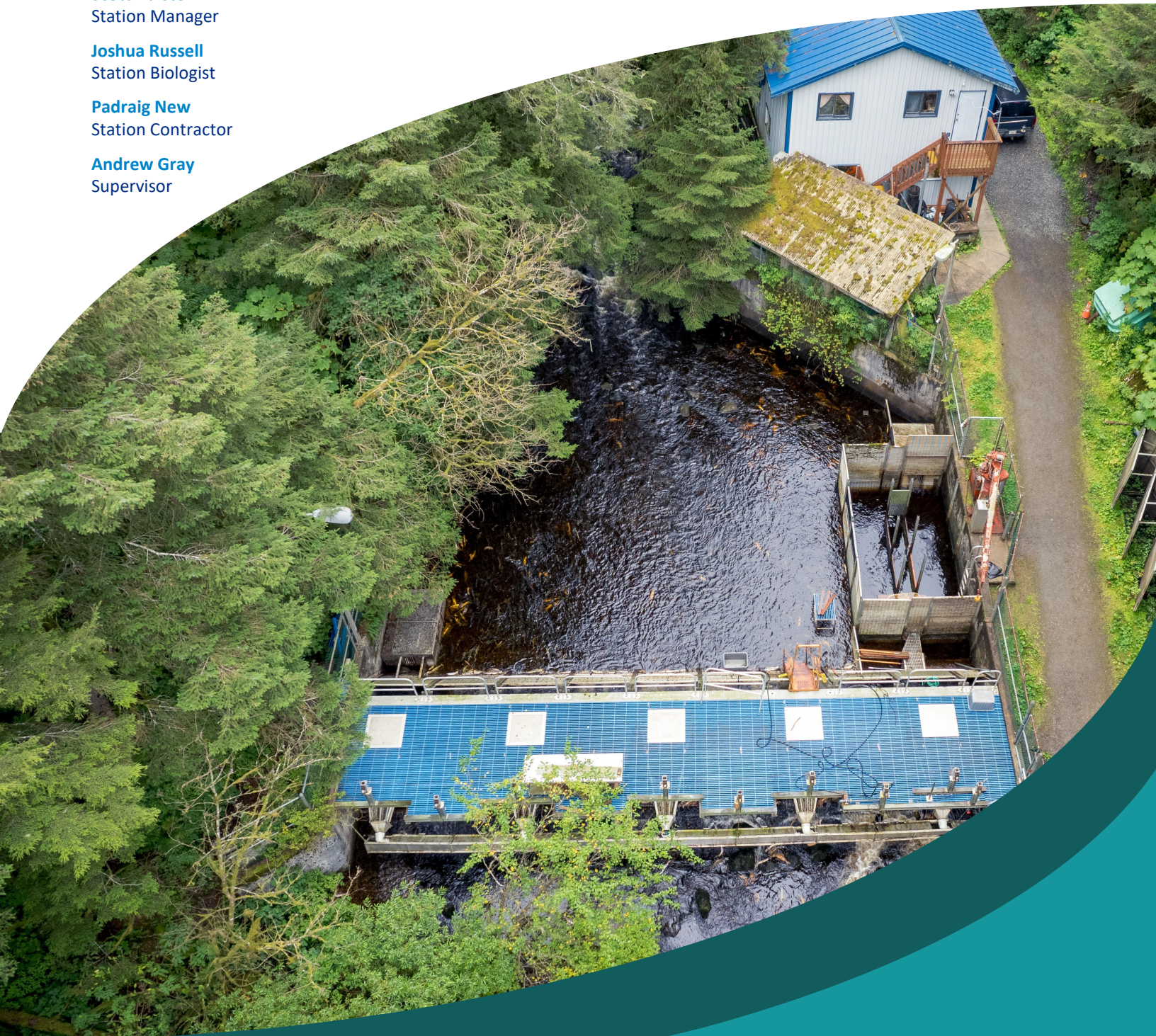
Scott Vulstek
Station Manager

Joshua Russell
Station Biologist

Padraig New
Station Contractor

Andrew Gray
Supervisor

Auke Creek Research Station 2022 Year in Review



2022

By the Numbers

3

Core Crew Members

245

Field Days

101,388

Fish Handled

10,072

Samples Taken

51

Active Research Projects

4

Outreach Events

Personnel

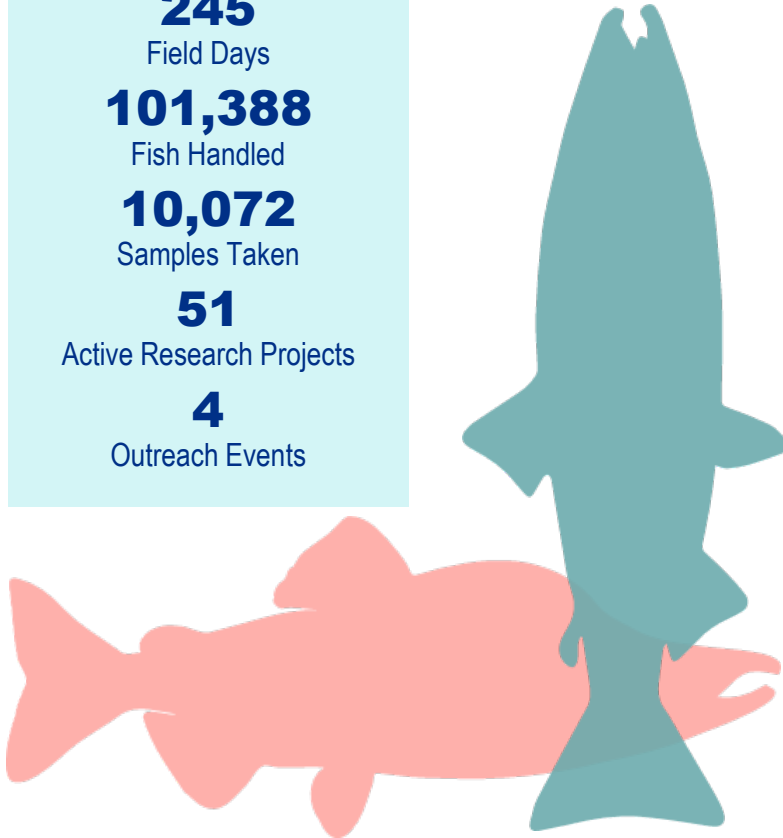
2 AFSC Scientists

1 AFSC Contractor

1 UAF Graduate Student

2 UAS Undergraduate Interns

1 Sealaska Heritage Institute Intern



Research Projects

Pacific Salmon Treaty Sockeye Salmon Enhancement Impacts

In collaboration with UAF and ADF&G, this project provides information regarding how hatchery supplementation may impact the fitness of wild Sockeye salmon populations. Three years of Sockeye spawning at the Auke Creek hatchery were performed in a manner that mimicked enhancement projects within the Taku and Stikine watersheds. Currently, a proportion of adult Sockeye returning to Auke Creek represent the second generation (F_2) of those initial broodstock. Parental-based tagging will allow us to determine the relative reproductive success of hatchery x wild individuals, while also allowing us to investigate any changes to size, age composition, and overall genetic diversity of the population.

Pacific Salmon Treaty and State of Alaska Management of Coho Salmon

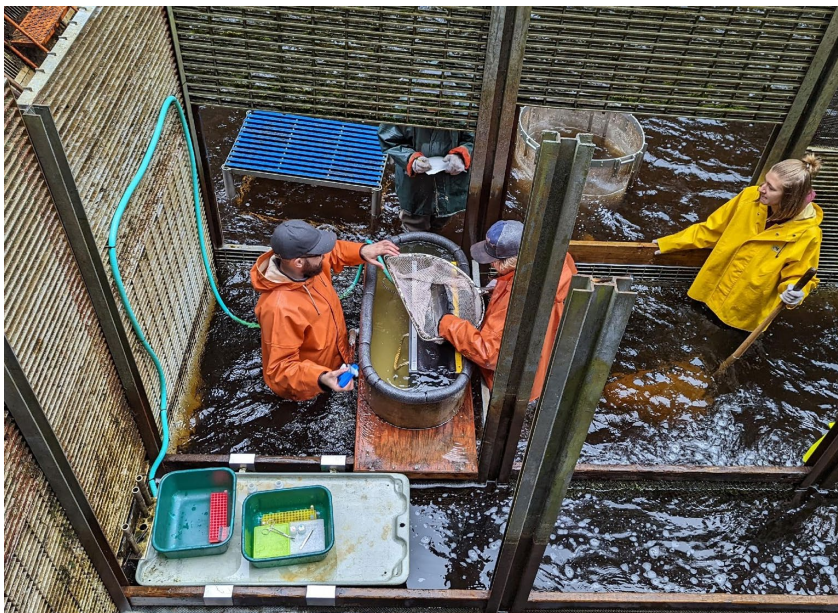
In a long-standing collaborative effort with colleagues at the ADF&G, ACRS marks and tags virtually 100% of outmigrating Coho salmon smolts. The enumeration and tagging of smolt at Auke Creek, paired with ADF&G's extensive sampling of commercial and recreational fisheries in Southeast Alaska, provides robust estimates of fisheries harvest rates and marine survival. These data inform Coho management within the Transboundary and Northern Boundary areas under the Pacific Salmon Treaty.

Pink Salmon Pre-Spawn Mortality

This work monitors the pre-spawn mortality of Pink salmon returning to the Auke Creek system. This research has involved yearly a mark-recapture study from 2016 in collaboration with Dr. David Tallmon (UAS).

Auke Lake Limnology

This project was started in 2021 with the goal of creating a long-term dataset to monitor changing freshwater conditions in Auke Lake. Sampling includes: zooplankton eDNA, temperature, turbidity, and will be expanded to include biochemical sampling. This project is in collaboration with Dr. David Tallmon (UAS).



Joshua Russell and UAS Interns Gage Cadenhead and Louise Tymrak sample adult salmon.

Quantification of PFAS Compound Concentrations in Juvenile and Adult Coho and Pink Salmon

PFAS are a growing class of man-made chemical compounds used in a wide range of commercial applications. Because of their broad commercial utility, this class of chemicals is now found in all types of environments at a global scale. Levels of PFAS compounds from LPW (relatively pristine) will be compared to samples collected in Auke Creek (relatively urbanized) to understand the transport potential of these man-made chemicals across different environments and assess their bioaccumulation potential in commercial fish stocks. This work is led by Drs. Felipe Arzayus, Ed Wirth, and Tony Pait (NOS).

Pink Salmon Physiology

In collaboration with Mike Phelps (WSU), a project has started to understand the physiological transitions that occur in salmon prior to their return to the rivers, as well as, how their bodies change when they near freshwater. Auke Creek cultured pink salmon are being raised to look at the changes that occur in their bodies while they are still supposed to be in the ocean before they start their migration. To accomplish this, sampling of various tissues will be taken from the fish next fall, a year before they reach maturity. We will look at hormone levels and changes in the brain during this time period that could drive the behavioral changes that we have seen.

Outreach

- UAS and Sealaska Heritage Institute Students
- Dr. Spinrad and Senator Dan Sullivan
- 35 ANSEP Middle School Career Exploration Students
- Bill Stickel's LSU Students

Publications

- Vulstek, S. C., J. R. Russell, J. E. Joyce, and A. K. Gray. 2022. 2017 Auke Creek Research Station Report: Data summary and historical trends from 1980 to 2017. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-436, 49 p.
- Vulstek, S. C., J. R. Russell, and A. K. Gray. 2022. Auke Creek Research Station Report: Data summary and historical trends from 1980 to 2020. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-449, 48 p.
- Vulstek, S. C. and J. R. Russell. 2022. 2022 Trends in Survival of Coho, Sockeye, and Pink Salmon from Auke Creek, Southeast Alaska. Ecosystem Considerations Stratus Report 2022: Gulf of Alaska
- King, E., D. A. Tallmon, S. C. Vulstek, J. R. Russell, and M. V. McPhee. *Accepted*. Reproductive success of jack and full-size males in a wild Coho Salmon population. *Royal Society of Open Science*
- McPhee, M. V., P. D. Barry, S. C. Vulstek, J. R. Russell, W. W. Smoker, A. J. Gharrett, J. E. Joyce, C. Habicht, and S. E. Gilk-Baumer. *In prep*. Hatchery supplementation provides a demographic boost but alters age composition of sockeye salmon in Auke Lake, Southeast Alaska. *Canadian Journal of Fisheries and Aquatic Sciences*

Reproductive Success of Jack and Full-Size Males in a Wild Coho Salmon Population

We quantified adult-to-adult reproductive success (RS) of jacks, and their relative reproductive success (RRS) compared to full-size males. We used genetic data from all individuals (~8,000) returning to spawn over a decade (2009–2019) to conduct parentage analysis and calculate RS of individuals. The average adult-to-adult RS of jacks (mean=0.7 & SD=1.9) was less than that of full-size males (mean=1.1 & SD=3.3). Despite their lower average success, jacks contributed substantially to the population by fathering 23% of the total returning adult offspring (1,033 out of 4,456) produced between 2009 and 2015.

Alternative Life History Strategy Contributions to Effective Population Size for a Wild Coho Salmon Population

Alternative life history tactics are predicted to affect within-population genetic processes but have received little attention. For example, the impact of precocious males on effective population size (N_e) has not been quantified directly in Pacific salmon *Oncorhynchus* spp. We investigated the contribution of precocial males to N_e in a naturally spawning population of Coho Salmon from Auke Creek. Mature adults that returned from 2009 to 2019 (~8,000 individuals) were genotyped at 259 single-nucleotide polymorphism (SNP) loci for parentage analysis. We used demographic and genetic methods to estimate the effective number of breeders per year (N_b). Jack contribution to N_b was assessed by comparing values of N_b calculated with and without jacks and their offspring. Over a range of N_b values (108–406), the average jack contribution to N_b from 2009 to 2015 was 12.9% (SD=9.6%). Jacks consistently made up over 20% of the total male spawners and we estimated that immigrant spawners produced 4.5% of all returning offspring.



Auke Creek during a spring flood.



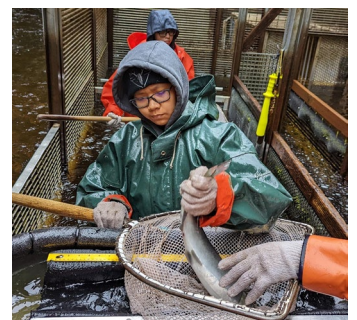
Coho salmon.



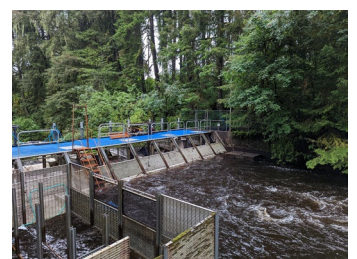
Cutthroat trout.



Dolly Varden in traditional spawning colors.



Sealaska Heritage Institute Intern, Jaylynn Bennett, removes a Dolly Varden from the net for sampling.



Auke Creek fall weir.



Gina M. Raimondo
U.S. Secretary of Commerce

Richard W. Spinrad
Under Secretary of Commerce
for Oceans and Atmosphere

Janet Coit
Assistant Administrator
for Fisheries

Scott Vulstek
Station Manager, Auke Creek
Research Station

www.fisheries.noaa.gov
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**National Marine
Fisheries Service**
Alaska Fisheries Science Center
7600 Sand Point Way N.E.
Seattle, WA 98115-6349