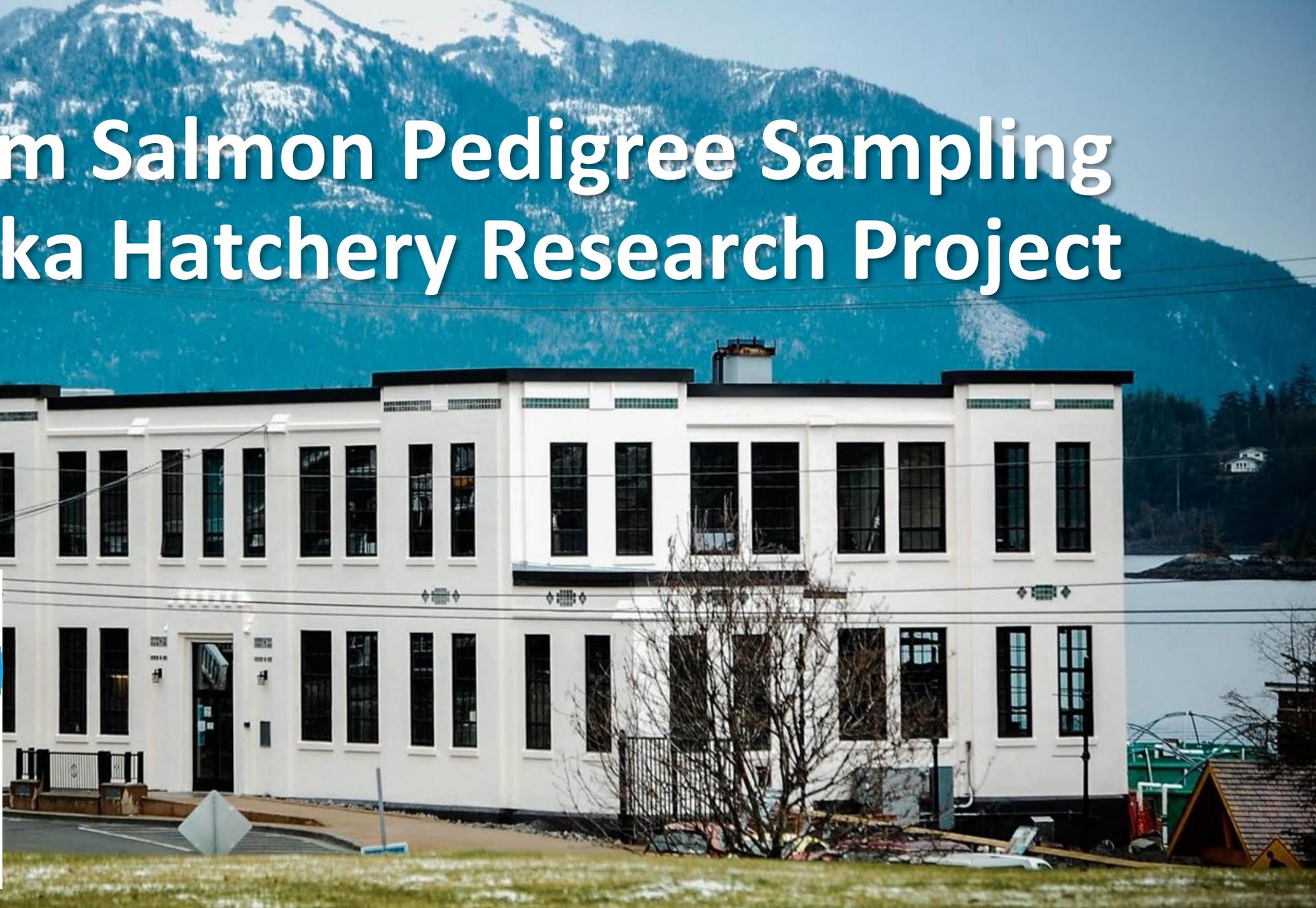


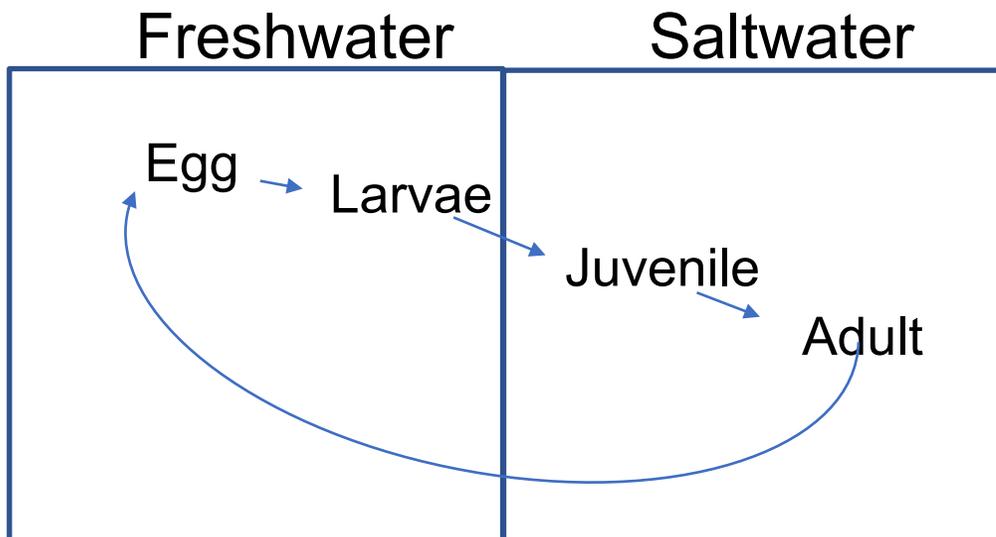
# Chum Salmon Pedigree Sampling Alaska Hatchery Research Project



# Pedigree Sampling Aims at Question 3

What is the impact on fitness (productivity) of wild chum salmon due to straying of hatchery chum salmon?

Photo credit skipperotto.com



## Pedigree Analysis

The identification of an individual fish's parents and grandparents

Allows us to determine if different families have different reproductive success

Requires collecting genetic data that acts as an inherited name tag.

Akin to looking for needles in haystacks.

# Chum Salmon Pedigree Sampling Complicated by Chum Life History

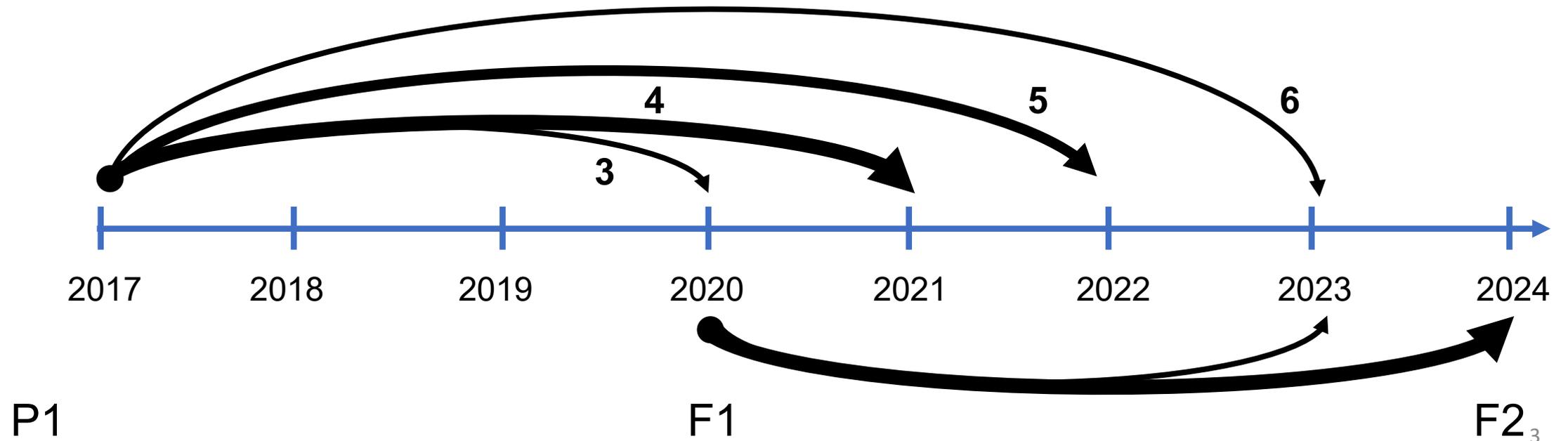
Majority return as age 4 or 5

Example:

2017 – Parental generation (P1)

Offspring return in 2020, **2021**, **2022** and 2023 (F1)

Grand offspring return in 2023, 2024, **2025**...2029 (F2)



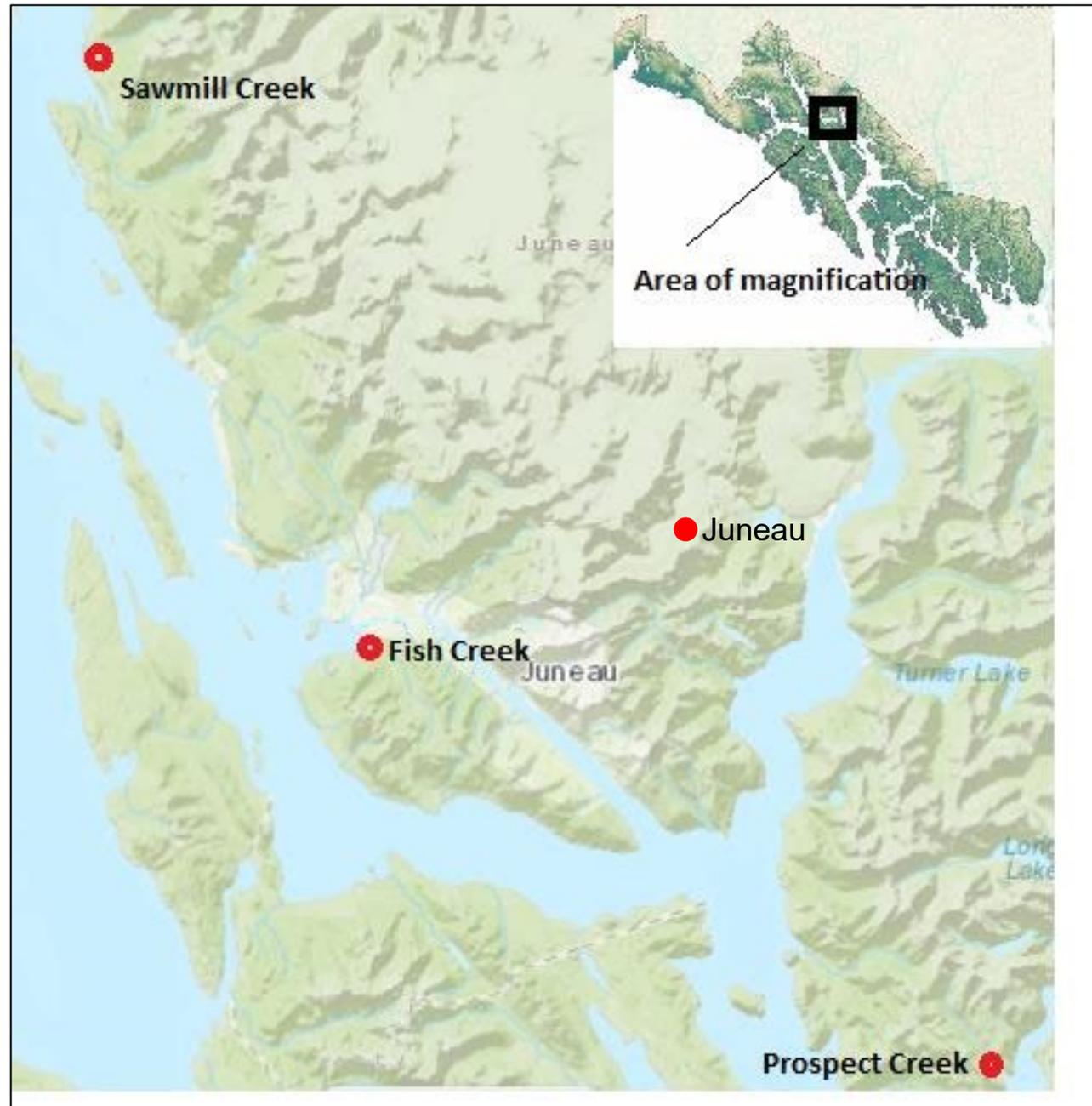
# Streams Sampled Beginning in 2013

- Established protocol
  - Carcass samples location, length, sex, otolith, scale, genetics
  - Stream - live, dead counts
- 2016 not sampled

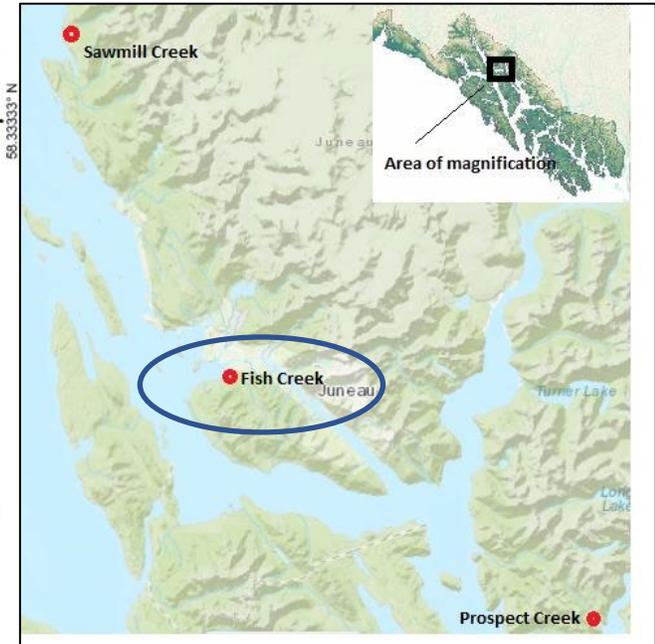
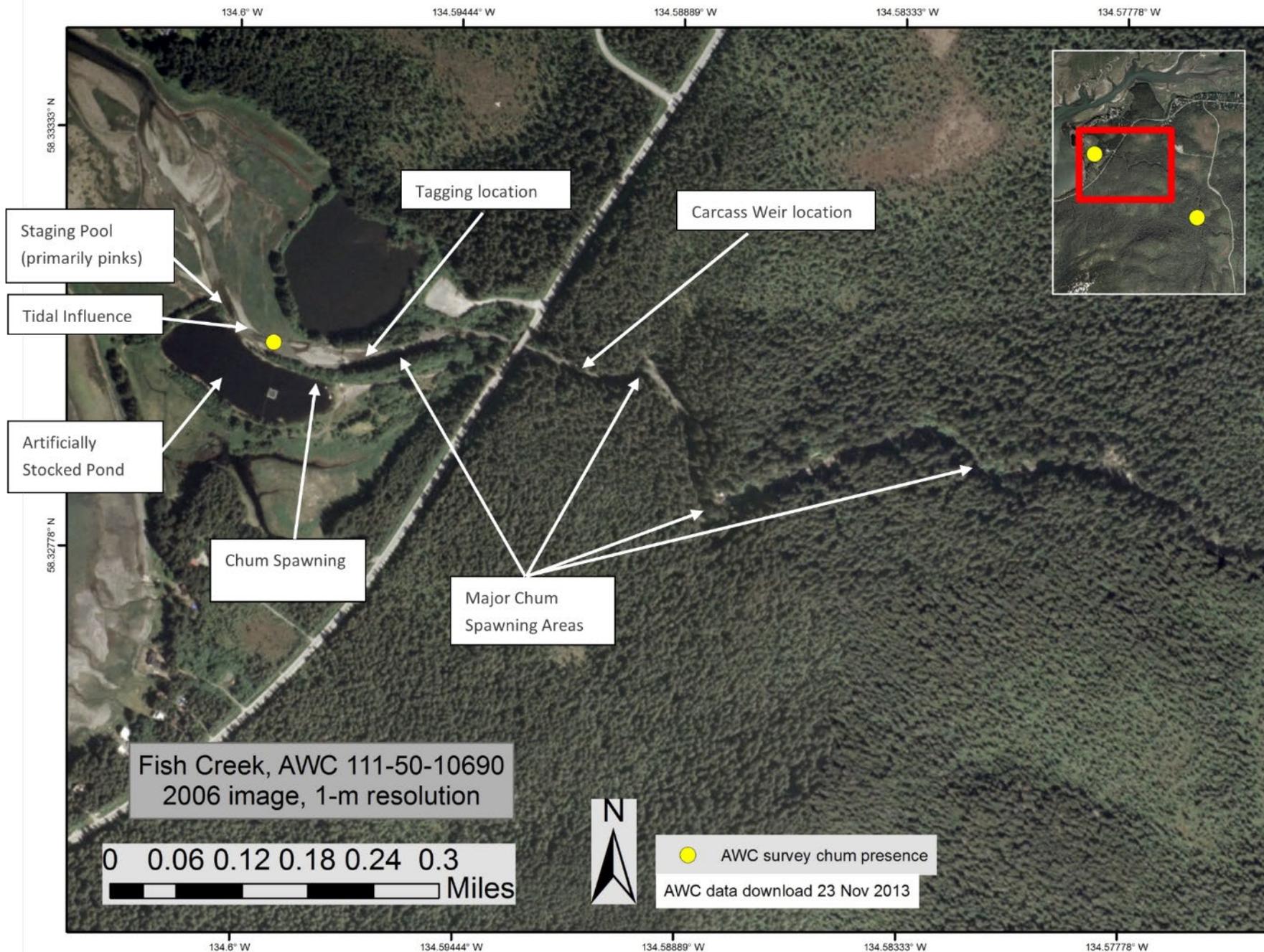


# 2021 Our First Chance at Building Pedigrees

- 4 yr old fish –
  - P1
  - F1 of 2017 fish
  - F2 of 2013 fish that spawned as age 4
- 5 yr old fish –
  - P1
- In 2021 increased effort
  - Dedicated 4 person crew to each stream
  - Daily visits
  - Installed carcass weirs
  - Estimated proportion of run sampled

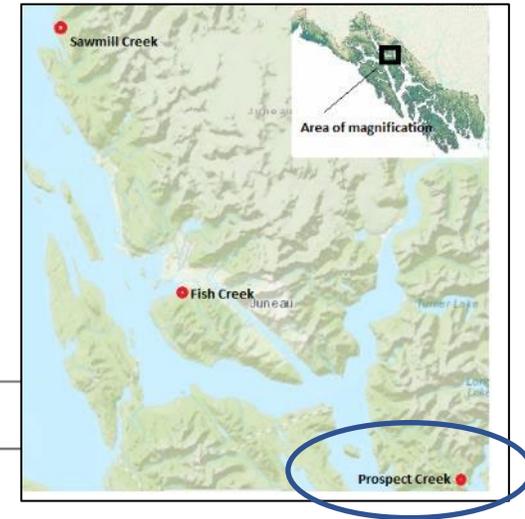
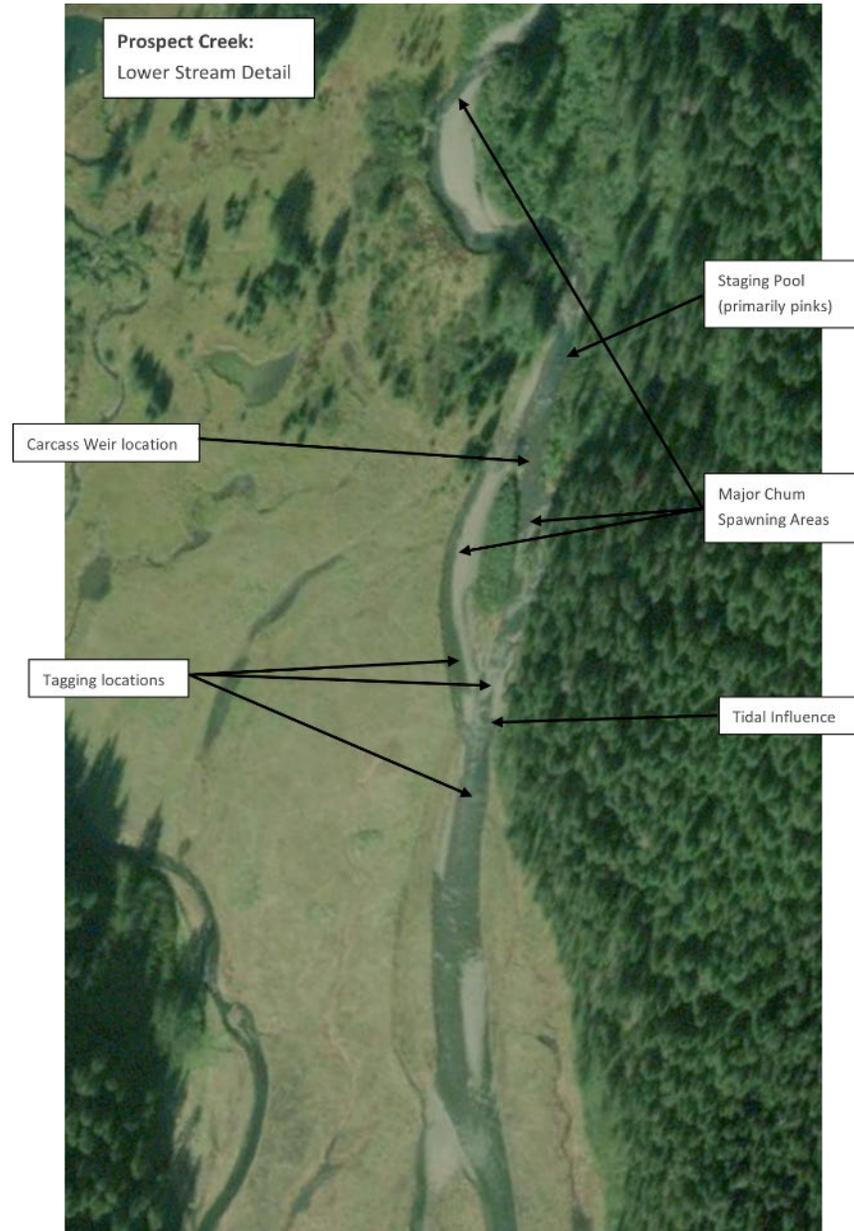
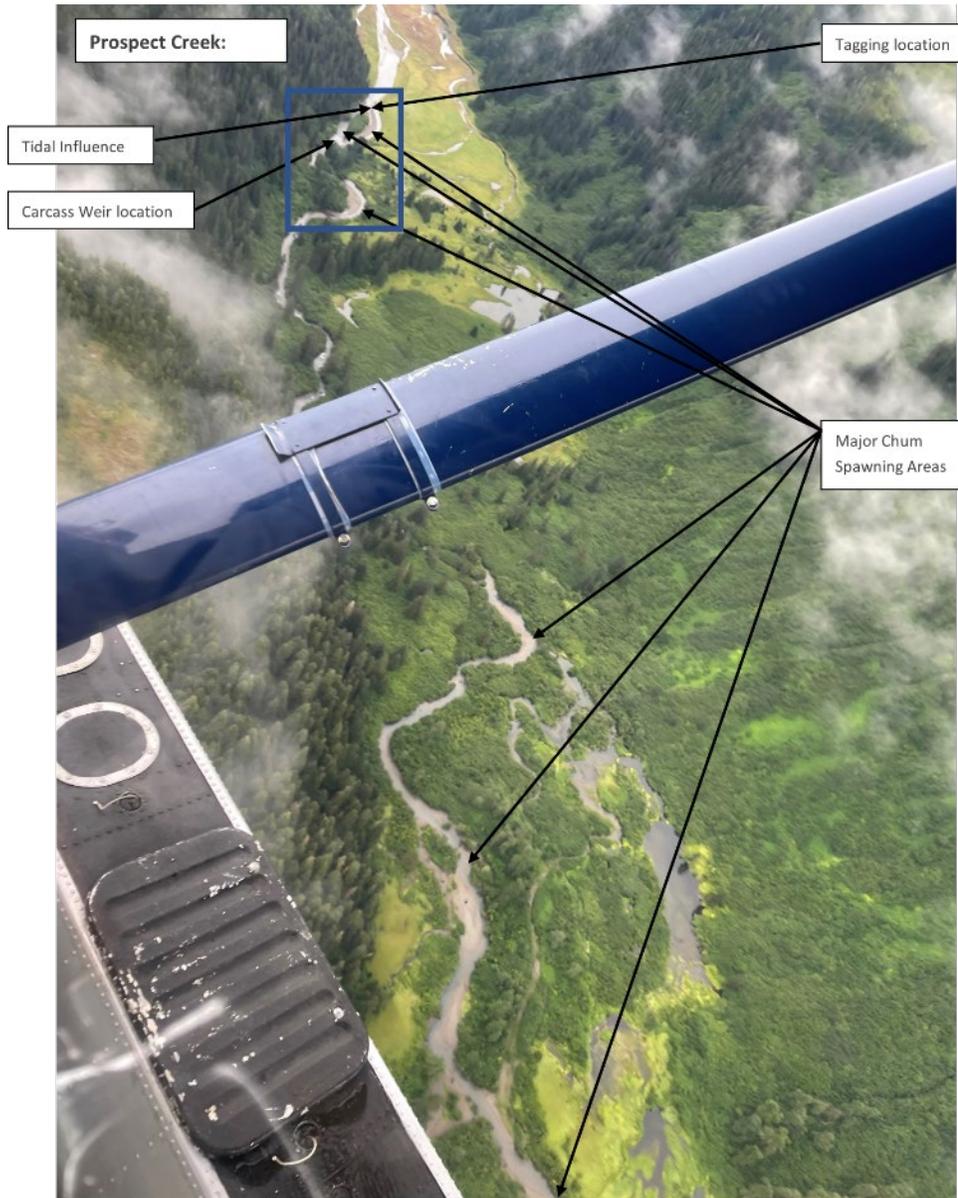


# Fish Creek



- On the road system
- 2.5 mile survey length
- Public present

# Prospect Creek

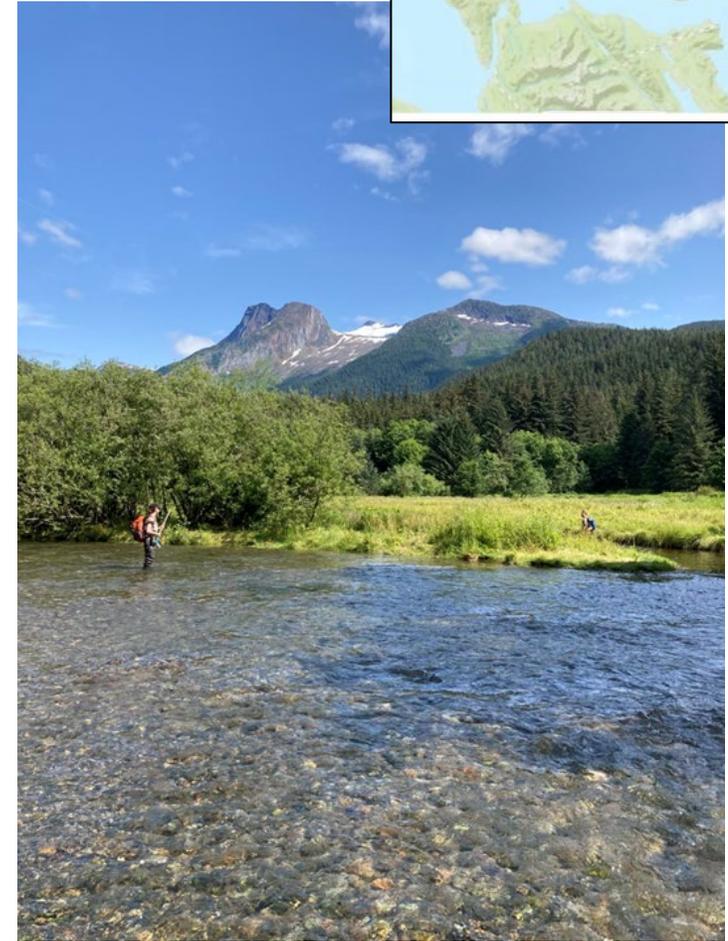


- 4 mile survey length
- remote location
- 15 min by air from Juneau

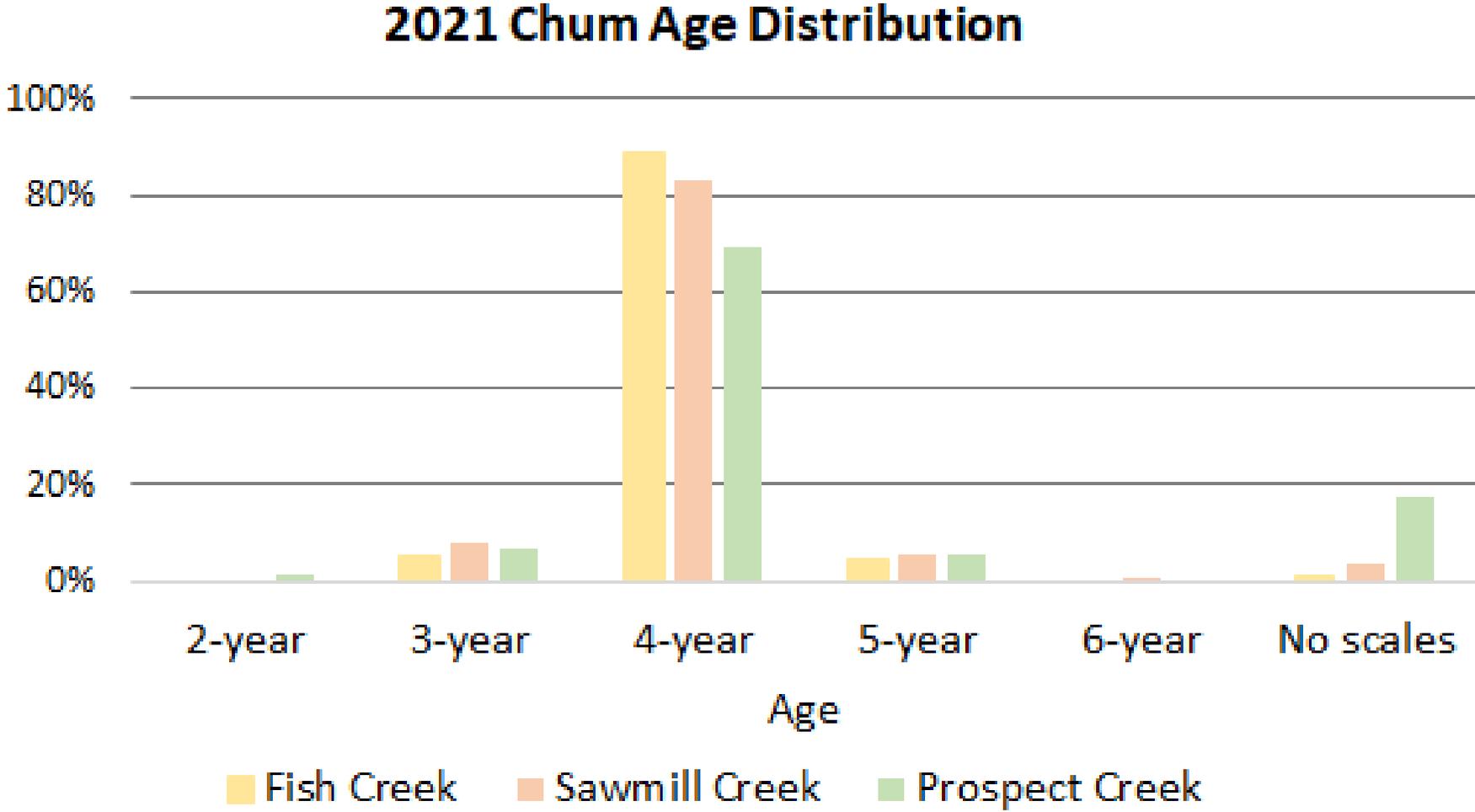


# Sawmill Creek

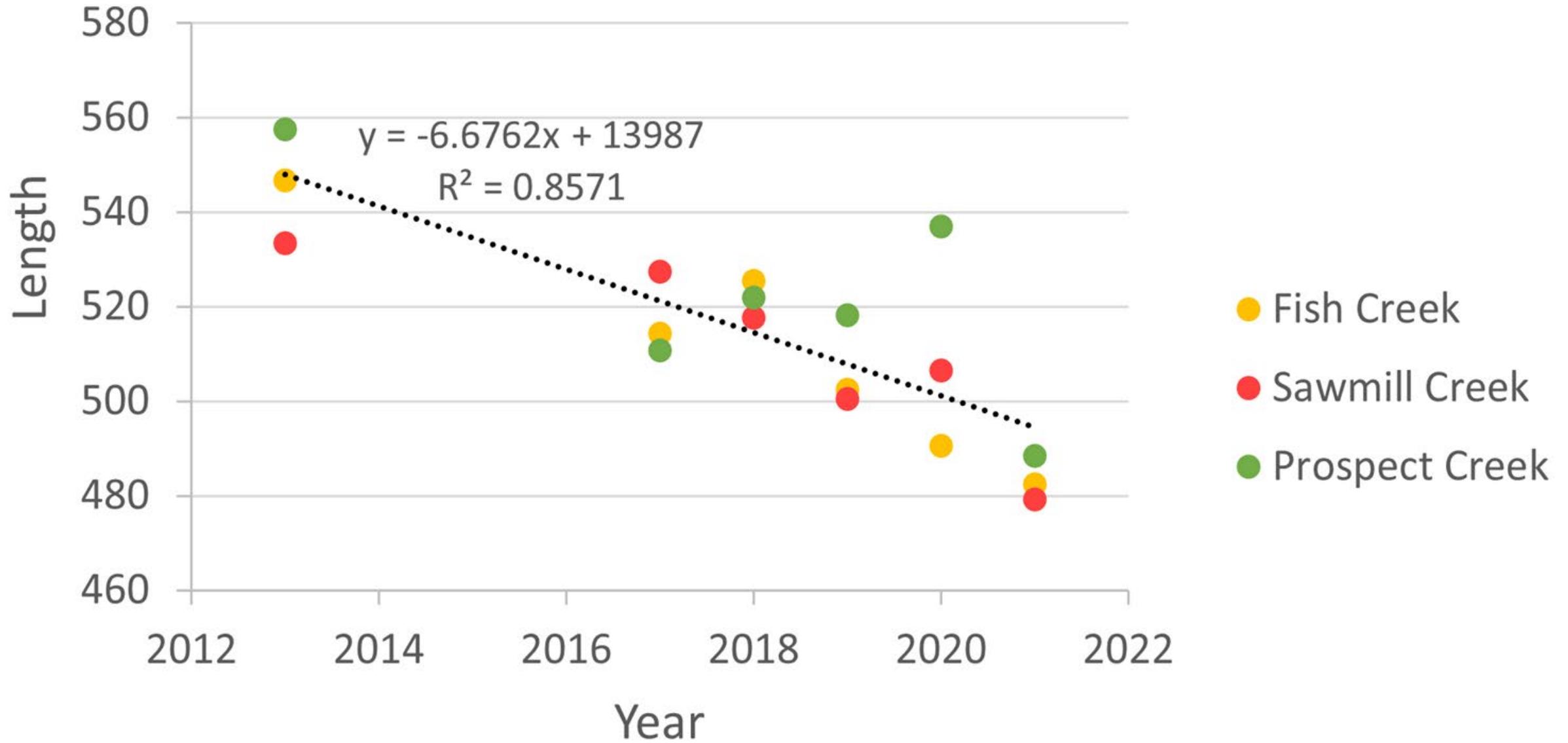
- ¾ mile survey length
- on road system
- remote
- bed shifted in 2021



# Runs dominated by 2017 Brood Year



# Average Size of Age Four Females Over Time



# Number of Survey Days Increased in 2021

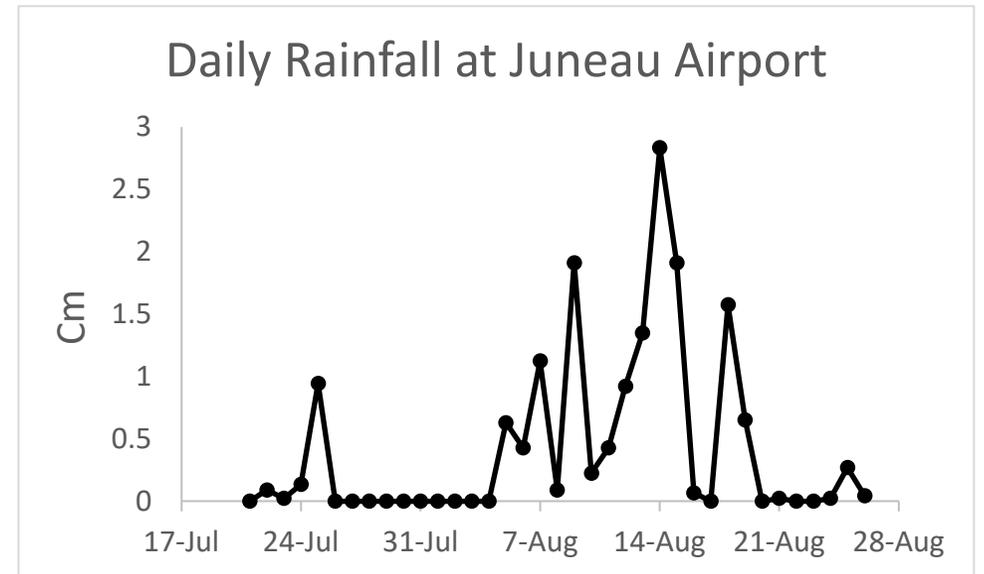
	Start – End Dates	Number surveys	Number pedigree samples	Number otolith samples	Number scale samples
Sawmill	7/21 – 8/26	33	230	222	301
Fish	7/22 – 8/27	29	659	643	822
Prospect	7/25 – 8/26	24	123	85	114

	Live pinks counted	Live chum counted
Sawmill	37,982	2240
Fish	24,259	2481
Prospect	24,120	1123



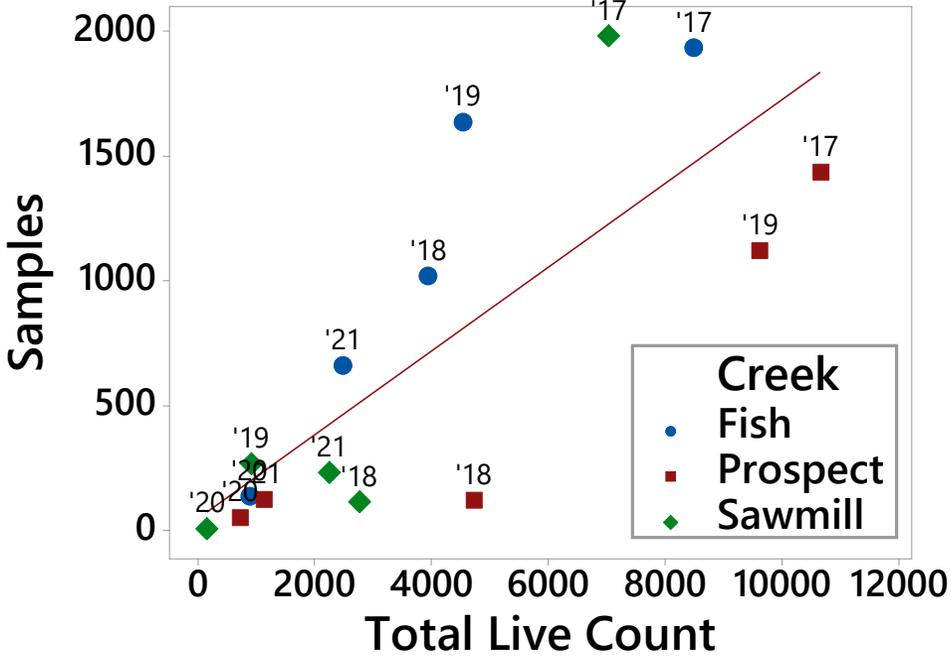
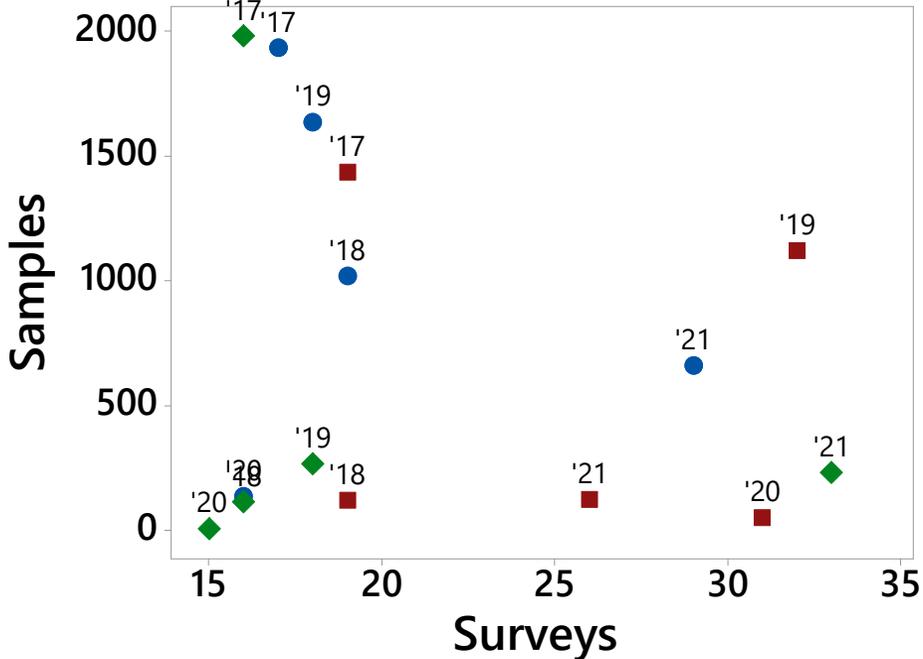
# Carcass Weirs Had Limited Utility

- Storm events blew weirs out on all 3 creeks
- Lots of time spent on maintenance
- Mostly collected pinks – lots of sorting



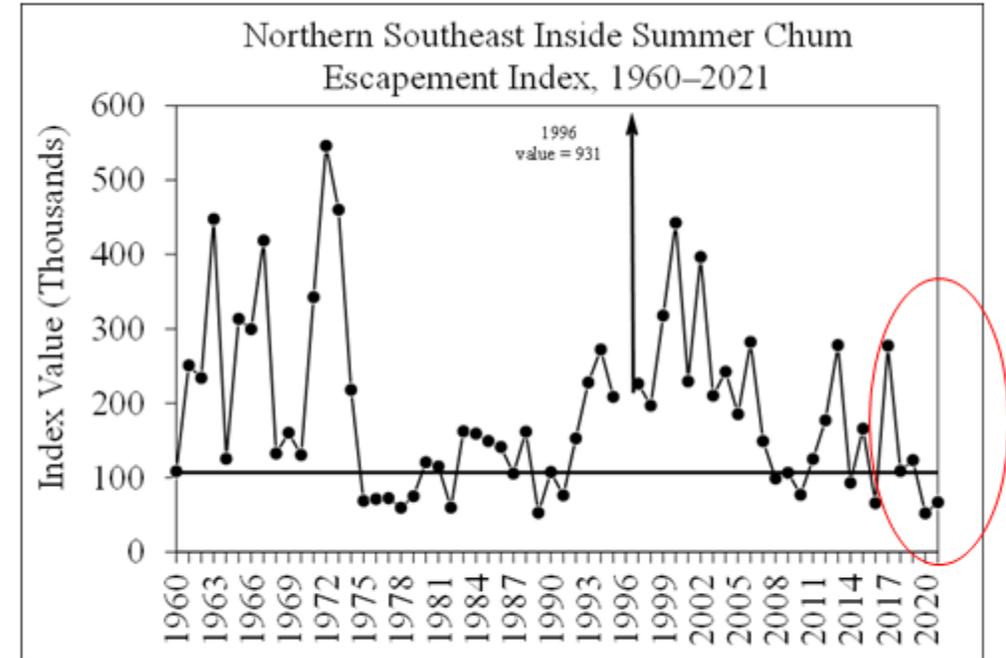
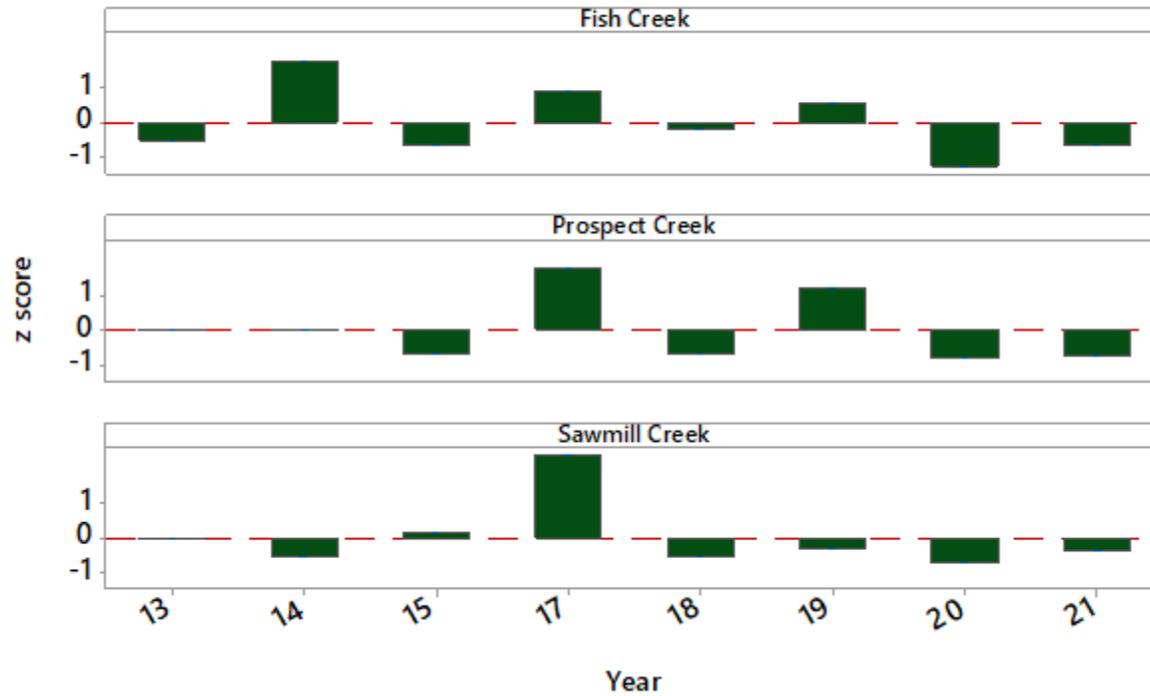
# Proportion of Run Sampled is Relatively Constant

Live per survey explains 61% of variation in sample number  
Roughly 10% - 24% of total live count is sampled  
How does live count relate to run size?



# Live Counts Track Across Streams

Total Live Count Anomaly by Stream



# How much of the runs did we sample?

Estimate the run size (N)

Conduct a Mark/Recapture Study

Capture, mark and release live fish

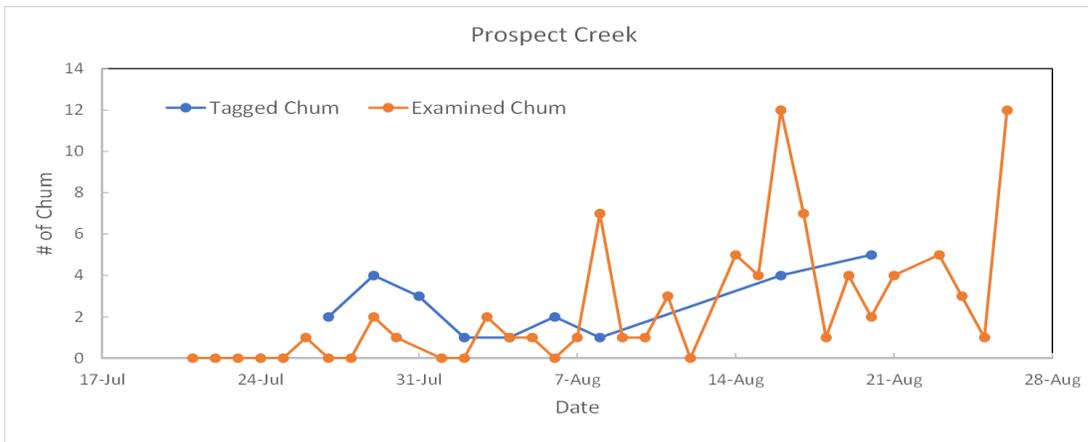
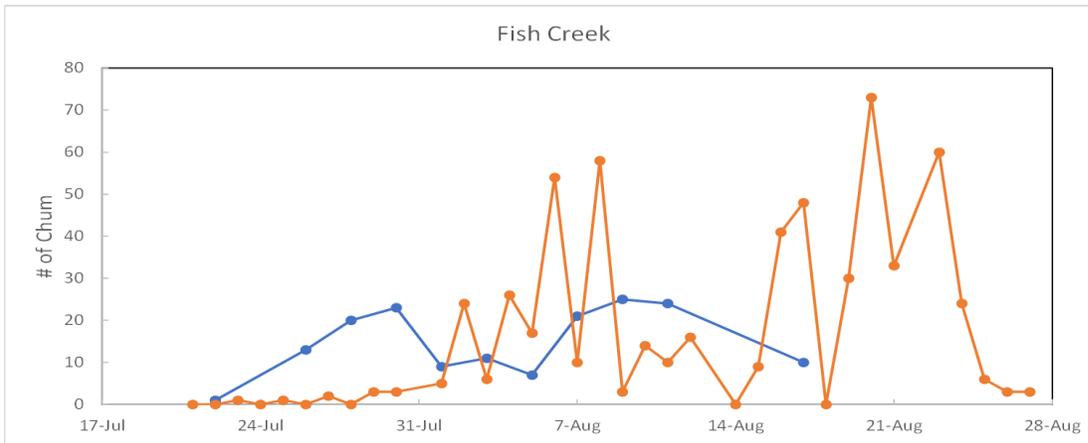
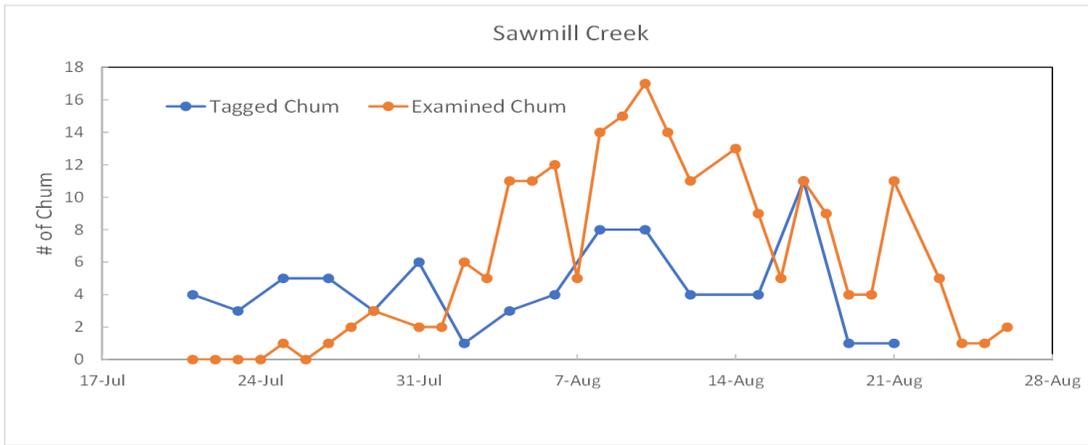
Recapture, look for marked fish among the carcasses

$$\frac{\textit{Number of carcasses examined}}{\textit{Number of tagged carcasses}} = \frac{\textit{Run size}}{\textit{Number released with tags}}$$

Divide run size (N) into the number of samples

# Mark Recapture Design

- Mark and Release on alternating days
- Record sex, length, age, genetics
- Capture fish above tidal influence, below spawning grounds
- Double mark with opercle punches
- Recover on carcass surveys
- Compute Modified Chapman estimate
- Conduct analysis for potential bias and adherence to assumptions



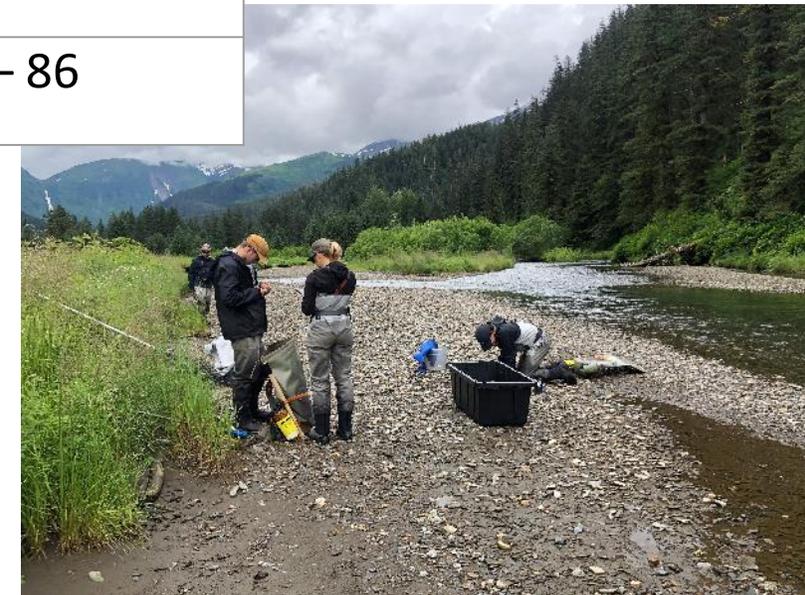
# Mark/Recapture Summary

Stream	Tags released	Tags Recovered	Carcasses examined
Fish	164	75	659
Sawmill	72	26	230
Prospect	23	10	91



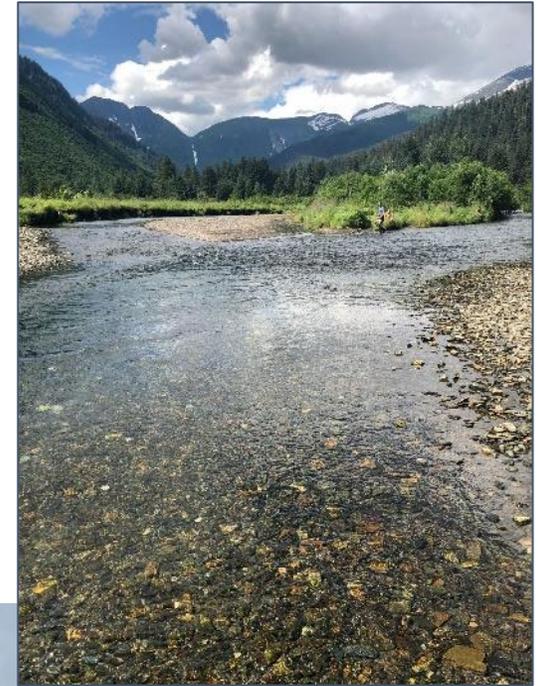
# Mark/Recapture Summary – Sampled > 40% of Run

Stream	Run Size	Number Unique Samples	Percent Sampled	95% Confidence Interval
Sawmill	624	276	44	35 – 61
Fish	1431	748	52	45 – 62
Prospect	200	104	52	37 – 86



# Conclusions

- Sampling effort increased on Sawmill, Fish
- Carcass weirs had limited value
- Proportion of live count sampled relatively constant over time ~17%
- Sample numbers driven by small run sizes
- Mostly sampled F1 from 2017BY or F2 of 2013BY
- Percentage of runs sampled > 44%



# Coming Year

- Continue increased sampling effort
- Sample 2013BY 2017BY,  
2018BY offspring
- Eliminate carcass weirs
- Improve efficiency on surveys
- Continue Mark/Recap effort
- Hope for large return

