



Combining parentage analysis with PIT-based estimates to evaluate stray rates and smolt-to-adult survival of hatchery coho salmon (*O. kistutch*) released from multiple sites within the Methow Basin

Danielle Grundy, Katie Weber, and Lydia Kleve

Mid-Columbia Coho Re-introduction Program, Fisheries Resource Management Methow Field Office

Introduction

- ◆ Coho salmon were once extirpated from the Methow Basin.
- ◆ The Yakama Nation MID-Columbia Coho Reintroduction program aims to develop a locally adapted self sustaining coho population able to support tribal and local fishery opportunities.
- ◆ Acclimation ponds are a key tool of the recovery effort.
 - Aids in dispersal of returning adults
 - ◆ Reduces competition
 - ◆ Mitigates risk and promotes adaptability
 - Adults are more likely to return to high quality spawning areas.

Methow Basin Release Sites

Methow River

- EARLWP: Early Winters Acclimation Pond
- MDVAP: Mid-Valley Acclimation Pond
- WNFH: Winthrop National Fish Hatchery

Chewuch River

- EIGHTP: Eight Mile Pond
- CHEWUP: Chewuch Acclimation Pond

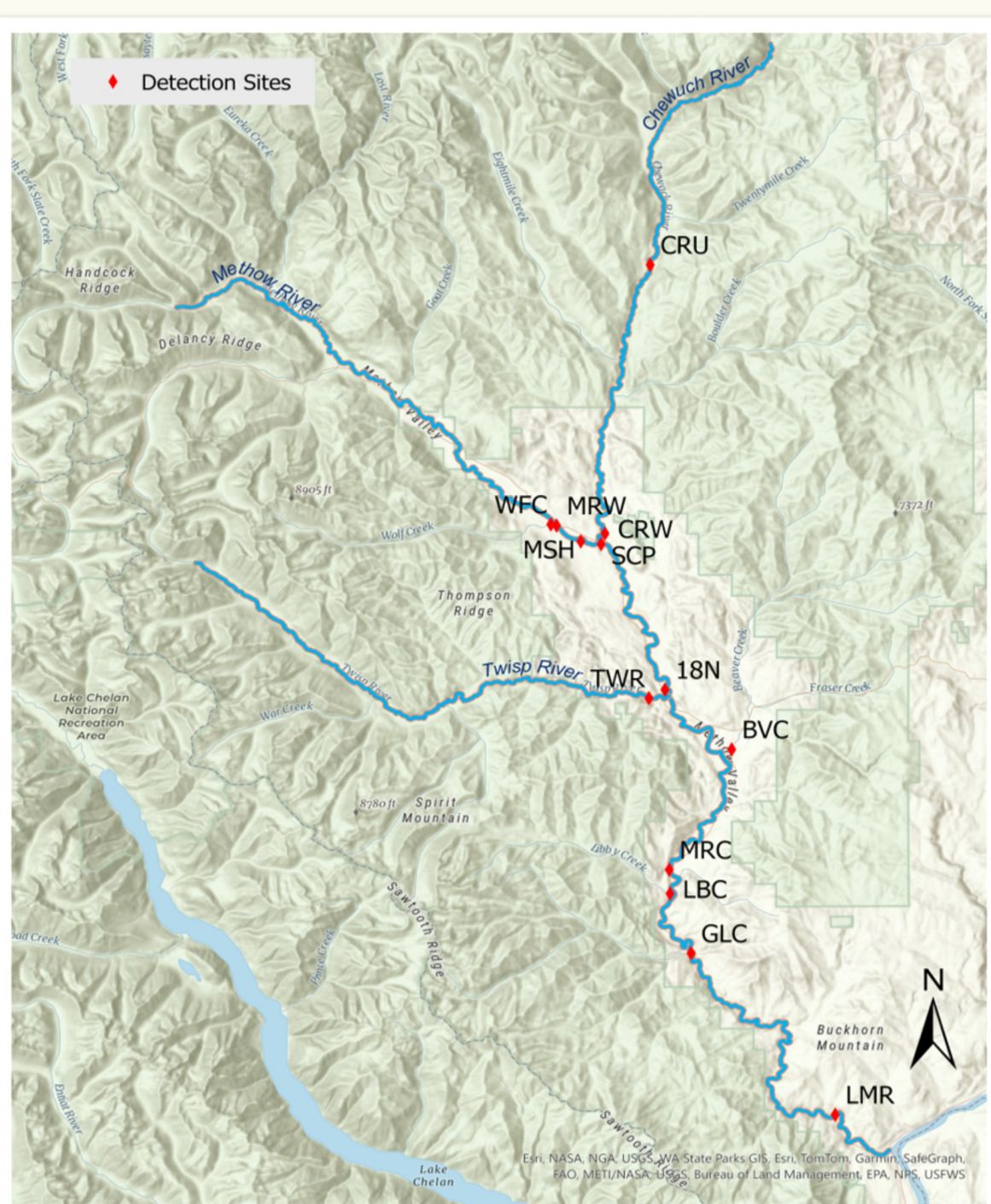
Twisp River

- TWISPP: Twisp Weir Pond
- LTWISPP: Lower Twisp Ponds



Escapement Methods

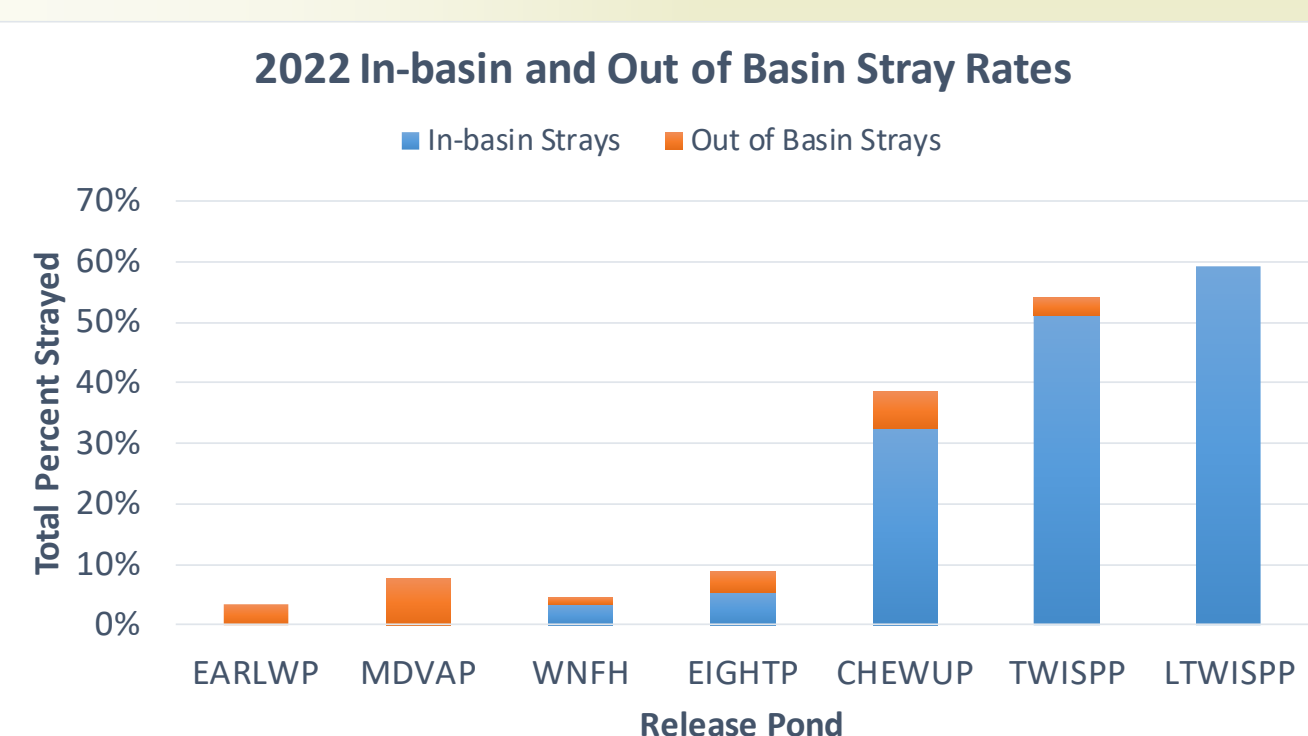
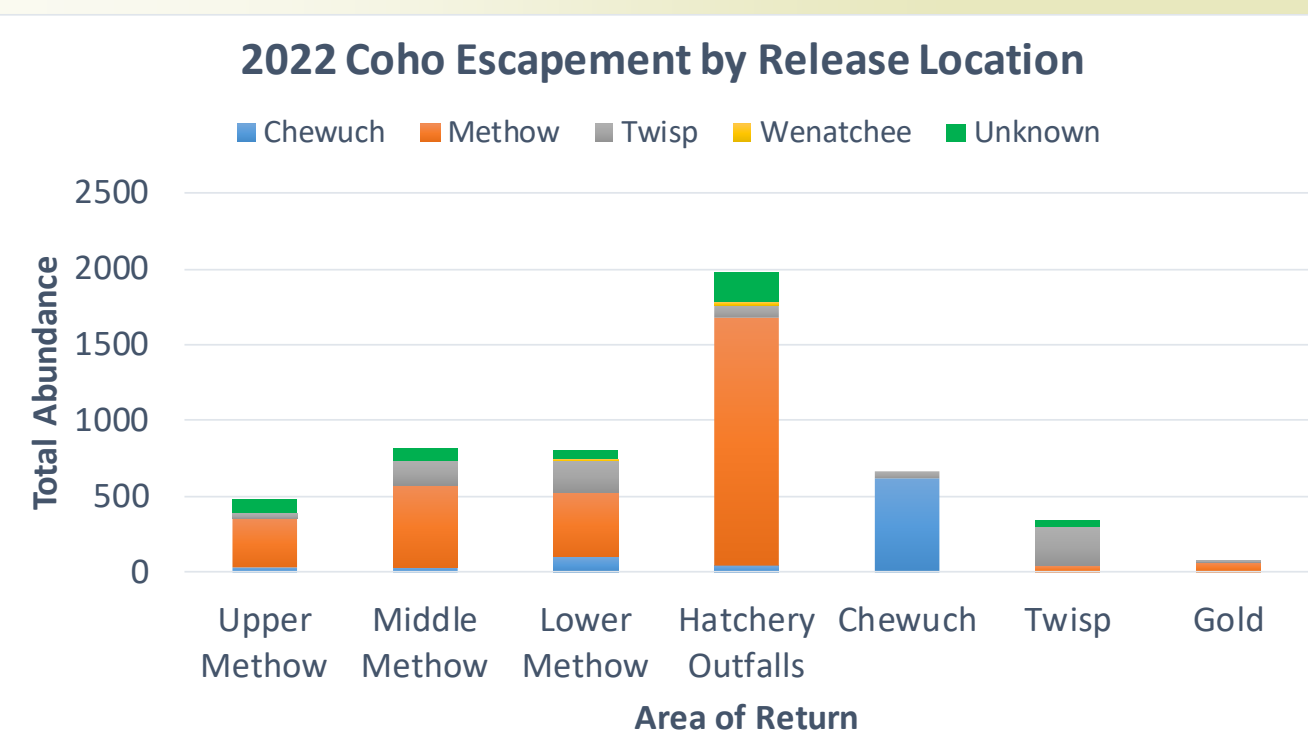
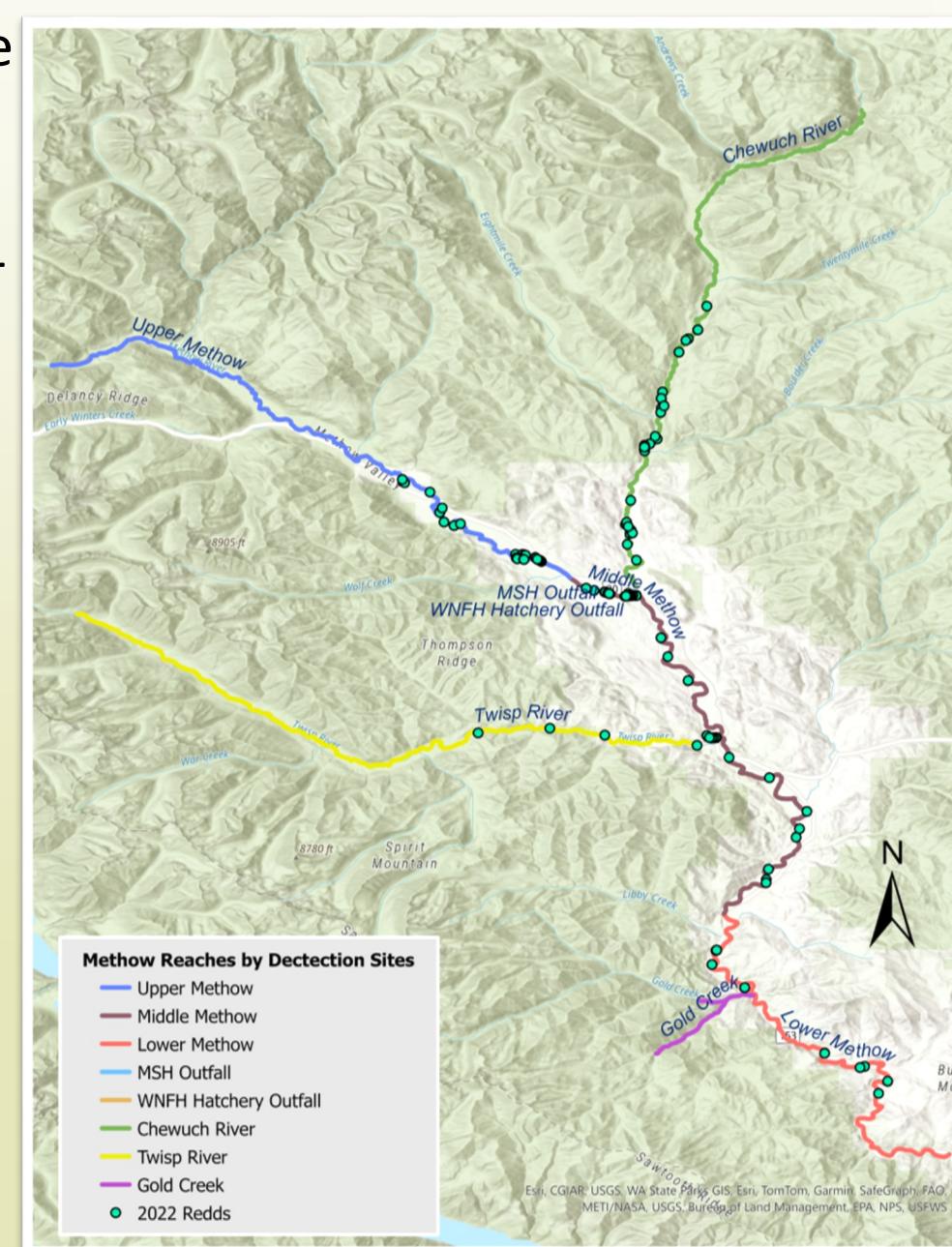
- ◆ Coho escapement has been estimated with PIT tags since 2019.
- ◆ Each year a subsample of adults are pit tagged at Priest Rapids Dam (PRA).
- ◆ Abundance estimates are generated at the site level via PIT detection based on movement and detection probabilities past the detection sites.
 - Dam Adult Branch Occupancy Model (DABOM) (Waterhouse, 2020)
- ◆ Parentage based tagging (PBT) is combined with these abundance estimates to determine the makeup of escapement at different spatial scales.



Results

Return Year 2022

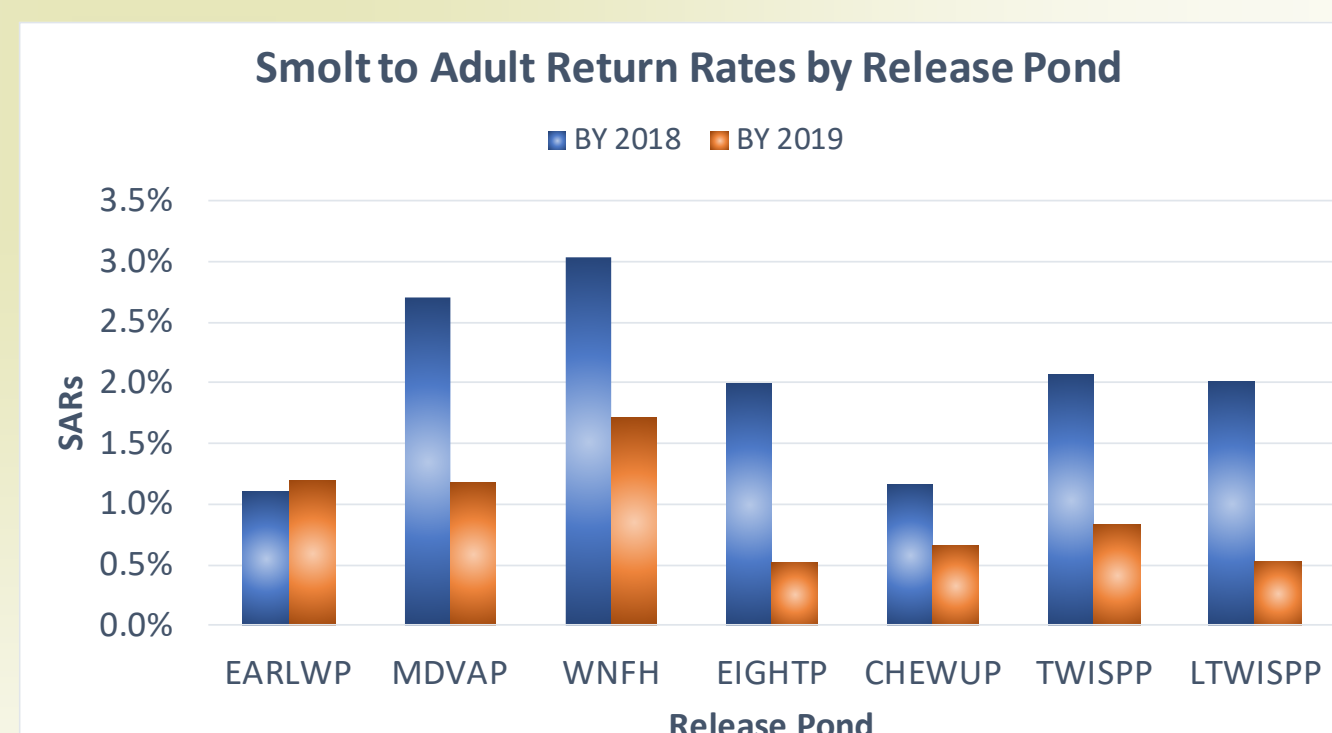
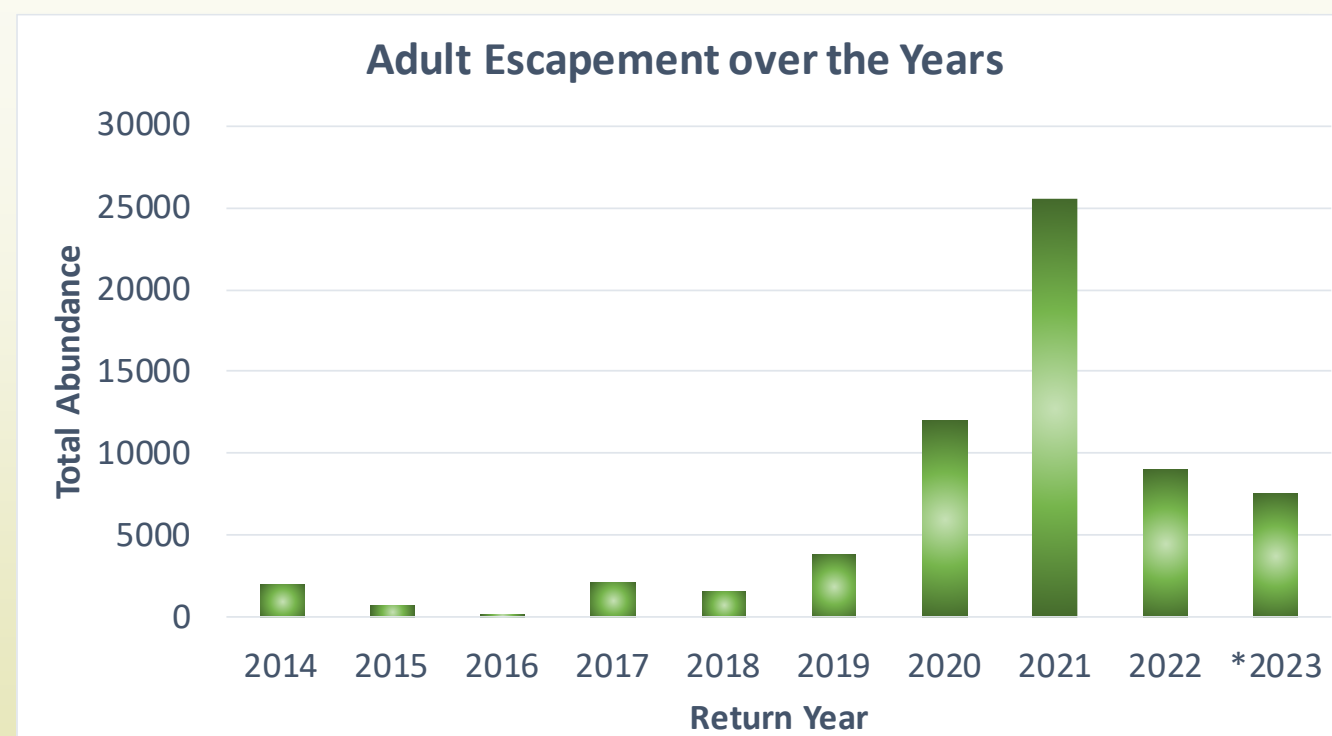
- ◆ The majority of escapement occurred in the middle to lower Methow Reaches and Hatchery outfalls.
- ◆ Lack of a fall freshet reduced attraction and spawning habitat availability in upper basins.
 - The Twisp and Chewuch River froze prior to peak spawn.
- ◆ Returning fish mainly consisted of Methow River released fish.



- ◆ Twisp released fish strayed the most, followed by the Chewuch releases and Winthrop.
- ◆ Methow River released fish were more likely to stray out of basin.
- ◆ Harsh winter conditions likely led to spawners being unable to access the Twisp and Chewuch.
- ◆ More data are needed to identify trends.

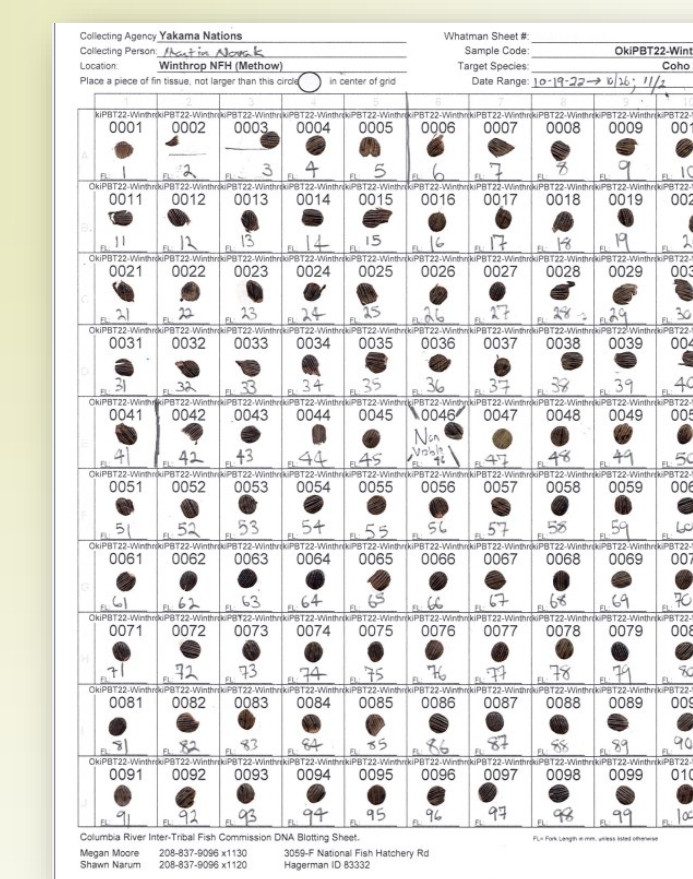
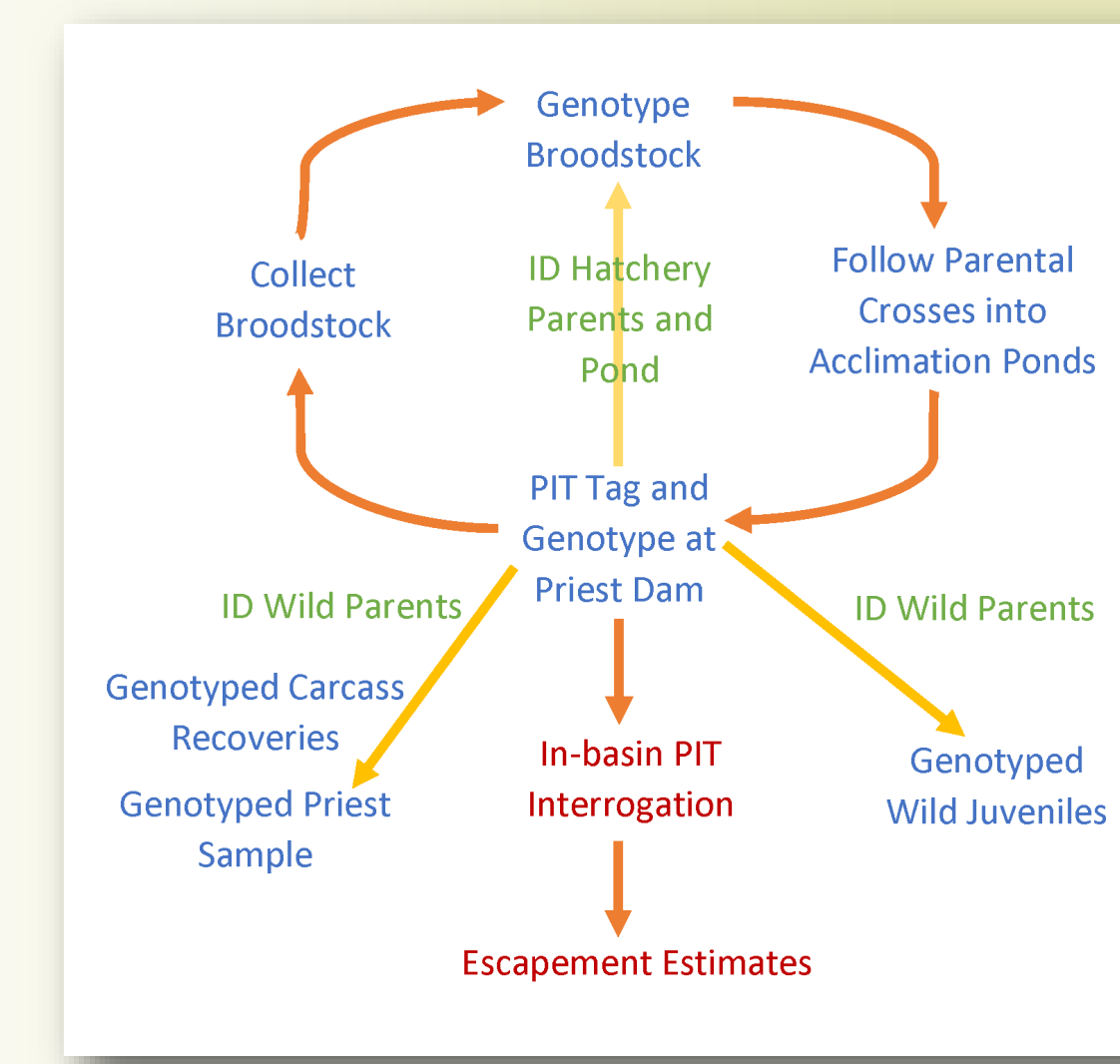
Returns by the Numbers

- ◆ Overall, returns have been trending upward over the past decade.
- ◆ Return year 2021 was the most successful yet.
 - All ponds contributed to that success.
- ◆ *Smolt to Adult Returns* (SARS) for brood year 2018 and 2019 were generated from PBT results and estimated from the lowest site in the basin (LMR).
- ◆ Onsite releases from Winthrop NFH returned at the highest rate for both years.
- ◆ Overall, fish released from the Methow River ponds are the most successful.



PBT Methods

- ◆ Monitoring the success of each acclimation pond is important in understanding the overall effectiveness of the program.
- ◆ Historically CWTs were used to determine return rates
- ◆ More recently parentage based tagging (PBT) has been used to track returns.
 - DNA is collected and genotyped at different life stages.
 - ◆ All Broodstock is genotyped and their progeny is tracked through out the rearing process including to the release site.
 - ◆ Returning coho are genotyped at Priest Dam.
 - ◆ Carcass recoveries from spawning ground surveys and wild juveniles are genotyped as well.
 - All samples are processed by CRITFC's genetics program at Hagerman Genetics Lab.



Example of DNA samples on a Whatman Sheet

PBT Assignment Process

Benefits of PBT

- ◆ Close to 100% tag rate
 - The average tag rate from 2017 to 2022 is 98.6%.
- ◆ Tag recovery is non-lethal
- ◆ No need to handle juveniles for tagging: reduces mortality/stress
- ◆ No tag loss
- ◆ Cost efficient
- ◆ More versatility
 - When combined with PITs, PBT can be used to determine escapement rate at various spatial scales as well as stray rates.
 - Reduces the need to recover carcasses to determine origin.

What's Next

- ◆ To reduce spawning densities in Hatchery outfalls and increase distribution, outplanting of adults to the upper basins will begin for return year 2024.
- ◆ Incorporation of Priest DNA dataset and wild juvenile DNA into PBT analysis will allow for identification of the natural origin component.