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November 5, 2019

MEMORANDUM

TO: Fish and Wildlife Committee Members

FROM: Todd Ungerecht

SUBJECT: Presentation of Kootenai Tribe of Idaho and Idaho Department of Fish & Game on the status of Kootenai River Burbot recovery efforts

Presenters: Shawn Young, Kootenai Tribe of Idaho
Ryan Hardy, Idaho Department of Fish and Game

Summary: Dr. Young and Mr. Hardy will update the Committee on the status of two successful Council-recommended resident fish programs (KTOI #1988-064-00 and IDFG #1988-065-00) to restore Kootenai River Burbot.

Background:

Native Burbot in the transboundary Kootenai basin were once abundant and provided an important subsistence, social, and sport fishery. However, due to changes in the ecosystem over the last century, the Burbot population collapsed. Burbot sport-fishing in Idaho was closed in 1992, and Tribal cultural harvest was no longer possible, due to declining populations.

Since 2003, the Kootenai Tribe of Idaho (KTOI), Idaho Department Fish and Game (IDFG), and British Columbia Ministry (BC) have co-led a Burbot recovery collaboration which includes other agencies, and a line of research through the University of Idaho Aquaculture Research Institute (UIARI). The collaboration has been guided by the Burbot Conservation Strategy, formally completed in 2005. The strategy outlines a suite of adaptive recovery measures to implement for rehabilitation of the burbot population, and is a culmination of a multitude of agencies and stakeholders coming together through the Kootenai Valley Resource Initiative (KVRI) to state that Burbot recovery is a priority and agree upon a path forward for restoration of the population.

The Burbot program has focused on re-establishing a naturally produced, self-sustaining population, using genetically similar stock from within the subbasin, as well as annual population and hatchery monitoring. From 2009-2014, Burbot were reared and released from the research collaboration. In 2014, the KTOI completed a conservation hatchery at the confluence of the Moyie and Kootenai Rivers in northern Idaho to increase flexibility for the Tribe's sturgeon aquaculture program, as well as to implement population rehabilitation for Burbot. Since then, the Twin Rivers Sturgeon and Burbot Hatchery has greatly scaled up releases that have resulted in a significant Burbot abundance increase.

KTOI collaborates with IDFG and BC to capture and spawn adults from the donor population and from the re-established in-river population. In the hatchery, KTOI rears the Burbot in a manner to simultaneously support rebuilding Burbot abundance, post-release research, monitoring, and evaluation, and studies investigating early life habitat requirements that determine recruitment dynamics. Dr. Young will present an overview of the collaborative effort, and how KTOI conducts the in-hatchery portion to support post-release monitoring and evaluations completed primarily by IDFG, which then helps guide adaptive management by the working group collaboration.

IDFG performs the primary in-river evaluations to determine the efficacy of the stocking program, to identify factors limiting wild recruitment, and gauge the success of reaching population targets identified in the Burbot Conservation Strategy. Mr. Hardy will present results of these surveys, which are provided to the Kootenai Tribe of Idaho to assist in setting hatchery stocking numbers as well inform the effect of different stocking strategies on survival. Through these evaluations, it is clear that the Burbot restoration program has been a success at accomplishing many pre-established objectives including the ability to sustain a harvest fishery, which was re-opened in January of 2019.

Kootenai River Burbot Restoration



Shawn Young and Nathan Jensen
Kootenai Tribe of Idaho (KTOI)



Ryan Hardy and TJ Ross
Idaho Fish and Game (IDFG)



Picture of Kootenai Tribe of Idaho's Twin Rivers Sturgeon and Burbot Hatchery



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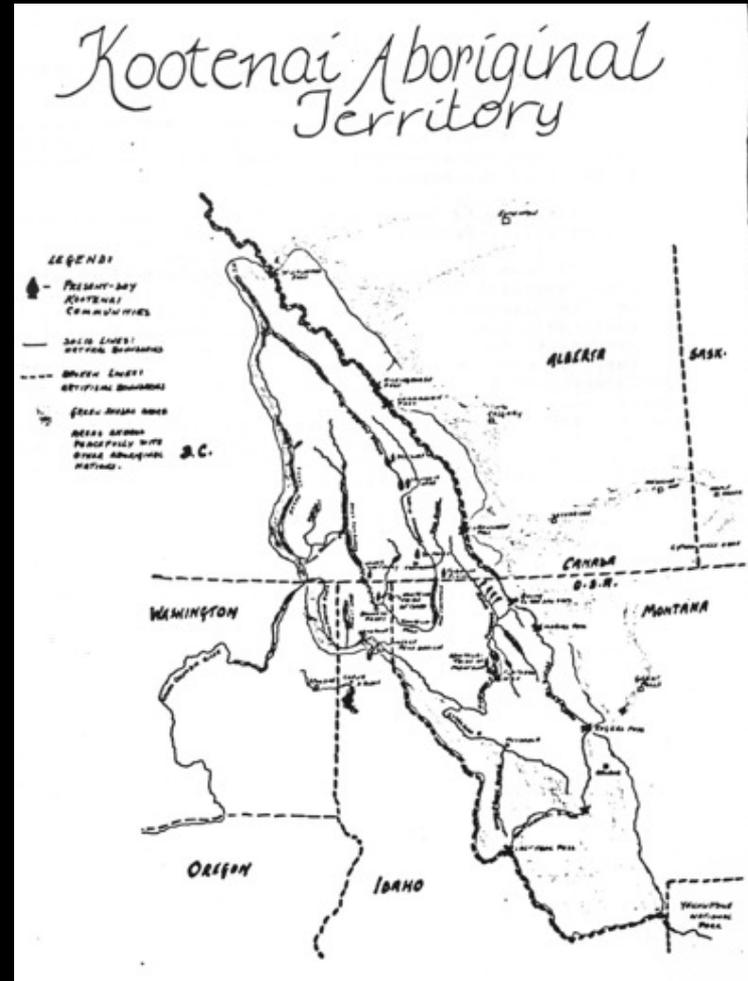


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The Kootenai Tribe







British Columbia Ministry of Environment

Kootenai River

Prior to European settlement, the Kootenai River watershed with its riparian forest and wetland complexes was one of the most productive in the Pacific Northwest.



Since 1890's.....

- **> 100,000 acres of off-channel floodplain disconnected.**
- **60,000 acres of wetlands converted.**



An aerial photograph of the Libby Dam, a large concrete structure with a spillway, situated in a mountainous region. The dam is surrounded by dense green forests and a large, deep blue reservoir. The water level is high, and the surrounding terrain is rugged with some rocky outcrops. The sky is clear and blue.

Libby Dam was completed in 1974.

“Nutrient Sink”

- Hydrograph is managed seasonally and annually.
- Thermograph is altered across annual cycle.



+





- ✓ No natural recruitment since 1970's.
- ✓ Burbot were functionally extirpated by 1990's.
- ✓ There were not enough burbot to support a hatchery program or to use for research.

Agency, Tribal and Community Collaboration

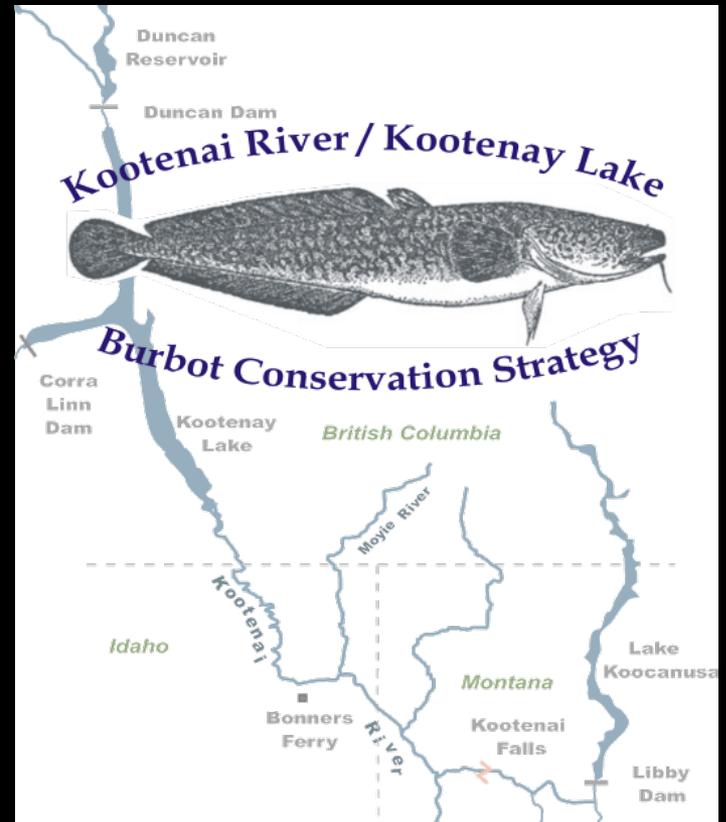
February 2002

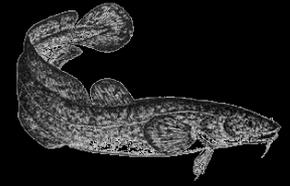
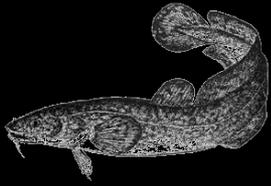
KVRI agrees to form a Burbot Subcommittee to develop a conservation strategy.



Burbot Conservation Strategy

- Habitat Restoration
- Conservation Aquaculture
- Alternative Hydro Operations Plan
- Monitoring and Evaluation
- Education and Outreach





Burbot Program History

1999-2002: KTOI, IDFG, BC investigate feasibility

2003: Aquaculture Research Begins (U. of Idaho)

2005: Burbot Conservation Strategy (multi-agency)

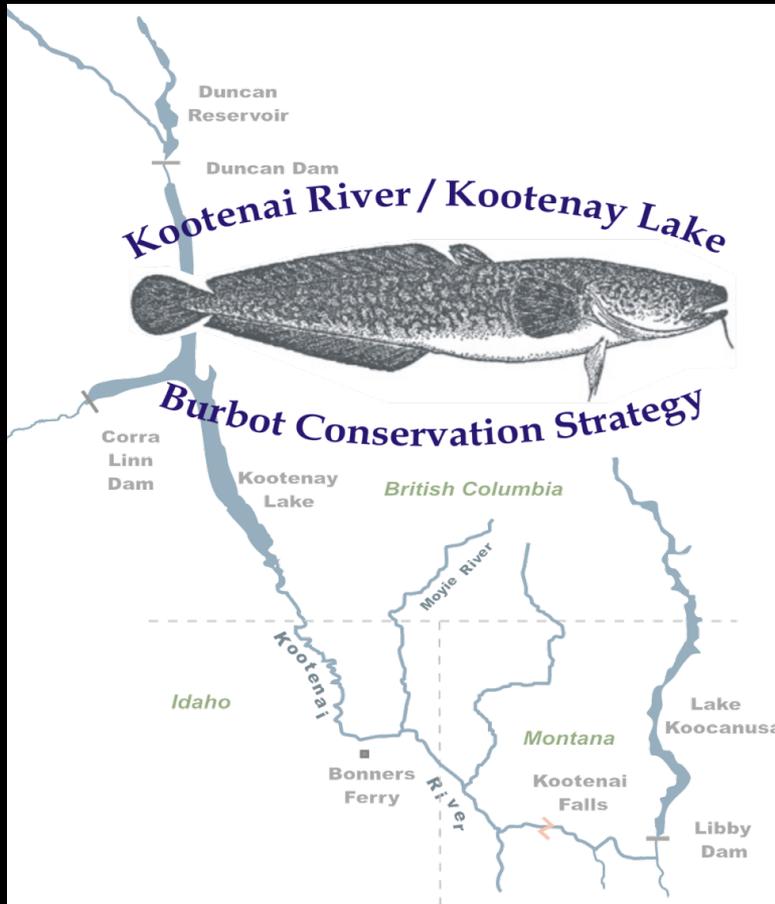
2009: 1st Hatchery Burbot Released

2009-2014: U. of Idaho Reared Burbot



Burbot Conservation Strategy

Guiding Documents:



Kootenai River Native Fish Conservation Aquaculture Program

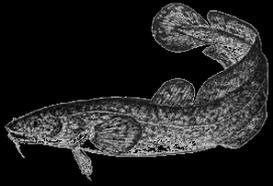
Step 2 Document

Volume 2 – Appendices

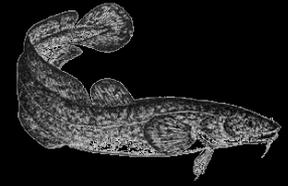


Appendix C

Monitoring and Evaluation Plan
for Kootenai River Burbot
(*Lota lota maculosa*)



Burbot Program History



2015-2019: KTOI assumes all rearing,
Twin Rivers Hatchery Operational



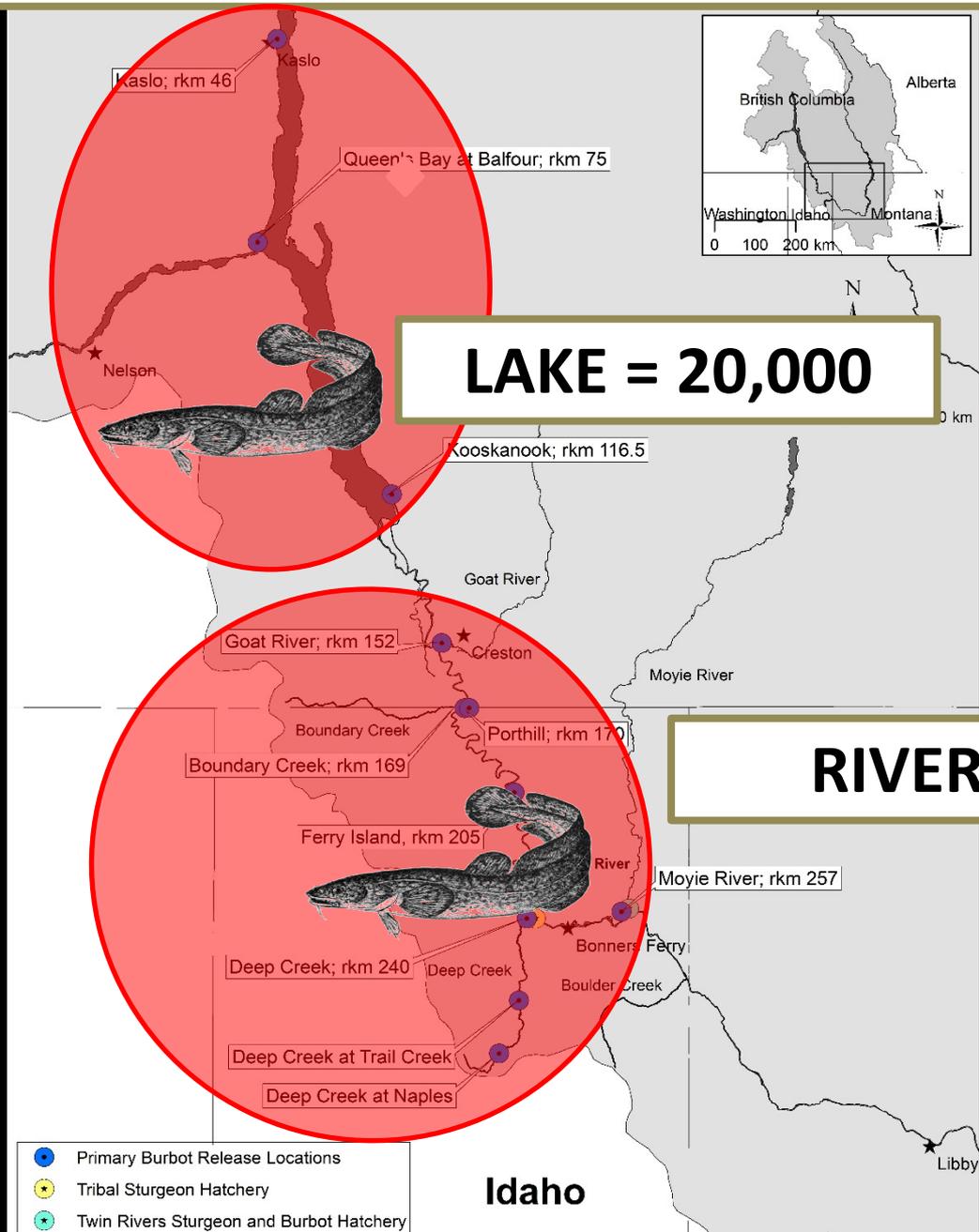
With this information, here we are again:

Adaptive Management – Change your plan

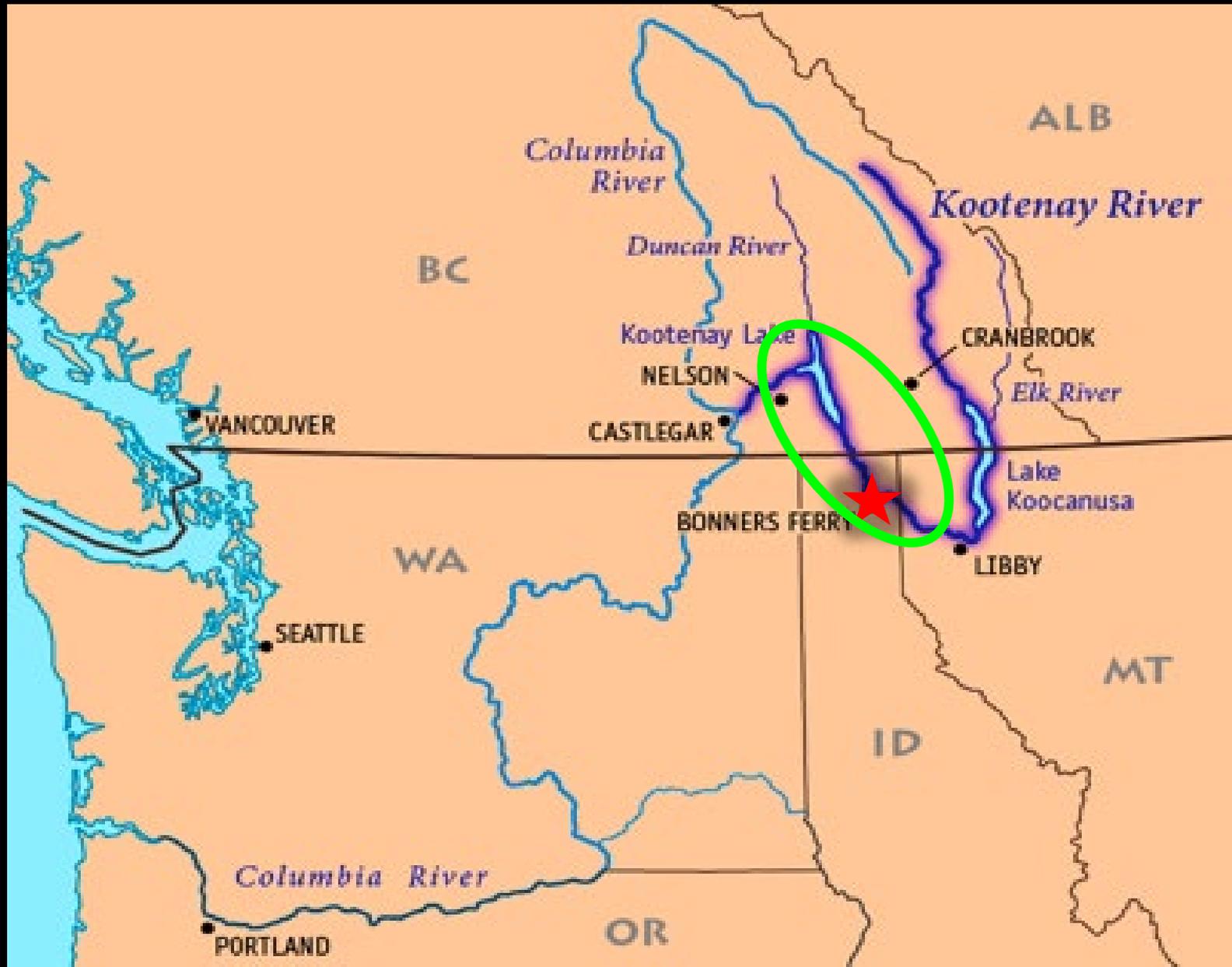
1. Population Rebuild
2. Genetic Diversity
3. Research, Monitoring, and Evaluation
 - Supports science-based adaptive management.



RECOVERY AREAS – ADULT ABUNDANCE GOALS

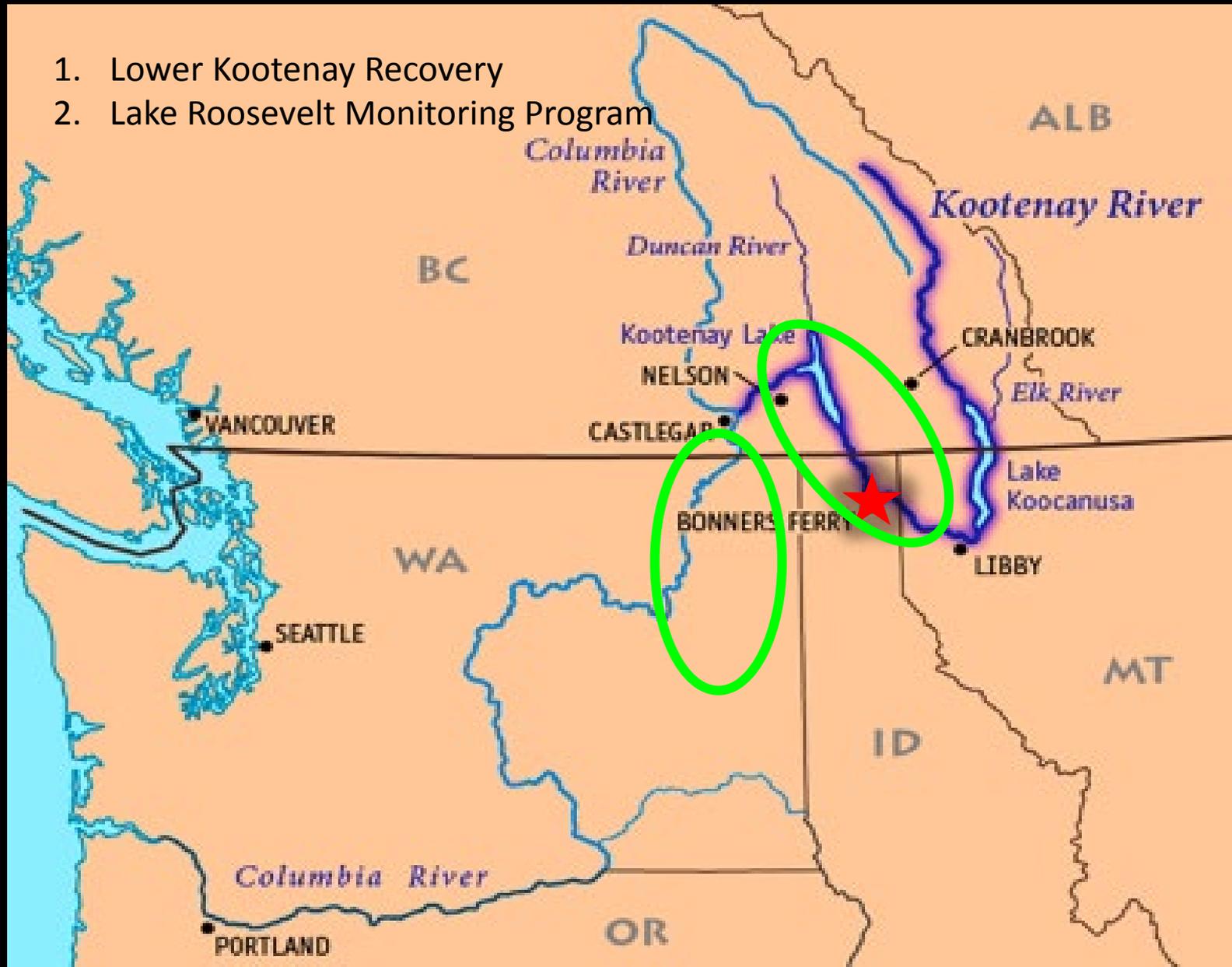


Knowledge Transfer



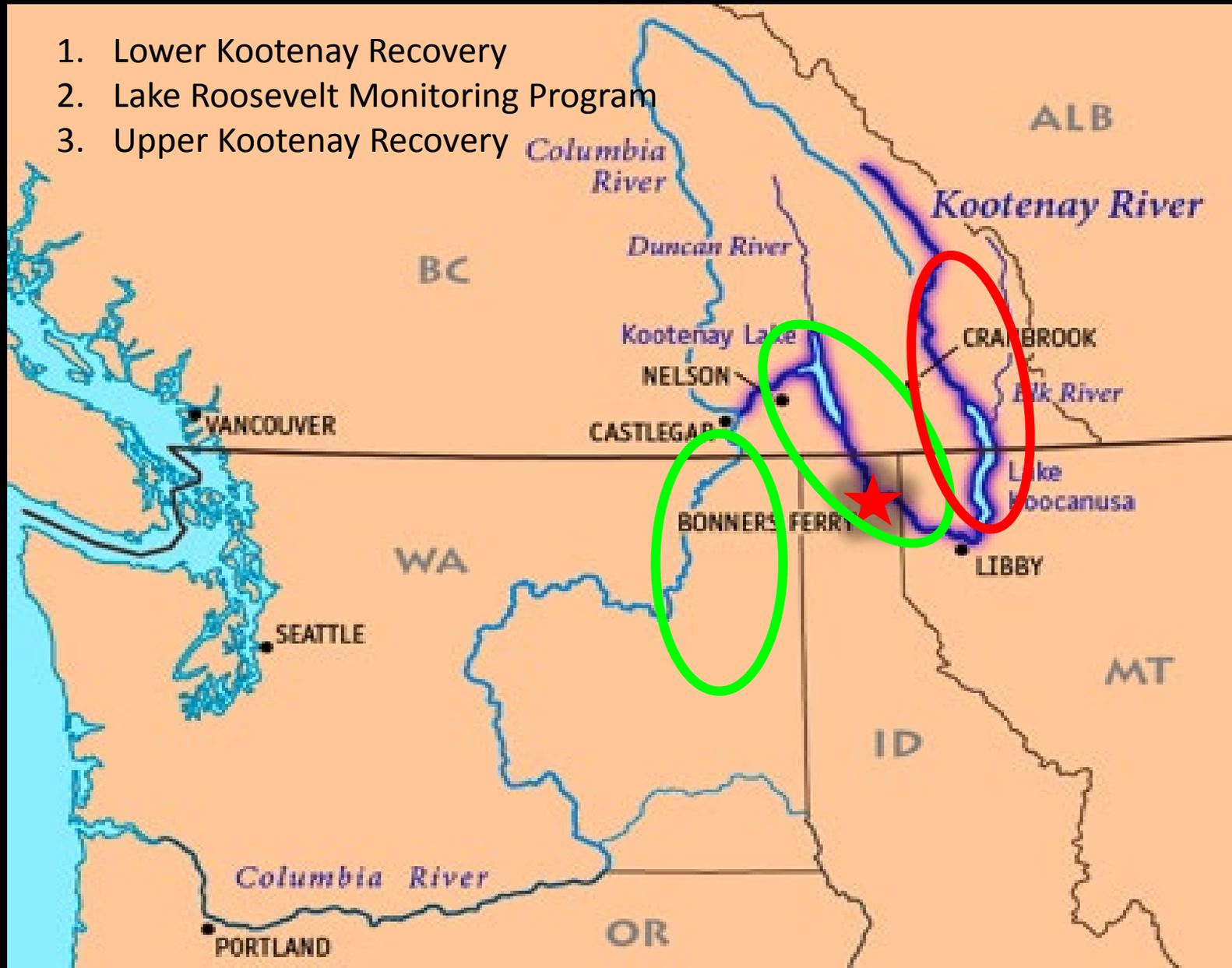
Knowledge Transfer

1. Lower Kootenay Recovery
2. Lake Roosevelt Monitoring Program



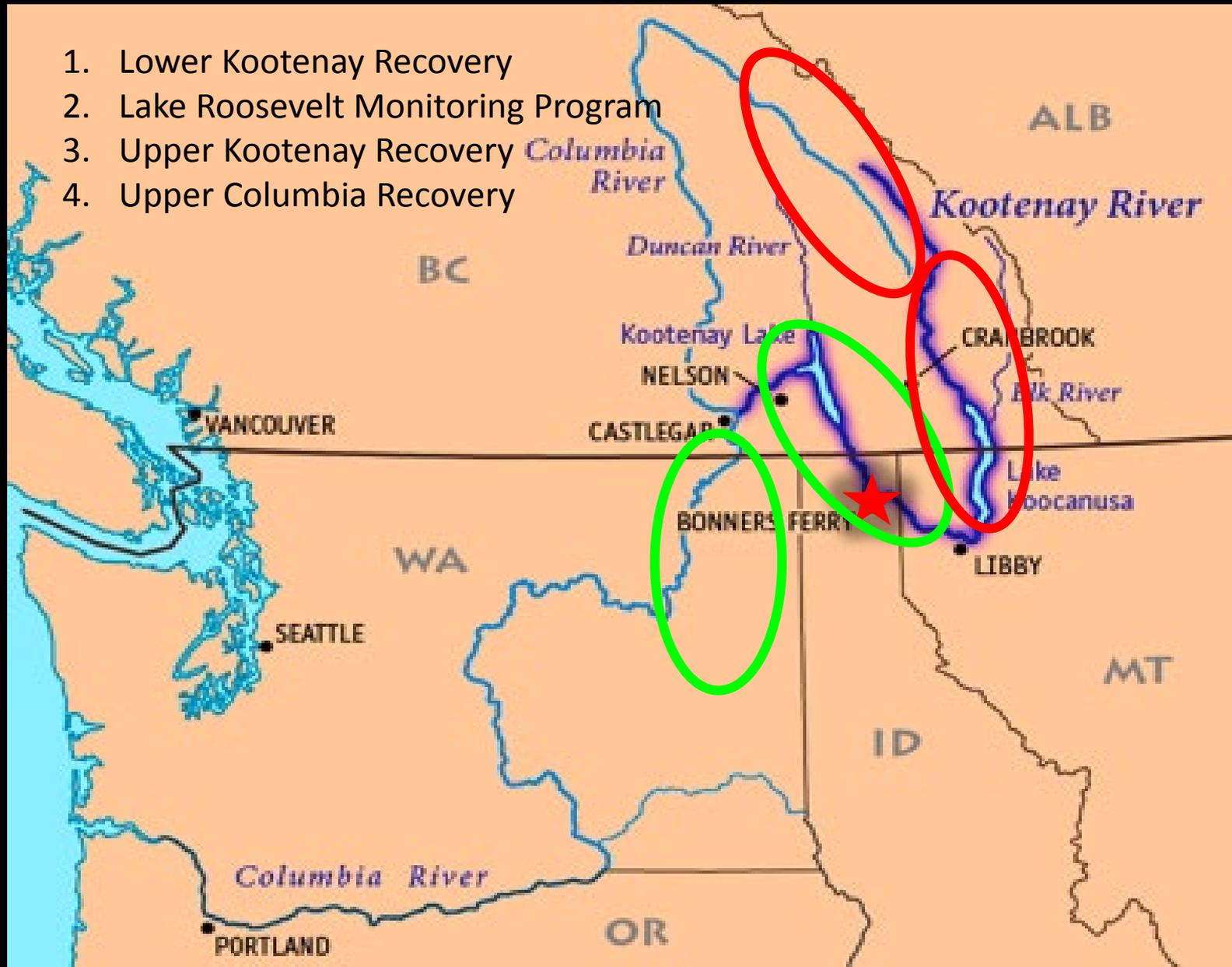
Knowledge Transfer

1. Lower Kootenay Recovery
2. Lake Roosevelt Monitoring Program
3. Upper Kootenay Recovery



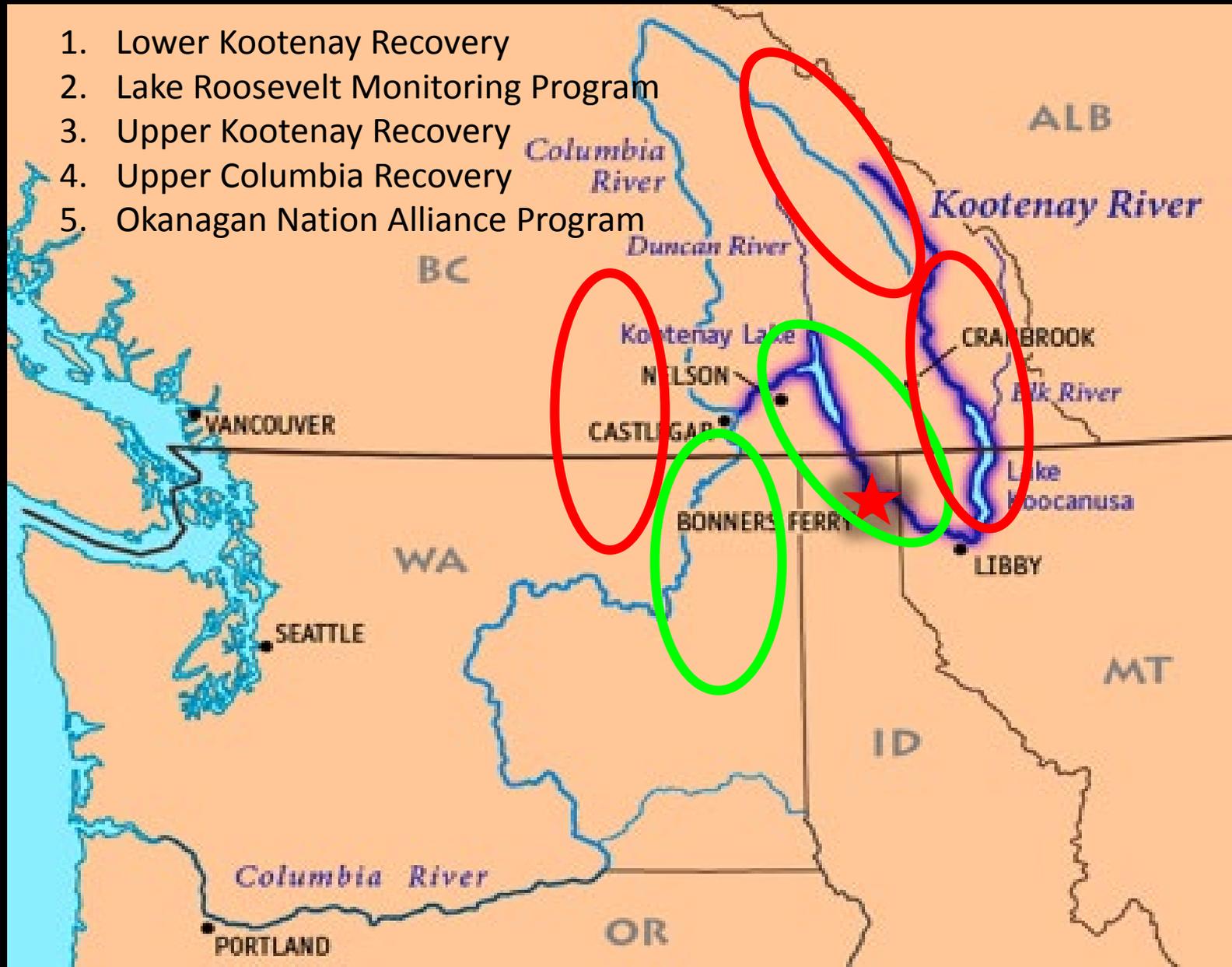
Knowledge Transfer

1. Lower Kootenay Recovery
2. Lake Roosevelt Monitoring Program
3. Upper Kootenay Recovery
4. Upper Columbia Recovery



Knowledge Transfer

1. Lower Kootenay Recovery
2. Lake Roosevelt Monitoring Program
3. Upper Kootenay Recovery
4. Upper Columbia Recovery
5. Okanagan Nation Alliance Program



Kootenai Tribe of Idaho Burbot Hatchery Operations to Support Idaho Fish and Game M&E

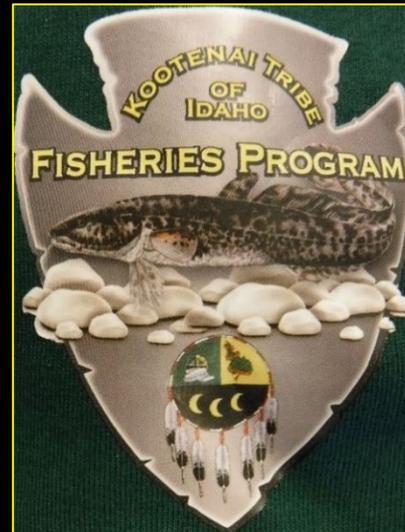
NPCC Meeting

12-13Nov2019

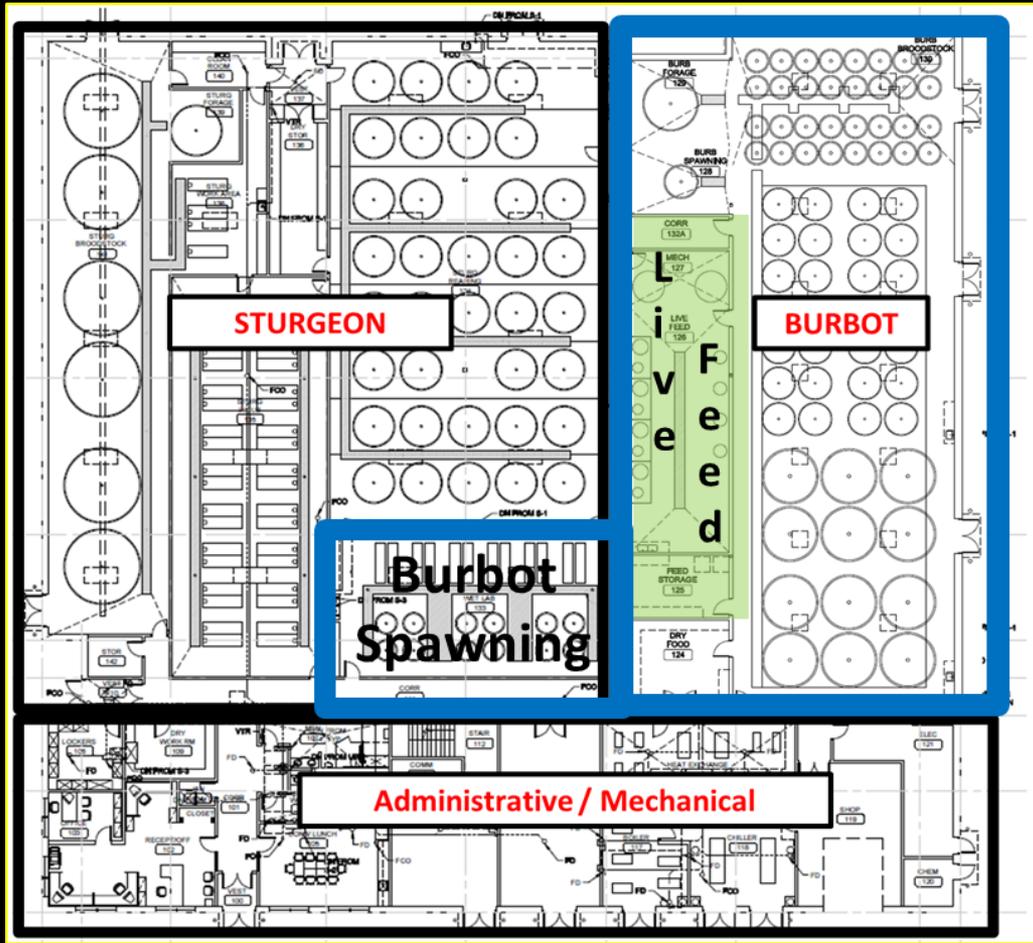
Nathan Jensen

njensen@kootenai.org

208-267-1689



Hatchery Plan View and General Production Timeline



Burbot adults and eggs come in **January-February**



Larvae/Juveniles out to specific locations **April-September**

October-December
Prepare for next Life-cycle/Year-class

Kootenai River Adults

1. Broodstock are captured by IDFG in January and transported to KTOI-H2 by KTOI
2. Fish are sorted in hatchery, PBT is used to track fish-groups and groups are allowed to voluntarily spawn
3. Eggs are collected in a custom catch system



Bottom: Eggs being collected in hatchery

Eggs From Moyie Lake B.C.

(Primary source for program)

1. Adults captured through ice
2. Adults are given unique code(s) and 'fin-clips' are collected for parental based tagging (PBT)
3. Fertilized eggs are transported through US customs to hatchery

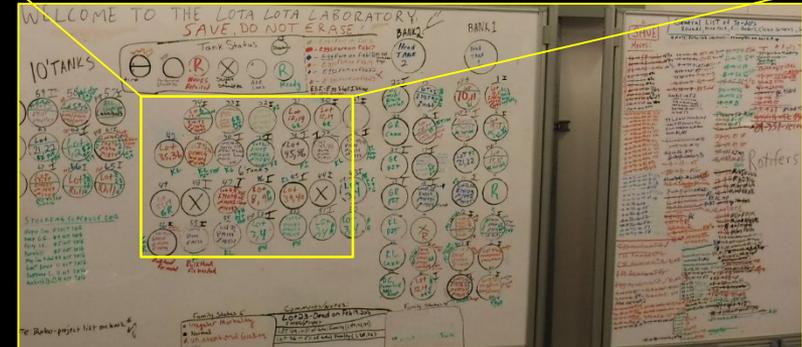
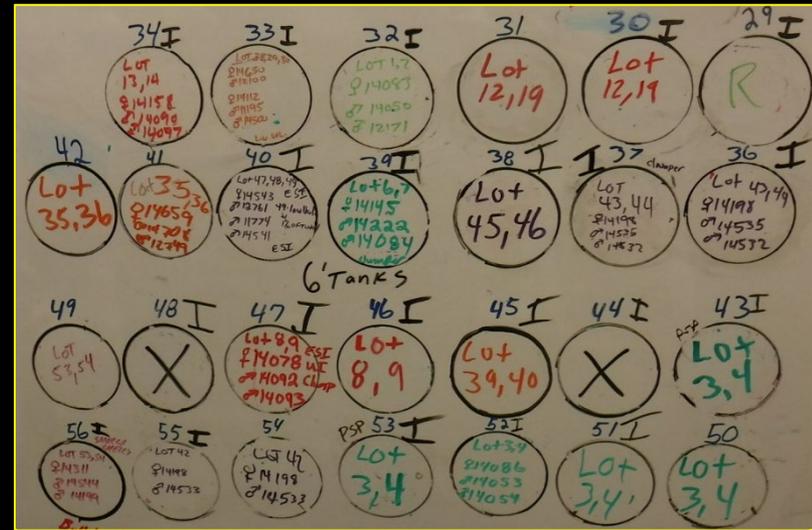


Some Program Notes

1. We have multiple brood sources now
 - Adults from Kootenai River
 - 99%ish Hatchery Fish
 - Fertilized eggs from Moyie Lake
 - Genetic variation from lake is now in river

2. Individual family separation is required

3. Burbot require live feed during early life



In-hatchery family tracking example

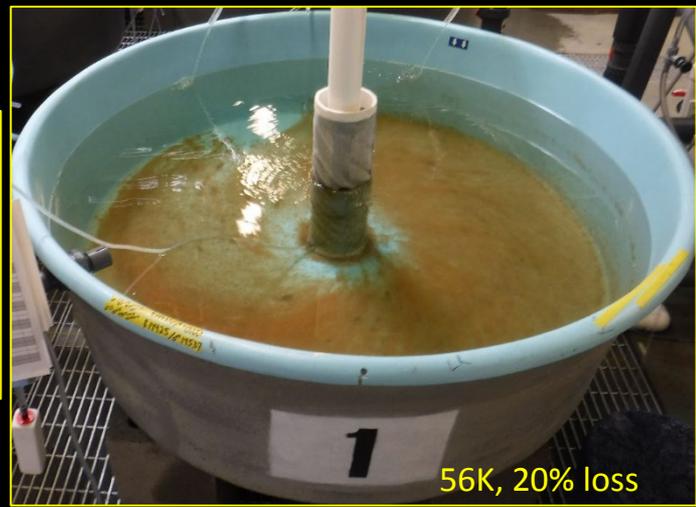
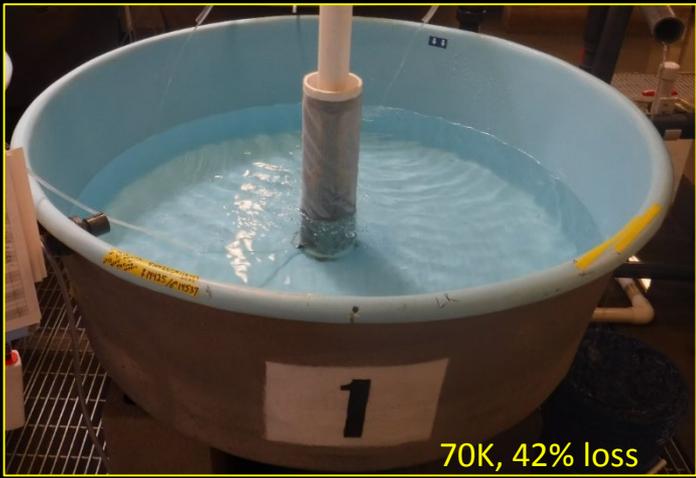
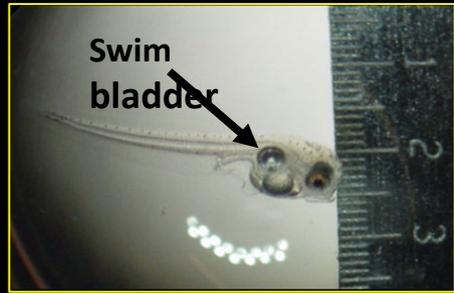
Burbot Larviculture

- 1. Live feed begins when mouth develops
- 2. No mouth for two weeks
- 3. Swim bladder inflation is a critical phase for survival



Two weeks

A white rectangular box with a yellow arrow pointing downwards from the top image to the bottom image, containing the text "Two weeks".



Live Feed Culture is Required

1. Rotifer and Artemia are raised March-June
 - 200 Million organisms are needed per day
2. Harvestable populations of 10 Billion is the target
3. We are investigating other 'native' freshwater zooplankton species



Rotifer

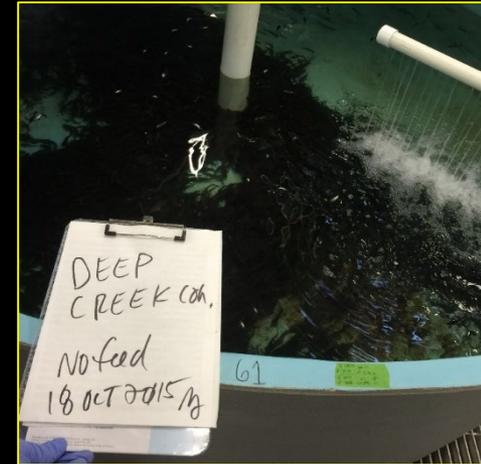


Artemia



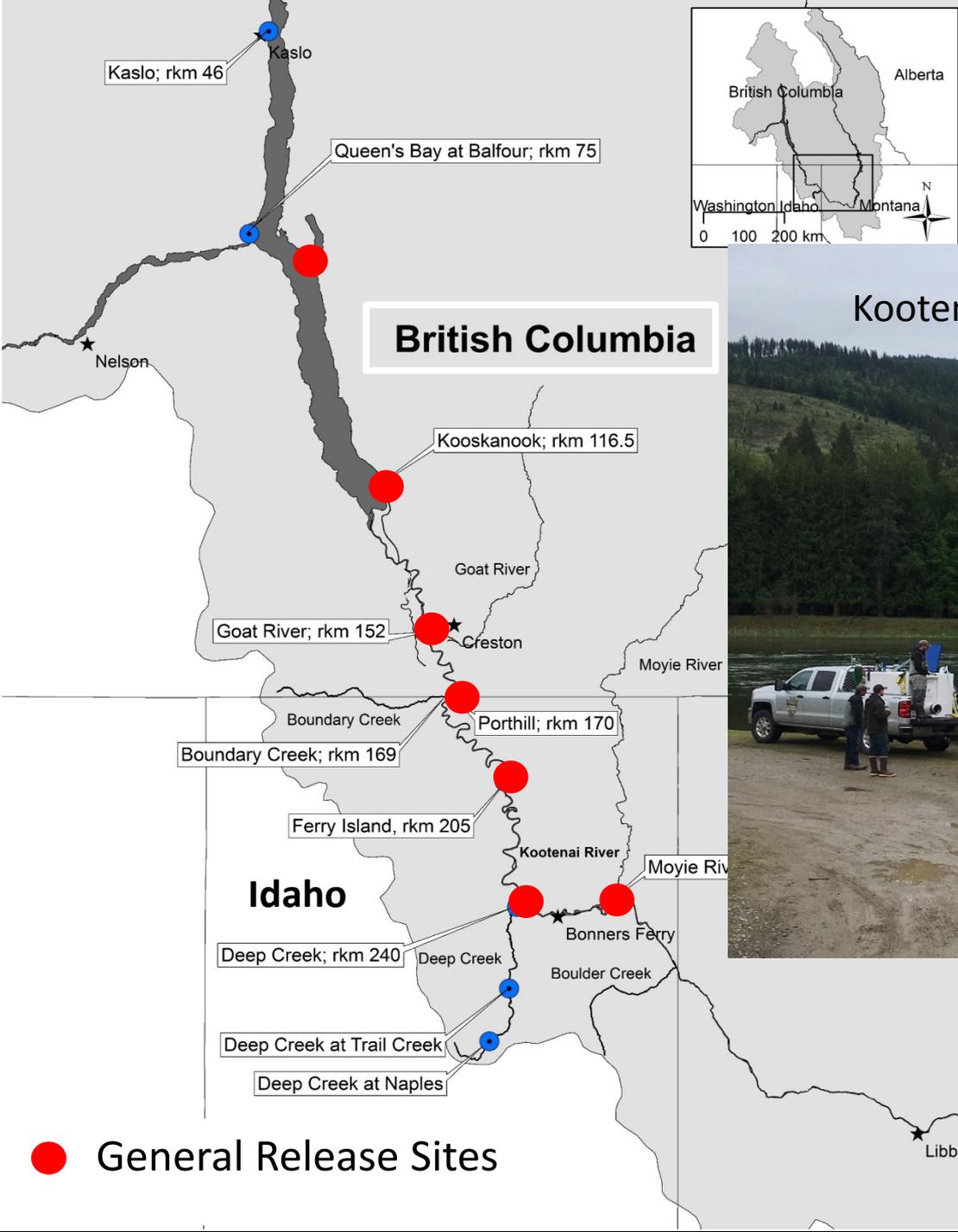
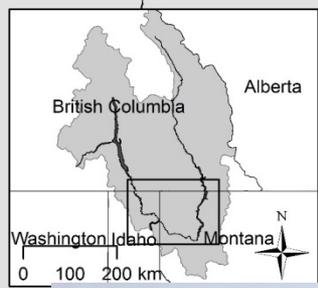
Juvenile Rearing

1. Numbers and size vary by family
2. After feed training mortality subsides
3. Cannibal fish can be graded out or left in rearing tanks to “clean-up” poor-quality fish



(Top) a look into a tank of fish ready to go to river; (Bottom) example of size variation within a family group

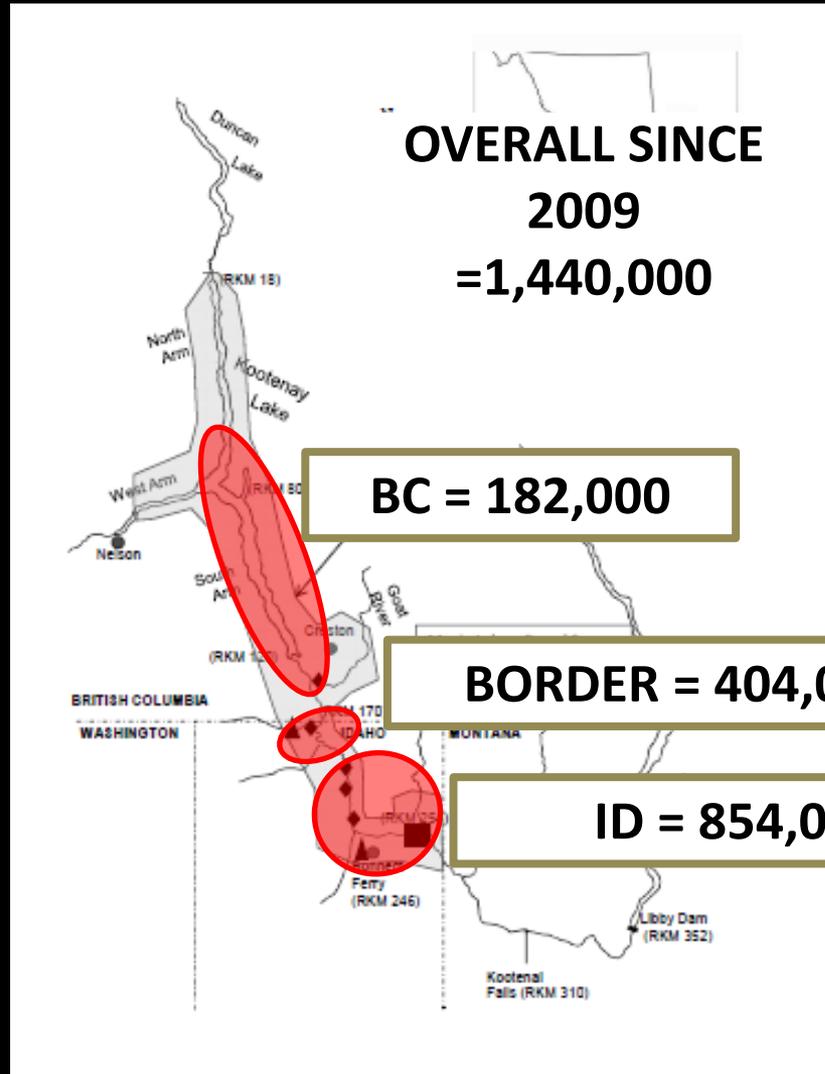
Release Locations



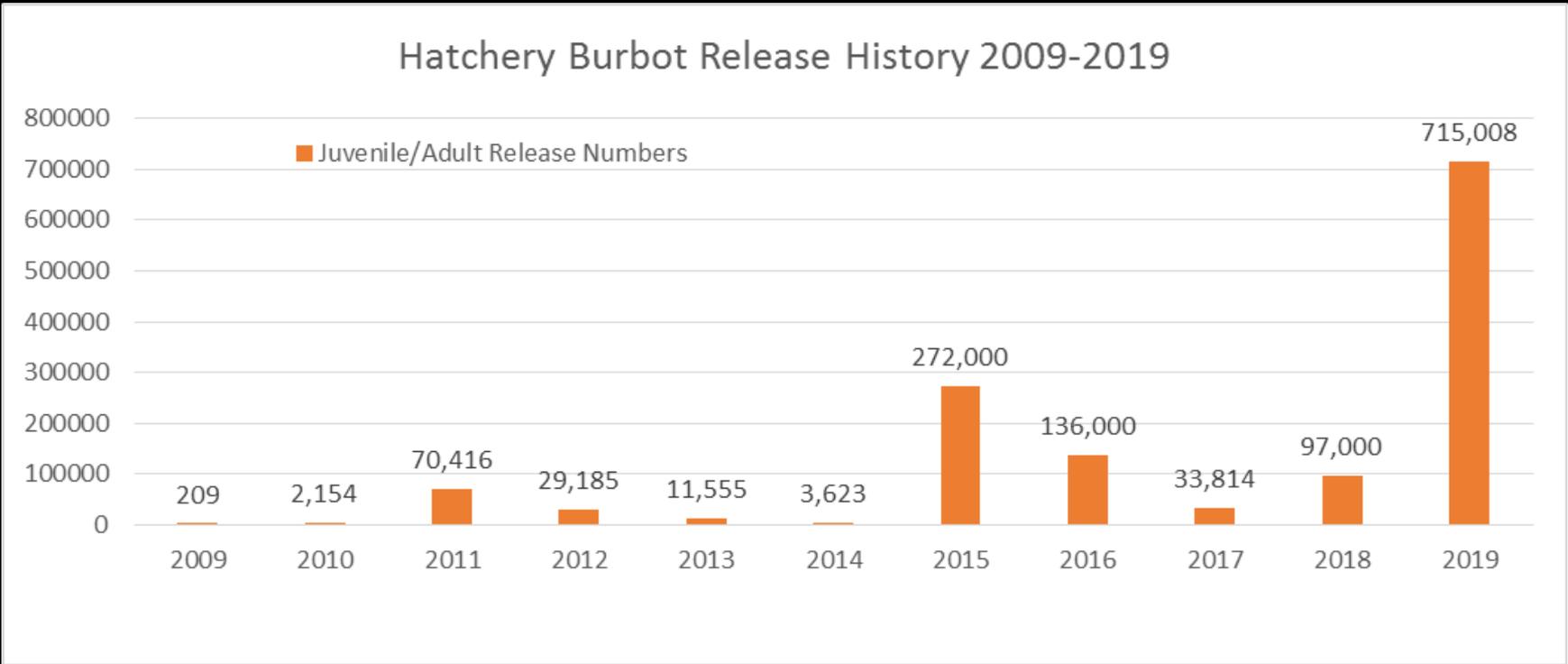
Kootenai Tribe Community Burbot Release



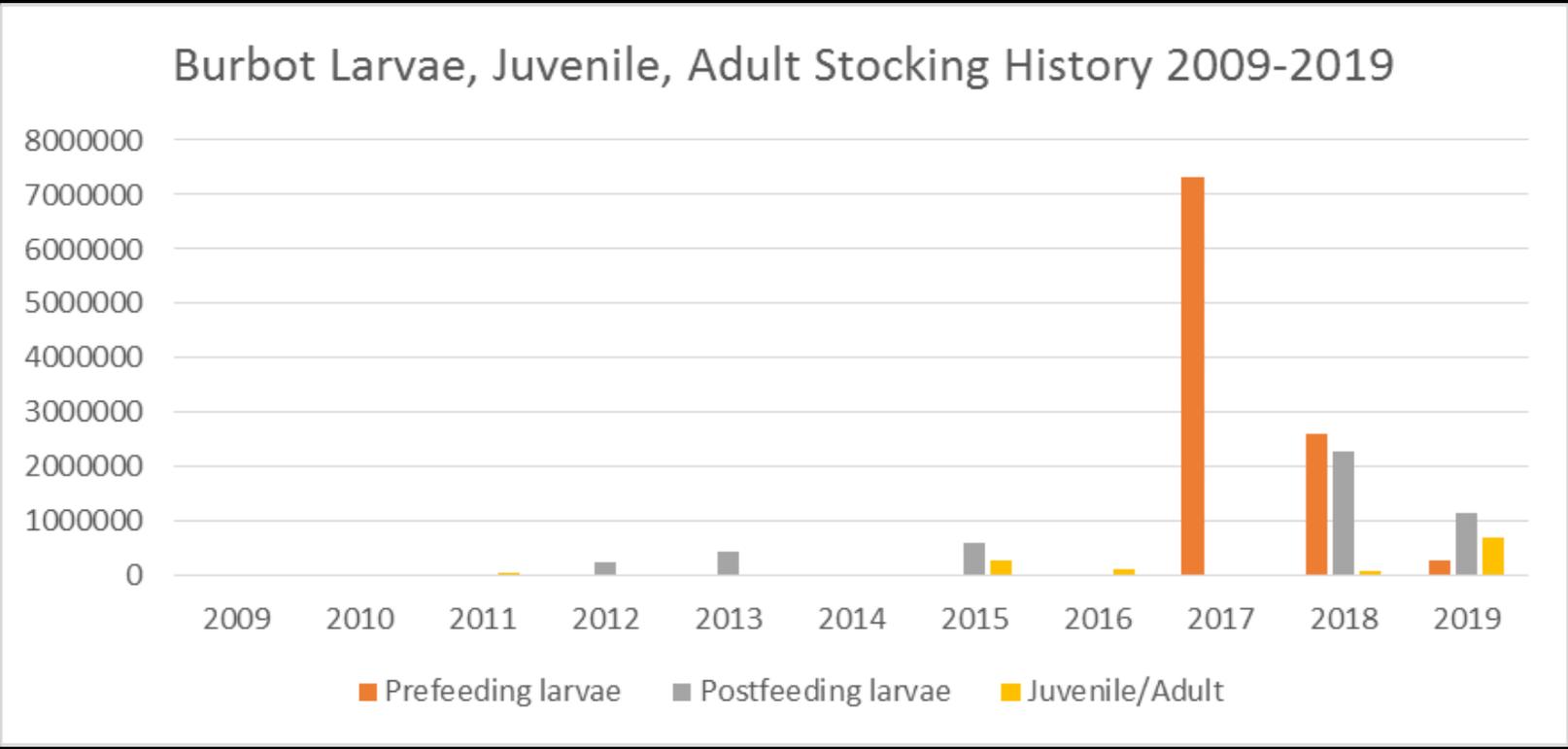
**ALL JUVENILE
BURBOT
RELEASES
COMBINED
(2009-2019)**



Release numbers since 2009



Release numbers since 2009



Summary

1. Expect high mortality, variability among year classes
 - We have PBT now, can now experiment with release of small fish to study survival bottlenecks
2. Hatchery burbot larvae will survive post release
 - May be able to use this to condense some production cycles to provide more 'natural' fish
 - Still need to produce juveniles for disease testing and diversify releases to spread out risk
3. All hatchery operations are focused on supporting IDFG monitoring program while meeting production targets



KOOTENAI RIVER RESIDENT FISH MITIGATION PROJECT



Ryan S. Hardy

Idaho Department of Fish and Game

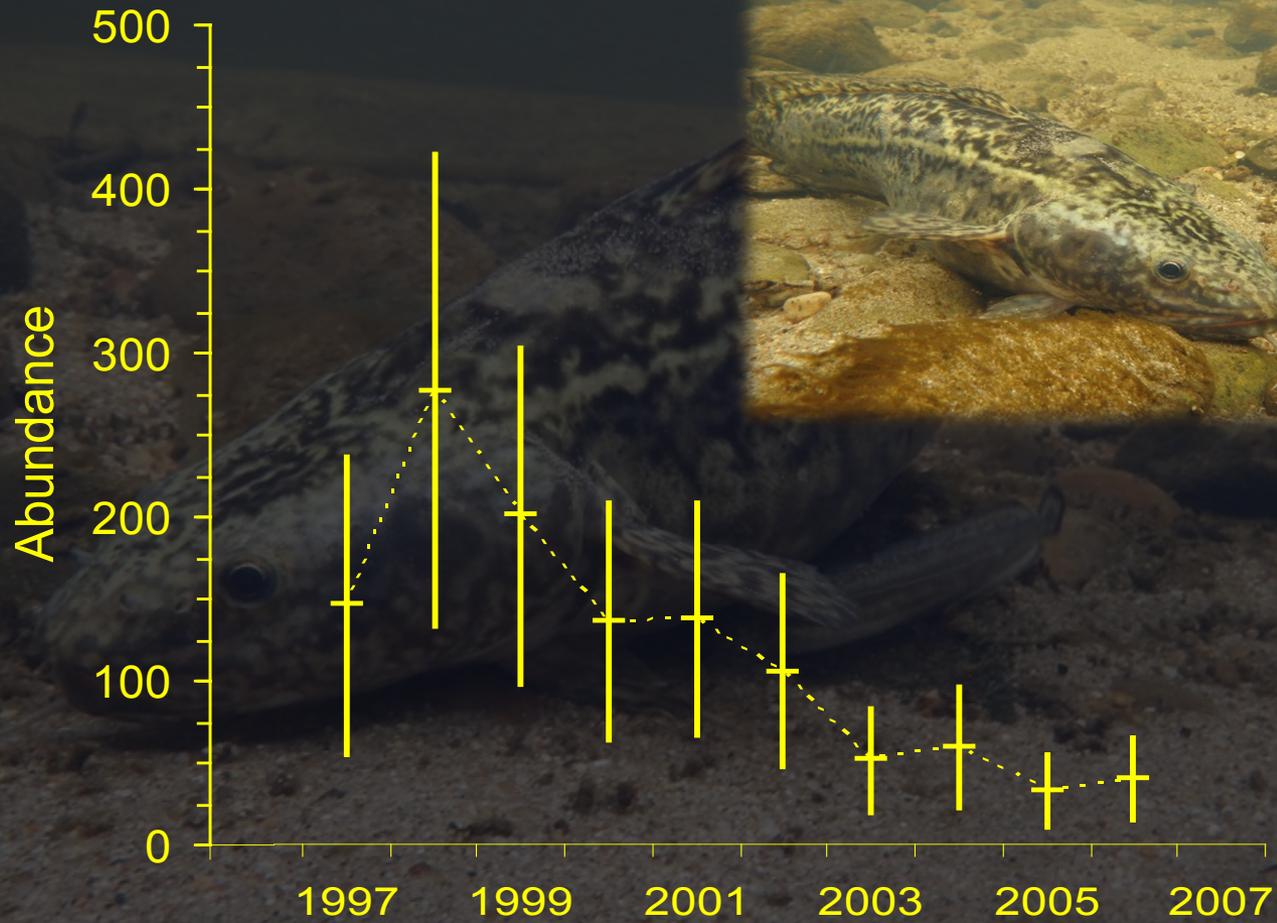


BURBOT

(Lota lota maculosa)



BURBOT ABUNDANCE



RESEARCH OBJECTIVES

- AGE SPECIFIC SURVIVAL
- EFFECTS OF STOCKING LOCATION,
SIZE, AND AGE AT RELEASE
- JUVENILE AND ADULT ABUNDANCE
- MOVEMENT AND DISTRIBUTION
- RECRUITMENT BOTTLENECKS

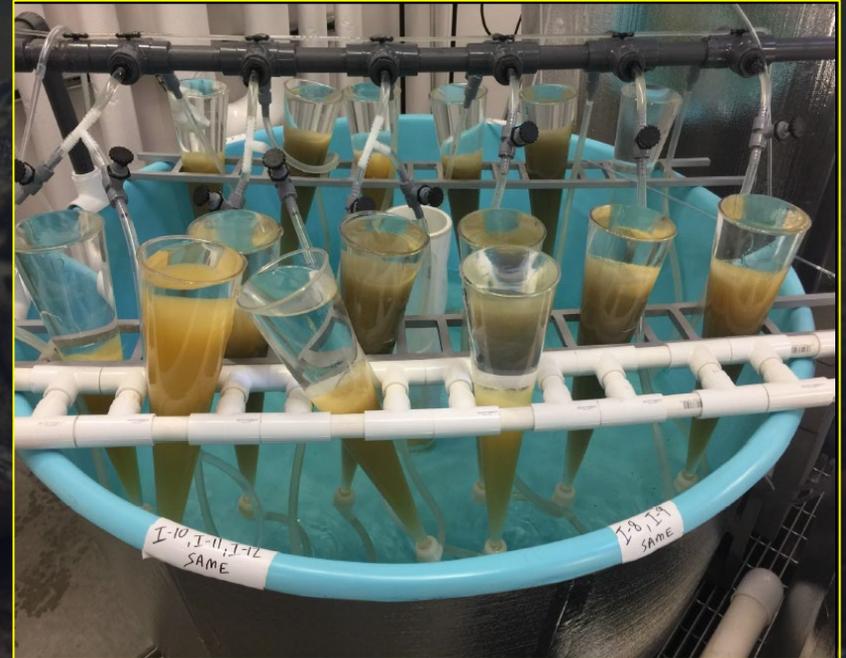
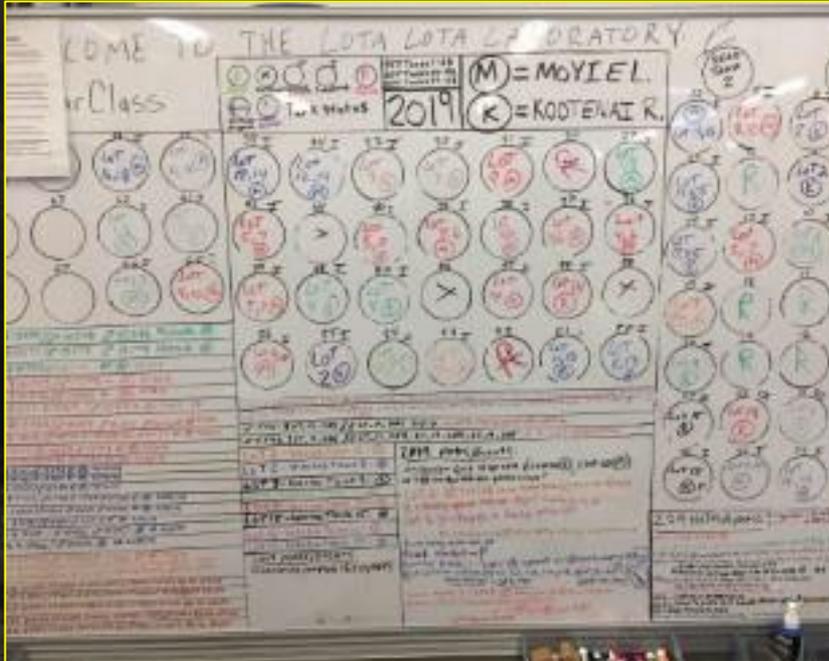
BURBOT



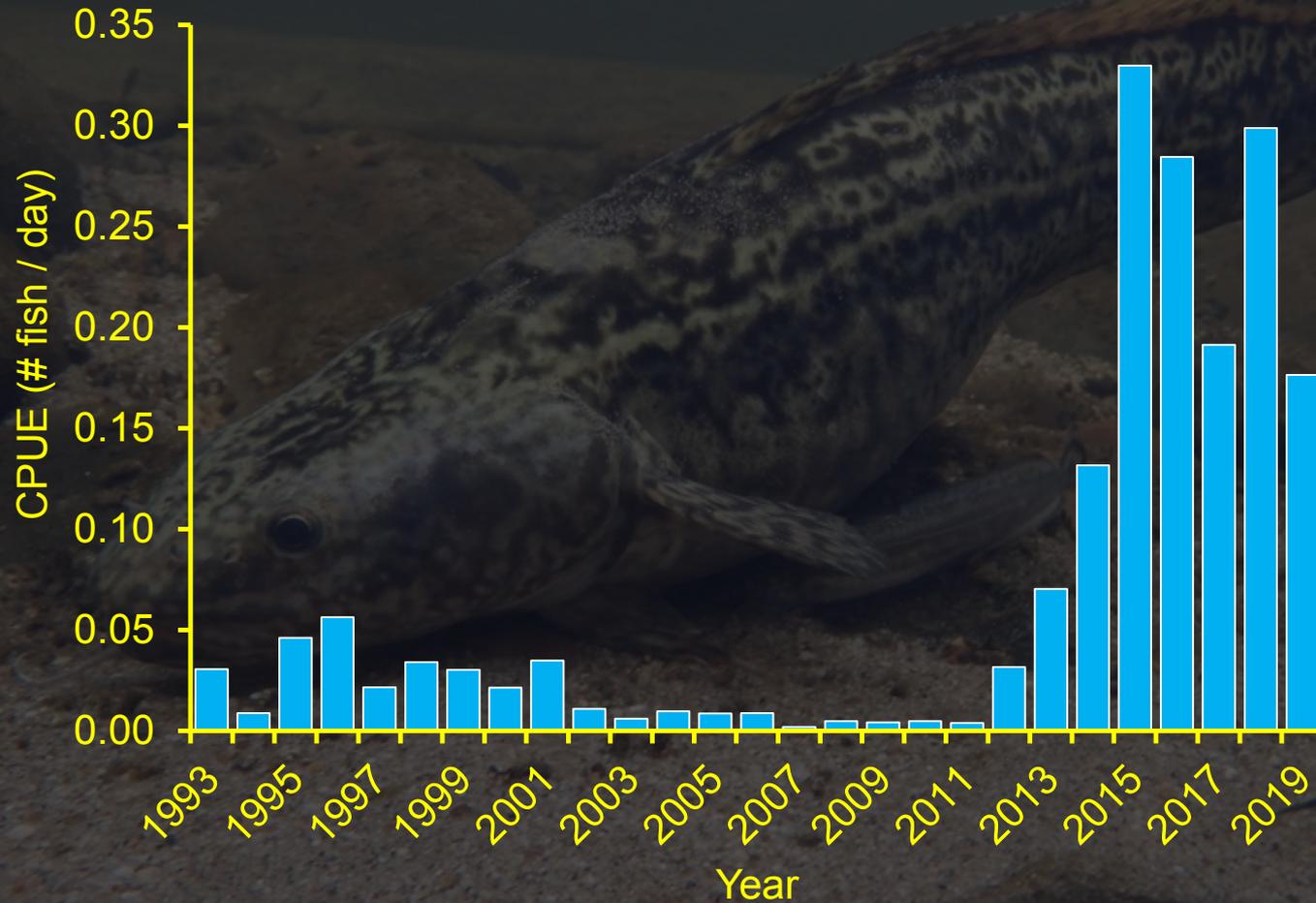
PARENTAL BASED TAGGING (PBT)



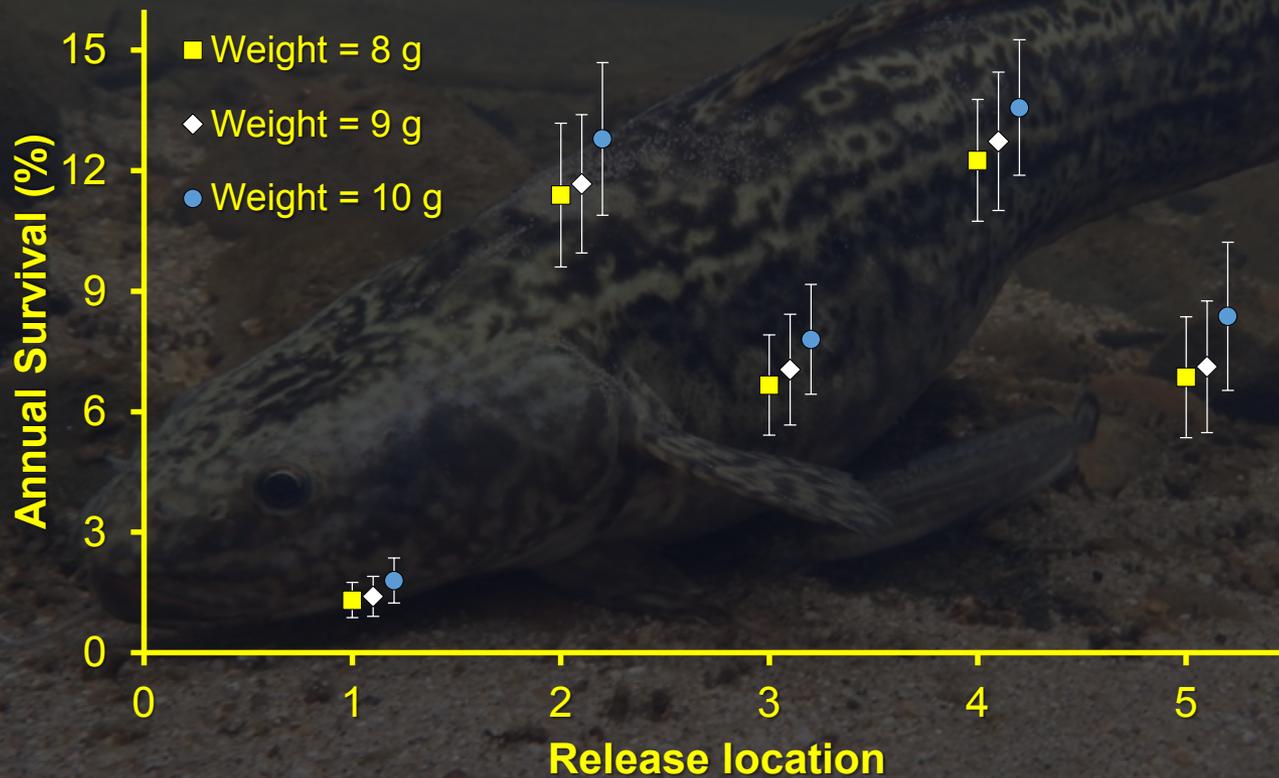
FAMILY SEPARATION IN HATCHERY



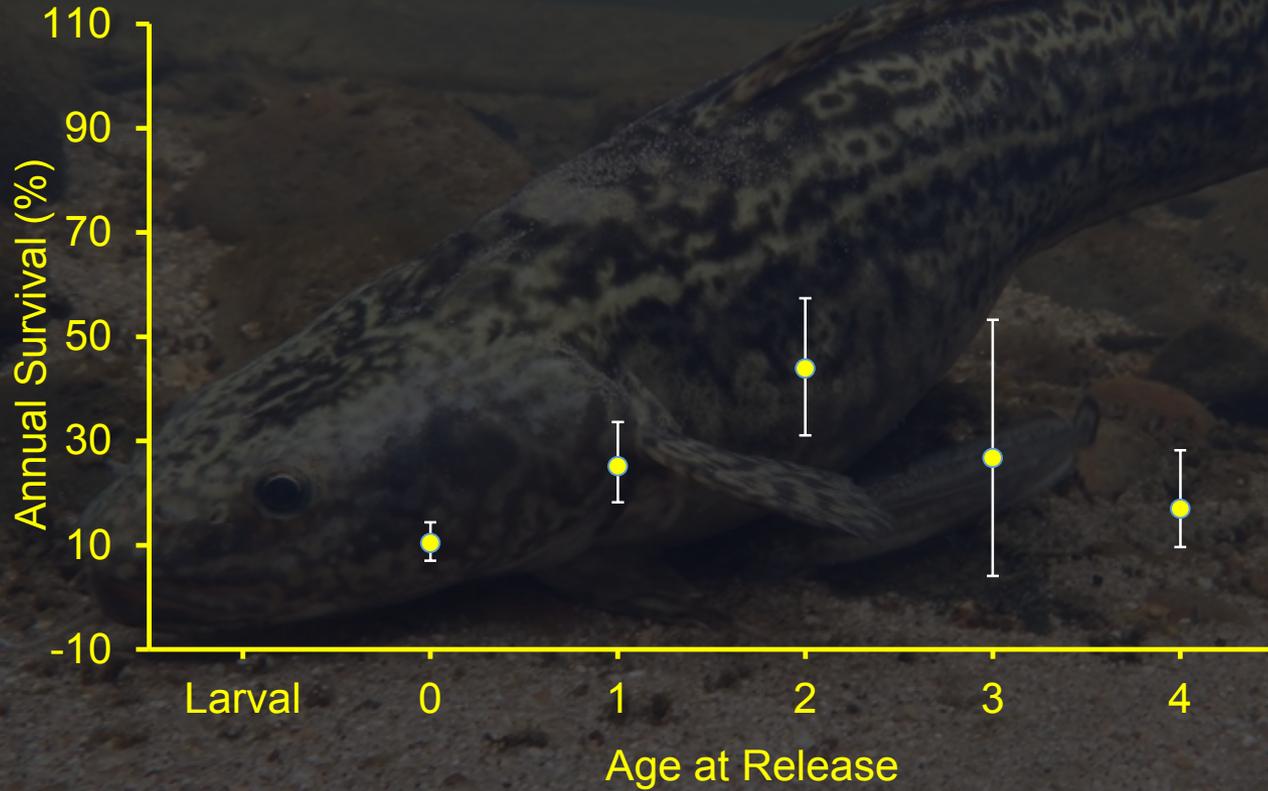
RESULTS – CATCH RATES



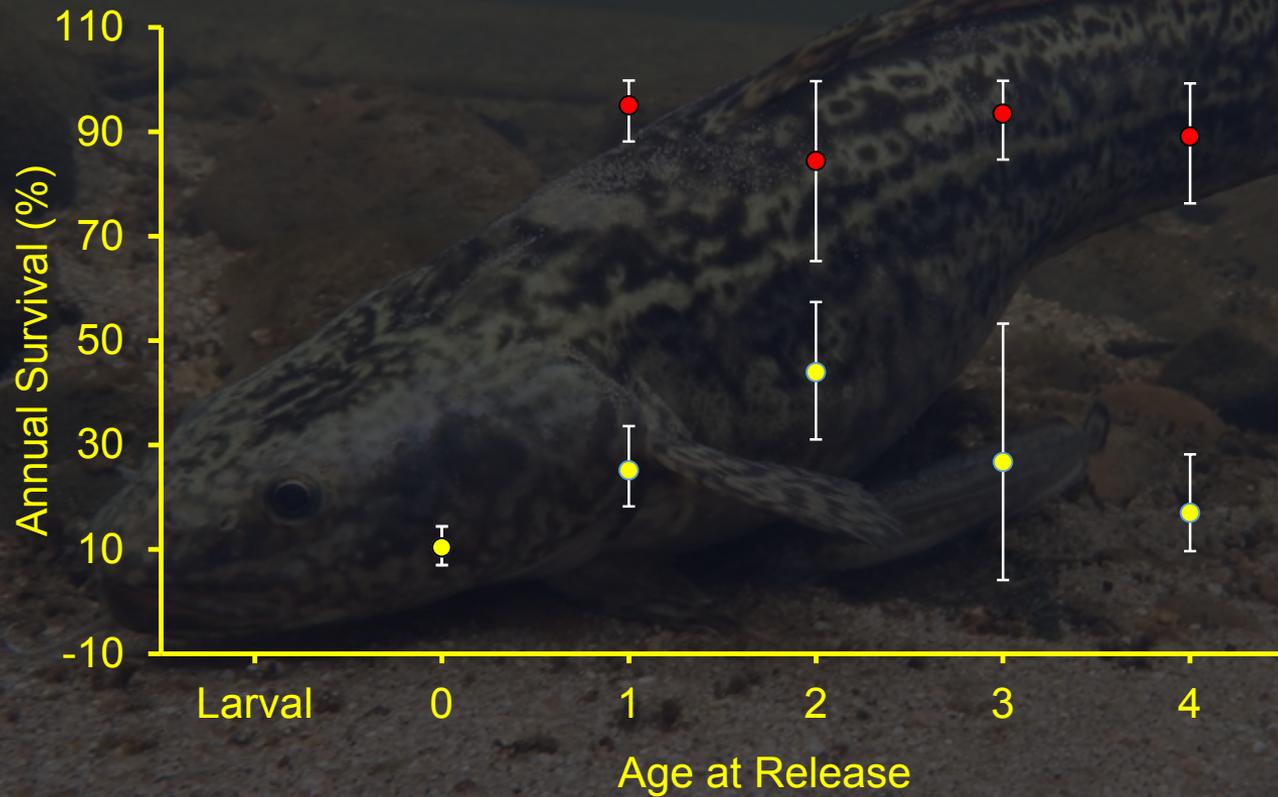
BURBOT SURVIVAL



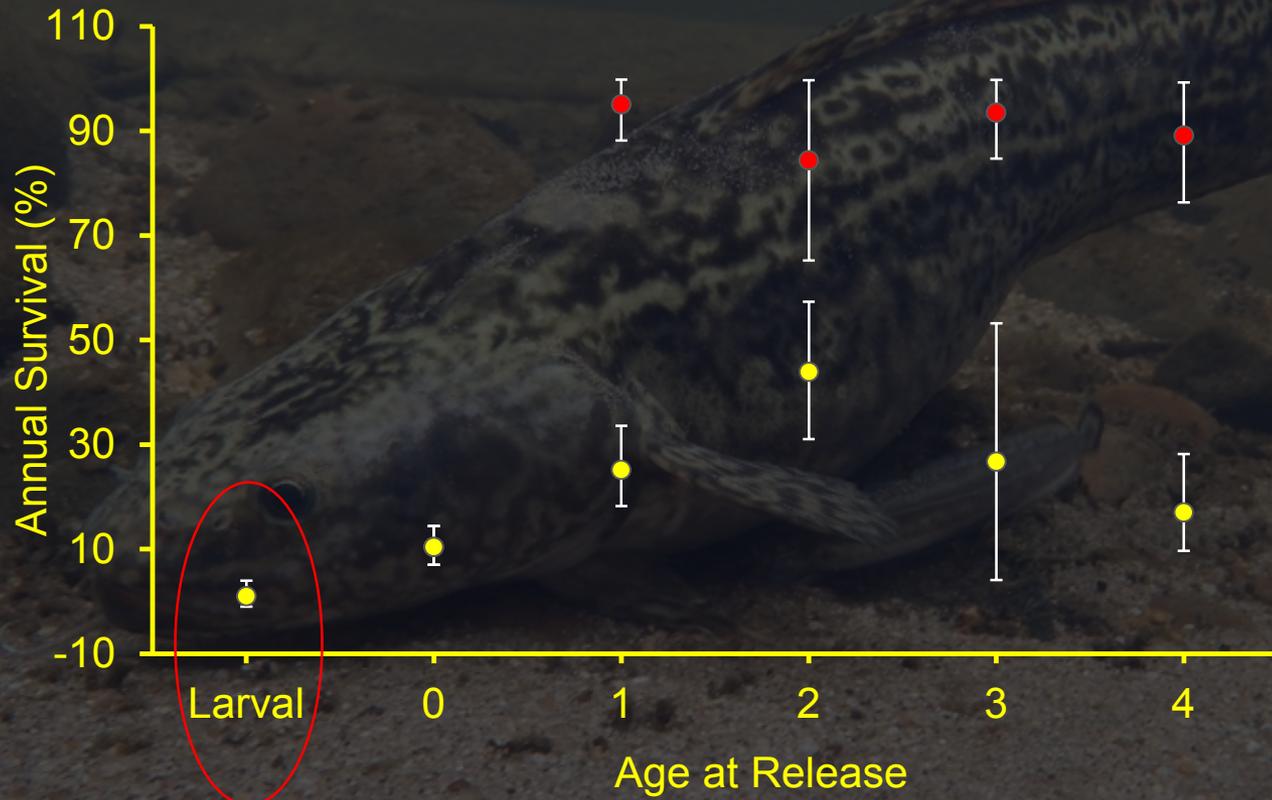
BURBOT SURVIVAL



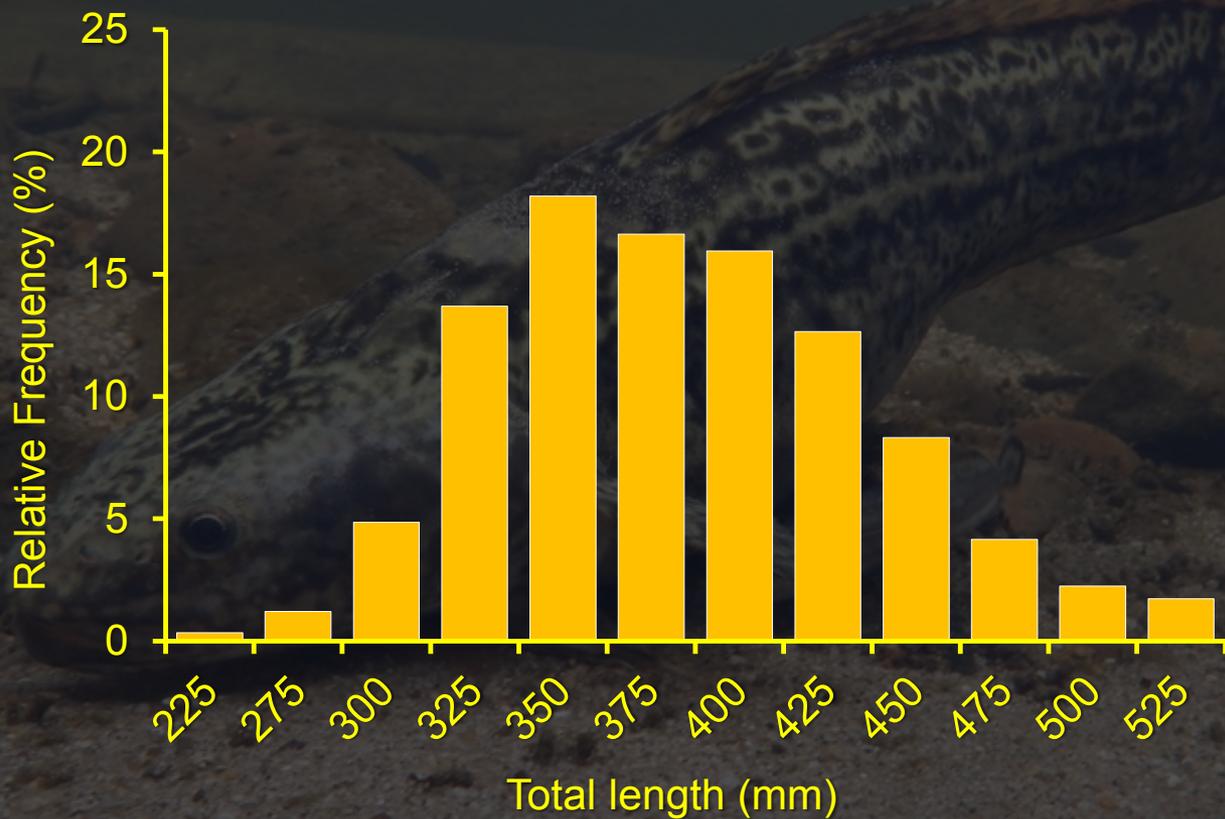
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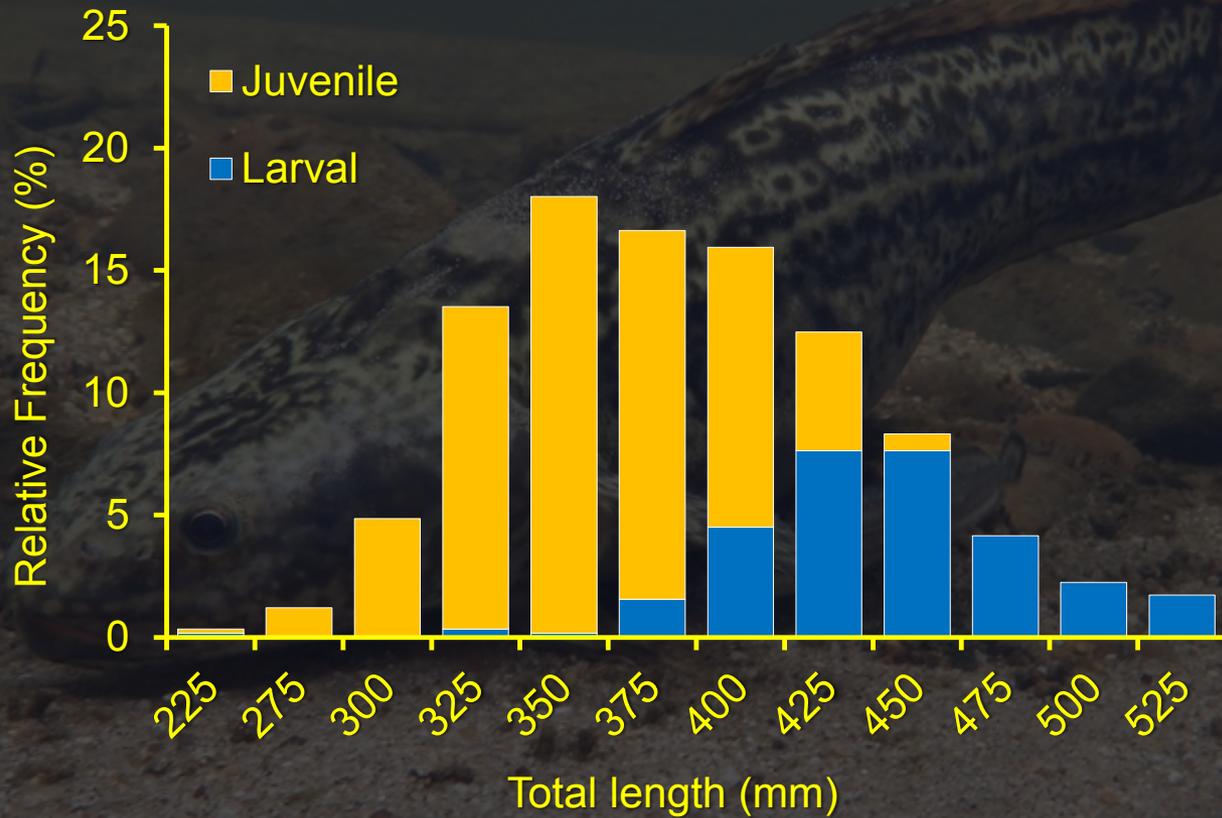
BURBOT SURVIVAL



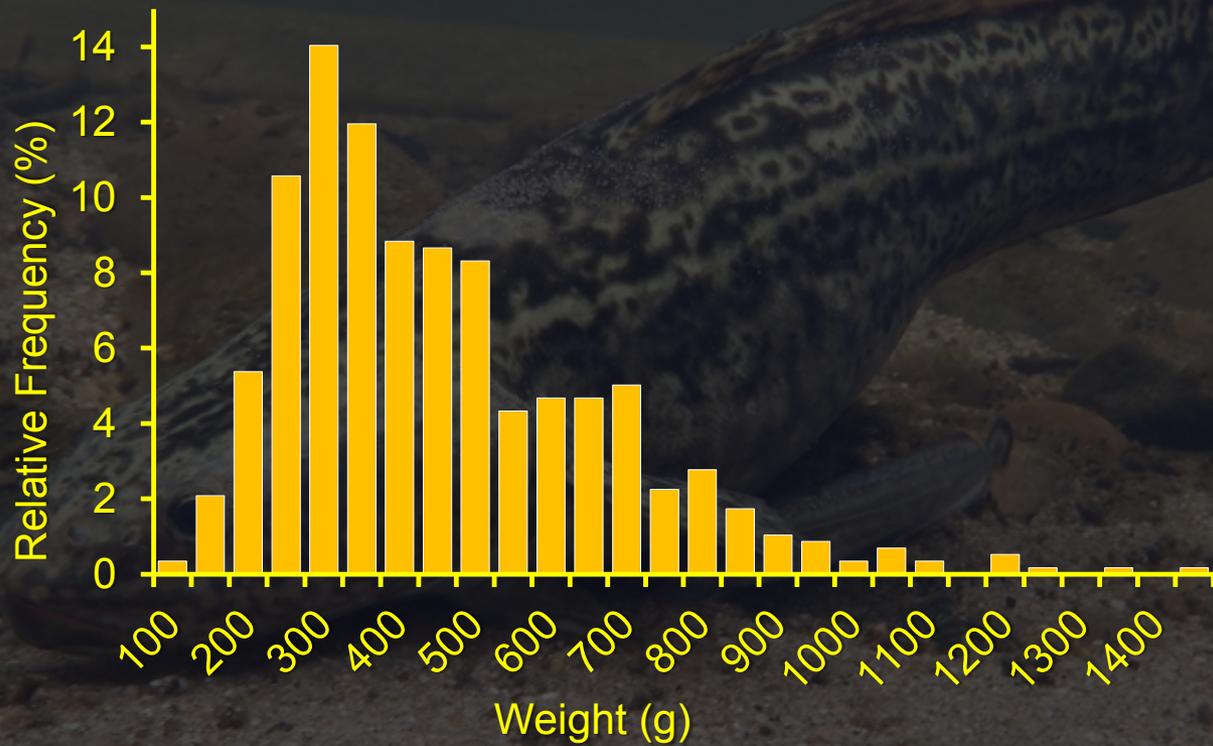
BURBOT GROWTH



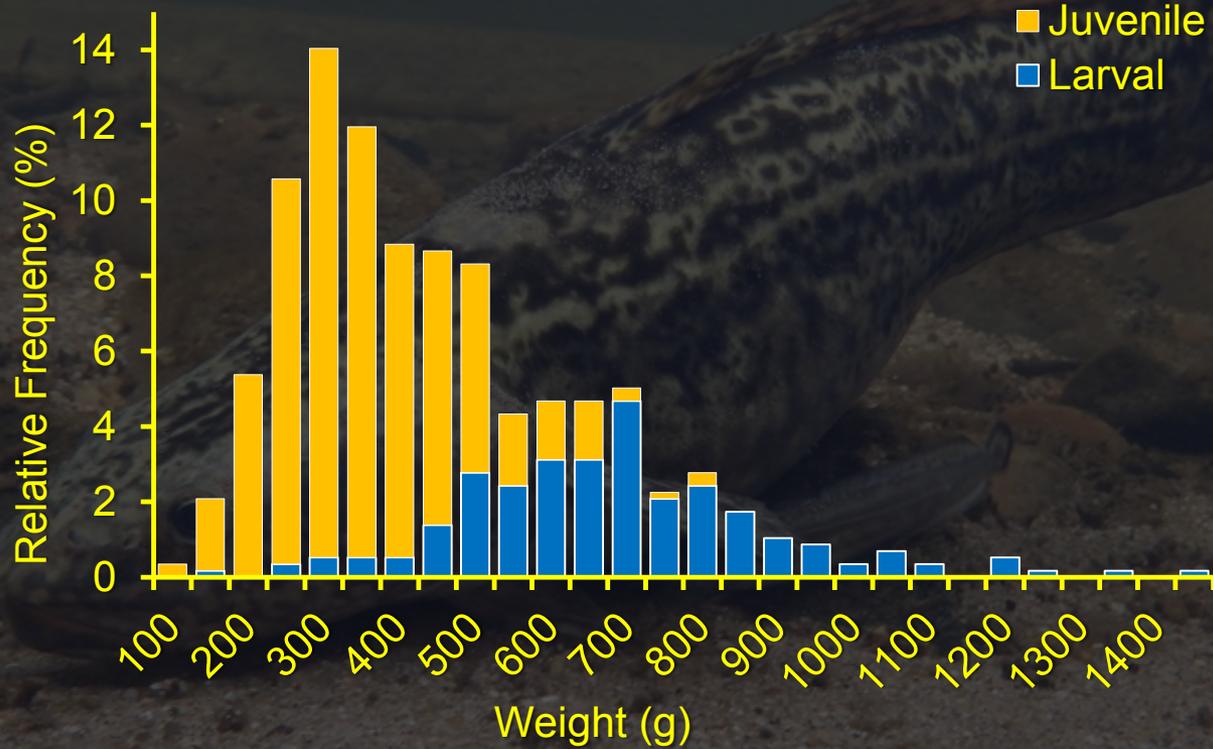
BURBOT GROWTH



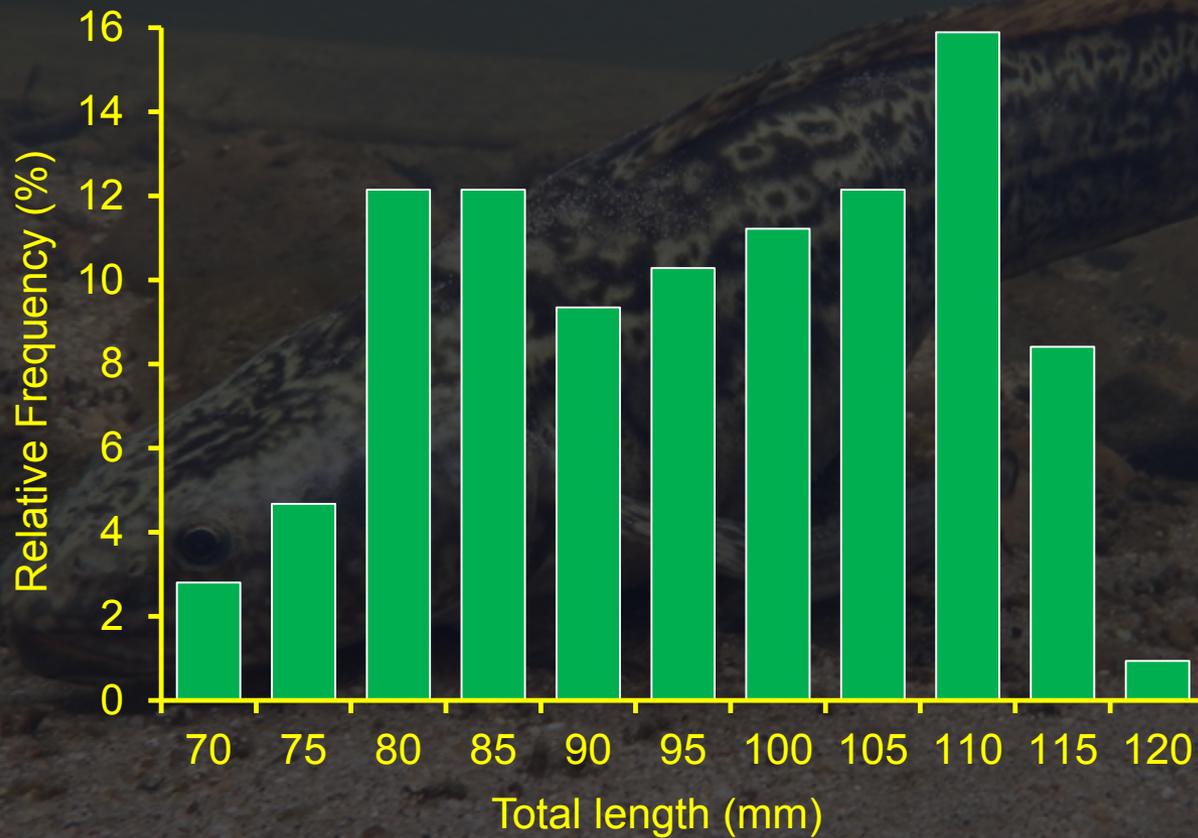
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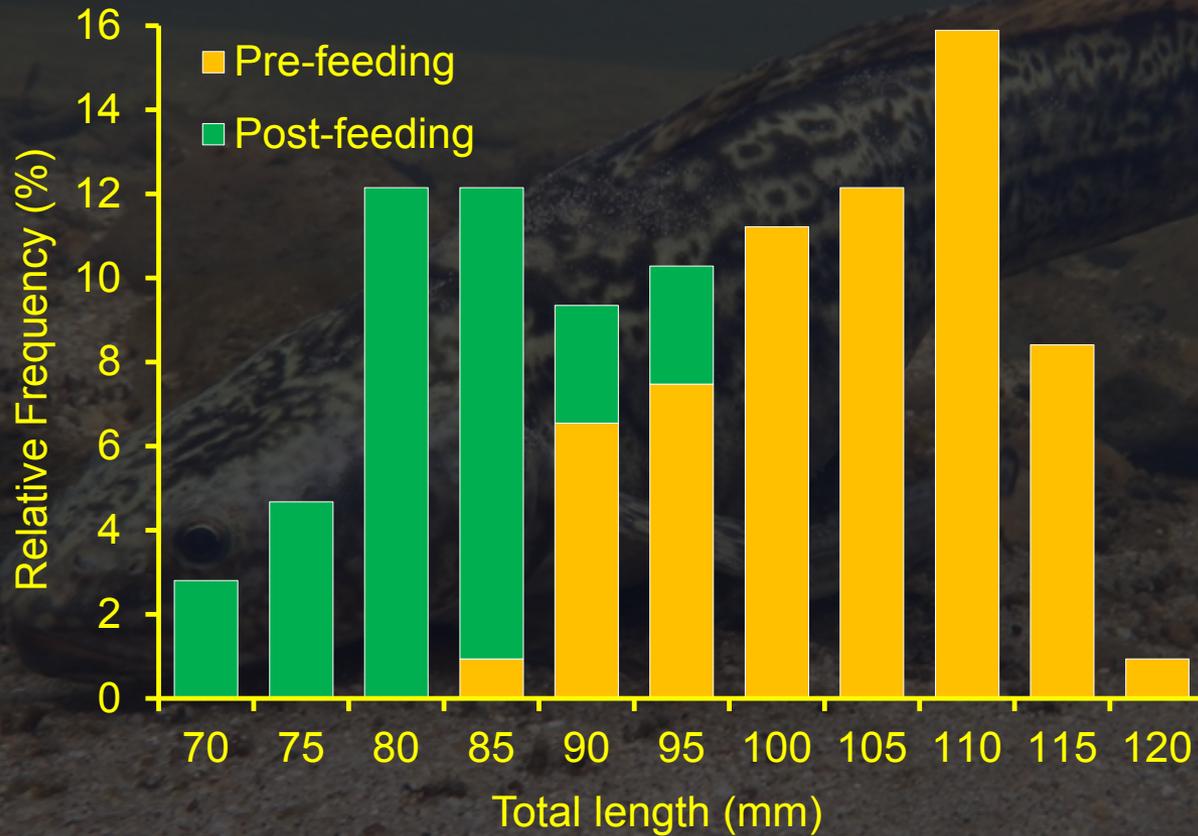
BURBOT GROWTH



BURBOT GROWTH



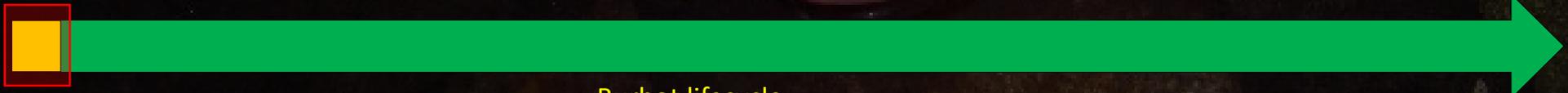
BURBOT GROWTH



BURBOT
RECRUITMENT

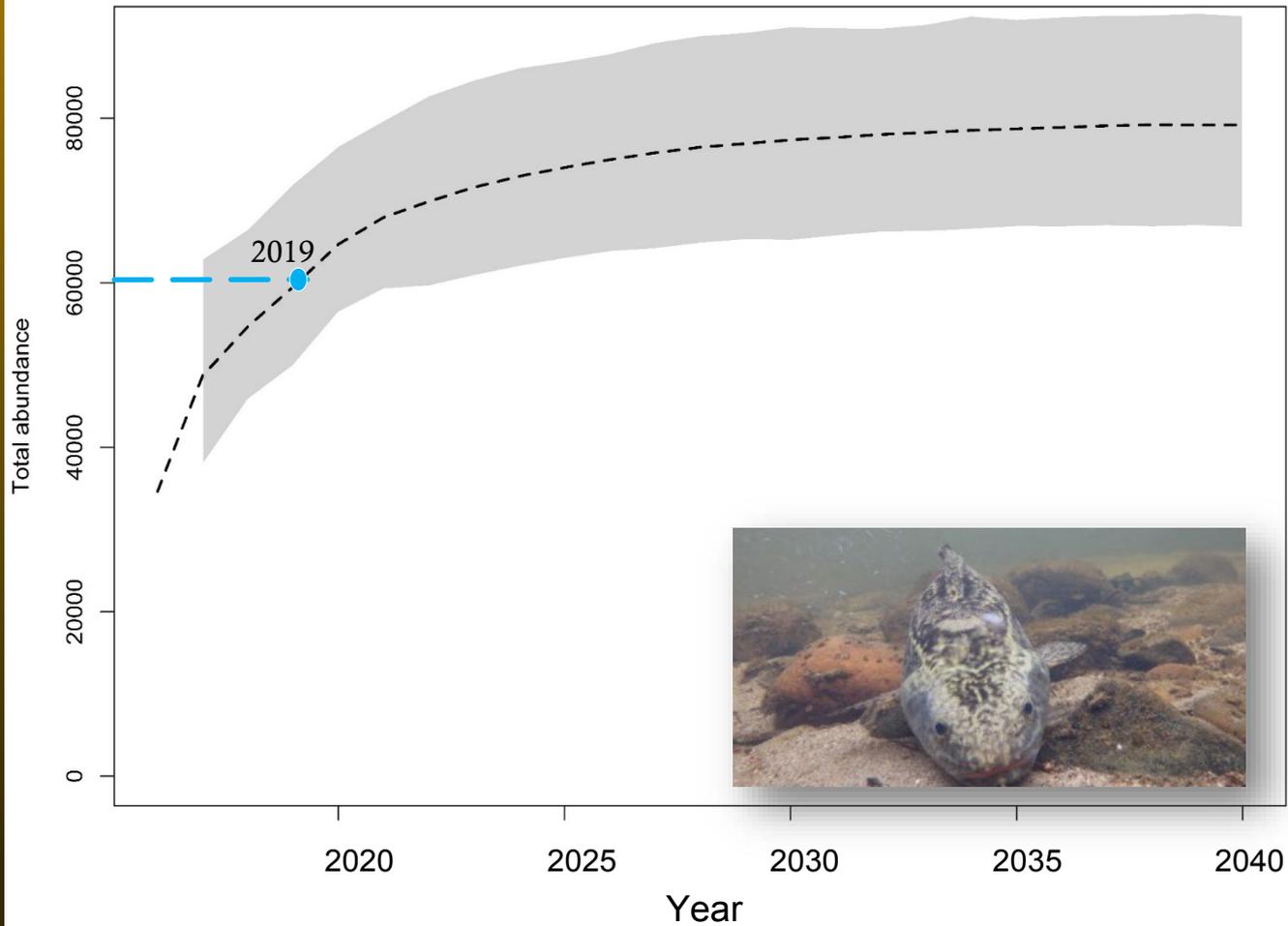


BURBOT RECRUITMENT

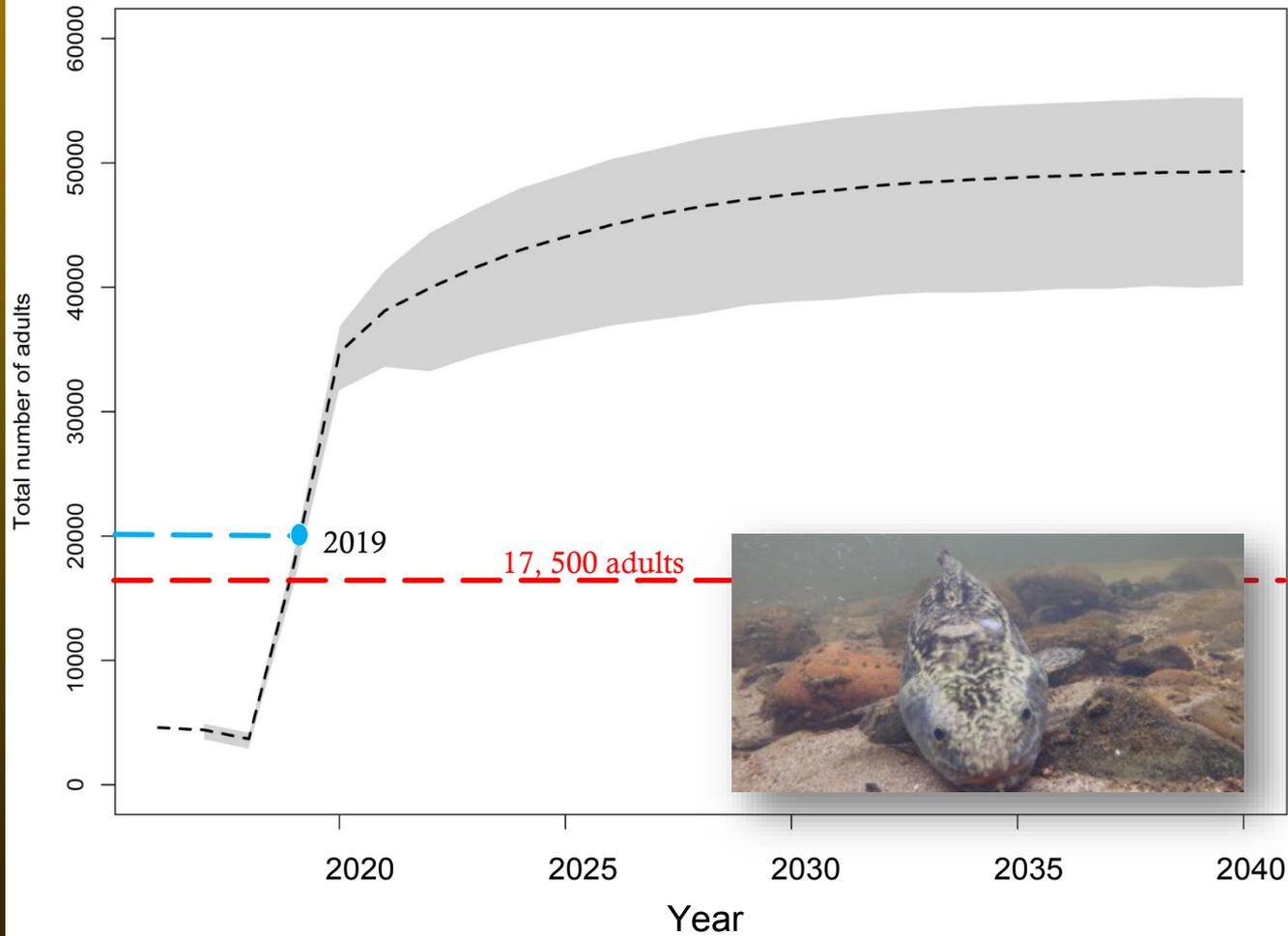


Burbot lifecycle

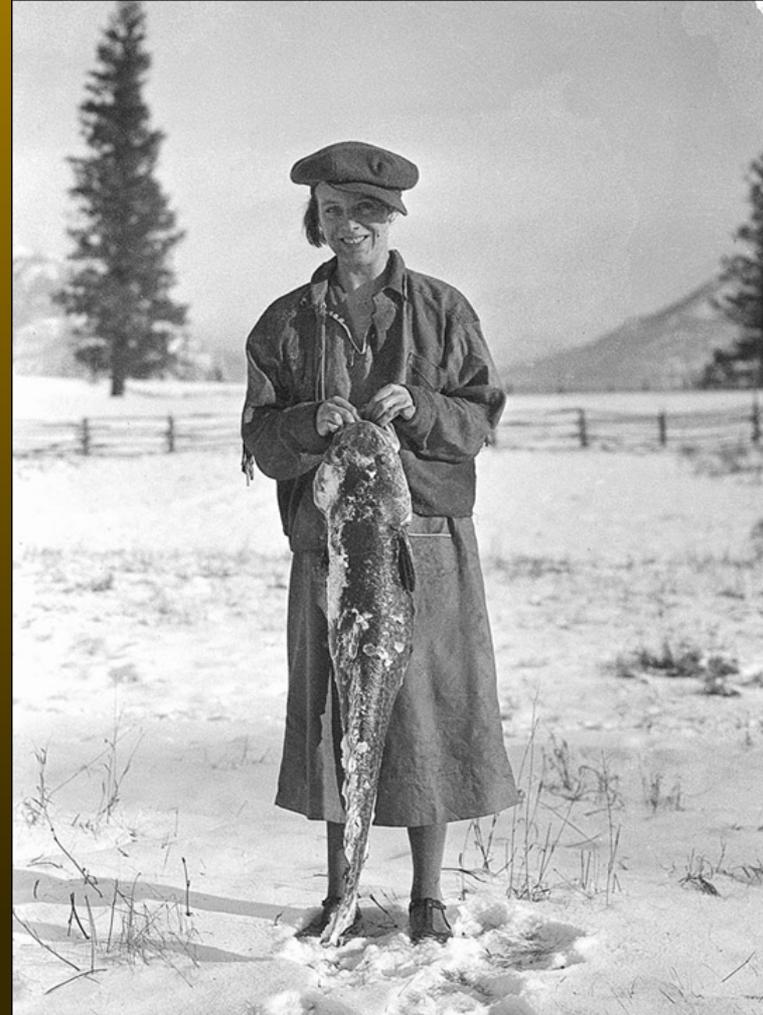
BURBOT ABUNDANCE



BURBOT ADULT ABUNDANCE



HISTORICAL BURBOT FISHERY



BURBOT FISHERY – REOPENED IN 2019



BURBOT FISHERY – REOPENED IN 2019



BURBOT FISHERY – REOPENED IN 2019



BURBOT CONCLUSIONS



Thanks to Cooperators:

KTOI

BCMFLNRO

MFWP

USFWS

USGS

USACE

Steve Dinsmore – Iowa State University

IDFG Staff

NWPCC

BPA

