

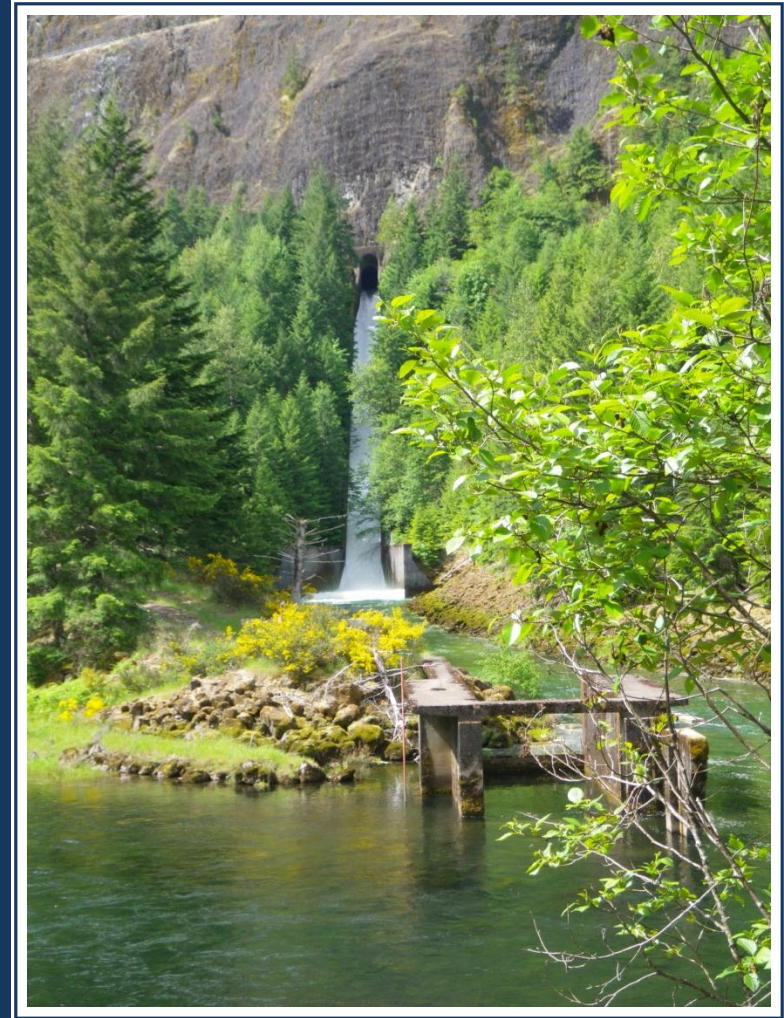
Development of wild fish surrogates for Upper Willamette River salmonids



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Need for wild surrogates for studies for the Willamette Valley Project RME Plan



Need for wild surrogates for studies for the Willamette Valley Project RME Plan

- Wild juveniles
 - Limited availability
 - Unacceptable levels of take
- Use of hatchery-origin juveniles
 - Hatchery phenotype $\neq$ wild phenotype

Development of wild surrogates for Upper Willamette River salmonids

- Goal:
 - Assess targeted rearing techniques to produce hatchery-origin fish with desired phenotypes for RM&E studies.
- Objective 1:
 - *coordinate with researchers to provide wild fish surrogates.*
- Objective 2:
 - *conduct experimental research to optimize performance of wild fish surrogates.*

Wild Fish Surrogates and the Oregon Hatchery Research Center

- Oregon Hatchery Research Center Mission Statement
 - Understand mechanisms that may create differences between hatchery and wild fish.
 - Develop approaches to manage hatchery fish that conserve and protect native fish.
 - Educate the public on the relationship between hatchery and wild fish...

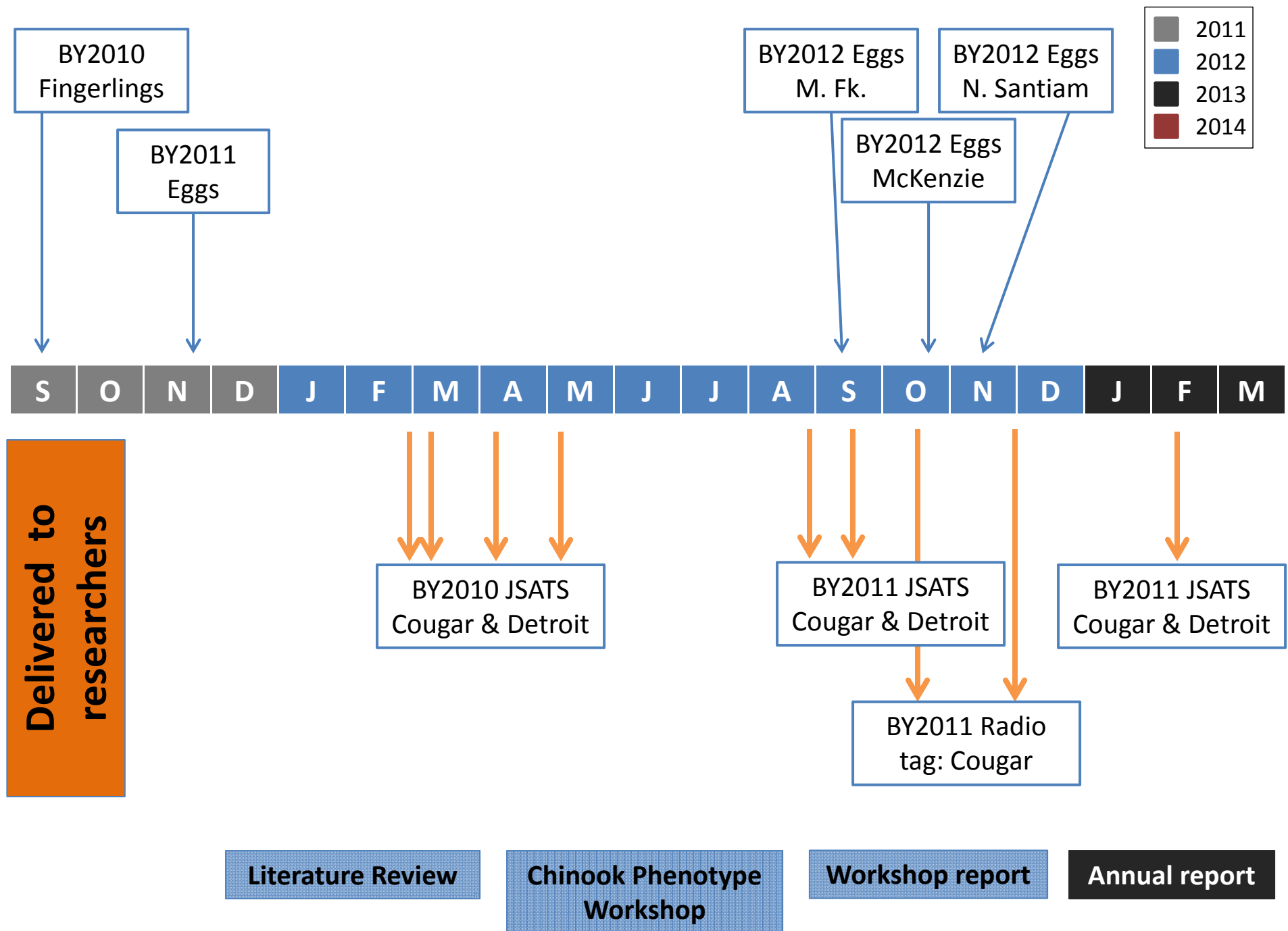


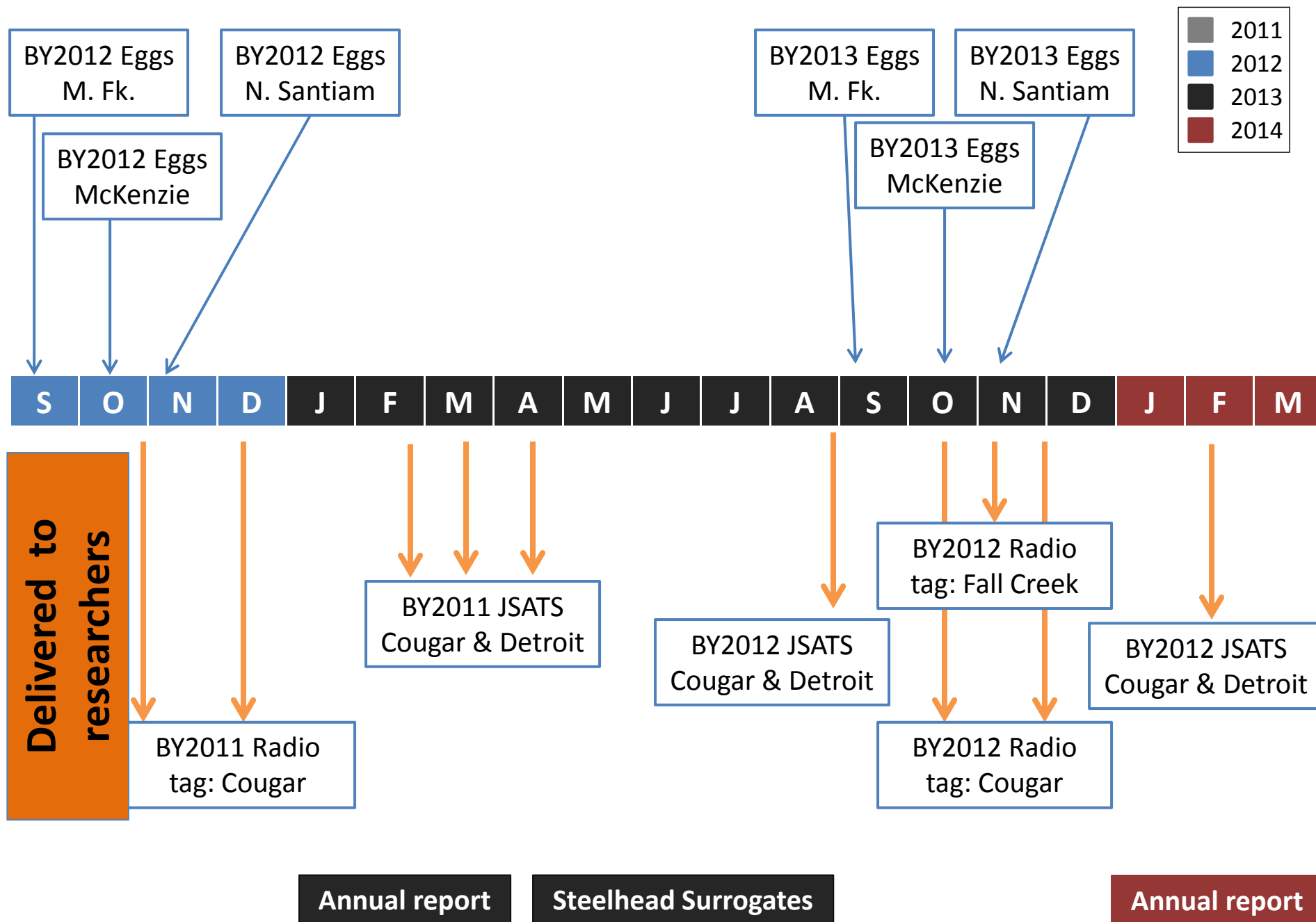
Objective 1: Provide wild fish surrogates

- Determine need
 - Desired phenotype for research objectives
 - Natal sub-basin for fish source
- Produce wild fish surrogates
 - exhibit select aspects of wild fish phenotype to best meet study needs at release.

Establishing target







Wild fish surrogates for RM&E studies

- Deliveries to researchers
 - Total = 3,860 wild fish surrogates
 - Cougar Dam
 - 10 deliveries
 - JSATS tag studies – Spring and Fall 2012
 - Radio tag study – Fall 2012
 - Detroit Dam
 - 6 deliveries
 - JSATS tagging studies – Spring and Fall 2012

Wild fish surrogates for RM&E studies

- Planned deliveries
 - Total = 6,040 wild fish surrogates
 - Cougar Dam
 - 13 deliveries
 - JSATS tag studies – Spring and Fall 2013, Spring 2014
 - Radio tag study – Fall 2013
 - Detroit Dam
 - 9 deliveries
 - JSATS tag studies – Spring and Fall 2013, Spring 2014
 - Fall Creek Dam
 - 2 deliveries
 - Radio tag study – Fall 2013

Objective 2: experimental research to optimize performance of wild fish surrogates

- Research facilities
 - Fish Performance and Genetics Lab
 - Oregon Hatchery Research Center
- Controlled studies to determine aspects of rearing necessary to produce desired phenotype
- Establish measurable criteria to evaluate wild fish surrogates



Challenge of developing wild surrogates



- Managing growth and early maturation with constraints of end user's research objectives
- Balancing equation:
environment + diet = growth + condition + life history tactic

Challenge of developing wild surrogates

Fall Creek Reservoir



Experimental research

Rearing protocol + Phenotype = Optimize surrogates

Incubation temperature
Incubation substrate
Rearing temperature
Cover
Substrate
Density
Circular tank
Trough
Artificial stream
Diet
Feeding regime
Behavioral phenotypes

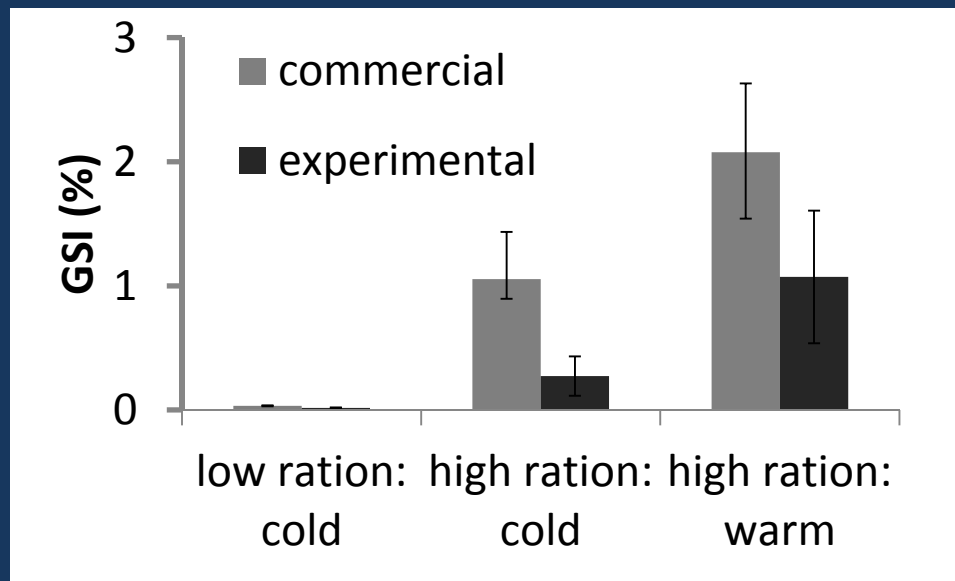
Growth patterns
Maturation
Movement
Morphology
Coloration
Fin condition
Lipid content
Fatty acid composition
Stress response
Brain development
Metabolic rate
Migratory patterns



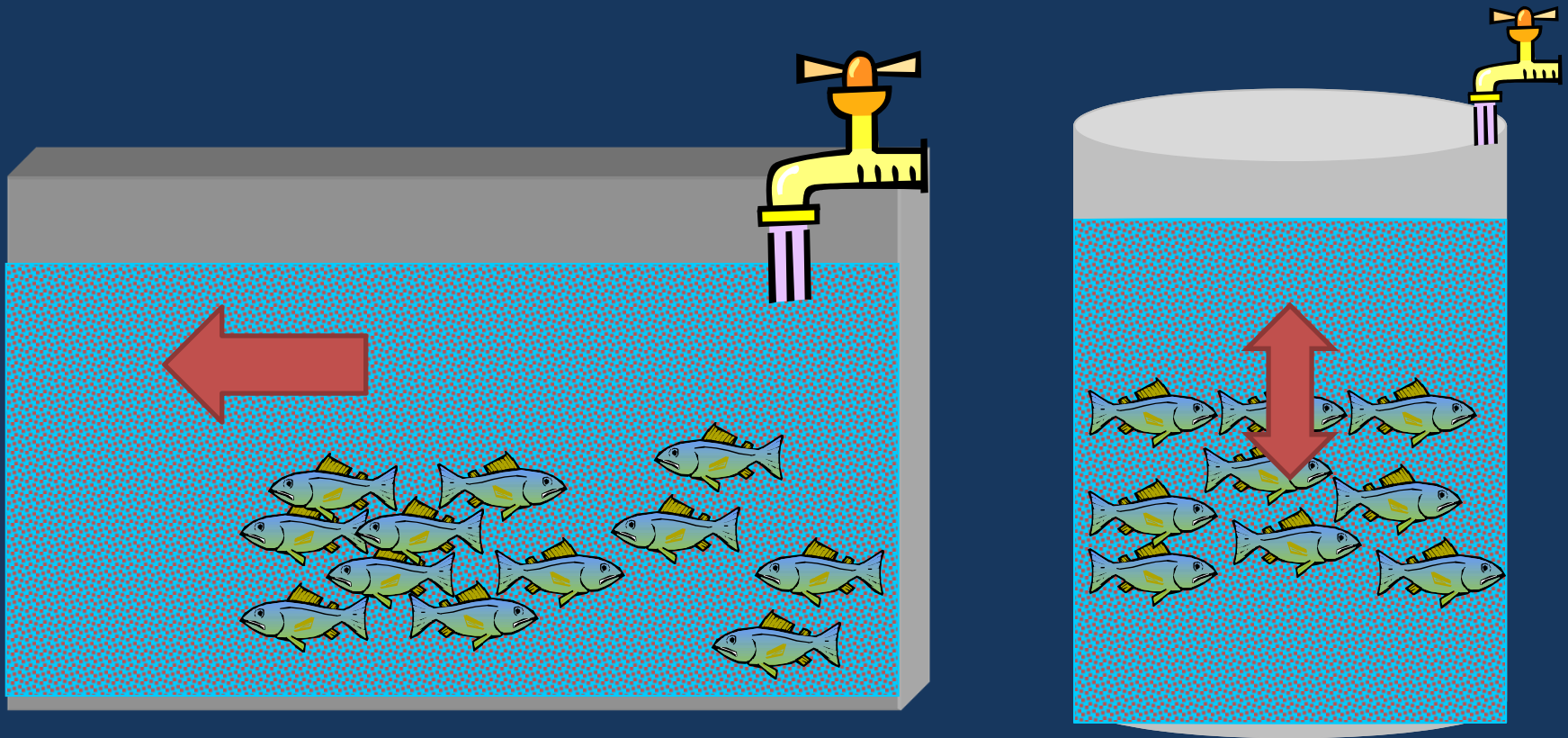
- What aspects of rearing protocol are necessary to produce desired phenotype for wild fish surrogates?

Assessment of experimental diets with low lipid content

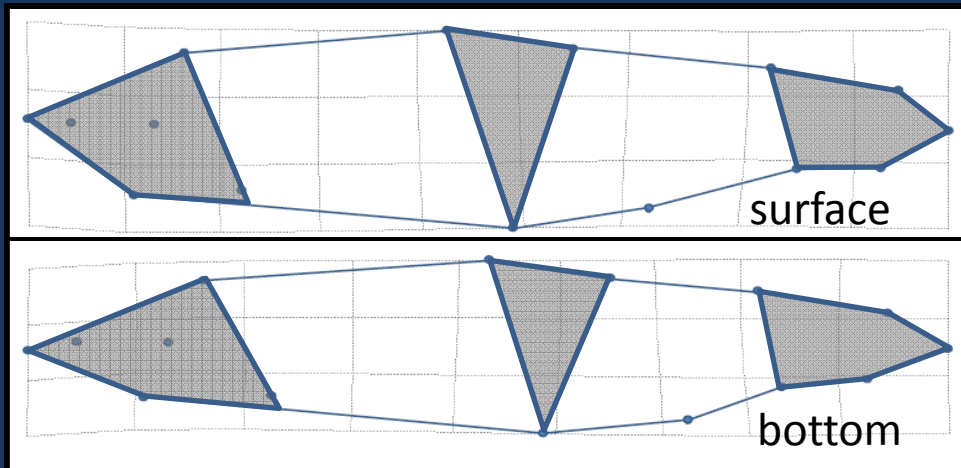
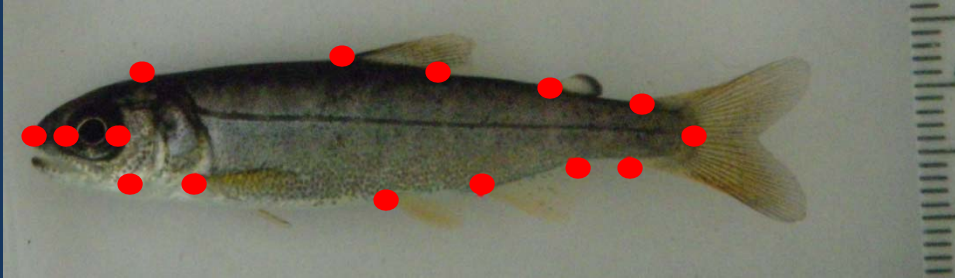
- Modulated growth
- Lower fat index
- Reduced precocity



Relationship between life history tactics and behavioral phenotypes early in life



Vertical position in tanks of first-feeding fry



Morphological variation at 60 mm FL

- Surface vs bottom
 - Shorter head
 - Smaller eye
 - Deeper body
 - Shorter caudal peduncle

Downstream movement of fry after swim-up



- What abiotic or biotic stimuli contribute to downstream movement?

Evaluating surrogates

Wild fish



Wild fish surrogates



Evaluating surrogates: behavior

- **Test movement behavior**
 - Wild fish surrogates compared to hatchery standard
 - 3 week study



Evaluating surrogates: behavior

- Downstream movement associated with rain events.
- Downstream movement at night.
- Movers were significantly larger than stayers and missing fish.
- Wild fish surrogates more likely to move at all sizes compared to the hatchery standard.



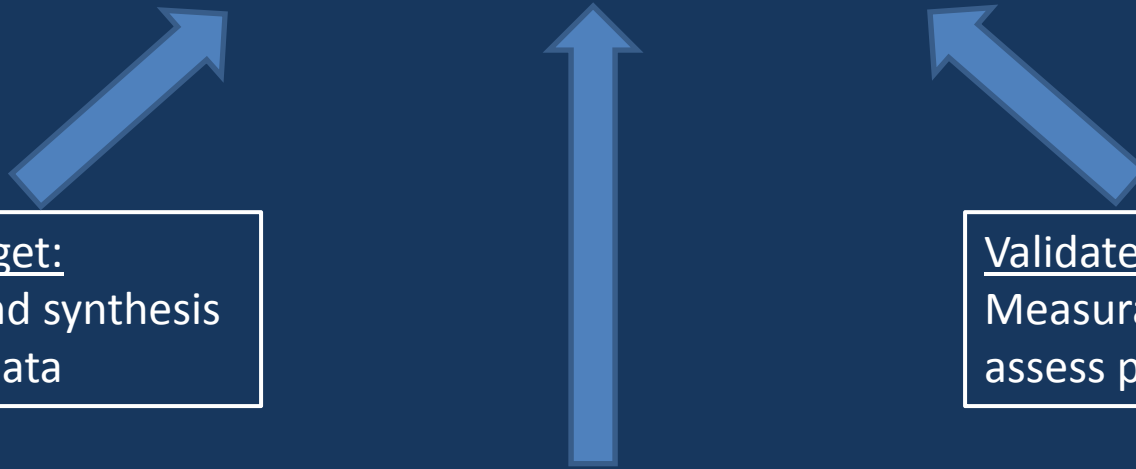
Future plans

Provide wild fish surrogates
with desired phenotypes

Establish target:
Collection and synthesis
of wild fish data

Validate surrogates:
Measurable criteria to
assess performance

Experimental research:
Determine appropriate
rearing protocols



Collaborators and Partners

- US Army Corps of Engineers
- Fish rearing
 - Oregon Hatchery Research Center
 - Oregon State Fish Hatcheries
- Diet
 - Rick Barrows, Wendy Sealey, Gibson Gaylord: *Bozeman Fish Technology Center*
 - Ann Gannam, Ron Twibell: *Abernathy Fish Technology Center*
- Wild fish targets
 - Kirk Schroeder, Luke Whitman, Ben Clemens, Fred Monzyk, Jeremy Romer: *ODFW Corvallis Research Lab*
 - Greg Taylor, Todd Pierce: *US Army Corps of Engineers*

Questions

