

# Adult steelhead evaluations in Imnaha River tributaries

William Young, Jocelyn Hatch  
Nez Perce Tribe

Department of Fisheries Resources Management





# Project Goals

- Understand the impacts of the LSRCP Imnaha River hatchery steelhead program relative to Imnaha River population status
- Understand the abundance and population composition of adult steelhead escapement in lower Imnaha River spawning aggregates



# Relationship with Projects

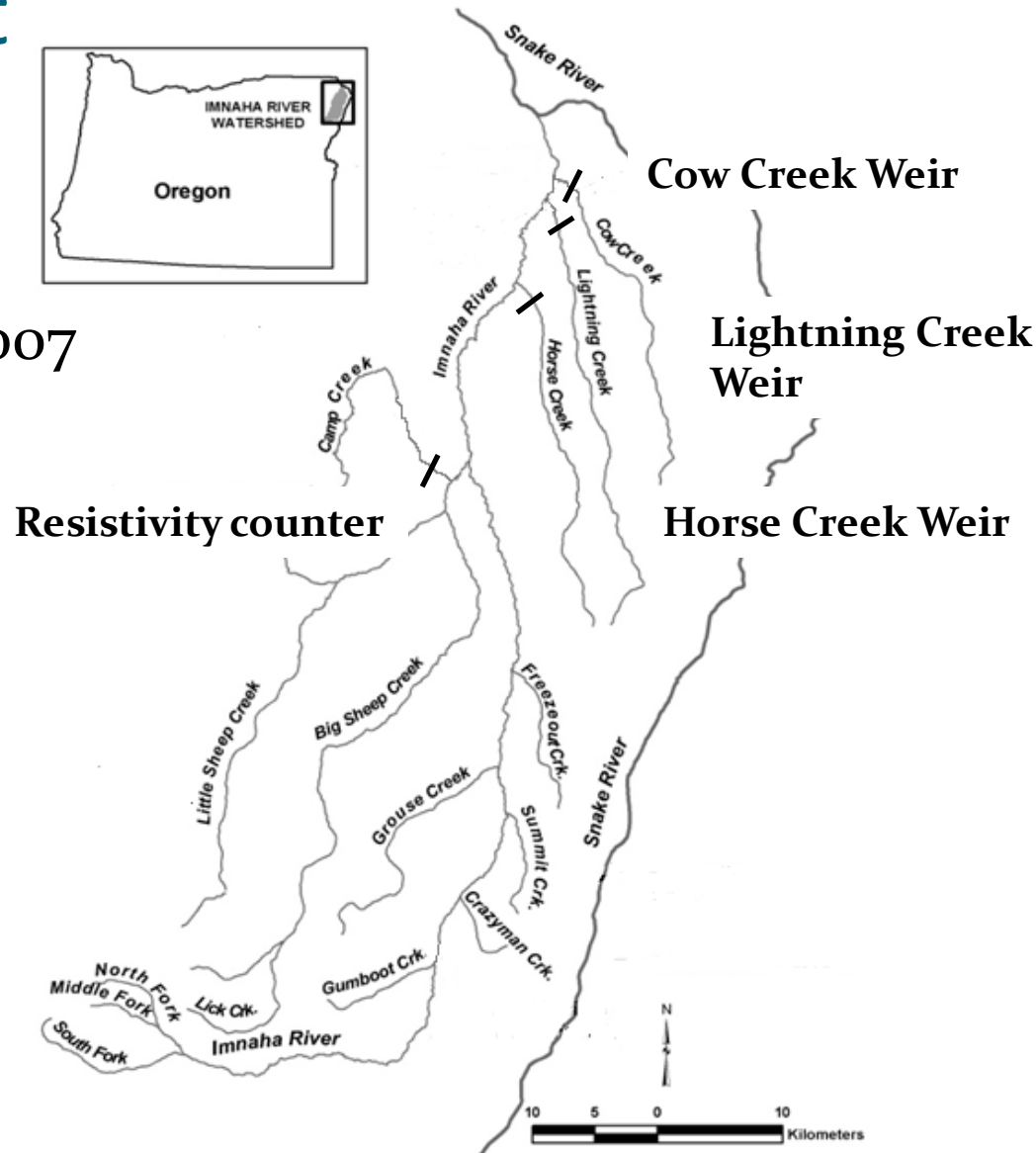
- Imnaha River Adult Steelhead Monitoring Project (ISAM)
  - BPA - Adult steelhead evaluations in upper Imnaha River tributaries
- Integrated Status and Effectiveness Monitoring Project (ISEMP)
  - BPA - Estimate NOR adult abundance to the entire Imnaha River basin



# History of the Project

## • Weir Operations:

- Cow Creek, 2001 – 2007
- Lightning Creek, 2000 – 2007
- Horse Creek, 2008 – 2012
- Camp Creek, 2008 – 2009





# Objectives

1. Operate weir during adult migration/spawning period (March 1 – June 15)
2. Collect biological information on captured fish
3. Conduct mark/recapture analysis

# Methods: Data collection

- Picket or floating panel weirs (March 1 – June 15)
- Captured fish in separate upstream and downstream box
- Collect biological information
  - Fork length
  - sex
  - Scale sample
  - Tissue sample for DNA analysis









## Methods: Annual abundance estimates

- Uniquely marked fish captured migrating upstream and downstream at the weir
- Documented the recapture of marked and unmarked fish
- Mark/recapture analysis using Peterson estimators



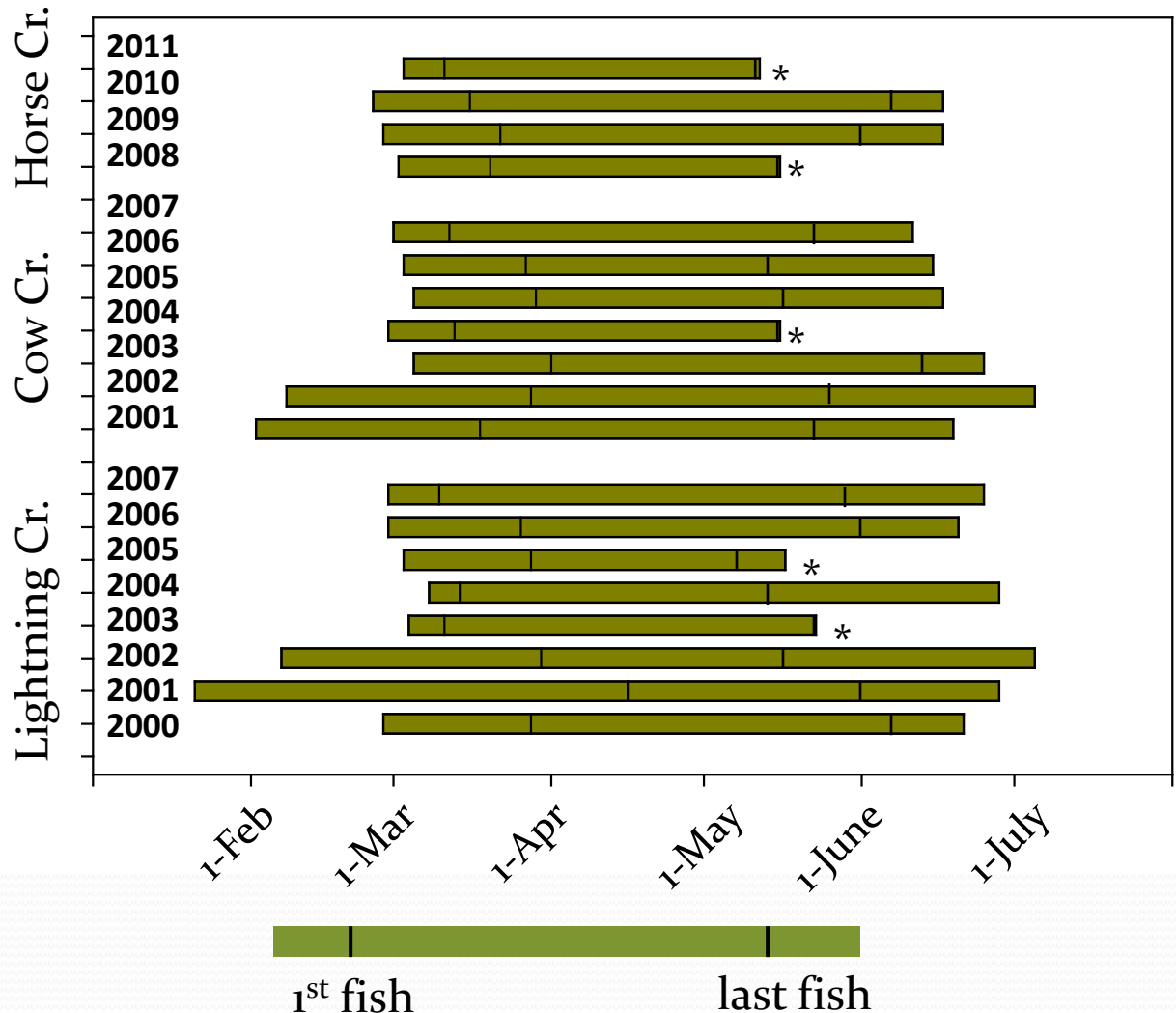


# Performance Measures

- Escapement (Spawner abundance)
- Hatchery fraction
- Size at return
- Adult sex ratio
- Migration timing
- Age at return (Scale analysis; Cow and Lightning)

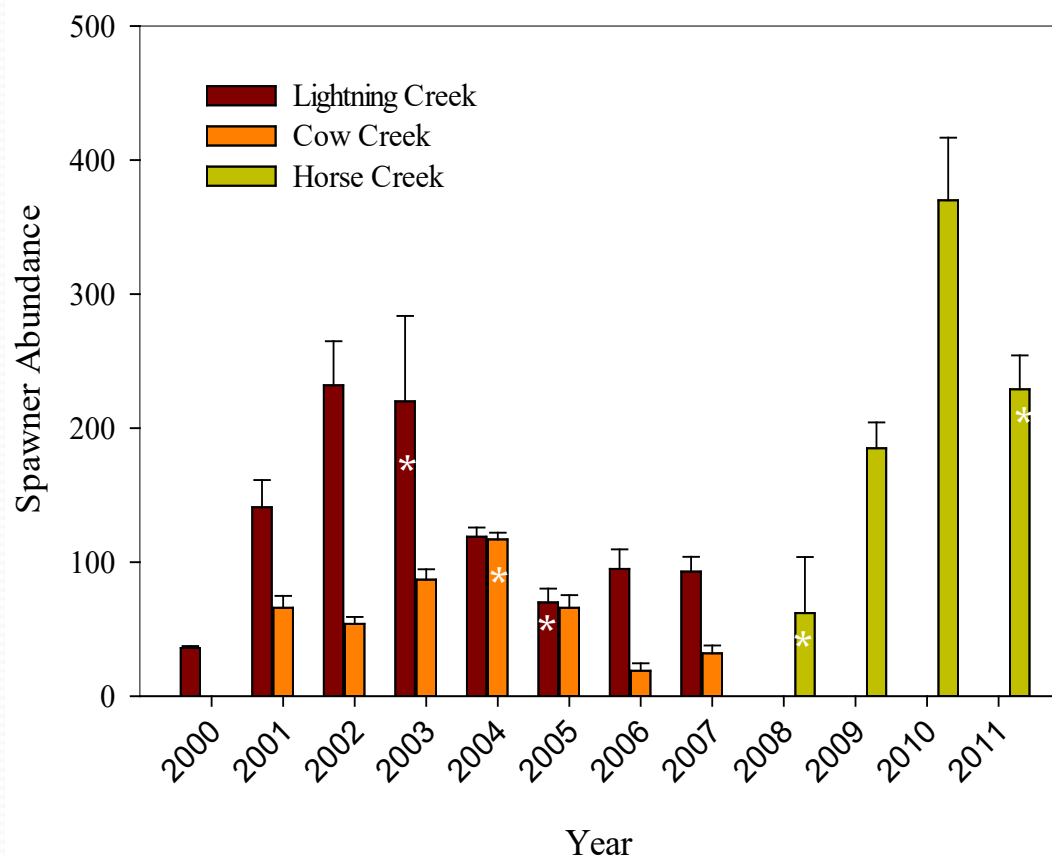
# Weir operation and efficiency

- Weir installation
  - March 1,
- weir removal
  - 10 days after last fish (June 15)
- \*5 years high water limited operations
- Ave. down time
  - Lightning Creek
    - 6 days
  - Cow Creek
    - 3 days
  - Horse Creek (floating weir)



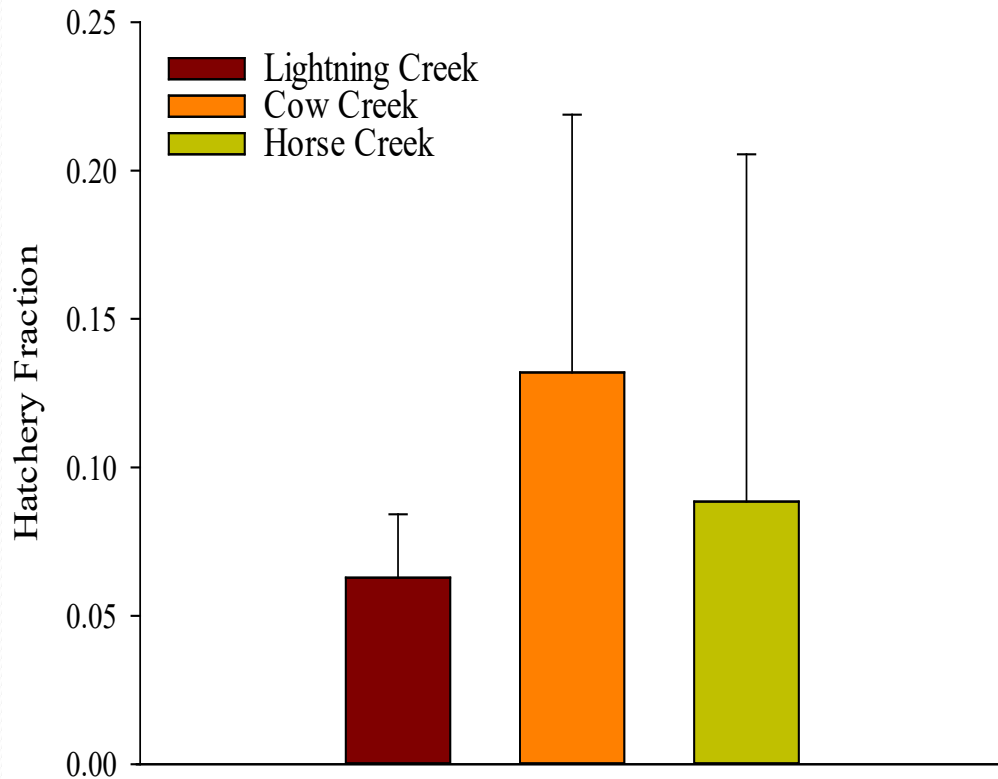
# Results: Escapement

- Steelhead returns were highly variable
- Average returns (C.V.)
  - Cow Creek = 77 (0.154)
  - Lightning Creek = 126 (0.168)
  - Horse Creek = 228 (0.175)





# Results: Hatchery Fraction

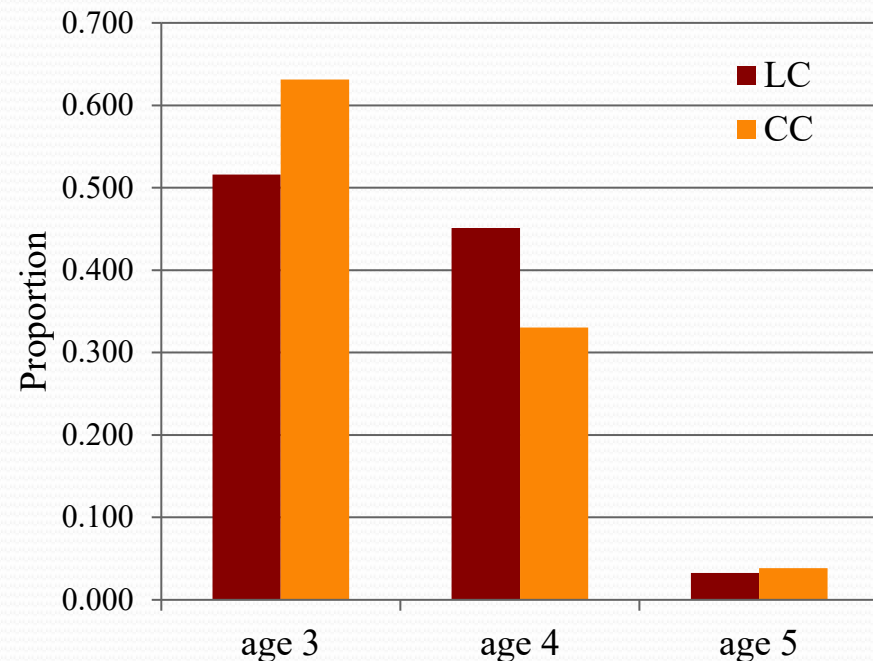


## Annual number of trapped hatchery fish

	CC	LC	HC
2000		2	
2001	4	2	
2002	16	8	
2003	5	7	
2004	21	8	
2005	5	3	
2006	3	3	
2007	3	5	
2008			10
2009			3
2010			4
2011			7

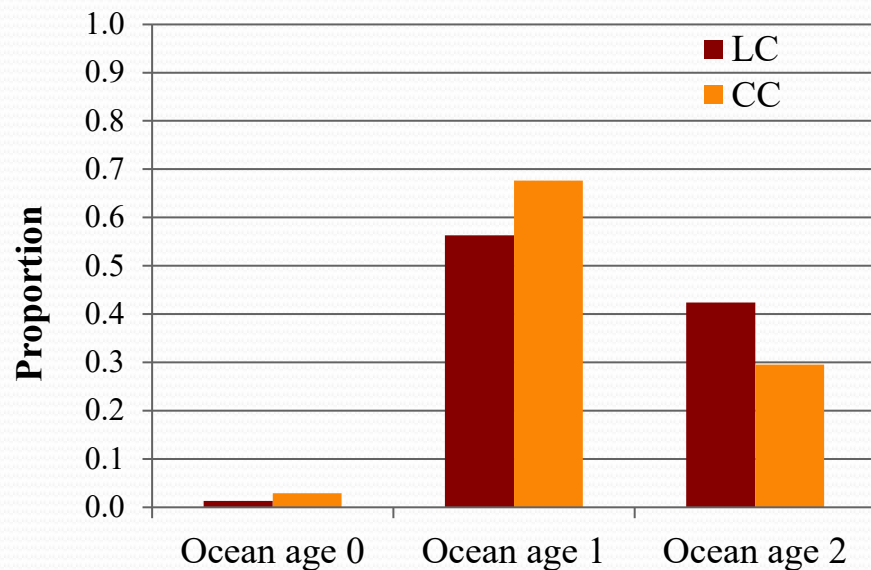
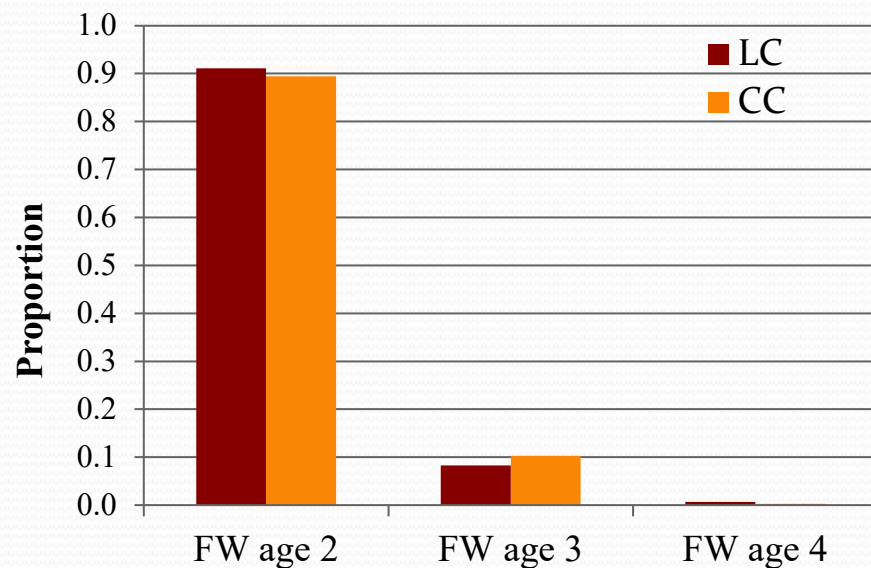
## Results: Age at return

- Dominant age 3 steelhead in both streams
- No difference between males and females for total age
- Significantly younger average age at return for Cow Creek steelhead;  $P < 0.022$



## Results: Age at return

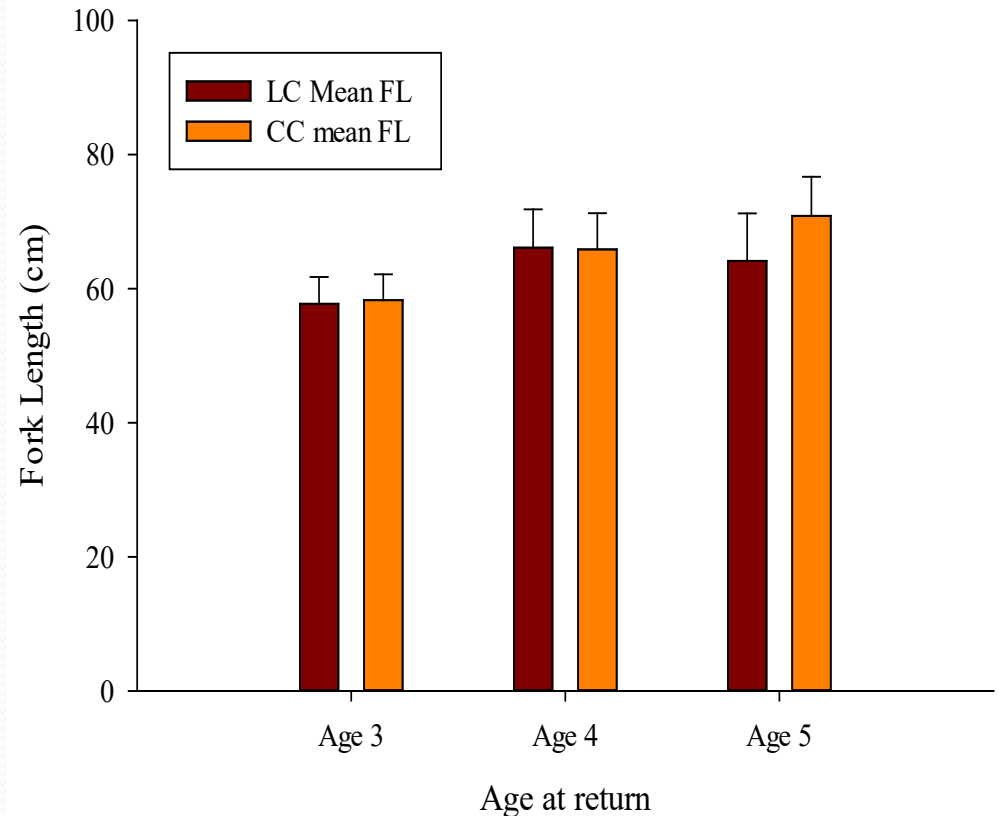
- Freshwater age
  - Predominantly age 2
  - Similar in Cow and Lightning Creeks
- Ocean age
  - Both streams had higher proportions of 1 ocean fish
  - Significantly higher proportion of 2 ocean fish in Lightning Creek





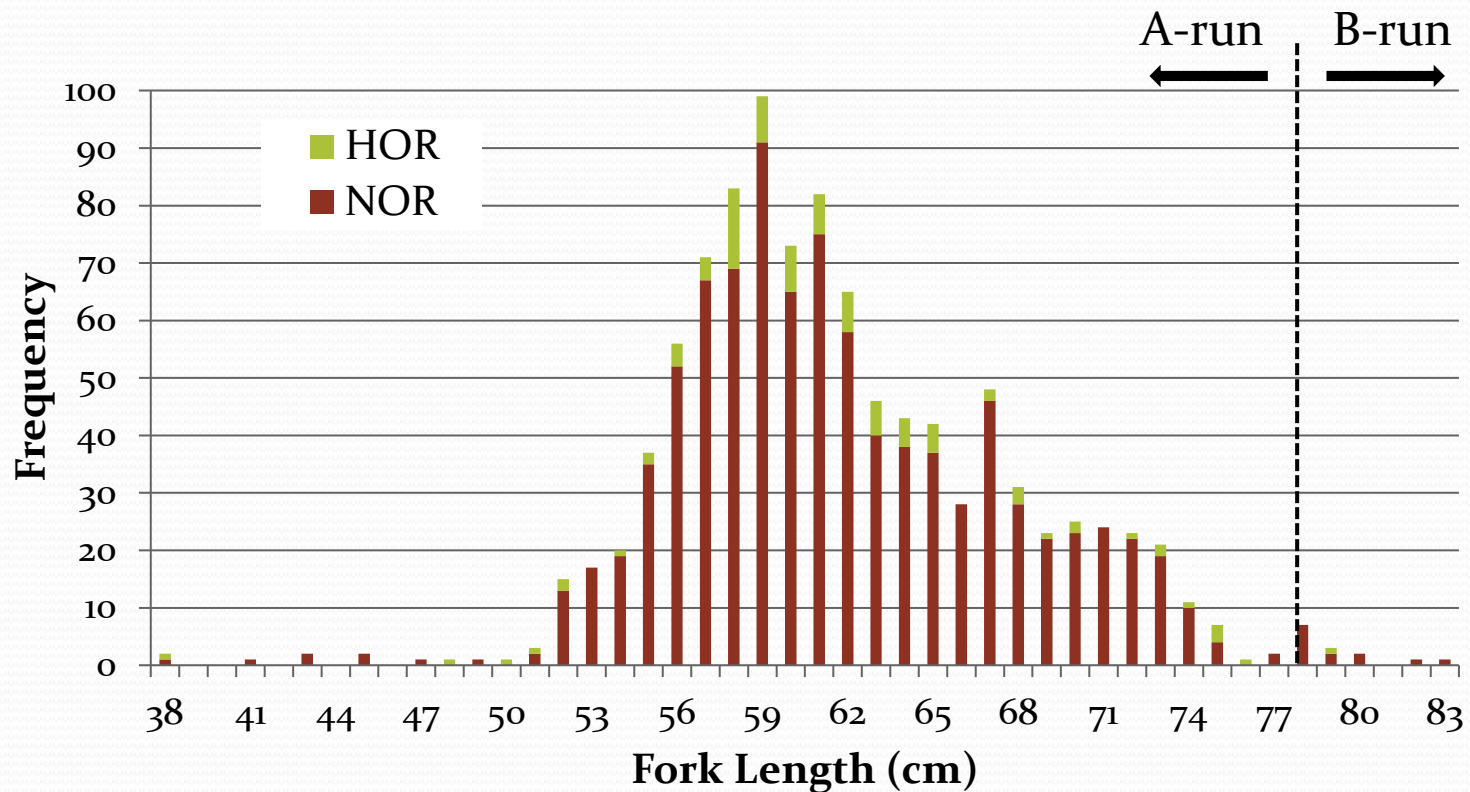
# Results: Size at return by age

- No difference between males and females
- No difference between LC and CC



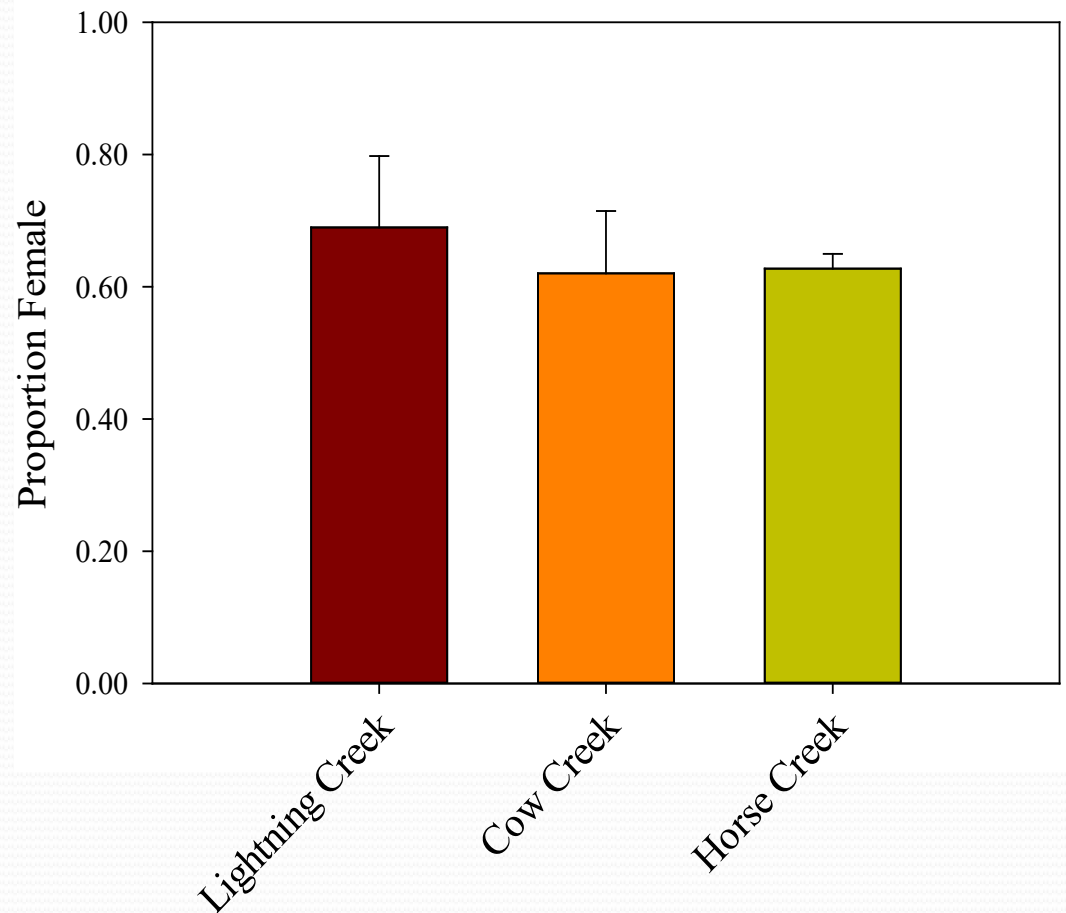
# Length distribution

- Similar length distribution, HOR vs NOR
- Some fish were  $\geq 78$  cm, B-run length cutoff



# Results: Adult sex ratio

- Significantly higher proportion of females; > 60%
- No difference among streams

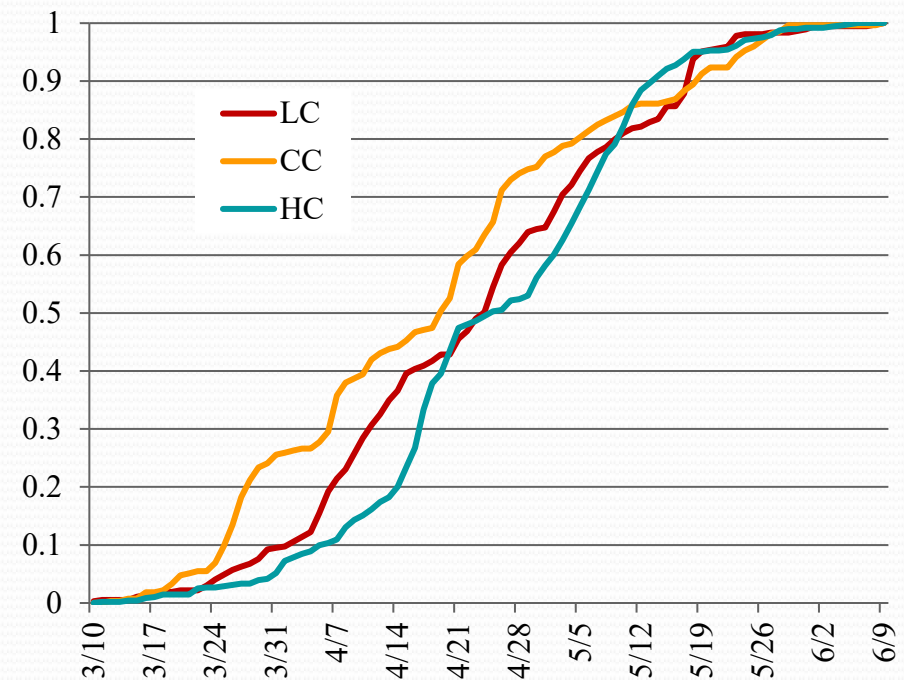




# Results: Migration timing – Arrival timing at Weir

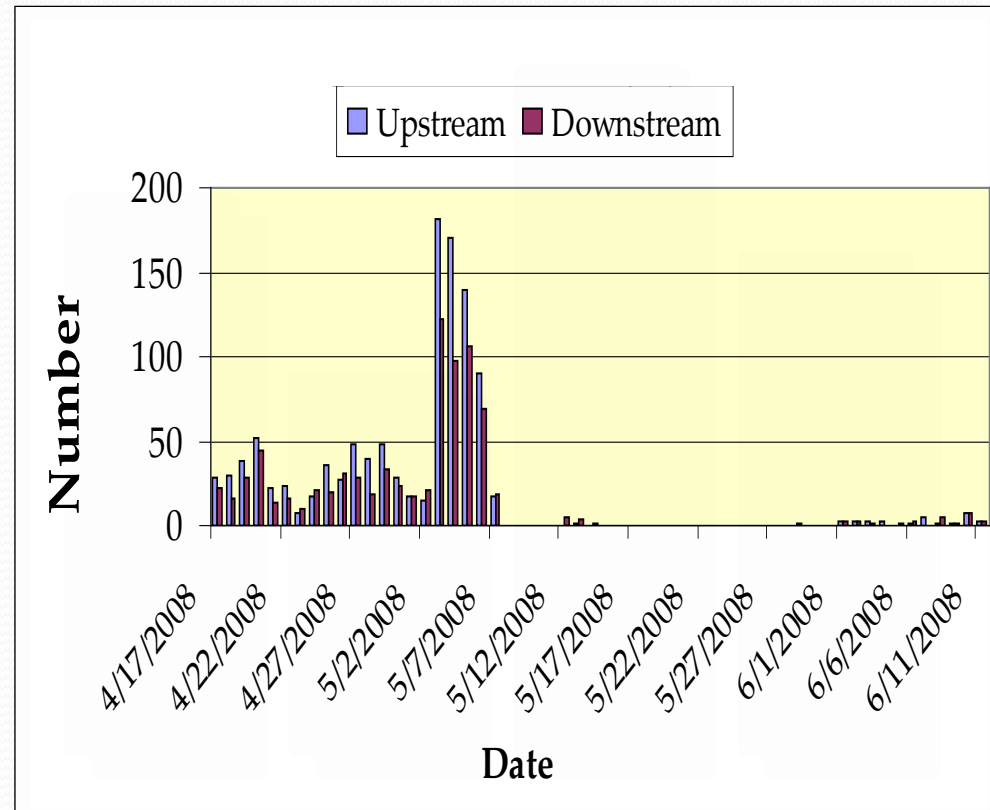
- NOR steelhead only, all years combined
- Similar migration timing, arrival timing progresses as distance from the Imnaha River mouth increases

Section	Median	10 <sup>th</sup> percentile	90 <sup>th</sup> percentile
Cow Creek	4/19	3/25	5/19
Lightning Creek	4/24	4/1	5/18
Horse Creek	4/25	4/6	5/14



# Results: Resistivity Counter

- Lightning Creek weir impedance, 2007
- Camp Creek adult abundance estimates, 2008-2009
- Limited utility
  - Operational and physical challenges made a precise abundance estimates difficult
- Conclusion
  - Lightning Creek
    - Confirmed no weir impedance
  - Camp Creek
    - Estimated annual abundance was high ( $\geq 200$  adults/year) in Camp Creek



# Population level monitoring

- 2011 total NOR steelhead escapement (ISEMP)

- 3410

Lower Imnaha tribs – 569

Cow Creek – 150

Lightning Creek – 190

Horse Creek – 229

Middle Imnaha & tribs – 751

Camp Creek & mainstem – 501

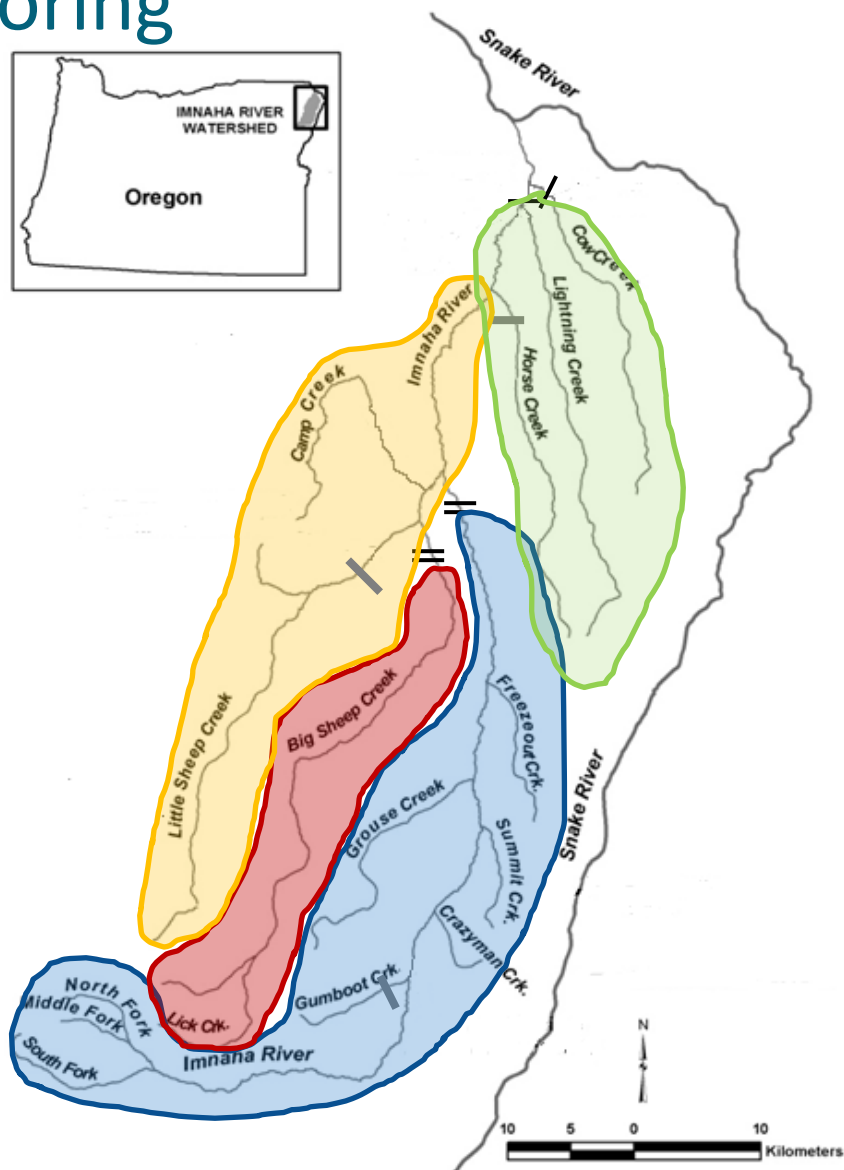
Little Sheep Creek – 250

Big Sheep Creek

- 760

Upper Imnaha mainstem

And tribs - 1330





# Performance Measures

- Escapement – significant contribution to the Imnaha River MPG
- Hatchery fraction – 5% – 10%
- Size at return – typical A-run size, < 78 cm
- Age at return – predominantly 2.1, significant number of 2.2
- Adult sex ratio – >60% female, resident males?
- Migration timing – median - late April; 2 month return period from late March – late May



## Recommendations

- Continue monitoring adult steelhead escapement in Lower Imnaha River tributaries concurrent with recently initiated upper tributary monitoring (ISAM)
- Maintain coordination with ISAM and ISEMP to provide comprehensive population status and trends data
- Continue to PIT tag natural origin juvenile *O. mykiss* under LSRCP/SMP to support monitoring of spatial structure within Imnaha River population
- PIT tag all adult kelts to study repeat spawning behavior and magnitude.



# Acknowledgements

- LSRCP – Funding
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