

Relative abundance and survival of wild, ESA listed juvenile winter steelhead in a tributary to the lower Clackamas River, Oregon



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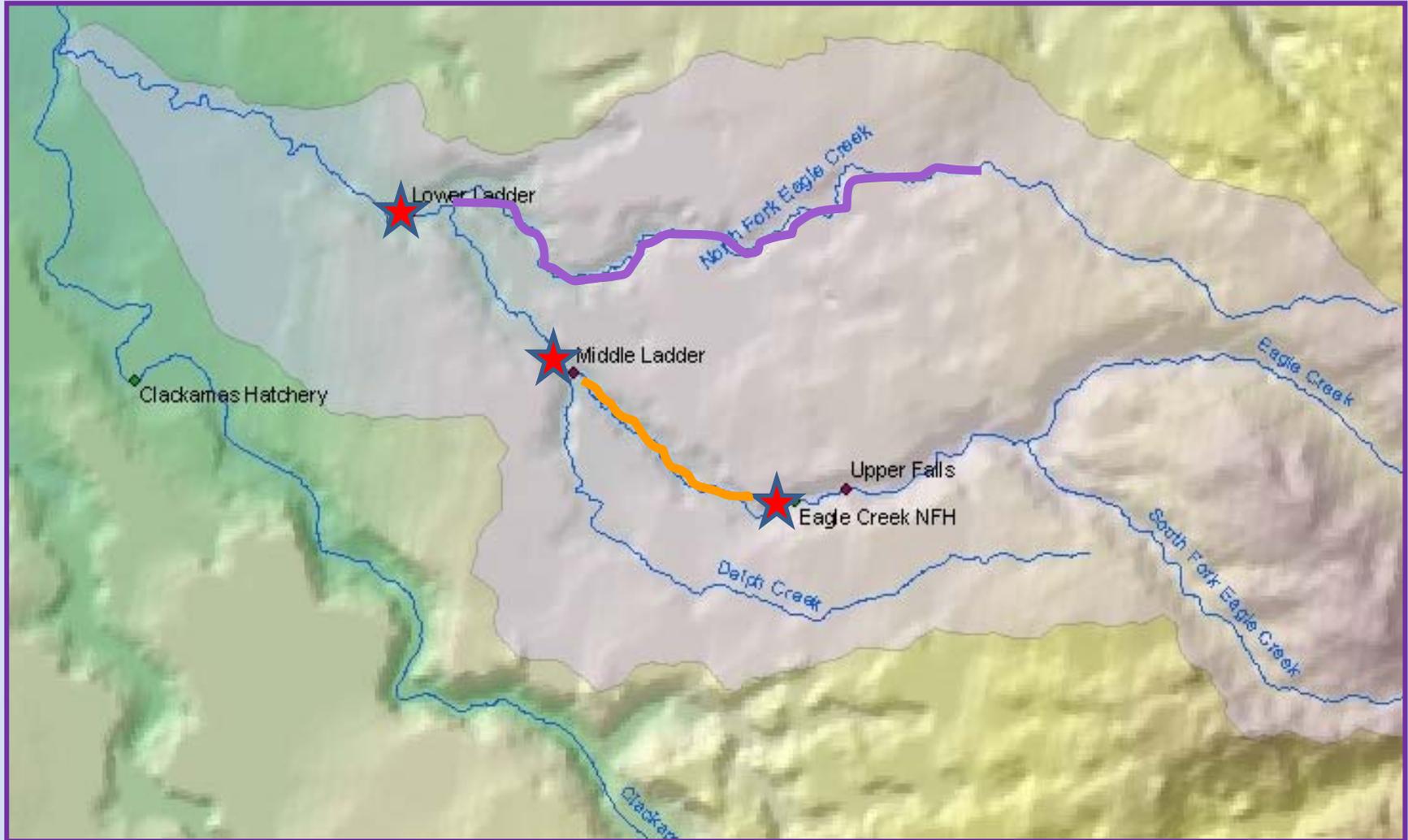
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Study Area



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Eagle Creek NFH steelhead program

Mitigate for resource loss:

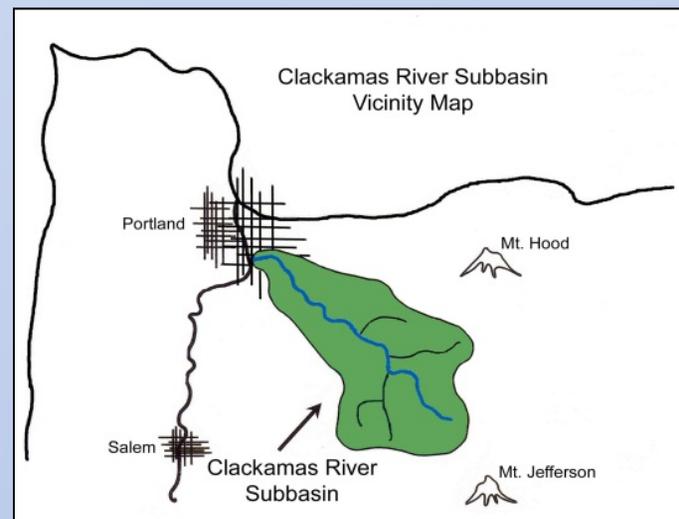
- Provide commercial, sport, and tribal harvest

Broodstock origin:

- Big Creek Hatchery broodstock,

Return-time distribution:

- HAT – generally December through March
- NOR – generally February through June



Wild winter steelhead considered unique run

- ESA listed under LCRESU
- North Fork Eagle Creek is major spawning area.

USFWS commenced M&E in 2003:

- Ecological Interaction Study
- Effects on ESA listed NOR population



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Past M&E findings

Upper Eagle Creek

- pHOS may be > 5% in some years
- Residual hatchery winter steelhead abundance estimated at 10% of the total population
- Genetic analysis suggests successful reproduction of hatchery fish in the wild (*Kavanagh 2009*)

North Fork Eagle Creek

- Primary producer of “wild” adult winter steelhead?
- Minimal straying of hatchery fish into NFEC

*Are there differences in freshwater survival of juvenile steelhead
In Eagle and North Fork Eagle Creeks?*



Objectives

Objective 1: Estimate relative abundance and survival of juvenile winter steelhead in Eagle and North Fork Eagle Creeks

Objective 2: Determine migration timing of juvenile and adult winter steelhead in Eagle and North Fork Eagle Creeks

Objective 3: Determine hatchery and wild fish contribution to natural production in Eagle and North Fork Eagle Creeks



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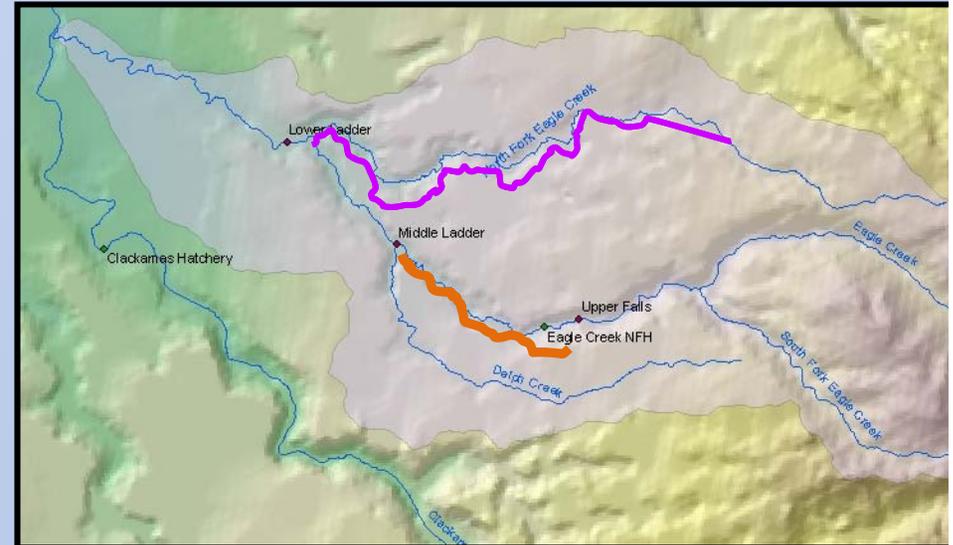
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Methods

Mark/Recapture (July-September 2010-2012)

- 200 m reaches, single pass e-fish, PIT > 74 mm
- UEC- 6000 m & NFEC- 11,400 m
- Relative survival calculated using the Cormack Jolly Seber model in MARK
- Collect genetic samples (spatially and temporally)
- ECNFH hatchery steelhead PIT tagged in 2010 and 2011



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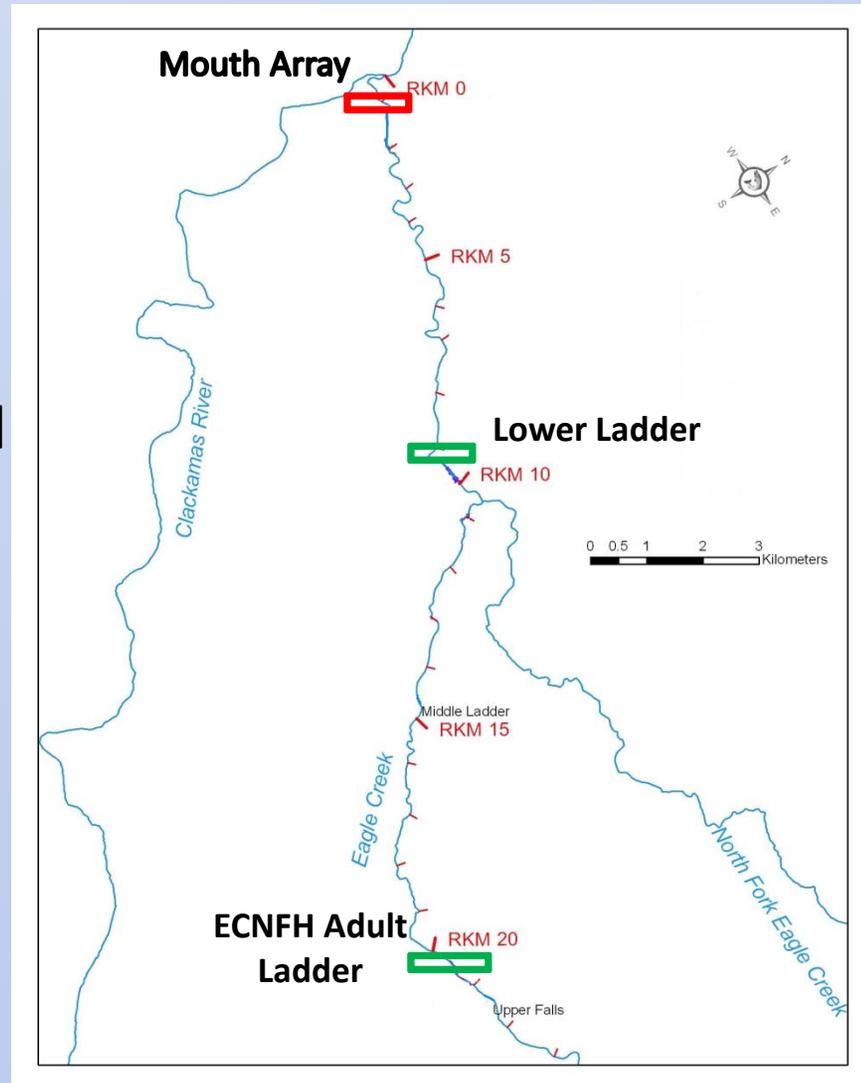
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PIT Array's

- Full Duplex
- Detect out-migrating juvenile and returning adult steelhead
- Mouth array installed in July 2010 and removed in December 2011
- Lower ladder and Hatchery antennas installed in December 2011
- Lower ladder and Hatchery antennas installed in December 2011



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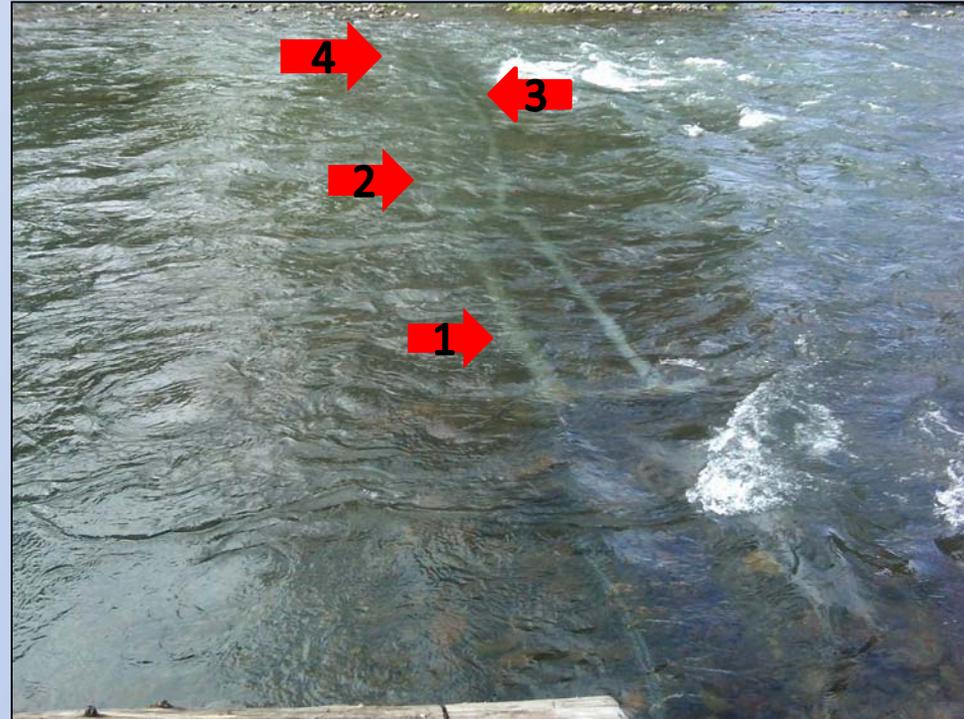


Eagle Creek Mouth PIT Array

- What's not working...



Hybrid Pass Over



Traditional Pass Over



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Eagle Creek Mouth PIT Array

- What's not working...



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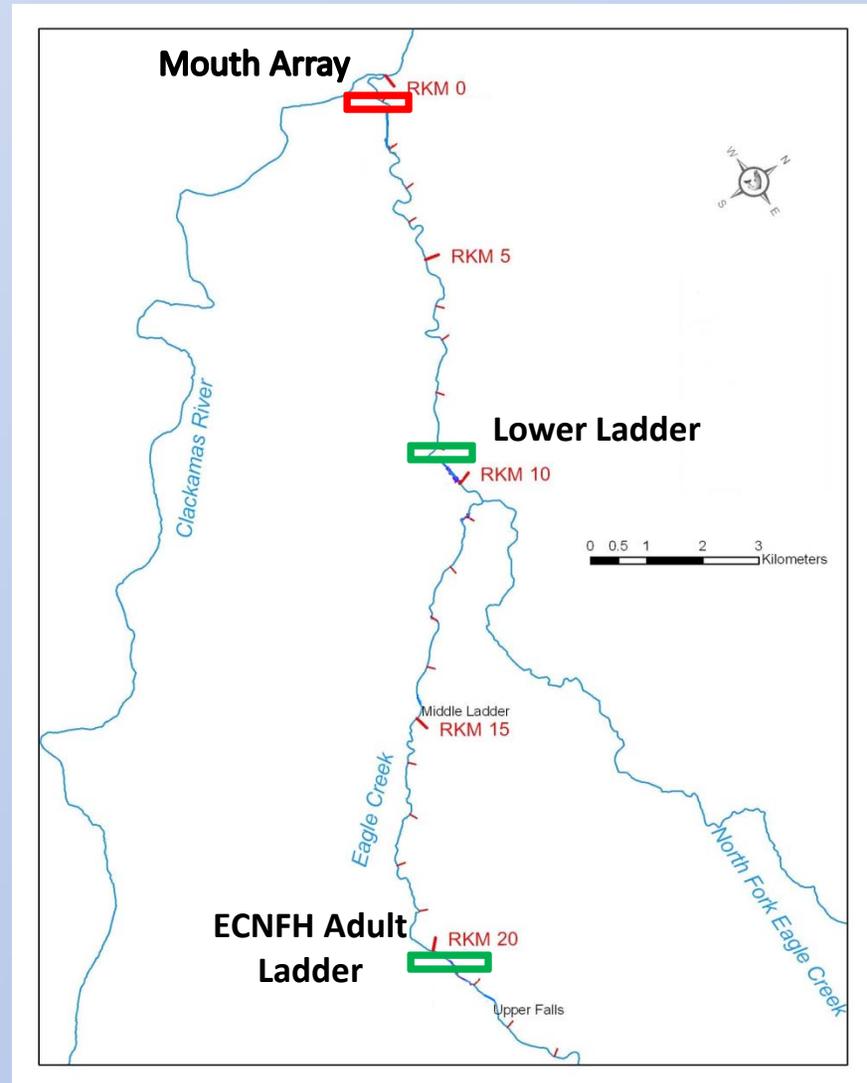
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Eagle Creek PIT Arrays

- What's Working...



Results

PIT Tagging

Stream	2010-2012		
	Marked	Recaptured	% Recap
U. Eagle Creek	3,686	181	4.9%
North Fork Eagle Cr	3,775	175	4.6%



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Relative abundance

Year	Stream	Relative Abundance	
		Age 0 (95%CI)	Age 1 (95%CI)
2010	U. Eagle Creek	620 (\pm 3,362)	8,372 (\pm 1,562)
	NFEC	1,201 (\pm 767)	4,896 (\pm 1,094)
2011	U. Eagle Creek	9,051 (\pm 10,058)	5,865 (\pm 1,883)
	NFEC	2,216 (\pm 1,447)	4,247 (\pm 994)
2012	U. Eagle Creek	5,579 (\pm 4,327)	4,303 (\pm 1,522)
	NFEC	1,539 (\pm 1,678)	4,854 (\pm 1,527)



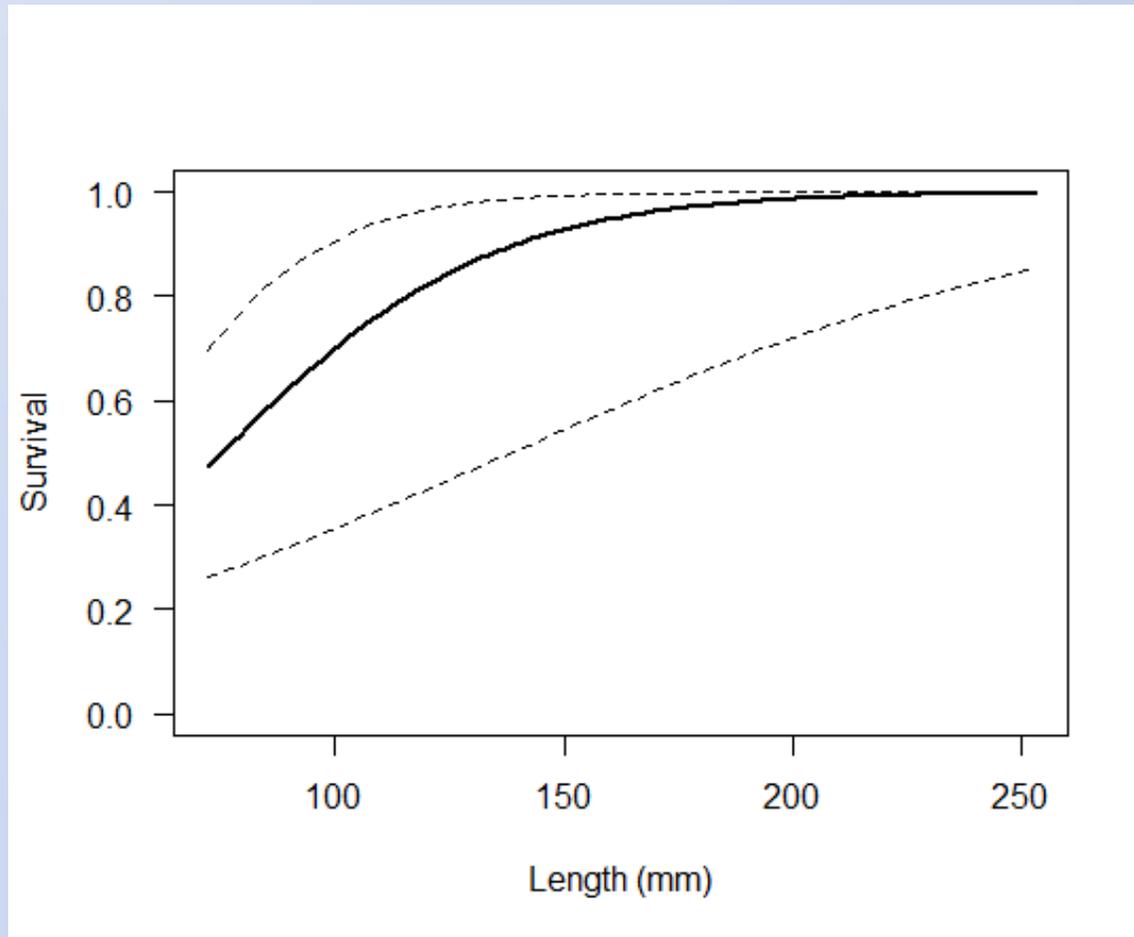
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Relative Survival



Predicted summer survival as a function of length at tagging for Eagle and North Fork Eagle Creek steelhead, 2010-2012.



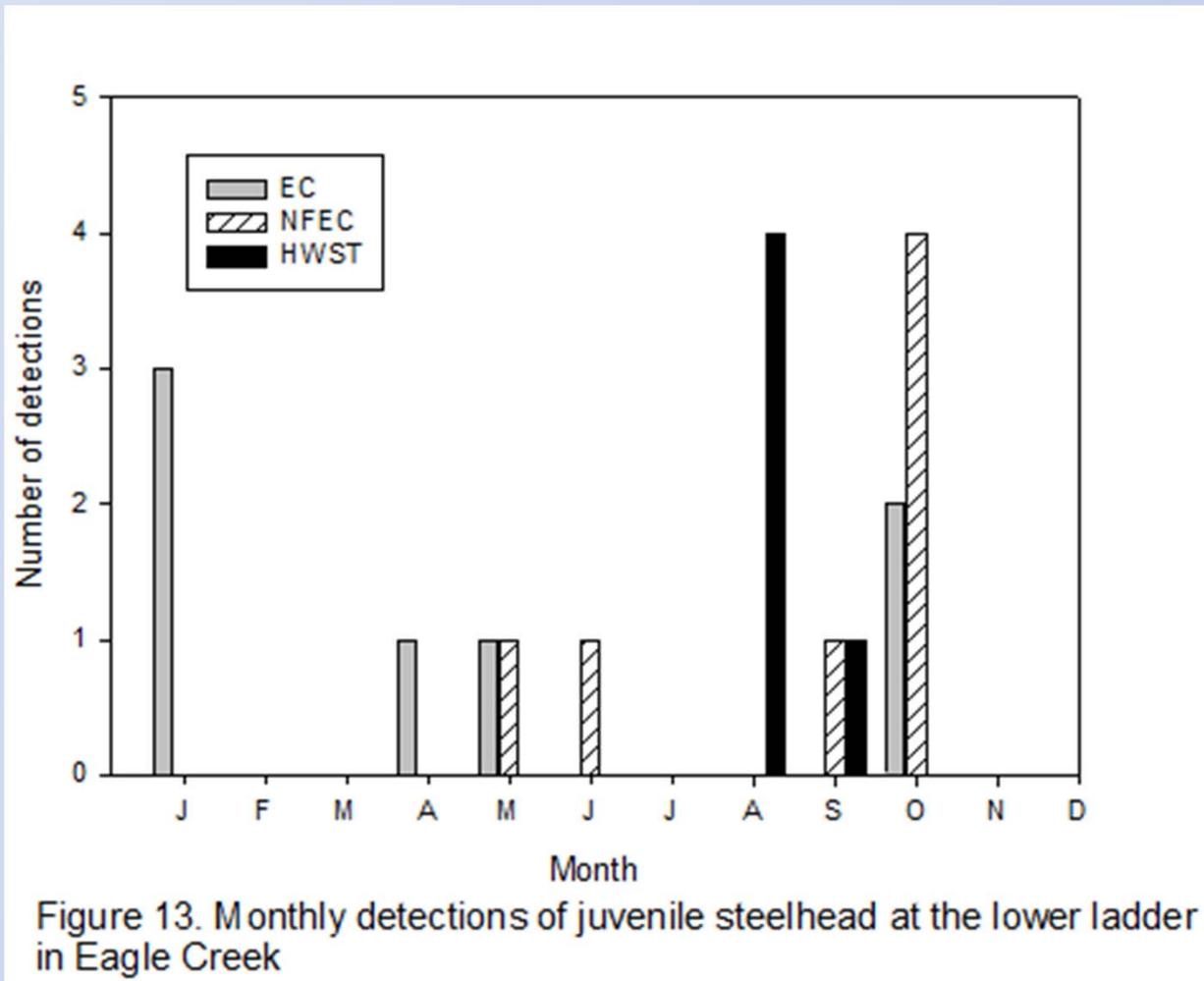
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Juvenile Outmigration



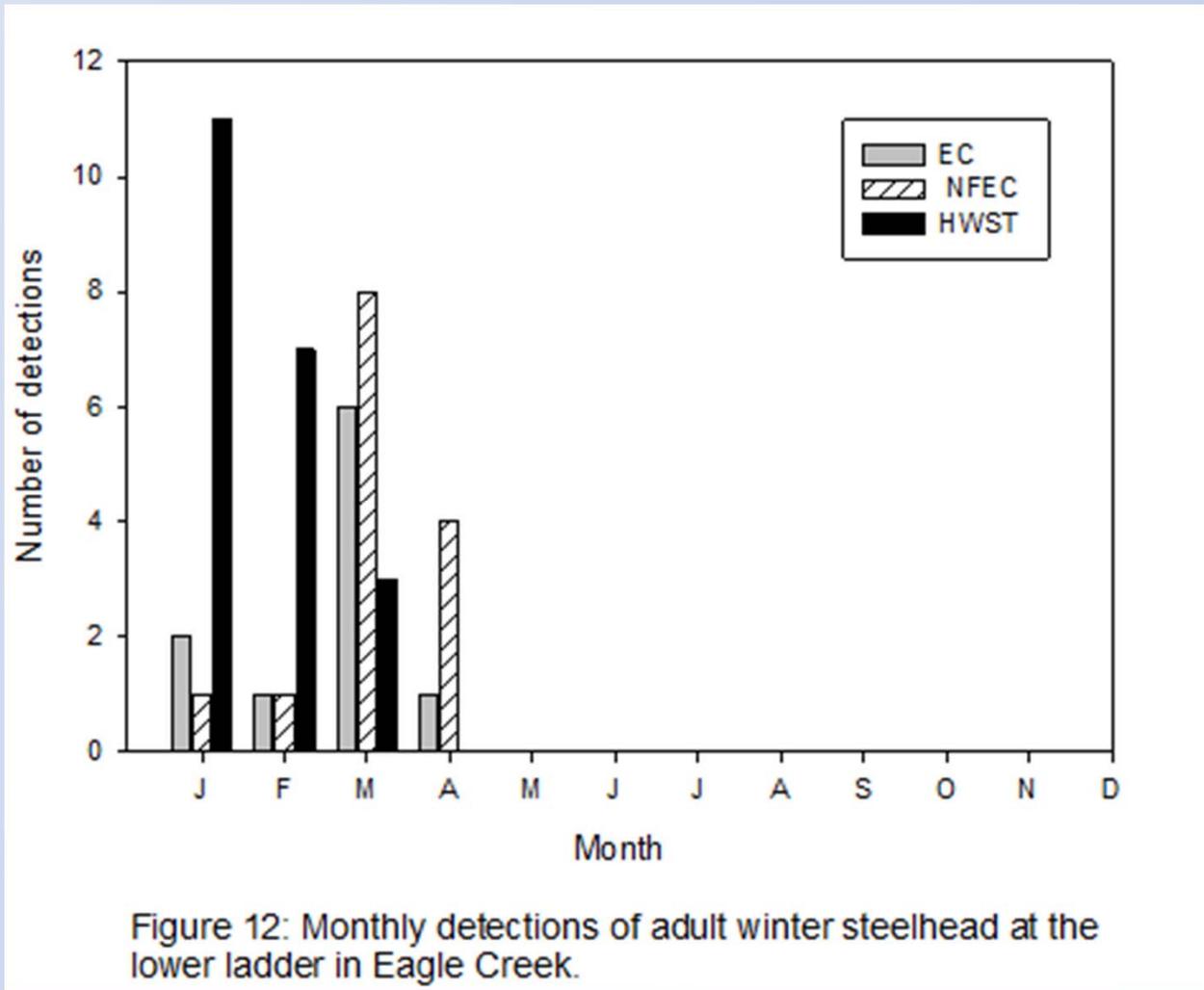
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Adult Returns



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Steelhead genetics

- Hatchery admixture in wild populations in the Eagle Creek basin appears dynamic.
- The hatchery influence from samples collected in 2010 and 2011 is higher in upper Eagle Creek than in North Fork Eagle Creek.



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Conclusions

- Relative abundance of juvenile steelhead varied between sample years and streams. The annual differences in our estimates were likely influenced by sampling efforts and stream conditions.
- No differences in relative survival of juvenile steelhead in Eagle and North Fork Eagle Creeks. *We may have lacked power to detect differences?*
- Length at tagging significantly increased summer survival. Survival increased by 50% for fish greater than 74 mm and by 100% for fish greater than 170 mm at tagging



Conclusions

- Temporal segregation in return timing of hatchery and natural origin adult steelhead.
- Outmigration timing is similar for juvenile steelhead in Eagle and North Fork Eagle Creeks.
- Hatchery admixture in wild populations in the Eagle Creek basin appears dynamic. The hatchery influence from samples collected in 2010 and 2011 is higher in upper Eagle Creek than in North Fork Eagle Creek.



ESA, Biological Opinions, and Improved Hatchery Programs

Through
Monitoring,
Evaluation, and
Adaptive
Management



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Acknowledgments

- USFWS-Columbia River Fisheries Program
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