

Fifteenmile Action to Stabilize Temperatures (FAST)

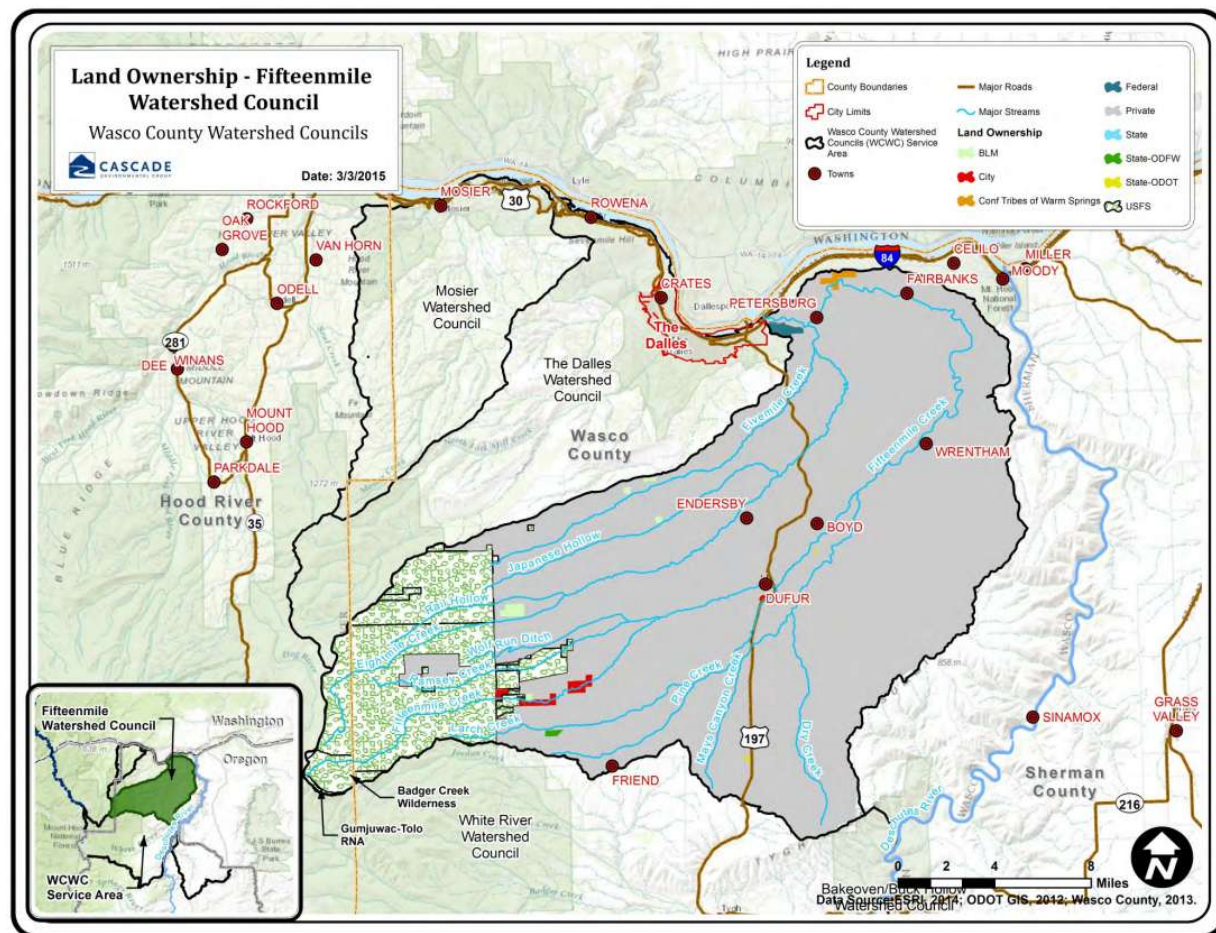
Climate Adaptation & Steelhead Conservation

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Fifteenmile Creek Watershed



Physical Characteristics

- 236,689 acres (370 sq mi)
- Mt. Hood National Forest origin
- Columbia River confluence below TDA

Social Context

- 83% private, agriculture-based
- Conservation-minded irrigators
- Summer flows fully (over) allocated

What is FAST?

Flow Restoration During Extreme Temperatures

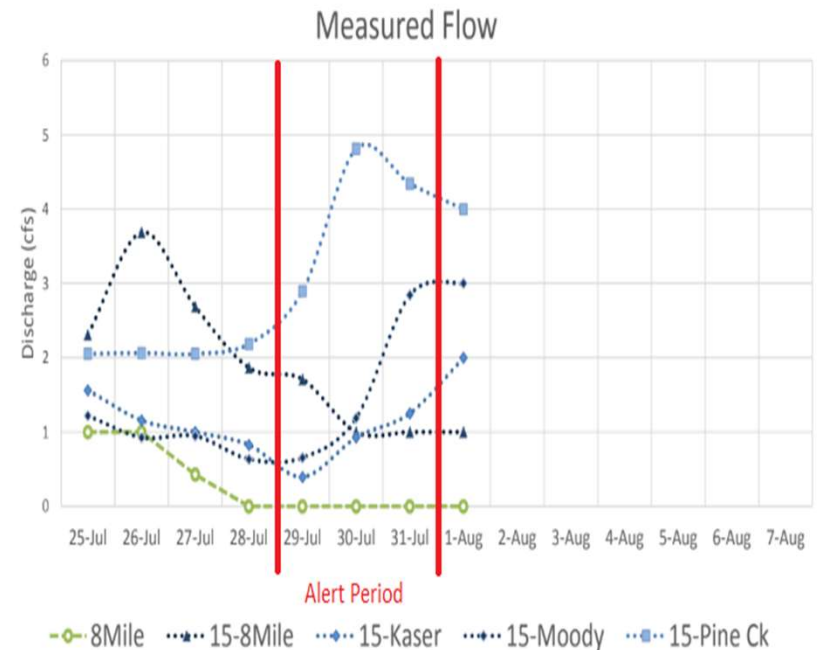
- Compensation for water curtailment
- Predictive temperature forecasting
- Daily alerts (email/phone)
- Field monitoring & verification

23 C

Lower Watershed

22 C

Upper Watershed



The 2009 Fish Kill: Catalyst for Action

The Crisis

- Summer 2009 - ESA-listed steelhead mortality
- Low flows + extreme temperatures
- Temperatures exceeded juvenile tolerance
- NOAA enforcement investigation

The Response

No penalties issued due to irrigators' conservation history and good faith. Strong warning: future ESA violations would require enforcement.

WATER TEMPERATURE ALERT

Alert issued when water temperatures exceed 71.6°F (22°C) in upper Fifteenmile Creek or 73.4°F (23°C) in lower Fifteenmile Creek (including Eightmile Creek), and at two sites for two or more days.

Elevation	7/28/2022 Measured	Today	Water Temperature Forecast (°F)					
	27-Jul	28-Jul	29-Jul	30-Jul	31-Jul	1-Aug	2-Aug	2-Aug
Eightmile Ck: 200 ft		72.3	73.2	73.3	72.0	71.9	71.2	71.2
Fifteenmile Ck: 200 ft	73	71.2	72.5	72.0	71.4	71.0	69.5	69.5
900 ft		73.3	74.7	74.9	73.8	73.5	72.3	72.3
1200 ft		71.6	72.6	73.5	72.5	71.7	70.3	70.4
1525 ft		65.3	66.4	67.1	66.5	66.4	65.3	65.4

Program Evolution & Social Changes

4 Years

From Concept to Implementation
(2009 fish kill → 2013 program launch)

Trust-Building Process

- Started with flexible options
- Low-commitment entry points
- Professional field verification
- Reliable compensation

Social Changes Achieved

- Regular temperature monitoring
- Proactive scheduling around alerts
- Watershed-wide awareness
- Voluntary accountability culture
- Conservation ethic strengthened
- Collaborative problem-solving

FAST Program Options & Evolution

Program Option	Payment Structure	Commitment	Status
Option 1	Upfront payment	Mandatory shutoff	✓ Active
Option 2	Payment by curtailment	Voluntary	✗ Discontinued 2021
FAST Plus	Season-long compensation	Full season	✓ Active
Split-Season Lease	Partial season payment	Flexible timing	✓ Active

Historical Evolution

- Started with 4 options to build flexibility
- Option 2 was critical for initial trust-building
- Participants switched to Option 1 as trust grew
- Option 2 streamlined out in 2021

"Collaboration moves at the speed of trust"

Steelhead Biology & Migration Challenge

Life History

- Summer-run timing: Aug-Oct peak
- Anadromous lifecycle
- Age-3 and age-4 returns predominate
- Iteroparity (0-11%)

Critical Challenge

Adult fish are FORCED to hold in the Columbia River mainstem during hot summer months because:

- Low summer flows at creek mouth
- Impassable waterfall/fishway
- Cannot enter until fall flows increase



Population Status: Critical Numbers

200-450

Current Annual Spawners

(down from ~1,000 in 2004)

89

Historic Low (2017)

Population collapse year

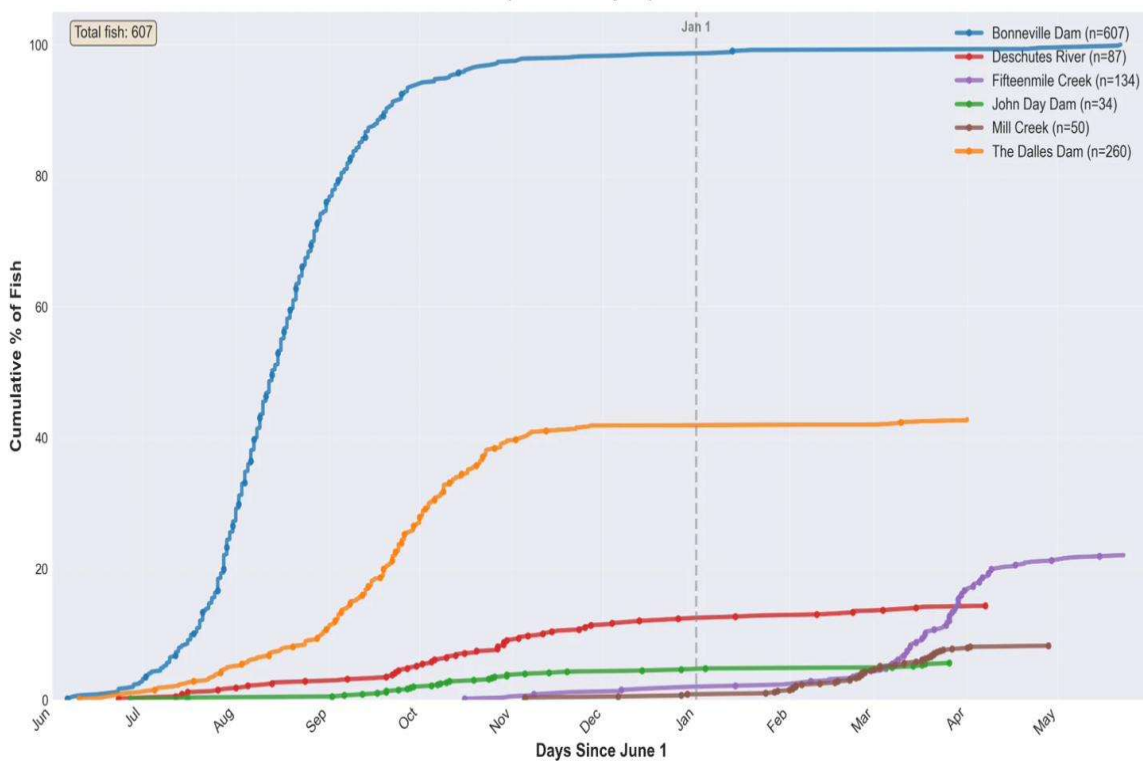
Status Summary

- ESA Threatened listing (Mid-C Steelhead)
- Below replacement levels
- Vulnerable to stochastic events
- Small population = high extinction risk

Every fish matters when population is this small.
Conservation actions have outsized importance.

Migration Timing & Critical Periods

Steelhead - Cumulative Arrival Distribution (All Years Combined)
(June 1 - May 31)



Peak Adult Returns

August - October

- Hottest months of the year
- Lowest streamflows
- Maximum thermal stress
- Peak irrigation demand

The Timing Mismatch

Fish arrive when conditions are worst.
Extended holding in Columbia River.
Actual creek entry: late winter/spring.

This timing mismatch creates extended vulnerability during the most thermally challenging period.

The Overshoot Problem

50-80%

Overshoot Past TDA Dam

Year-to-year variation

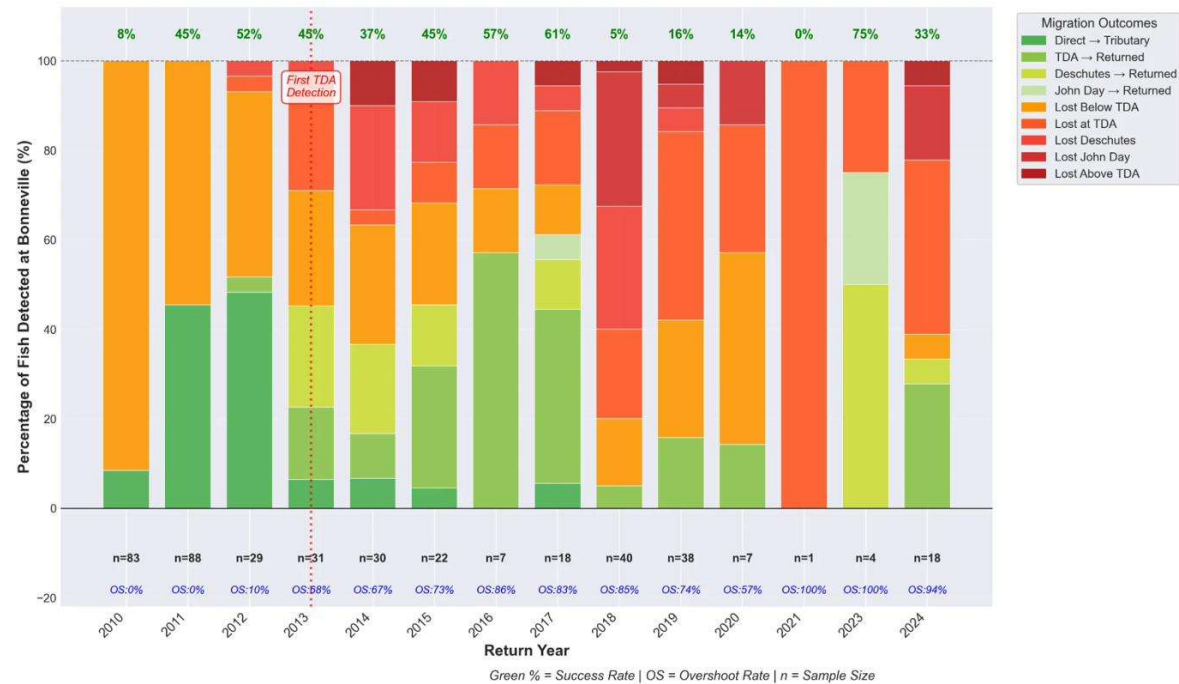
Causes

- Low flows
- Warm water
- Dam hydraulics
- Difficult entry location

Consequences

- Extra energy
- Migration delays
- Mortality risk
- Reduced spawning

Fifteenmile Creek - Steelhead Migration Fate After Bonneville Detection



Marine Survival Crisis: The Dominant Bottleneck

HISTORICAL SAR

2-4%

Pre-2000 baseline

CURRENT SAR

0.5-2%

Recent year average

2015 CATASTROPHE

0.07%

Marine heatwave year

Key Insights

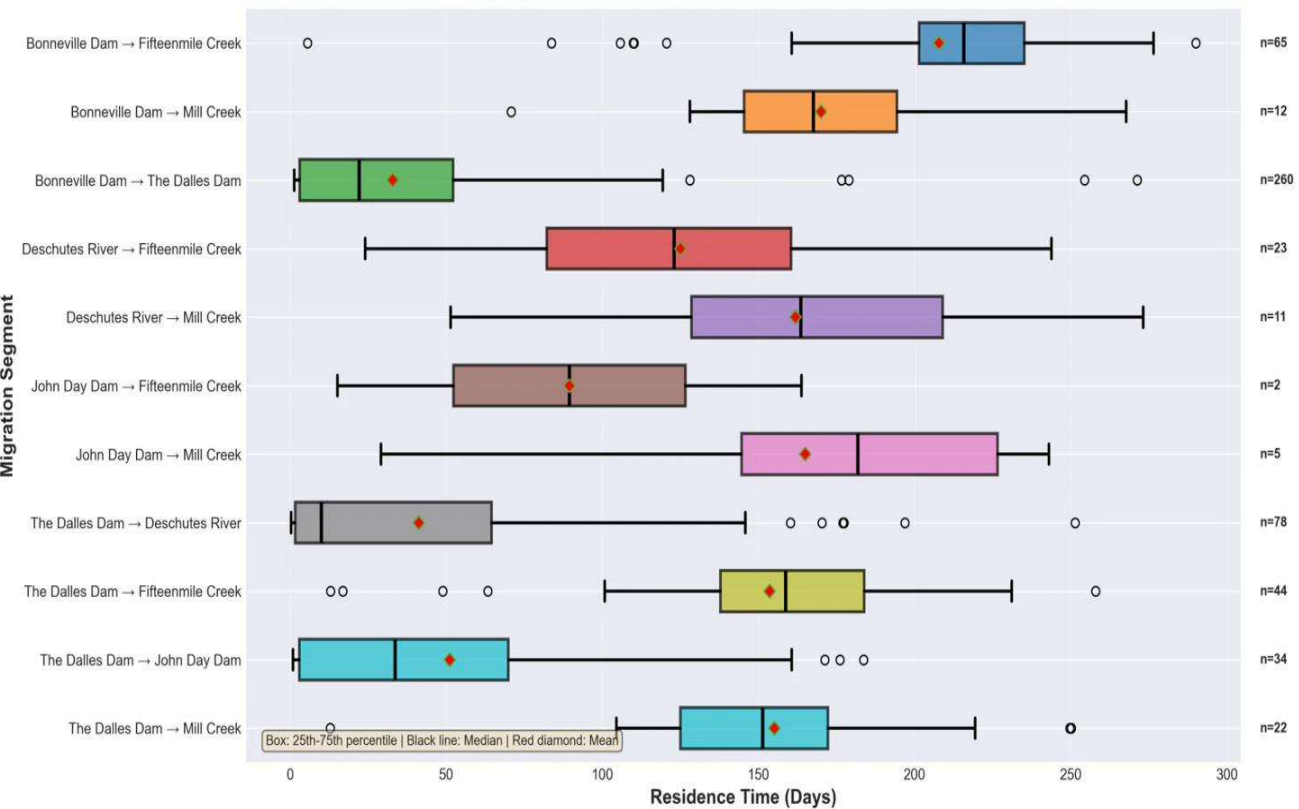
- Coast-wide phenomenon affecting all populations
- Marine survival is the dominant bottleneck
- Beyond local management control
- Makes freshwater optimization critical

Columbia River Residence Times: Extended Vulnerability

~200 Days

Bonneville to Fifteenmile entry

Steelhead - Residence Time Between Detection Sites (All Years Combined)
(Days Between First Detections)



The Gauntlet

- Long holding in Columbia mainstem
- Must navigate downstream past TDA Dam
- Then ascend waterfall to spawning grounds
- Waterfall impassable during low summer flows

Extended Columbia River residence means months of thermal stress exposure during the hottest time of year.

The Compounding Effect: Temperature × Withdrawal

The Problem

When ambient temperatures rise during heat events:

- Stream temperature rises
- Irrigation demand peaks

The Mechanism

Lower water volume heats faster (thermodynamics). Withdrawing water during peak heat accelerates thermal warming. Effects are multiplicative, not additive.

FAST Breaks This Cycle

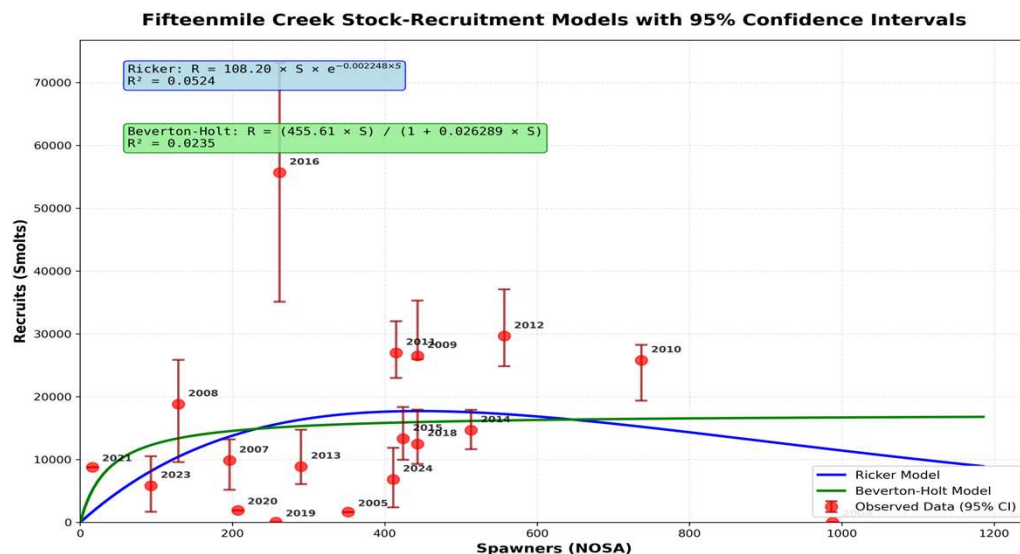
By maintaining water volume during extreme thermal periods, FAST tempers the compounding effect. The thermal mass of flowing water provides resilience exactly when it matters most - during heat events when fish are most vulnerable.

FAST is for the juveniles - The Good News

SMOLT PRODUCTION CAPACITY

186-409

smolts per spawner
(favorable freshwater conditions)



Critical Points

- Juvenile population below carrying capacity
- Freshwater is NOT the limiting factor
- High productive capacity when conditions maintained
- Habitat quality supports recovery

What This Means

In favorable years, each spawner produces 186-409 smolts. Habitat capacity exists to support recovery if marine survival improves.

Flow Restoration During Alert Periods

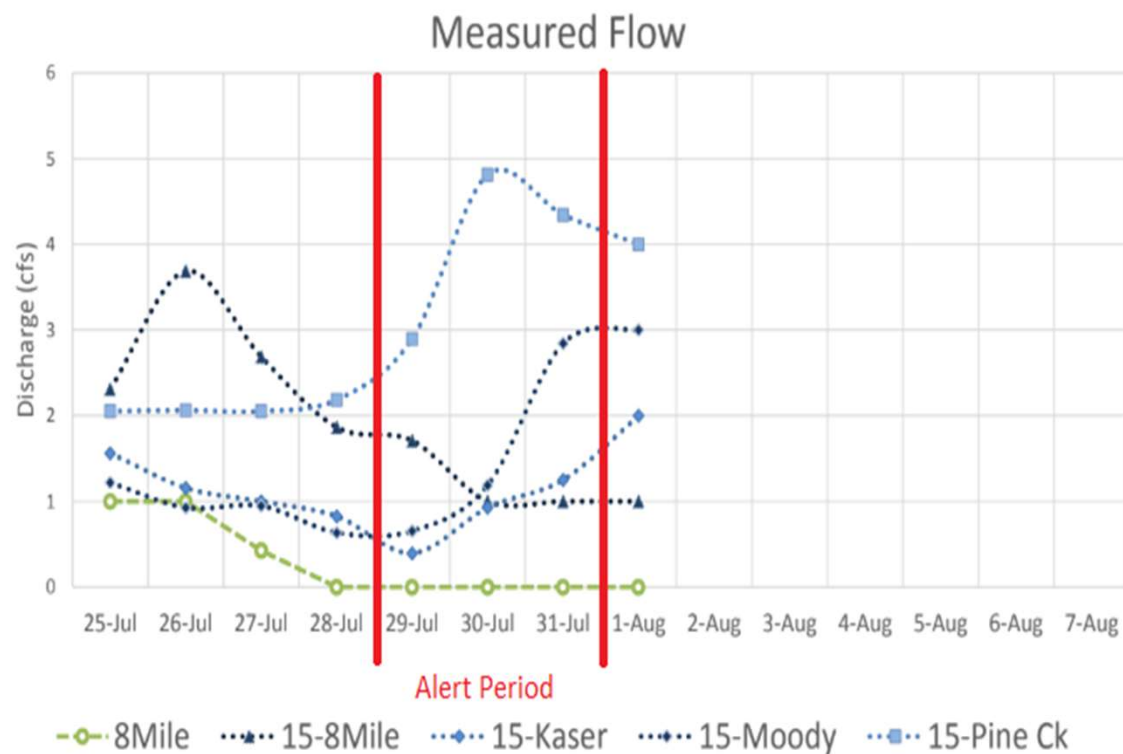
~3 CFS

Flow Increase

At Pine Creek gage during alerts

Observable Impacts

- Immediate measurable response
- Variable by conditions and timing
- Maintains migration corridor quality
- Preserves thermal refugia



Key Takeaways & Path Forward

- 1** Population vulnerable but resilient: 200-450 spawners with capacity for recovery (186-409 smolts/spawner) if conditions improve
- 2** Marine survival is the bottleneck: FAST optimizes what we CAN control (freshwater conditions) while marine factors remain beyond management reach
- 3** Compounding effects are multiplicative: Temperature + withdrawal accelerate thermal impacts through reduced thermal mass
- 4** Extended Columbia River residence: ~200 days of holding increases vulnerability during hottest months while waiting for creek entry conditions
- 5** FAST maintains climate adaptation capacity: Program preserves thermal resilience essential for population persistence as climate change intensifies

The Path Forward

Continue FAST as essential climate adaptation strategy while marine conditions remain challenging. Every fish matters when populations are this small.

Acknowledgements

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Why FAST is Essential: Population Dynamics Integration

✗ Cannot Control

- Marine survival (dominant limiting factor)
- Ocean conditions
- Climate change trajectory
- SAR collapse (coast-wide)

✓ Can Optimize

- Freshwater thermal conditions
- Flow regimes during critical periods
- Thermal refugia availability
- Habitat capacity maintenance

FAST Benefits

- Tempers compounding heat/withdrawal effects
- Maintains thermal resilience
- Preserves productive capacity (186-409 smolts/spawner)
- Positions population for recovery when marine conditions improve

"We cannot fix the ocean, but we can ensure the habitat is ready when those fish come home."