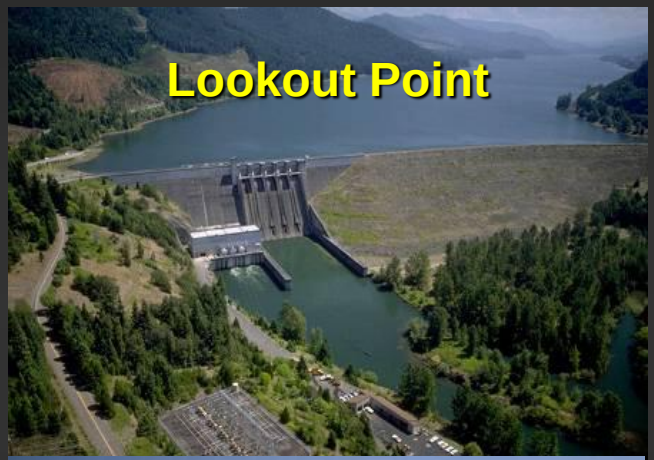
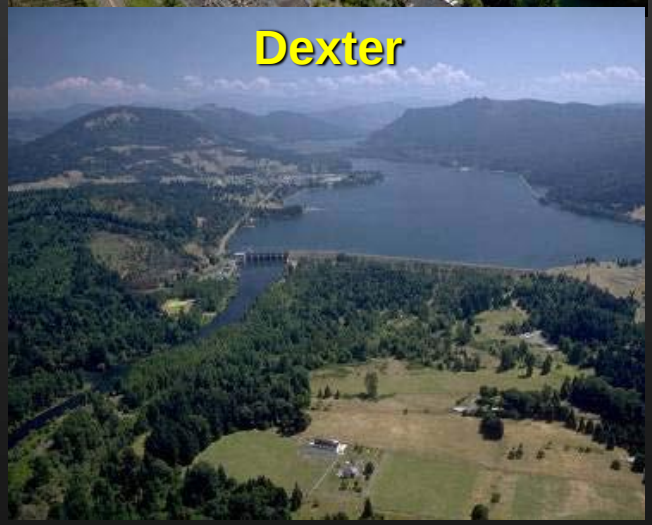
Outmigration of Hatchery Spring Chinook Salmon Released above and below Dams in the Middle Fork Willamette River

Thomas A. Friesen
Marc A. Johnson
Paul M. Olmsted

Corvallis Research Laboratory
Oregon Department of Fish and Wildlife

Willamette Project Dams and Reservoirs





Juvenile salmon produced by outplanted adults above WVP dams and reservoirs may experience serious impacts during rearing and outmigration

Passage Options

At Dam Passage:

- Reservoirs may impact migration timing/rate
- Predation risk
- Parasites
- Altered (high) growth rate in reservoirs – good or bad?
- Mortality from direct passage through dams

Collection,Transport & Release:

- Reduce many reservoir/dam risks
- Expensive and technically challenging
- Effects from inferior rearing habitat below dams

Drawdown / Run of River?

Detroit Reservoir CWT Releases and SARs, 2005-2010

Rel. Yr	N	SAR(%)
2005	24,272	0.0082
2005	52,685	0.0132
2005	25,355	0.0197
2006	15,166	0.1517
2006	74,900	0.2336
2007	107,080	0.0205*
2008	107,788	0.0056*
2009	108,210	0.0000*
2010	106,669	0.0000*

* Incomplete return data

A “Paired Release” Study

Former Title: “Comparing the Effectiveness of Head-of-Reservoir Collection and Transport with Direct Reservoir and Dam Passage”

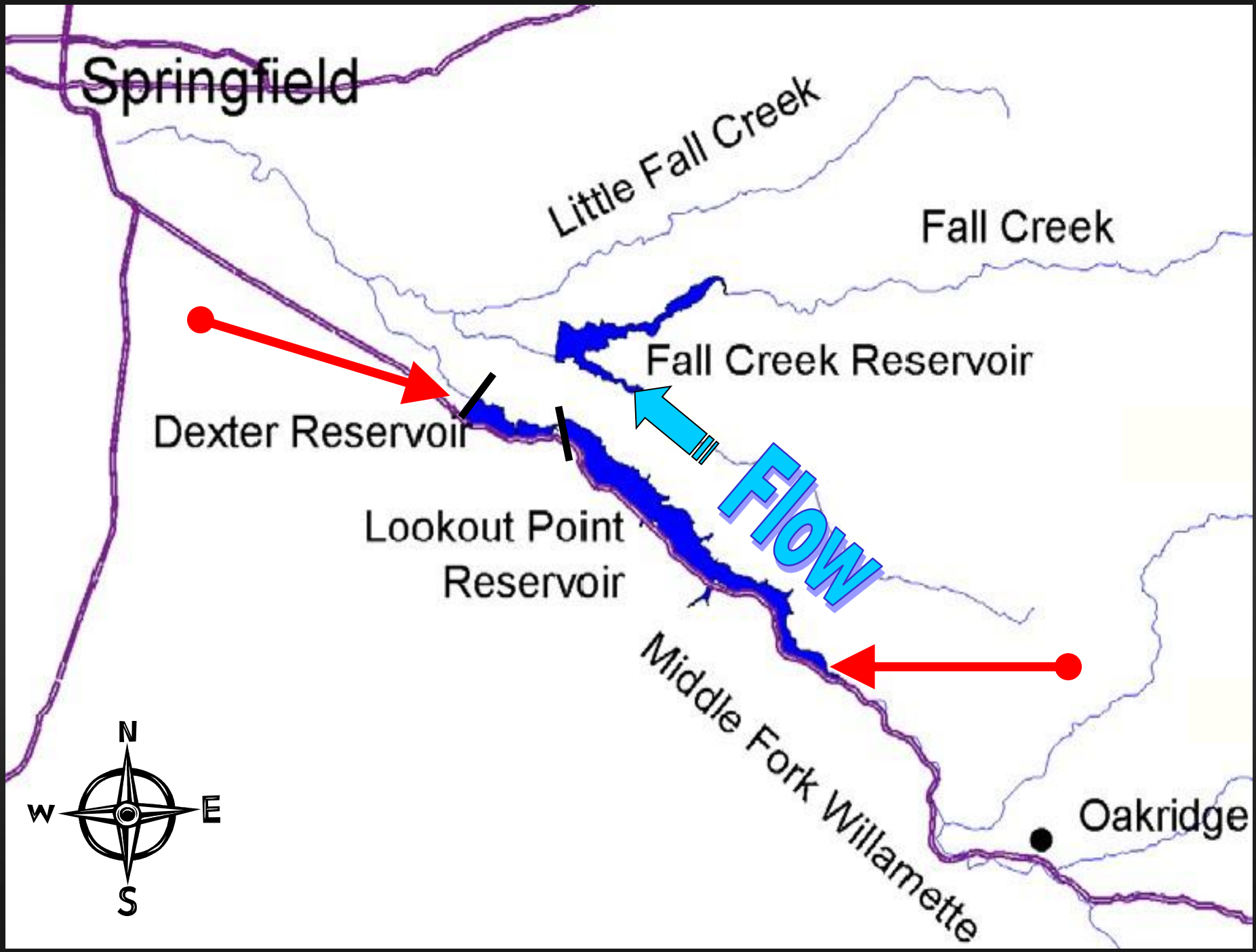
More succinctly, Reservoir and Dam passage x2 vs. none

Objective – Compare survivorship, outmigration timing and migration rate of juvenile hatchery spring Chinook released above LOP Reservoir and below Dexter Dam, MF Willamette R.

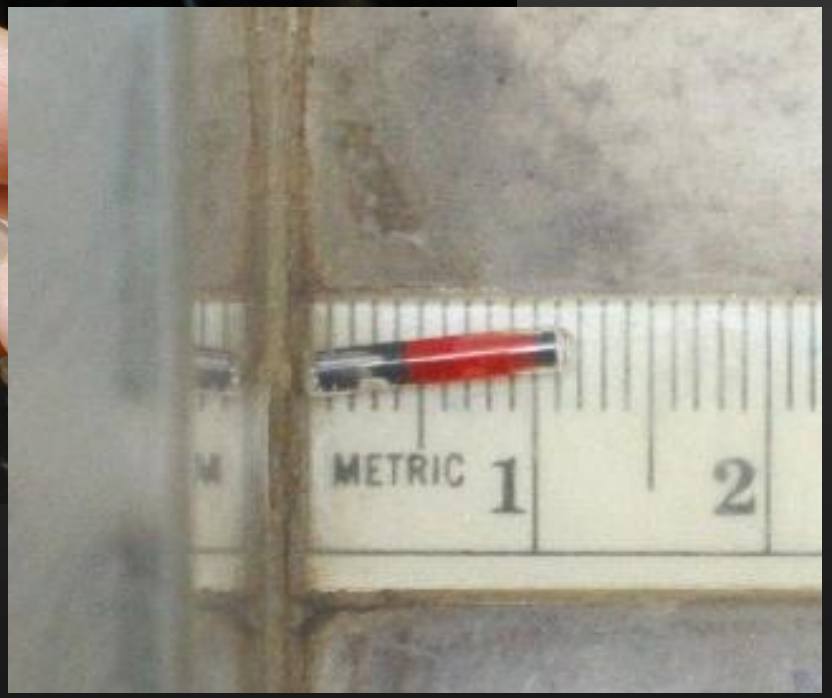
Methods

- Release 6K PIT tagged juvenile Chinook *above* LOP Reservoir
- Release 6K PIT tagged juvenile Chinook *below* Dexter Dam
- For each group, measure and compare:
  - Growth of recaptures
  - PIT detections at Willamette Falls
    - Number of detections (index of surviving outmigrants)
    - Time until arrival (days post-release; migration rate)
    - Temporal pattern

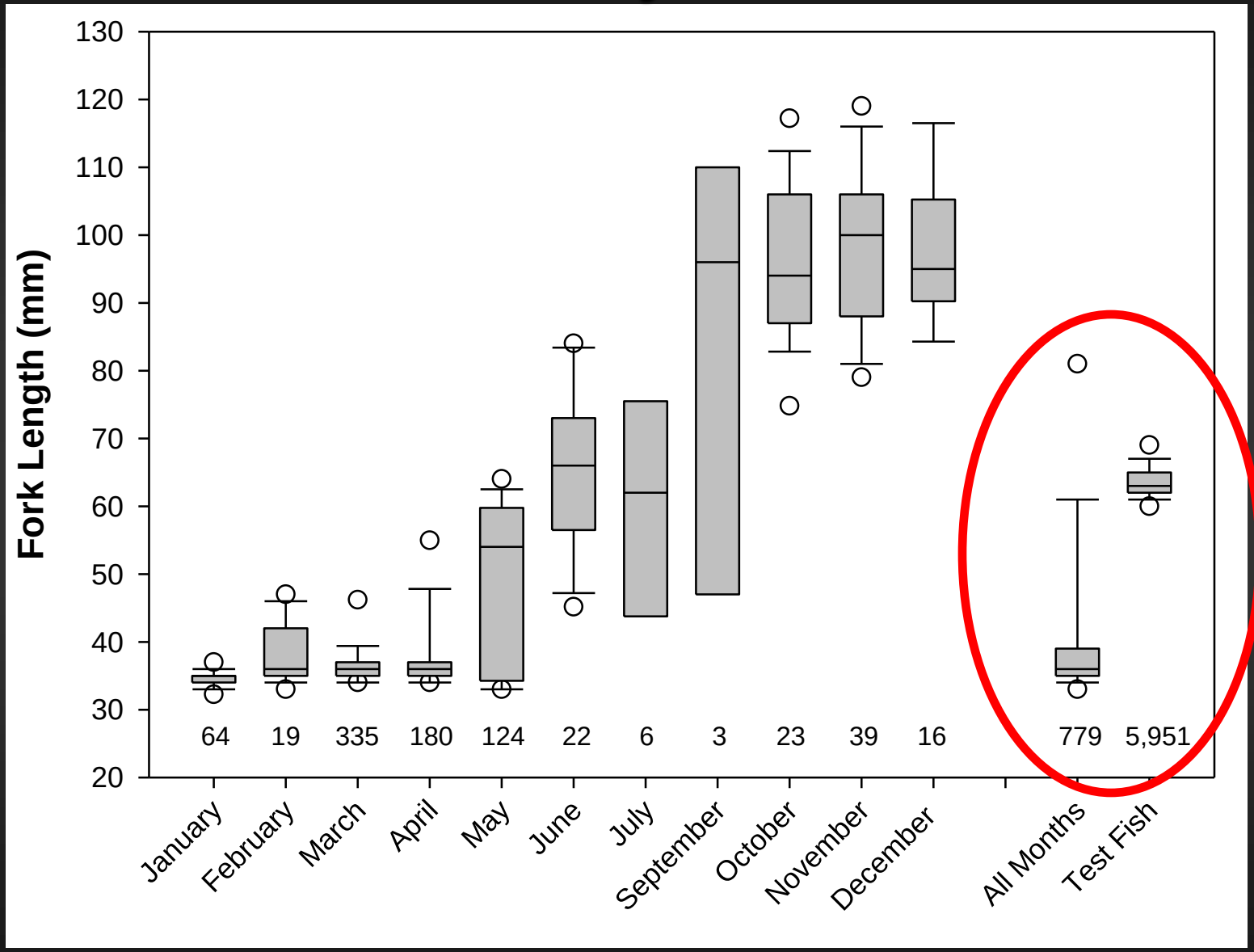
(plus 200K coded-wire tagged, reservoir only)


Springfield
Little Fall Creek
Fall Creek
Fall Creek Reservoir
Dexter Reservoir
Flow
Lookout Point
Reservoir
Middle Fork Willamette
Oakridge
N
W
E
S

Major assumption: hatchery fish are similar to “wild” fish entering the reservoir (size, behavior, condition, etc)



Preliminary Results



Fork Lengths of Juvenile ChS Entering LOP (from Monzyk et al.)

Preliminary Results

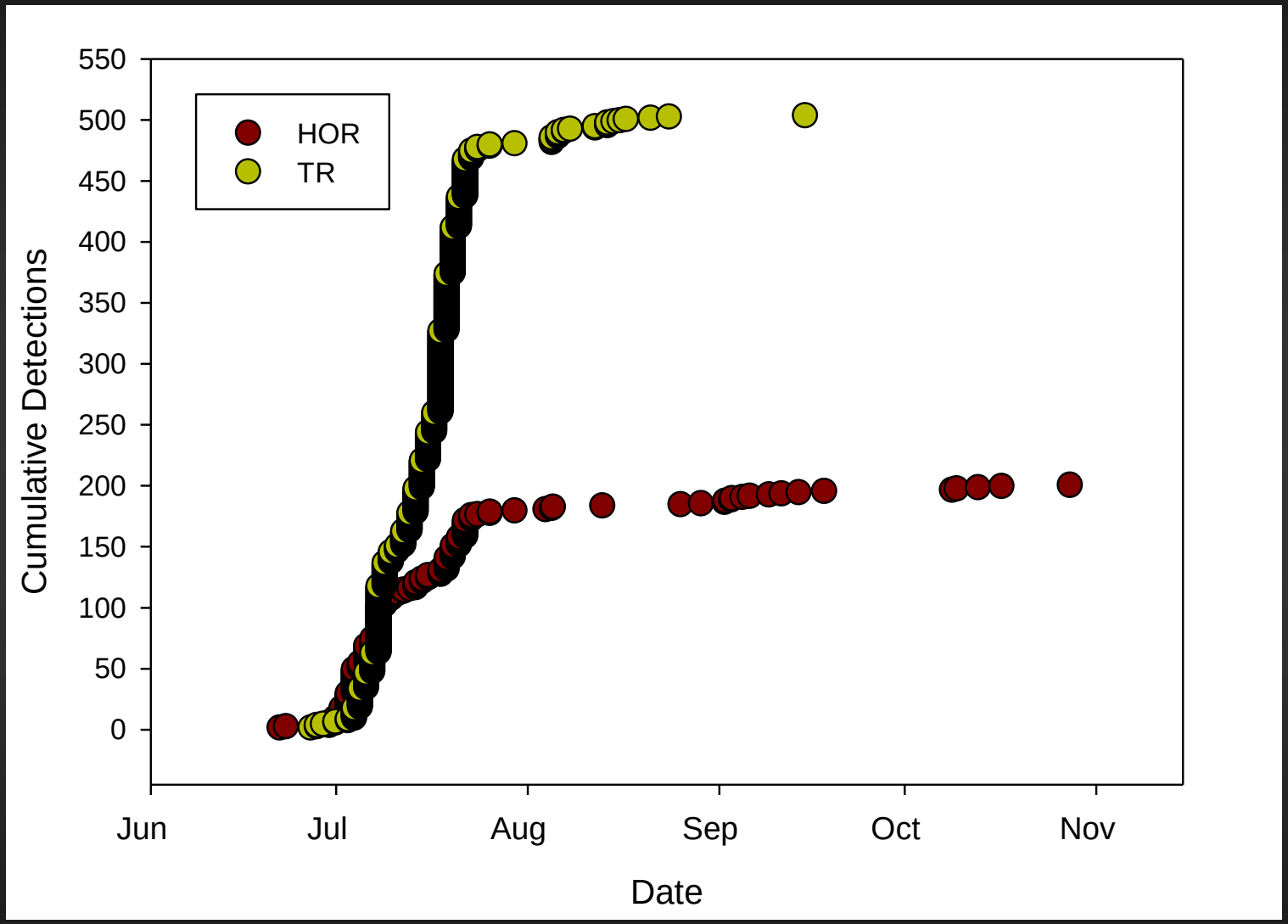
Downstream Migration

	Above LOP	Below Dexter
Number Released	5,967 (19 May)	5,959 (25 May)
Detections at W. Falls	200 (3.4%)**	505 (8.5%)**
Days to W. Falls (median)	50.6	53.2
Days to W. Falls (range)	34-162	34-113
Median Rate (km/day)	6.1	5.4

**$z = 11.86$

$p<0.001$

Preliminary Results



Cumulative detections at Willamette Falls

Preliminary Results

Growth from Recaptures

Released *above* (*n*=12): mean 1.09 mm/d

Released *below* (*n*=11): mean 0.95 mm/d

Significantly different, but small *n*

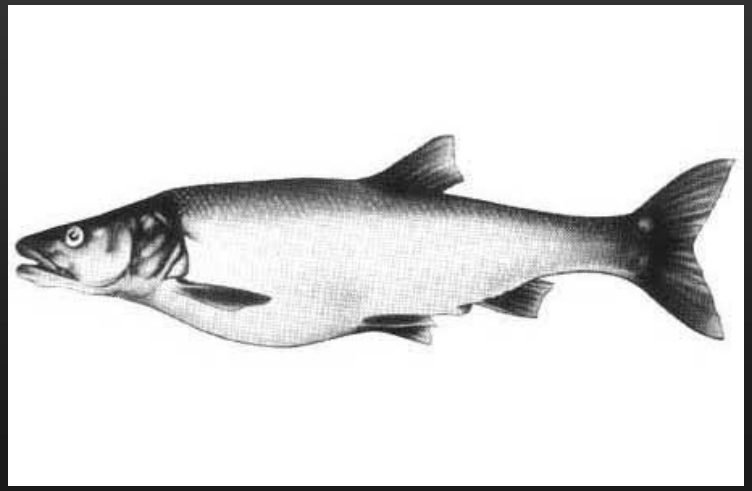
Similar or greater than:

- 0.48 mm/d (*Sommer et al. 2001*) – subyearling Chinook
- 1.20 mm/d (*Connor and Burge 2003*) – subyearling Chinook
- 0.75 to 1.05 mm/d (*Fisher and Pearcy 1995*) – hatchery Chinook

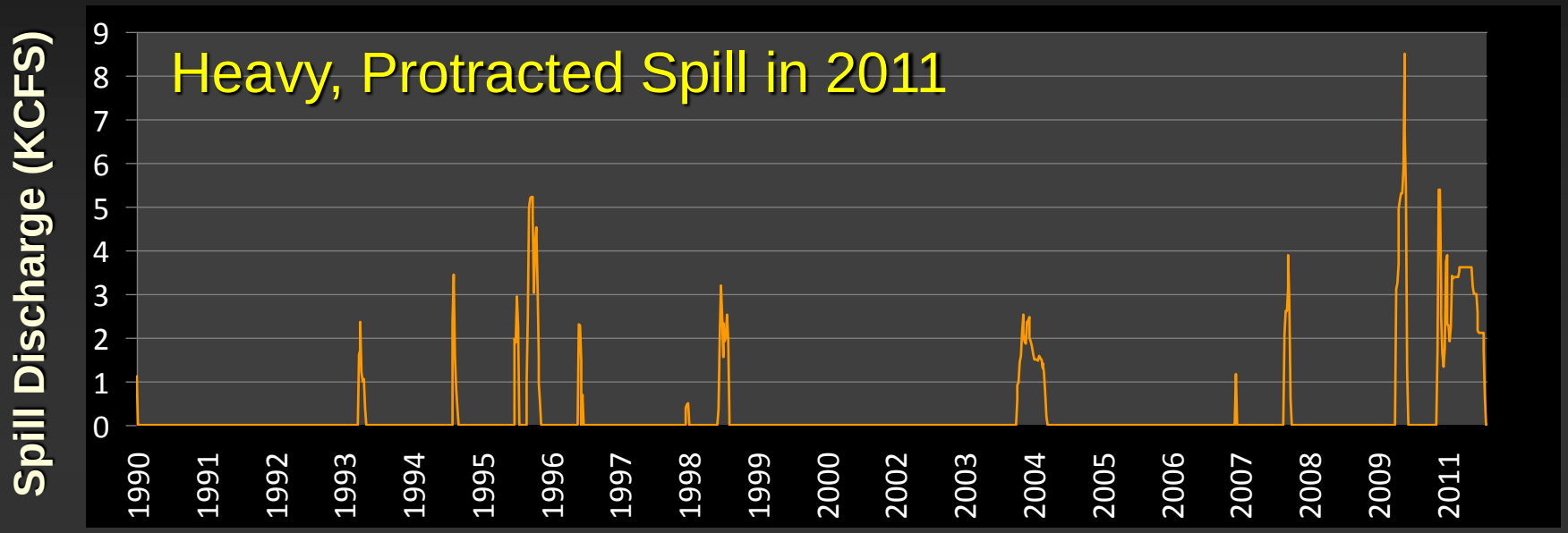
Preliminary Results

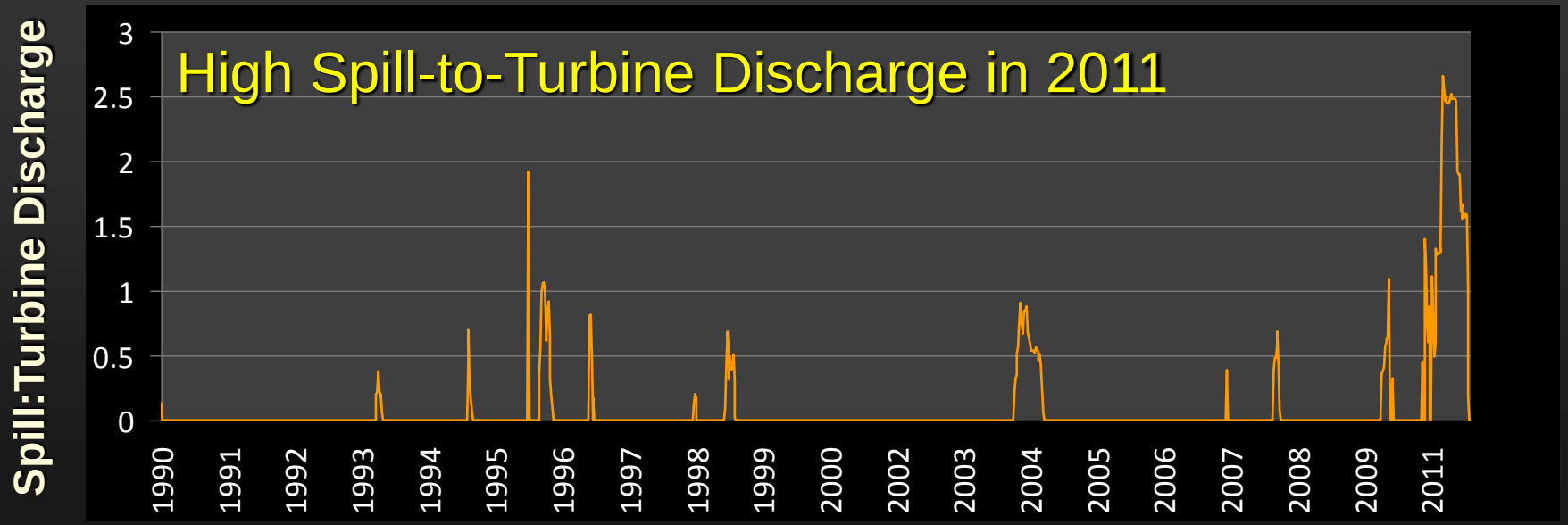
Other Recoveries – Mortality

- Avian Predation – 11 (East Sand Island)
- Northern Pikeminnow – 1 (LOP Reservoir)
- Researchers Who Shall Remain Anonymous – 3

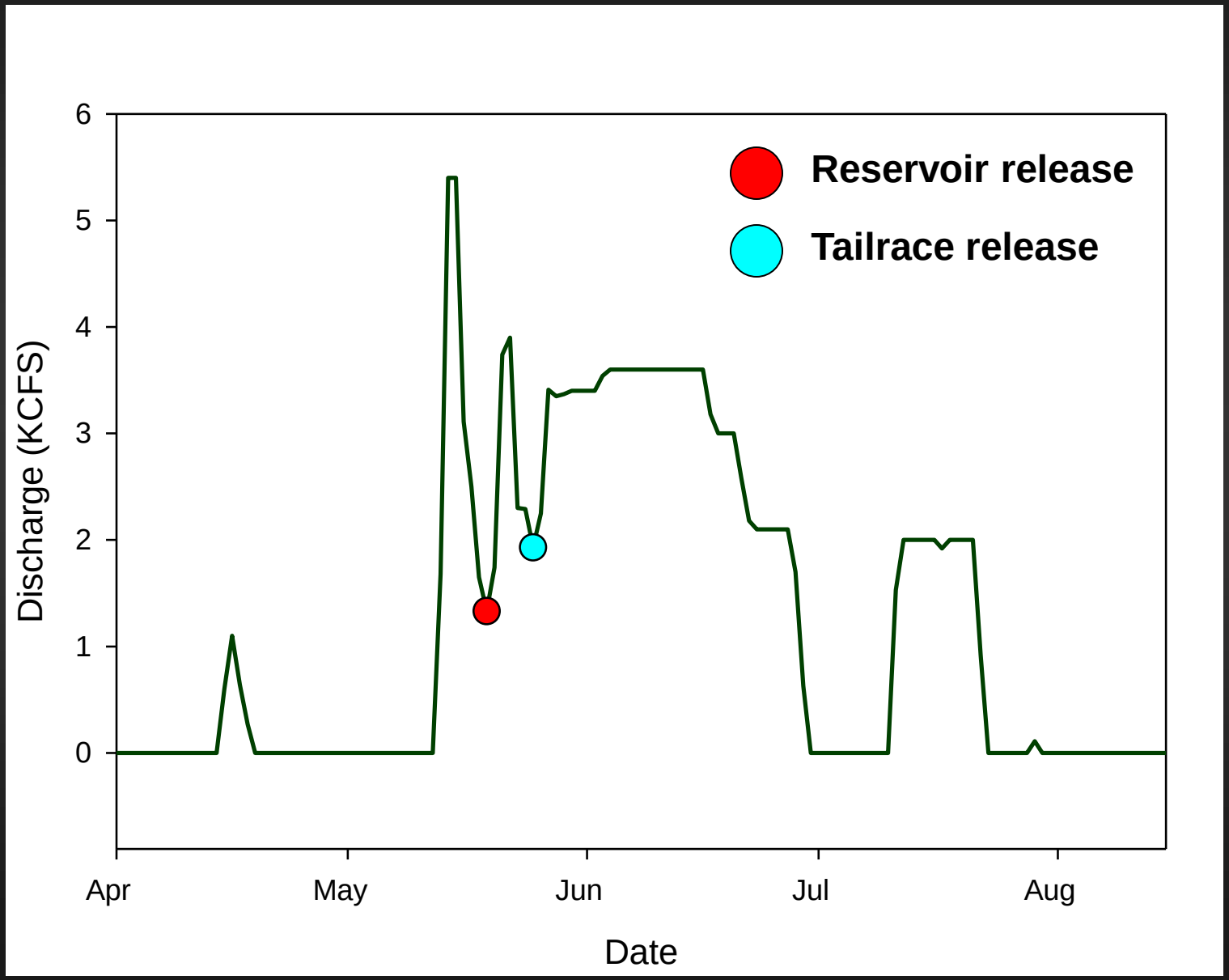


May-June Dam Operations at LOP





Spill and Release Dates



Summary

- Hatchery fish without the “reservoir experience” were 2.5X more successful in reaching Willamette Falls
- Surprisingly, faster migration rate for reservoir-released fish to Willamette Falls
- Spill likely affected our results – what happens during normal operations?
- Very high growth rates for both groups; higher for reservoir release = ?
- Useful for identifying ultimate fate of fish
- Additional releases, SARs will help corroborate findings
- Big bang for the buck

Future Research

Estimate survivorship to adulthood from PIT tagged and coded-wire tagged fish

Replicate this effort in 2012, using four release groups of 50K each

- Two groups (FL=65 mm), PIT tagged
- Two groups (FL=40 mm), genetic tags

Conduct a similar study on the North Santiam River to evaluate effects of passage through vs. around Detroit and Big Cliff (CWT and PIT)

Acknowledgments

USACE – funding, Dexter screw trap

Biomark, Inc. – PIT tagging

Dan Peck and Willamette Hatchery

PSMFC – recovery data

ODFW “Reservoir Dogs” – recovery data

PGE – Interrogation facility

Bill Muir, NOAA – original concept

Questions?