

# IMPACTS OF DAM AND RESERVOIR PASSAGE ON SPRING CHINOOK SALMON AND WINTER STEELHEAD IN THE WILLAMETTE RIVER BASIN

Principal Investigators

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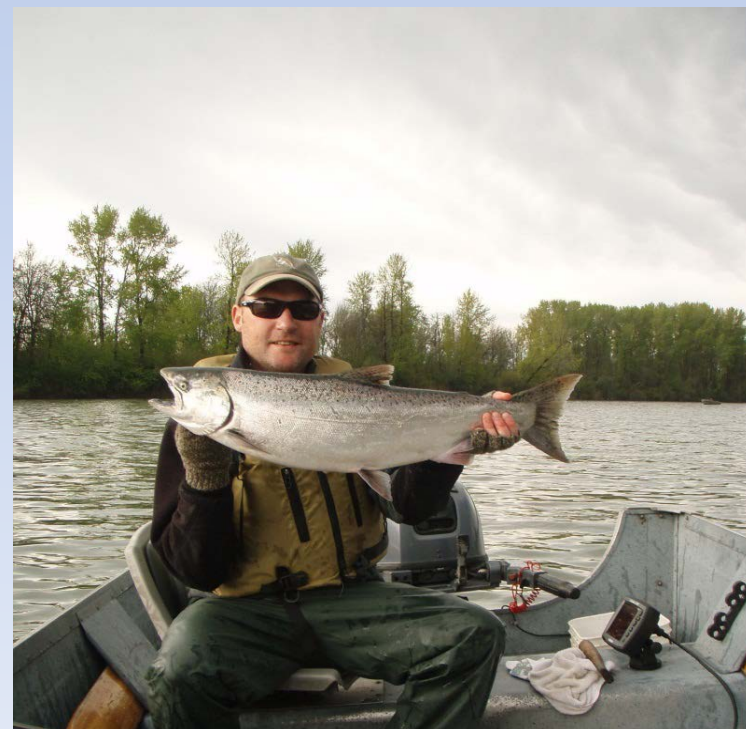


Oregon Department of Fish and Wildlife  
Corvallis Research Laboratory



# *Objectives*

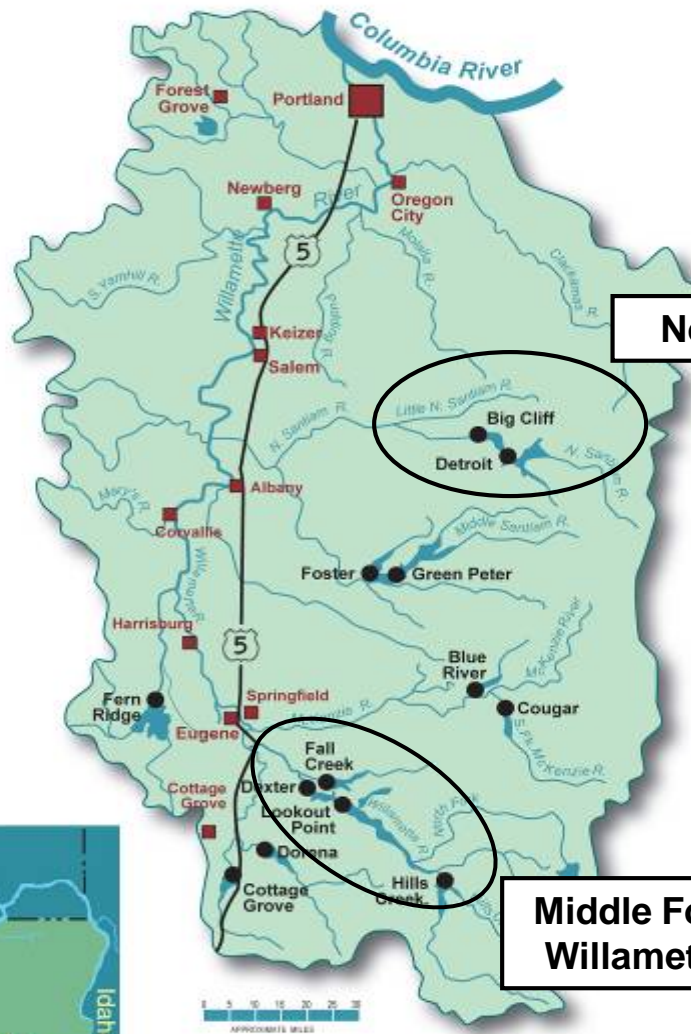
- Estimate the effect that passage through dams and reservoirs has on hatchery spring Chinook salmon and winter steelhead focusing on:
  - Outmigration success of juveniles
  - Survivorship to adulthood



# The Willamette Basin



US Army Corps of Engineers  
Portland District



North Santiam

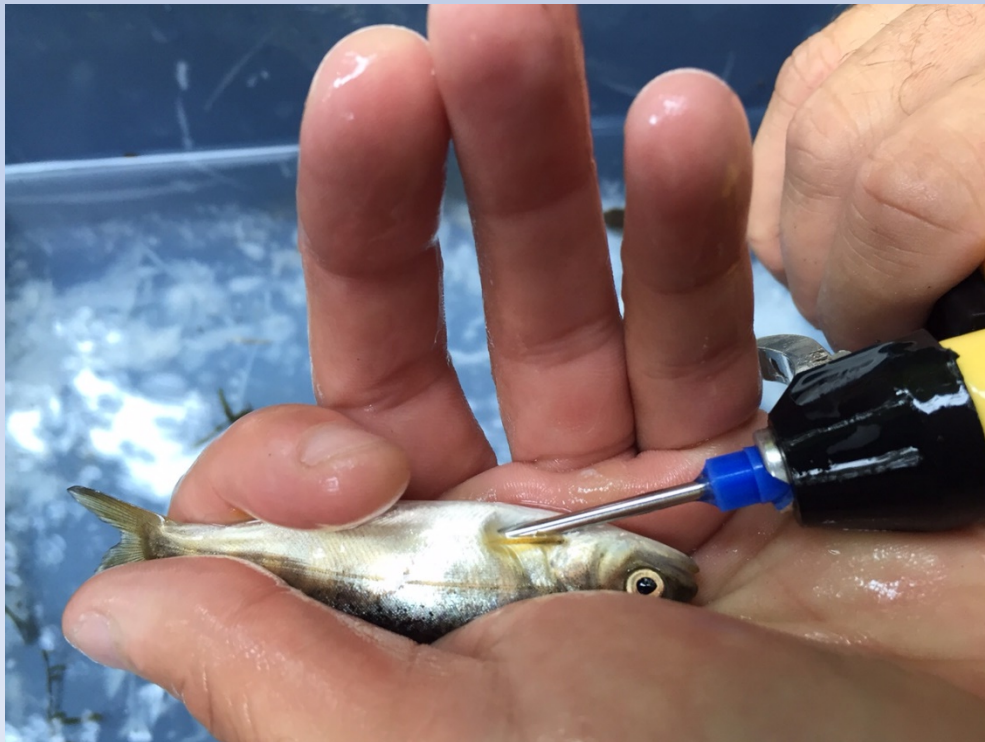
Middle Fork Willamette



Courtesy USACE

# *Tagging*

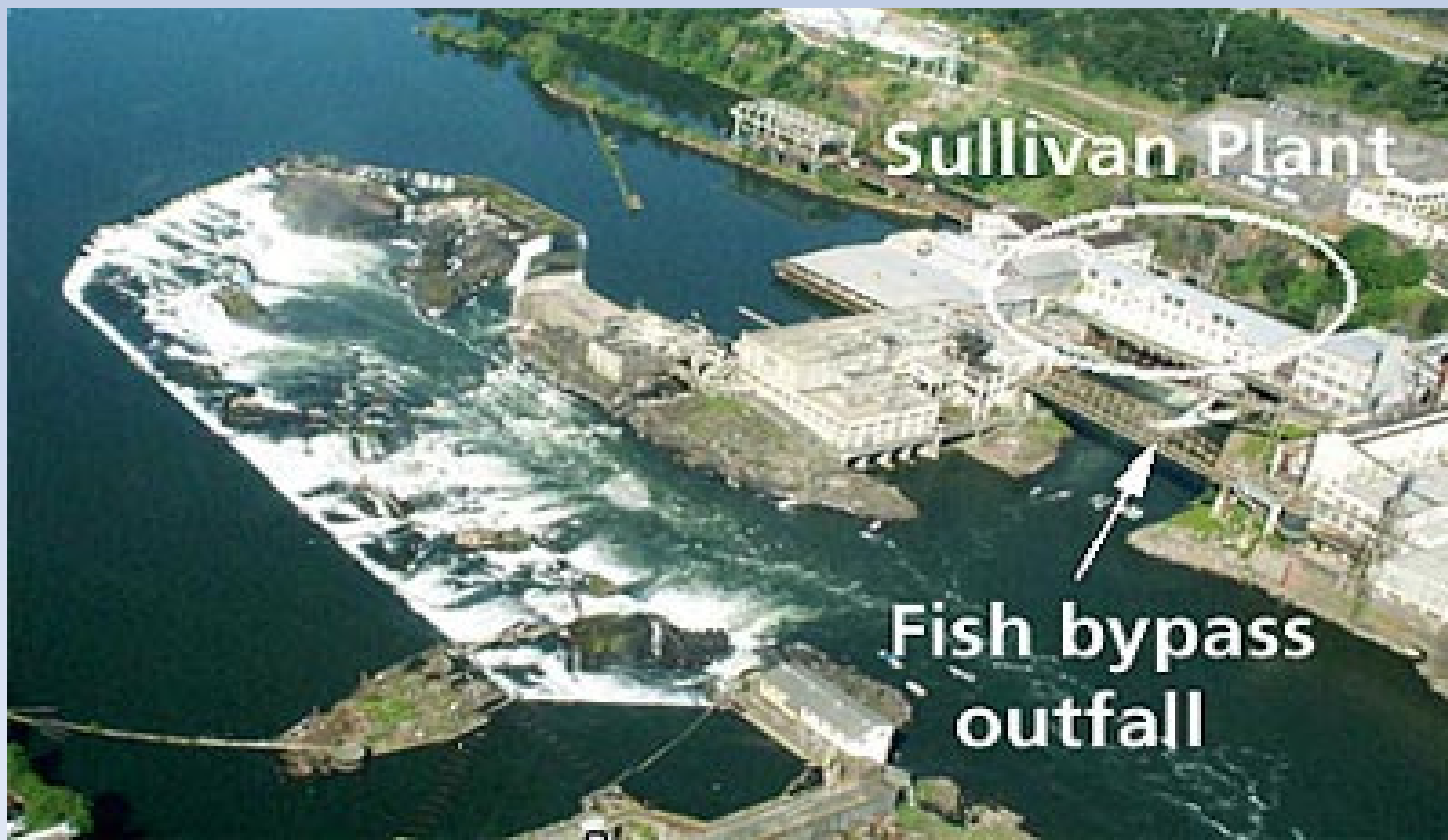
Major assumption: hatchery fish are phenotypically similar to naturally-produced fish entering the reservoir (size, timing, behavior, condition, etc.)



# *Detection & Recovery*

PIT tags (2011-2020):

- Outmigrants at Willamette Falls, <10% detection efficiency
- Adults at Willamette Falls, 100% detection efficiency

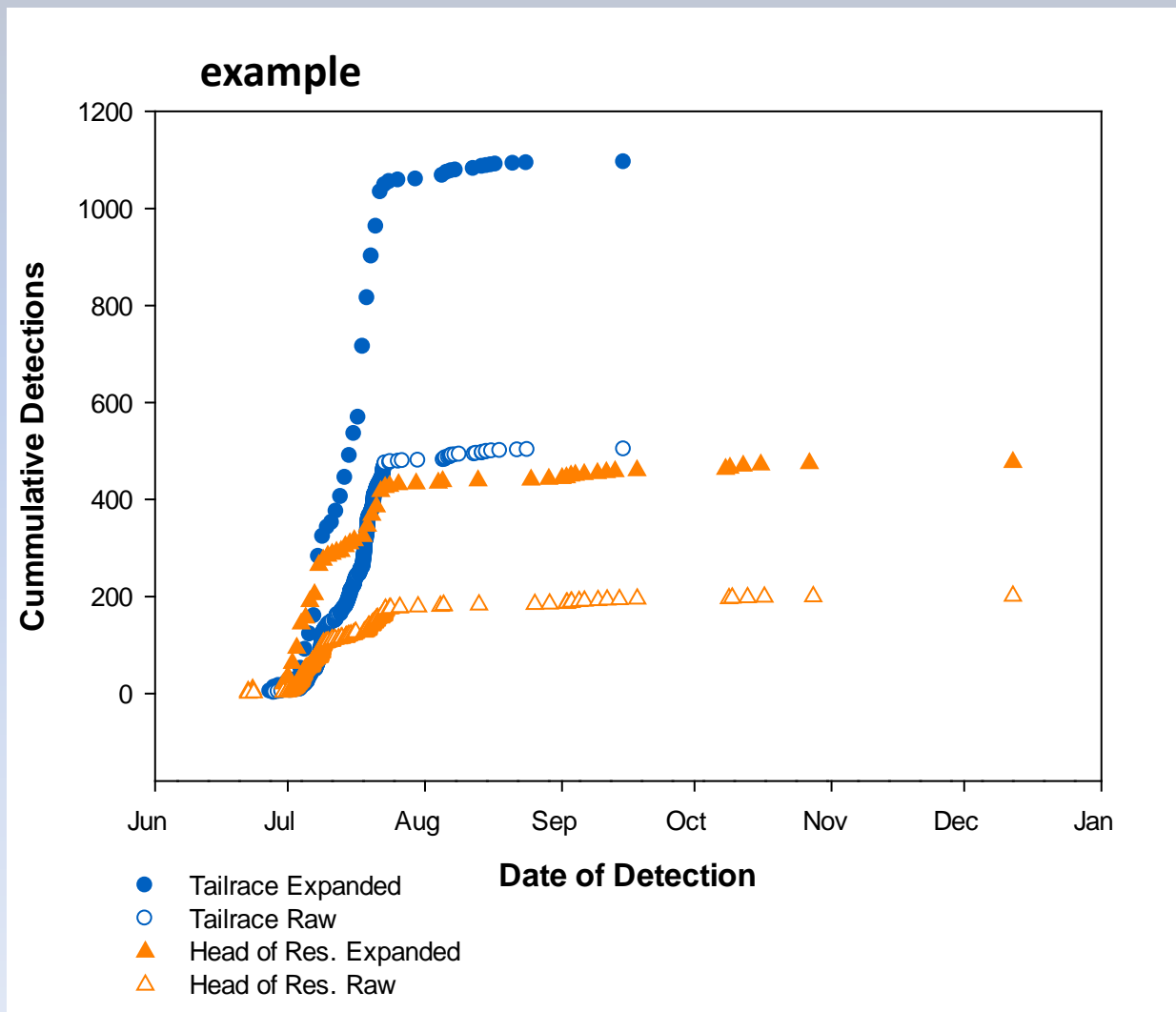


# *Tagging & Release – MFW*

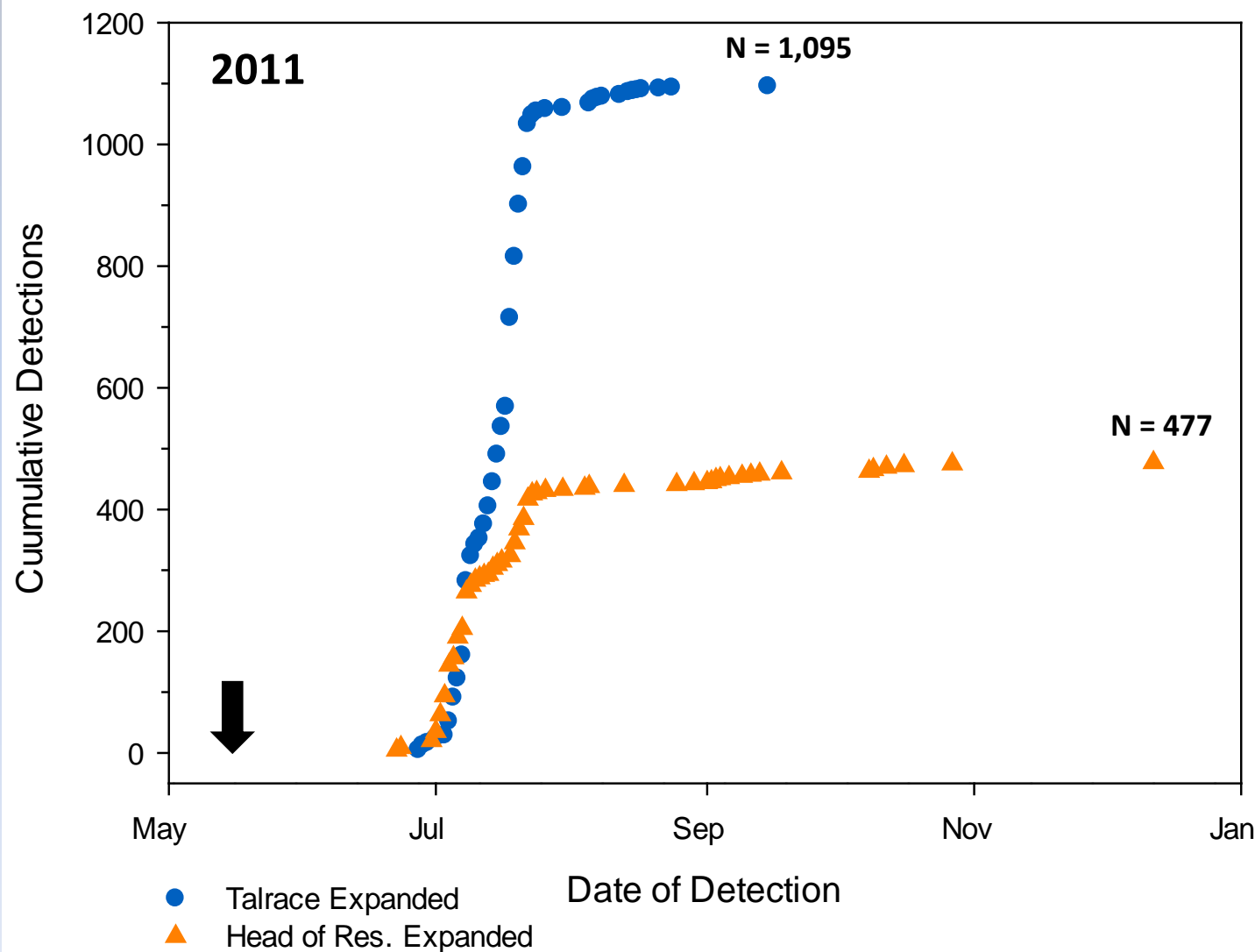
	Release Location				
Release Year	Dexter Tailrace	LOP Tailrace	LOP Forebay	LOP Head of Res.	Hills Cr. Reservoir
2011	6K	--	--	6K	--
2012	50K	--	--	50K	50K
2013	37K	--	37K	37K	33K
2014	33K	33K	33K	33K	--

# Expansion Factors

(Schroeder et. al., 2015)

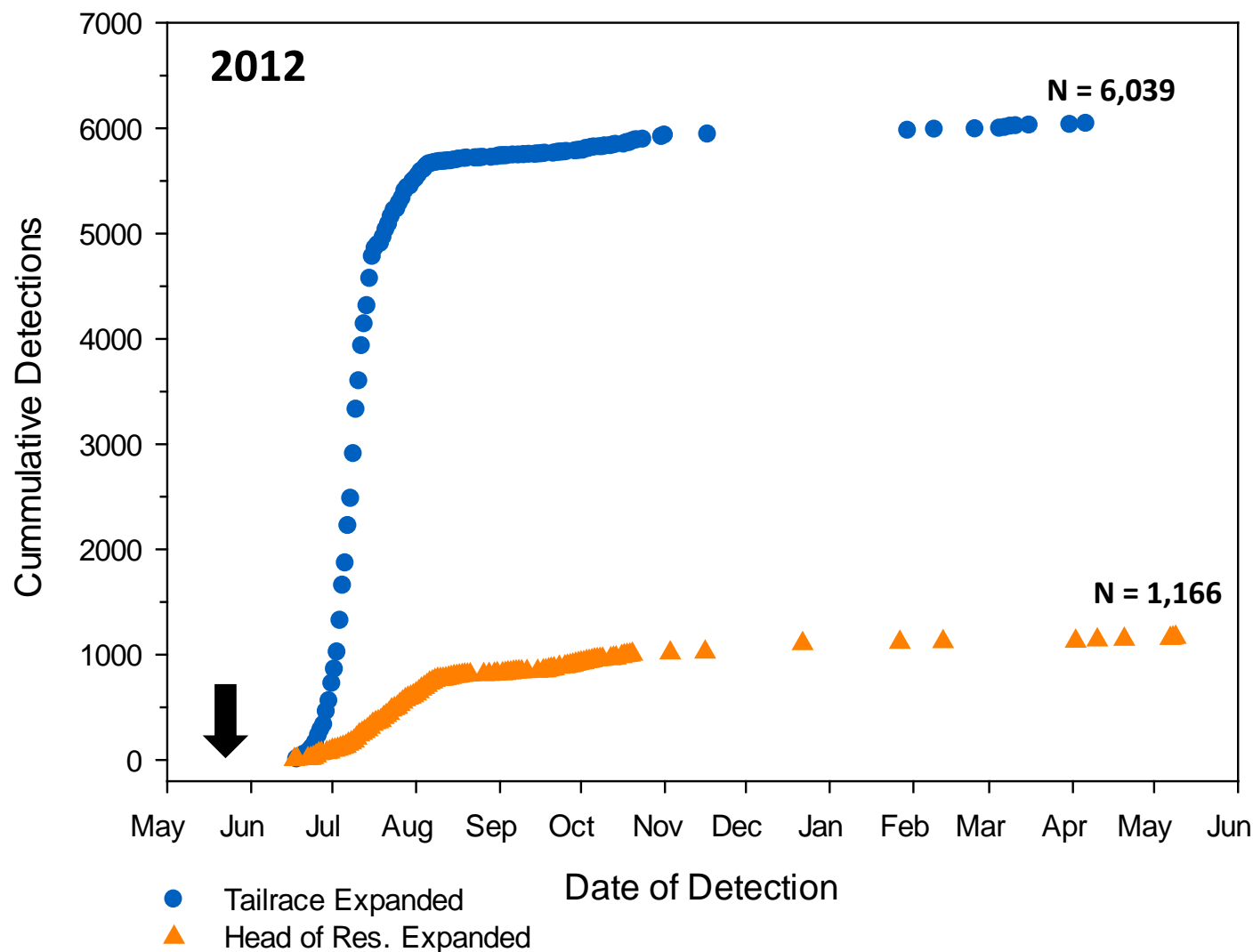


# *Outmigration Success— MFW*

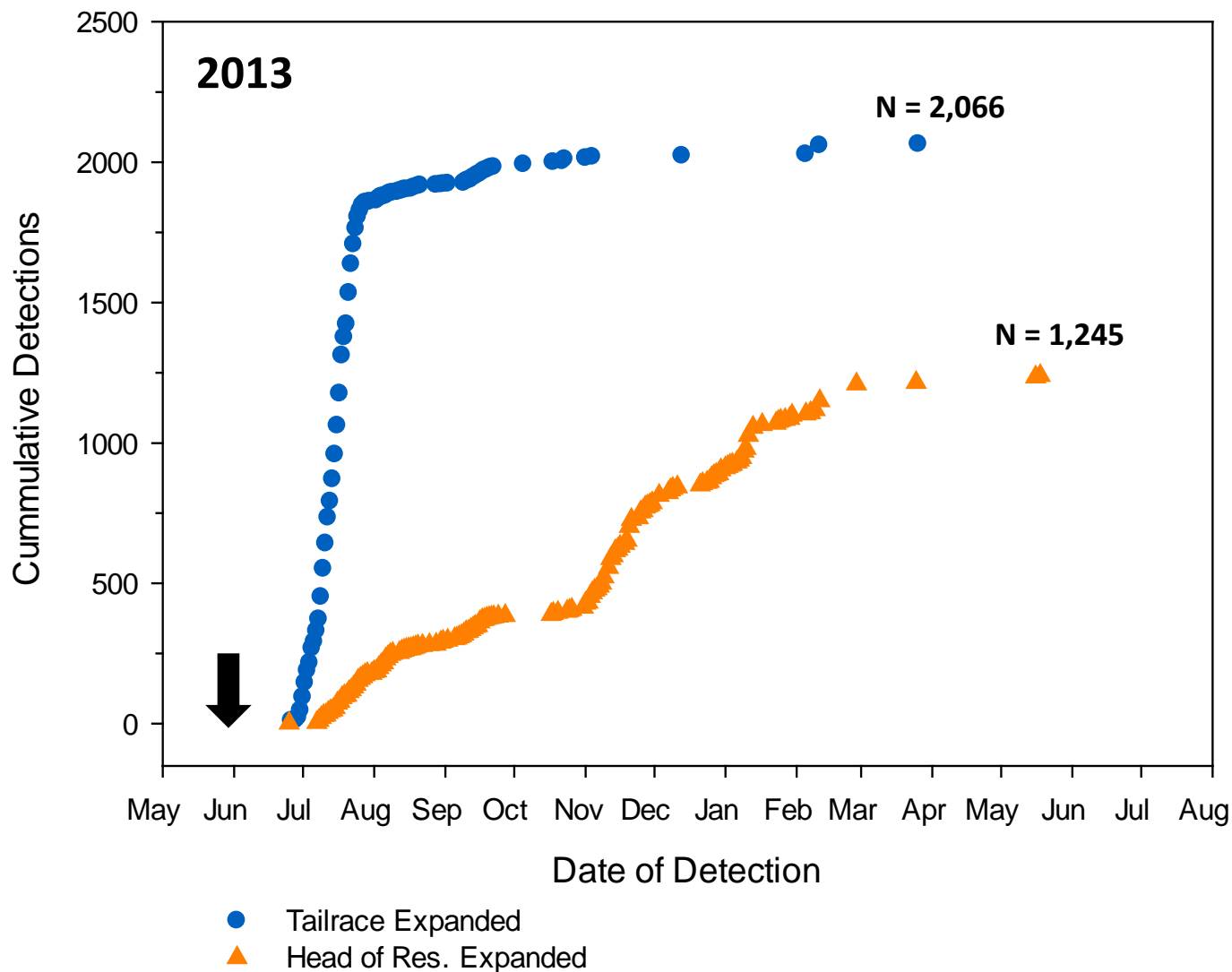




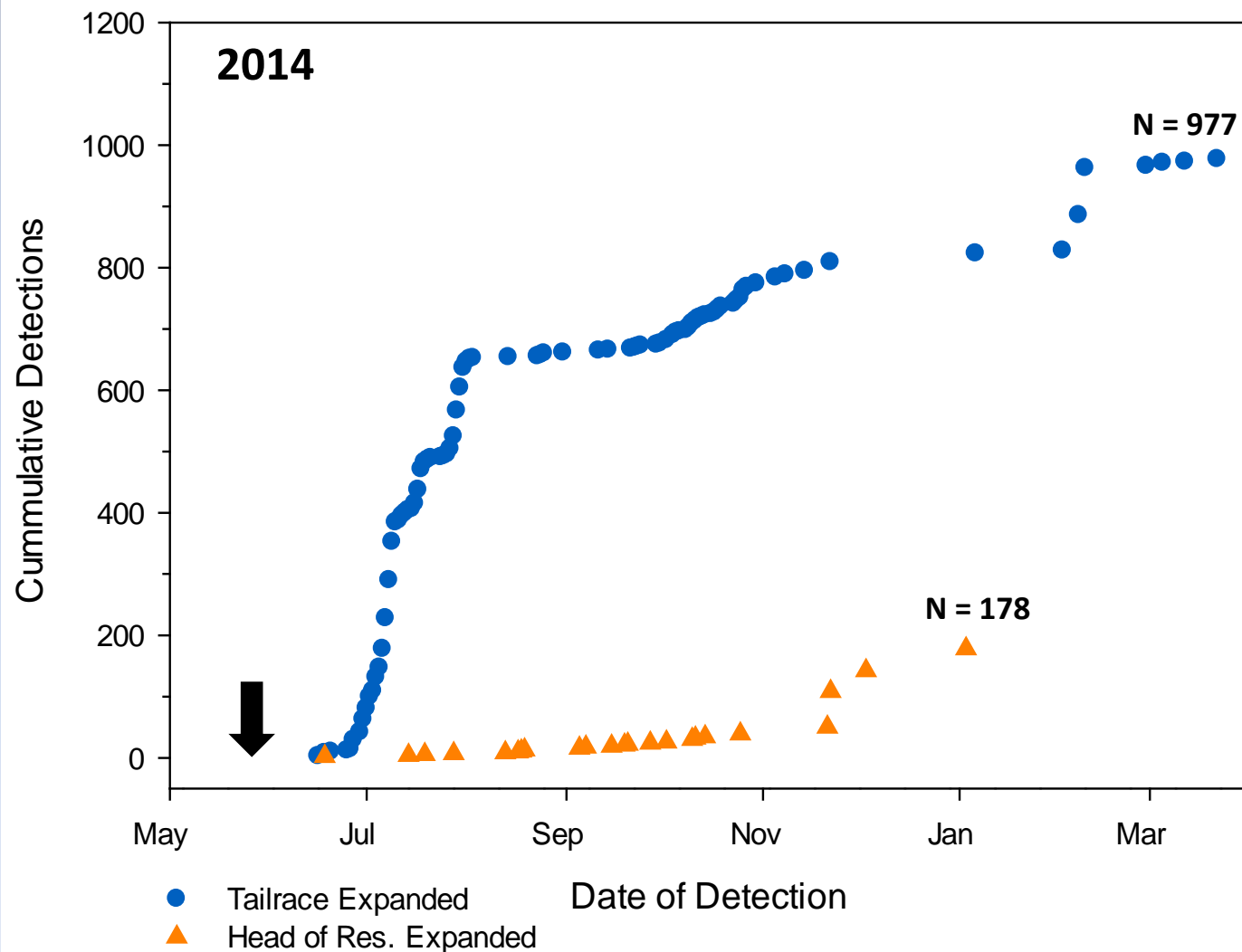
# *Outmigration Success— MFW*



# *Outmigration Success— MFW*



# Outmigration Success– MFW



# *Tagging & Release – N. Santiam (Chinook)*

## Release Location

Release Year

**Minto TR**

Detroit FB

**Detroit HOR**

2012

**12K**

--

**12K**

2013

**33K**

33K

**33K**

2014

**33K**

33K

**33K**

2015

**33K**

--

**66K**

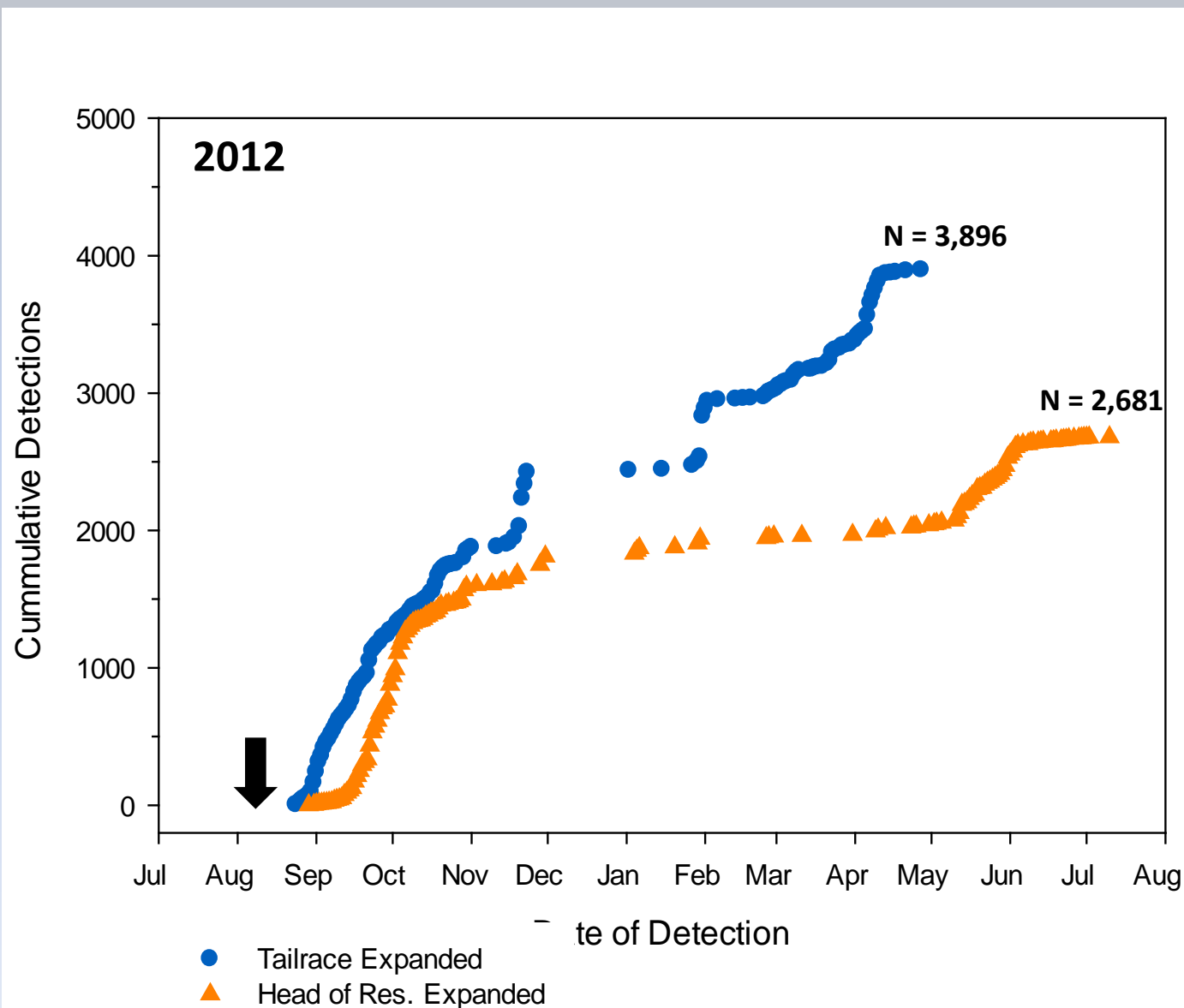
2016

**33K**

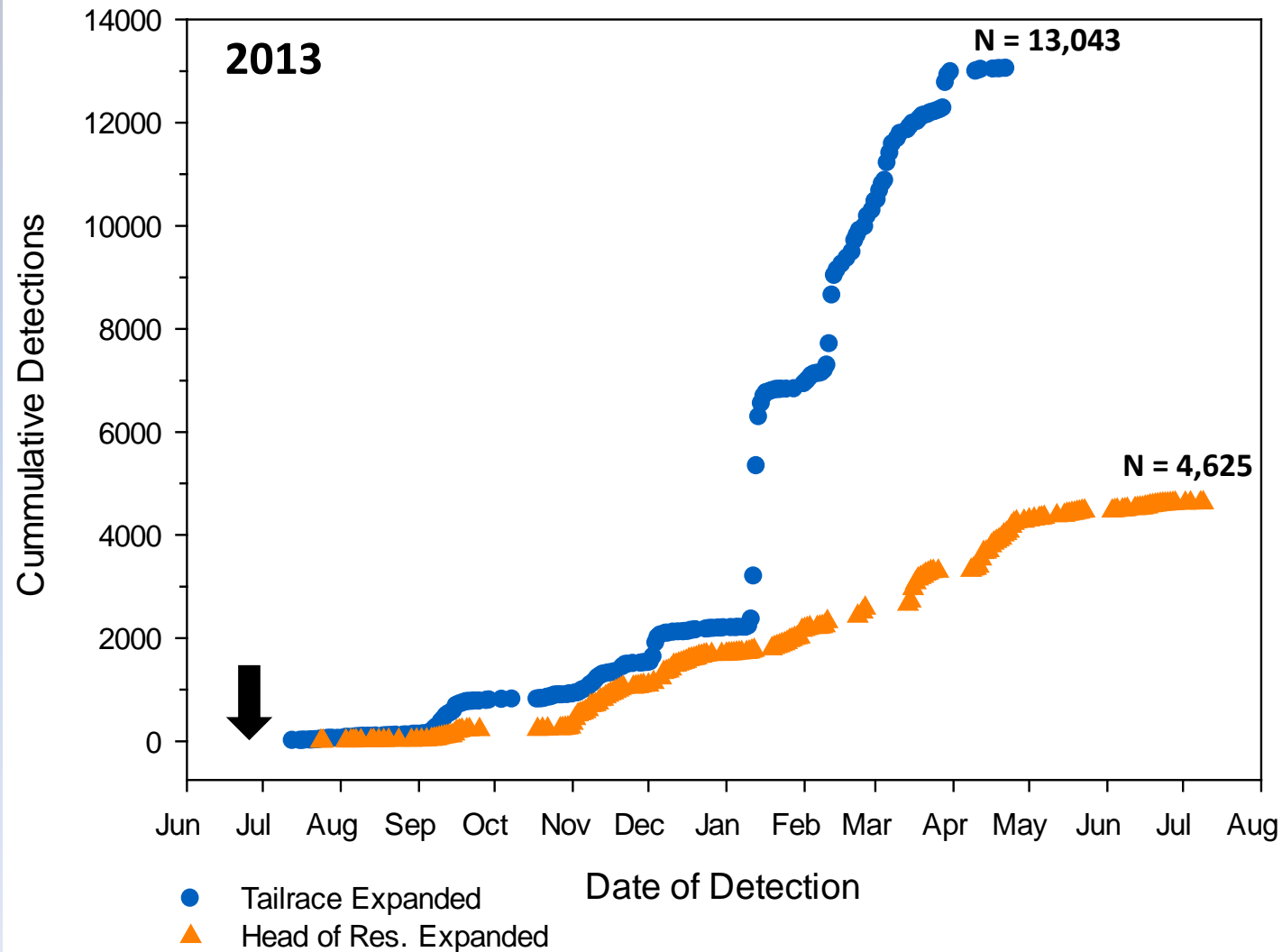
33K

**33K**

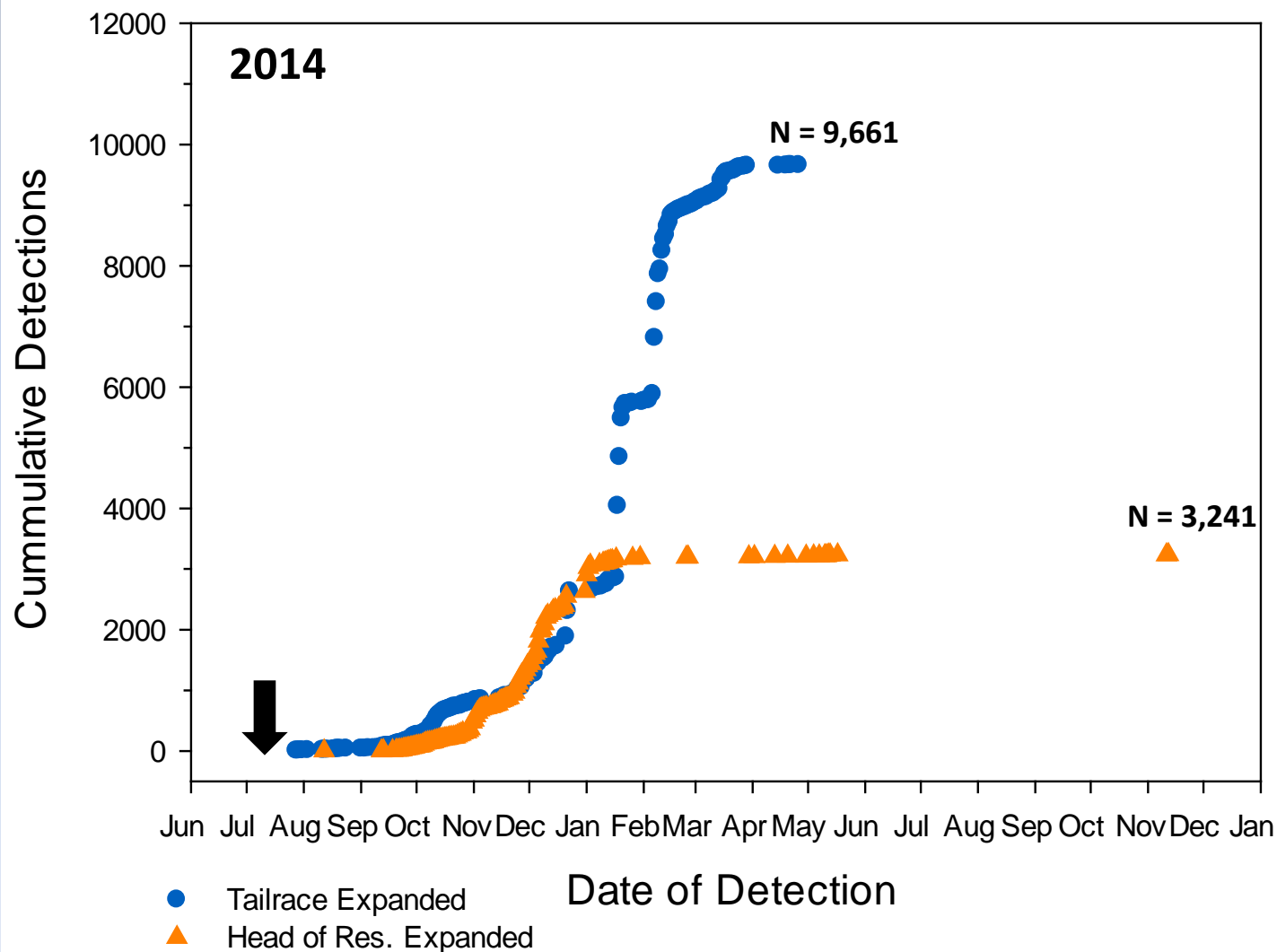
# Outmigration Success— N. Santiam (Chinook)



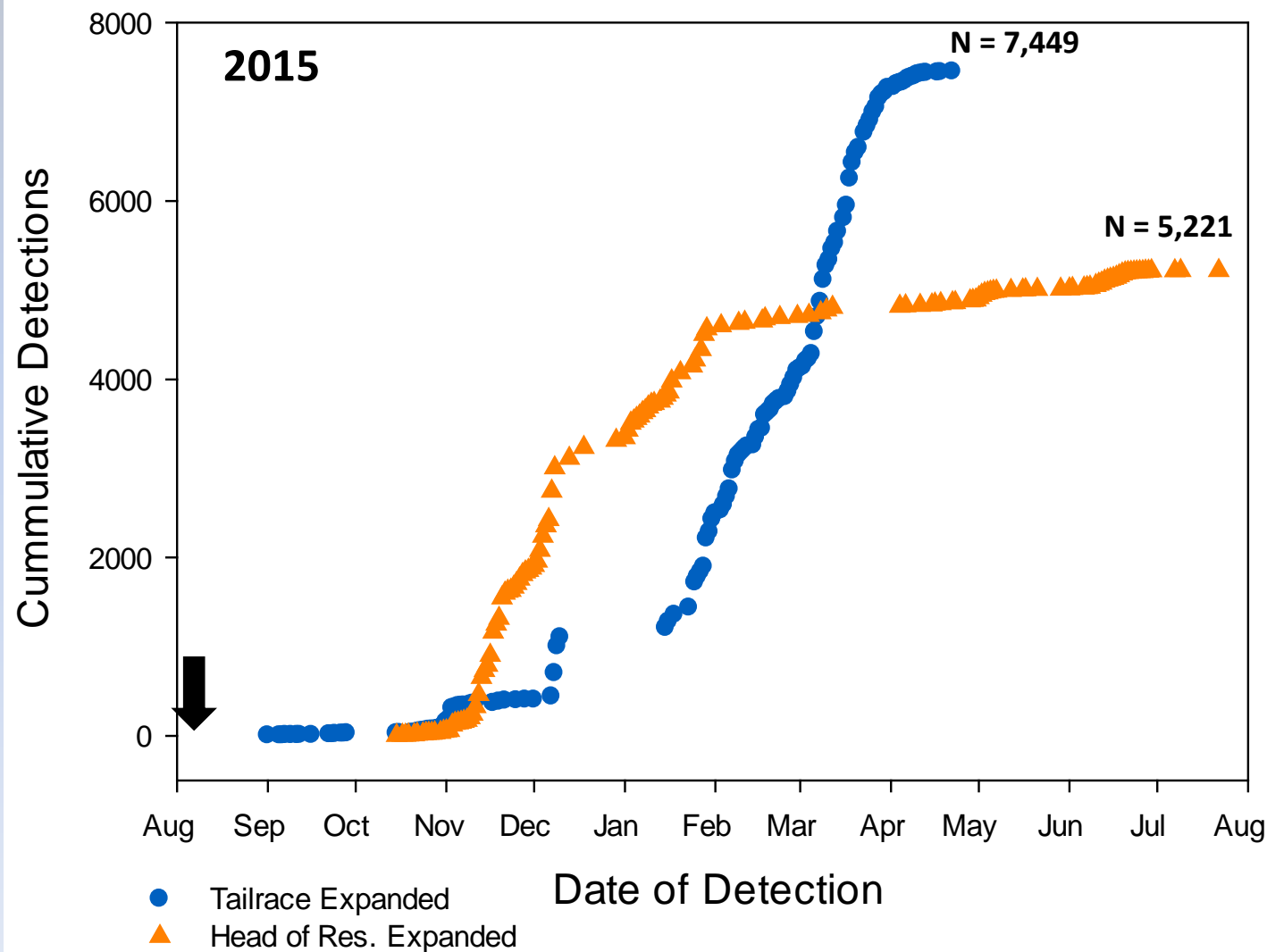
# Outmigration Success— N. Santiam (Chinook)



# Outmigration Success— N. Santiam (Chinook)

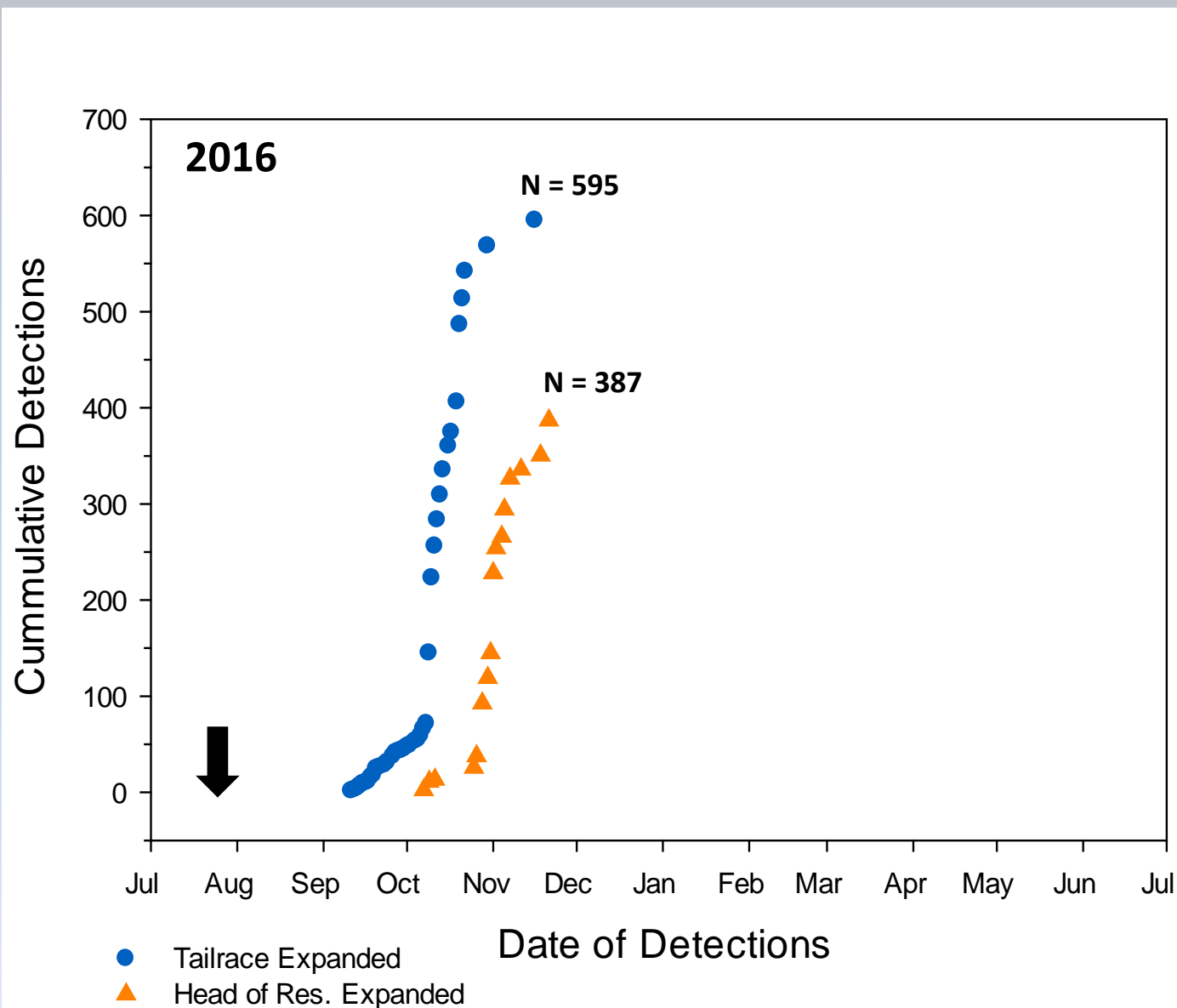


# Outmigration Success—*N. Santiam* (Chinook)





# Outmigration Success— N. Santiam (Chinook)

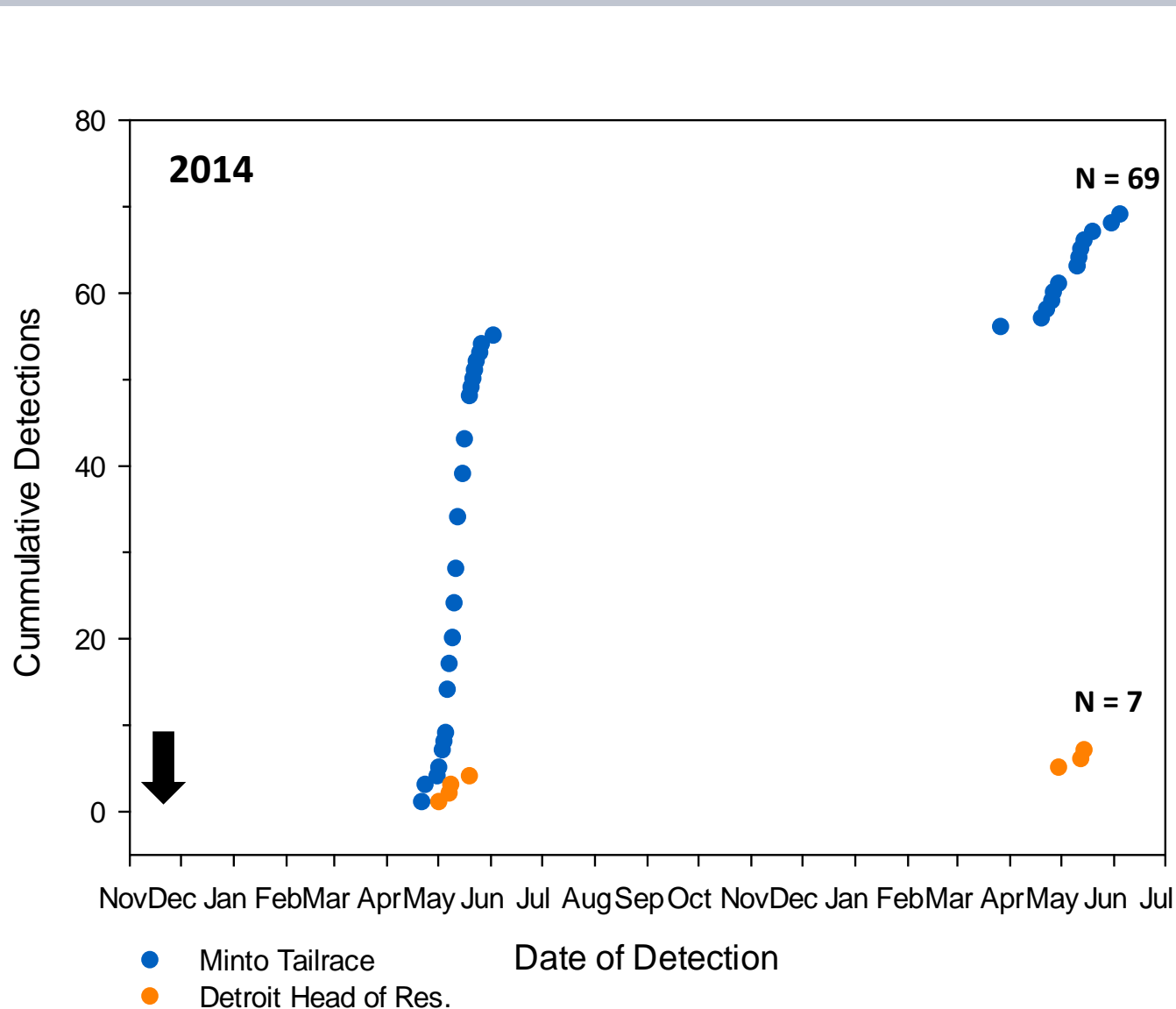


# *Tagging & Release – N. Santiam (Steelhead)*

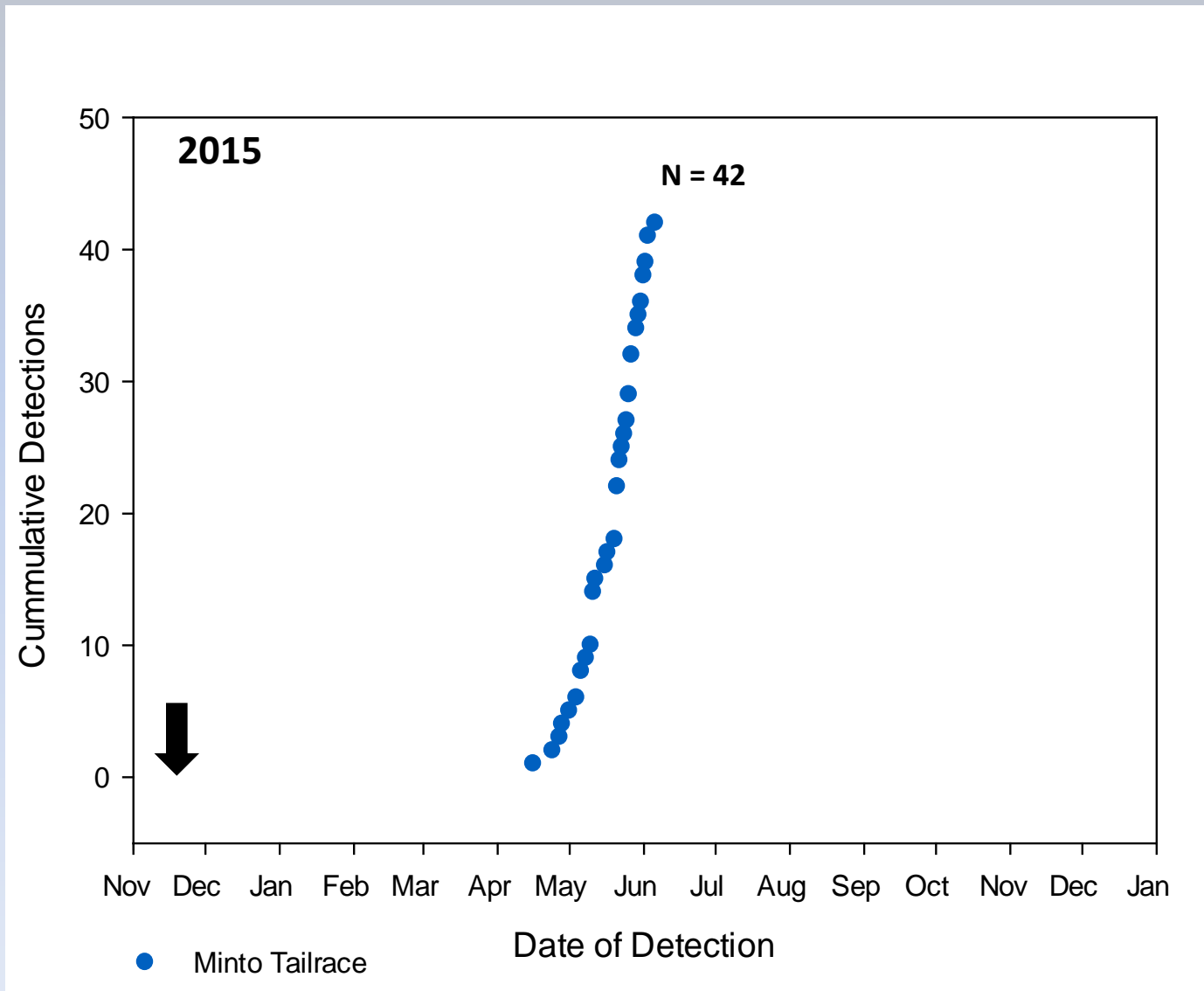
	Release Location	
Release Year	Minto TR	Detroit HOR
2014	6K	6K
2015	10K	10K
2016	11K	11K



# *Outmigration Success— N. Santiam (Steelhead)*



# *Outmigration Success— N. Santiam (Steelhead)*



# *Outmigration Success*

## Effect Size

Md. Fk. Willamette (Chinook)		N. Santiam (Chinook)		N. Santiam (Steelhead)	
TR	HOR	TR	HOR	TR	HOR
10,177	3,066	34,644	16,155	111	7
3:1		2:1		16:1	

# *Juvenile to Adult Survival*

## Adult Detections at Willamette Falls (Chinook)

	TR	HOR	Totals
N. Santiam (3 Years)	76	89	165
Md. Fk. Willamette (4 Years)	17	40	57

# *Juvenile to Adult Survival*

## 2012 N. Santiam Release (Chinook)

Age	Minto TR	Detroit HOR	CWT Recoveries	N. Santiam Unmarked	McKenzie Unmarked
3	7%	9%	3%	6%	1%
4	69%	63%	57%	49%	36%
5	24%	28%	38%	43%	60%
6	--	--	1%	2%	3%

# *Juvenile to Adult Survival*

## 2012 Md. Fk. Willamette Release (Chinook)

Age	Dexter TR	LOP HOR	CWT Recoveries	Md. Fk. Willam Unmarked	McKenzie Unmarked
3	<b>17%</b>	<b>18%</b>	3%	3%	1%
4	<b>75%</b>	<b>75%</b>	57%	50%	36%
5	<b>8%</b>	<b>7%</b>	38%	45%	60%
6	--	--	1%	2%	3%



# *Key Points*

- Juvenile fish released above dams detected at a lower rate=consistent evidence of dam/reservoir impacts related to lower outmigration success; impacts appear to be greater in the MFW
- So far, fish released above dams showing better survival to adulthood in both basins than tailrace releases – based on partial cohort returns
- Very few winter steelhead released above dams detected at WF
- Effect size for winter steelhead much greater compared to Chinook
- Disproportionate numbers of age-3 and age-4 Chinook returning to both basins for both release groups

# *Acknowledgments*

- USACE - Task Order W9127N-10-2-0008-0009, administered by Rich Piaskowski; Greg Taylor, Todd Pierce, Doug Garletts, Chad Helms, Nathaniel Erickson et al.
- ODFW – Dan Peck & staff; Greg Grenbemer & staff; Fred Monzyk, Jeremy Romer, Ryan Emig, Kelly Reis
- NOAA – Bill Muir (original concept)
- Biomark, Inc. – PIT tagging
- PSMFC – Tag recovery database
- PGE – Interrogation facility



# *Questions & Discussion*

<http://oregonstate.edu/dept/ODFW/willamettesalmonidrme>