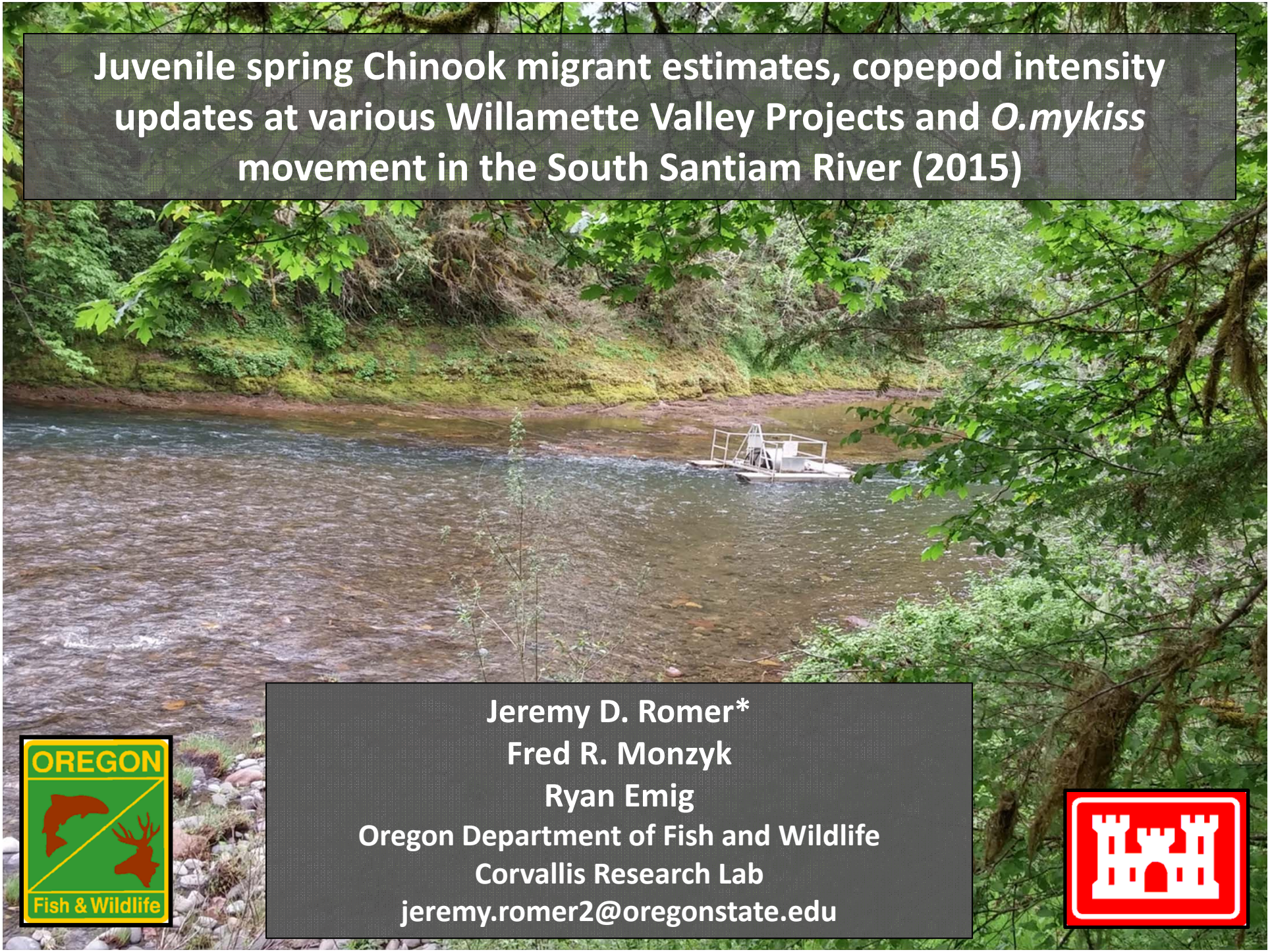
Juvenile spring Chinook migrant estimates, copepod intensity updates at various Willamette Valley Projects and *O.mykiss* movement in the South Santiam River (2015)



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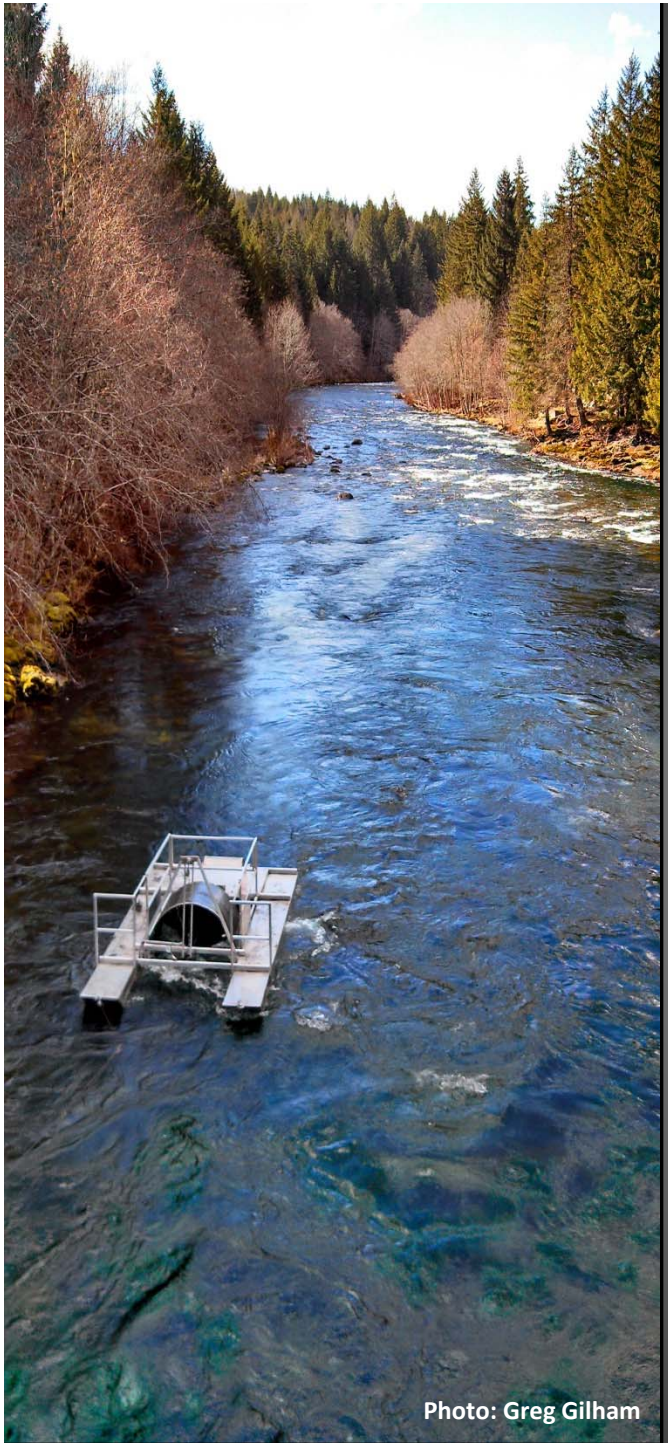


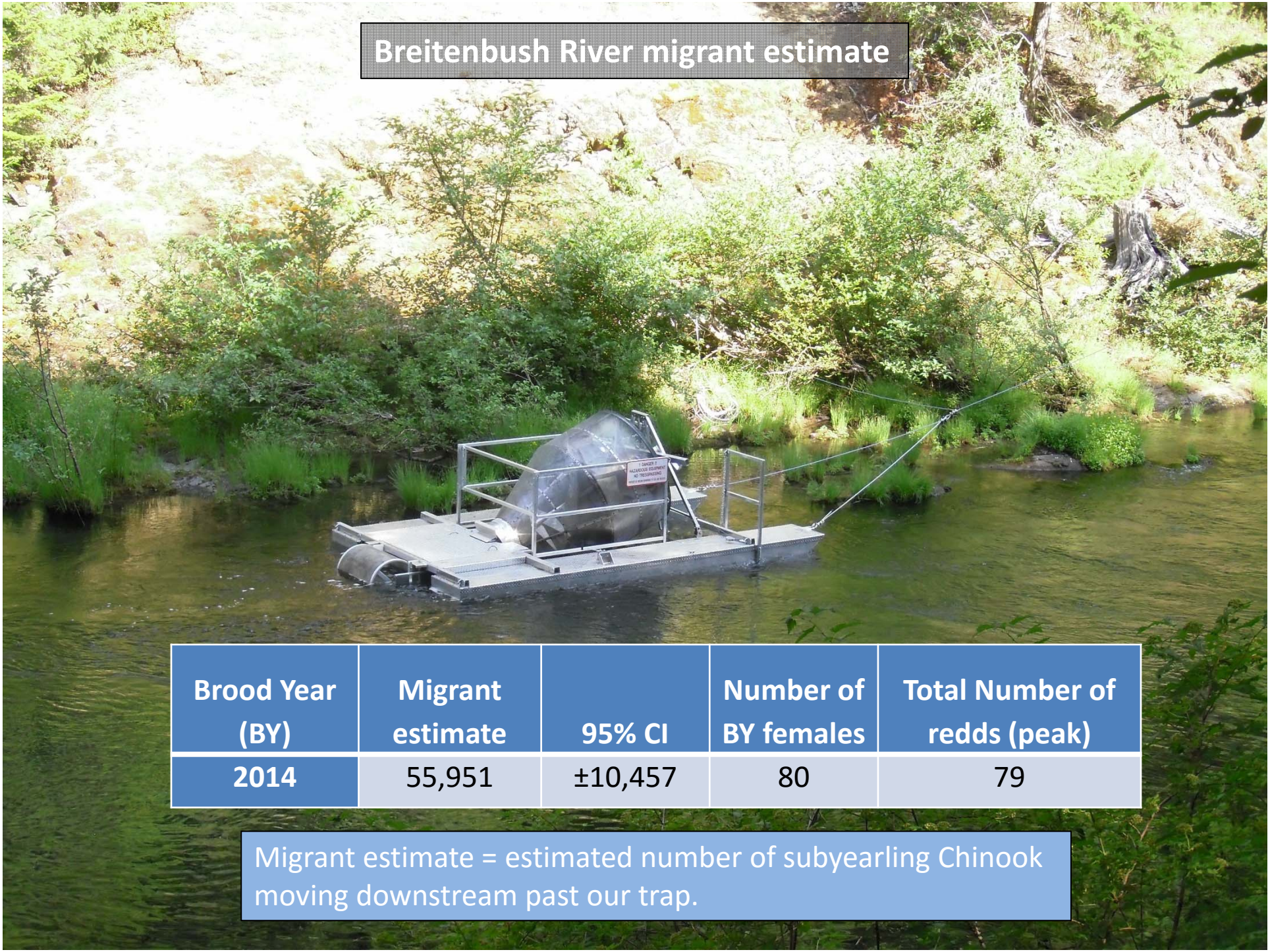
Project Objectives

- Determine migration timing and size of salmonids entering and exiting WVP reservoirs
- Provide abundance estimates where possible
- Contribute additional information on factors potentially affecting juvenile survival in Willamette Reservoirs

Topics covered in this presentation

- Migrant estimates for subyearling Chinook entering and exiting the Cougar Project
- Trends in copepod infection on Chinook gills in Cougar, Detroit and Fall Creek reservoirs
- Movement of *O.mykiss* in the South Santiam River associated with the Foster Project and beyond

Breitenbush River migrant estimate



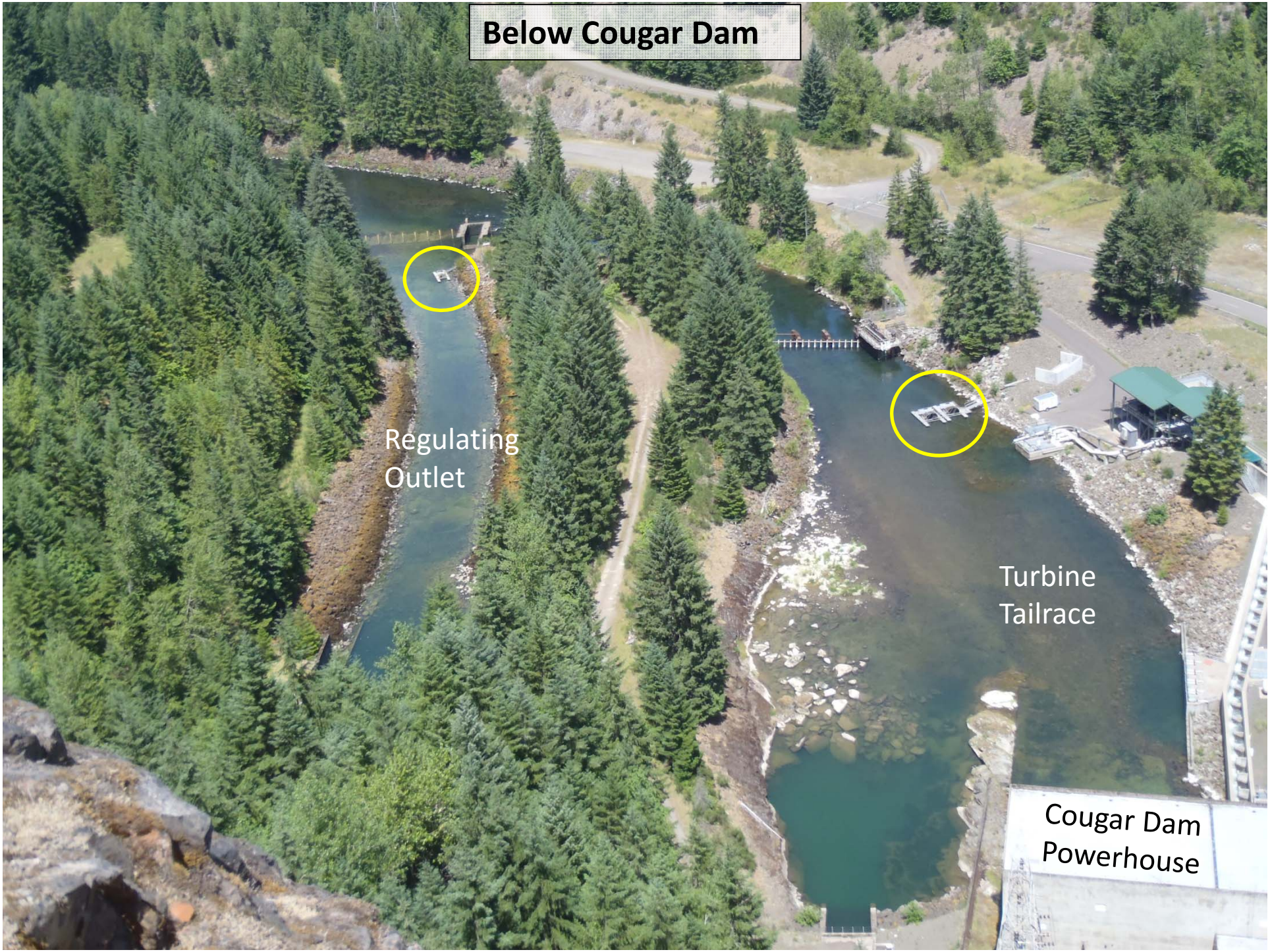
Brood Year (BY)	Migrant estimate	95% CI	Number of BY females	Total Number of redds (peak)
2014	55,951	±10,457	80	79

Migrant estimate = estimated number of subyearling Chinook moving downstream past our trap.

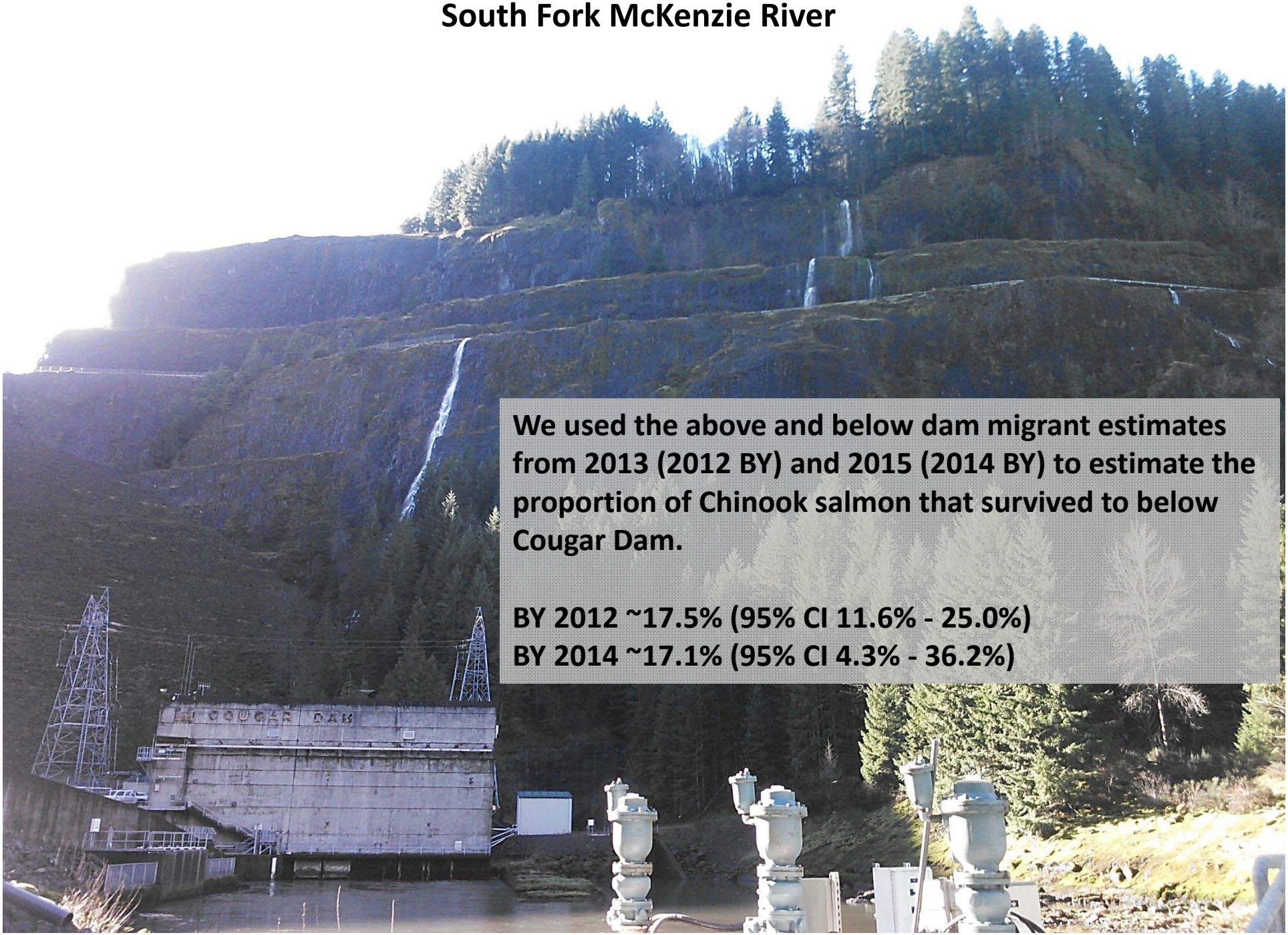
South Fork McKenzie River migrant estimates

Brood Year (BY)	Migrant estimate	95% CI	Number of BY females	Total Number of redds (peak)	Number of redds below trap
2009	685,723	±72,519	629	274	< 5
2010	152,159	±26,665	320	190	--
2011	228,241	±34,715	336	241	29
2012	557,526	±66,031	448	249	33
2013	413,515	±56,164	337	146[a]	--[b]
2014	227,780	±44,765	462	222	--[b]

[a] Storm event in fall 2013 near peak spawn decreased redd numbers by flattening redds (2013) brood year.
[b] Redds below trap were not surveyed.


Below Cougar Dam
Regulating Outlet
Turbine Tailrace
Cougar Dam Powerhouse

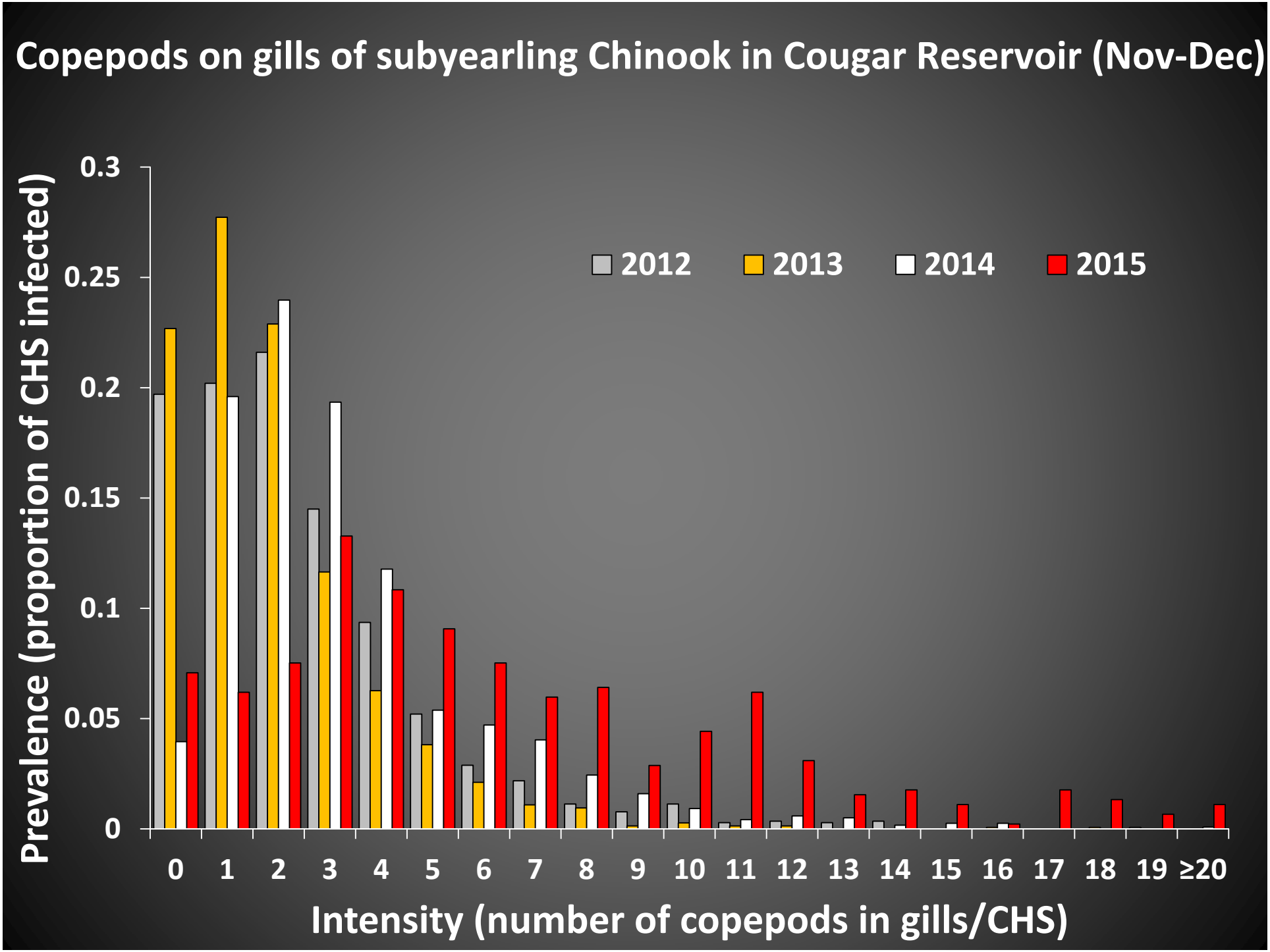
South Fork McKenzie River

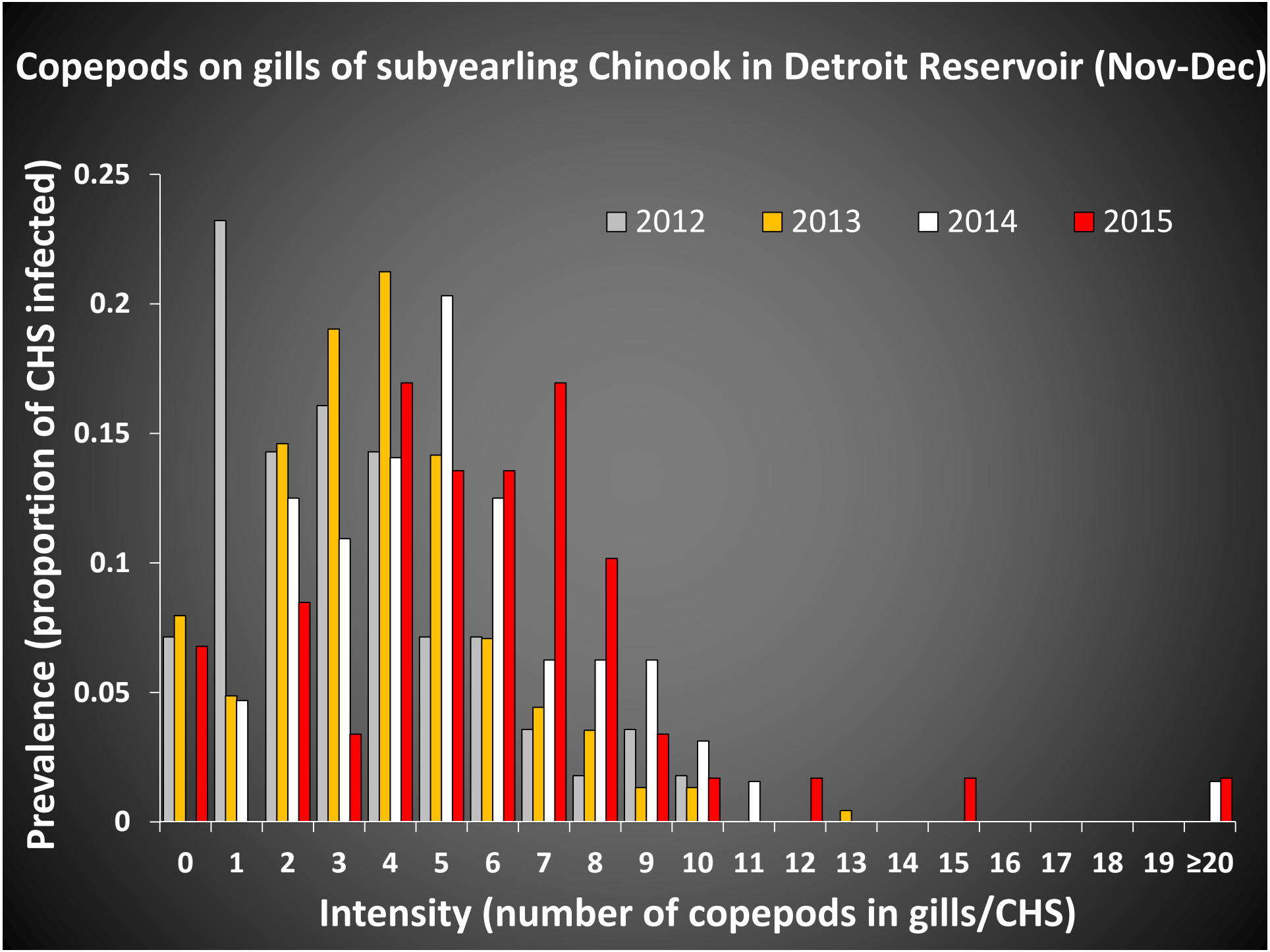


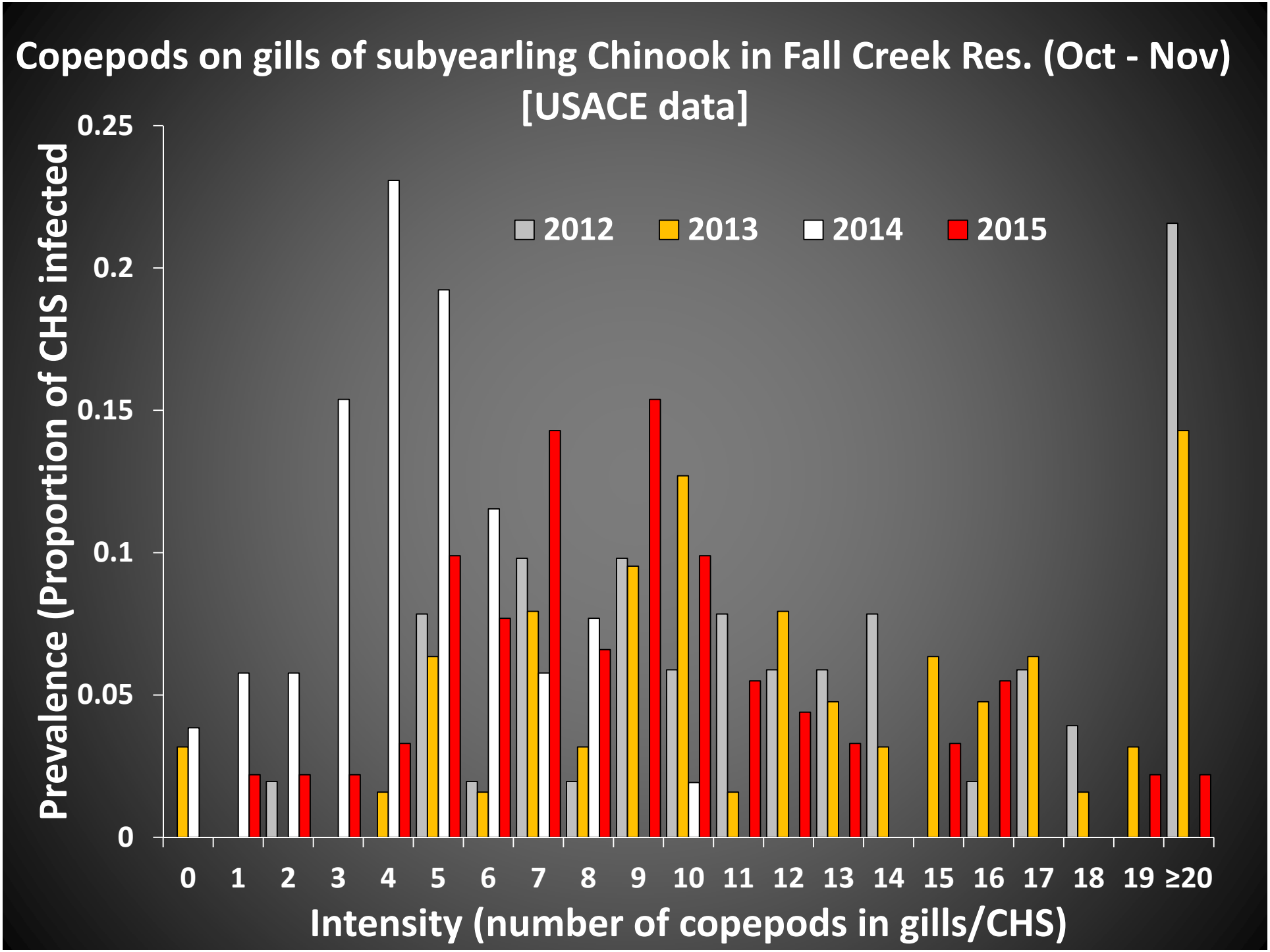
We used the above and below dam migrant estimates from 2013 (2012 BY) and 2015 (2014 BY) to estimate the proportion of Chinook salmon that survived to below Cougar Dam.

BY 2012 ~17.5% (95% CI 11.6% - 25.0%)
BY 2014 ~17.1% (95% CI 4.3% - 36.2%)

Copepod infection trends in Cougar, Detroit, and Fall Creek reservoirs 2012 - 2015


Copepods on gills of subyearling Chinook in Cougar Reservoir (Nov-Dec)
Prevalence (proportion of CHS infected)
0.3
0.25
0.2
0.15
0.1
0.05
0
2012
2013
2014
2015
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 ≥20
Intensity (number of copepods in gills/CHS)


Copepods on gills of subyearling Chinook in Detroit Reservoir (Nov-Dec)
Prevalence (proportion of CHS infected)
0.25
0.2
0.15
0.1
0.05
0
2012
2013
2014
2015
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 ≥20
Intensity (number of copepods in gills/CHS)


Copepods on gills of subyearling Chinook in Fall Creek Res. (Oct - Nov)
[USACE data]
Prevalence (Proportion of CHS infected
0.25
0.2
0.15
0.1
0.05
0
2012
2013
2014
2015
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 ≥20
Intensity (number of copepods in gills/CHS)

Copepod infection trends among reservoirs

COUGAR		Intensity			Prevalence
Year	n	Mean	Median		
2012	1,141	3.1	2	w	0.803
2013	1,135	2.5	2	x	0.773
2014	1,142	3.4	3	y	0.960
2015	658	6.3	5	z	0.929

DETROIT		Intensity			Prevalence
Year	n	Mean	Median		
2012	52	3.5	3	z	0.929
2013	208	4.1	4	z	0.920
2014	64	5.3	5	y	1.000
2015	55	6.1	6	y	0.932

FALL CREEK		Intensity			Prevalence
Year	n	Mean	Median		
2012	51	13.3	12	z	1.000
2013	61	13.0	12	z	0.968
2014	50	4.6	4	y	0.962
2015	91	8.9	9	x	1.000

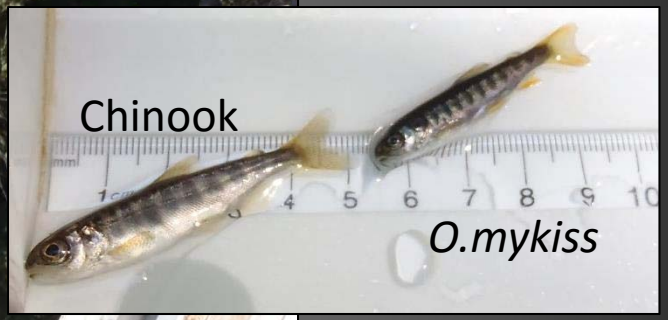
2015 mean intensity x2 greater than previous years

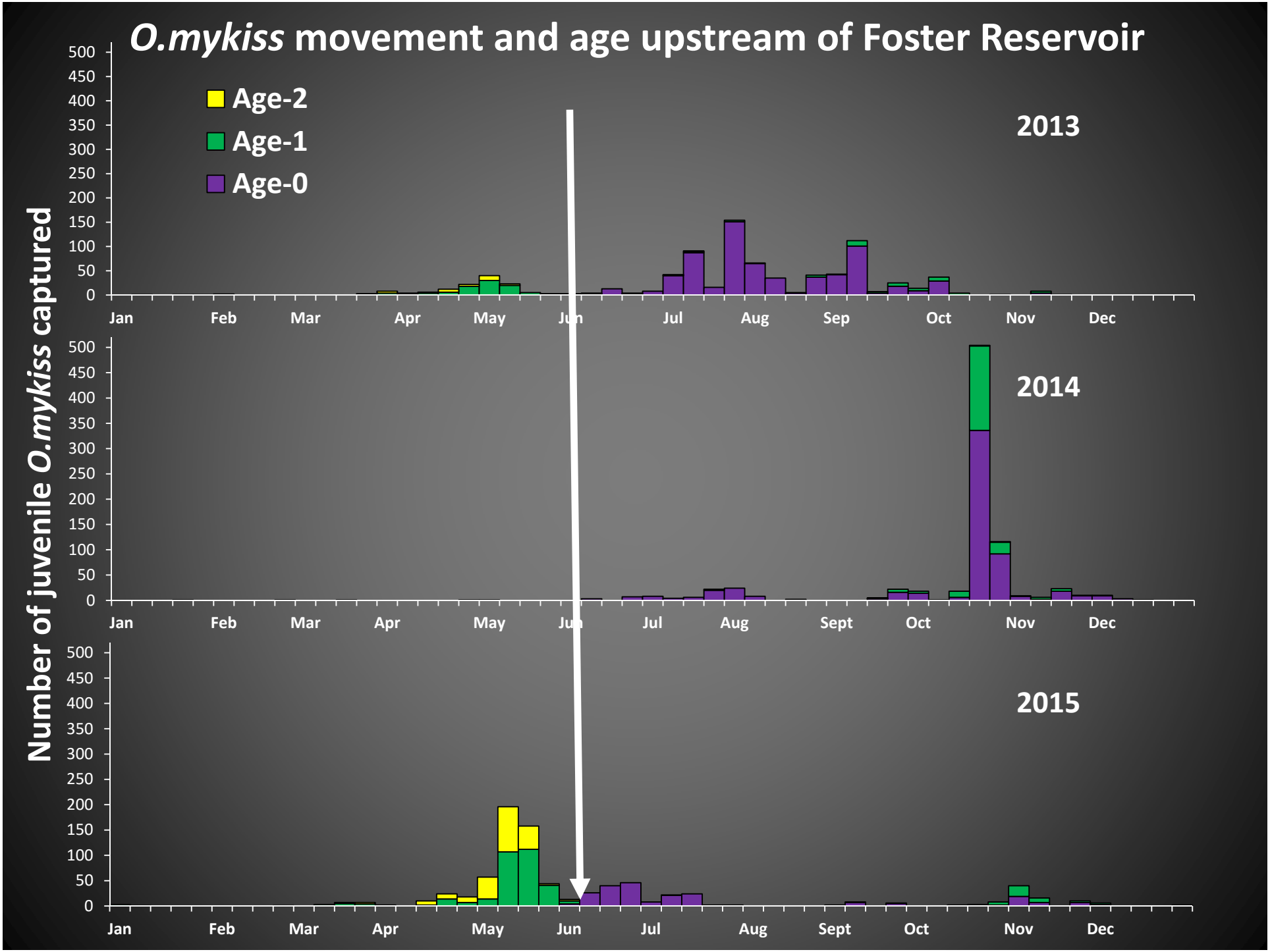
Mean intensity increased each year but 2014-15 not statistically different

2015 intensity rebounded from low in 2014

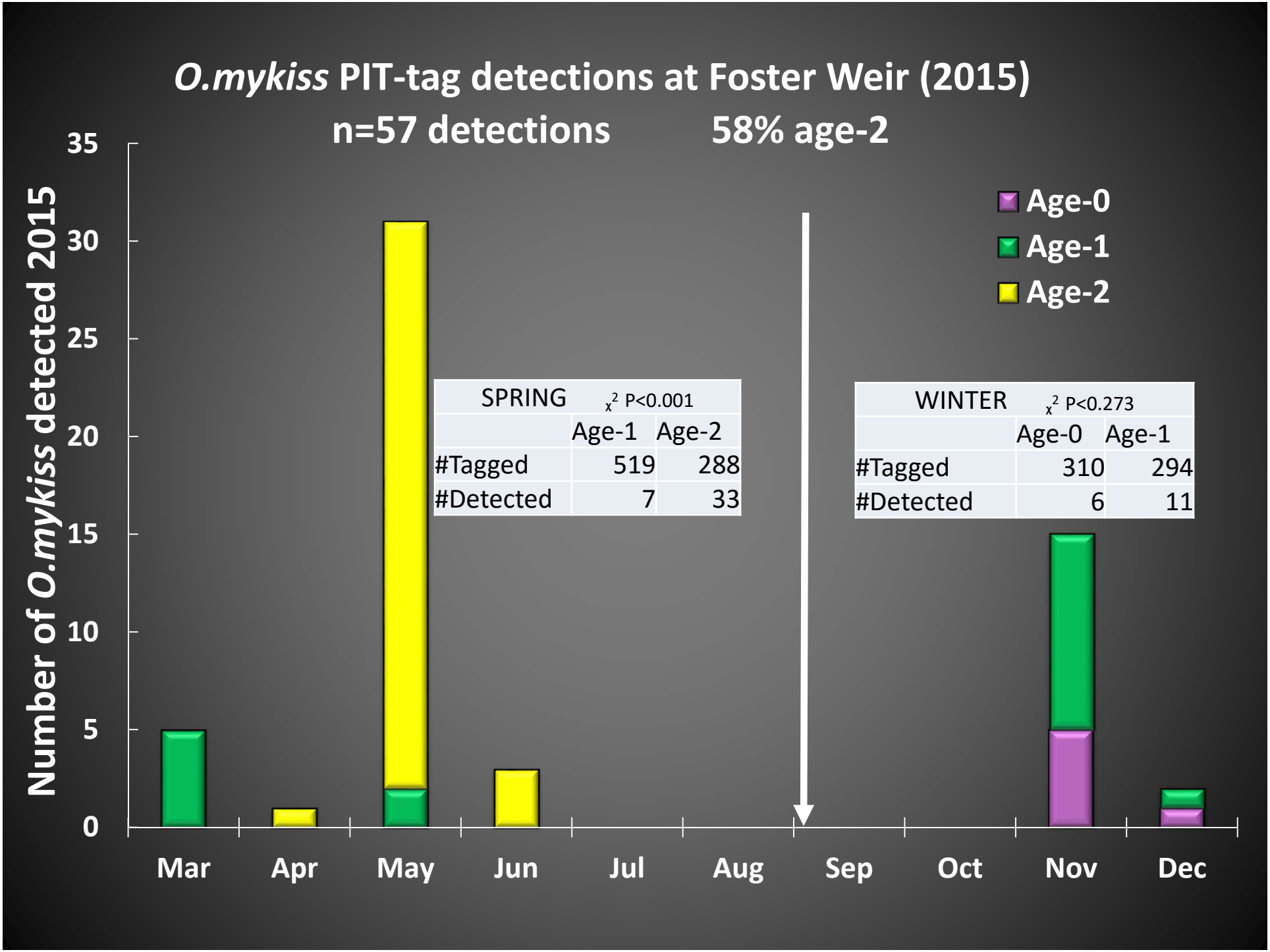
n = number of Chinook where copepods were counted (used for mean and median)

South Santiam River *O.mykiss* movement above Foster Reservoir




O.mykiss movement and age upstream of Foster Reservoir
Age-2
Age-1
Age-0
2013
2014
2015
Number of juvenile O.mykiss captured
0
50
100
150
200
250
300
350
400
450
500
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sept
Oct
Nov
Dec

Foster Dam Weir


O.mykiss PIT-tag detections at Foster Weir (2015)
n=57 detections
58% age-2
Number of O.mykiss detected 2015
35
30
25
20
15
10
5
0
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Age-0
Age-1
Age-2
SPRING
x^2 P<0.001
Age-1 Age-2
#Tagged 519 288
#Detected 7 33
WINTER
x^2 P<0.273
Age-0 Age-1
#Tagged 310 294
#Detected 6 11

Lebanon antennas (x4)

28 rkm below Foster

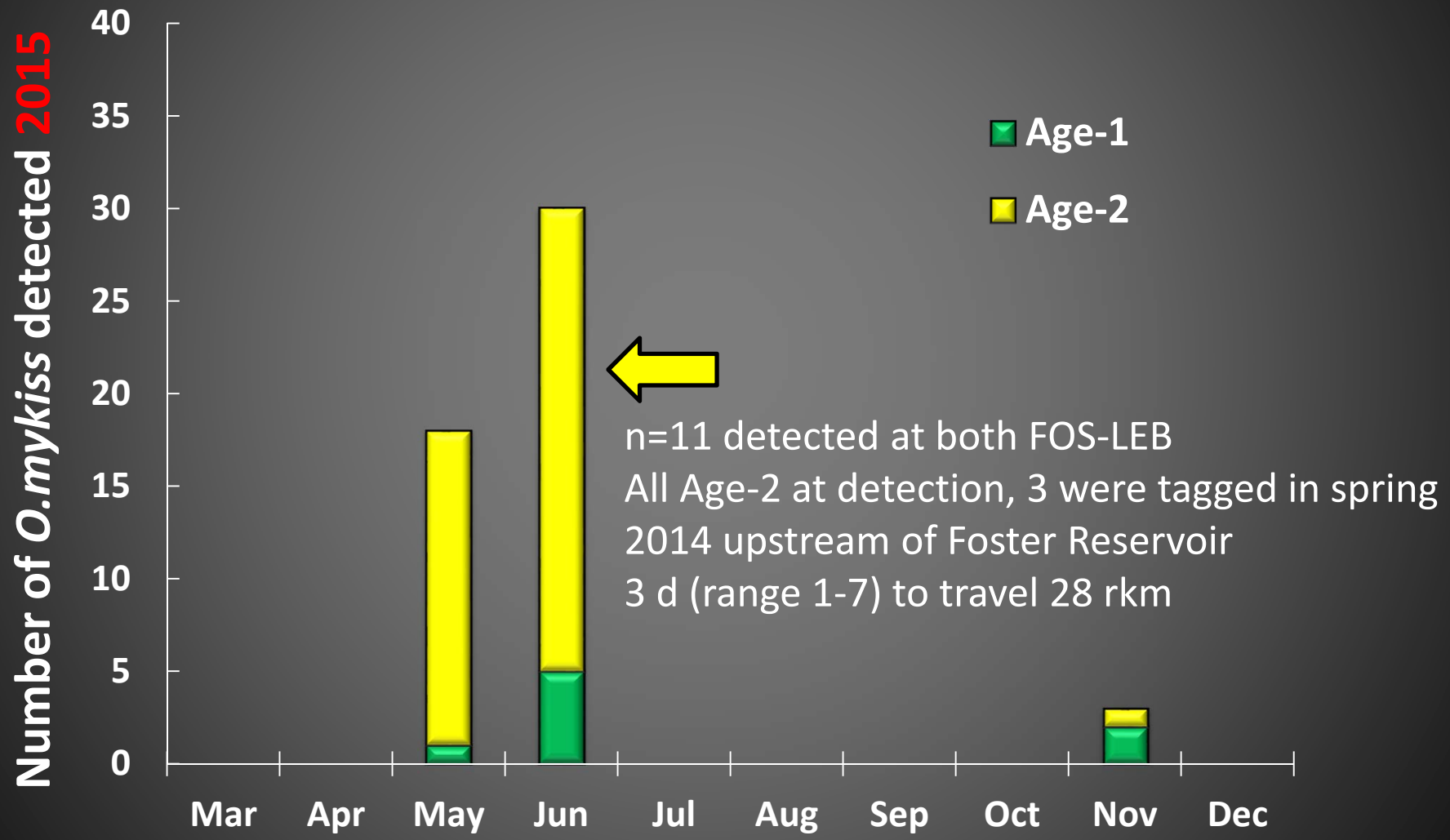
Spanning antenna LD4

South antenna LD1 (River Rd)

North antenna LD2 (Berlin Rd)

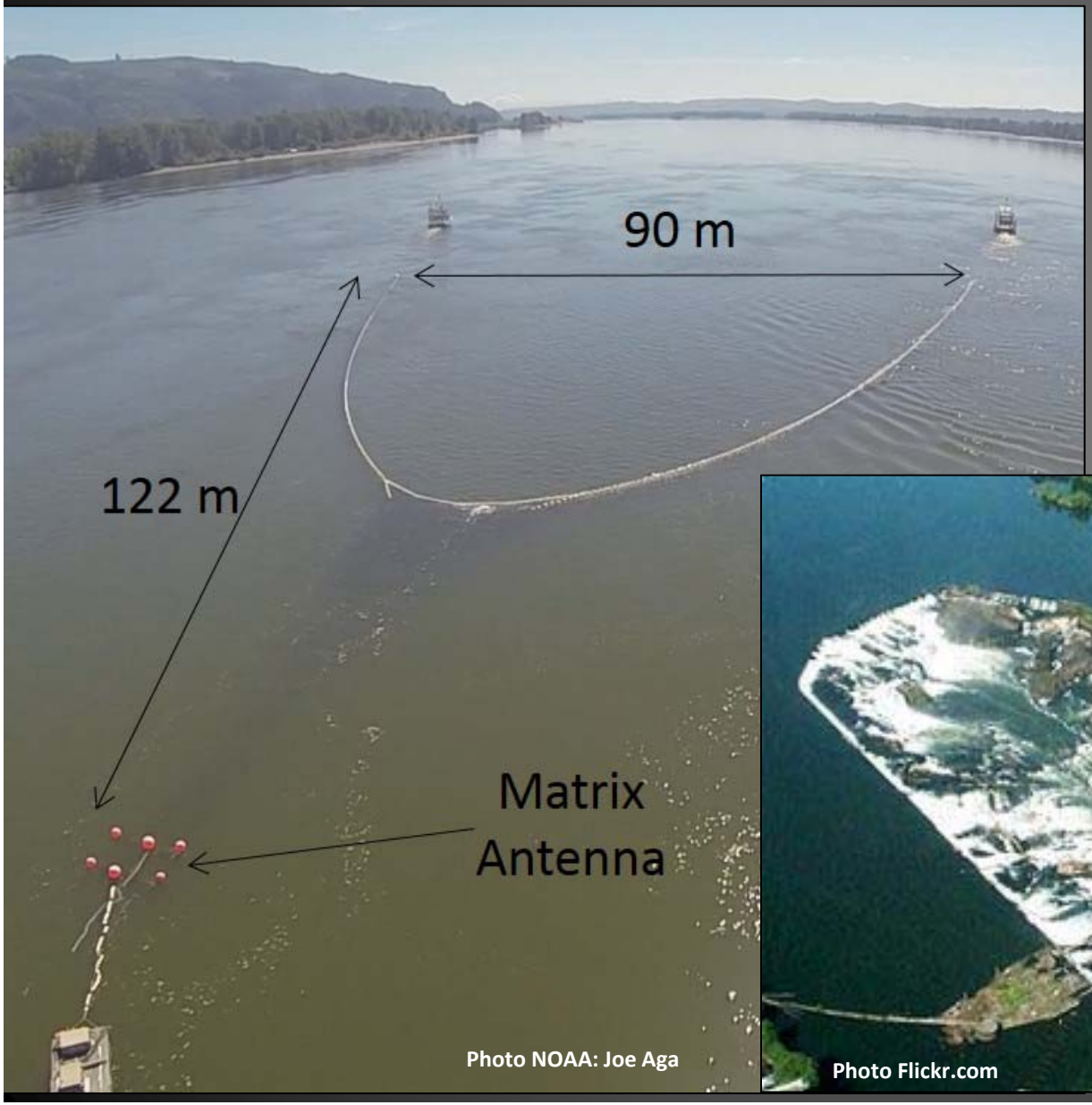
O.mykiss PIT-tag detections at Lebanon Dam (tagged 2014 - 2015)

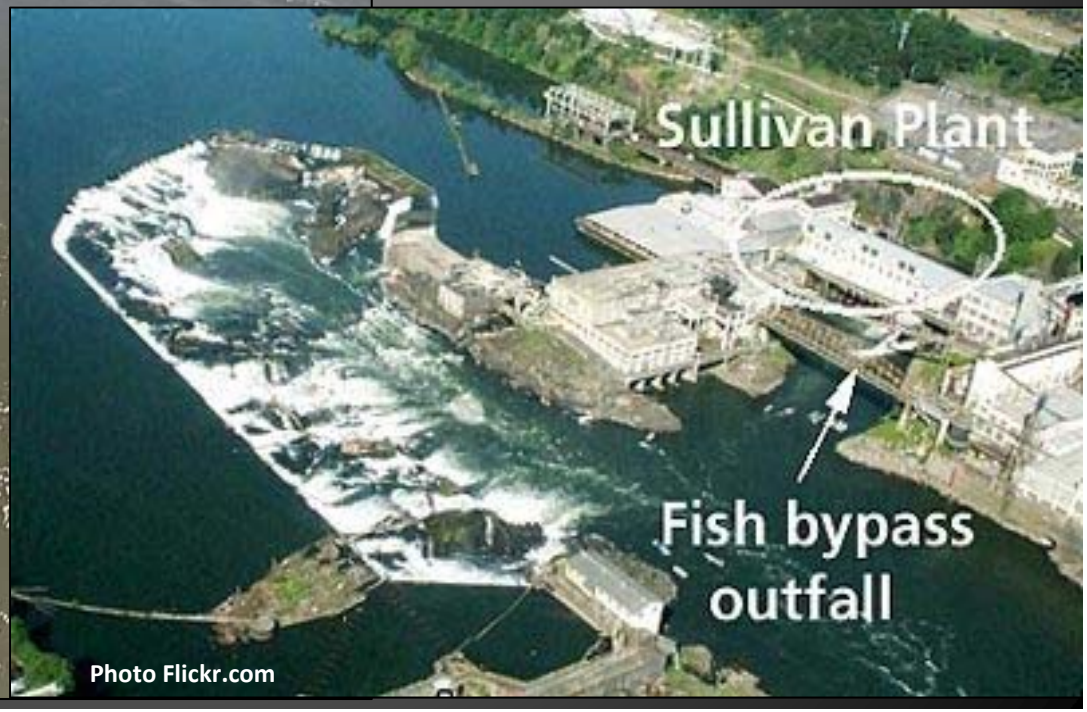
n=51 84% age-2



Columbia River Trawl Vessel / Willamette Falls

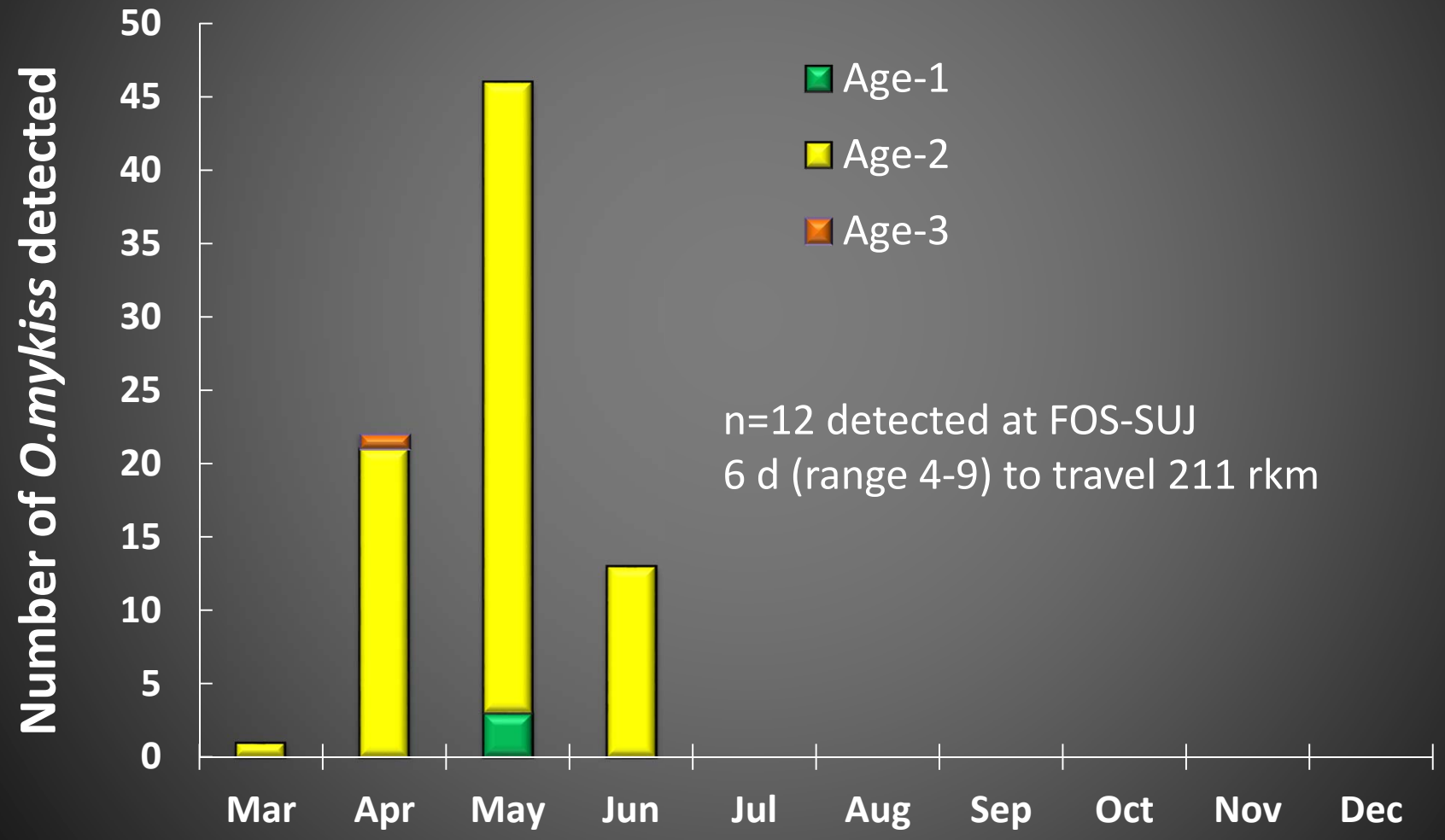
211 rkm below Foster





O.mykiss PIT-tag detections at Willamette Falls (tagged 2011 - 2015)

n=82 95% age-2



O.mykiss age at tagging vs. age at detection at Willamette Falls or Columbia River Estuary.

			Age at Tagging (Age Detected)				
Year Tagged	Number Tagged	Number Detected	0	1	2	3	% Smolt Detections Migrating at Age-2
2011	205	2		2	(2)		100
2012	370	1		1	(1)		100
2013	800	18	2	2	14 (18)		100
2014	1,802	36	3	32 (3)	1 (32)	(1)	89
2015	1,468	25			25 (25)		100

Fun facts – longest time from tagging to detection thus far 646 d
No adults have been detected returning to date (March-April 2016)

Summary

Juvenile Chinook above and below WVP dams

- Migrant estimates between consecutive years can be highly variable.
- Estimated survival for juvenile Chinook through the Cougar Project for both brood years (2012, 2014) were ~ 17% (wide CI).

Copepod trends in WVP reservoirs

- Juvenile Chinook had higher intensity of copepod infection in all reservoirs in 2015 compared to 2014.
- Infection prevalence for subyearlings exiting reservoirs in the fall was ~90% in all years and reservoirs sampled.
- Infection intensity is consistently higher in Fall Creek Reservoir

Juvenile *O.mykiss* in the South Santiam River

- **Migration timing for different age classes into Foster Reservoir is highly variable among years.**
- **95% migrated as age-2 smolts from March – June (peak May) regardless of age tagged.**
- **Mean migration time from detection at Foster Weir to Willamette Falls (n=12) was 6 days (211 rkm)**

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http://oregonstate.edu/dept/ODFW/willamettesalmonidrme/reservoir-research