



NOAA
FISHERIES

Sacramento River Temperatures: A Fish Perspective

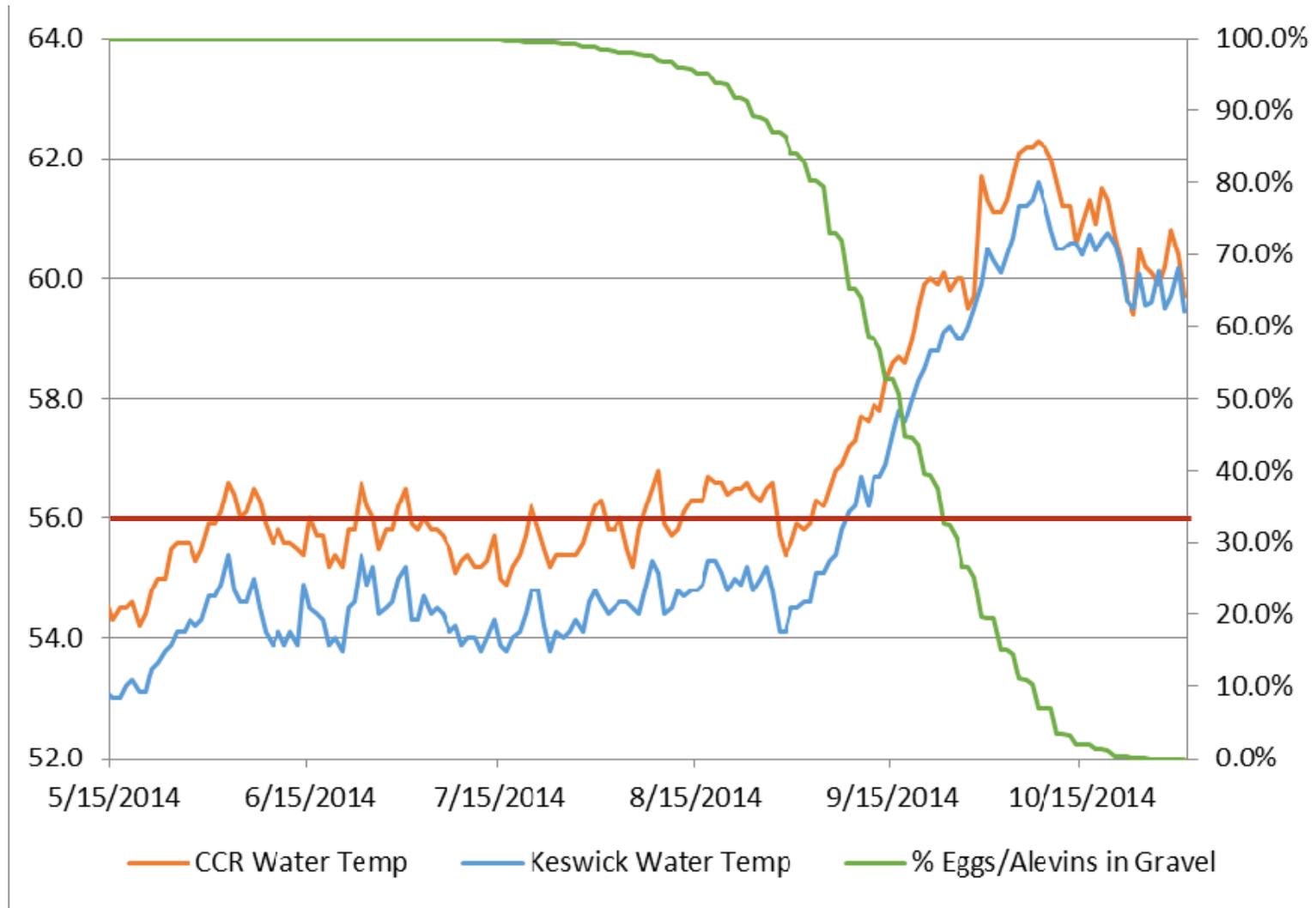
Annual Review
November 5, 2015

Garwin Yip
CCVAO, West Coast Region,
NOAA Fisheries

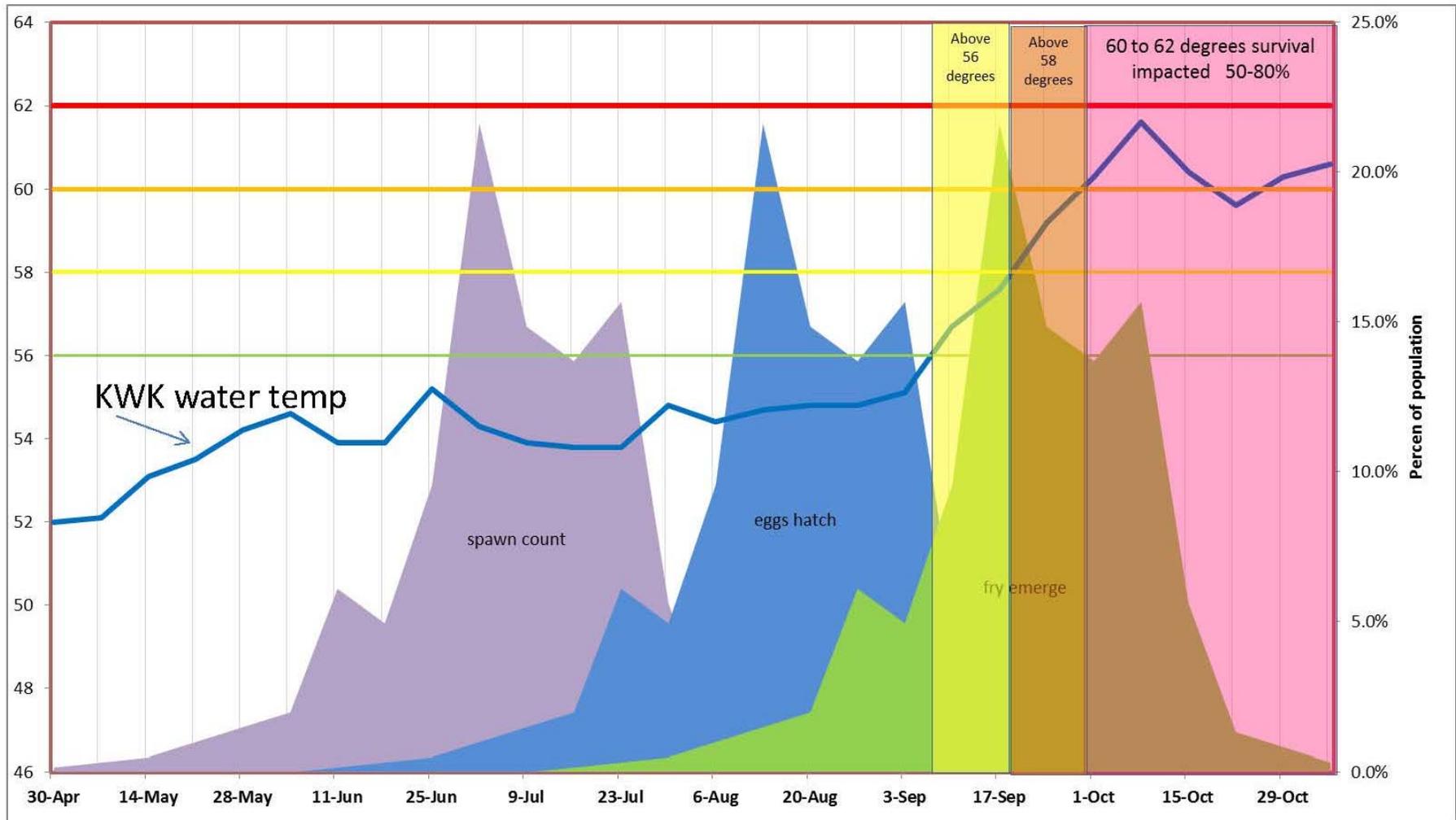
Questions for the Panel:

- 1. What additional approaches, methods, or studies would you recommend to improve the accuracy and effectiveness of Sacramento River temperature management?*
 - How best to monitor for temperature related impacts to species
- 2. How effectively has the temperature management process linked spatial temporal-life-stage specific fish distributions with spatial-temporal temperature distributions?*
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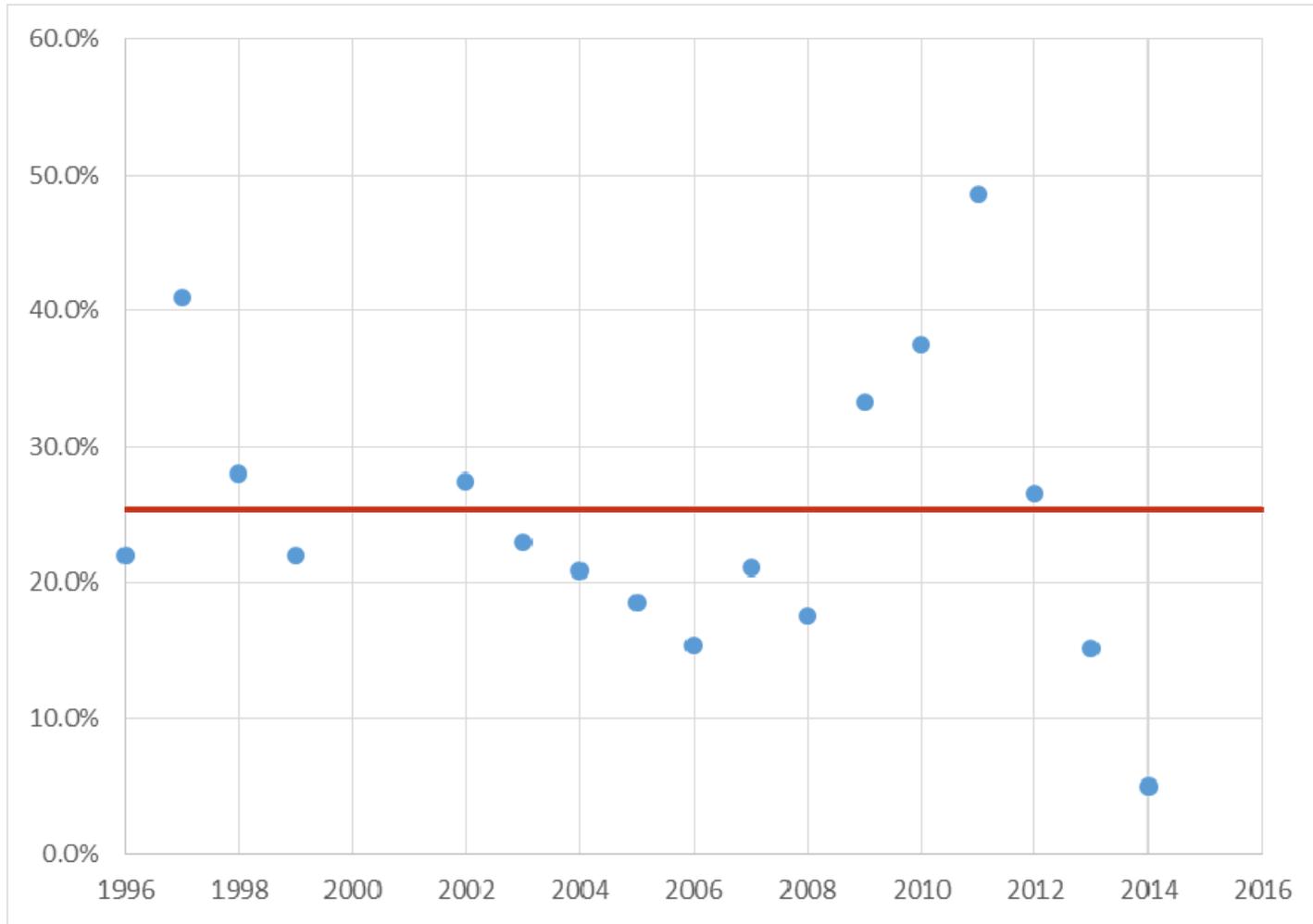
2014 Impacts to Winter-Run Life Stages due to Upper Sac Water Temps



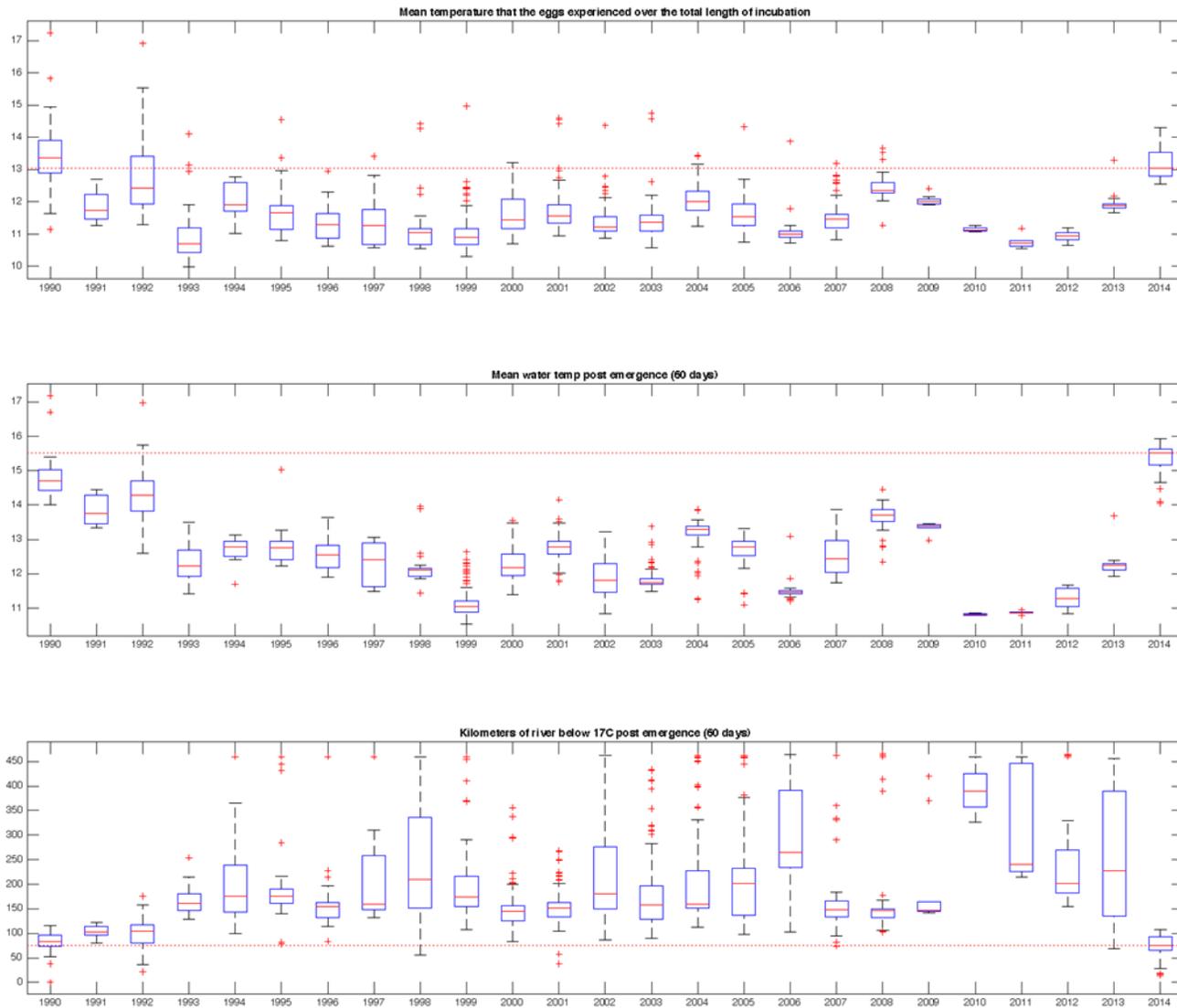
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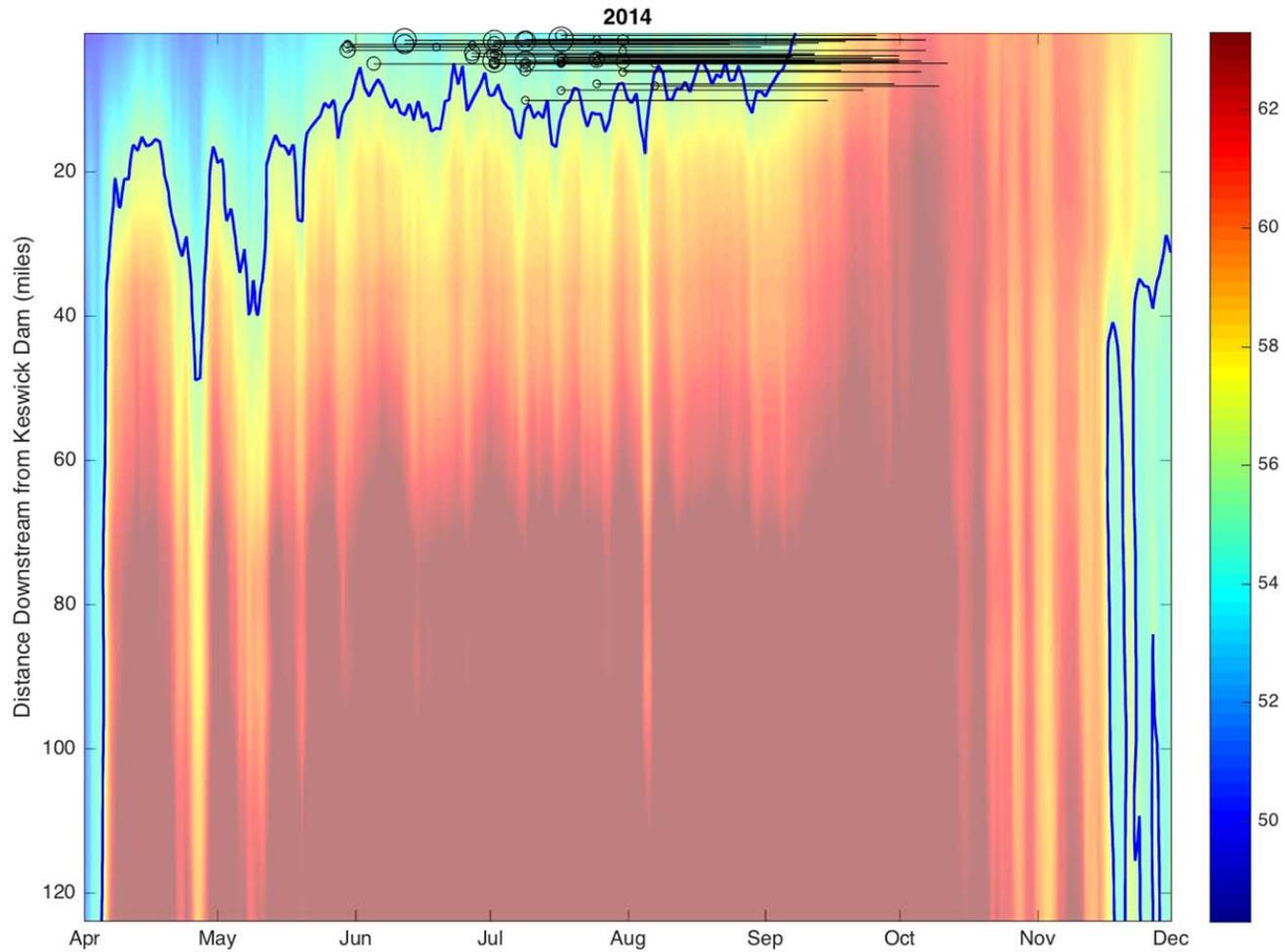
Winter-run egg to fry survival RBDD



Comparison of available habitat in 2014



2014 High Temperatures Throughout the Sac



Assessment and Action

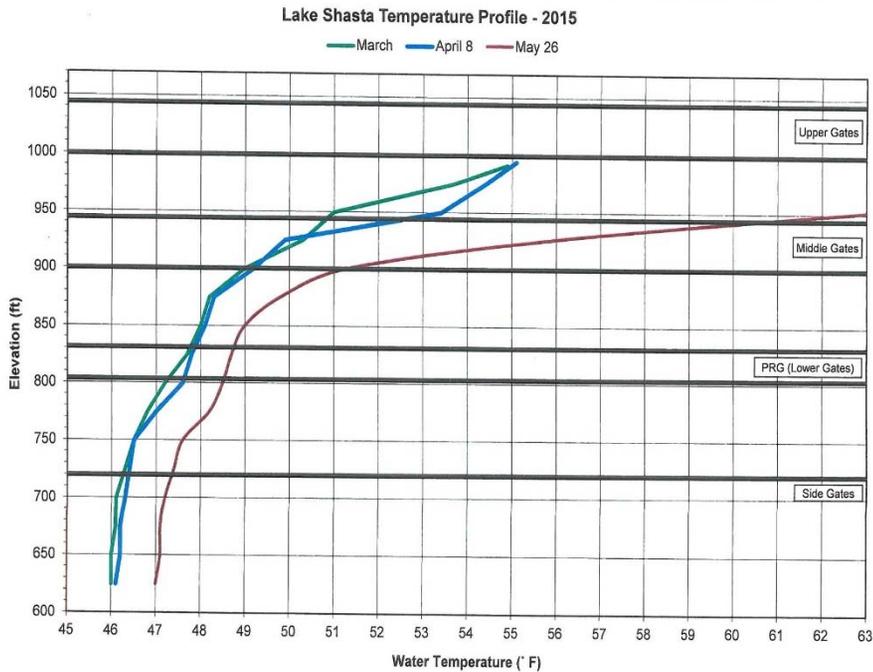
2014 Hindcast - Lessons Learned

- Loss of water temperature control when full side gates were accessed
- Difficulty predicting temperatures with low storage

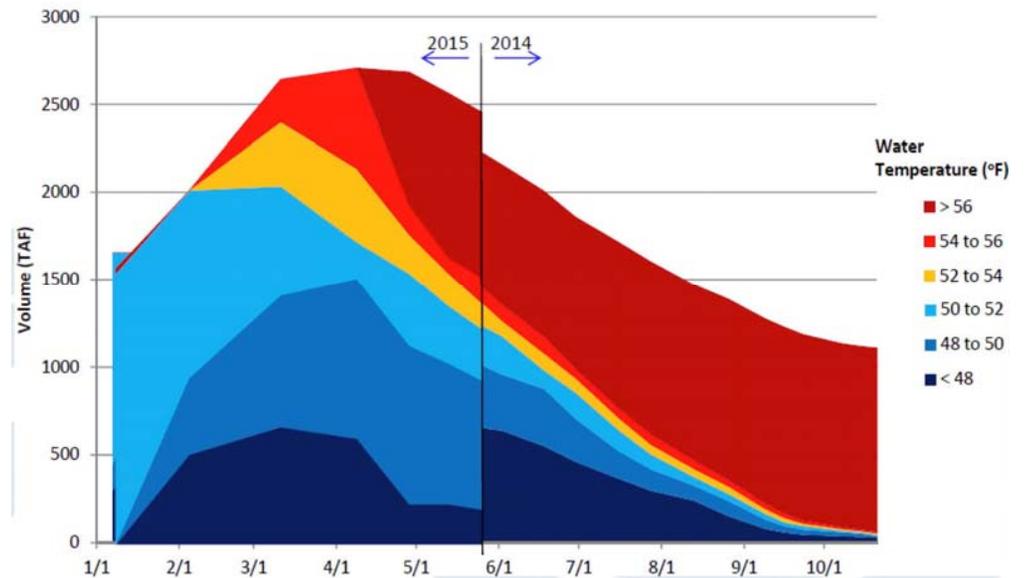
2015 Temperature Management Plan - Adaptations to Improve Shasta Cold Water Pool (March 18, 2015)

- Relaxed minimum Wilkins Slough flow requirement
- Relaxed Delta water quality requirements
- Delayed Sacramento River Settlement Contractor depletions
- Higher early temperature target (58°F)
- Warm water bypass

Updated May 2015 Shasta Lake profiles and isothermobaths



Lake Shasta
Isothermobaths as of
5/26/15 (Water Temps
in °F)

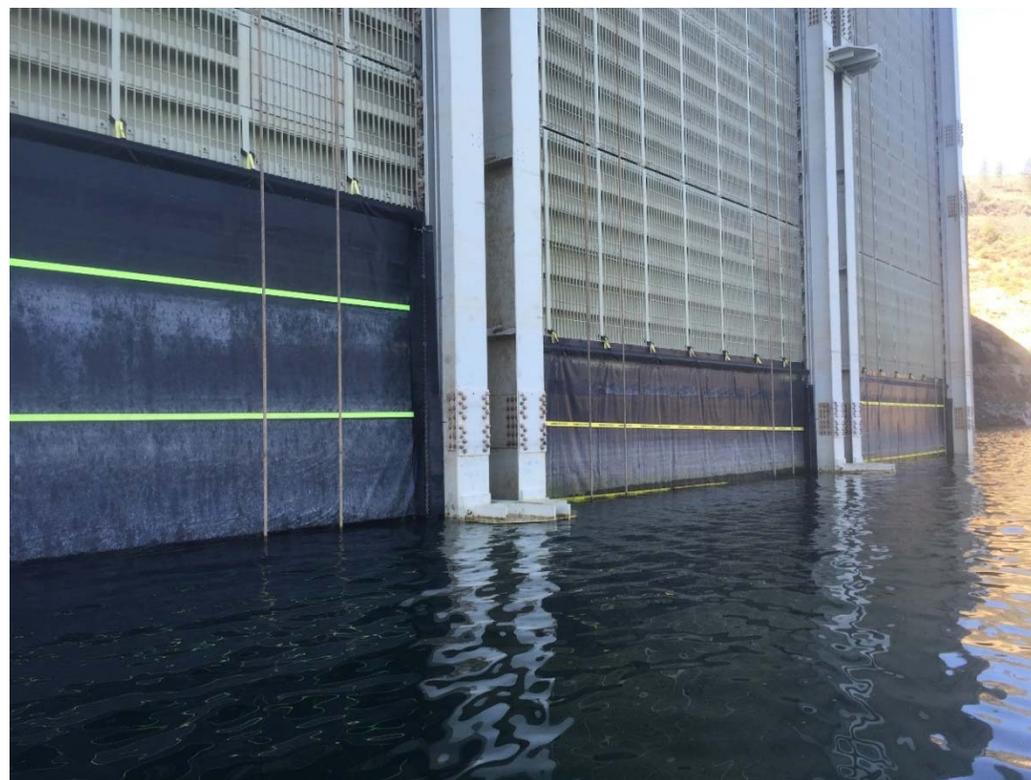


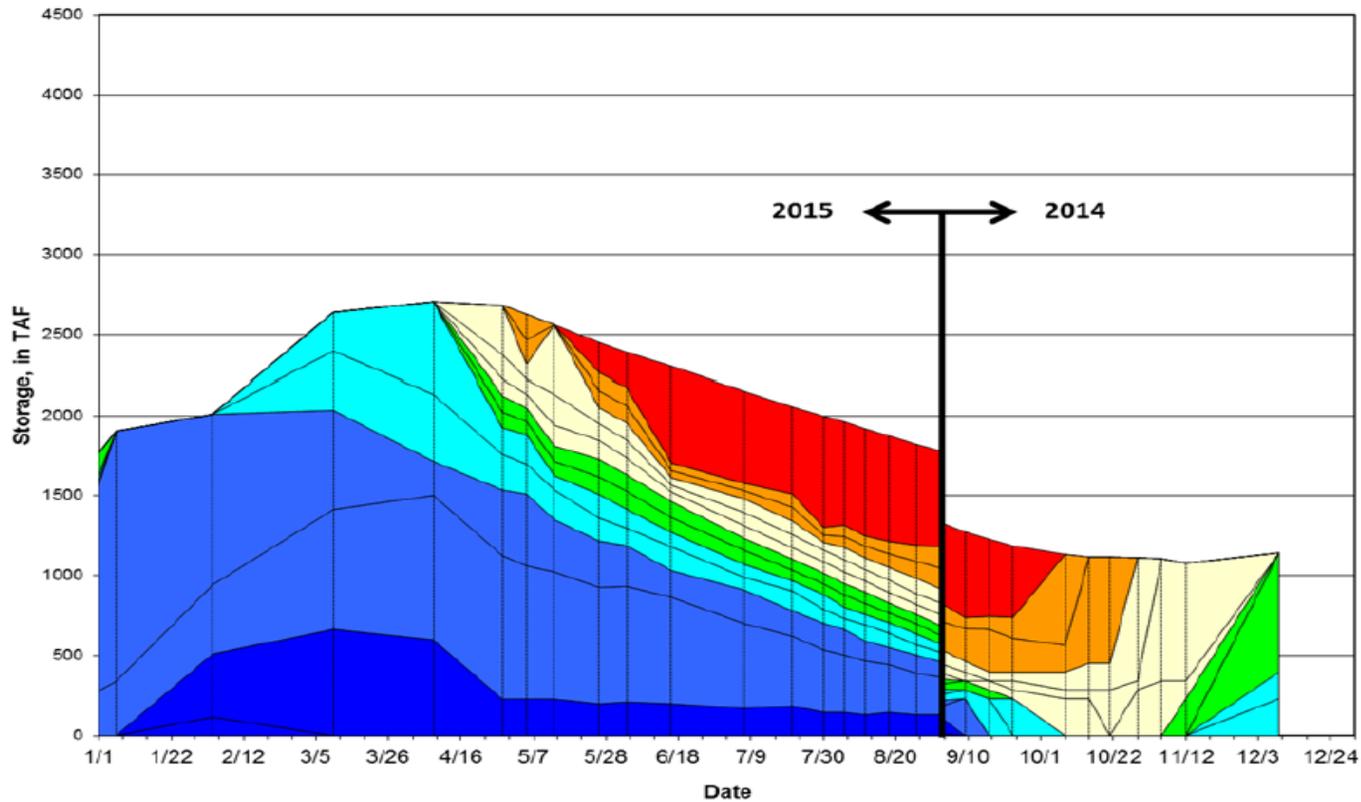
Plan Updates

2015 Revised Sacramento River Temperature Management Plan (June 25, 2015)

- Target 57° F at Clear Creek (CCR),
- Maintain Keswick releases of 7,250 cfs,
- Delay full side gate operation as long as possible
- Optimize temperature using real-time monitoring and decision making
- Increase water temperature monitoring
 - Establish real-time Shasta/Keswick reservoir temperature profiles
 - Install new upstream temperature gage location
 - Deploy additional temperature sensors in river
- Increase redd monitoring
- Increase production and capacity at LSNF Hatchery
- Review temperature model for refinements

Installation of TCD curtains



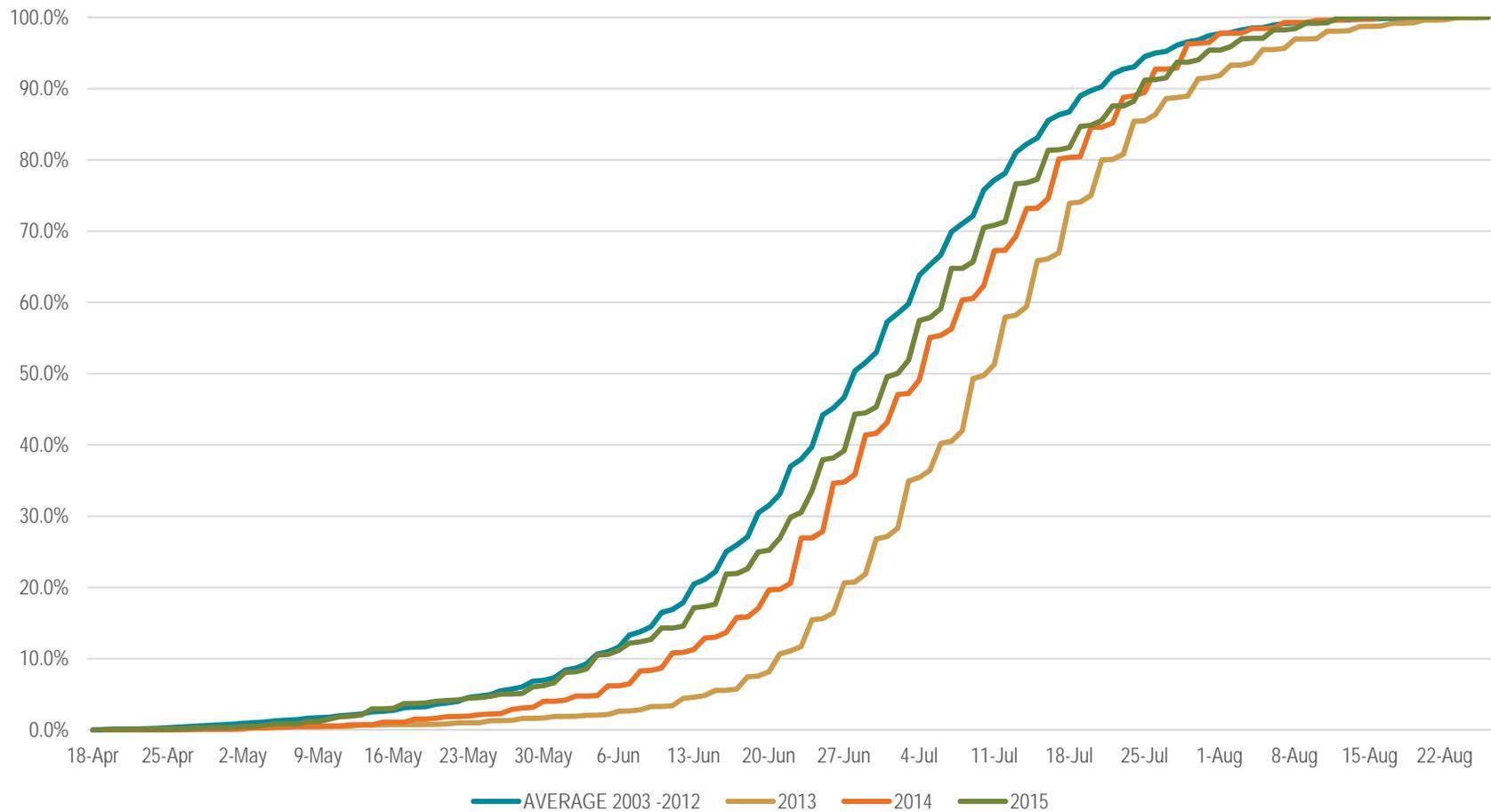


Lake Shasta
Isothermobaths
as of 9/3/15
(Water Temps
in °F)



Credit: Rachel Hallnan/University of Nevada, Reno

Proportion of WR spawning (Carcass survey) by date and year



Fish and Redd Location

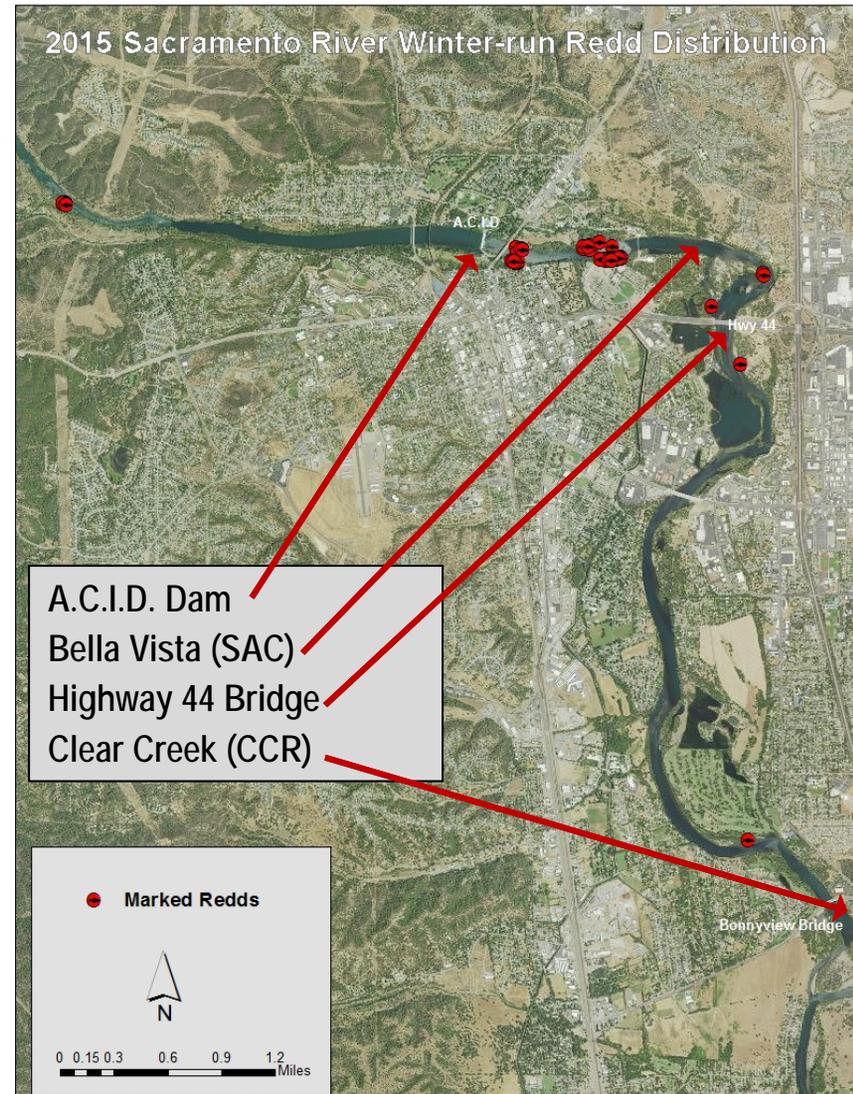
2015 Winter-Run aerial Redd counts by river area			
Flight Sections	Redds	2015 Percent	% Average (2003-2014)
Keswick to A.C.I.D. Dam (RM 302 to 298)	74	37.8%	45.0%
A.C.I.D. Dam to Highway 44 Bridge (RM 296)	120	61.2%	42.1%
Highway 44 Br. to Airport Rd. Br. (RM 284)	2	1.0%	12.2%
Airport Rd. Br. to Balls Ferry Br. (RM 275)	0	0.0%	0.3%
Balls Ferry Br. to Battle Creek (RM 271)	0	0.0%	0.1%
Battle Creek to Tehama Br. (RM 229)	0	0.0%	0.3%
Total	196	100.0%	100%

▣ These two redds were located just downstream of the Hwy 44 Bridge close to rm 296.

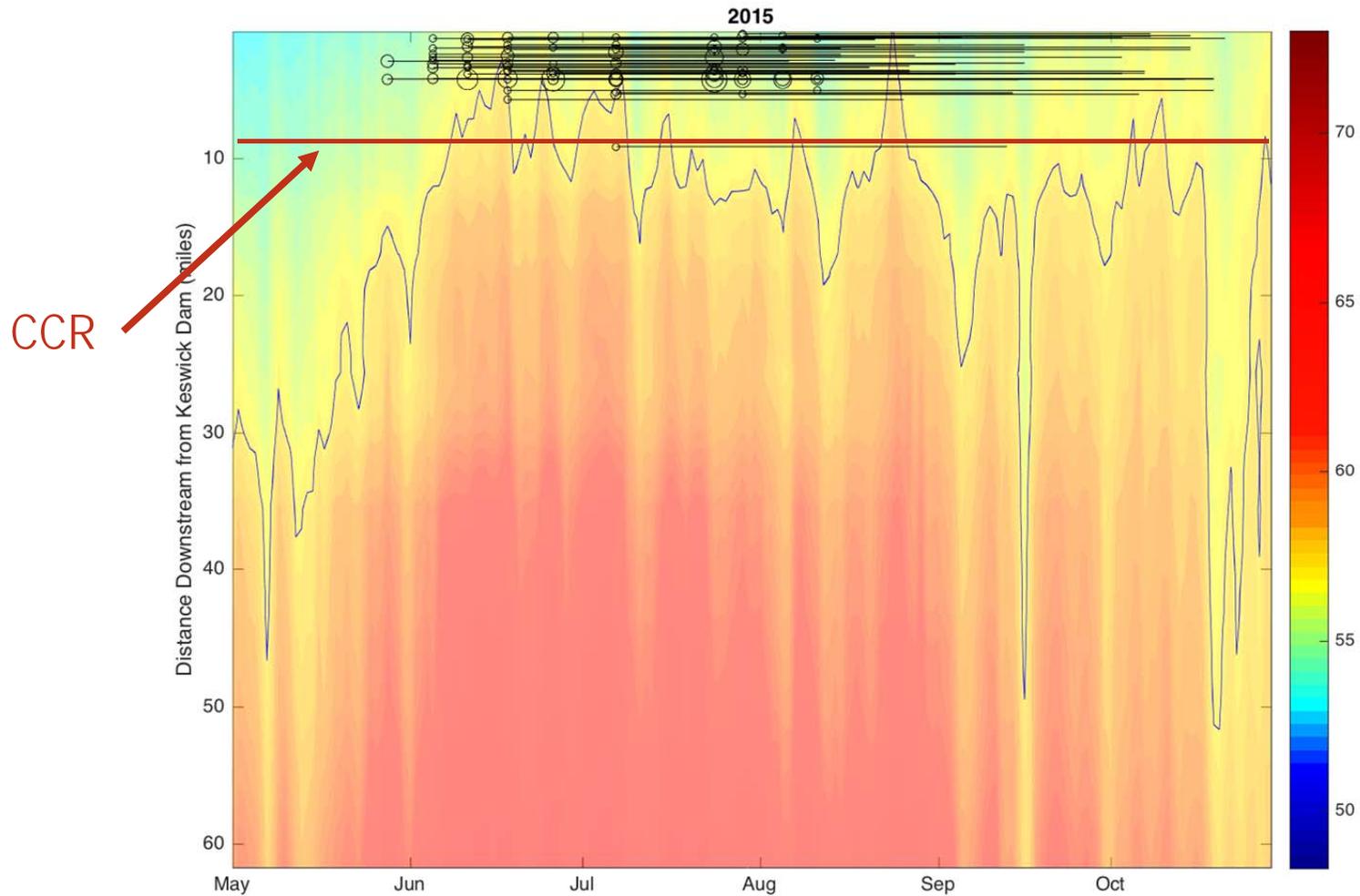
2015 Winter-Run Carcass counts by river area			
River Section	Carcasses	2015 Percent	% Average (2003-2014)
Keswick Dam to ACID Dam (RM 302 to 298)	593	49.8%	35.4%
ACID Dam to Hwy 44 Brg (RM 296)	349	29.3%	39.6%
Hwy 44 Brg down to Clear Crk Powerlines (RM 288)	205	17.2%	21.8%
Clear Crk Pwrl to Balls Ferry Brg (RM 276)	44	3.7%	3.2%
Total	1191	100.0%	100.0%

BY 2015 WR redds at 12" water depth or shallower

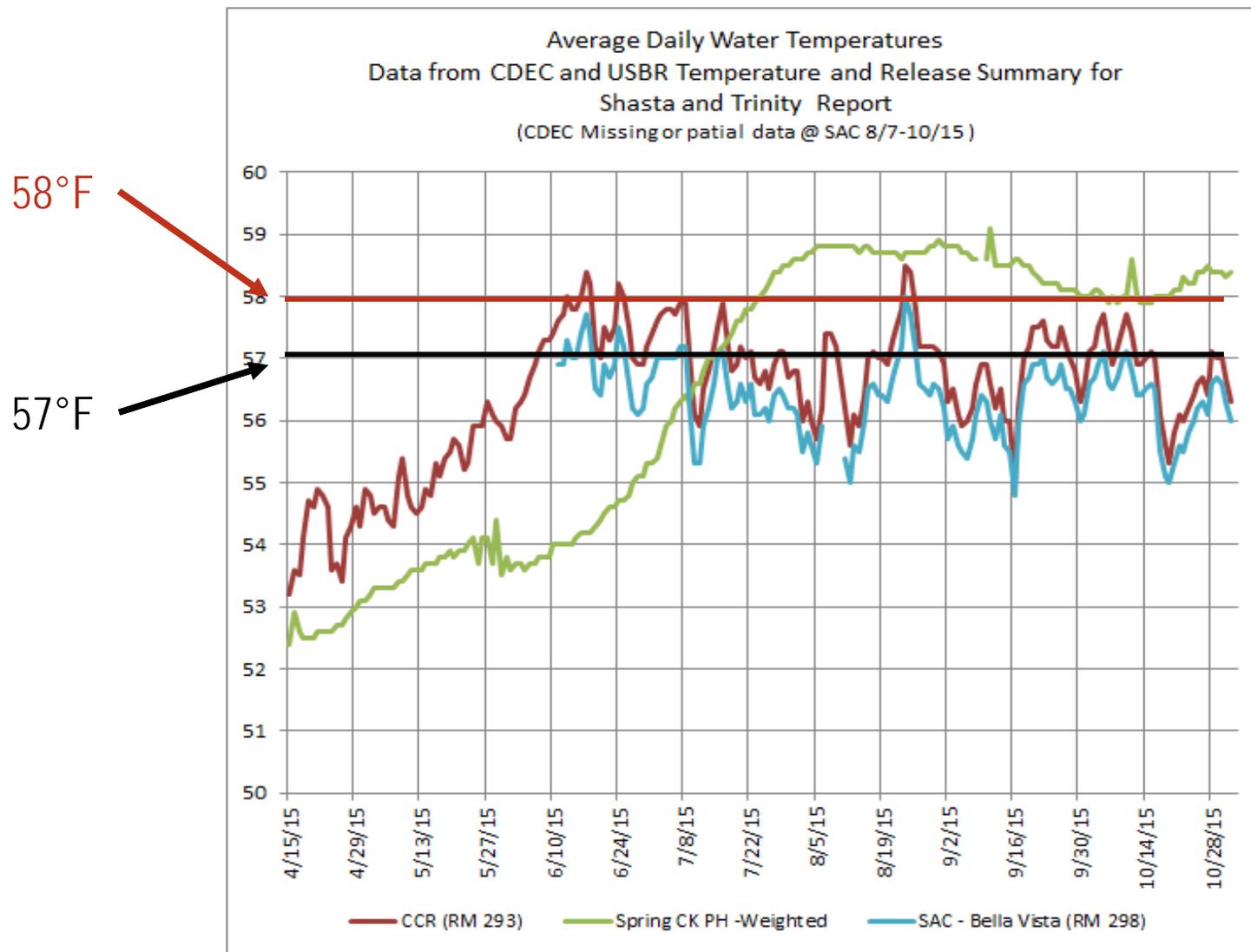
- 19 redds were found to be at a depth of 12" or shallower as of Aug 27 (@ 7,217 cfs)
- CDFW continued to monitor for redd dewatering and juvenile stranding
- no WR redds were dewatered this year



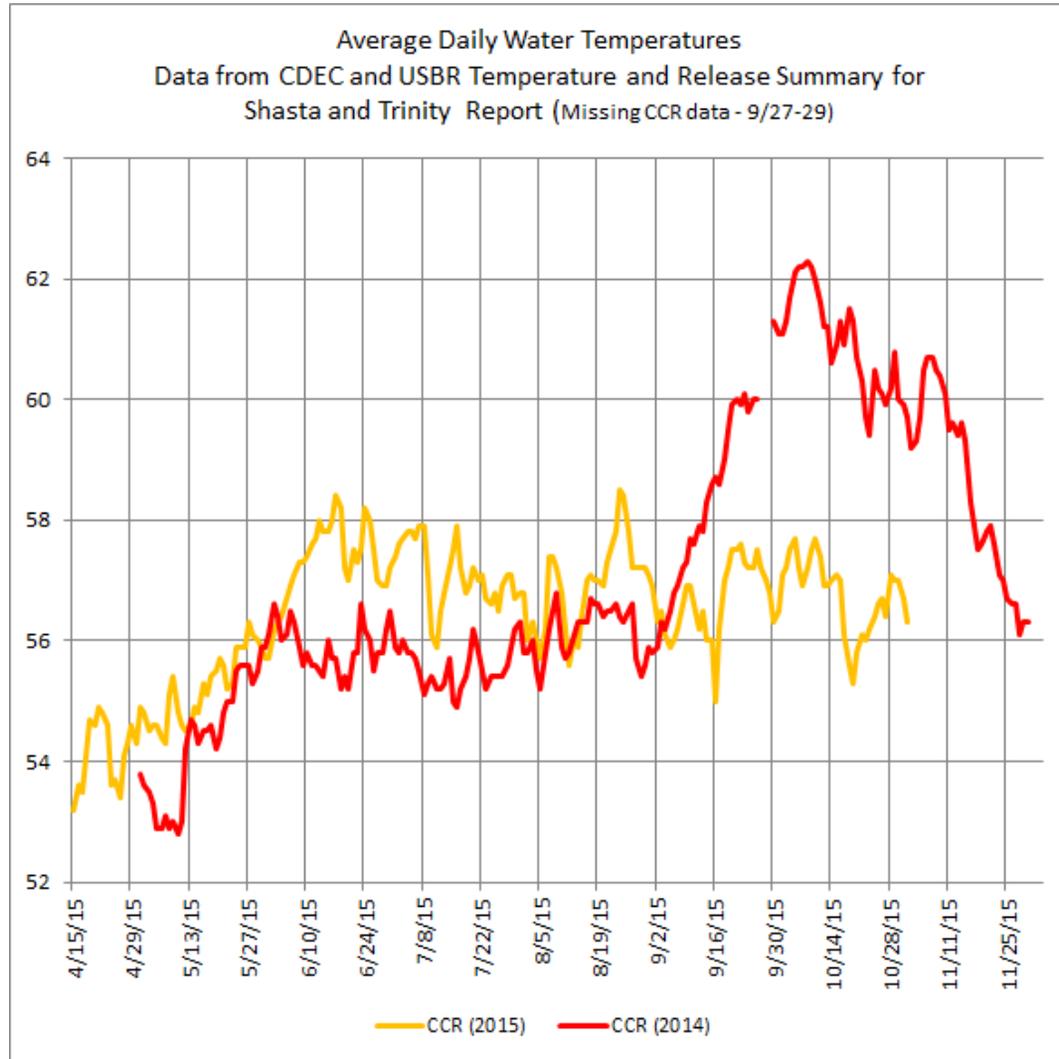
2015 Temperature Landscape and Redd Location



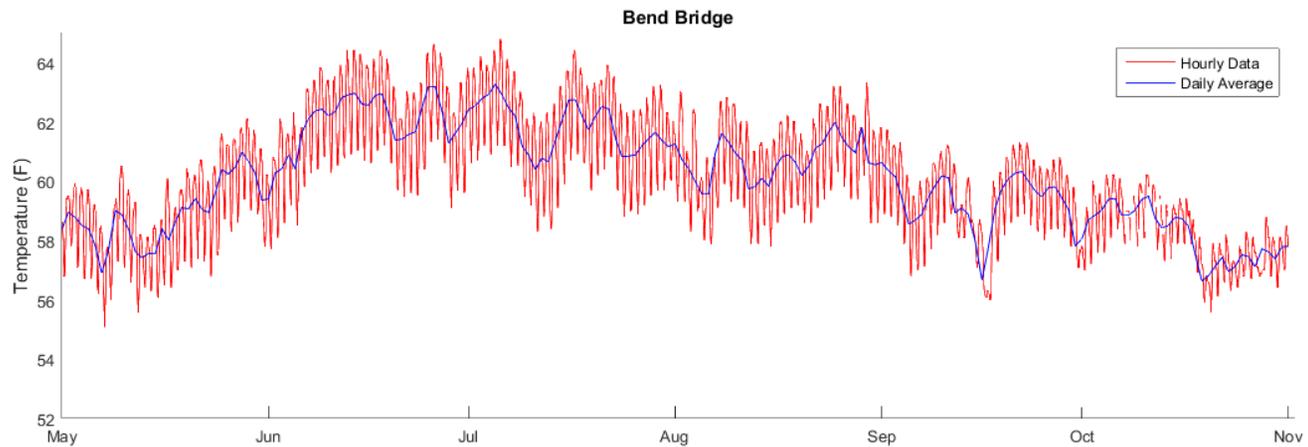
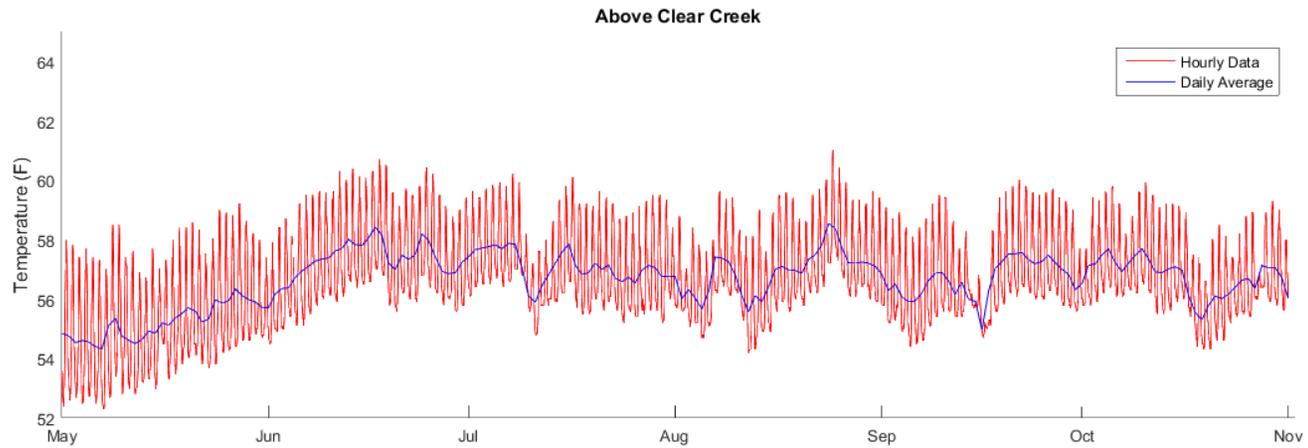
Temperature Deviations



CCR comparison 2014 - 2015

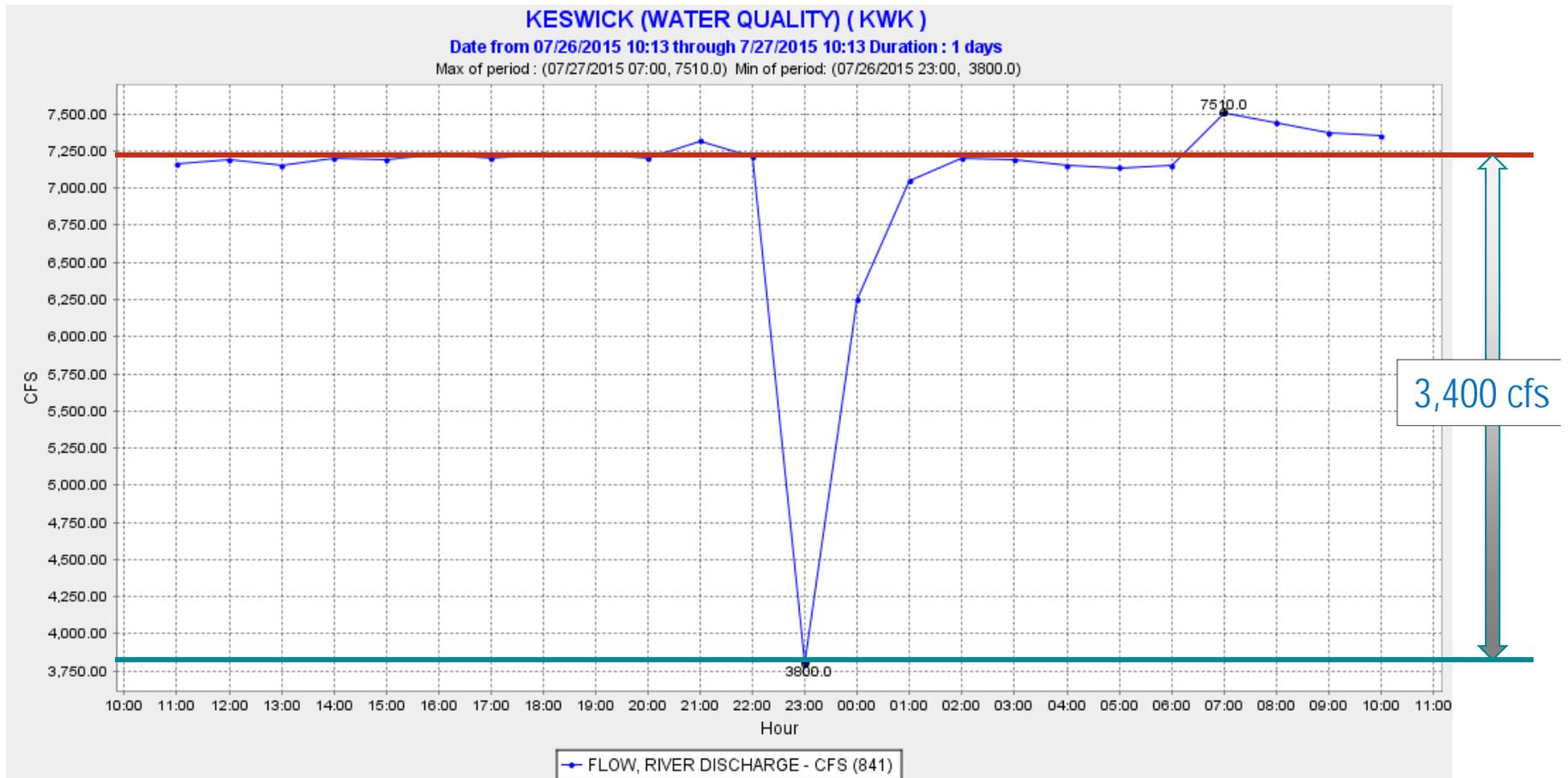


Temperature Variation



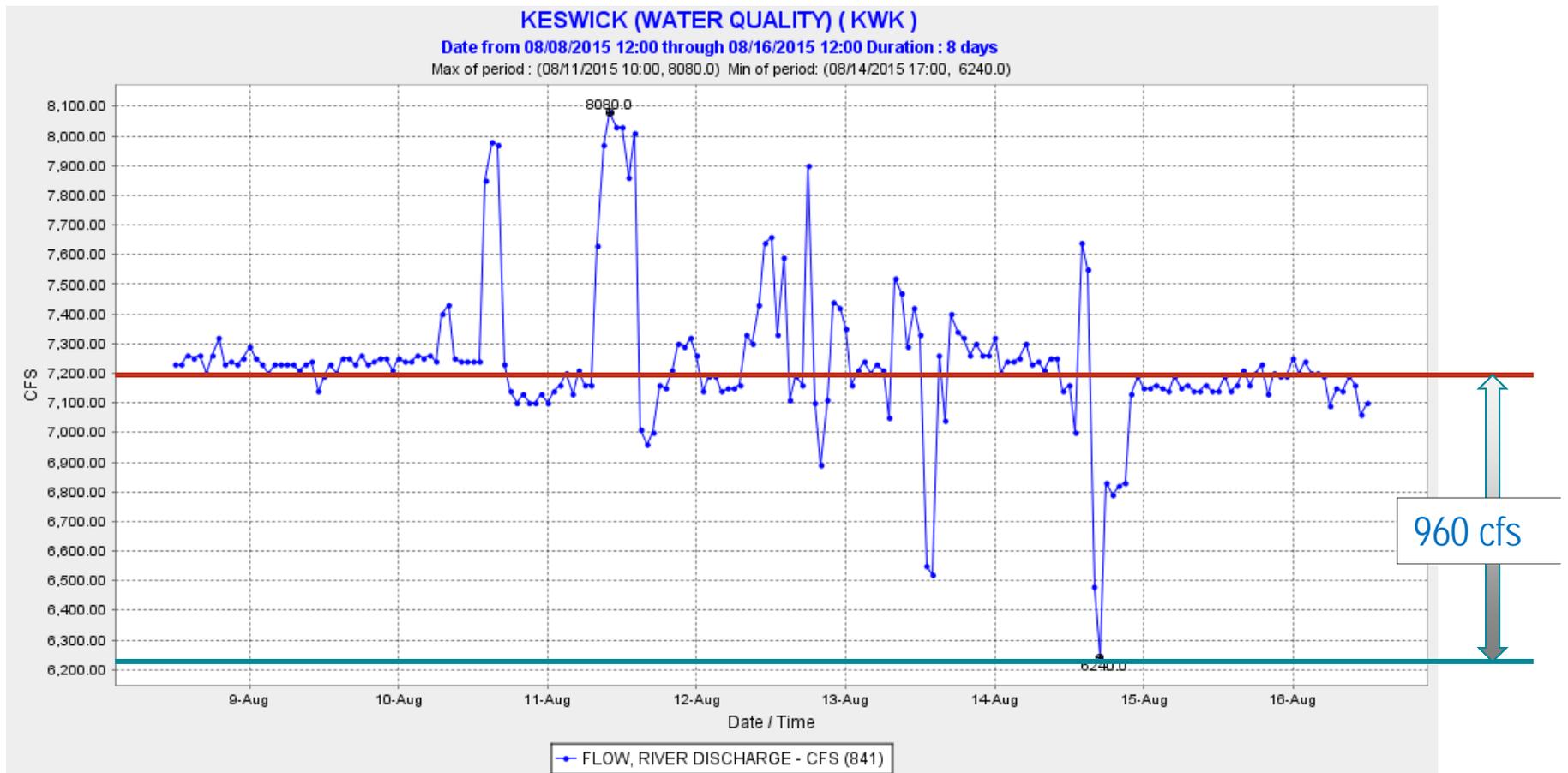
Flow Fluctuations

Flow interruption (7/26)



Flow Fluctuations

NERC testing (8/10 – 8/15)



Estimate of Juvenile WR Passage at RBDD

Year	Winter run Fecundity eggs per female	Winter run Population Estimate <u>estimate</u> *	Red Bluff Juvenile passage estimate through 11/4
2014	5308	2,627	322,600
2015	4819	3,171	236,220
<u>Dif</u> 2015-2014	-489	544	-86,380
Percentage	-9%	21%	-26.8%
* Population estimate is preliminary and will change			

USFWS data from RBDD RSTs

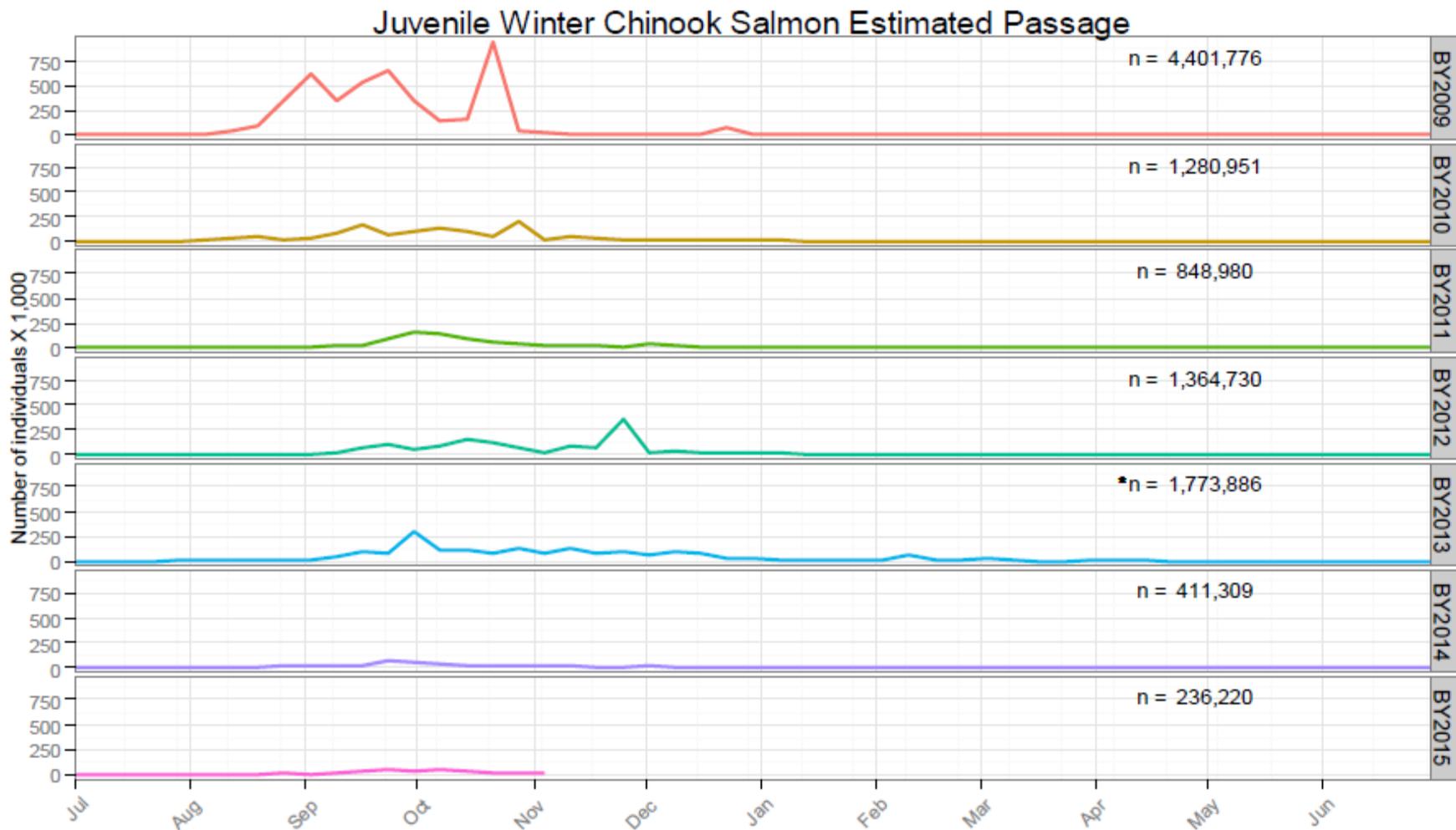


Figure 1. Weekly estimated passage of unmarked juvenile winter Chinook salmon at Red Bluff Diversion Dam (RK391) by brood-year (BY). Fish were sampled using rotary-screw traps for the period July 1, 2009 to present.

*Winter run passage value interpolated using a monthly mean for the period October 1, 2013 - October 17, 2013 due to government shutdown.

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Questions?