

# Effects of Drought and CVP/SWP Operations on Fish - A Fish Agency Overview



# Operation and Monitoring Actions conducted in 2014

- Smelt
- Temperature Management
- Flow Management
- Delta Cross Channel
- OMR & Exports

# Smelt

- Survey Data
- Early Warning Monitoring
- Delta smelt – peak spawning March through Mid-May
- Longfin smelt – peak spawning January through March

# 2014 Index of Delta Smelt Relative Abundance from Spring Kodiak Trawl

The 2014 Spring Kodiak Trawl (SKT) Delta Smelt index is 30.1, which is greater than the 2013 index (21.0; Figure1).

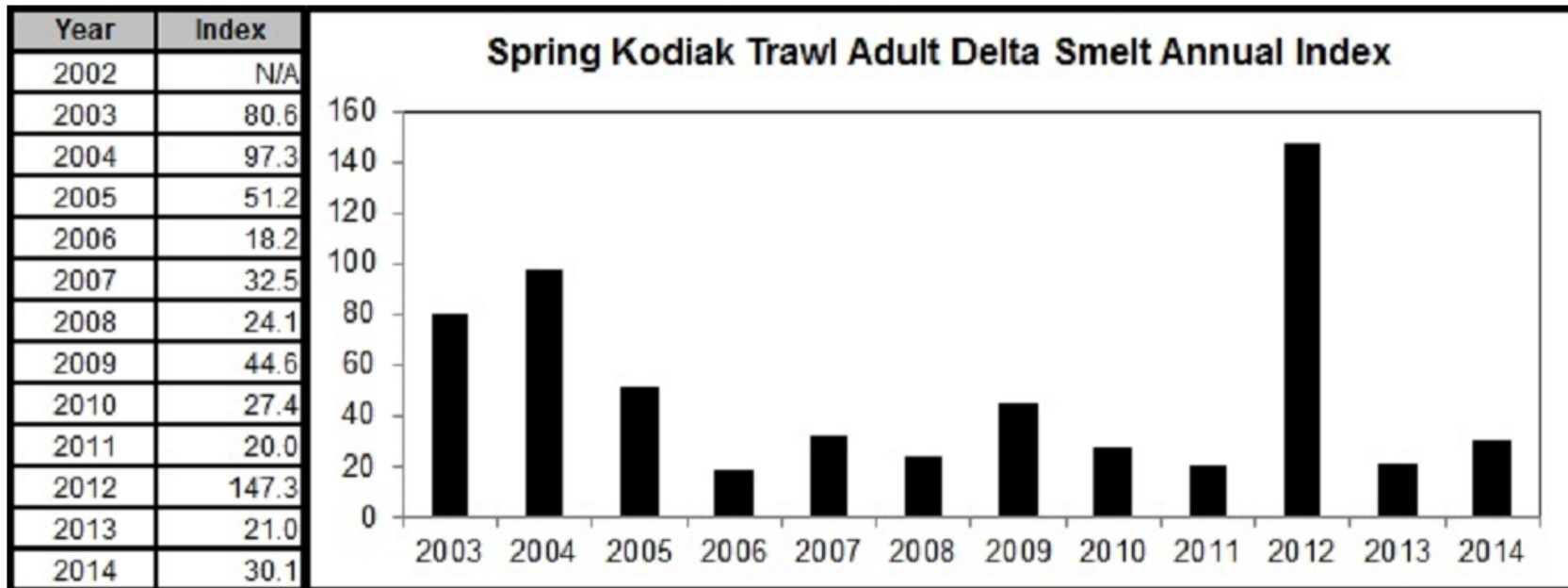
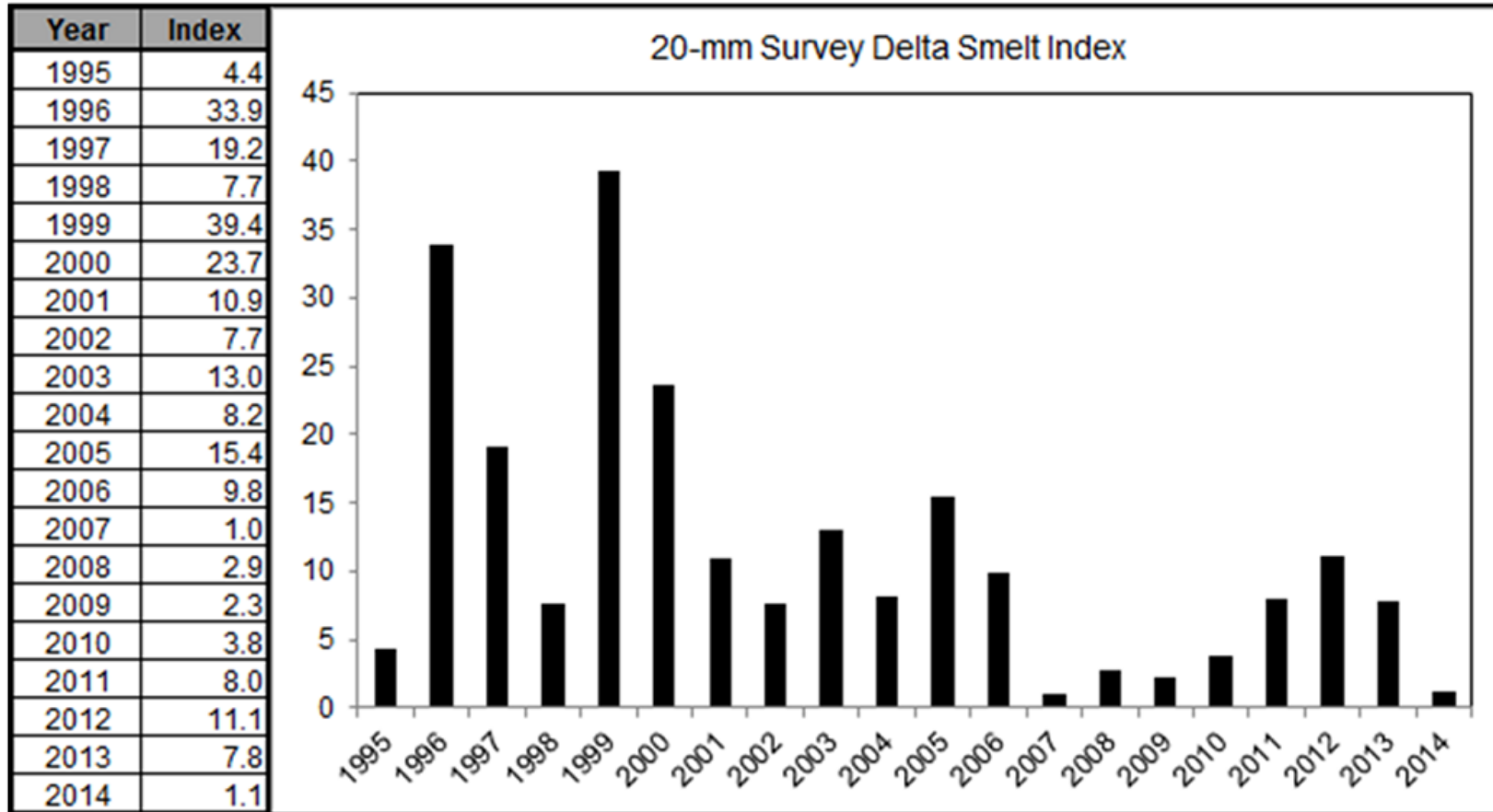


Figure 1. The SKT Delta Smelt index over the period of record, 2002 - 2014.

# 2014 Index of Smelt Relative Abundance from the 20-mm Survey



# 2014 FMWT

## September-October Fish Abundance

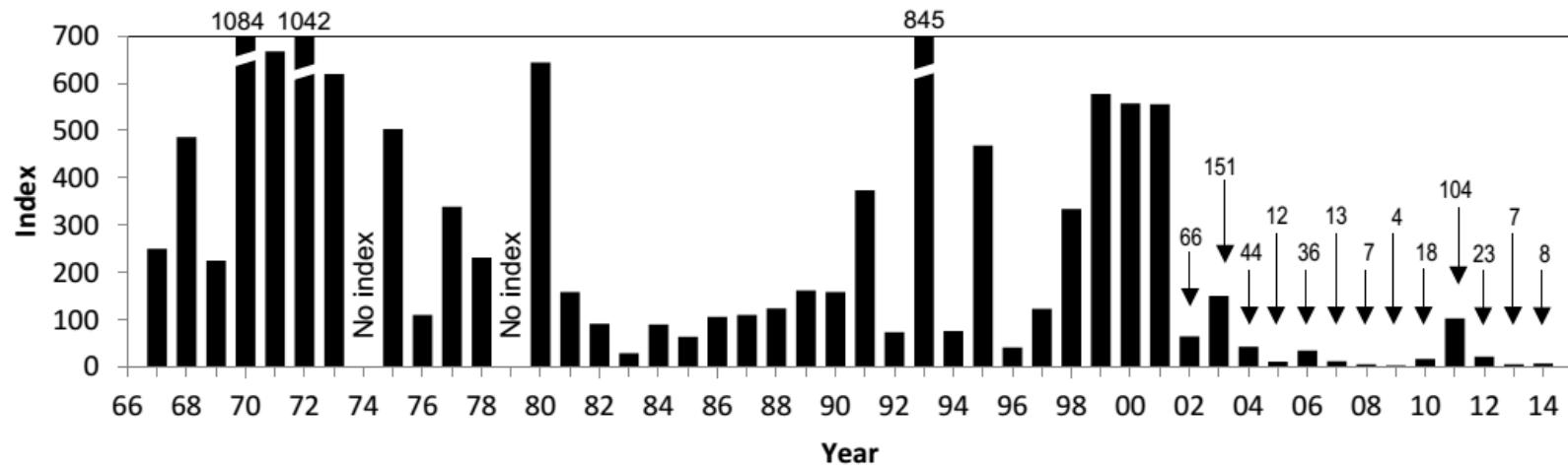


Figure 1. FMWT Delta Smelt September-October abundance indices, 1967-2014.

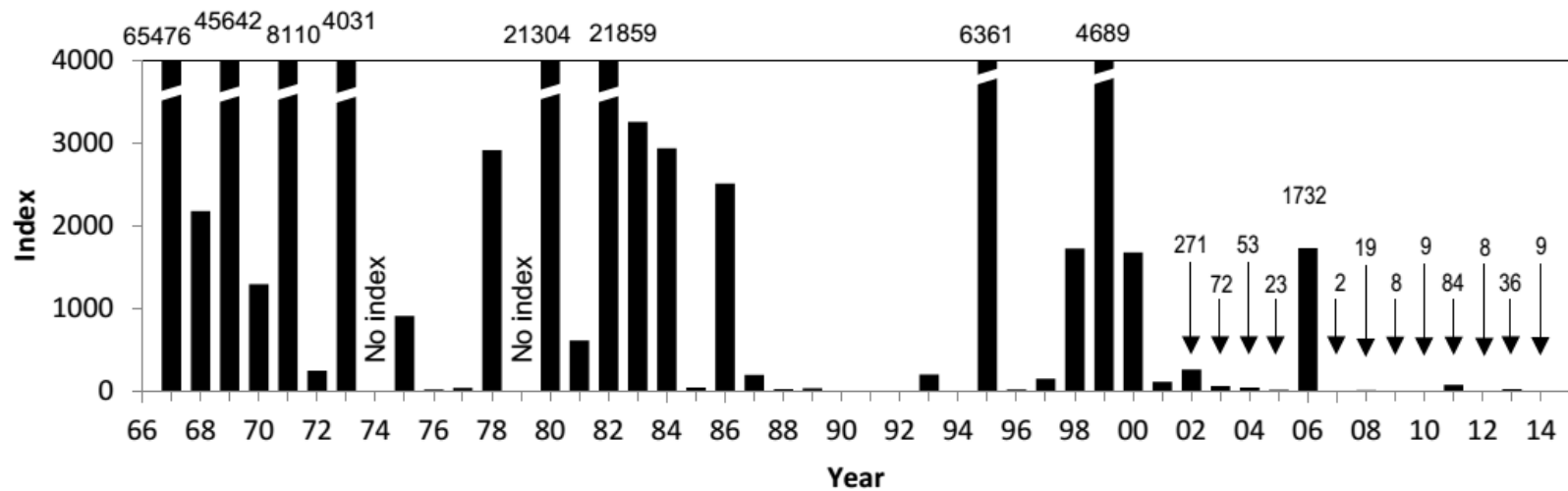
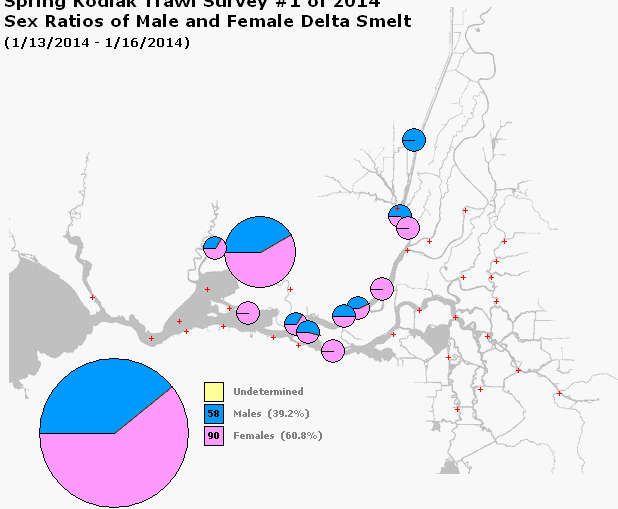


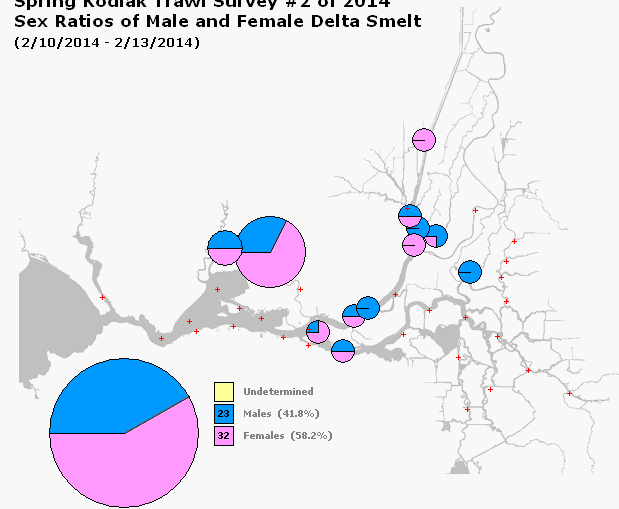
Figure 3. FMWT Longfin Smelt September-October abundance indices, 1967-2014.

# The SKT showed that smelt mostly migrated up the Sacramento River

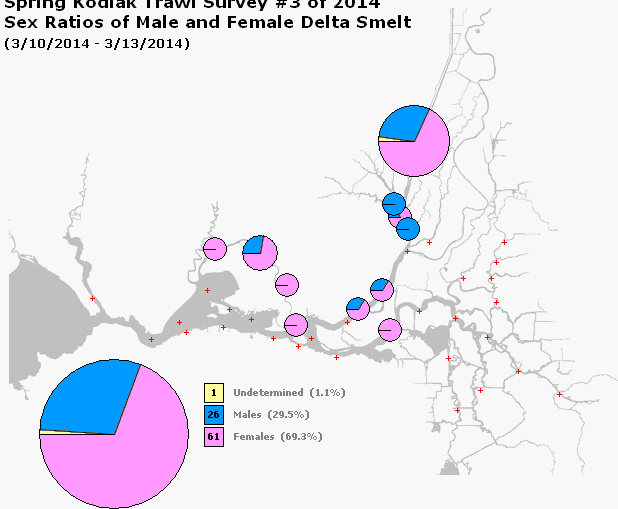
Spring Kodiak Trawl Survey #1 of 2014  
Sex Ratios of Male and Female Delta Smelt  
(1/13/2014 - 1/16/2014)



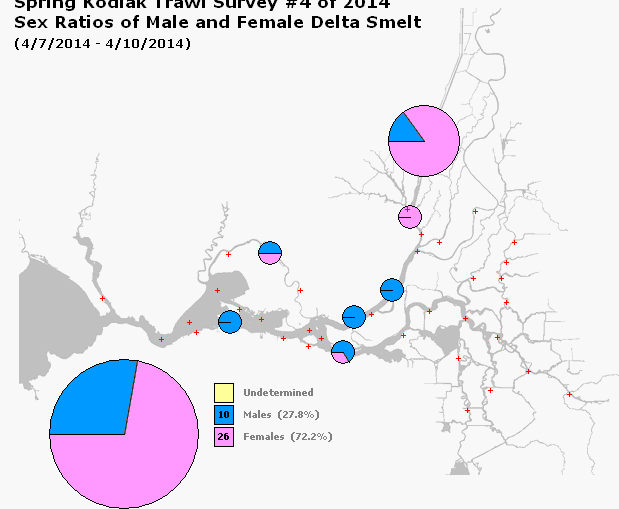
Spring Kodiak Trawl Survey #2 of 2014  
Sex Ratios of Male and Female Delta Smelt  
(2/10/2014 - 2/13/2014)



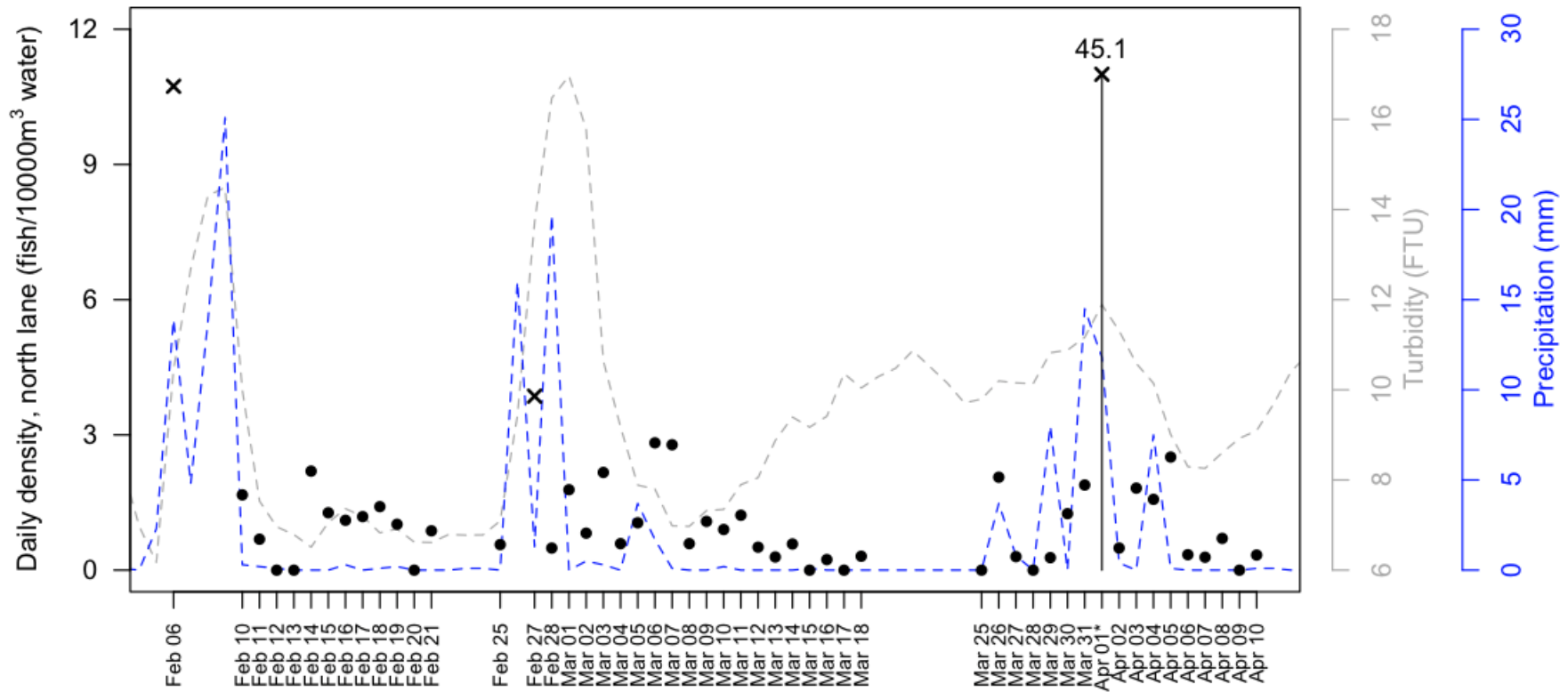
Spring Kodiak Trawl Survey #3 of 2014  
Sex Ratios of Male and Female Delta Smelt  
(3/10/2014 - 3/13/2014)



Spring Kodiak Trawl Survey #4 of 2014  
Sex Ratios of Male and Female Delta Smelt  
(4/7/2014 - 4/10/2014)



# Early warning monitoring showed persistence smelt presence at Jersey Point and catch spikes during storms

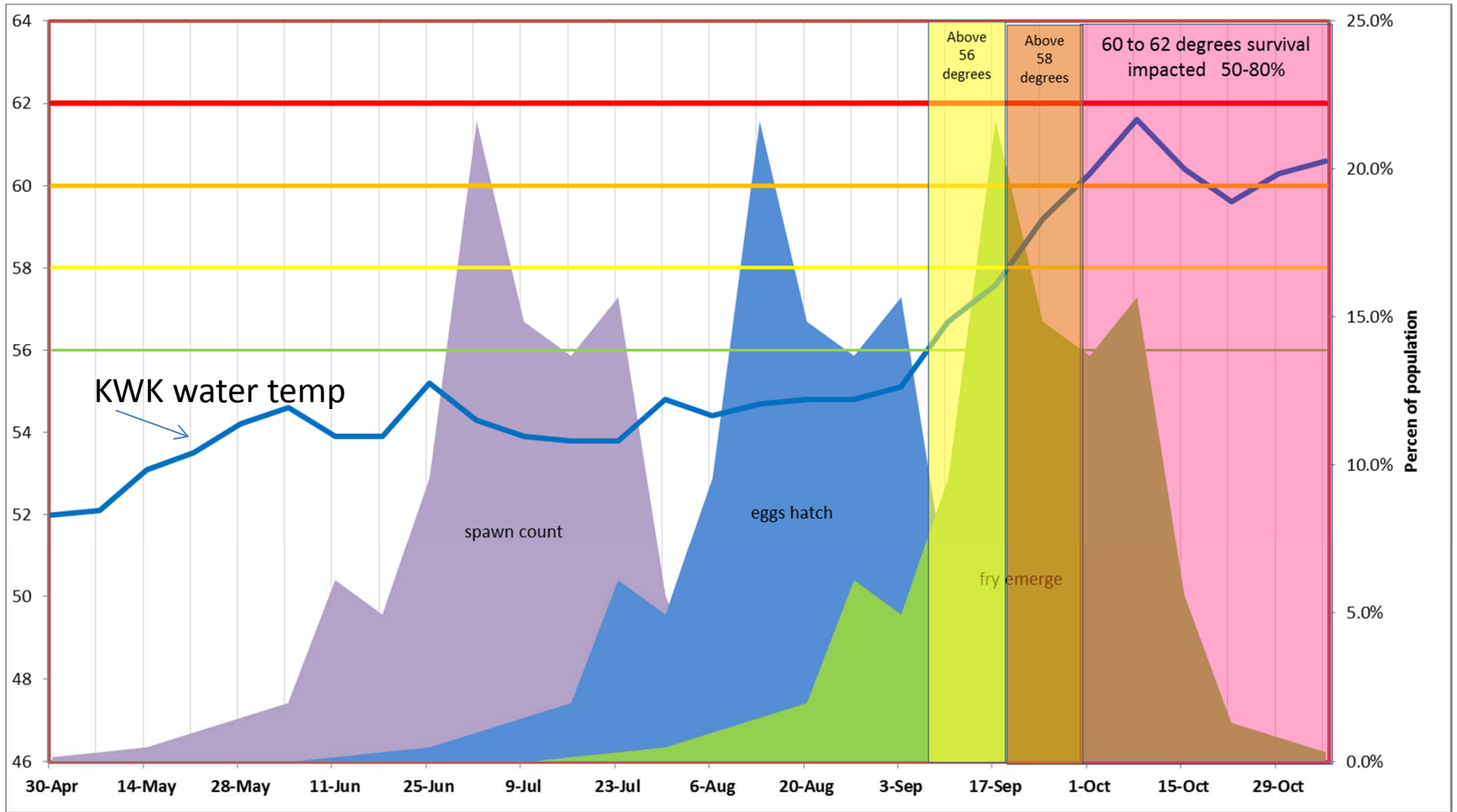




# Sacramento and American River Temperature Management

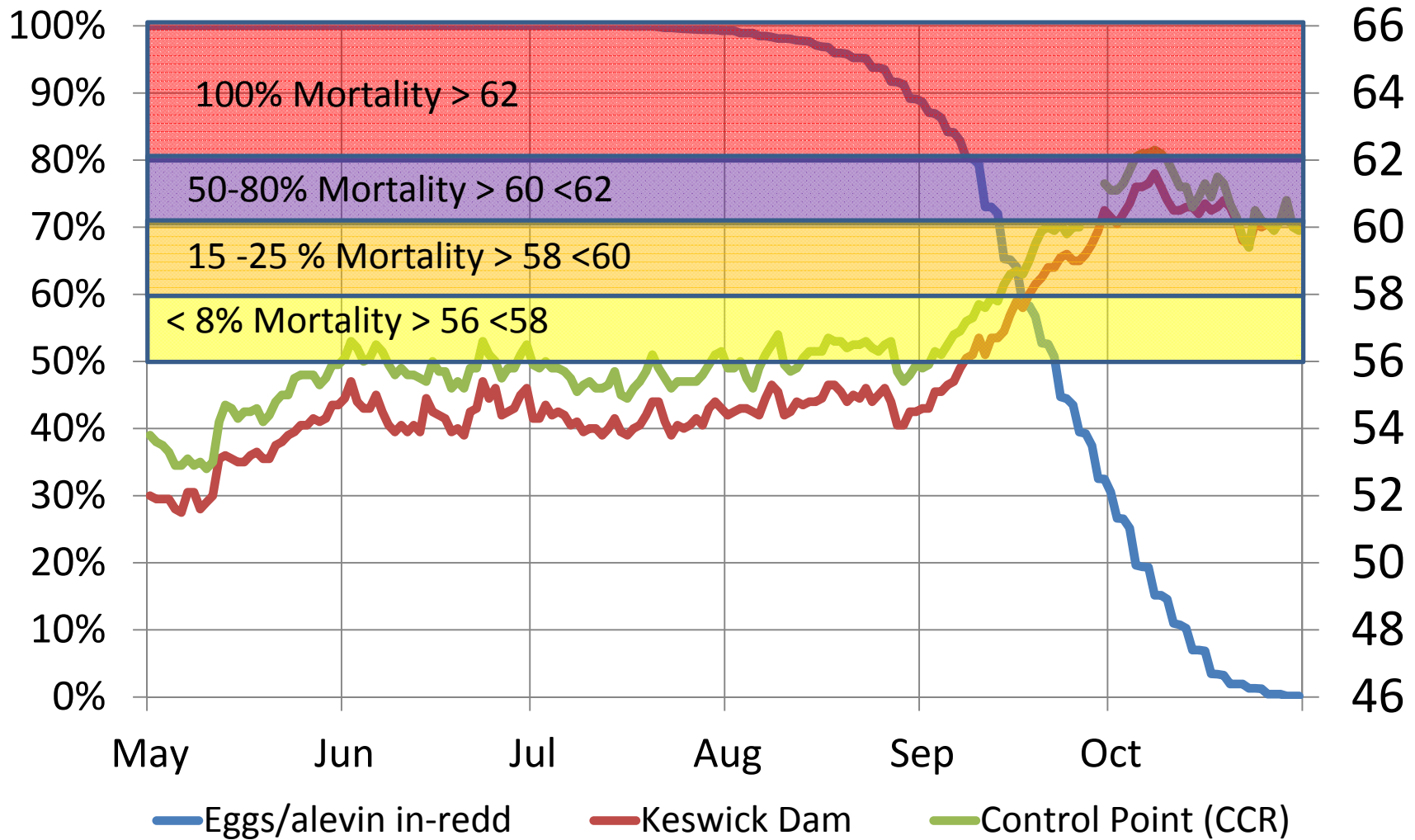
- Temperature management is critical throughout egg/alevin incubation
- Winter-run peak spawning typically occurs in Sacramento River in May and June
  - Egg to fry emergence is ~80 days
- Fall-run peak spawning typically occurs in November in both the Sacramento and American rivers

# Potential Impacts to 2014 Winter-Run Life Stages due to Water Temperatures in the Upper Sacramento River

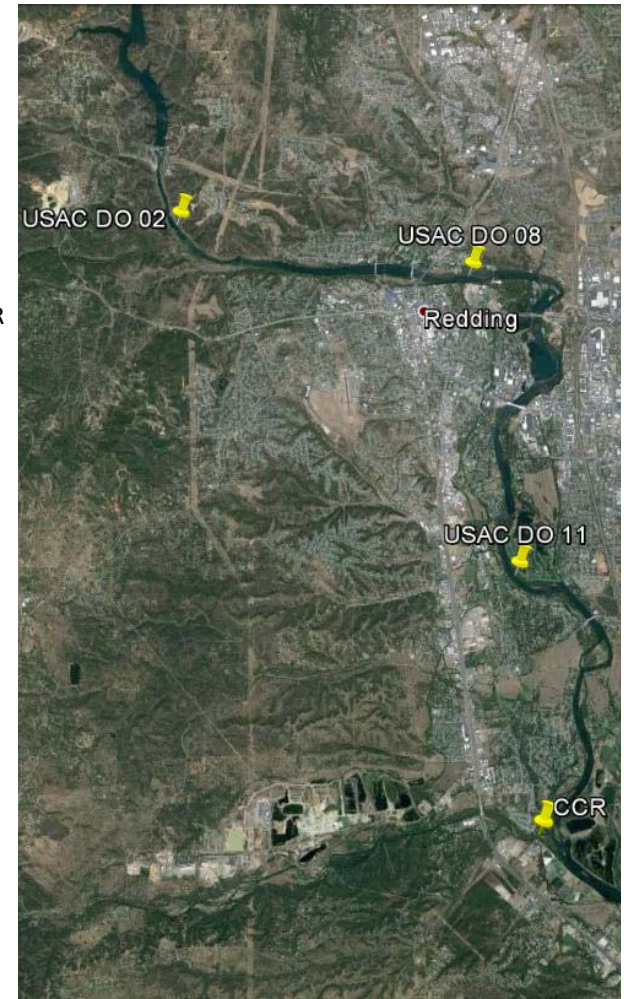
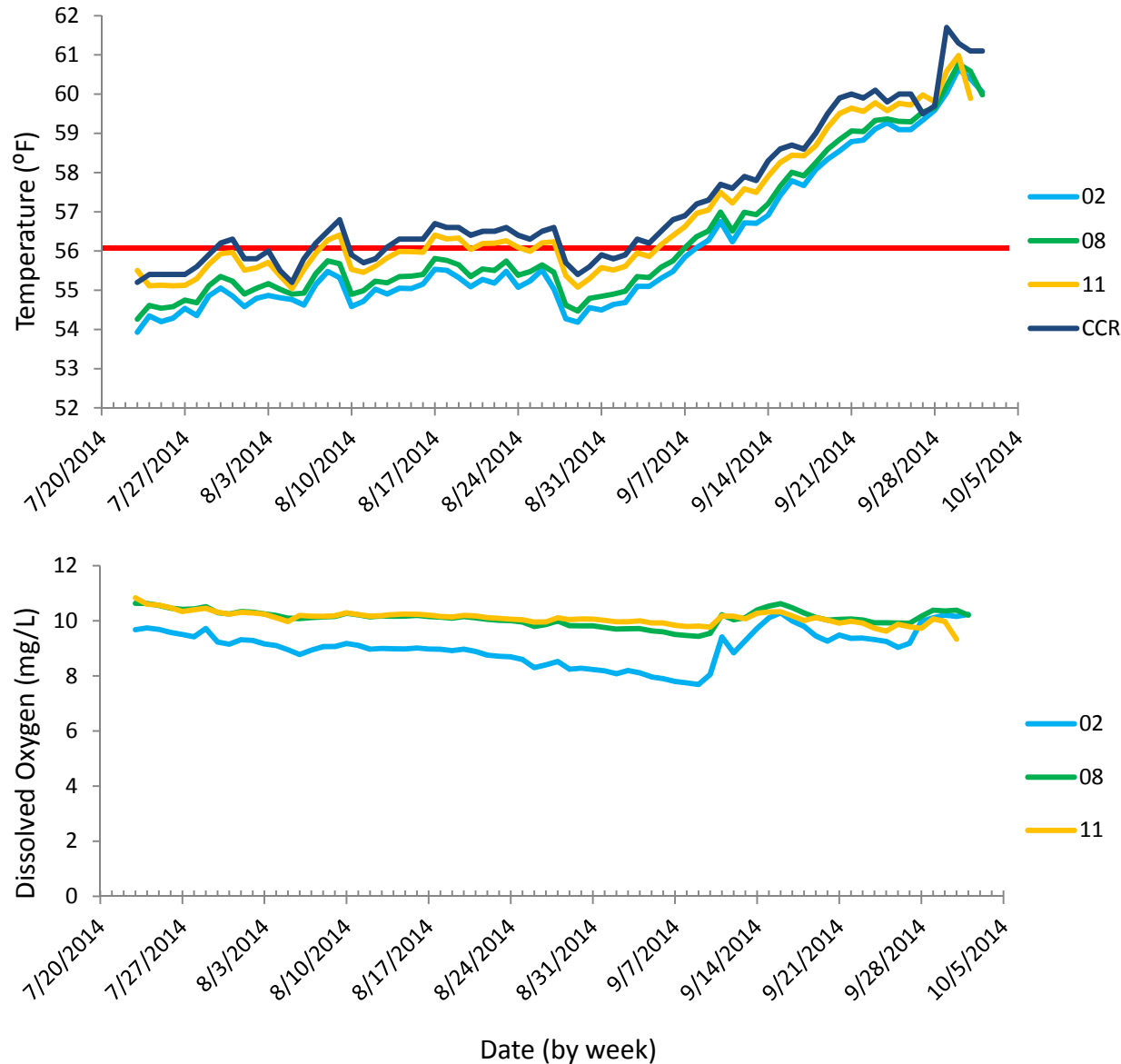


DATE

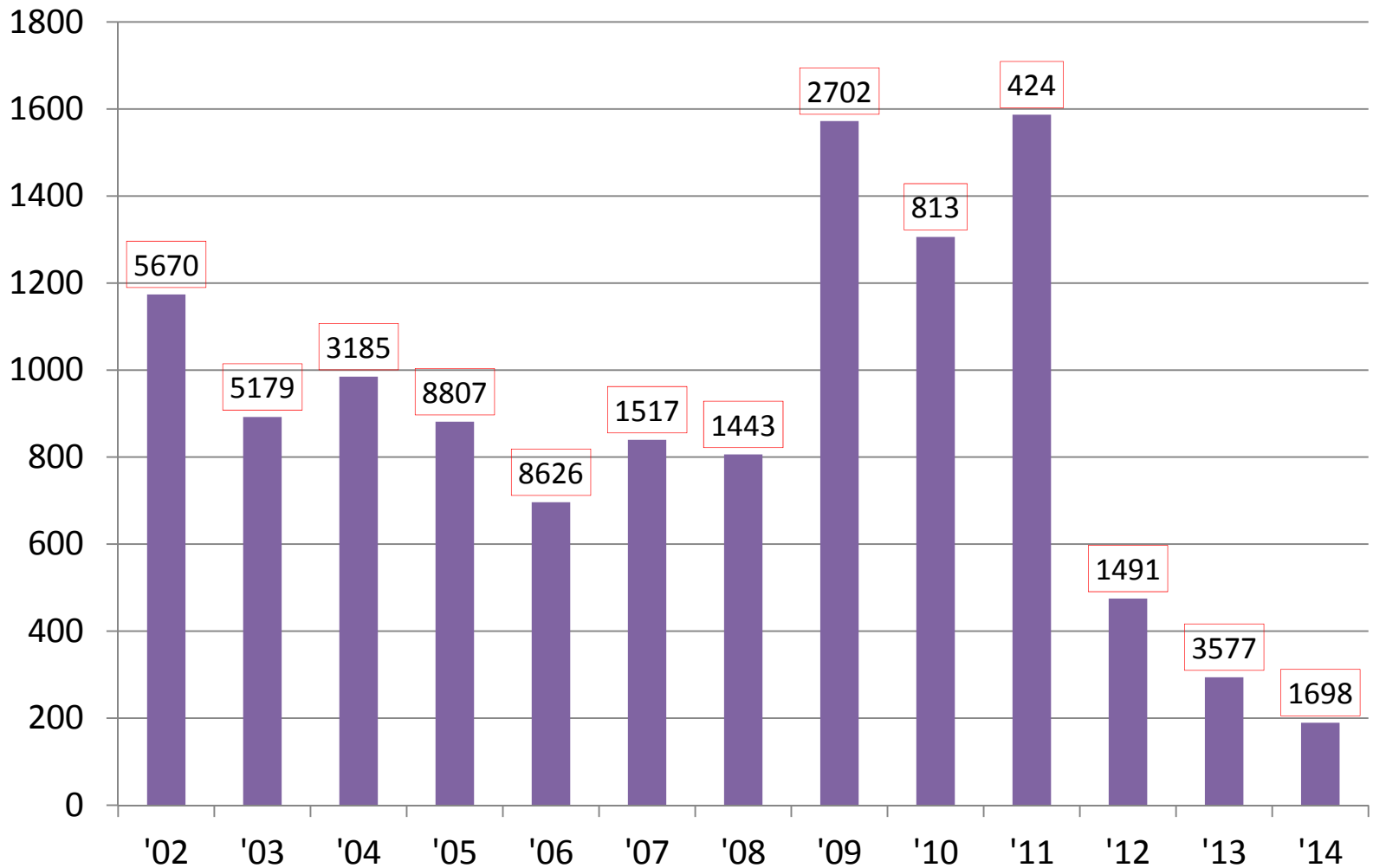
# 2014 Winter-run Egg Temperature Mortality- Sacramento River



# Daily average substrate level temperatures and dissolved oxygen readings in the Upper Sacramento River - 2014



Winter run Juveniles Passing Red Bluff per female spawner  
through Nov 4 for the years 2002-2014  
Box value is number of Female Spawners



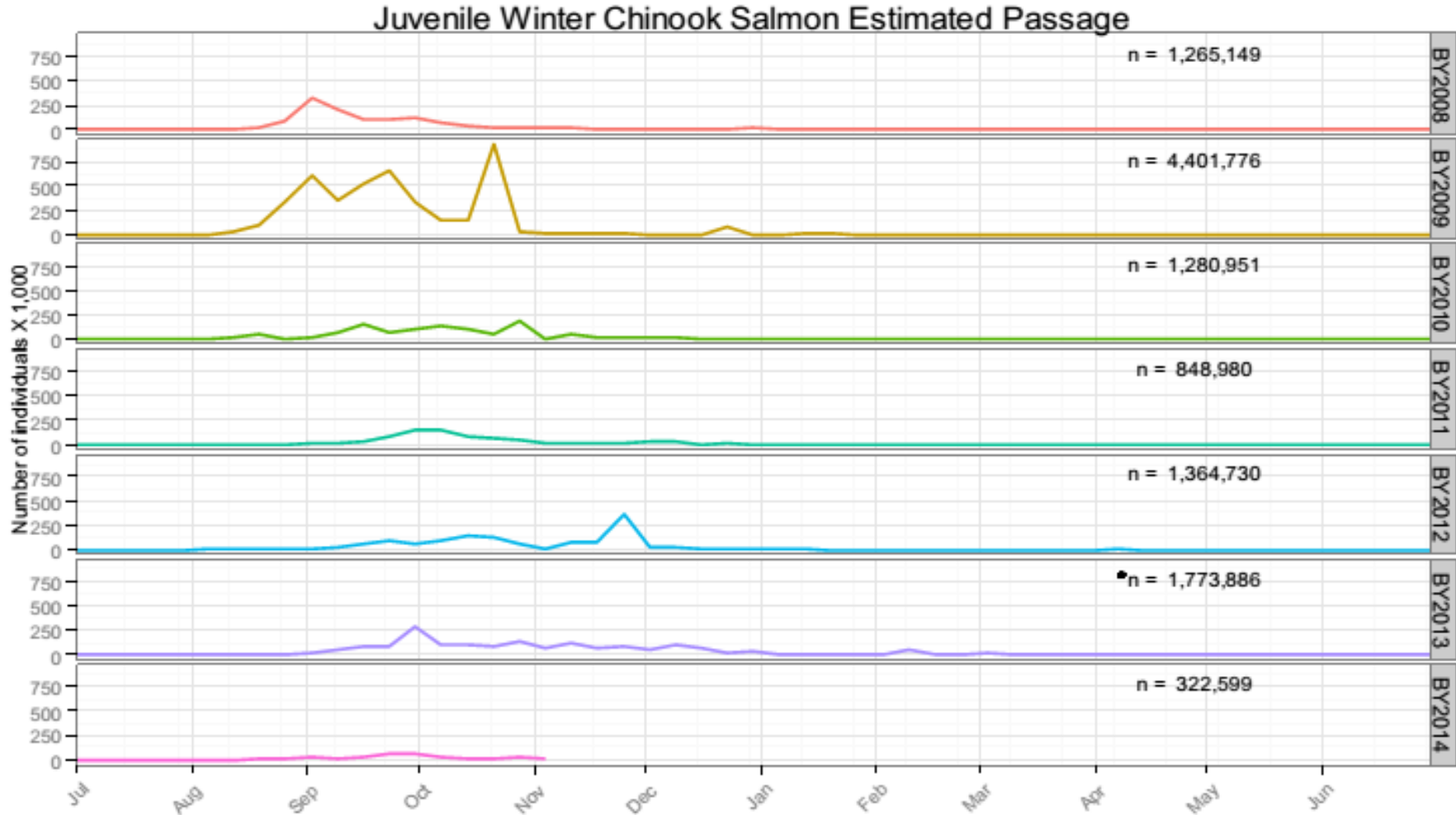
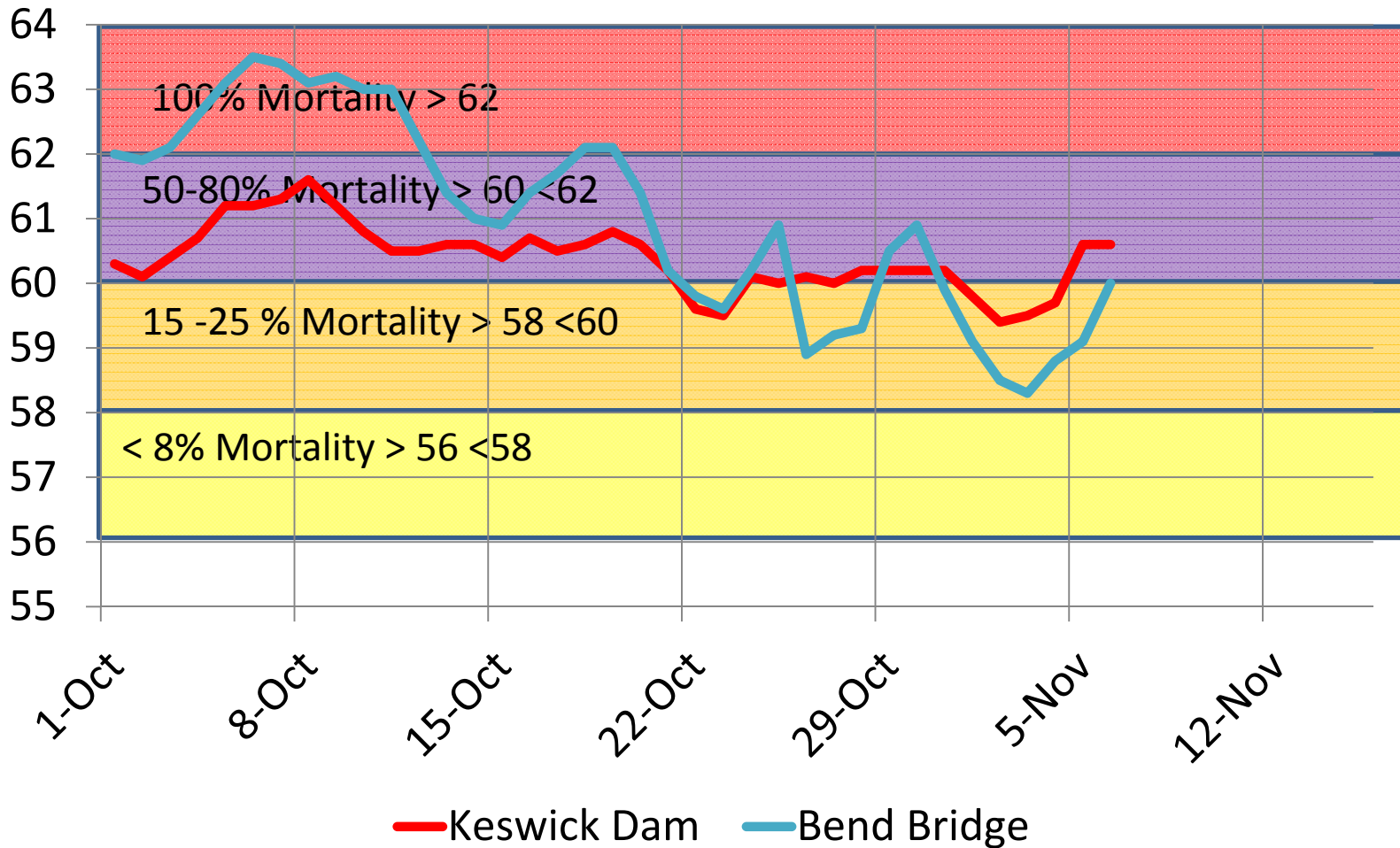


Figure 1. Weekly estimated passage of juvenile winter Chinook Salmon at Red Bluff Diversion Dam (RK391) by brood-year (BY). Fish were sampled using rotary-screw traps for the period July 1, 2008 to present .

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

Figure taken from USFWS Biweekly report (October 22, 2014 – November 4, 2014)

# 2014 Fall-run Egg Temperature Mortality – Sacramento River



# Flow Management

- Management of flow is critical to the spawning success of salmonids
  - Winter-run peak spawning typically occurs in the Sacramento River in May and June
    - Egg to fry emergence is ~80 days
  - Fall-run peak spawning typically occurs in the American River in November
    - fry emergence typically occurs from January to Mid-April



# Winter-Run Redd Modification

**Before Modification: Water depth = 2 in.  
Velocity = 1.41 ft/s**



**After Modification: Water depth = 4 in.  
Velocity = 2 ft/s**

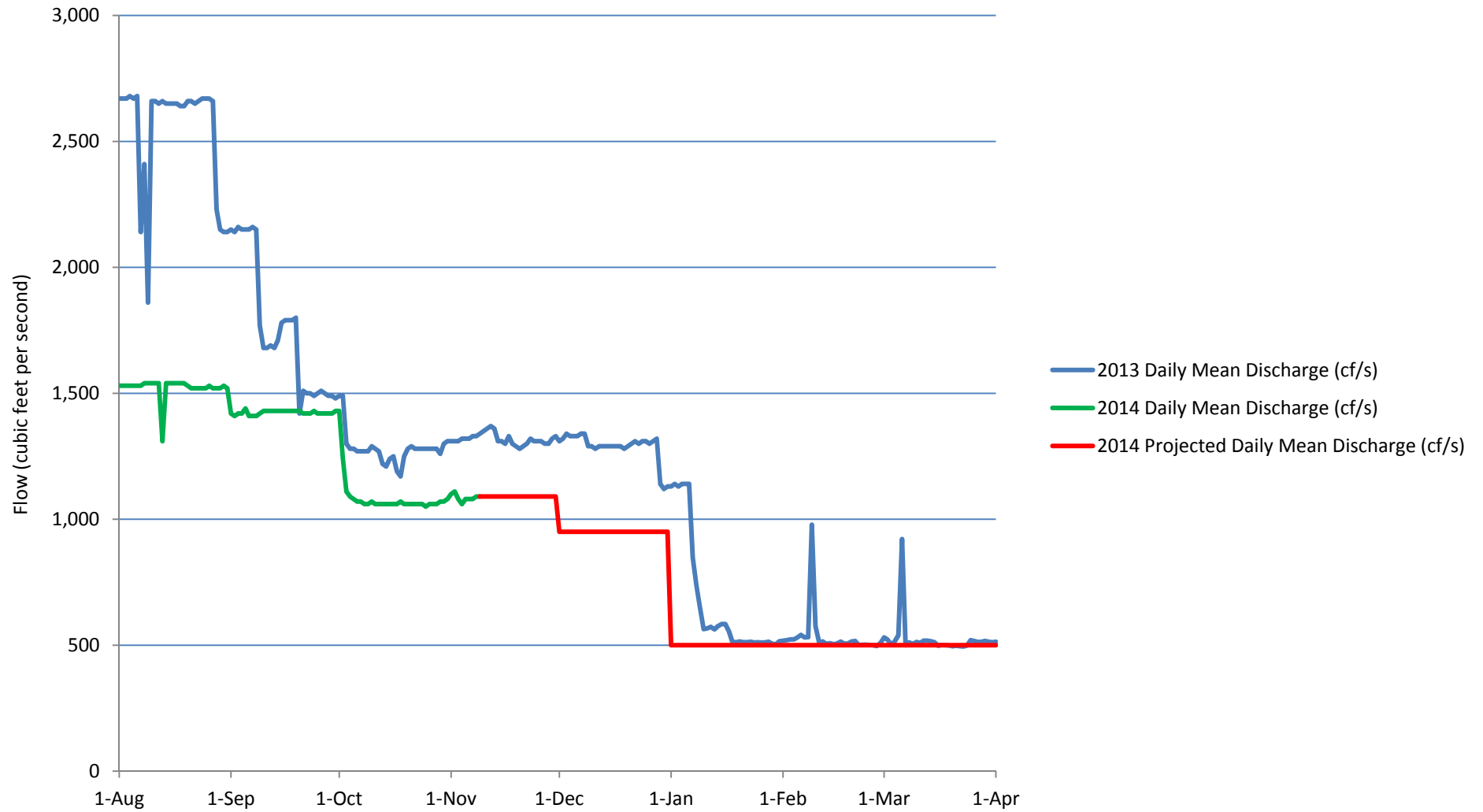




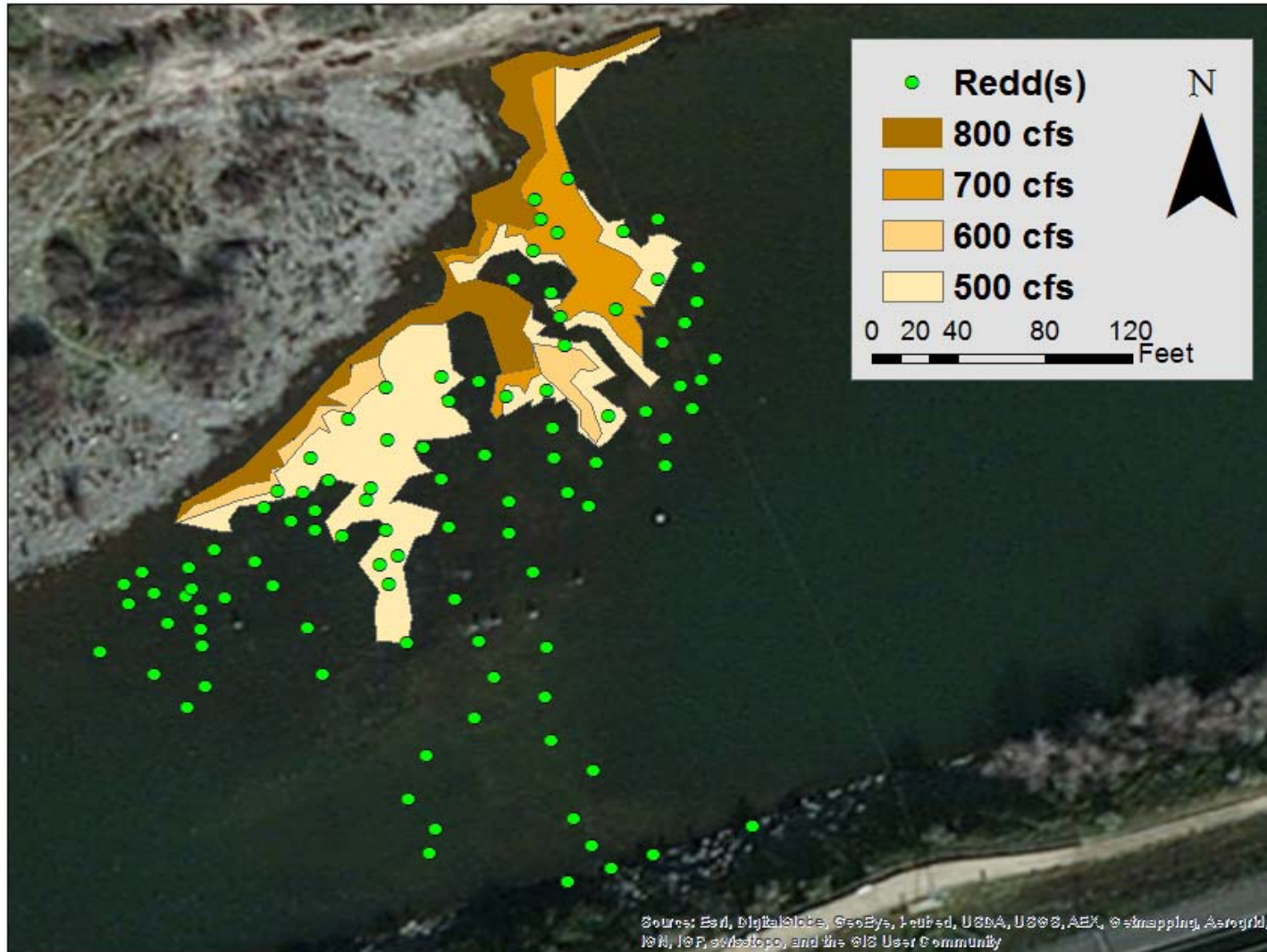
## **Fish rescue efforts during 2014**

PSMFC and CDFW crews seine juvenile fishes from stranding pools on the Sacramento River.

# American River flow at Fair Oaks (AFO)



# Dewatered area at incremental flow reductions



# Sailor Bar Gravel Augmentation site

800 cfs



700 cfs



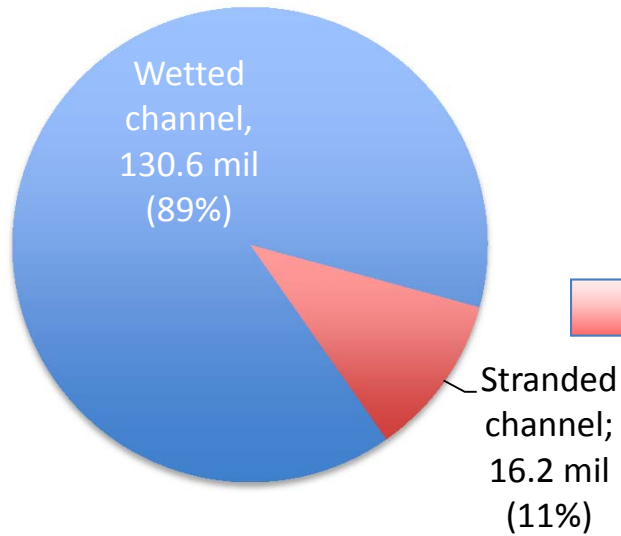
600 cfs



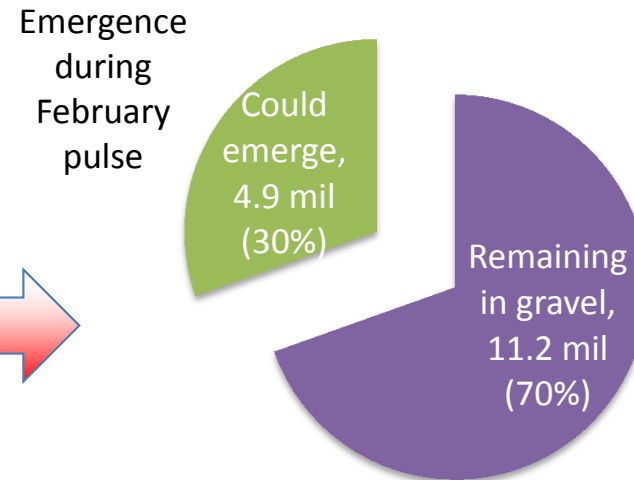
500 cfs



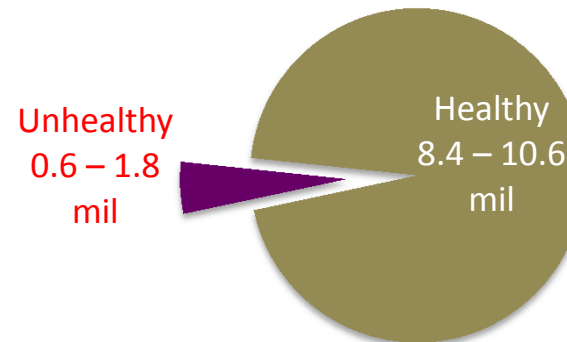
**146.8 million Chinook salmon embryos available in 2013/14**



**16.2 million Originally Stranded**



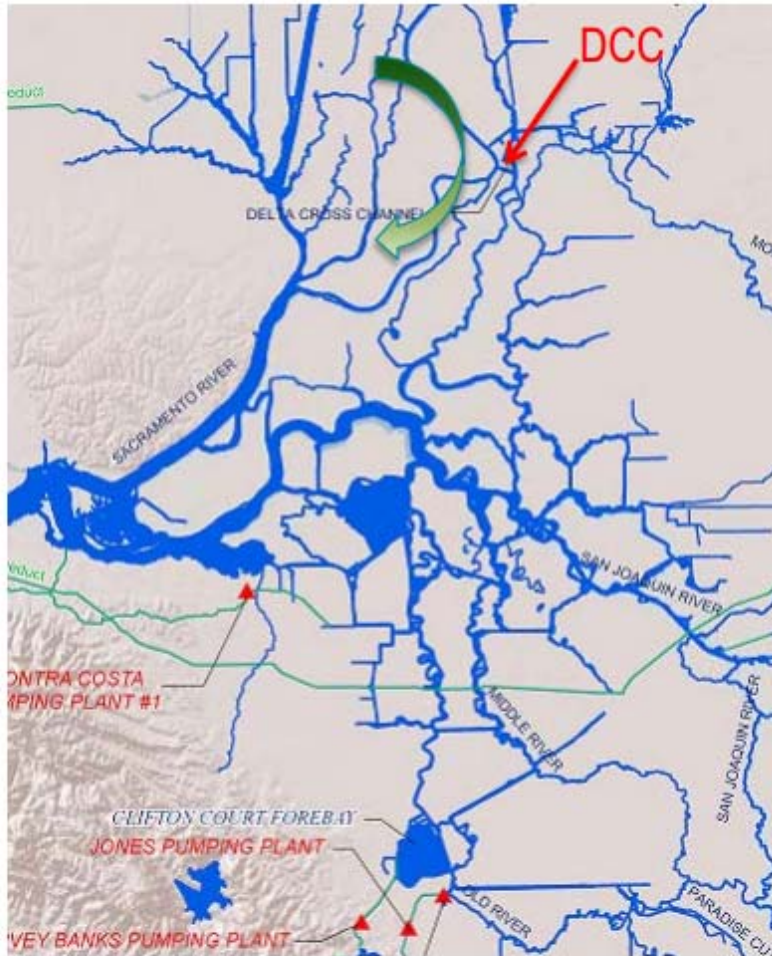
**11.2 million remain stranded after February 7-9 pulse**



# Delta Cross Channel



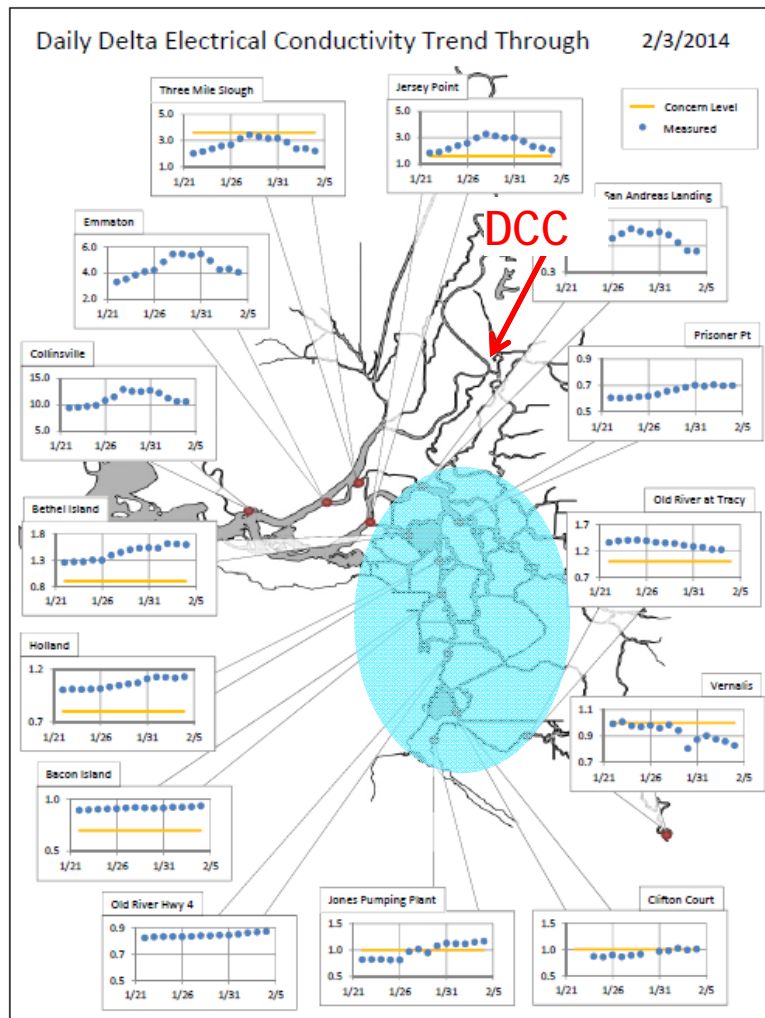
# DCC Operations – salmonid concerns



- Keep DCC closed during juvenile salmonid outmigration in winter & spring to reduce routing through interior delta.

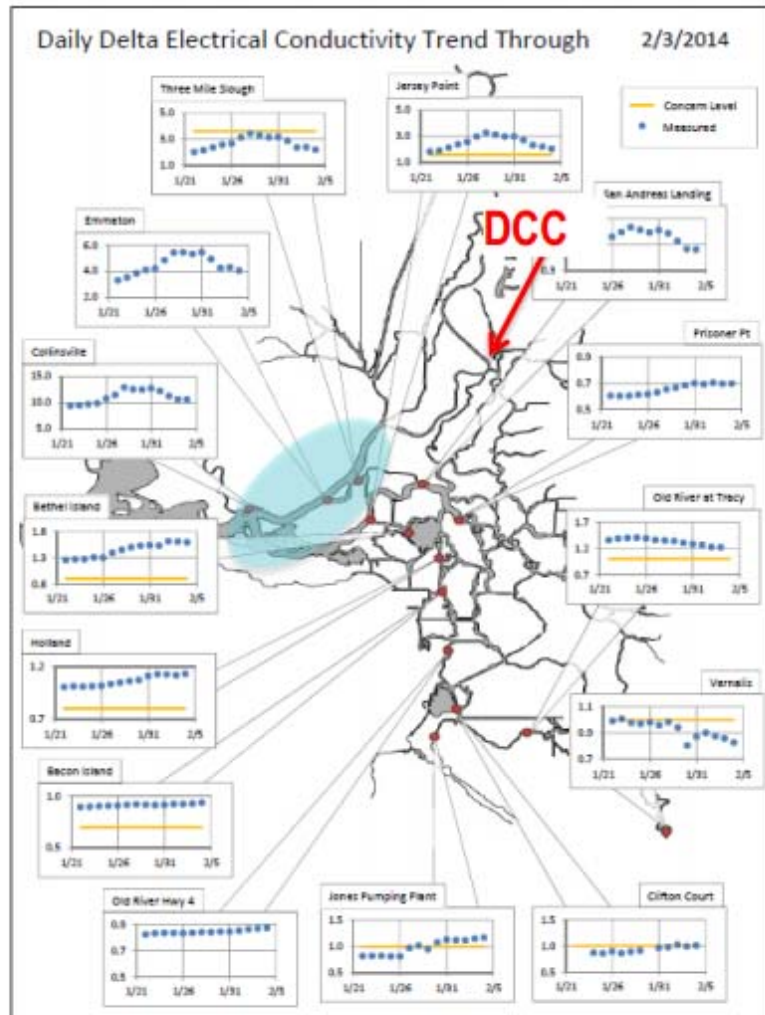


# DCC Operations – water quality concerns



- *Interior delta stations:*  
Keep DCC open to  
freshen interior delta

# DCC Operations – water quality concerns



- *Interior delta stations:* Keep DCC open to freshen interior delta
- *Mainstem Sacramento River stations:* Keep DCC closed to maximize flow in Sacramento R.

# Where were the winter-run?

- RBDD
- GCID
- Tisdale RSTs



Photo credit: CDFW

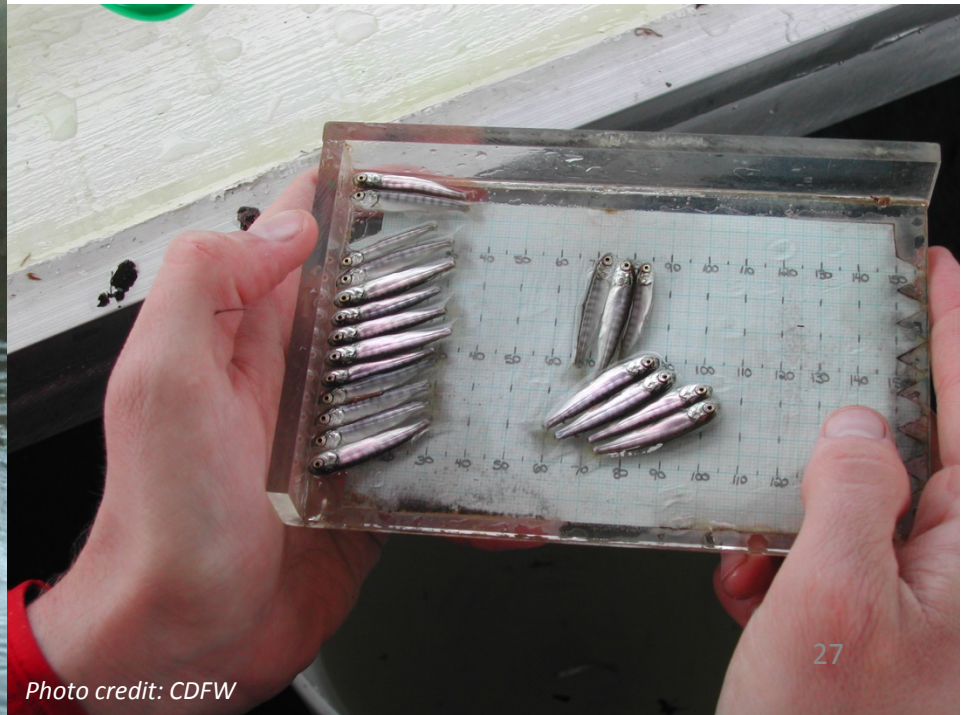
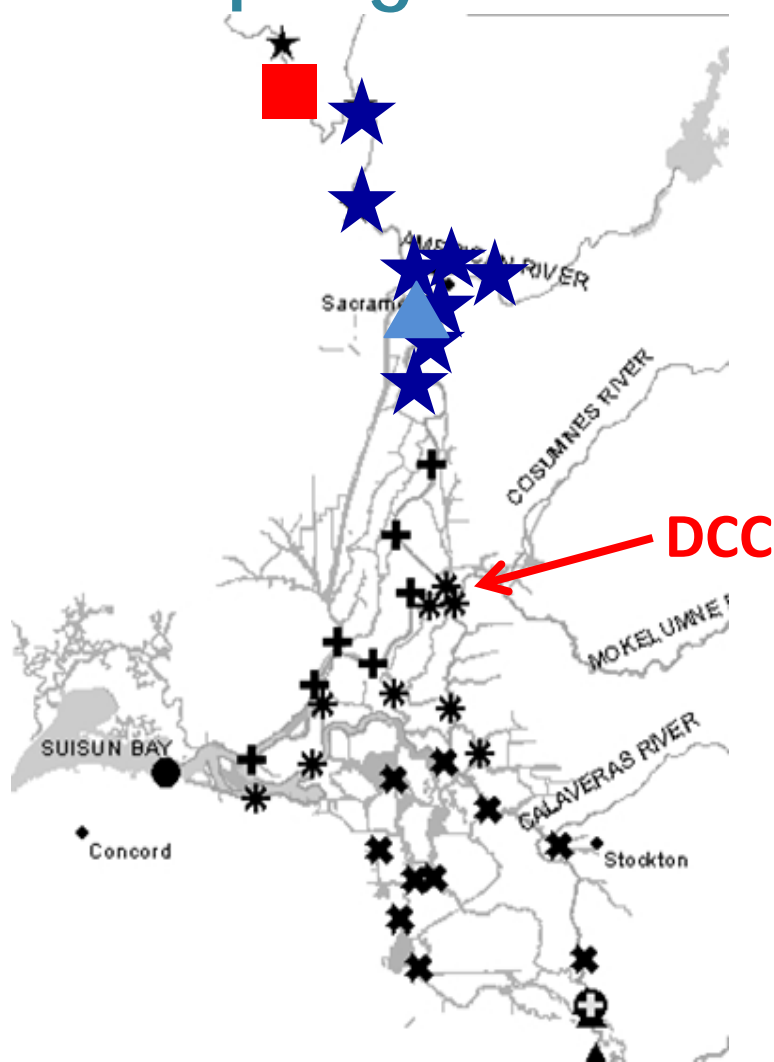


Photo credit: CDFW

# Sampling Locations Used in DCC Triggers



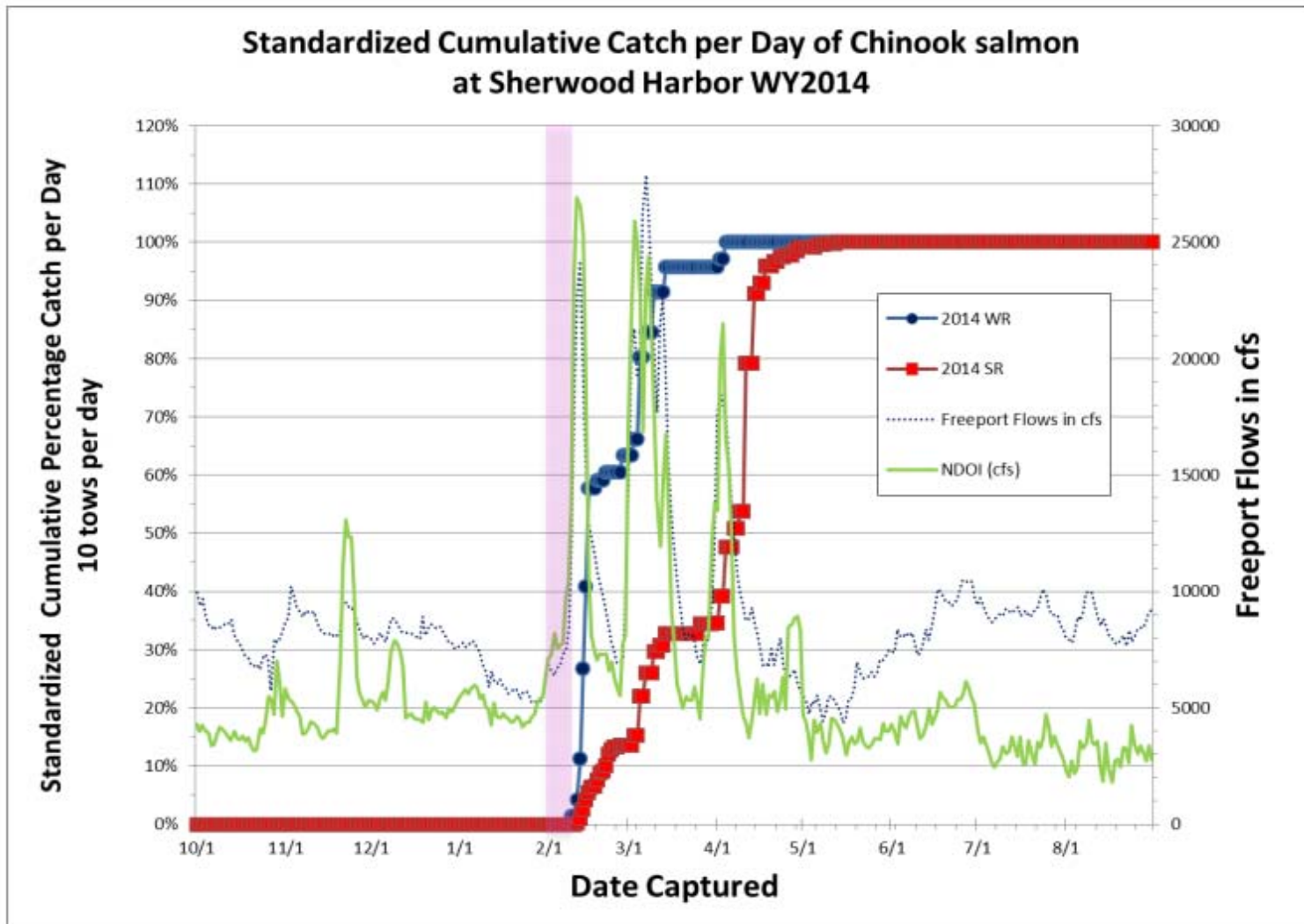
- Knights Landing rotary screw trap
- ★ Sacramento beach seines
- ▲ Sacramento trawl

# Actual DCC operations in WY 2014



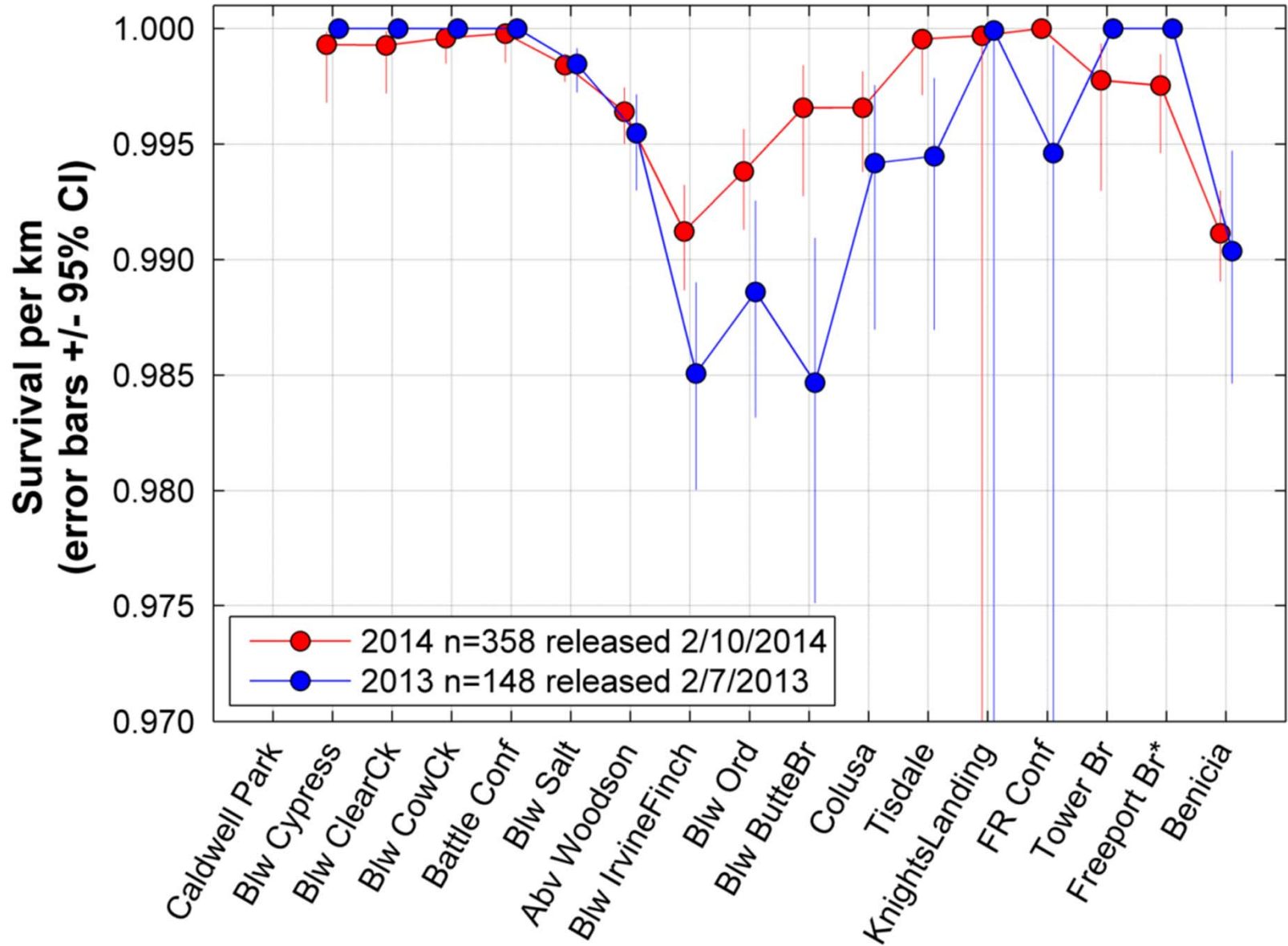
*Photo credit: USGS*

# Risks to listed Chinook salmon in WY 2014



# OMR and Exports

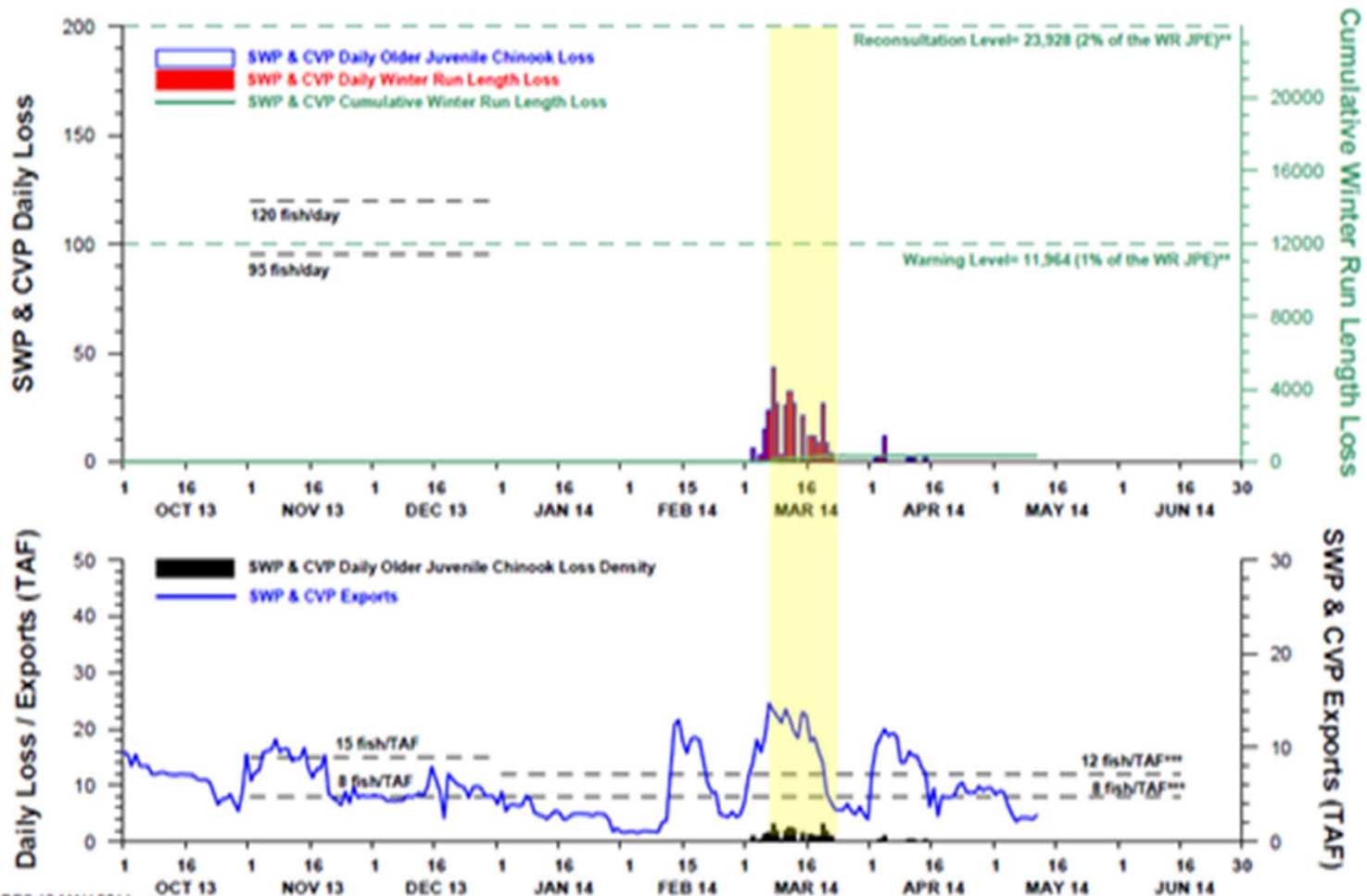
## CJS Modeled Survival: Winter-run Chinook 2013 vs 2014





# Loss of Older Juveniles (including WRCS) in WY 2014

## NON-CLIPPED WINTER RUN & OLDER JUVENILE CHINOOK LOSS AT THE DELTA FISH FACILITIES 01 OCT 2013 THROUGH 11 MAY 2014



DWR-DES 12 MAY 2014

Preliminary data from DFVW; subject to revision.

\*Older juvenile Chinook defined as all Chinook greater than or equal to the minimum winter run length-at-date criteria and less than the maximum size included in the length-at-date criteria (Delta model) for which a race is assigned on a given sampling date.

\*\*Based on the final juvenile production estimate (JPE), which comes out to 1,196,387 non-clipped winter run (WR) Chinook entering the Delta during water year 2014.

\*\*\*Used to roughly estimate whether the daily loss is greater than 8 fish/TAF multiplied by the volume exported in TAF or 12 fish/TAF multiplied by the volume exported in TAF. The daily JPE based older juvenile Chinook loss density triggers of 11.96 fish/TAF (first stage) and 23.93 fish/TAF (second stage) are not controlling this water year.

# Combined loss vs. OMR

Date	USGS Tidally Filtered OMR (cfs)			OMR Index Calculation (cfs)			Older <u>juv</u> Chinook loss density	Steelhead loss density
	Daily	Mean 5-Day	Mean 14-Day	Daily	Mean 5-Day	Mean 14-Day		
1/23/14								6.33
2/19/14								0.94
2/20/14								1.30
3/1/14	-592e			-1,150	-1,230	-2,410		
3/2/14	-1,264			-3,240	-1,630	-2,290		
3/3/14	-2,642			-3,590	-2,100	-2,210	0.80	
3/4/14	-3,315			-3,970	-2,640	-2,170		1.85
3/5/14	-3,346			-4,920	-3,380	-2,280	0.30	
3/6/14	--			-5,050	-4,150	-2,420	1.31	1.54
3/7/14	--	-4,110		-5,980	-4,700	-2,690	1.60	1.36
3/8/14	-5,212	-4,610		-6,020	-5,180	-2,950	3.13	
3/9/14	-5,215	-4,980		-5,790	-5,550	-3,280	2.00	0.31
3/10/14	-5,756	-5,220		-6,020	-5,770	-3,620	0.23	
3/11/14	-4,689	-5,170		-5,960	-5,950	-3,960	1.83	0.31
3/12/14	-4,994	-5,150		-5,600	-5,880	-4,270	3.03**	
3/13/14	-5,600	-5,240		-6,250	-5,920	-4,630	2.28	
3/14/14	-6,120	-5,370		-5,520	-5,870	-4,930		
3/15/14	-4,727	-5,290		-5,660	-5,800	-5,250	1.57	
3/16/14	-5,165	-5,350	-4,860	-5,900	-5,780	-5,440		
3/17/14	-5,782	-5,450	-5,060	-4,810	-5,630	-5,530	1.10	1.62
3/18/14	-4,967e	-5,340	-5,180	-5,000	-5,380	-5,600	1.66**	2.34
3/19/14	-4,996e	-5,130	-5,230	-4,320	-5,140	-5,560	0.90	0.50
3/20/14	-4,234	-5,000	-5,170	-3,830	-4,770	-5,470	3.16	0.32
3/21/14	-3,977	-4,690	-5,060	-2,420	-4,080	-5,220	1.76	
3/22/14	-2,201	-4,050	-4,860	-2,030	-3,520	-4,940	0.93	0.65
3/23/14	-1,553	-3,350	-4,600	-1,610	-2,840	-4,640		5.12
3/24/14	-1,474	-2,680	-4,320	-1,620	-2,300	-4,320		3.39
3/25/14	-1,818	-2,170	-4,090	-1,890	-1,910	-4,030		5.14
3/26/14	-2,142	-1,810	-3,870	-1,920	-1,820	-3,770		
3/27/14	-1,027	-1,590	-3,560	-1,550	-1,720	-3,430		
3/28/14	-1,057	-1,500	-3,220	-1,500	-1,700	-3,150		
3/29/14	-1,565	-1,490	-2,970	-1,480	-1,670	-2,850		
3/30/14	-1,160	-1,370	-2,670	-1,480	-1,590	-2,530		
3/31/14	-1,287e	-1,180	-2,350	-1,430	-1,490	-2,290		

\*\*Values include the latest interpretation of a NMFS/USBR interim procedure to estimate loss due to secondary channel construction outage

# Retrospective analysis

- Winter-run Chinook Salmon Drought Operations and Monitoring Assessment (<http://deltacouncil.ca.gov/sites/default/files/2014/11/2014-11-12-Juvenile-Salmonids-Drought-Operations-and-Monitoring-Assessment.pdf>)

# Take Home Messages

- Smelt response to drought still under study
- Keeping smelt on Sac River side of the estuary is helpful
- Better temperature management is needed on the Sacramento River
- Continued coordination of efforts and funding are needed for flow management to reduce redd dewatering and fish stranding
- DCC gate operations trigger table adequately protected salmonids in WY 2014
- Relaxation of D-1641 X2 requirement saved quite a bit of water