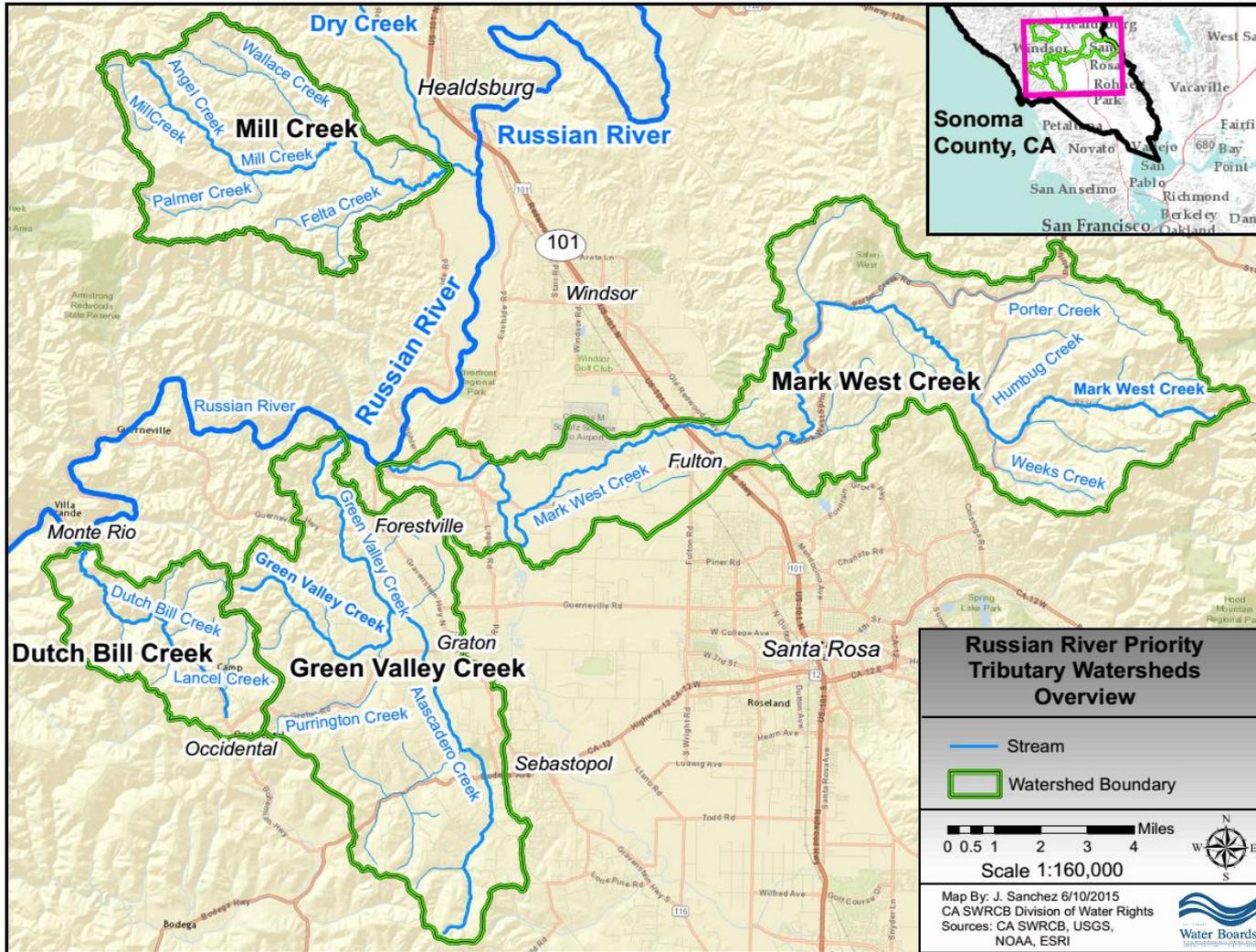


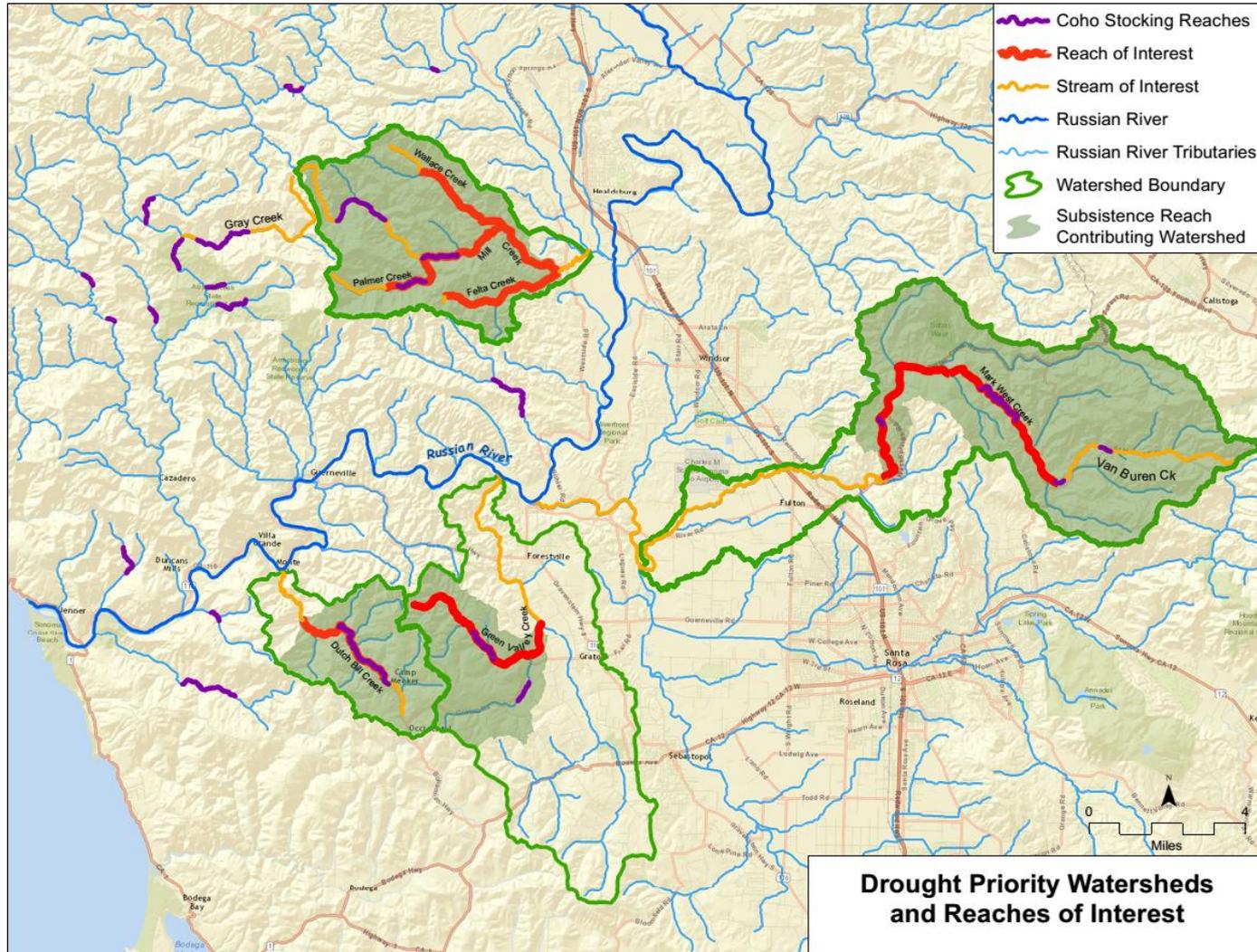
**Drought-Related Emergency Regulation Requiring Enhanced Water Conservation and Additional Water User Information for the Protection of Specific Fisheries in Tributaries to the Russian River
- California State Water Resources Control Board -**



Russian River Priority Tributary Watersheds



Important Reaches Within RR Priority Tributary Watersheds



The Russian River is Critical Habitat for Three Salmonid Species

1) Coho Salmon



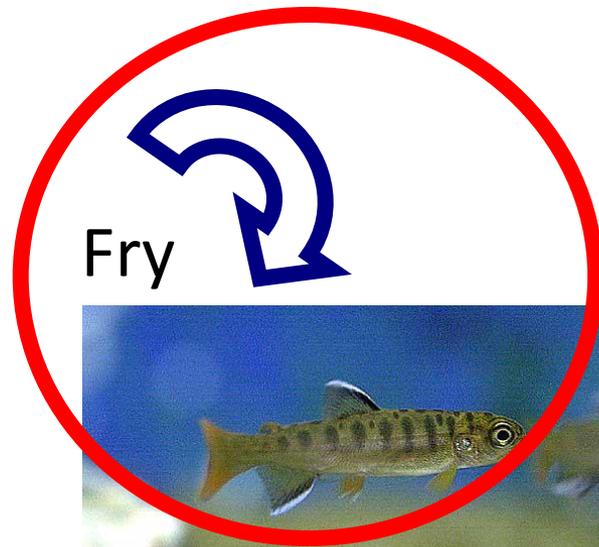
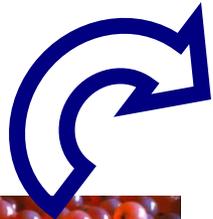
2) Steelhead Trout



3) Chinook Salmon



Alevin



Fry

Salmonid Life Cycle

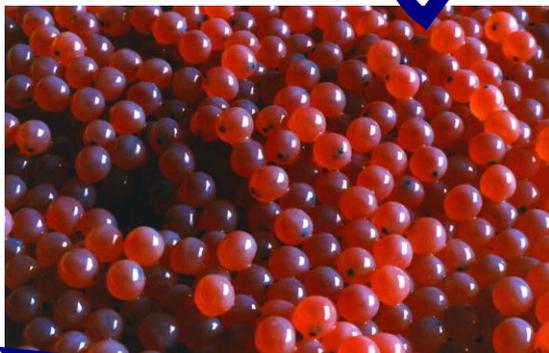
Smolt



Adult



Spawner



Egg



**Russian River Coho and Steelhead
are Dependent on the Tributaries for the First
Full-Year of Their Three Year Lifespan**



Coho Salmon Evolutionary Significant Unit Populations in California



Connected Stream Channel vs. Isolated Pools



Porter Creek, RR Watershed Sonoma County



Green Valley Creek,
RR Watershed, Sonoma County

Coho Salmon Smolt



Fish Rescues are the Last Resort in the Efforts to Save Coho and Steelhead



Pena Creek Fish Rescue, May 2015

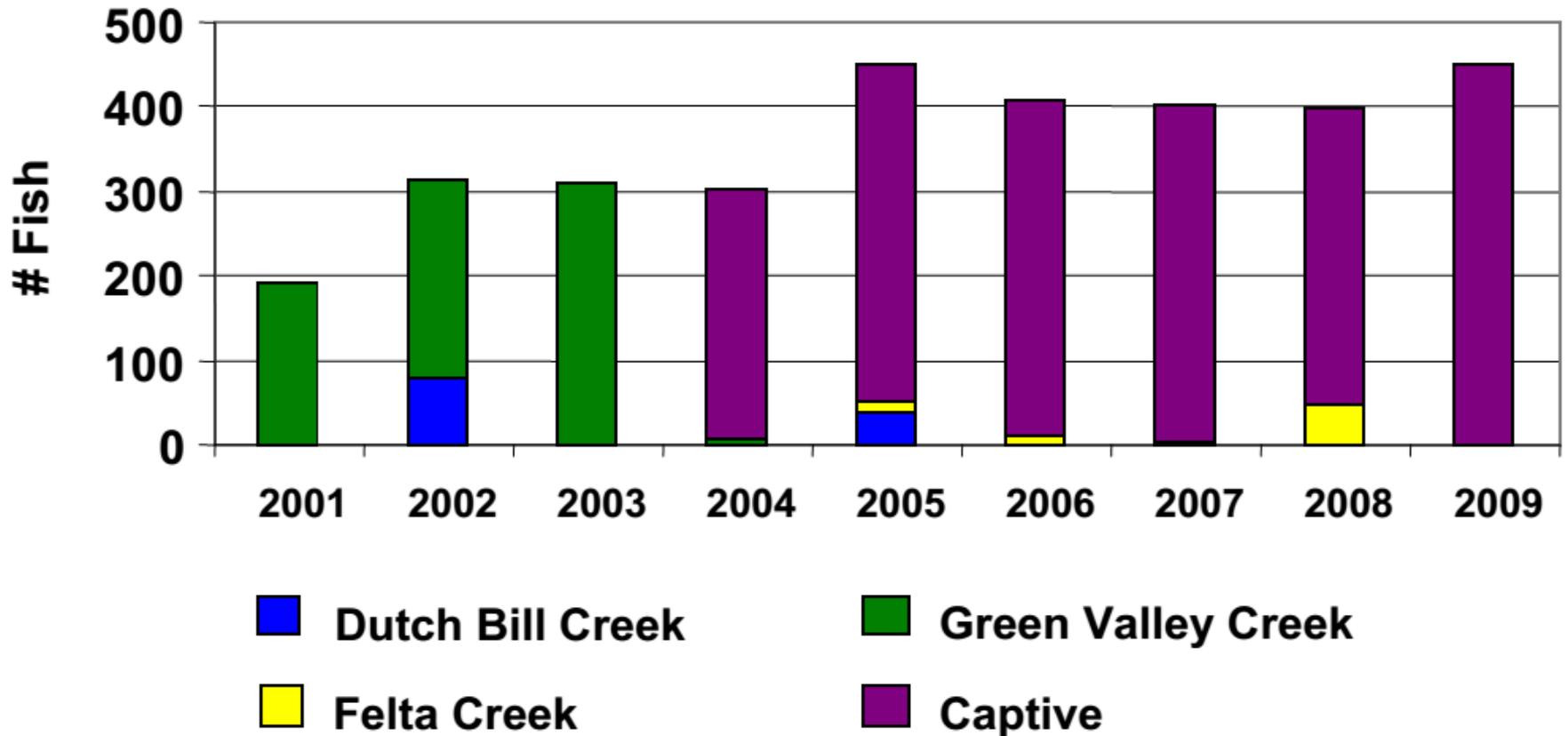


Coho Salmon Smolts Returned to the Mainstem of the RR

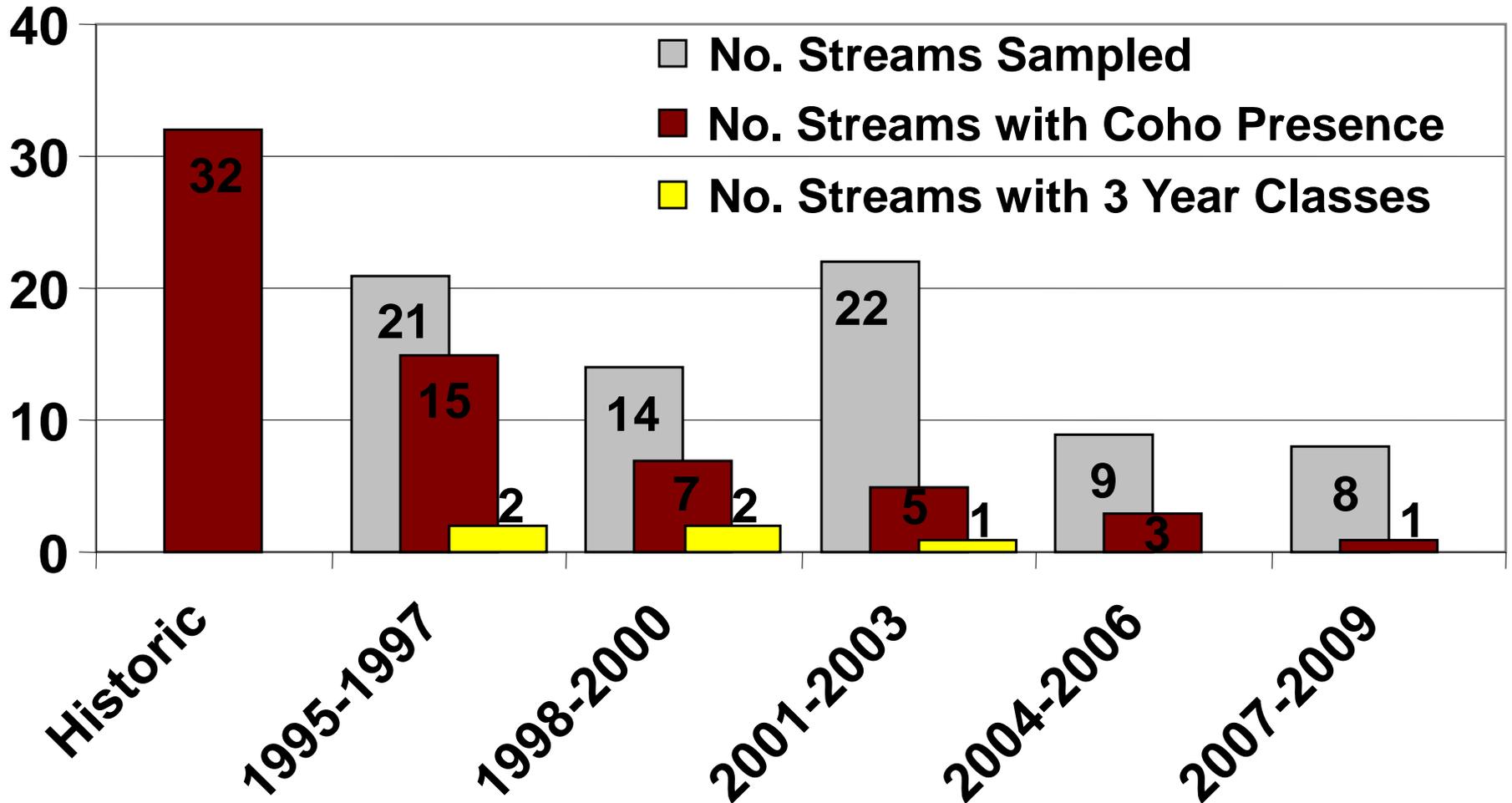
Russian River Coho Salmon Captive Broodstock Program

- Extinction of coho salmon in the Russian River basin was imminent without immediate intervention
- In 2001, state and federal agencies, along with non-profit groups, collaborated to begin a captive broodstock program.

Broodstock Collection History



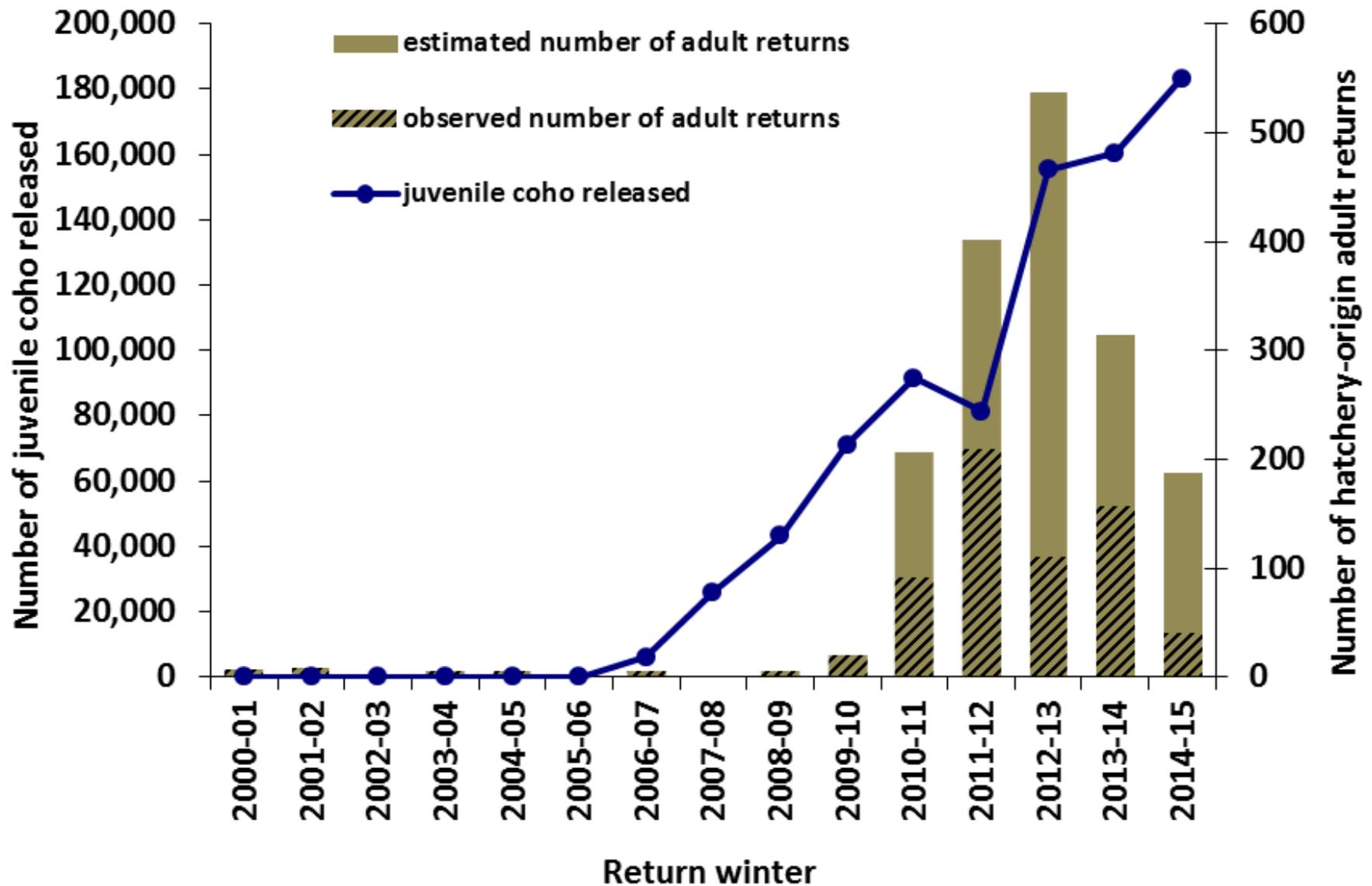
Decline of Coho in the Russian River Watershed



•Brown, et al. 1994

•Jong, 2006

Juvenile releases and corresponding hatchery-origin adult coho returns to the Russian River basin





Nearly \$10 Million has been spend within the four Priority Watersheds in the last 10 Years

Contact:

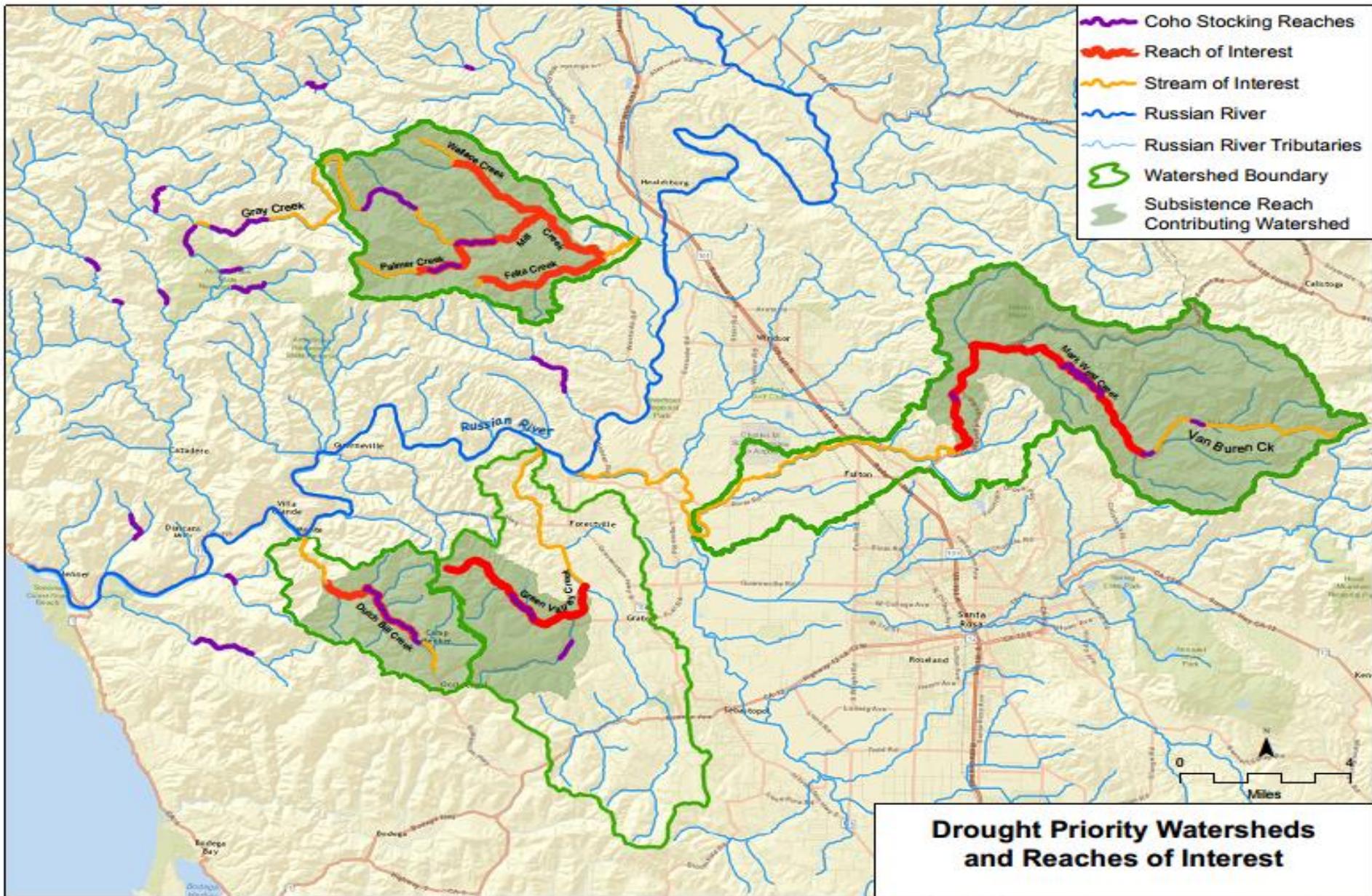
Eric Larson, Environmental Program Manager

California Department of Fish and Wildlife

Bay Delta Region

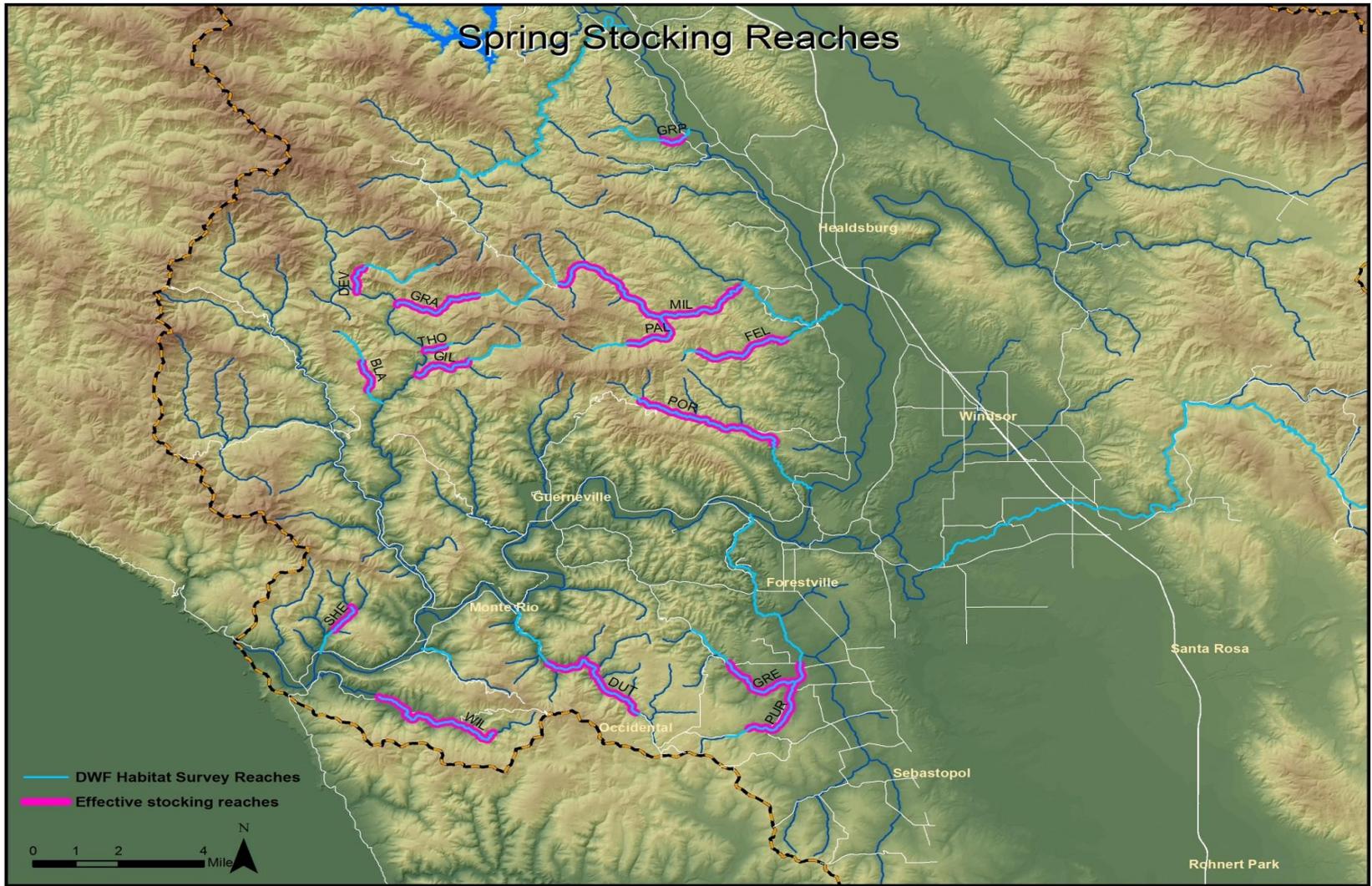
707-944-5528

Eric.Larson@wildlife.ca.gov

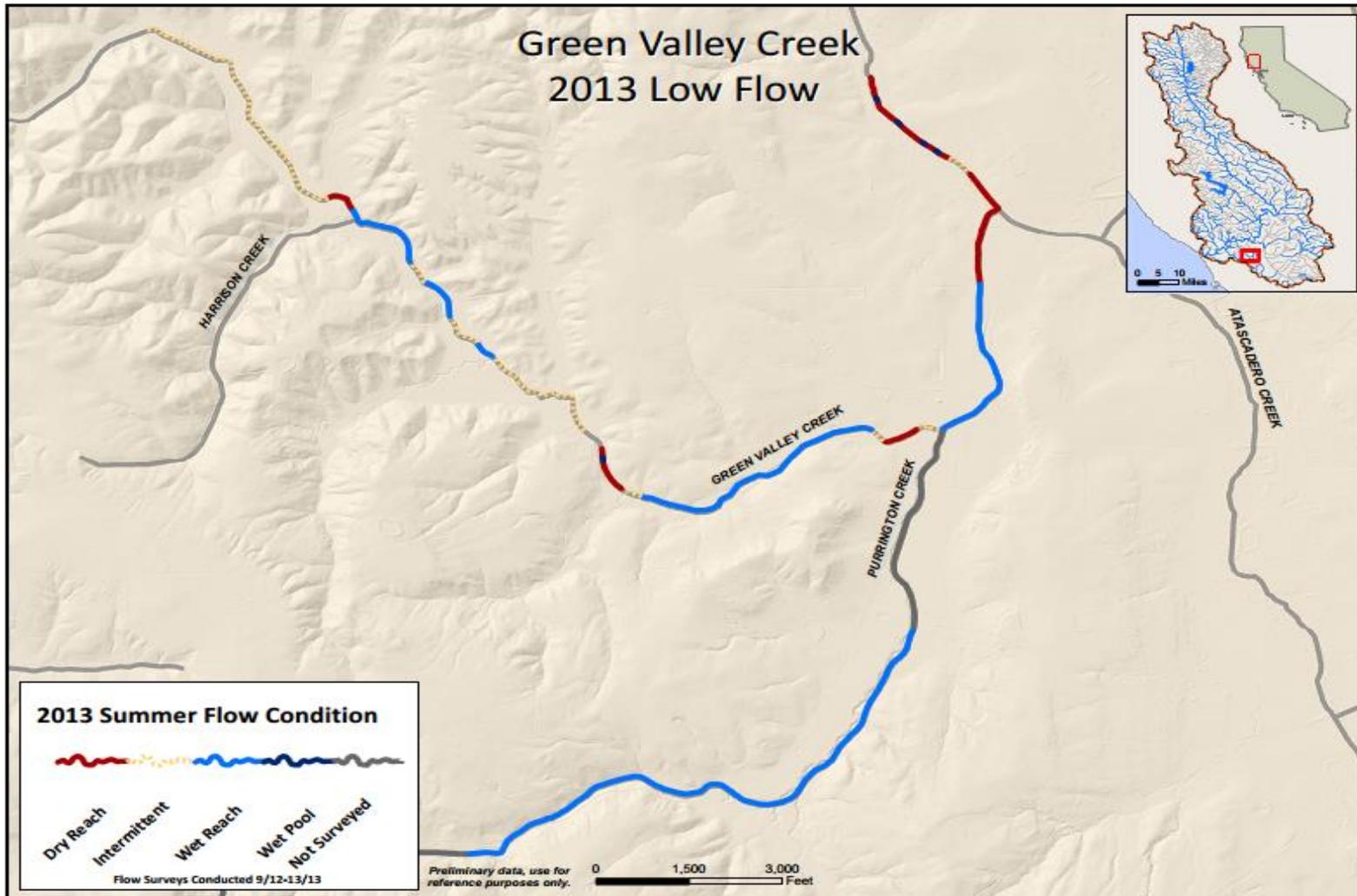


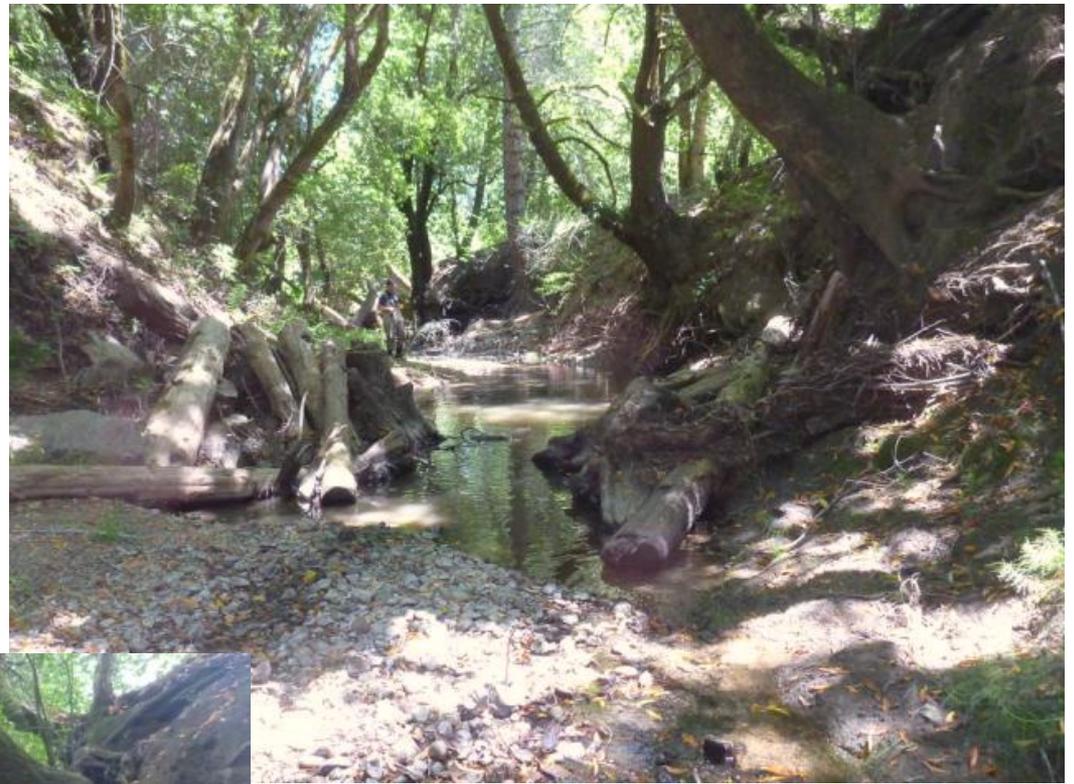
Drought Priority Watersheds and Reaches of Interest

Historical Stocking and wet/dry



Historical Stocking and wet/dry





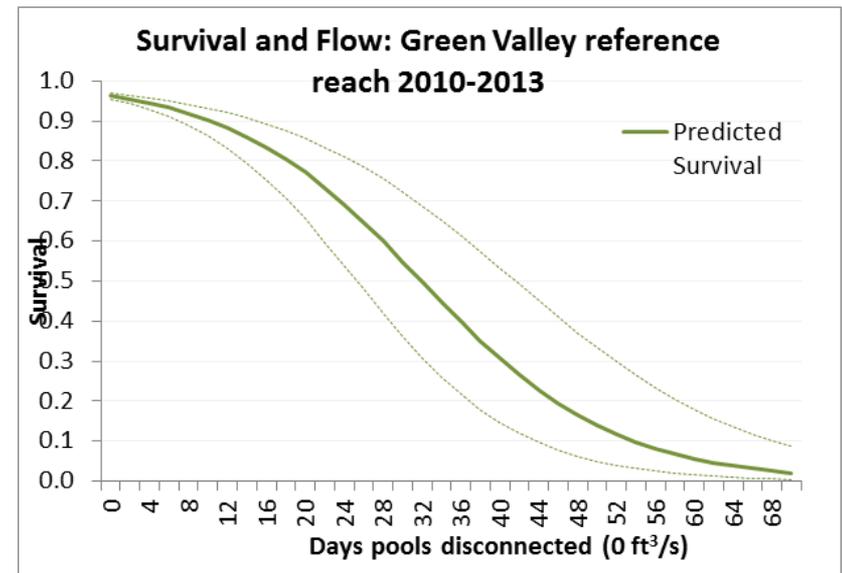
Trickle of water
maintains surface
connection between
pools

Juvenile Rearing

- Juvenile coho salmon rear in pools through the summer
 - They require low water temperatures and dissolved oxygen in those pools in order to survive
- Research indicates that even small amounts of surface flow can maintain sufficient water quality in pool habitats
 - However, once surface water connection between pools is lost due to lack of flow, water quality conditions deteriorate rapidly
- Flow conditions described here are minimum subsistence flow conditions and are not suitable management standards outside of this drought emergency
 - Summer rearing flows for growth and maintenance of populations over time are substantially greater

Survival in Disconnected Pools

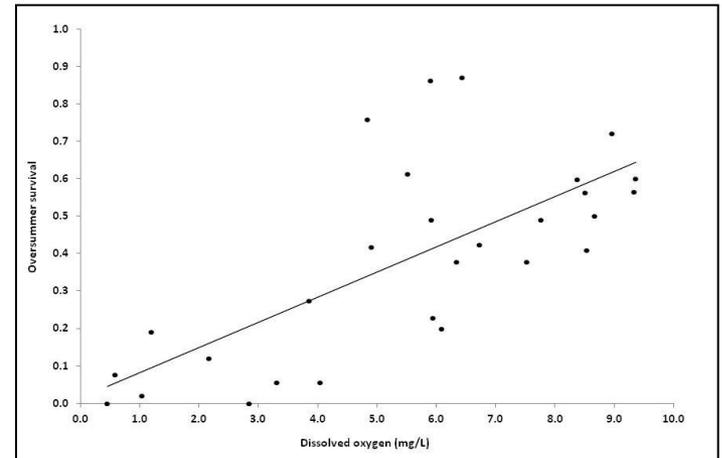
- This figure shows results from an empirically derived model of coho salmon survival developed by the Russian River Coho Salmon Captive Broodstock monitoring program
 - Once pools become disconnected, the probability of juvenile survival decreases
 - The longer the fish are forced to reside in disconnected pools, the more likely they are to perish



Modeled relationship between juvenile coho salmon survival and persistence in hydraulically disconnected pool habitats (Obedzinski 2015).

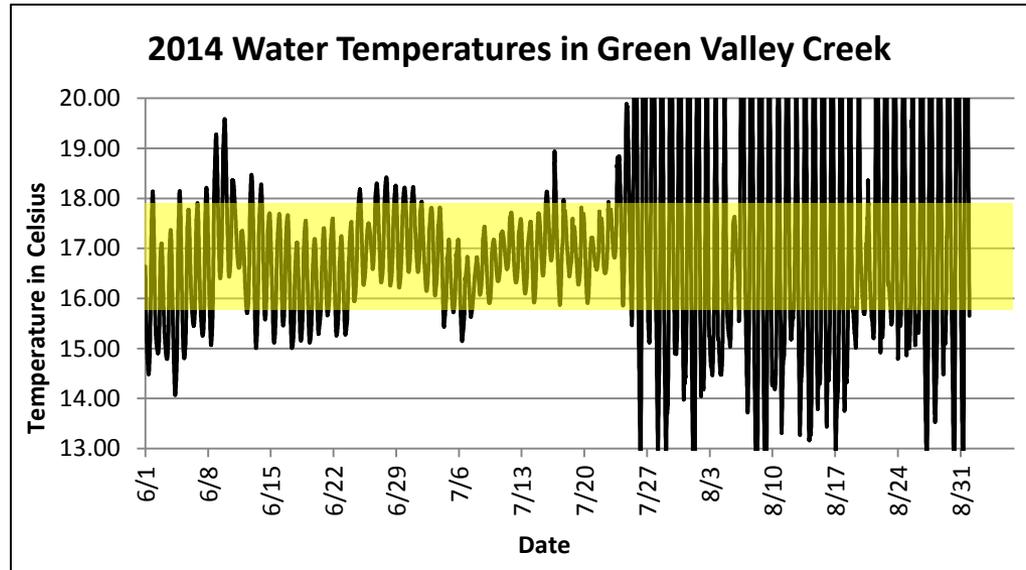
Dissolved Oxygen

- The correlation between low dissolved oxygen levels with poor juvenile survival suggests asphyxiation may be a causative factor in their mortality
- A trickle of surface flow over riffles and into pools will help keep dissolved oxygen levels up in rearing pools



Observed relationship between dissolved oxygen in milligrams per liter (mg/l) and monthly juvenile coho salmon survival between 2011 and 2013 (CBP 2014).

Temperature

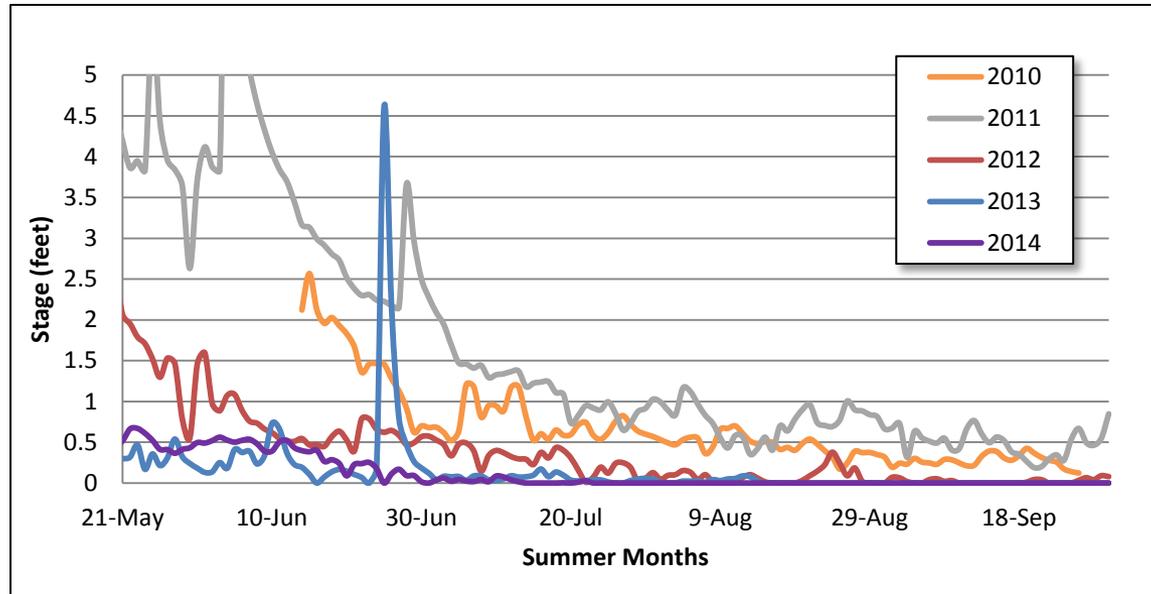


- Juvenile coho salmon require cool water to survive
 - Temperatures within the yellow field are potentially stressful
- It is not clear how hydraulic connectivity will effect temperatures
 - But, increases in groundwater inputs to surface streams will likely have a cooling influence in pool habitats

How Emergency Regulations will Help

- Issuing the Conservation Order is likely to improve flow conditions in the four priority stream reaches by:
 - Allowing more groundwater seepage to contribute to stream flow, and;
 - Retain existing surface flow in streams
- In the next two slides, we compare recent stream flow measurements with water use estimates in Green Valley Creek
 - Water use estimates were developed in 2014 by O'Connor Environmental as part of an integrated hydrologic modeling exercise using 2012 data

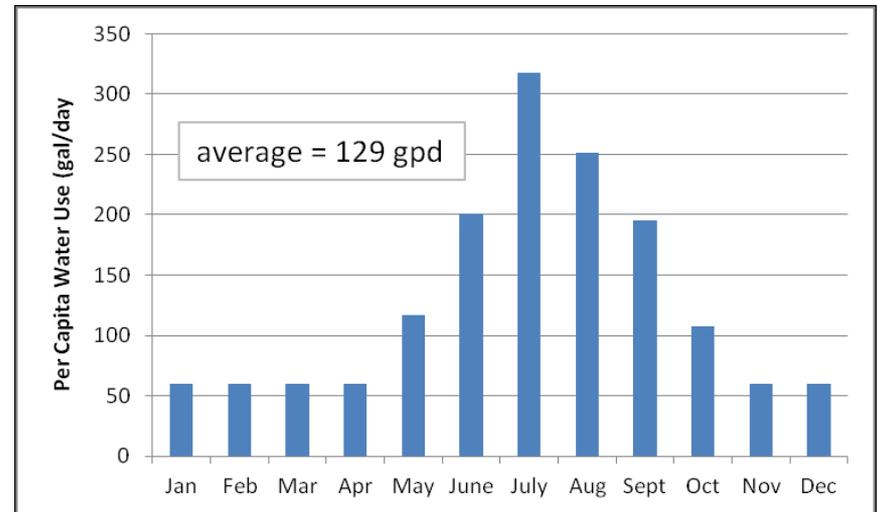
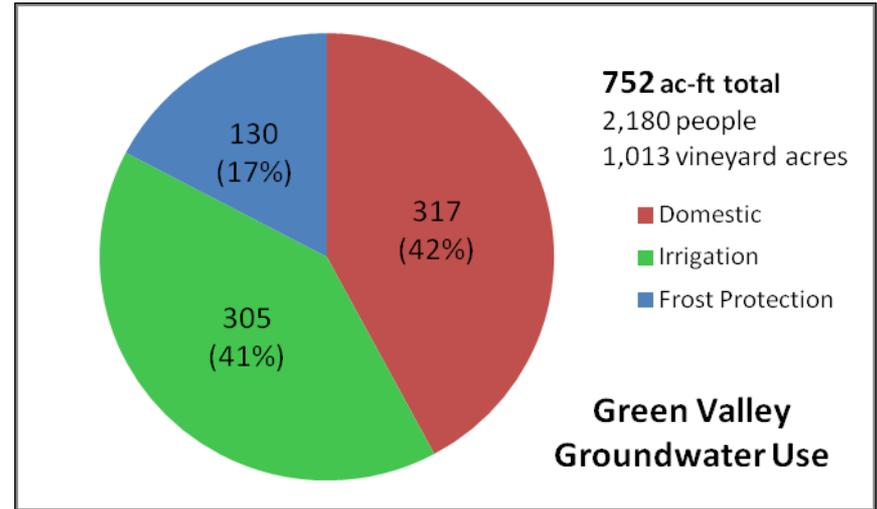
Stream Flow Conditions



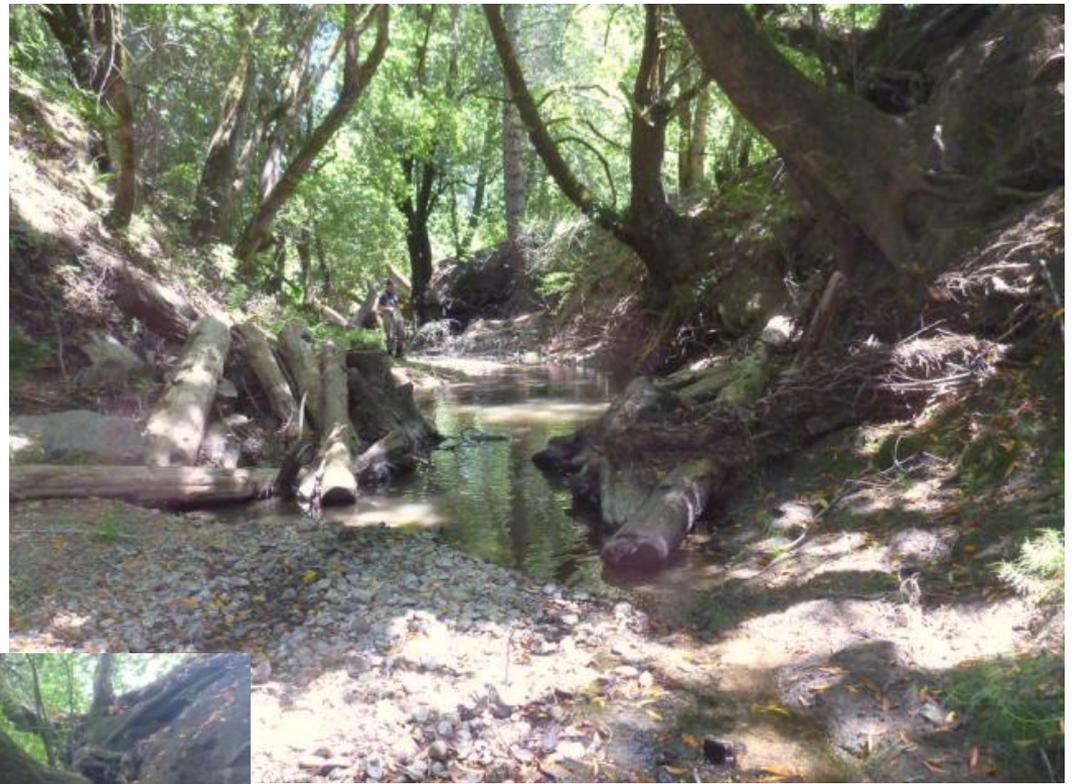
- Flow just below the priority reach in Green Valley Creek persisted through the summer months in 2010, 2011, and perhaps in 2012
 - The stream appeared to go dry in 2013, and 2014
- Keep in mind the following:
 - Drought conditions have reduced summer stream flows across all four priority streams by 90% or more from 2010 levels (Russian River Coho Partnership).
- Can we keep the stream from drying up?

Water Demand

- Non-commercial water use constitutes an estimated 42% of overall annual groundwater demand in Green Valley Creek
- Demand for water is greatest in the summer months
- Reduction in such water use this summer is therefore likely to “free up” water for the creek
 - Only a small amount is needed to maintain a trickle



What is success?



Trickle of water
maintains surface
connection between
pools

Green Valley Creek 2014 Low Flow



HARRISON CREEK

GREEN VALLEY CREEK

PURRINGTON CREEK

ATASCADERO CREEK

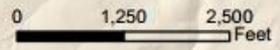
2014 Summer Flow Condition



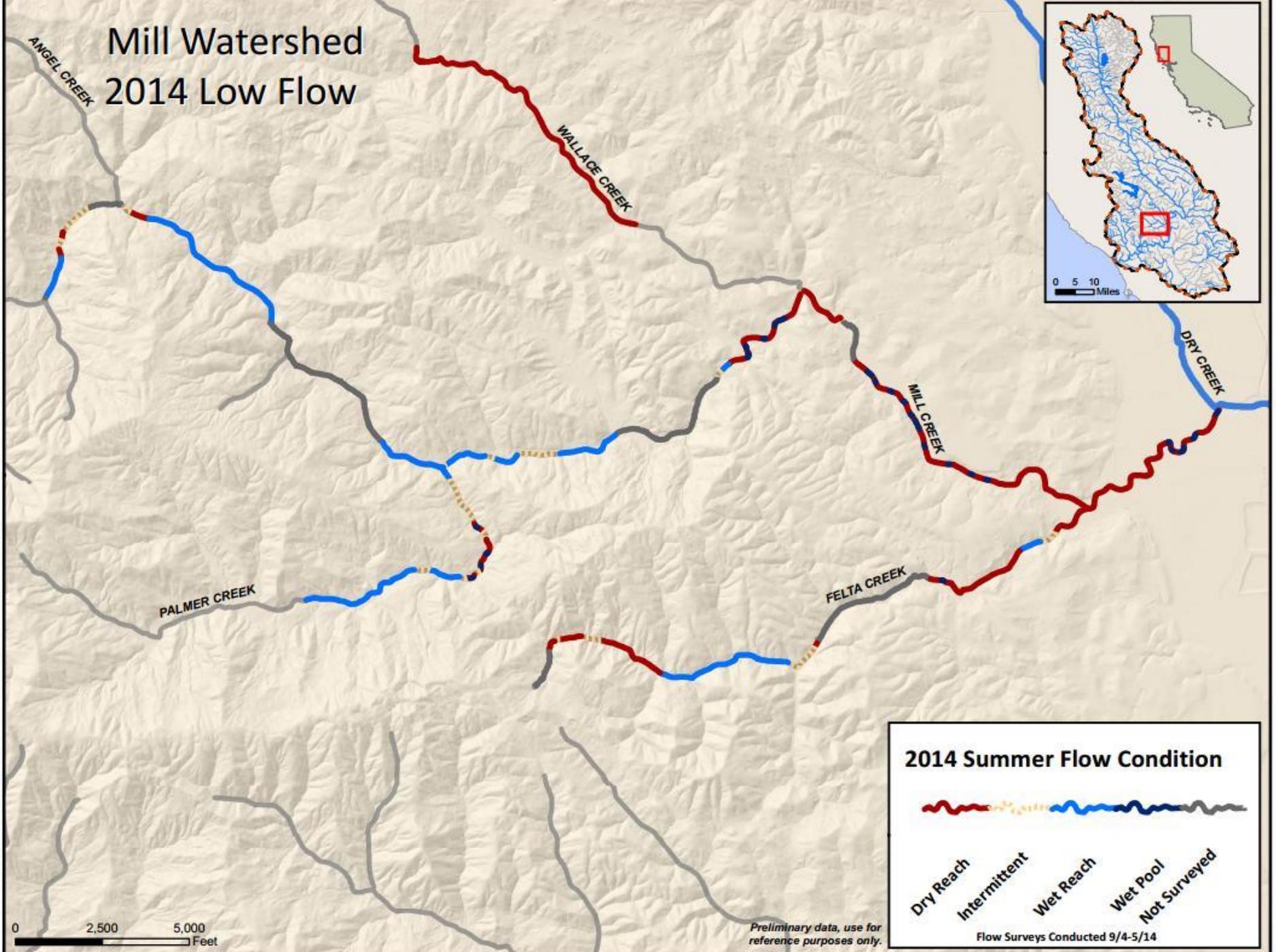
- Dry Reach
- Intermittent
- Wet Reach
- Wet Pool
- Not Surveyed

Flow Surveys Conducted 9/22-23/14

Preliminary data, use for reference purposes only.



Mill Watershed 2014 Low Flow



2014 Summer Flow Condition



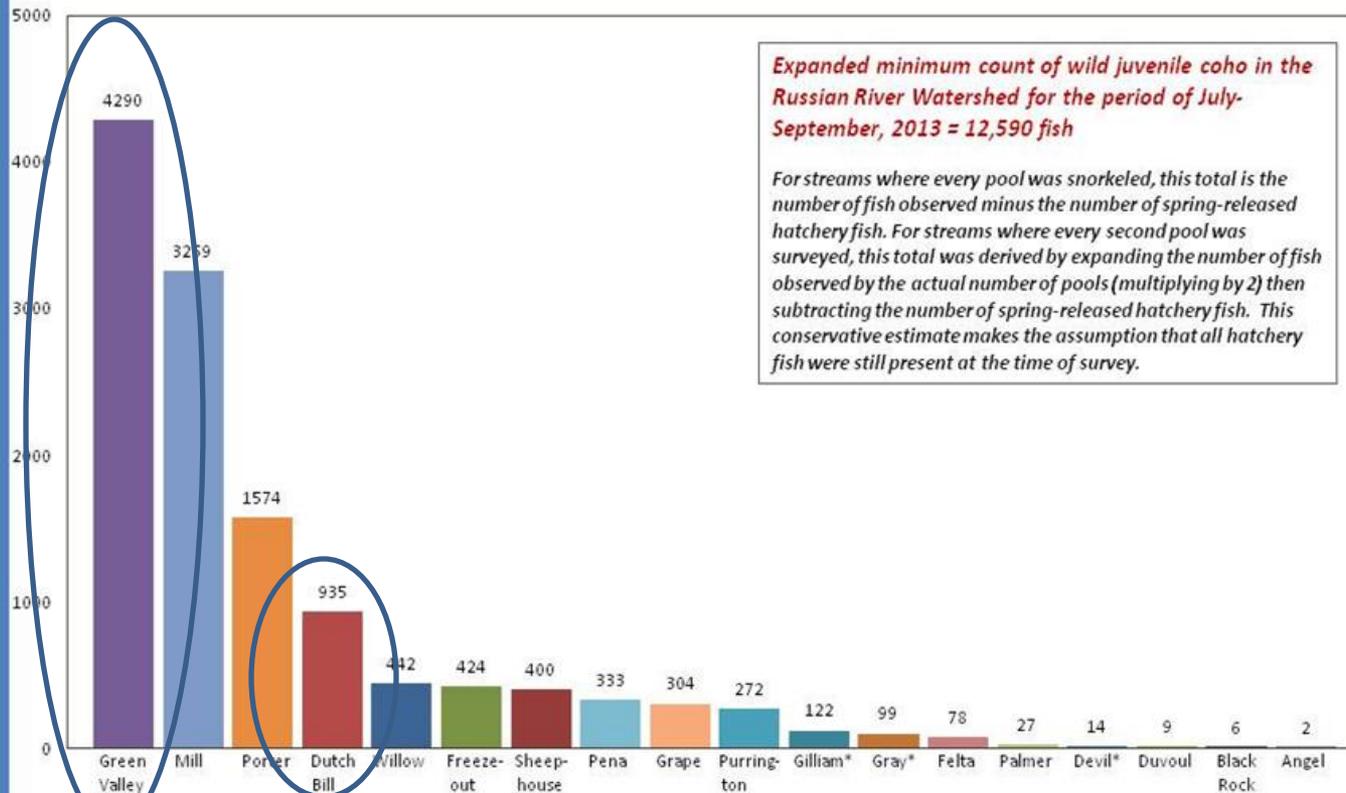
- Dry Reach
- Intermittent
- Wet Reach
- Wet Pool
- Not Surveyed

Preliminary data, use for reference purposes only.

Flow Surveys Conducted 9/4-5/14

2013 Coho Survival

2013 Juvenile Wild Coho Expanded Minimum Count by Tributary



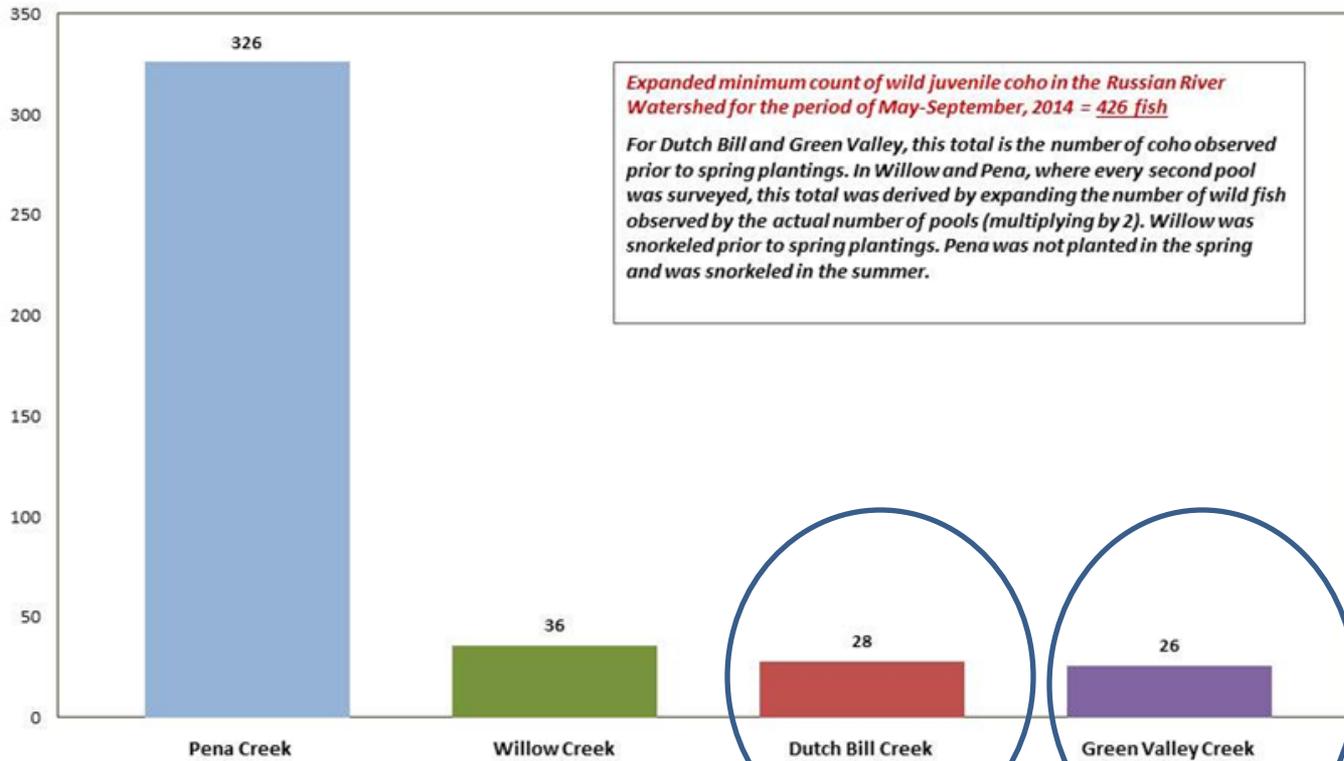
Expanded minimum count of wild juvenile coho in the Russian River Watershed for the period of July-September, 2013 = 12,590 fish

For streams where every pool was snorkeled, this total is the number of fish observed minus the number of spring-released hatchery fish. For streams where every second pool was surveyed, this total was derived by expanding the number of fish observed by the actual number of pools (multiplying by 2) then subtracting the number of spring-released hatchery fish. This conservative estimate makes the assumption that all hatchery fish were still present at the time of survey.

*Counting from NOAA electrofishing surveys

2014 Coho Survival

2014 Juvenile Wild Coho Expanded Minimum Count by Tributary



Voluntary Drought Initiative Outreach in 2014

- **June 5 – CDFW and NMFS met with Sonoma County Farm Bureau regarding Voluntary Drought Initiative Program**
- **June 6 – NMFS met with Mendocino County Farm Bureau regarding Voluntary Drought Initiative Program**
- **September 2 – CDFW sends out letters notifying Green Valley Creek landowners of the 2014 Voluntary Drought Initiative Program**
- **October 27 – CDFW sends out letters notifying Mill Creek and Dutch Bill Creek landowners of the 2014 Voluntary Drought Initiative Program**

Voluntary Drought Initiative Outreach in 2015

April 9 – CDFW sends out letters notifying landowners of 2015 Voluntary Drought Initiative Program

April 21 - Joint letter sent to landowners in urging participation in the Voluntary Drought Initiative

April 23 - Op Ed article in Santa Rosa Press Democrat by CDFW Director Charlton H. Bonham and State Board Executive Director Thomas Howard

April 29 - Meeting with the Farm Bureau and Resource Conservation Districts

May 5 - Letters sent notifying landowners of Voluntary Drought Initiative public meetings

May 11 - Press release publicizing Voluntary Drought Initiative public meetings

May 14 - Meeting held in Occidental for Green Valley and Dutch Bill Creeks

May 20 - CDFW presents at Vineyard Irrigation Efficiency & Water Quality Management Workshop

May 21 - Meeting held in Windsor for Mark West and Mill Creeks

June 5 - CDFW presents at Sonoma County Winegrowers' Grower Seminar

Programs Available

NMFS and CDFW have made it a priority to continue work with landowners on projects that will enhance flow and conserve water

- Voluntary Drought Initiative Program
- Small Irrigation Registration
- Emergency Tank Registration
- Flow for Fish Rebate Program

CDFW and NMFS contacts for Voluntary Drought Agreements

Corinne Gray, CA Dept. of Fish and Wildlife

Corinne.Gray@wildlife.ca.gov

(707) 944-5526

David Hines, National Marine Fisheries Service

David.Hines@noaa.gov

(707) 575-6098

Conclusion

- To date voluntary measures have not resulted in enough water conservation in the four priority reaches
- The Enhanced Water Conservation Order is an important step toward the goal of maintaining a surface connection between pools this summer, and keeping these coho and steelhead alive.

Information Order

- We cannot say with certainty whether conservation actions will be sufficient to protect coho salmon in part because we lack information on water demand and the effect it has on stream flows
- The information order can provide this important data and therefore support better, more reliable, management decisions