

There and Back Again: Winter Run Chinook Salmon Drought/Temperature Management From ~~1988-2013~~ 1976 - 2015

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2016 Bay-Delta Science Conference

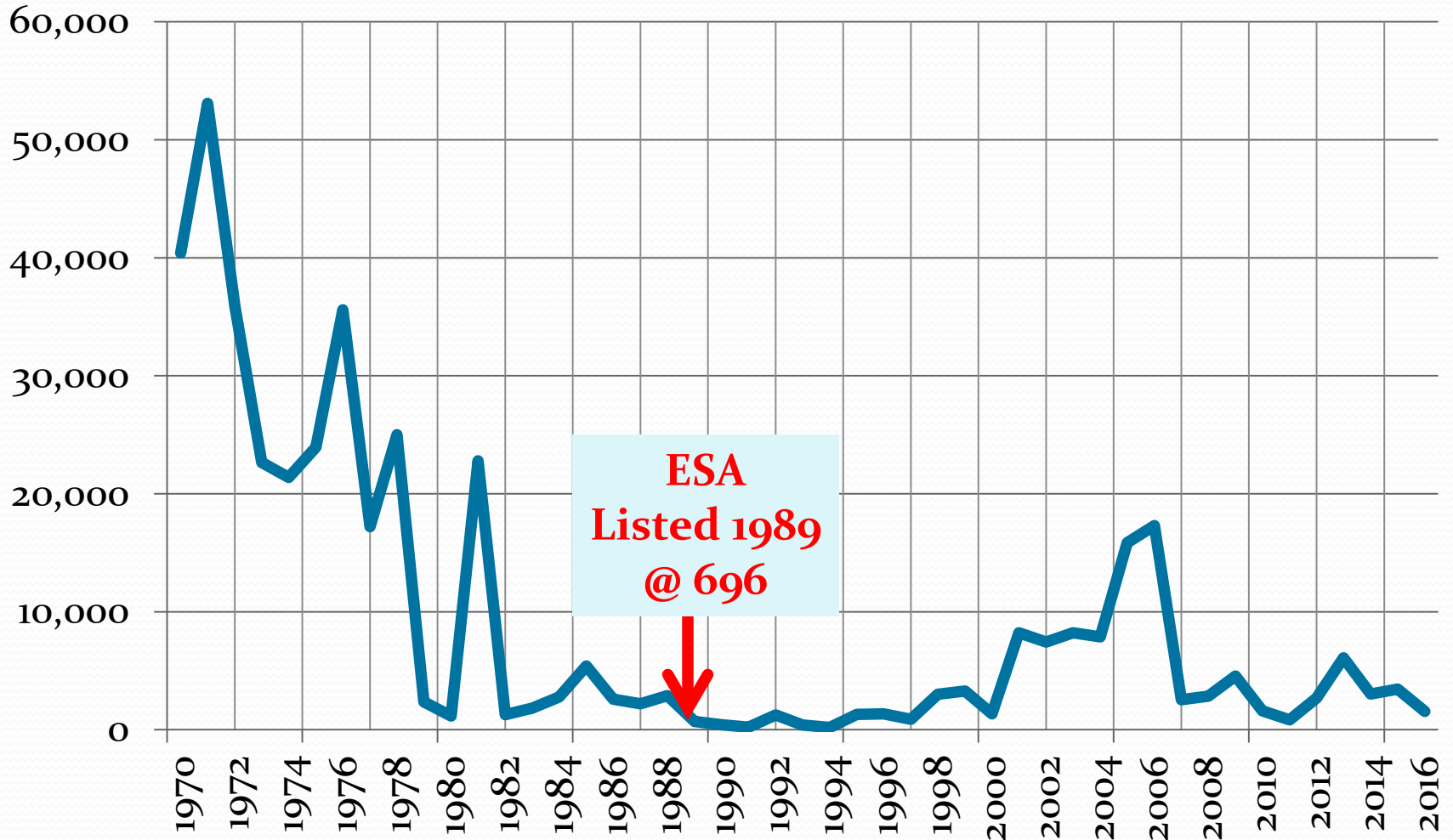


Winter Run Chinook

Drought/Temperature Management from 1976-2015

- Abundance, distribution and life history
- Management actions completed or initiated during drought periods
- 1976-77
- 1988-92
- 2013-15
- Summary

Winter Run Escapement 1970 - 2016



Freshwater Distribution

Keswick Dam

San Francisco Bay

San Francisco

San Jose

California

Google



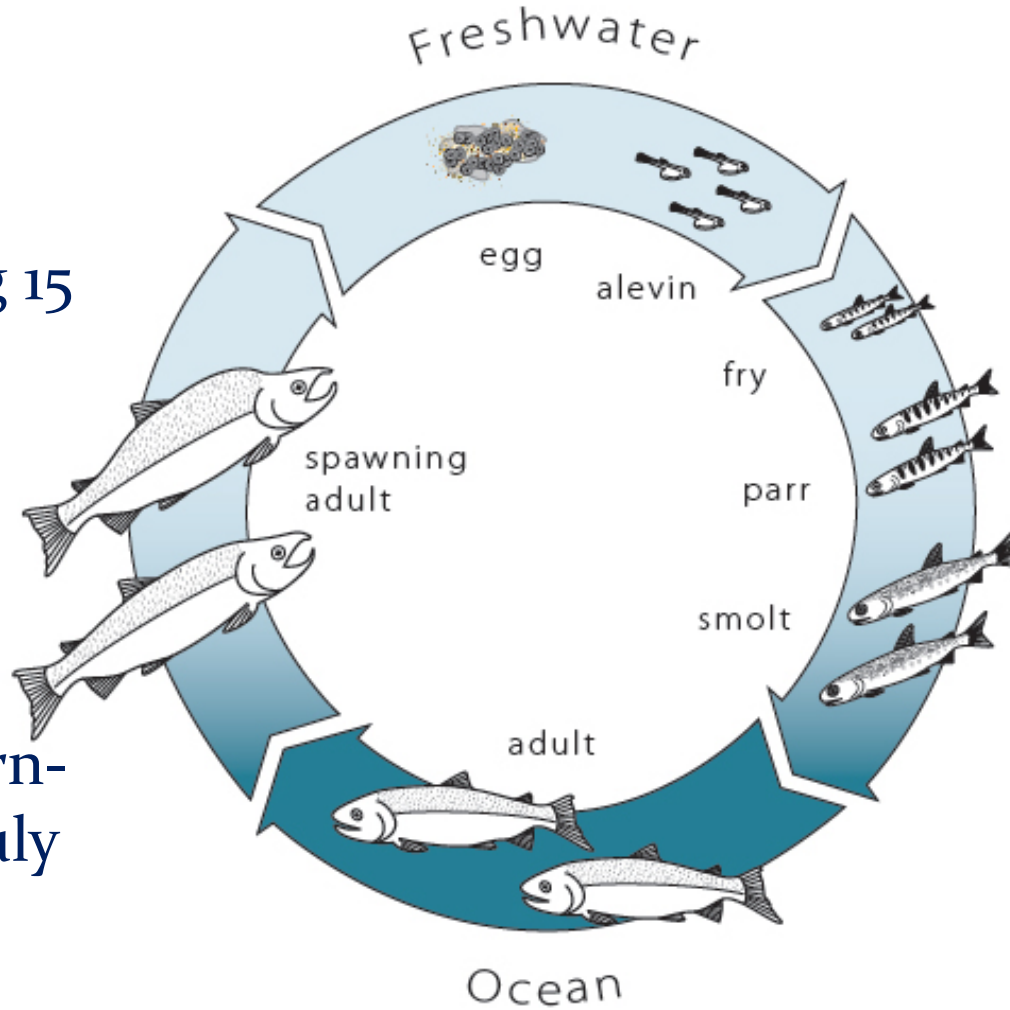
Pointer 39°42'54.60" N 121°15'40.49" W elev 3456 ft

Streaming 100%

Eye alt 364.80 mi

Winter Run Life History

Egg Incubation - Apr 15 - Nov 15 / 7 months

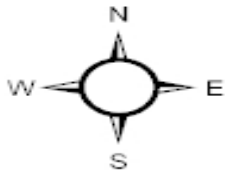


Spawning -
Apr 15 - Aug 15
4 months

Juvenile
Rearing-
Jul - Apr
up to 9 months

Adult Return-
January - July
7 months

Ocean Rearing - 1-3 years



Spawning Distribution

Upper Sacramento River

McCloud River

Pit River

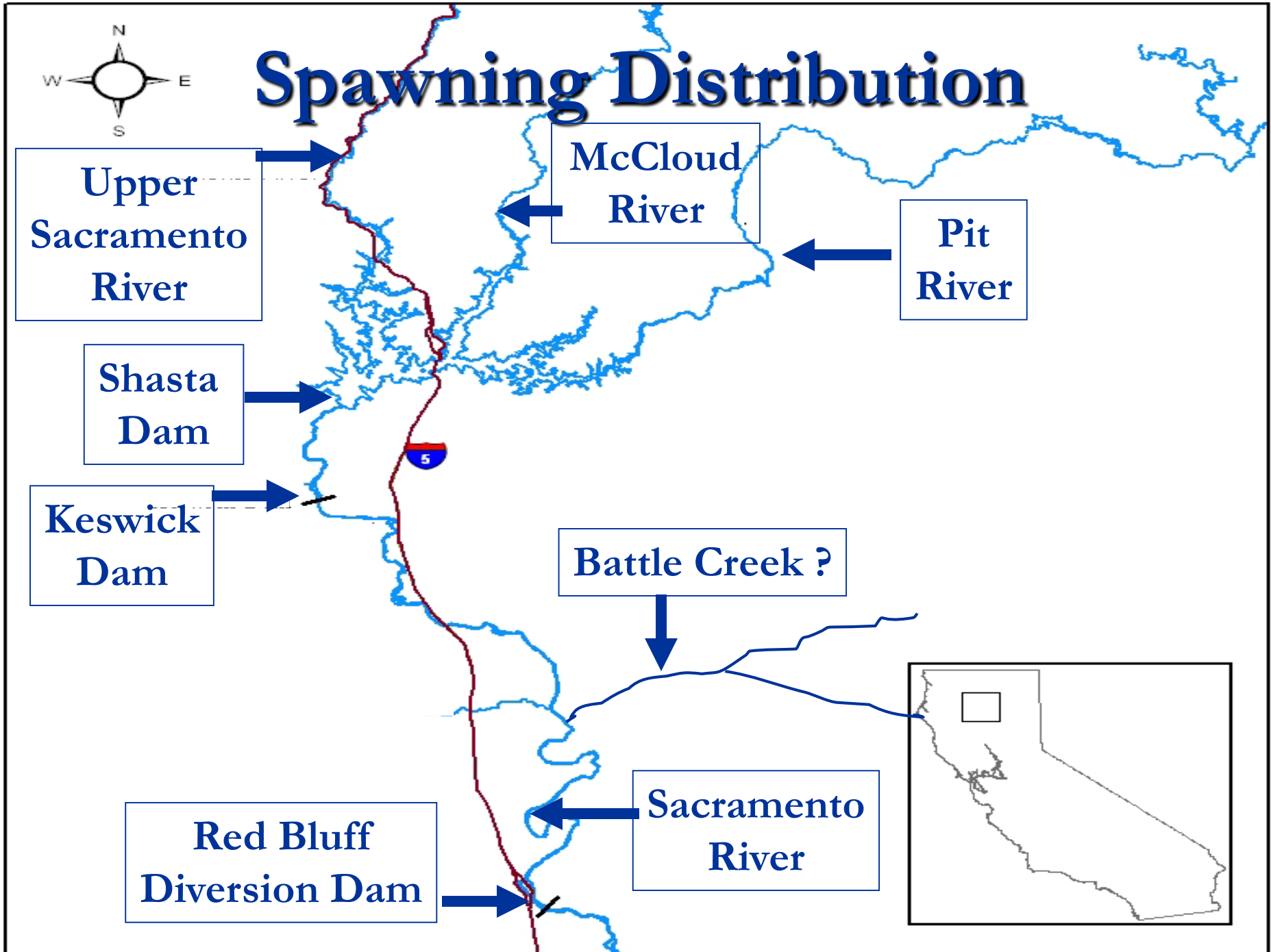
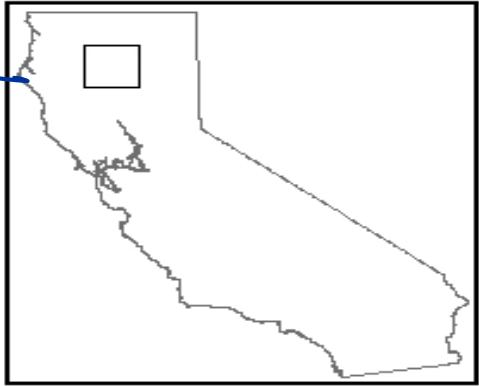
Shasta Dam

Keswick Dam

Battle Creek ?

Red Bluff Diversion Dam

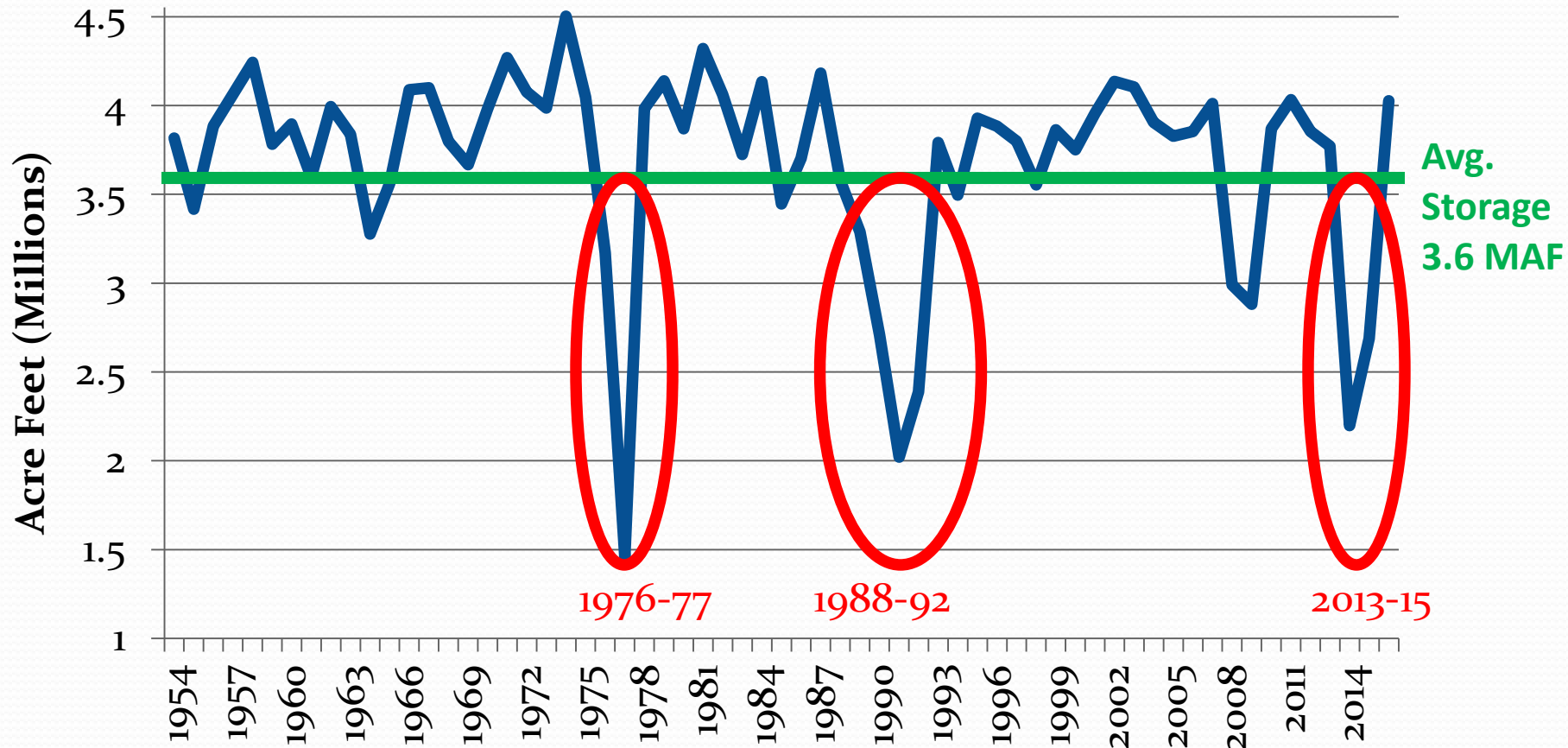
Sacramento River



Shasta Reservoir April 1 Storage

Max

Storage = 4.5 M AF

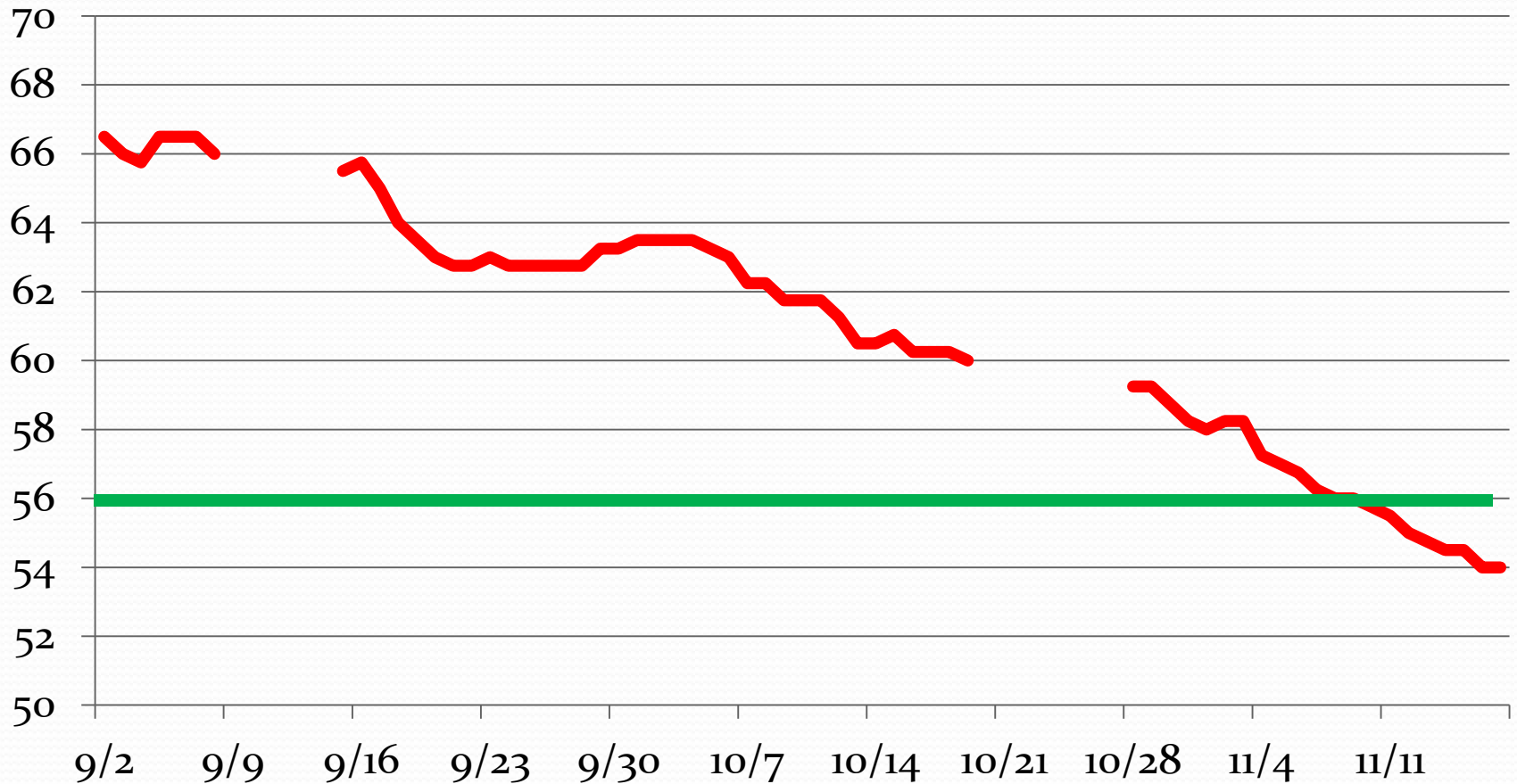


Management actions completed or initiated in 1976-77 drought

None

Mean Daily

Water Temperatures @ Keswick Dam in 1977



Management actions completed or initiated in 1988-92 drought

“Ten Point Action Plan” - May 1988

Federal ESA Listing – August - 1989

State Water Board Order - May 1990

NMFS Biological Opinions – February

1992/93

Central Valley Project Improvement Act (CVPIA) - October 1992

Winter Run Chinook 10 Point Action Plan

AKA - Cooperative Agreement Among CDFG, NMFS, USBR, USFWS to Implement Actions to Benefit Winter-Run Chinook Salmon in the Sacramento River Basin

Voluntary with a 5 year term from 1988-93

Winter Run Chinook 10 Point Action Plan

1. Raise Red Bluff Diversion Dam Gates from December 1 to April 1.
2. Develop Water Temperature Control for Warm Water Years
3. Develop Measures to Control Squawfish Predation at Red Bluff Diversion Dam
4. Correct Spring Creek Pollution Problem
5. Restore Spawning Habitat in Redding Area

Winter Run Chinook 10 Point Action Plan

6. Correct Salmon Related Problems at Anderson-Cottonwood Irrigation District Diversion Dam
7. Restrict In-River Harvest of Winter-Run Chinook Salmon
8. Develop a Winter-Run Chinook Salmon Propagation Program at Coleman National Fish Hatchery
9. Modify the Keswick Fish Trap to Prevent Mortality to Winter Run Chinook
10. Continue and Expand Studies on Winter Run Chinook salmon

Winter Run Chinook Federal Listed

- Listed as Threatened in 1989 (first pacific salmon)
- Reclassified to Endangered in 1992
- Requires federal agencies to ensure their actions are not likely to jeopardize the survival a listed species
- Required to consult with the NMFS
- Consultation is documented through Biological Opinions produced by the NMFS

State Water Quality Control Board

Order 90-5

- Modified US Reclamation water rights to establish certain water quality & flow standards
- Established a 56 ° average daily water temperature target @ Red Bluff
 - If the 56 ° target can not be met, then move upstream to a location where it can be met
 - Required Reclamation to consult with CDFW, NMFS, and USFWS in planning and executing operations to meet the targets

State Water Board Order

90-5

- Minimum Keswick flow of 3,250 CFS established (critical dry year exception)
- Established ramping rates to reduce redd dewatering and fish stranding

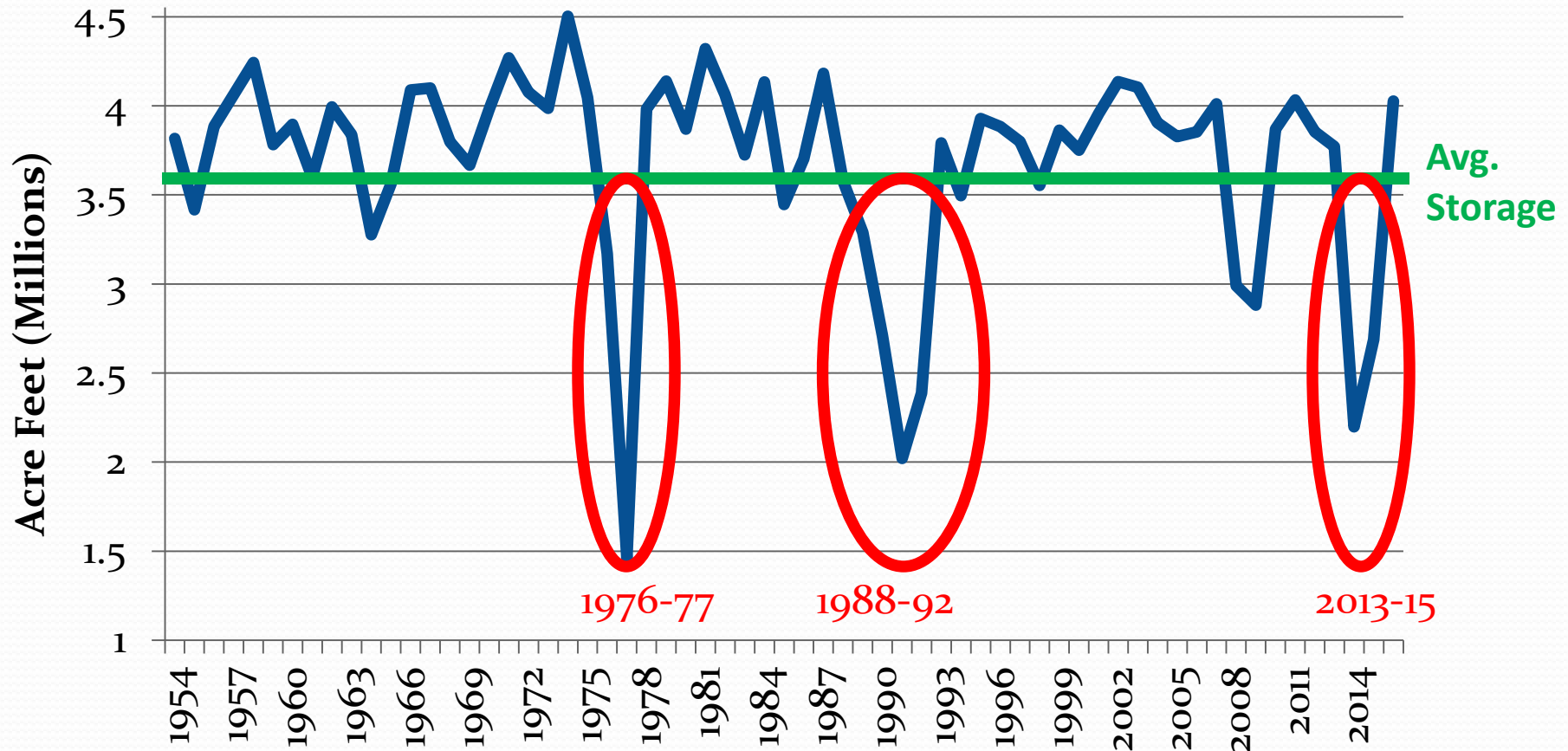
NMFS 1992 & 1993 Biological Opinions on the Operations of the USBR Central Valley Project

- Min. flow = 3,250 cfs (no exception)
- Min. carry over storage @ 1.9 MAF on Sep 30th
- Raise RBDD Gates Sept 15 to May 14
- More conservative (slower) ramping rates than Board Order 90-5
- Expanded temperature control procedures
- Close Delta X-Chanel gates Feb 1 to Apr 30 with option to start Oct 1 based on monitoring winter run occurrence in delta

Central Valley Project Improvement Act (CVPIA)

- Build Temperature Control Device on Shasta
- Fix fish passage problem at RBDD
- Fix fish passage problems at ACID Dam
- Replenish spawning gravels below Keswick Dam
- Dedicated 800,000 AF/yr of water for fish
- Established a Restoration Fund of \$50 million/yr

Shasta Reservoir April 1 Storage



Management actions completed or initiated in 2013-2015 drought

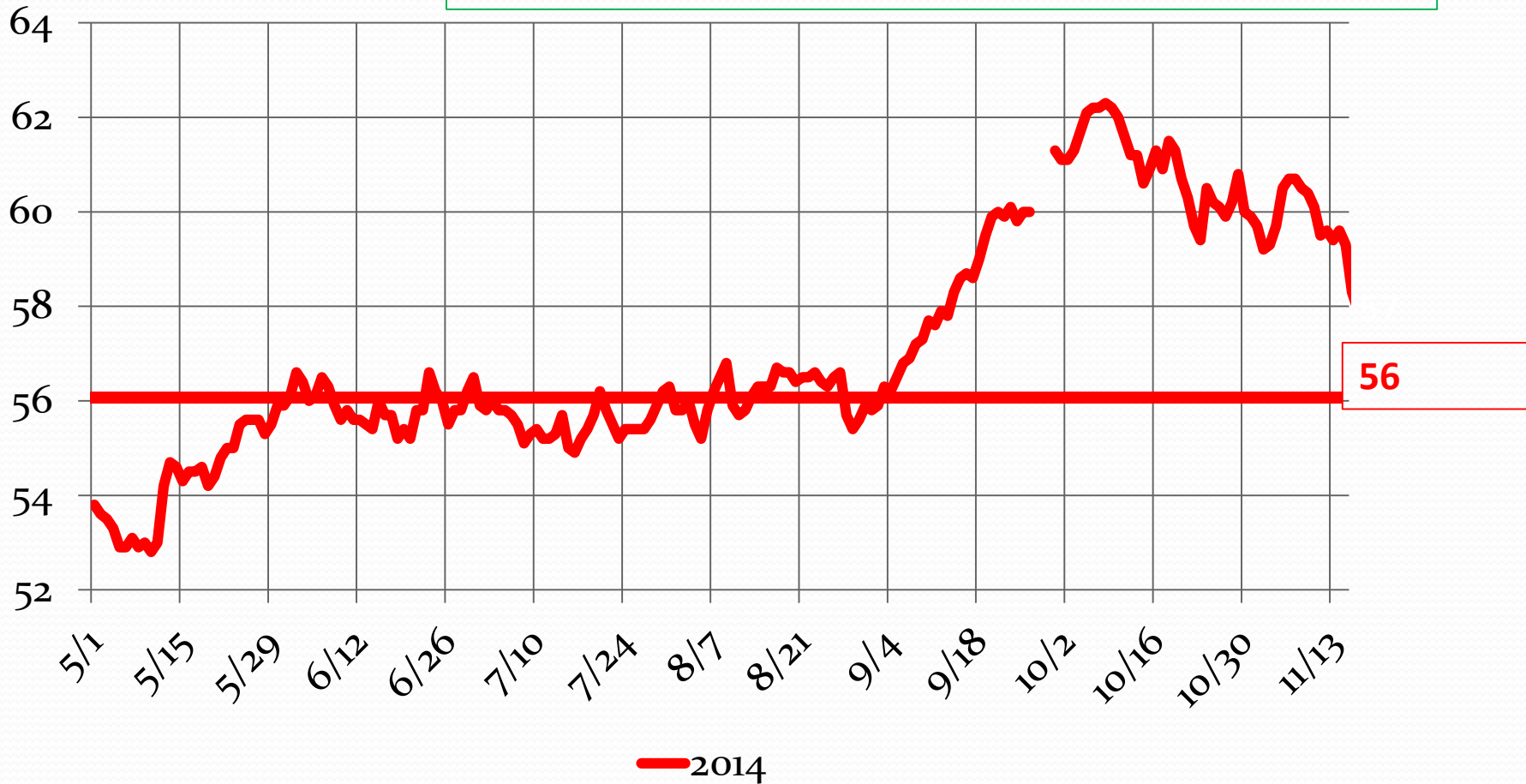
- Increased winter run hatchery production
 - Normal = 175K/yr
 - Increase to 600K in 2014
 - Increase to 400K in 2015
- Further restrictions on fishing in 2015
 - Five miles of the Sacramento River closed to ALL Fishing to protect spawning adults

Management actions completed or initiated in 2013-2015 drought

- Renewed emphasis in water temperature control in 2015
- Voluntary delays in water diversions to later in the spring to increase storage in Shasta Reservoir
- Junior/senior water rights somewhat modified in 2014 & 2015 by State Water Board to maintain storage in Shasta in the summer

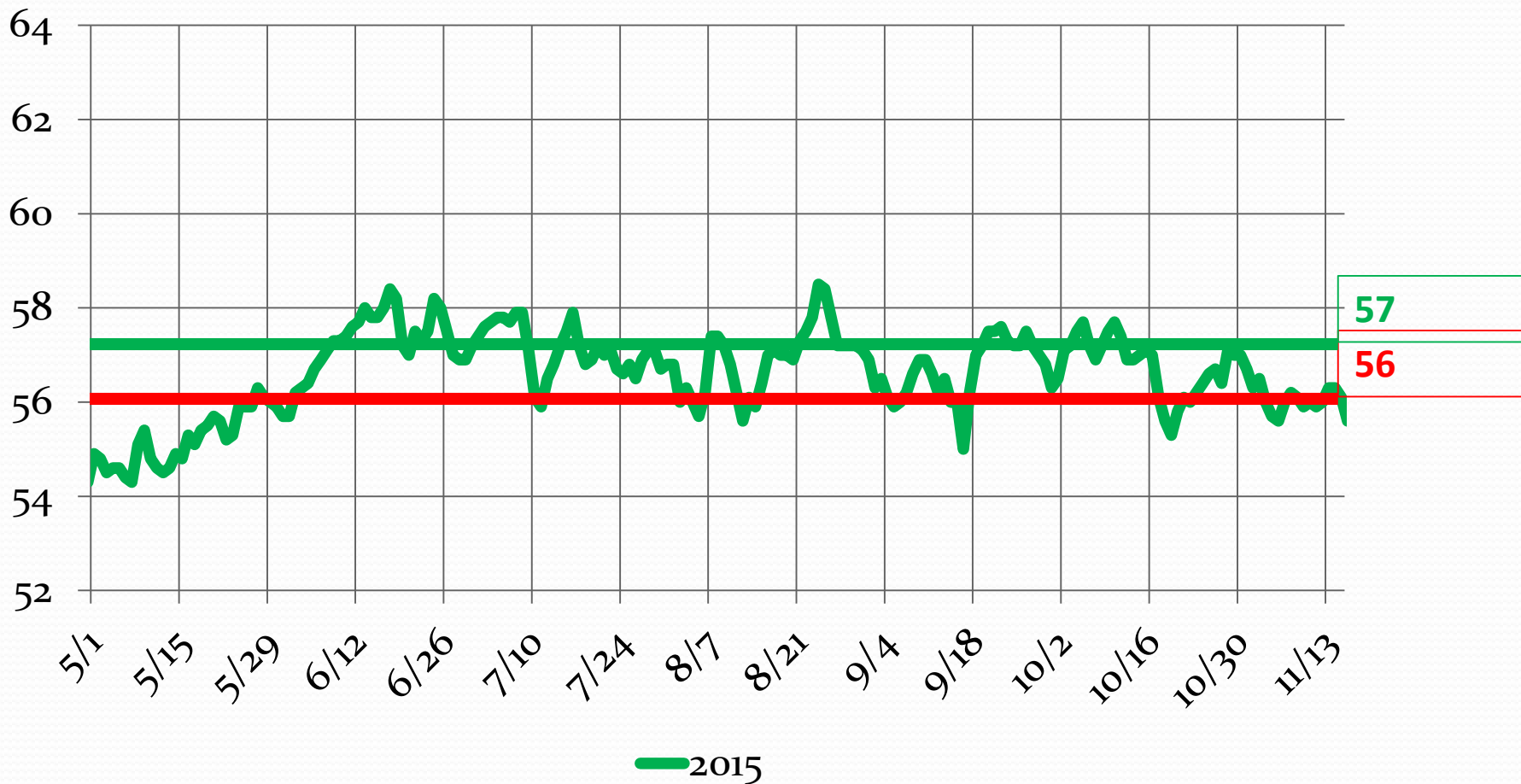
Mean Daily Water Temperatures at Bonneville Bridge 8 miles below Keswick in 2014

Egg to Fry Survival = 5.9 %



Mean Daily Water Temperatures at Bonneville Bridge 8 miles below Keswick 2015

Egg to Fry Survival = 4.2 %



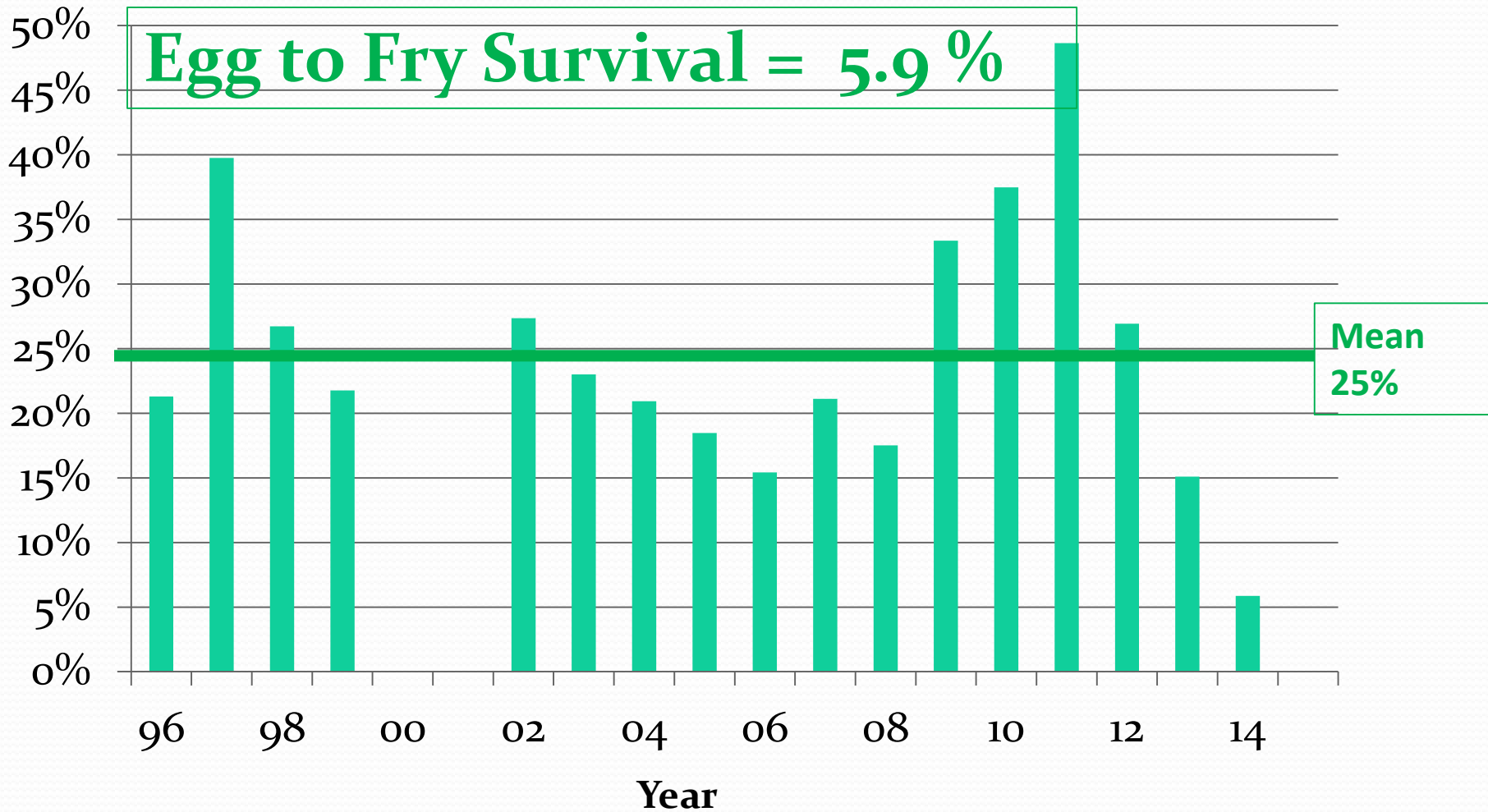
Summary

- Many management actions first initiated in 1988-92 drought period were either completed or have continued into the 2013-2015 drought period.
- NEW - Reducing April and May diversions in 2014 & 2015
- Research, evaluation, and monitoring efforts during the 2013-2015 increased greatly from earlier drought periods.

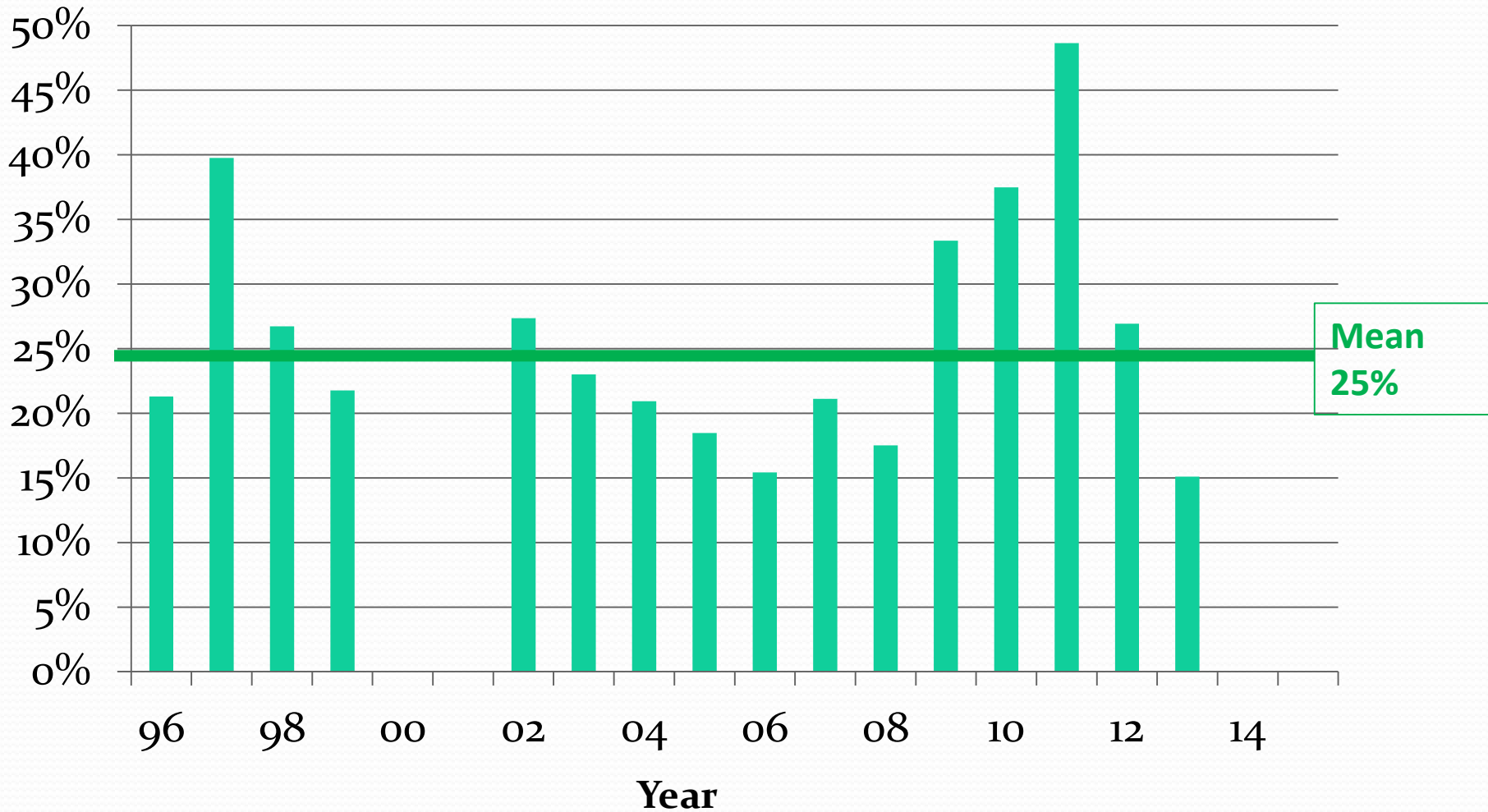
Questions?



Winter run - Egg to fry survival @ Red Bluff



Winter run - Egg to fry survival @ Red Bluff

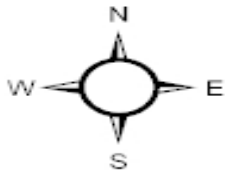


Winter run - Egg to fry survival @ Red Bluff



Winter run - Egg to fry survival @ Red Bluff





Spawning Distribution

Upper
Sacramento
River

McCloud
River

Pit
River

Shasta
Dam

Keswick
Dam

Battle Creek ?

Red Bluff
Diversion Dam

Sacramento
River

