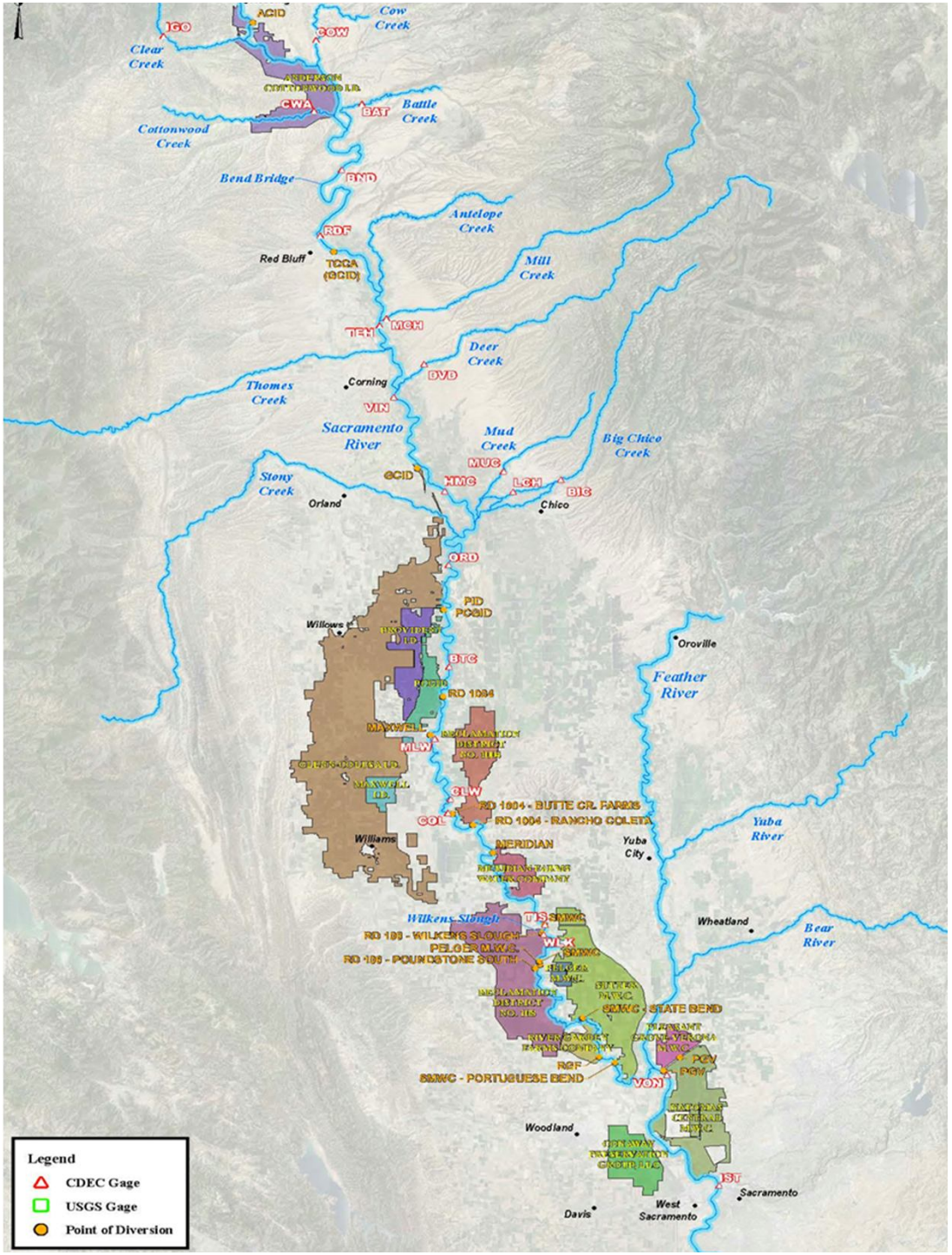
Sacramento River Temperature Workshop

State Water Resources Control Board

March 18, 2016










Panel Agenda

- Managing for Beneficial Uses – Fritz Durst
- 2016 Hydrology – MBK Engineers
  - Reservoir Operations Forecasts
  - Improved 2016 Hydrology
- 2016 Sacramento River Settlement Contractor Actions – Lewis Bair
  - Coordinated Operations Plan
  - Salmon Action Plan
- Salmon Monitoring & Habitat – Dave Vogel
  - Monitoring
  - Habitat Concerns Other Than Temperature
  - Recommendations
- Pacific Flyway – Ducks Unlimited

2016 Hydrology
Current and Projected

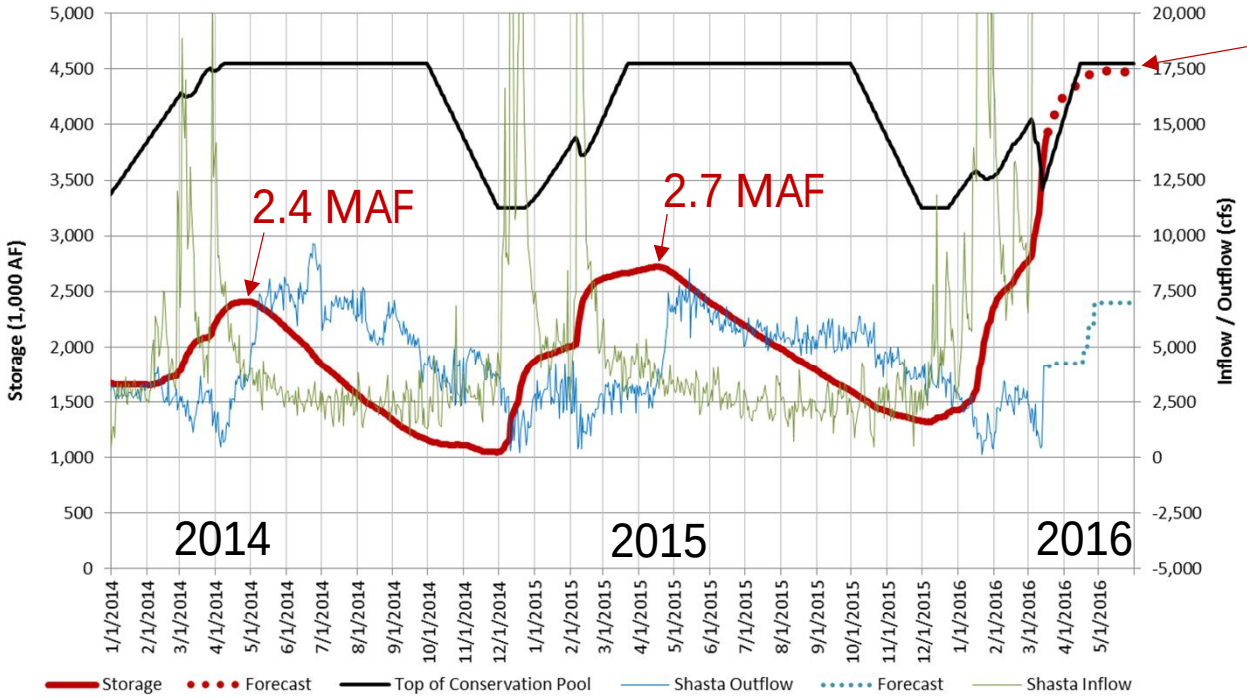
- 2016 conditions throughout the Sacramento Valley have NOT continued similar to 2014 and 2015

- 2016 conditions are more of a “Flood Operation” compared to drought conditions in 2014 and 2015

- 2016 conditions are such that State Water Board should NOT rush to impose operating restrictions

Shasta Operations Forecast

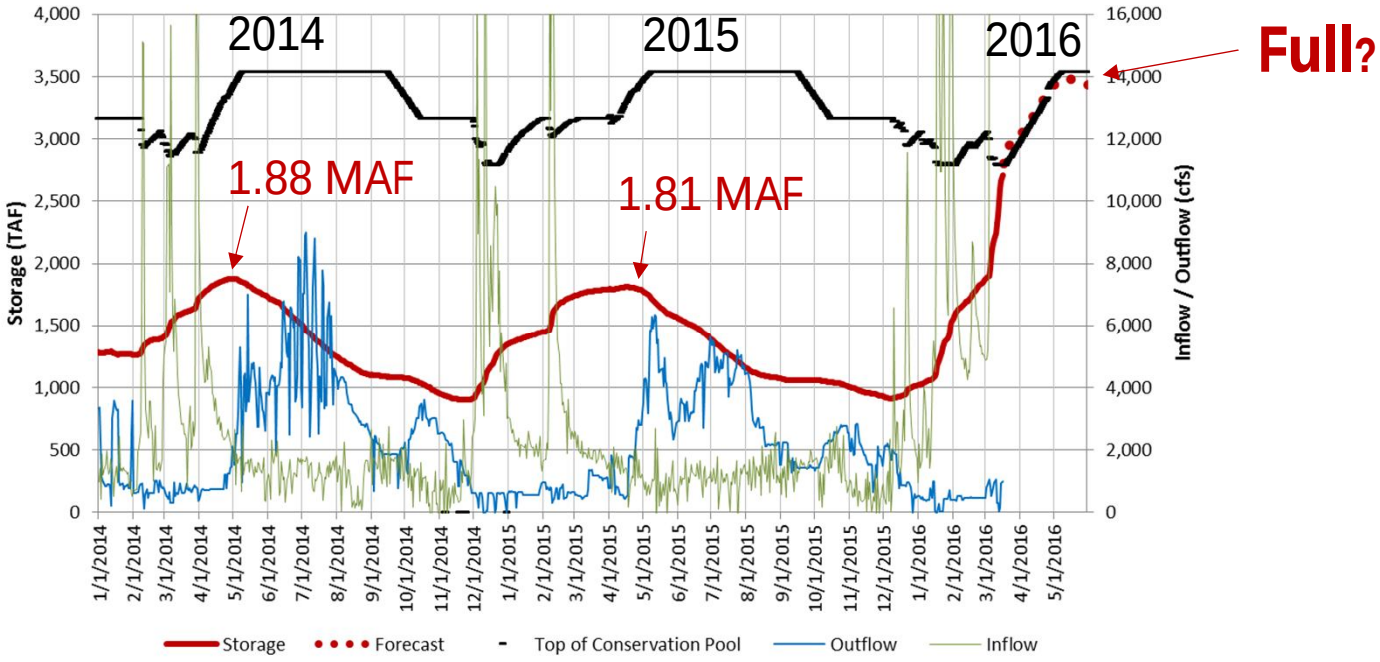
(Preliminary)



Key Points

- Way ahead of 2014/2015
- Must maintain high April - May release to prevent overfilling
  - May need additional flood release
- Ability to operate upper TCD gates
  - Can release warmer water prior to spawning and preserve cold water for spawning

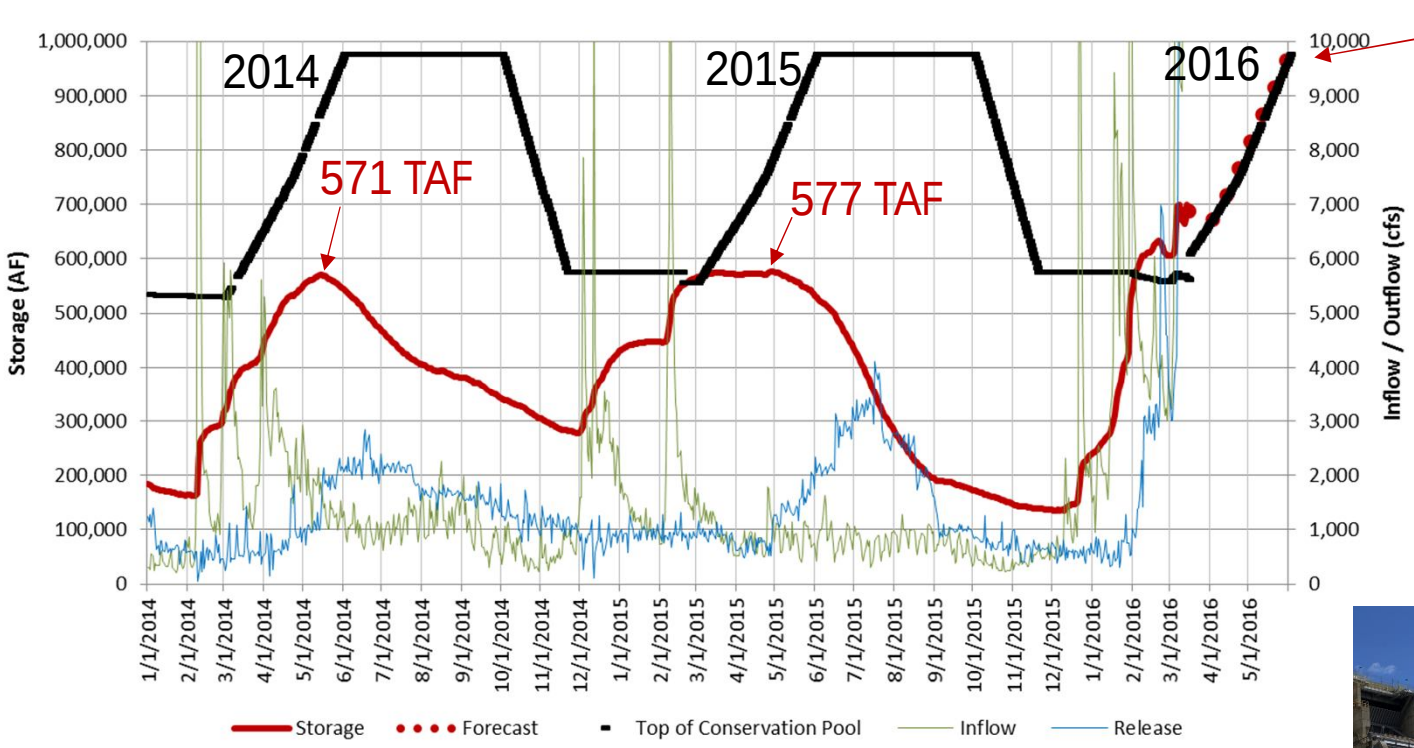
Oroville Operations Forecast
(Preliminary)



Key Points

- Way ahead of 2014/2015
- May need to release water due to flood requirements

Folsom Operations Forecast (Preliminary)



Folsom Dam

Friday March 11, 2016

Key Points

- Way ahead of 2014/2015
- Releases due to flood requirements

- 2016 Hydrology has improved to a point of “Flood Operations” as compared to drought conditions in 2014 and 2015
- Spilling Reservoirs
  - Bear River: Camp Far West
  - Yuba River: New Bullards Bar
  - Black Butte
  - Collins Reservoir
  - Others

17,000 cfs flow

Camp Far West Spillway
Monday March 14, 2016

Indications of Improved 2016 Hydrology

- Major flood control bypass facilities have been operating with maximum flows of:
  - Moulton Weir ≈ 650 cfs
  - Colusa Weir ≈ 23,000 cfs
  - Tisdale Weir ≈ 18,000 cfs
  - Fremont Weir ≈ 80,000 cfs

Fremont Weir
Sunday March 13, 2016

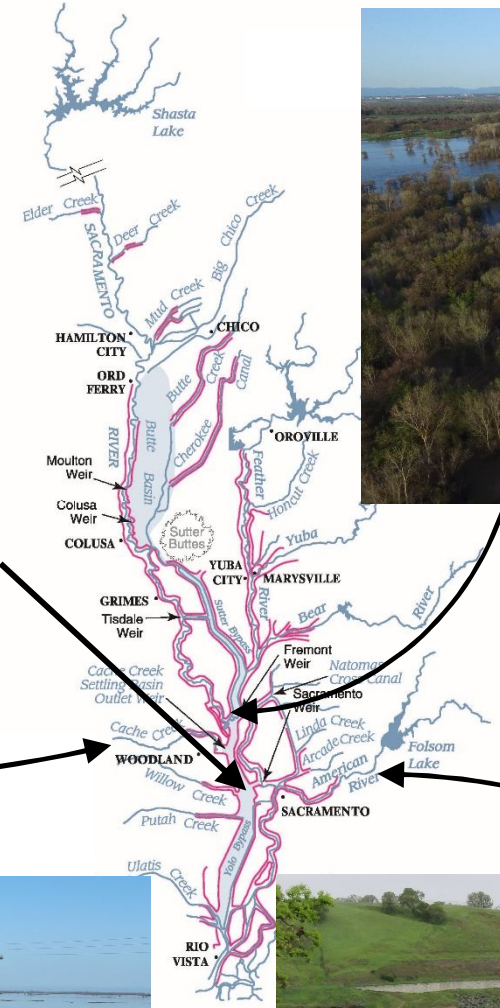
Tisdale Weir
Friday March 11, 2016

Yolo Bypass

Wednesday March 16, 2016

Fremont Weir

Wednesday March 16, 2016



Cache Creek

Wednesday March 16, 2016

American River below Nimbus

Saturday March 12, 2016

20,000 cfs flow

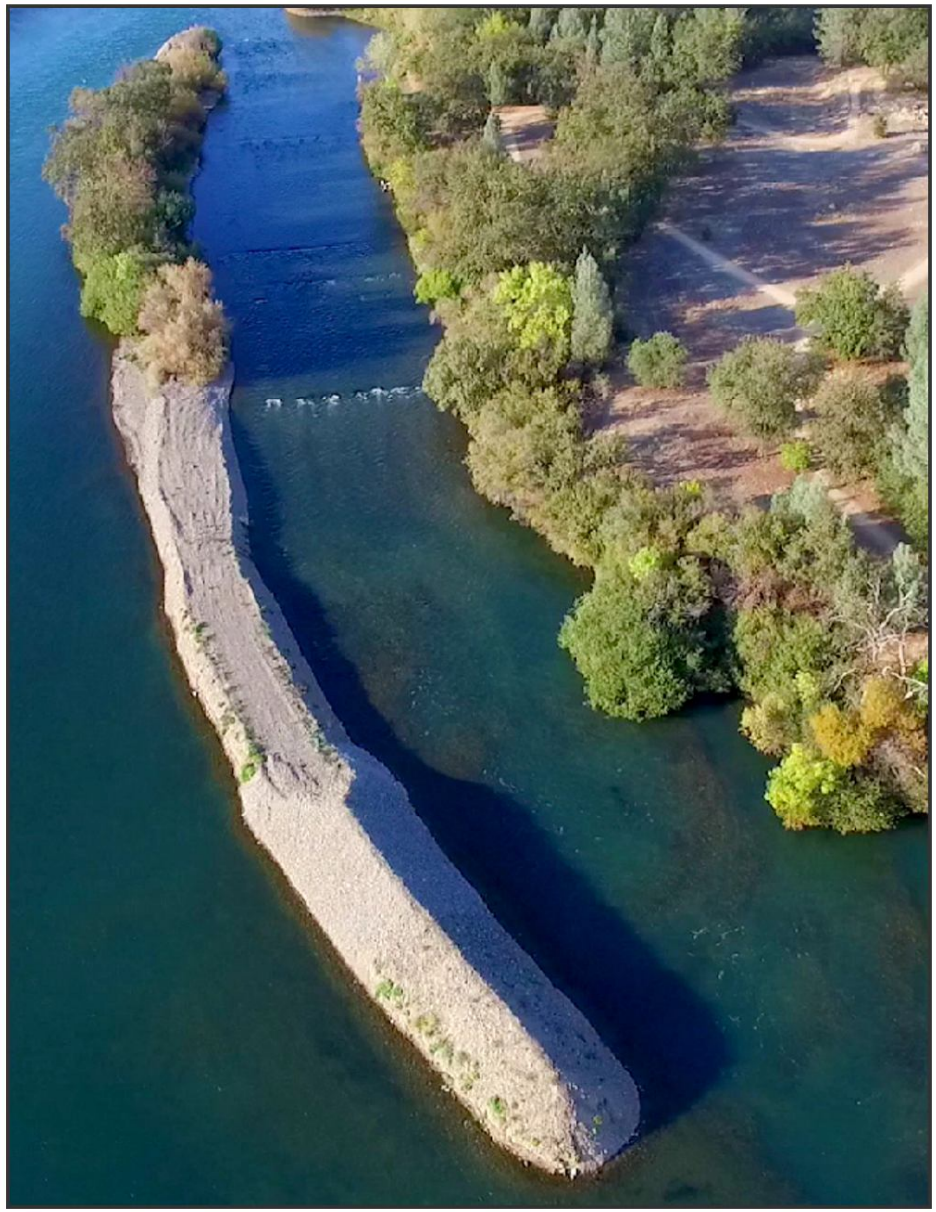
2016 Sacramento River Settlement Contractor Actions

- Coordinating with Reclamation, NMFS, SWRCB on Shasta operations and temperature plan
- Optimism for Fall deliveries for Pacific Flyway
- Opportunity to prepare for future years

Salmon Action Plan

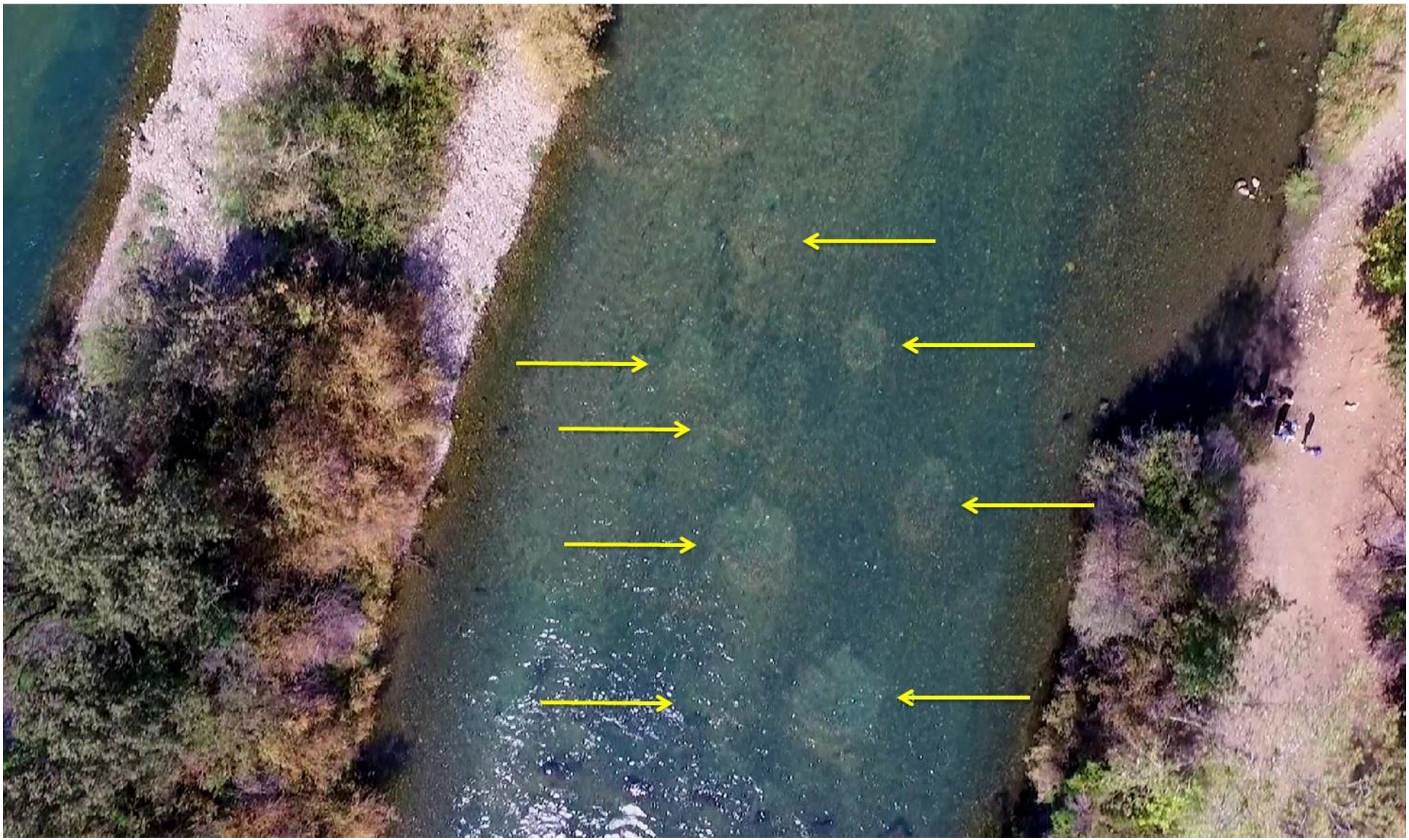
- Temperature Actions
- Improve Temperature Forecasting Tools
- Reduce Uncertainty of Monitoring Program
- Restoration Projects
  - Improve Spawning Success through Gravel Quality and Quantity Improvements
  - Improve Survival of Emerged Salmon
  - Limit Adult Straying
- Priority permitting commitment from federal/State agencies

Painters Riffle – Completed in 2014



Pre-restoration and post-restoration photos

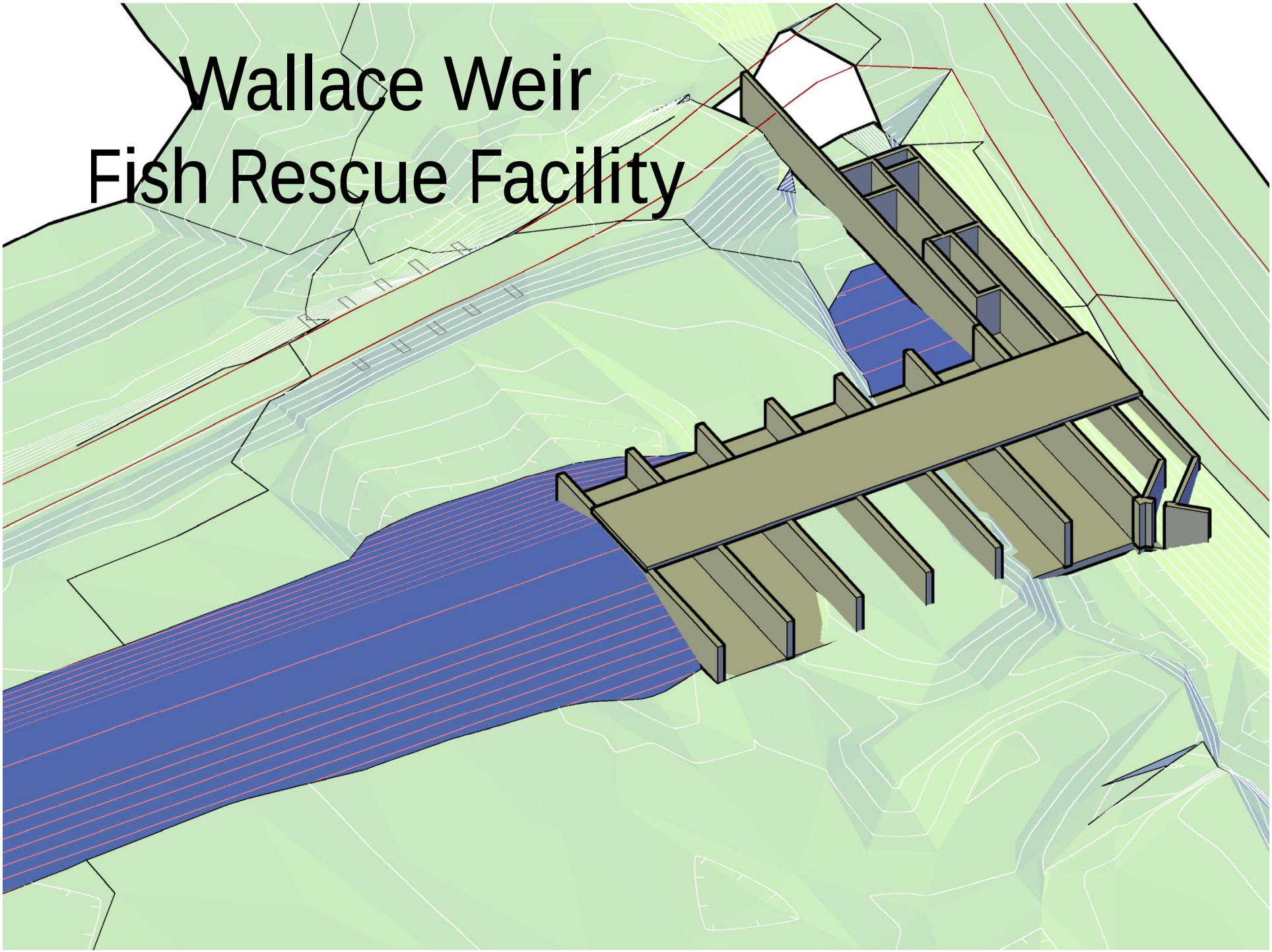
Spawning in Painters Riffle



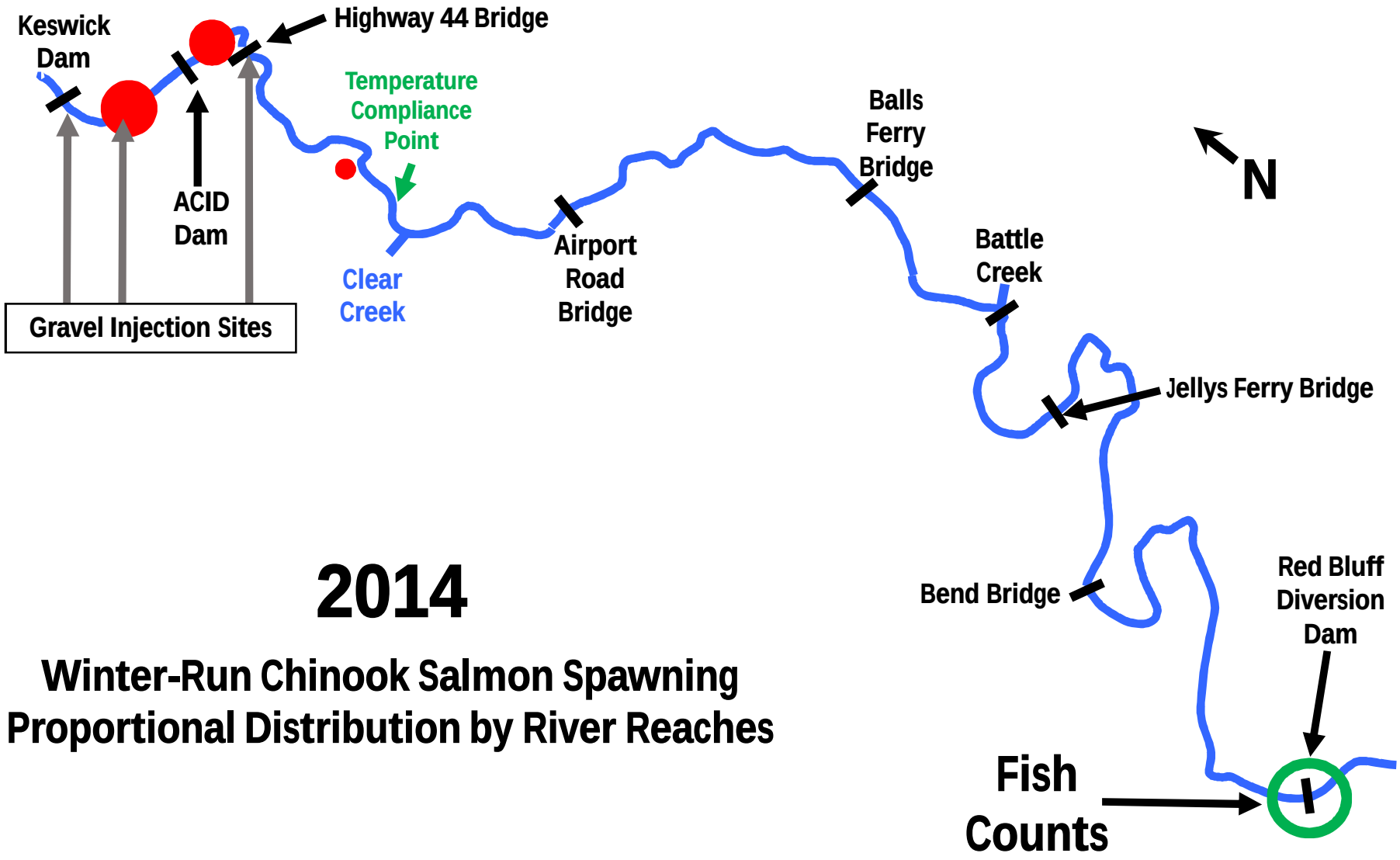
Knights Landing Outfall Gates

Market Street Spawning Gravel

Wallace Weir
Fish Rescue Facility



Winter-Run Chinook Monitoring



2014

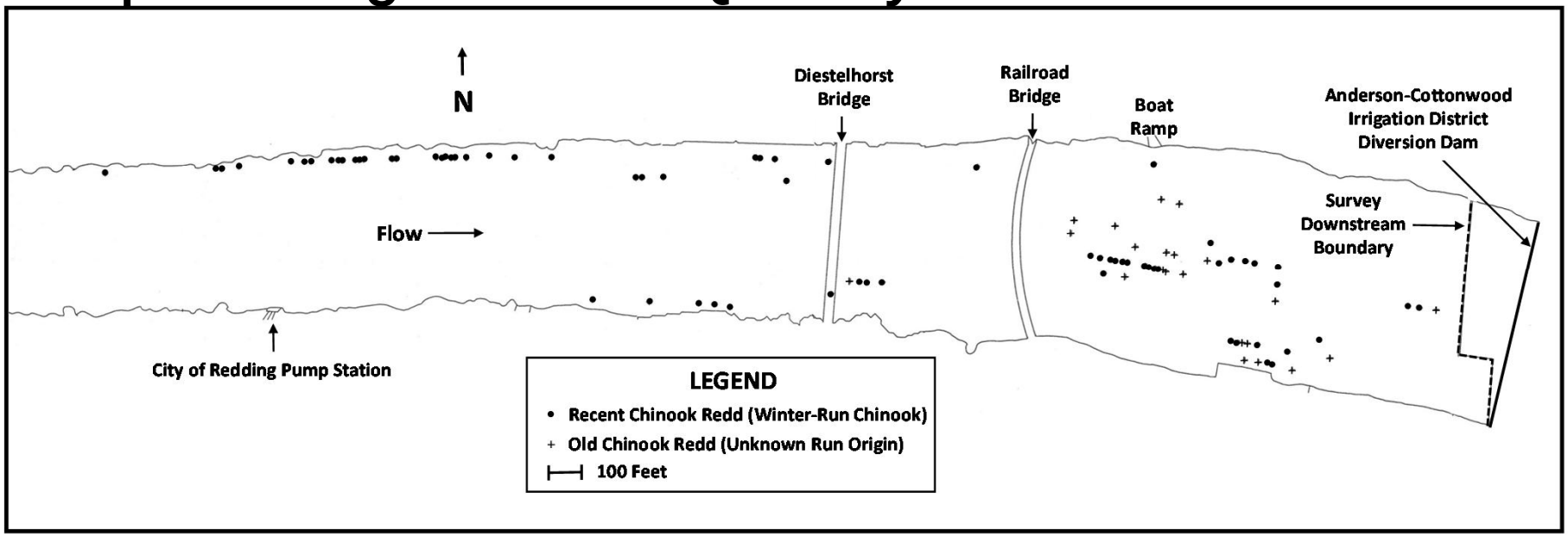
Winter-Run Chinook Salmon Spawning Proportional Distribution by River Reaches

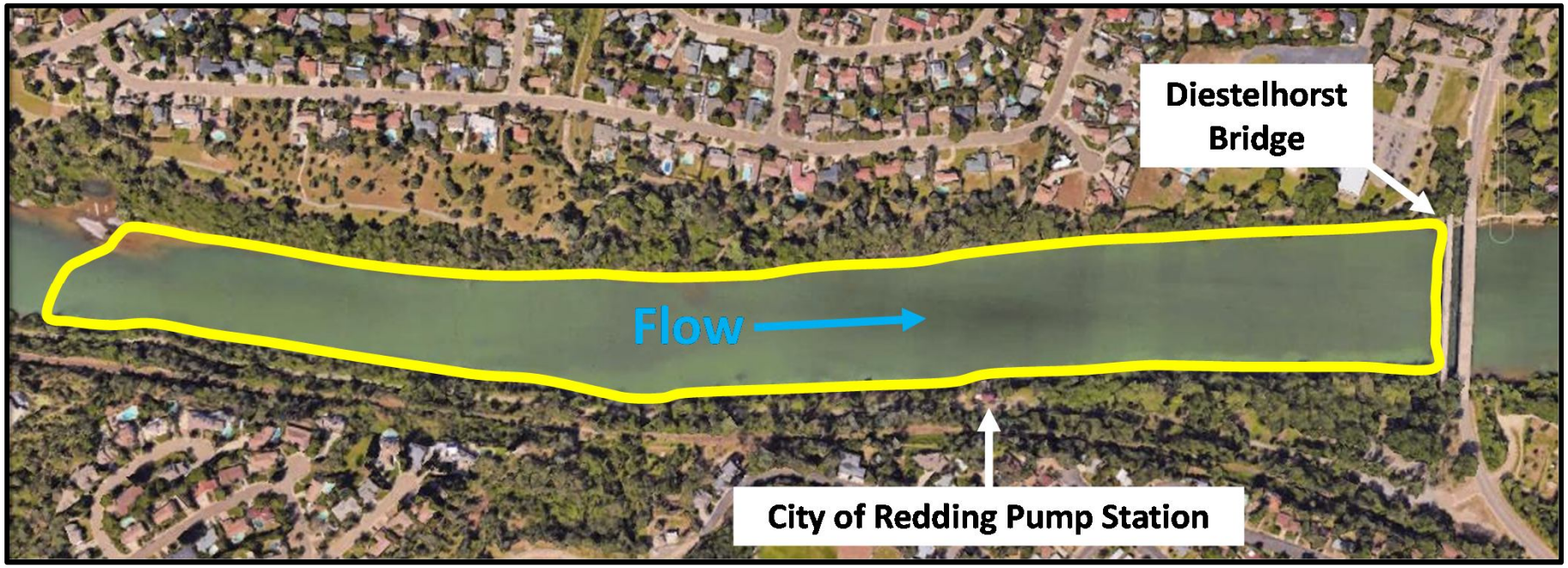
Factors Other Than Water Temperature?

"… the Panel had a general concern about the way "habitat" is apparently perceived in linking the biological requirements of salmon with water operations. A recurring theme through the reports and presentations was the description of 'available habitat' as the number of river miles maintained at a given target temperature."

Independent Review Panel for the Long-Term Operations Biological Opinions, December 2015

Spawning Habitat Quality

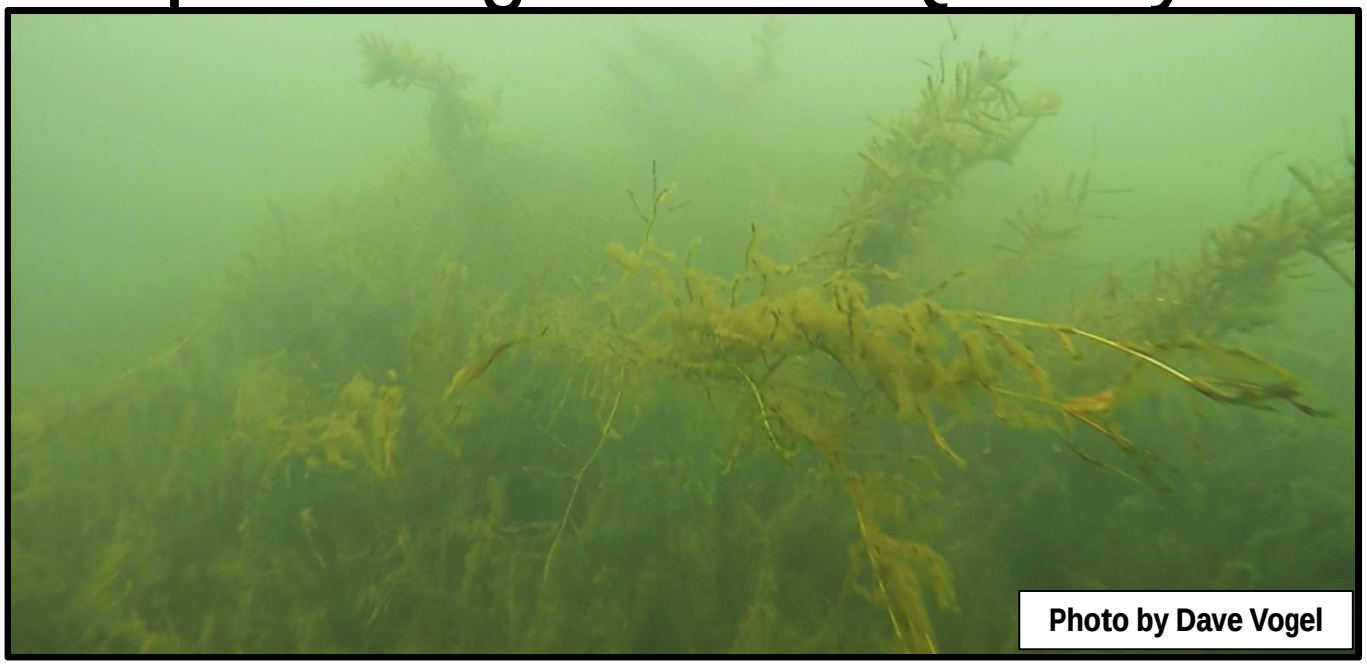




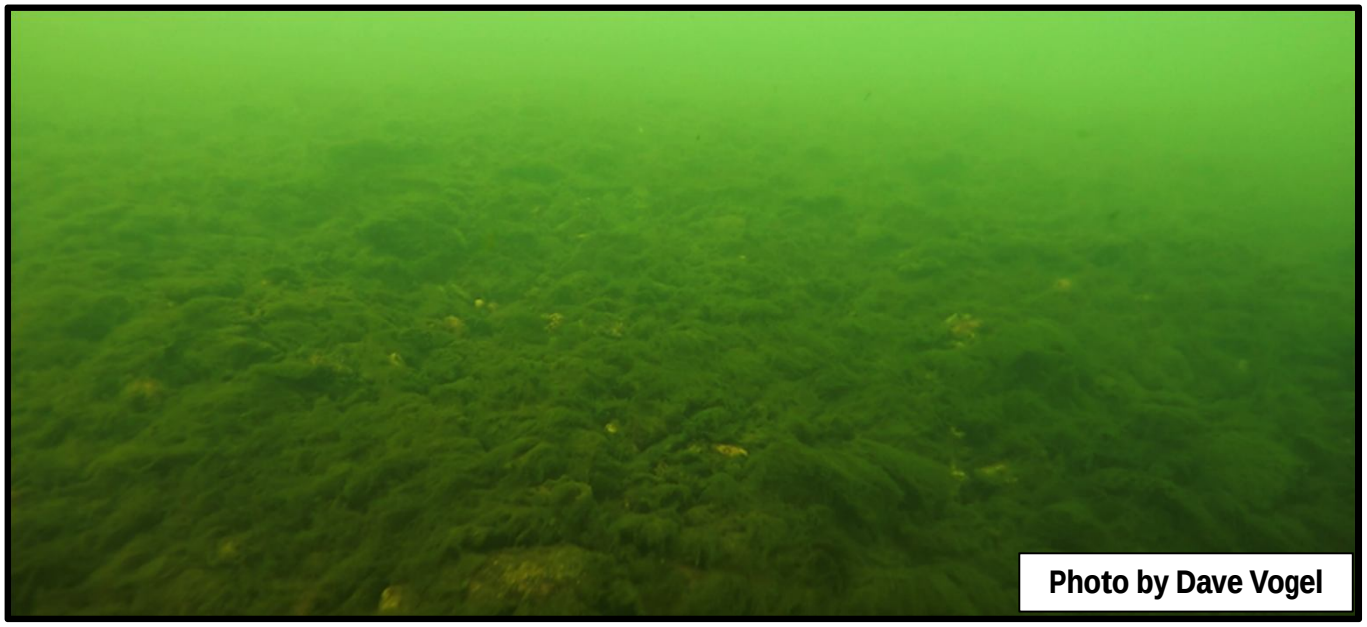
Spawning Habitat Quality

Sacramento River looking upstream from ACID Dam

Spawning Habitat Quality

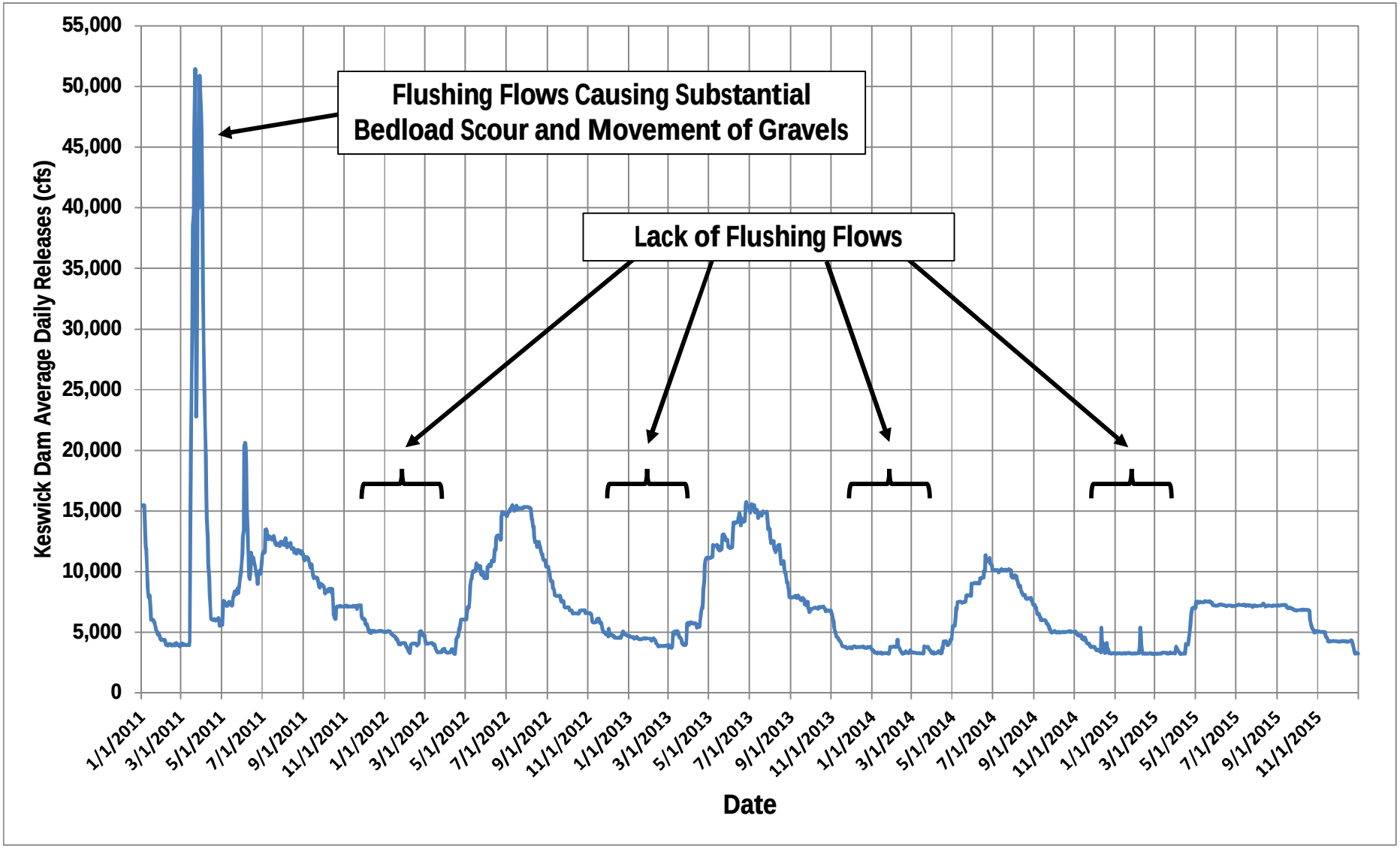


Choked with Weeds



Choked with Sediment

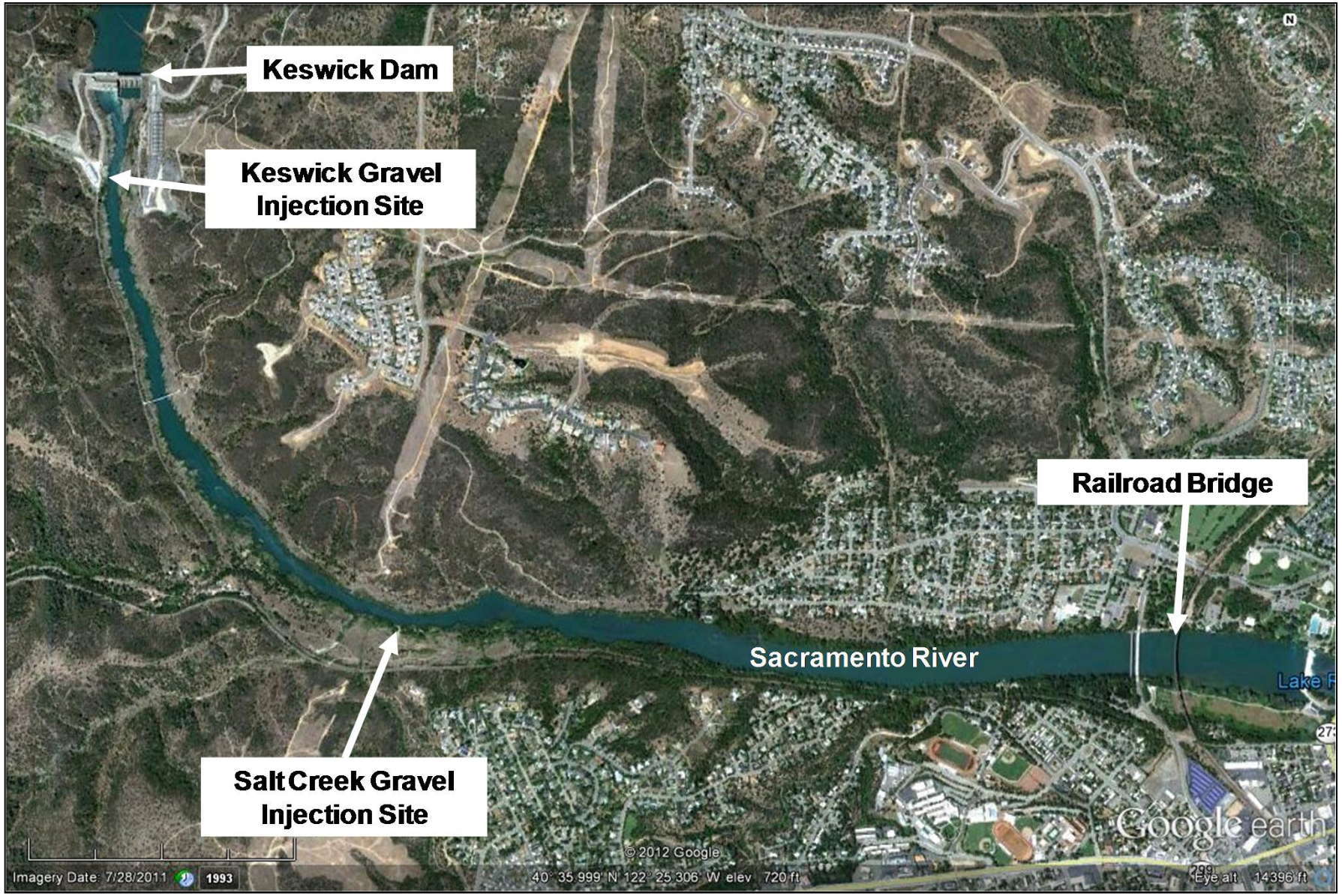
Spawning Habitat Quality



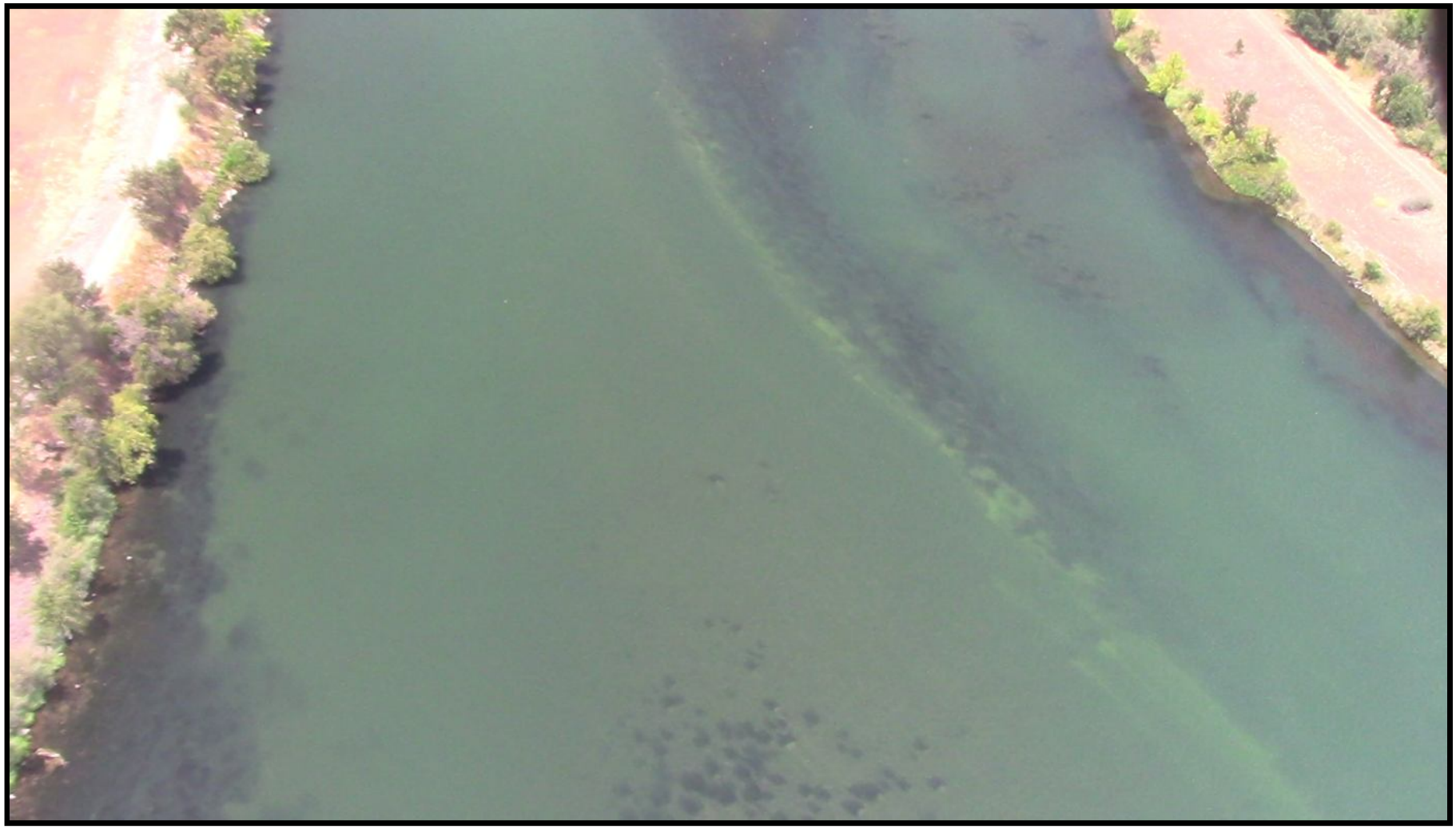
Spawning Habitat Quality

Keswick gravel injection site

Spawning Habitat Quality

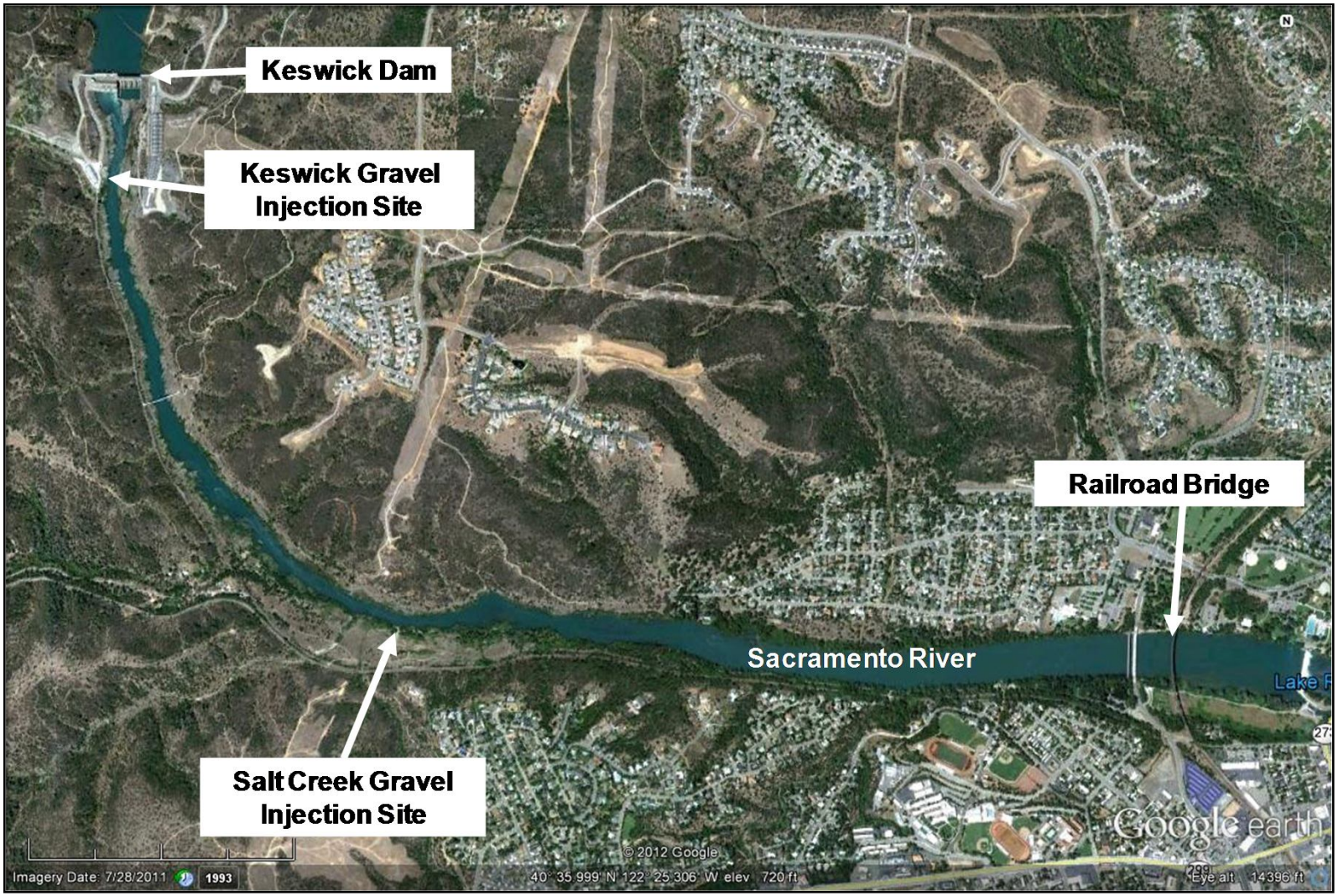


Juvenile Rearing Habitat Quality



Much of the habitat complexity for rearing is lacking

Juvenile Rearing Habitat Quality



Much of the habitat complexity for rearing is lacking

Juvenile Rearing Habitat Quality

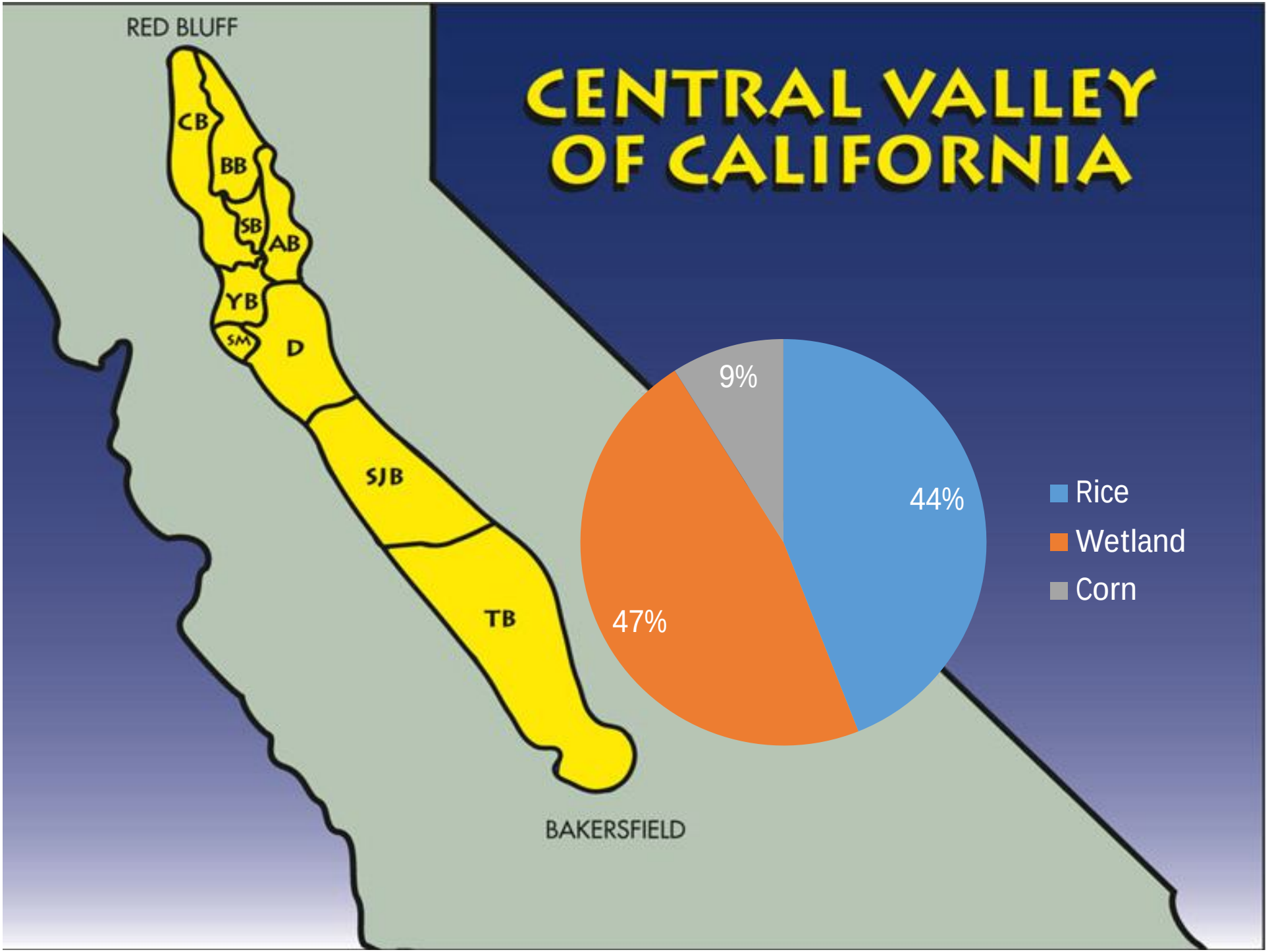
- NMFS Recovery Plan
- USFWS Anadromous Fish Doubling Plan
- Golden Gate Salmon Association Plan
- NCWA-TNC-AR-GGSA Salmon Plan

Recommendations

- Collaboration on monitoring and survival estimates
- Disease evaluation
- Predation evaluation
- Evaluations of spawning and rearing habitat quantity and quality
- Increase spawning and rearing habitats
- Flushing flows

Pacific Flyway Overview

- Central Valley wetlands and ricelands are essential for waterfowl, shorebirds, and other birds along the Pacific Flyway.
  - Historically: 20-40 million waterfowl; today 6-8 million
  - >350,000 shorebirds annually
  - Less than 10% natural wetland habitat remaining
- Drought is having severe impacts on habitats and birds
  - 25% reduction in managed wetlands…worse SOD
  - Little to no summer irrigation of those wetlands
  - Significant decline in planted and winter-flooded rice
  - Significant food shortages for waterfowl


RED BLUFF
CENTRAL VALLEY OF CALIFORNIA
CB
BB
SB
AB
YB
SM
D
SJB
TB
BAKERSFIELD
9%
44%
47%
Rice
Wetland
Corn

Annual Mileposts

- Spring plantings (rice & corn)
- Summer irrigation of wetlands
- Rice harvest, early = better prep for birds
- Fall Flooding of wetlands
- Winter-flooding of harvested rice fields

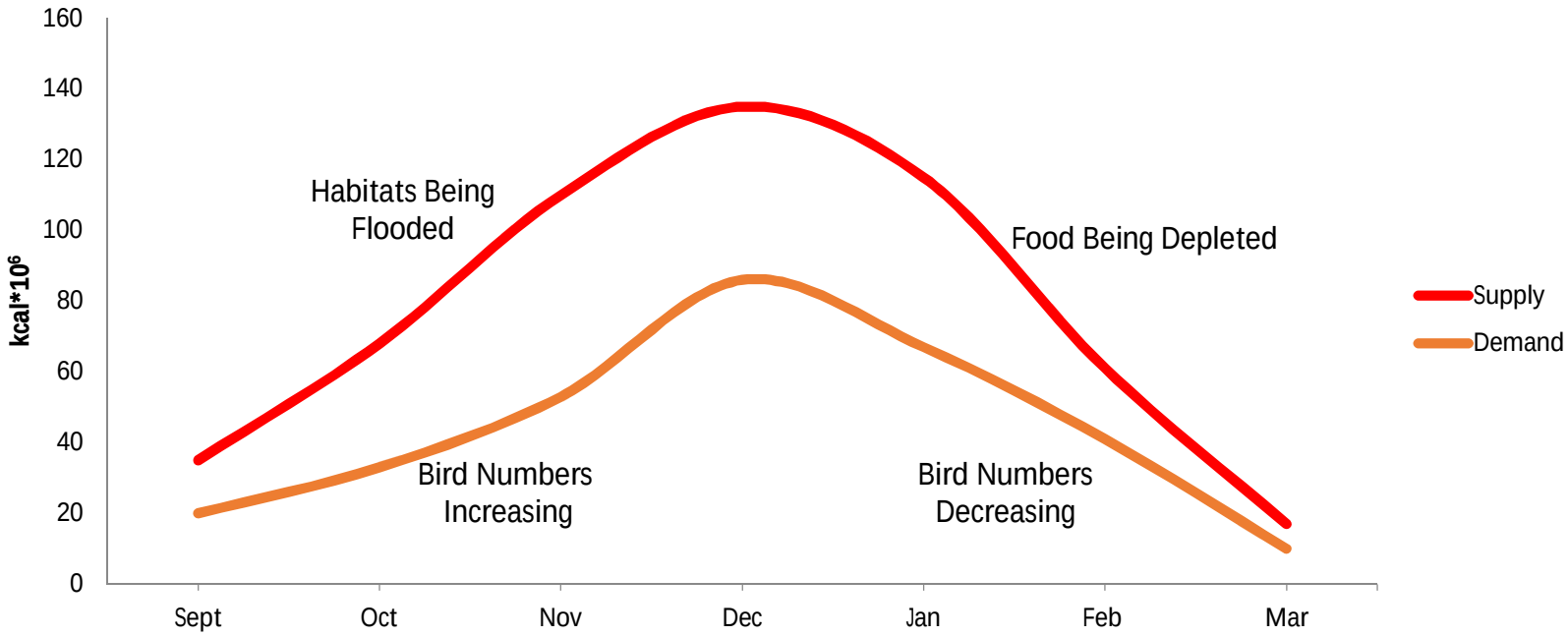
Waterfowl Habitats

Habitat Types	Normal Water Year	2015 Drought
Planted Rice	567,000	406,000
Planted Grain Corn	62,000	35,000
Summer Irrigated Wetlands	60%-70%	10%
Fall flooded wetlands	207,000	155,000
Winter-Flooded Rice	351,000	125,000 – 200,000

Summer Irrigation of Wetlands

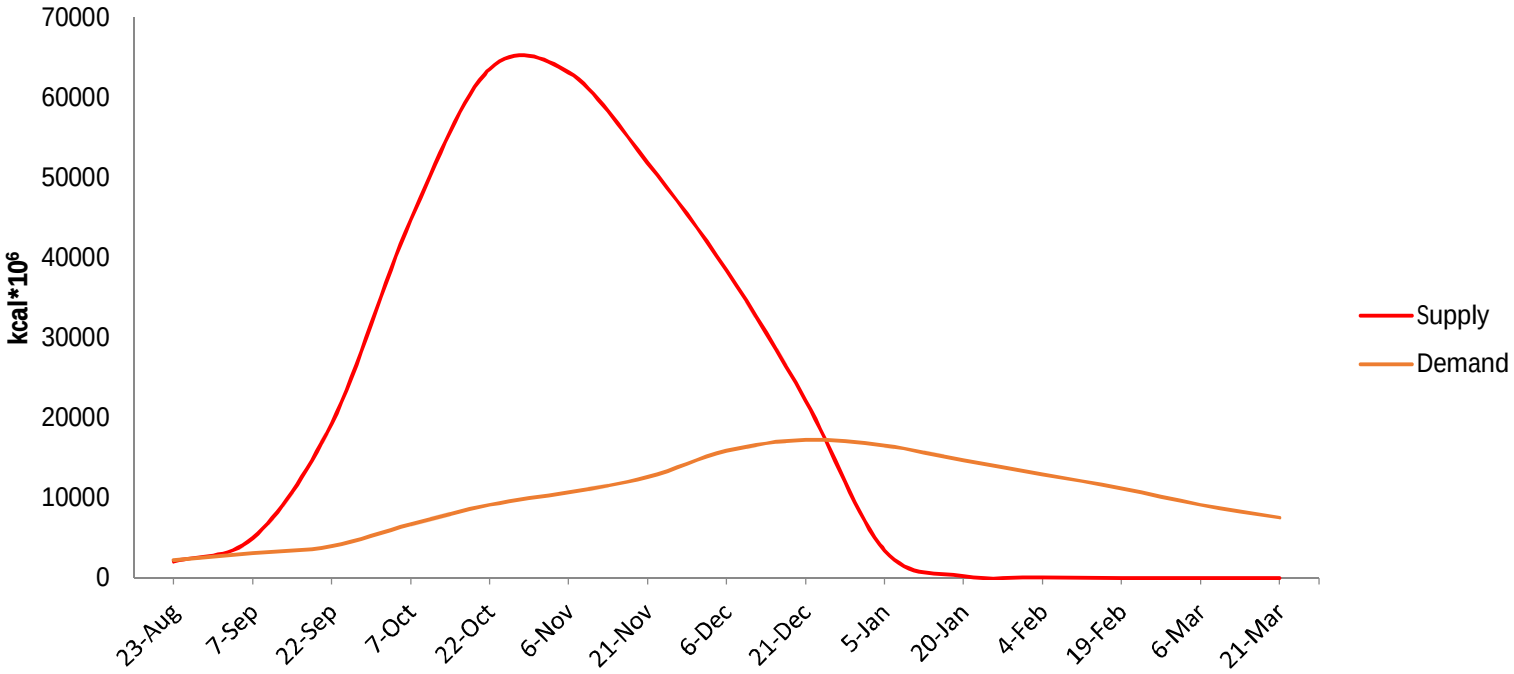
- 70% of managed seasonal wetlands summer irrigated (M. Brown 2008)
- Estimated that only 10% of wetlands will be summer irrigated in 2015.
- Food production in non-irrigated wetlands only 56% of irrigated wetlands (Naylor 2002).
- Overall, a 50% decline in foods provided by managed wetlands

Food Supply vs. Food Demand

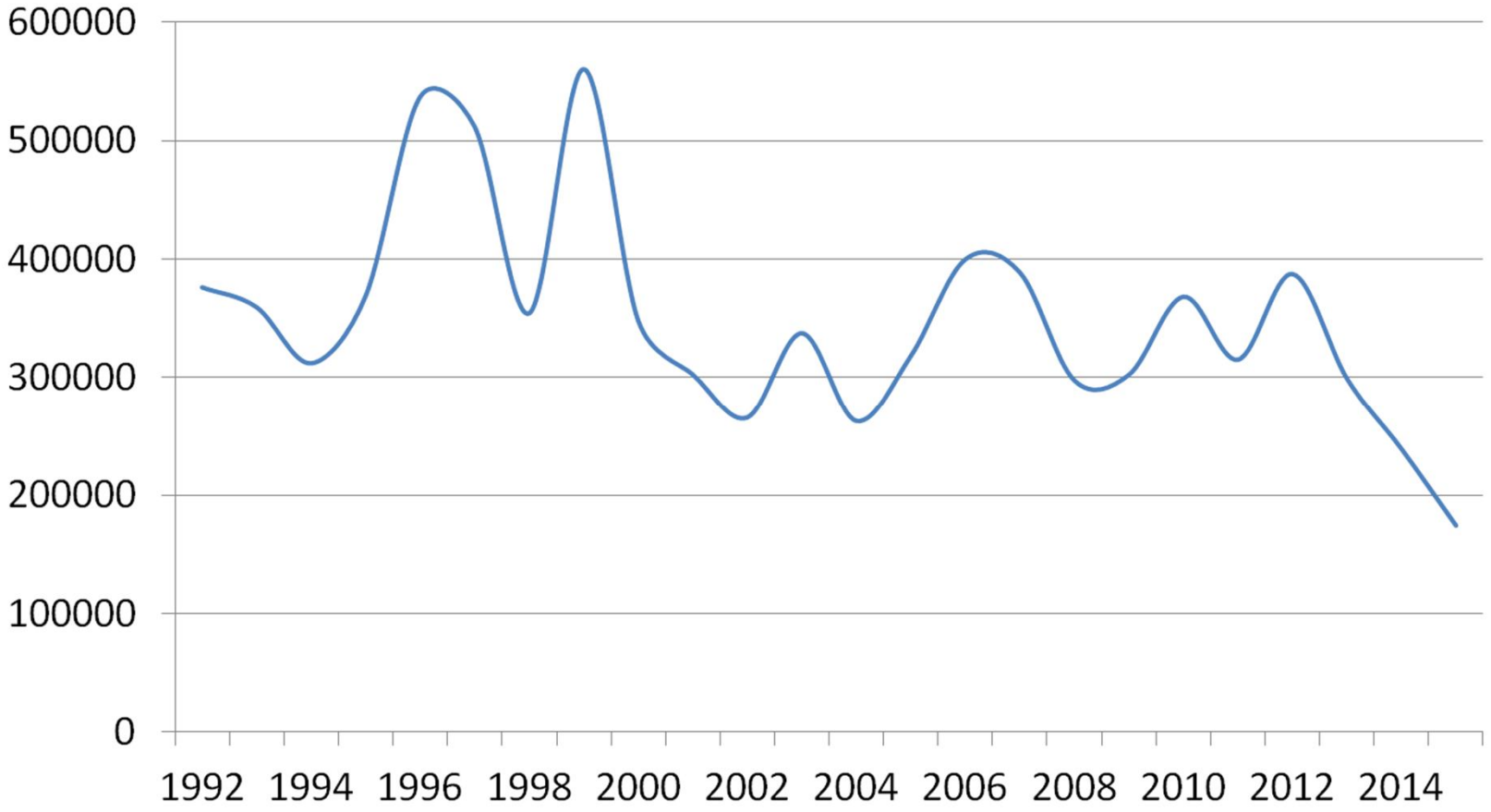


Food Supply vs. Food Demand

Drought Scenario



California Mallard Breeding Population



Long-Term Concerns


Past


Present


Future ?

What is the cost of replacing winter-flooded rice with managed wetlands .....

About $2,000,000,000