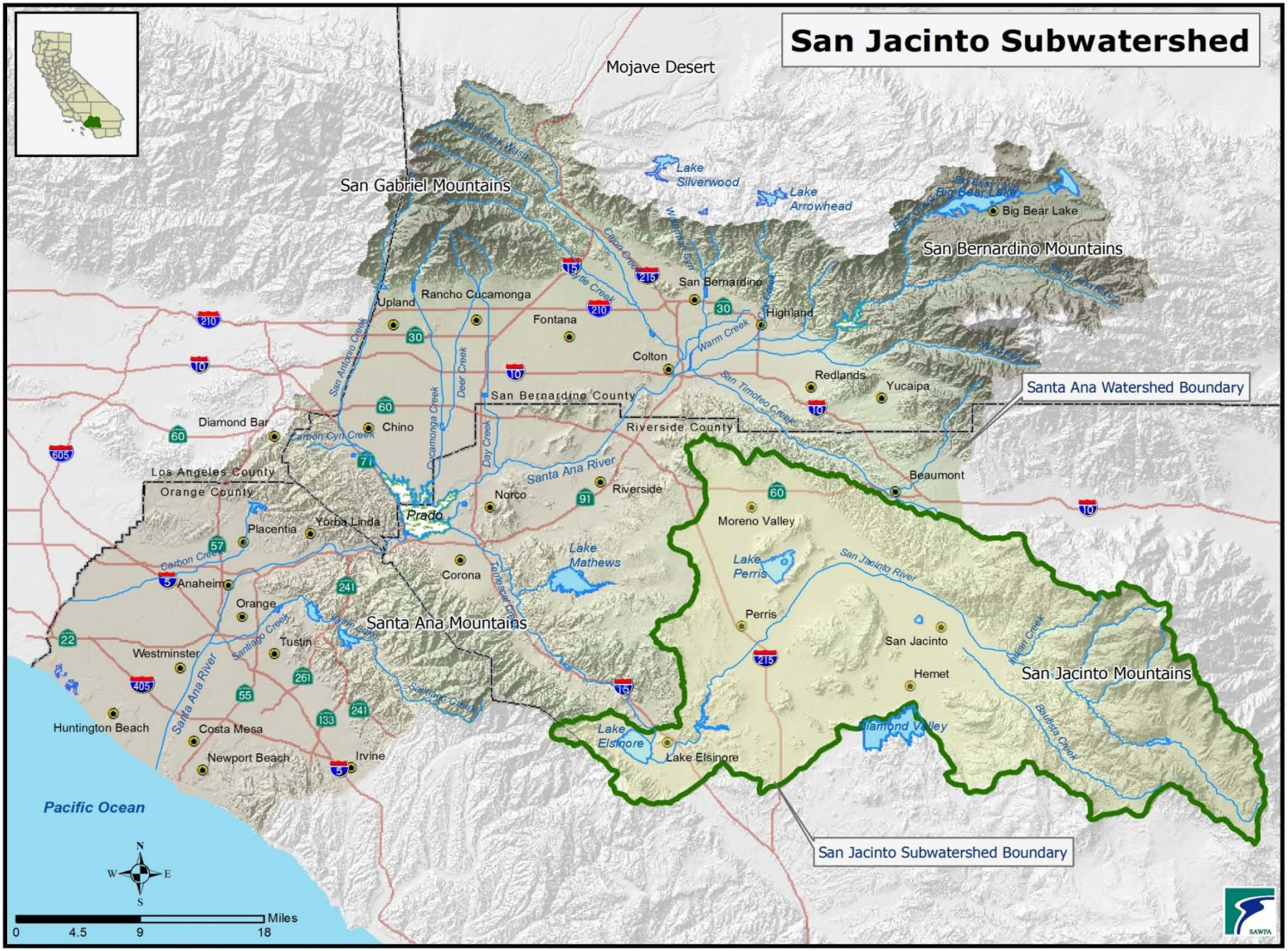
Mark R. Norton PE, LEED AP
Water Resources & Planning Mgr
Santa Ana Watershed Project Authority
Authority Administrator, LESJWA



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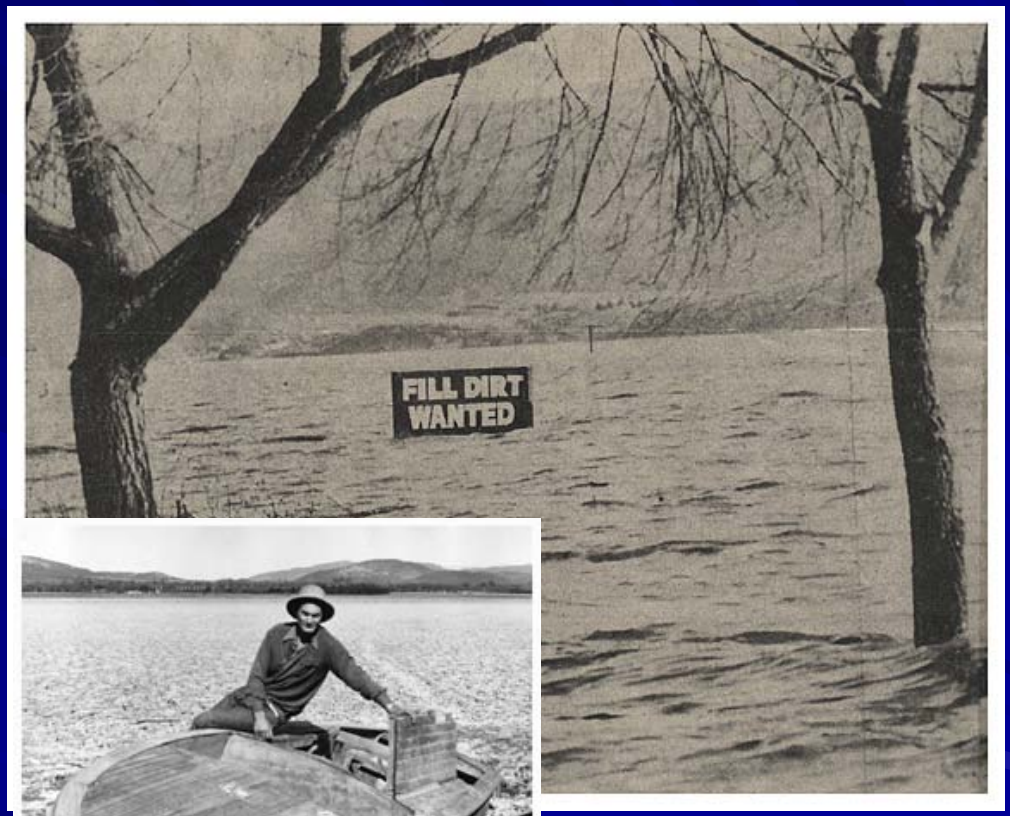
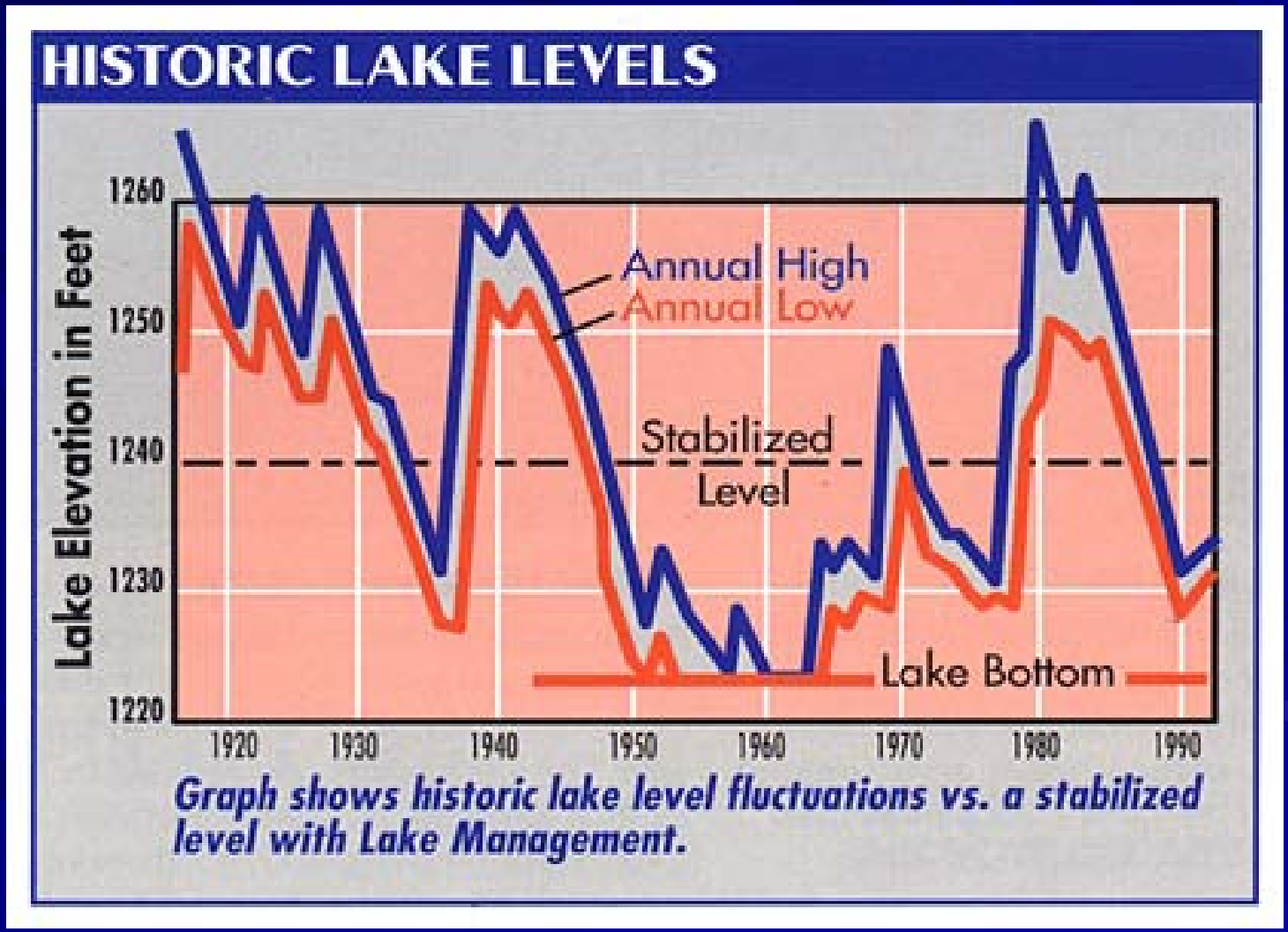
Lake Elsinore - History Ups & Downs

- Lake Elsinore has a history of flooding… and drying*

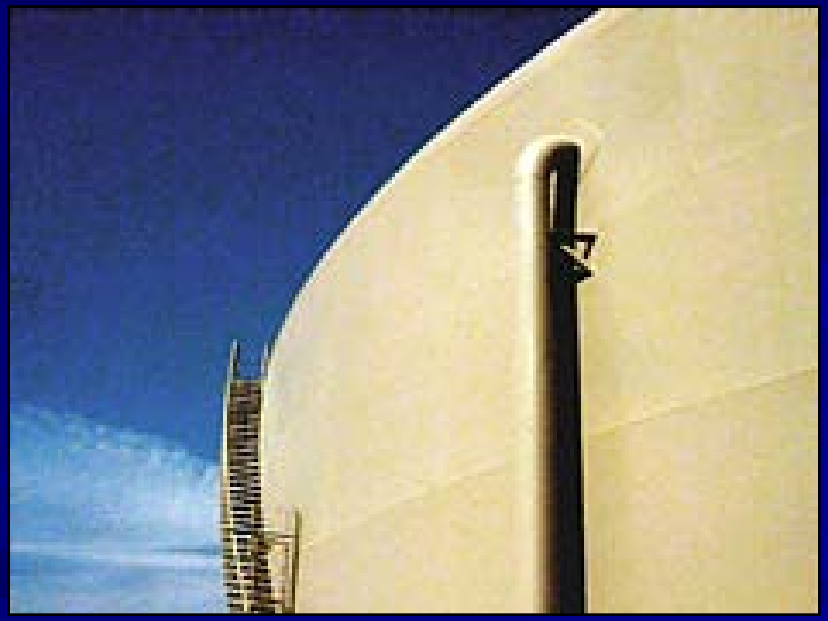


* The lake has spilled 7 times in the past 85 years and has gone dry twice

Historic Lake Levels & Events

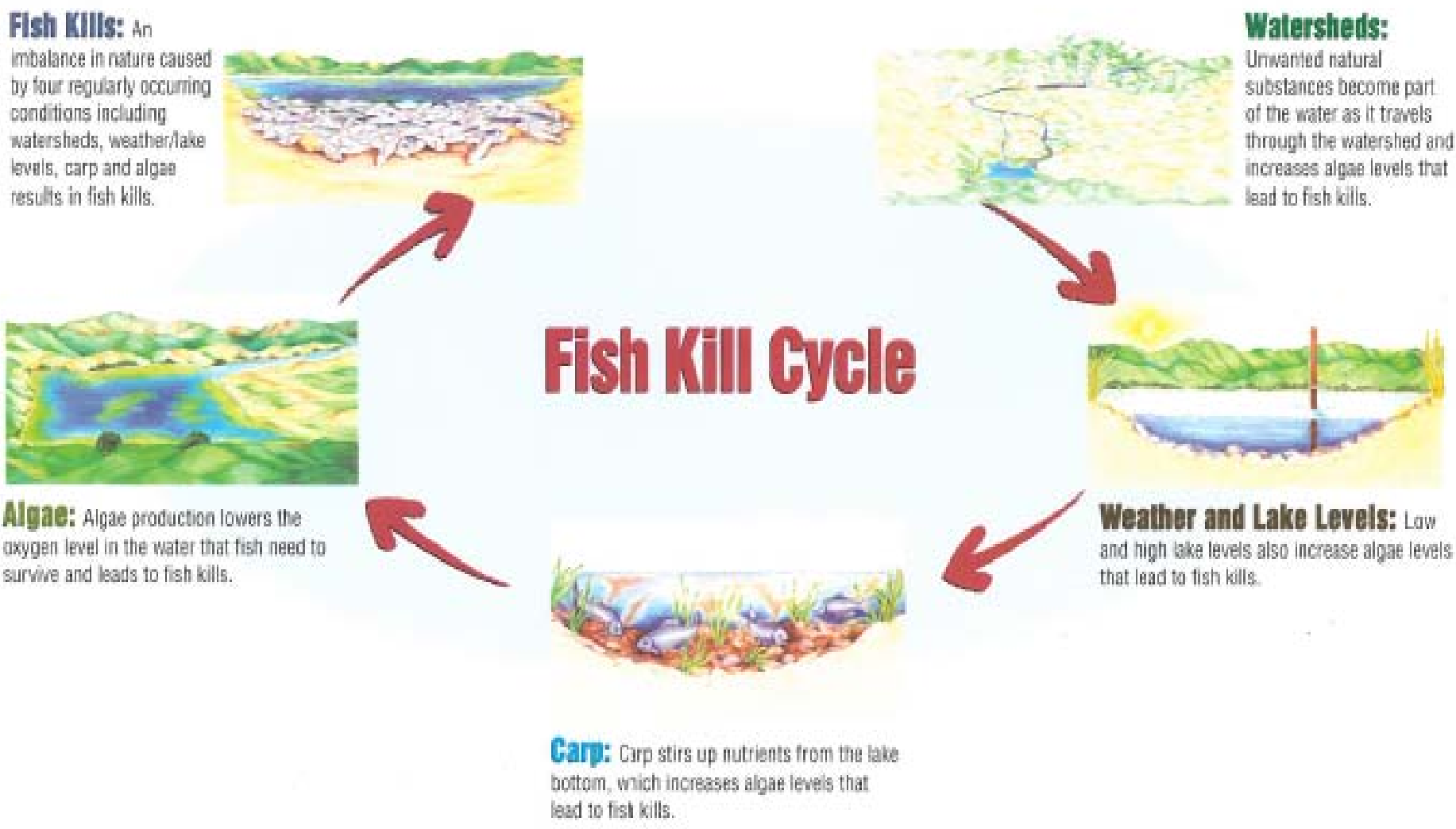


Lake evaporation drops lake level about 4 ½ feet each year



That's enough water to fill this 8 million gallon tank every day

Watershed runoff impacts to lakes

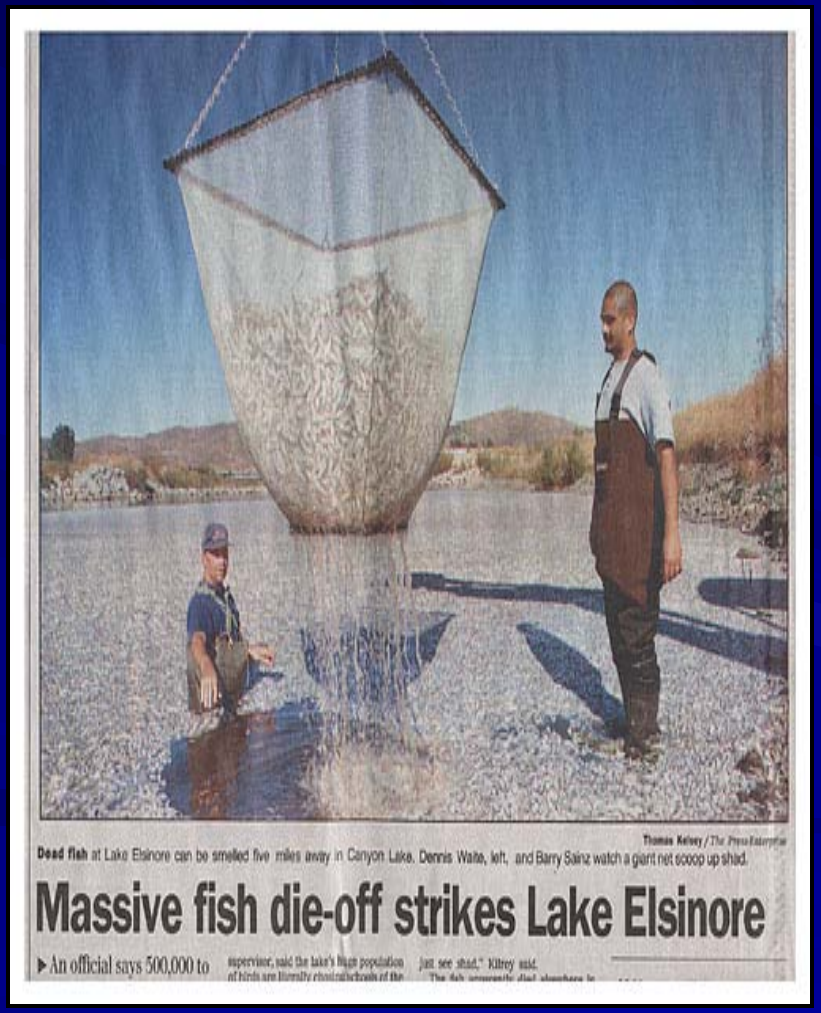


Historical Water Quality Problems

Excessive nutrient input at Lake Elsinore

- Algal Blooms - mostly blue-green
- Depressed Oxygen Levels
- Fish Kills

Lake Elsinore – Low lake levels are a major factor in fish die-offs



Thomas Kelsey / The Press-Enterprise

Dead fish at Lake Elsinore can be smelled five miles away in Canyon Lake. Dennis Waite, left, and Barry Sainz watch a giant net scoop up shad.

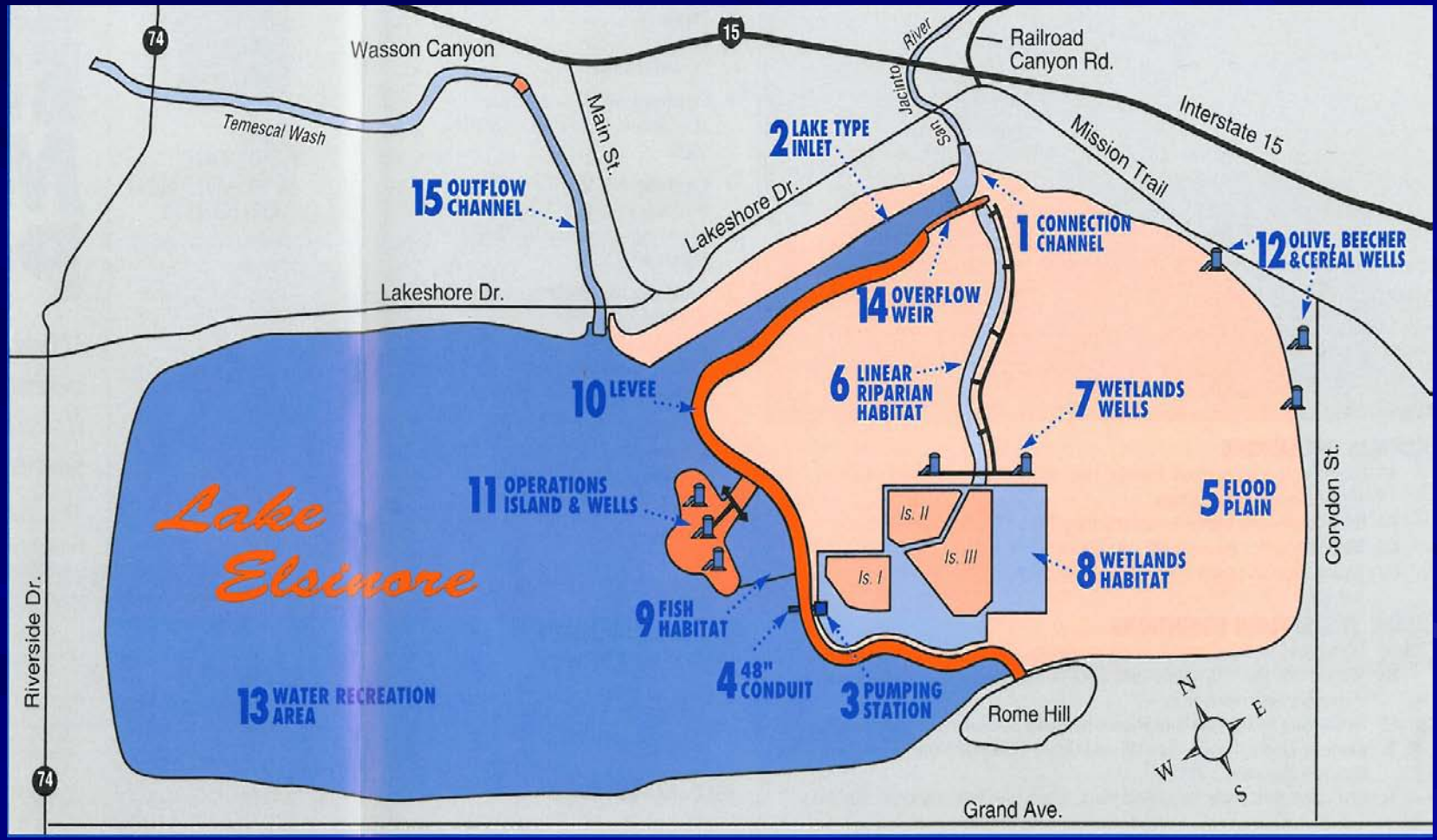
Massive fish die-off strikes Lake Elsinore

▶ An official says 500,000 to

supervisor, said the lake's huge population

just see shad," Kilrey said.

Lake Elsinore Management Project – Early Goal of A Stabilized Lake



Lake Elsinore Management Authority (LEMA) Formed

U.S. Bureau of Reclamation Grant and Loan	$26 million
Local contributions	$13.6 million
Total	$39.6 million

Lake Elsinore Management Project is completed by 1995

In 2000, a new agency formed to restore Lake Elsinore

Lake Elsinore & San Jacinto Watersheds Authority

City of Lake Elsinore • City of Canyon Lake • County of Riverside
Elsinore Valley Municipal Water District • Santa Ana Watershed Project Authority

Carp Removal

Annual Carp Removal until terminated in 2010 when fishery balance achieved

Removed over 1.1 million pounds of carp from Lake Elsinore

ISLAND WELL IMPROVEMENTS & WETLANDS PIPELINE

16” – 1 mile Wetlands Pipeline
Completed March 2005

Island Well Retrofits

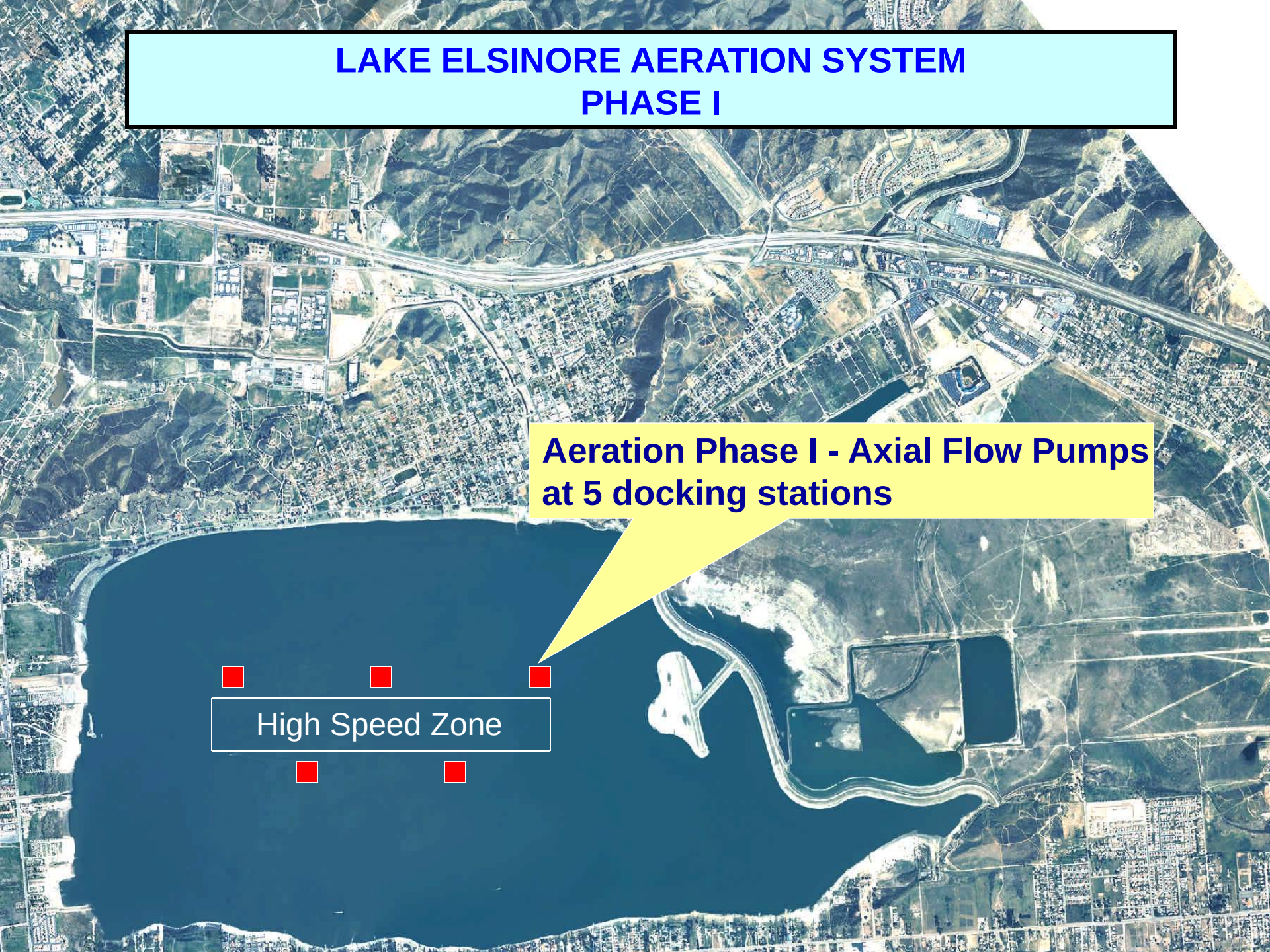
Completed June 2003

Produces 1.2 billion gallons of water annually for Lake Elsinore lake level stabilization

Operated by EVMWD

Experimental Striped Bass Stocking

26,500 hybrid striped bass stocked in Lake – feed on carp fingerlings and shad


LAKE ELSINORE AERATION SYSTEM
PHASE I
Aeration Phase I - Axial Flow Pumps
at 5 docking stations
High Speed Zone

Lake Elsinore Destratification System, Aeration Phase 1

Mixes high oxygen near surface down to lower lake depths

Completed July 2004 - Operates primarily during warm season months

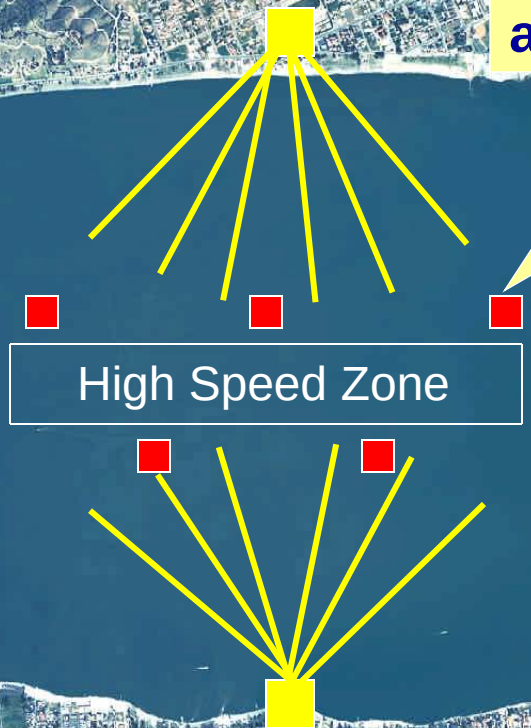
O&M funded by City of L.E., EVMWD and County

Operated by City of L.E.

LAKE ELSINORE AERATION SYSTEM PHASE II

Completed in April 2007 - Operated by EVMWD - Funded by City of Lake Elsinore, EVMWD, and County of Riverside

Aeration Phase I - Axial Flow Pumps at 5 docking stations



2 Compressor Buildings – 4000 CF/min of air

Diffused Air Lines – 48,000 LF

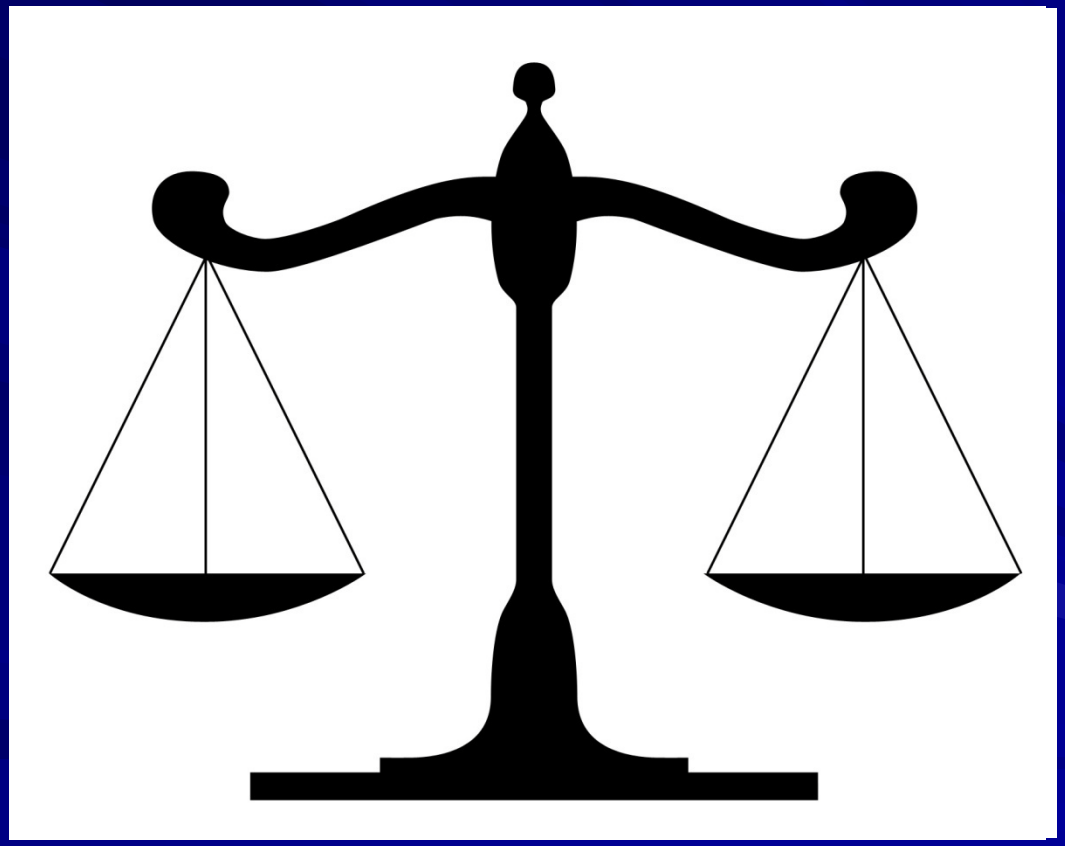
Phosphorus Removal Treatment at EVMWD Plant

Recycled water pipeline from EVMWD treatment plant to Lake Elsinore to help maintain water levels

Canyon Lake Improvements –
20,000 CY Sediment Removal in East Bay

LESJWA New Mission – Equal Lake Focus

Canyon Lake



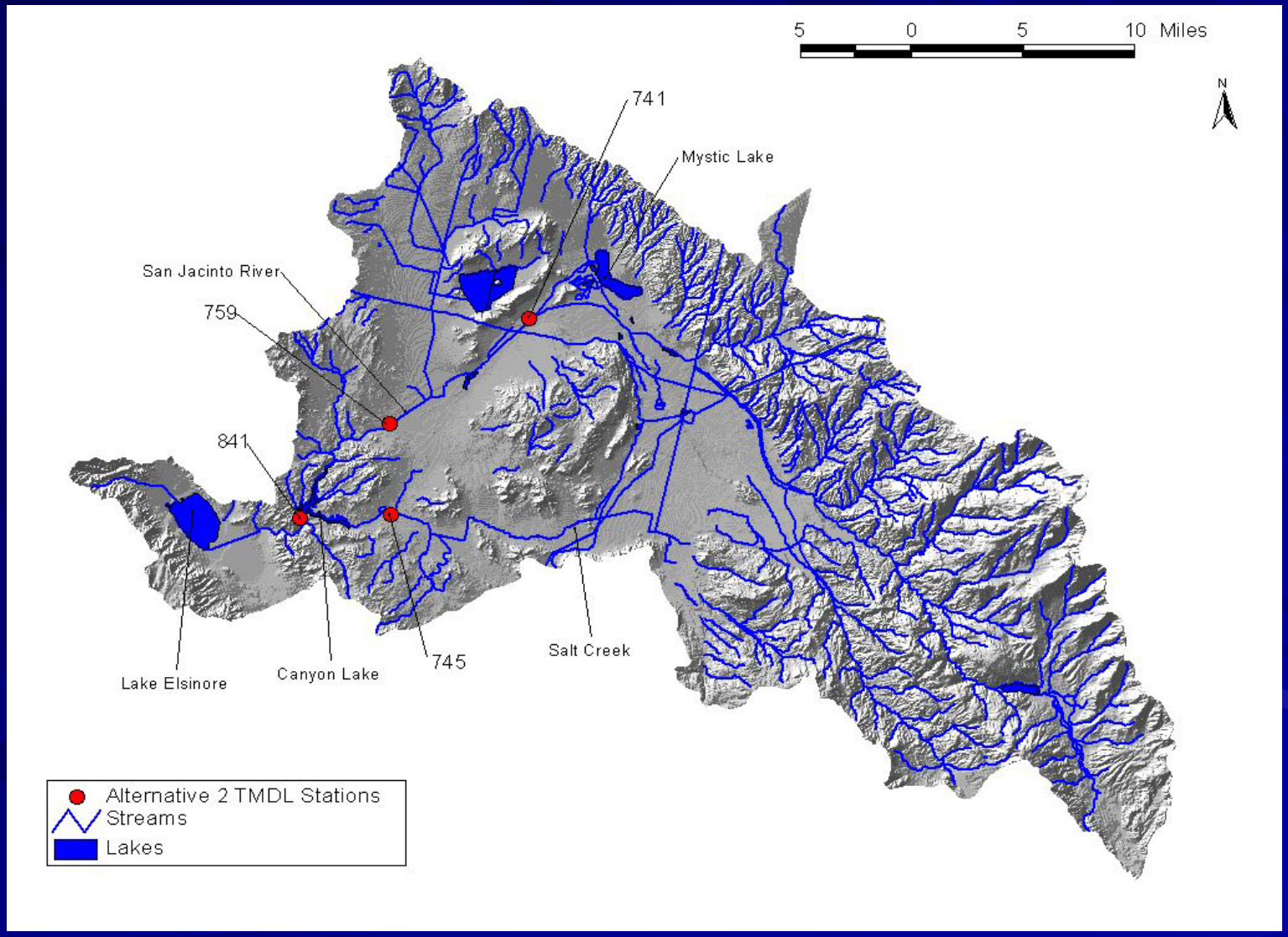
Lake Elsinore

LESJWA Benefits

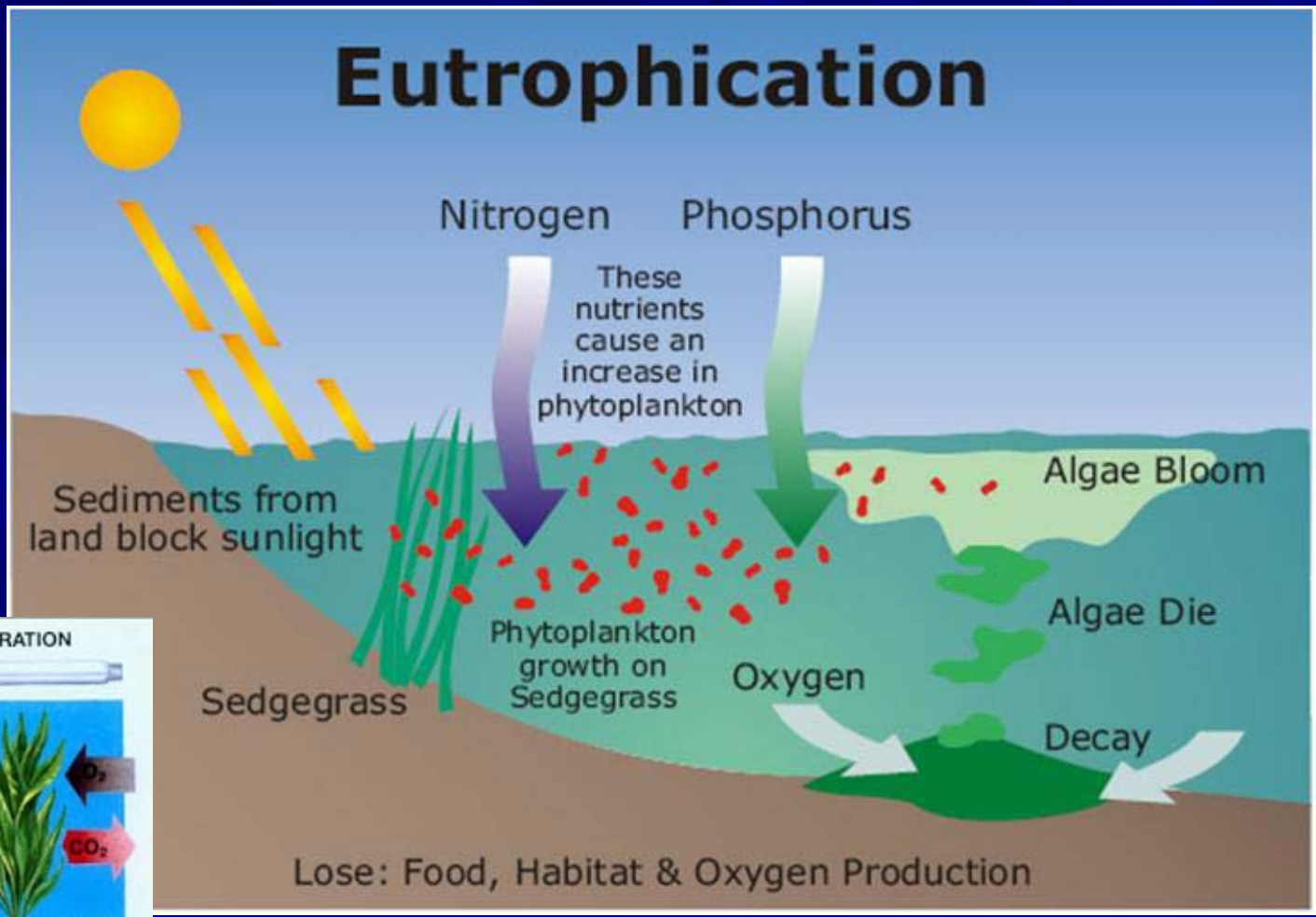
- Local Governance composed of many TMDL Task Force members
- Mutual goals as TMDL Task Force
- Contracting and financial entity for all Task Force consultants and monitoring support
- Implementing agency for lake improvements
- Successful grant application support
- Positive relationship with Regional Board

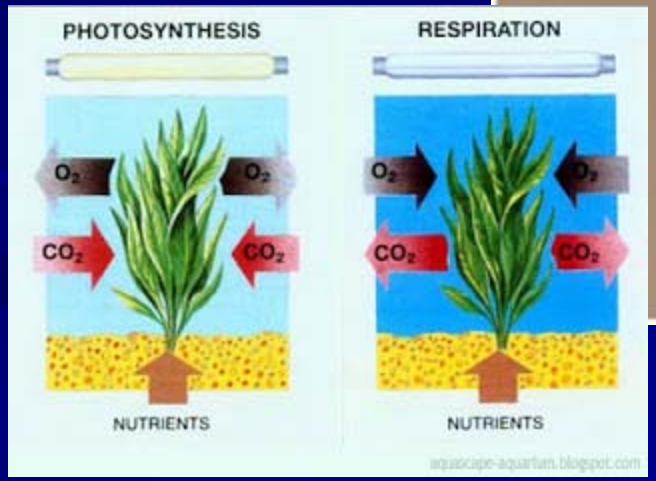
TMDL Task Force Agreement signed by 23 orgs in 2006

Task Force conducts Lake and Watershed Runoff Monitoring



Algae Life Cycle





Canyon Lake Improvements

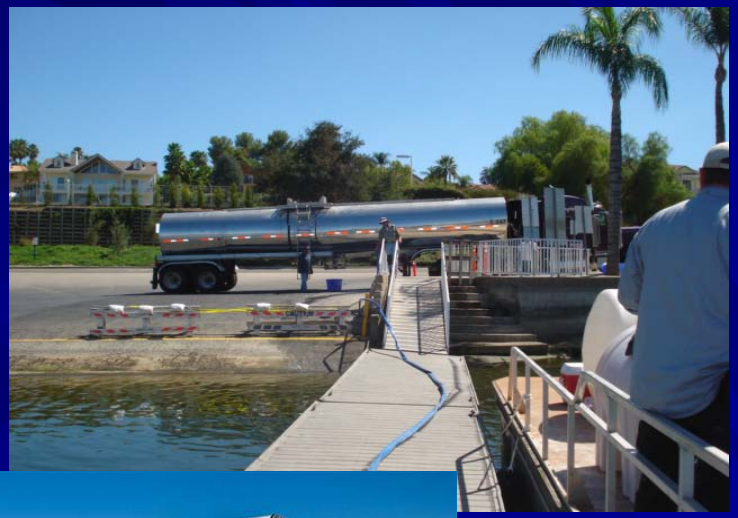
Canyon Lake Alum Treatment:

- Five Dosing Events
- Fall Event

(approximately 77,000 gal liquid or 190,000 kg dry alum)

- Spring Event

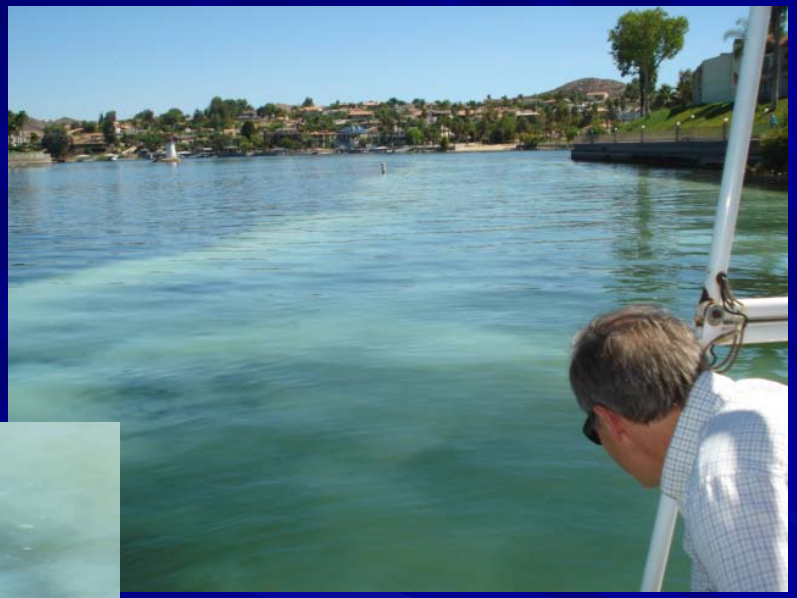
(approximately 50,000 gal liquid or 120,000 kg dry alum)



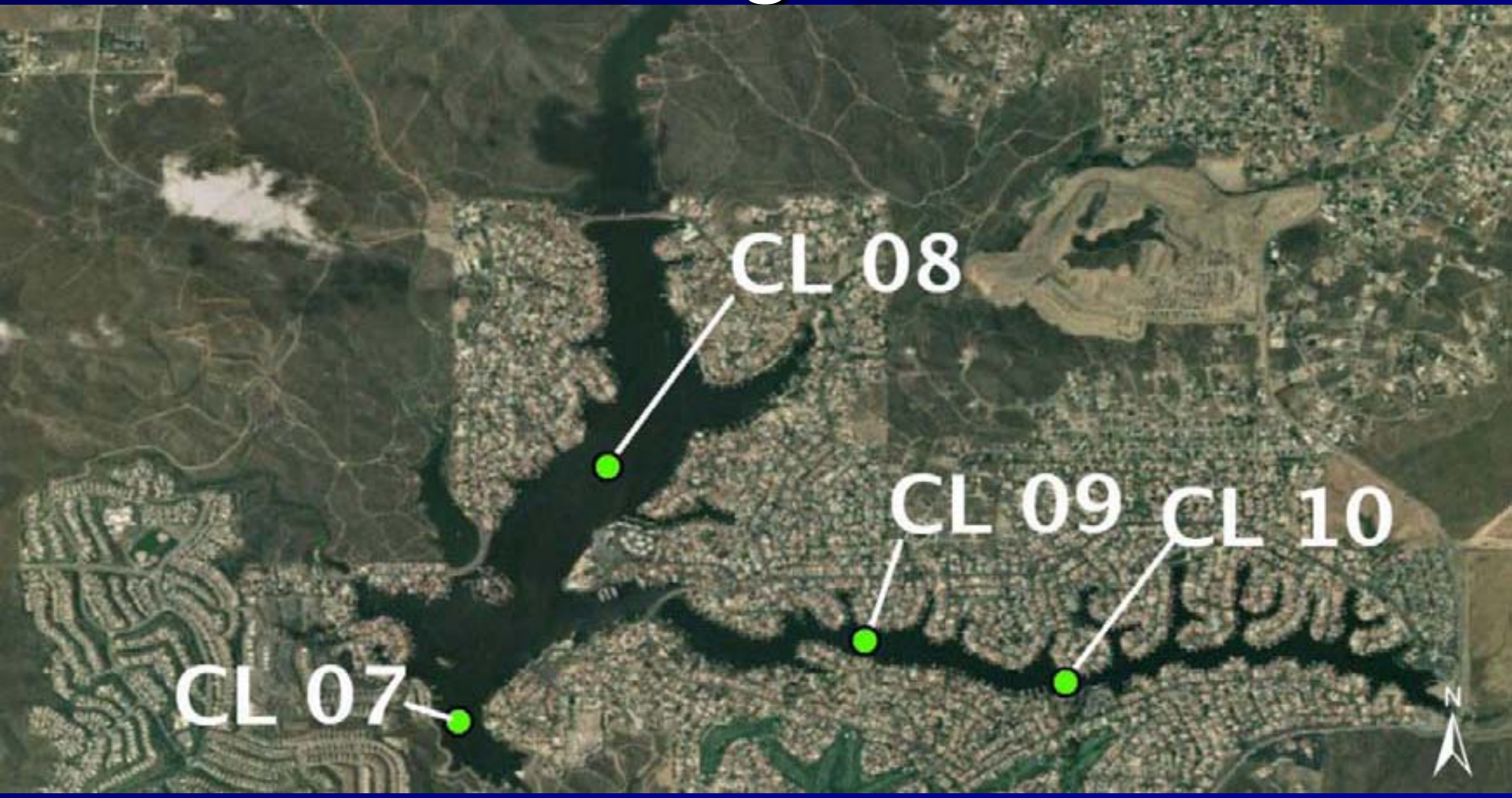
Alum Delivery: Main Body Canyon Lake September 2013 & Feb 2014

Alum Delivery & Dispersion Along Shore and Boat Docks: Main Body Canyon Lake Sep 2013 & Feb 2014

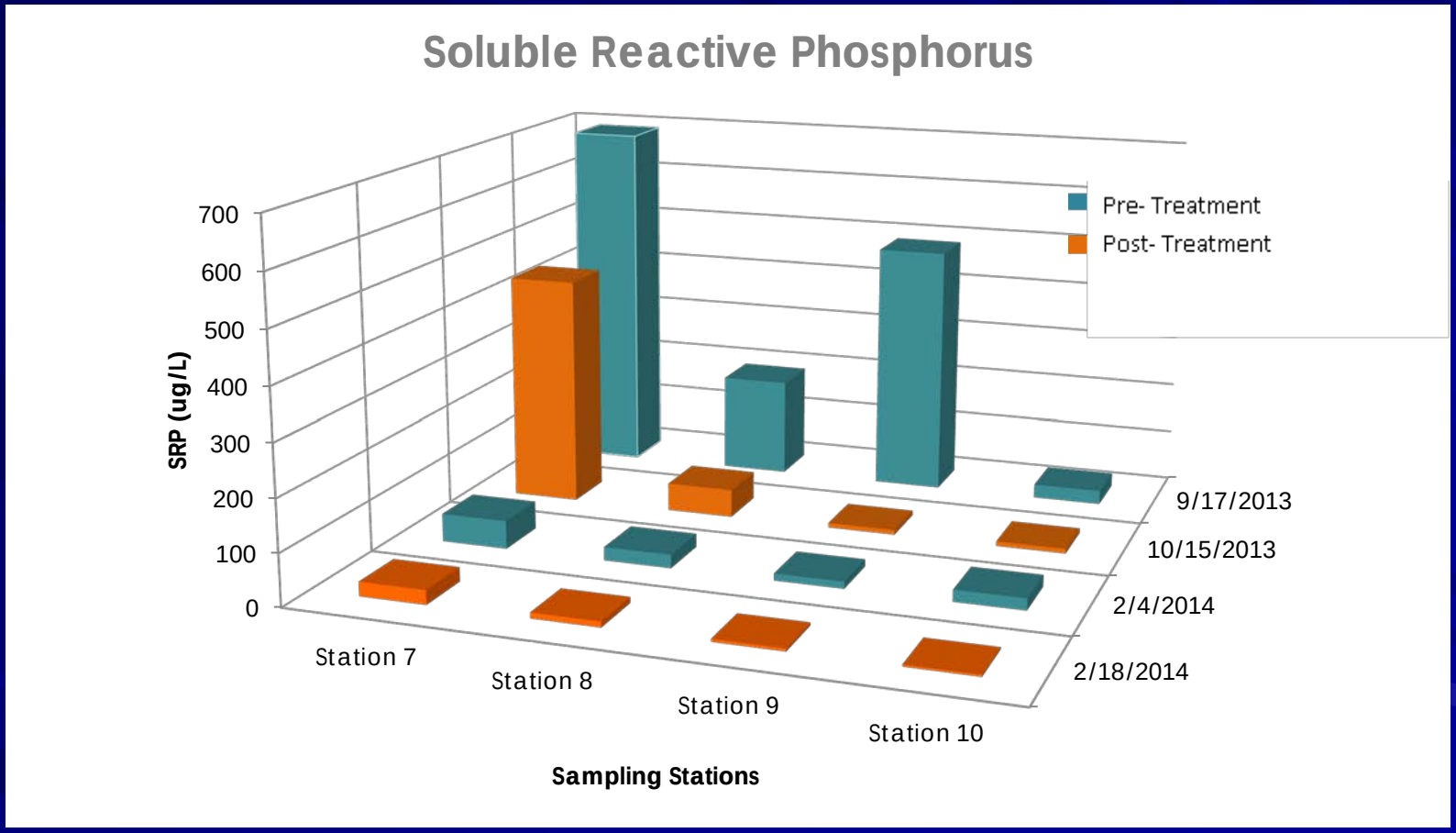
Alum Dispersion: Main Body Canyon Lake September 2013 & Feb. 2014



Monitoring locations



February Pre & Post Monitoring Results



Current Images of Lake

Looking Ahead: Alum Applications

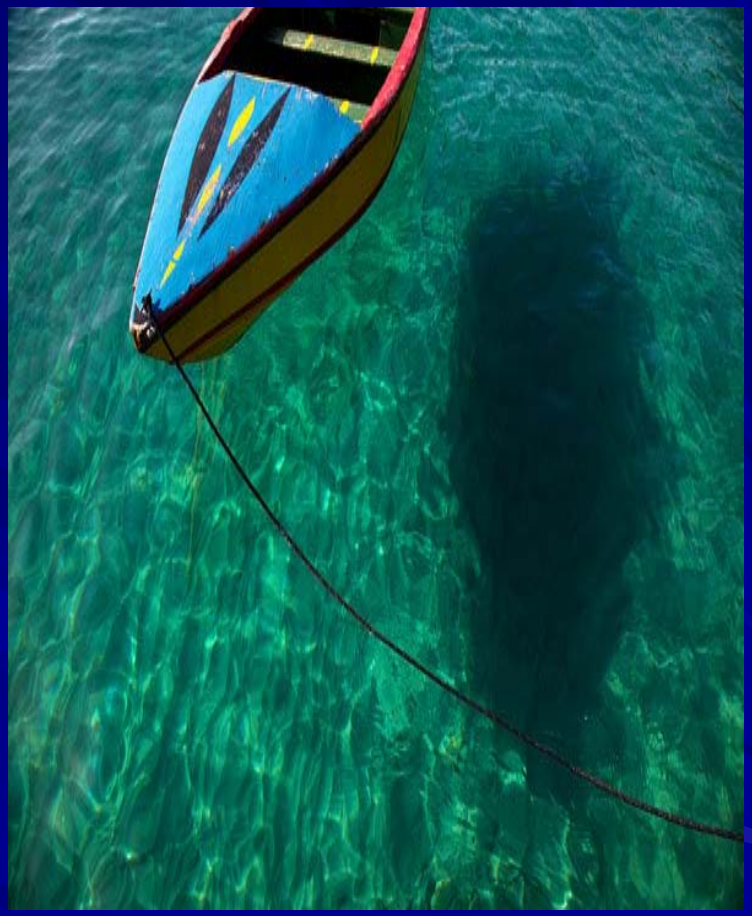
- **July 2014**

  Alum Team Coordination Meeting
- **Early September 2014**

  Conduct pre alum application sampling
- **Mid September 2014**

  Second Alum Application
  - Deliver approximately 120,000 kg dry alum or 50,000 gal liquid alum to Canyon Lake.
- **Late Sept- Oct 2014**

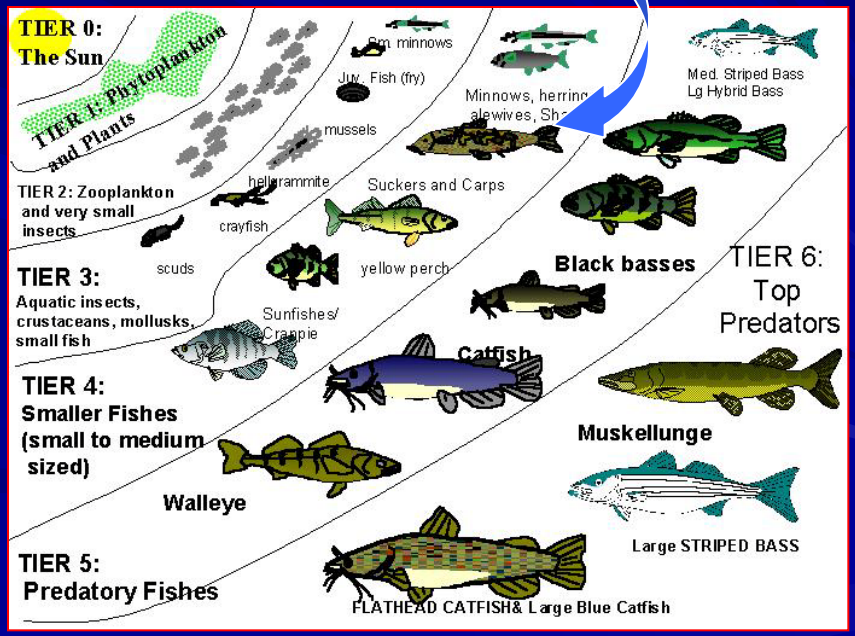
  Conduct post alum application sampling
- **Feb 2015** Future alum application
- **Sept 2015** Future alum application



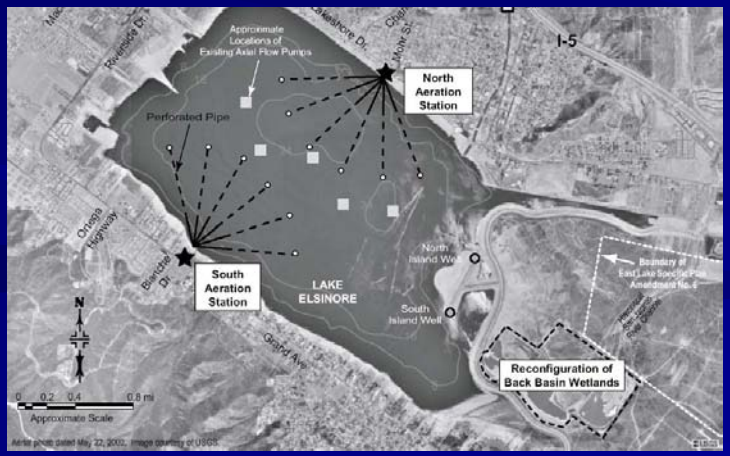
What more is needed for Lake Elsinore to comply with TMDL?

More recycled water and nonpotable well water

Balanced Fishery – More Carp Removal?



Continued Lake Aeration



TMDL Compliance Through Collaboration

Questions?