

Water Quality Objectives for Salinity and Boron



San Joaquin River
Basin Plan Amendment Addressing
Salinity and Boron

Water Quality Objectives Topics

- State and Federal Laws
- Effects of Salinity on Beneficial Uses
- Salinity Alternatives
- Effects of Boron on Beneficial Uses
- Boron Alternatives
- Questions and Comments

Why Evaluate Water Quality Objectives for Boron and Salt?

- Directed by State Board Bay-Delta Plan
- Boron Objectives Not US EPA Approved
- Impaired Water Body

State Laws and Policies for Setting Objectives

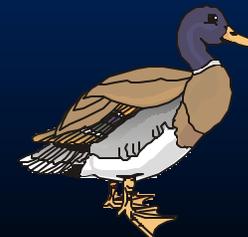
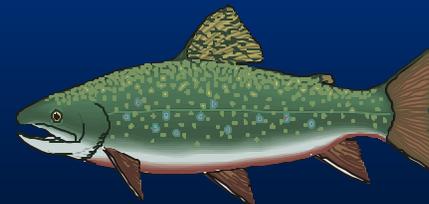
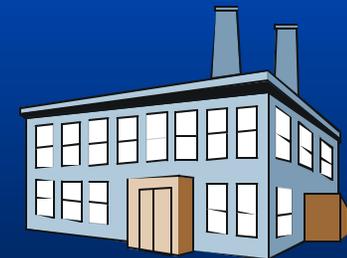
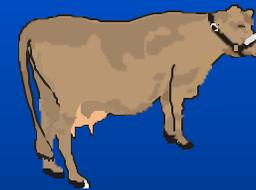
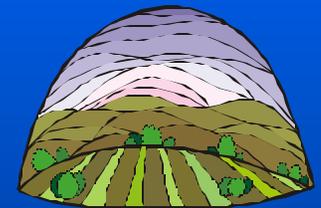
- Beneficial Uses
- Environmental Characteristics
- Reasonably Achievable
- Economic Considerations
- Need for Housing & Recycled Water
- Sources of Drinking Water Policy
- Antidegradation Policy

Federal Laws and Polices

- Latest Scientific Knowledge
- Protect Designated (Beneficial) Uses
- Concentration and Disposal of Pollutants
- Effects on Human Health and Welfare
- Effects of Pollutants on Biology
- Antidegradation Policy

Beneficial Uses of the Lower San Joaquin River

- Municipal and Domestic Supply
- Irrigation Water Supply
- Spawning, Reproduction, and/or Early Development
- Stock Watering
- Industrial Process Supply
- Recreation
- Freshwater Habitat
- Migration
- Wildlife





Salinity

- Dissolved Mineral Concentrations in Water
- Combination of Various Salts in Solution
- Typically Measured As:
 - Electrical Conductivity (EC)
 - Total Dissolved Solids (TDS)



Drinking Water EC (micromhos/cm)



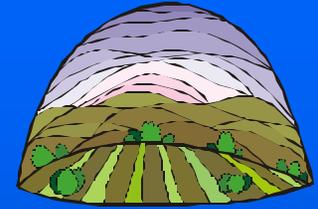
State Drinking Water Secondary MCL

- Recommended 900
- Upper Level 1,600
- Short Term 2,200



Irrigated Agriculture

EC_w (micromhos/cm)

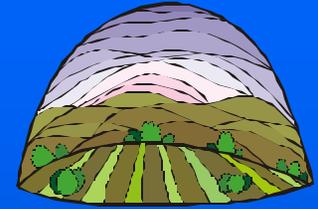


Ranges of Crop Sensitivity to Salinity

- Sensitive Crops under 1,000
- Moderately Sensitive 1,000 to 2,100
- Moderately Tolerant 2,100 to 4,200
- Tolerant 4,200 to 6,800
- Unacceptable over 6,800



Irrigated Agricultural Salt Sensitive Crops



- **Sensitive Crops Include:**

Beans, Rice, Carrots, Onions, Peas,
Almonds, Apples, Apricots

- **Moderately Sensitive Crops Include:**

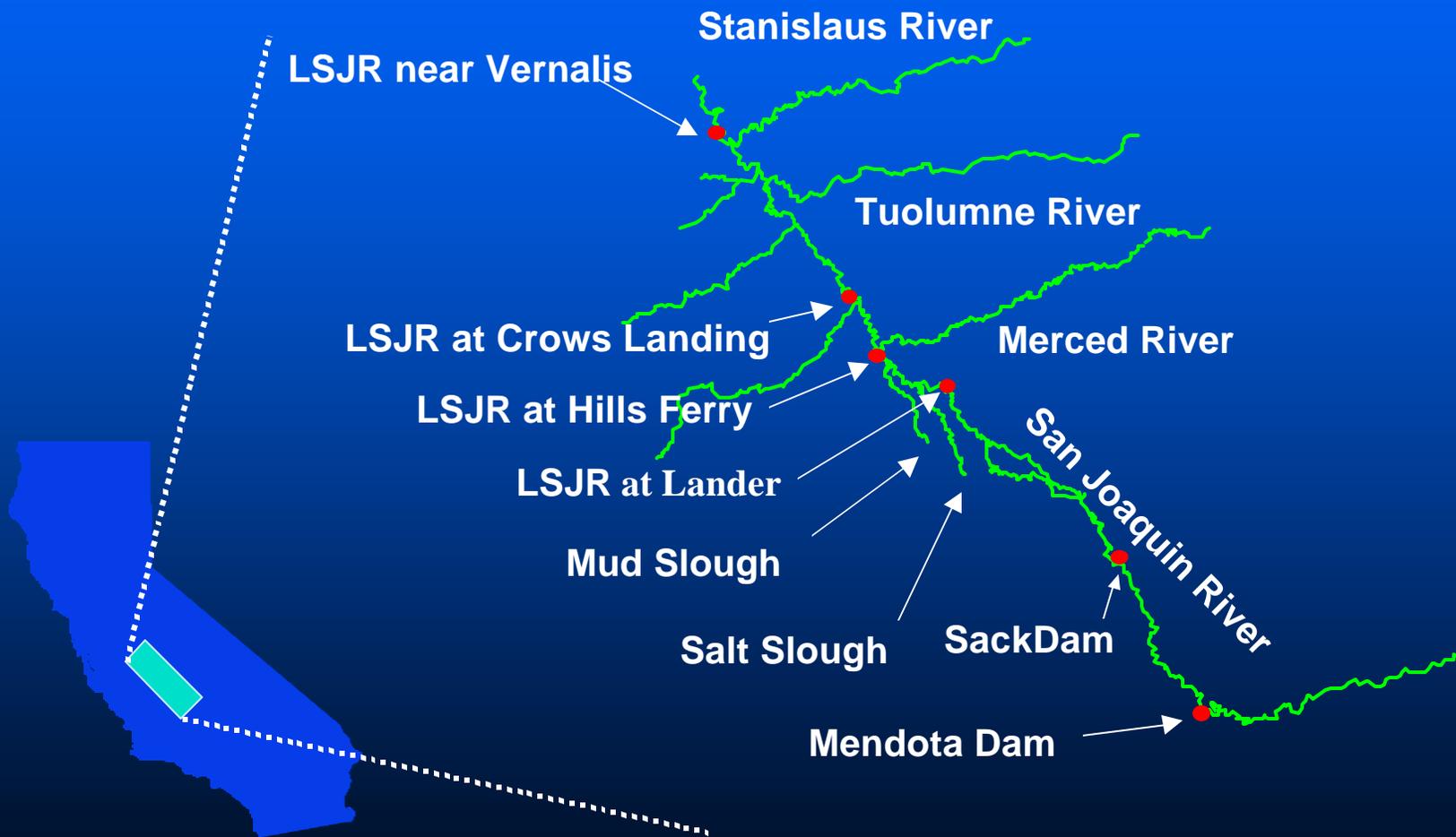
Alfalfa, Corn, Broccoli, Tomatoes,
Lettuce, Grapes



Alternative Water Quality Objectives for Salinity

- No Action
- Full Protection
- Delta Export

Lower San Joaquin River Basin





Salinity

No Action Alternative

EC (micromhos/cm)

State Board Vernalis Objective:

April through August **700**

September through March **1,000**

Secondary Drinking Water MCL:

Recommended **900**

Upper Level **1,600**



Salinity

Full Protection Alternative

EC (micromhos/cm)

State Board Vernalis Objective:

April through August **700**

September through March **1,000**

Mendota Dam to Vernalis

April through August **700**

September through March **900**

Salinity



Delta Export Alternative EC (micromhos/cm)

State Board Vernalis Objective:

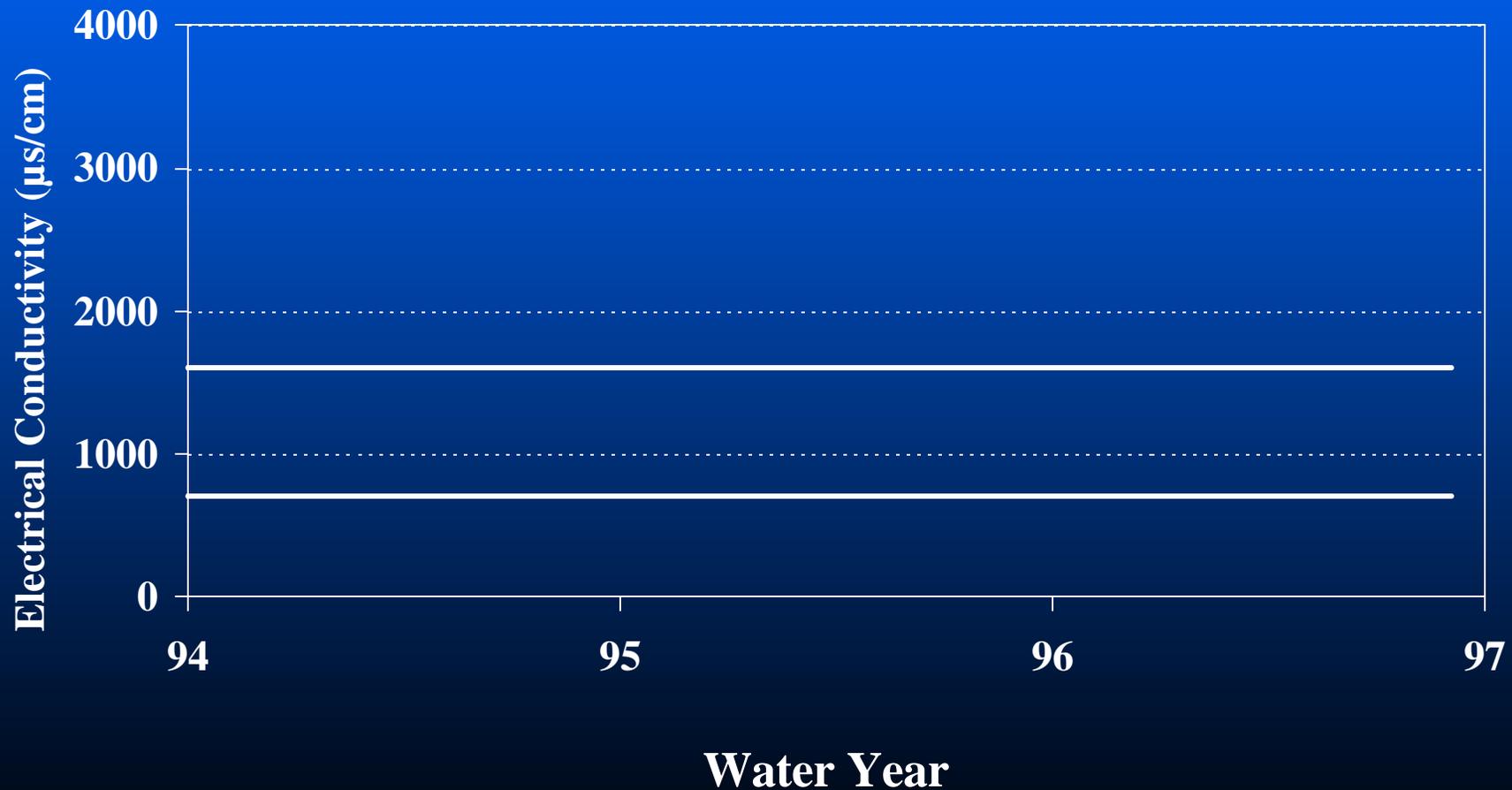
April through August **700**

September through March **1,000**

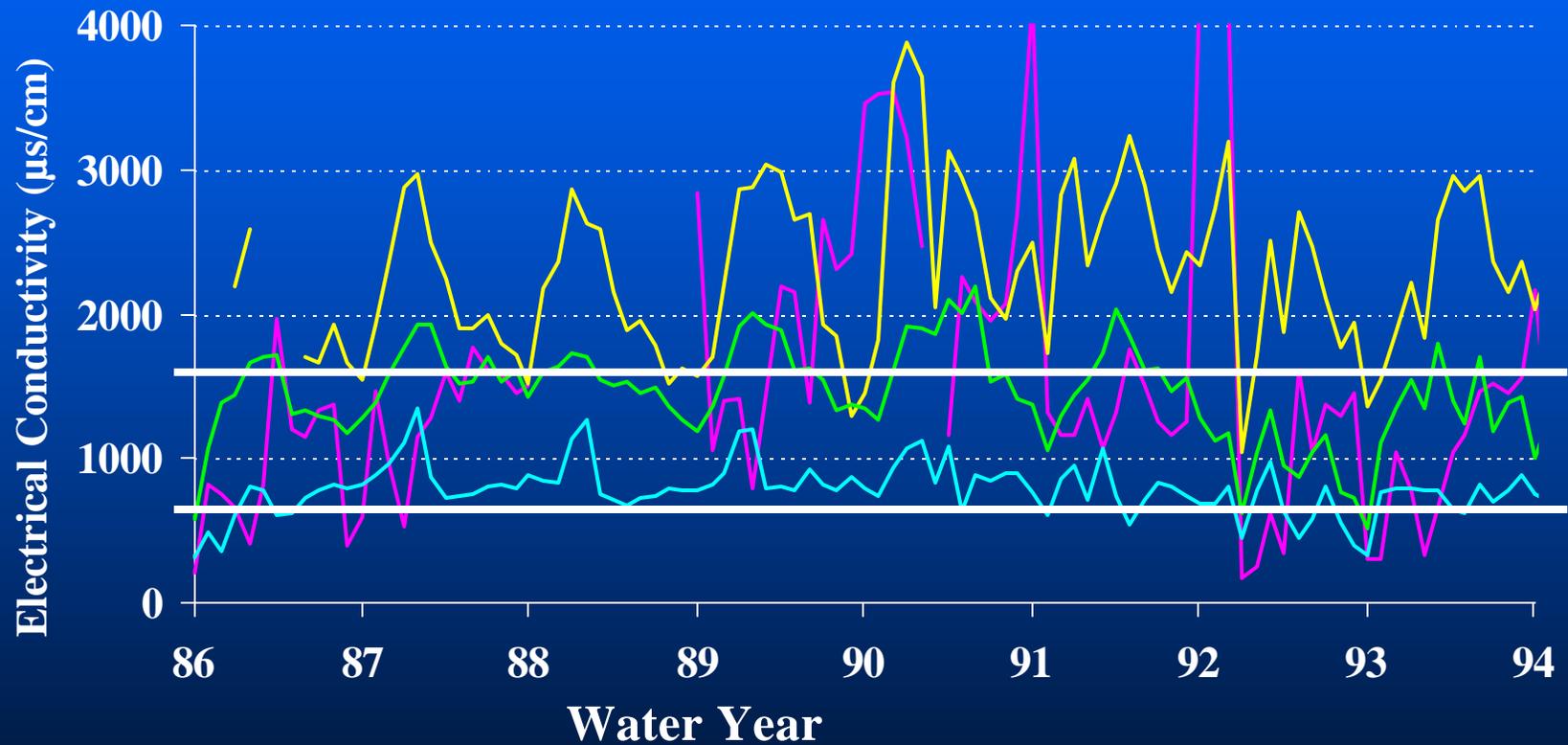
Mendota Dam to Vernalis

Year Around **1,000**

Range of Alternative Electrical Conductivity Objectives (700-1600 micromhos/cm)

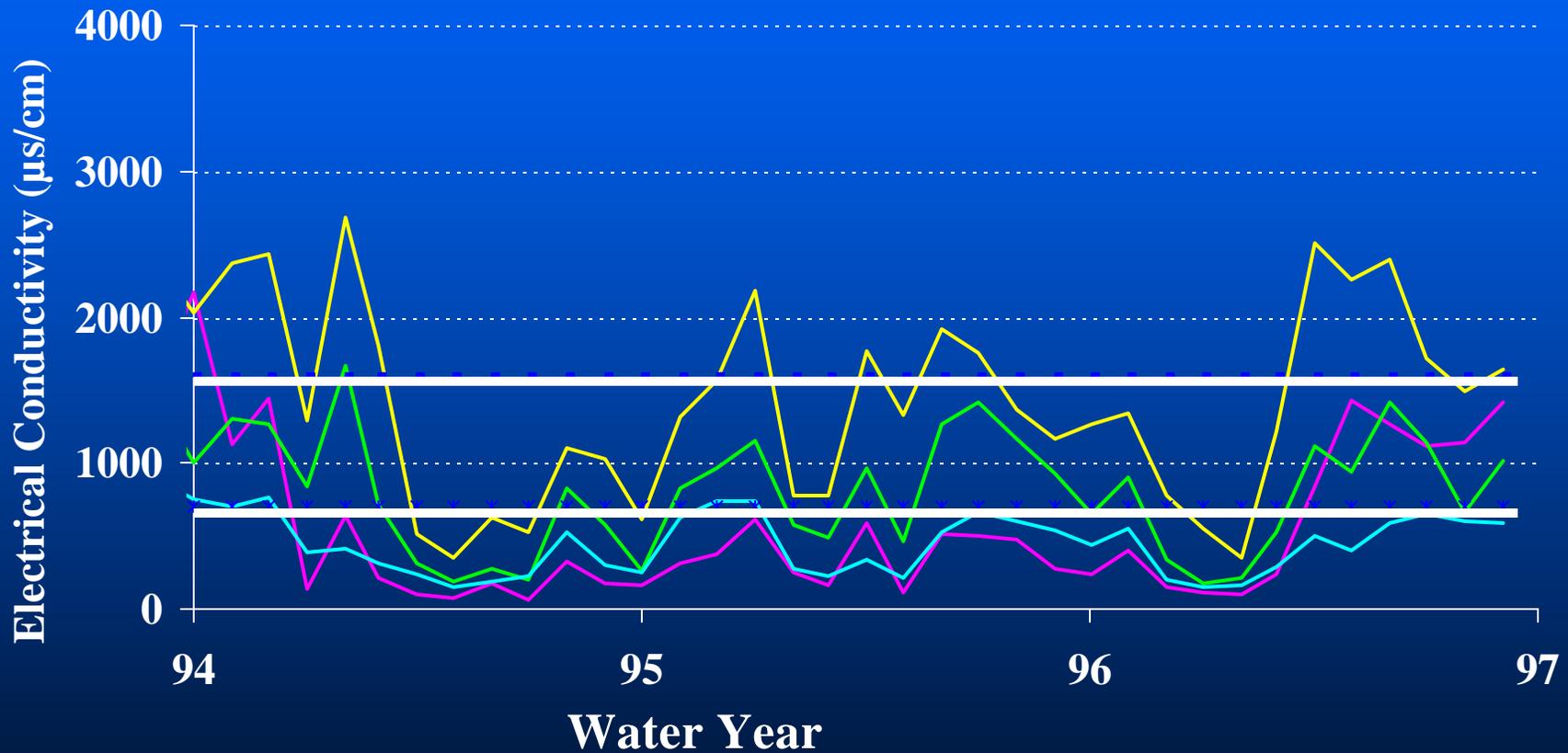


San Joaquin River Electrical Conductivity 1986-1994



— SJR @ Lander Avenue — Hills Ferry / Newman — Patterson — Vernalis

San Joaquin River Electrical Conductivity 1994-1997



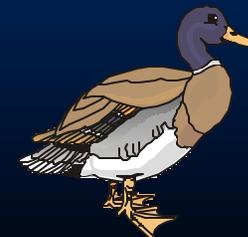
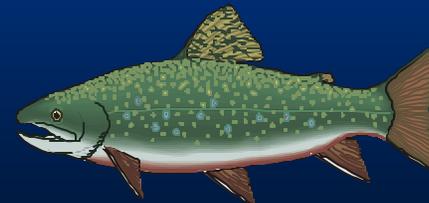
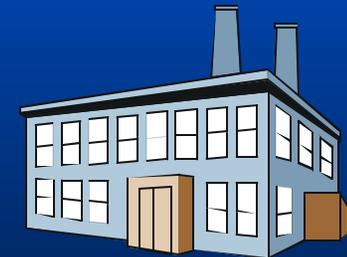
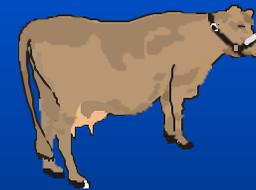
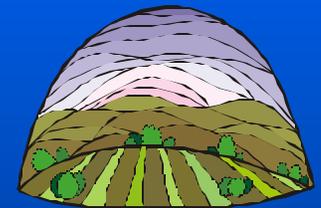
— SJR @ Lander Avenue — Hills Ferry / Newman — Patterson — Vernalis

Boron

- Element Found in Nature
- Common in the Arid Western USA
- Measured as Total Dissolved Boron, mg/L

Effects of Boron on Beneficial Uses

- Municipal and Domestic Supply
- Irrigation Water Supply
- Spawning, Reproduction, and/or Early Development
- Stock Watering
- Industrial Process Supply
- Recreation
- Freshwater Habitat
- Migration
- Wildlife



Drinking Water Boron (mg/L)



US EPA

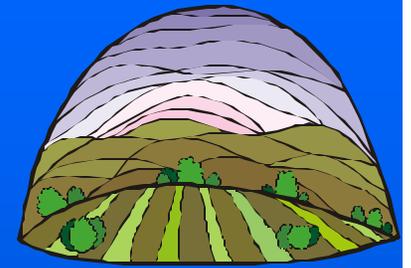
IRIS Reference Dose 0.63

SNARL 0.60

State Department of Health Services

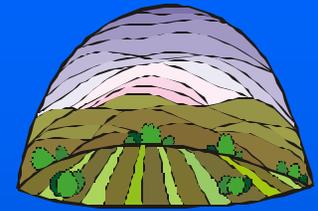
Action Level 1.0

Irrigated Agriculture Boron (mg/L)



- Very Sensitive under 0.5
- Sensitive Crops 0.5 to 1.0
- Moderately Sensitive 1.0 to 2.0
- Moderately Tolerant 2.0 to 4.0
- Tolerant 4.0 to 6.0
- Very Tolerant 6.0 to 15.0

Irrigated Agricultural Boron Sensitive Crops



Very Sensitive Crops Include:

Blackberry, Lemon

Sensitive Crops Include:

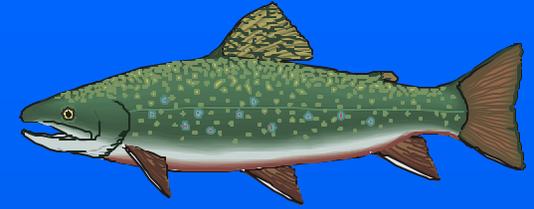
Apricot, Cherry, Grape, Walnut,
Beans, Strawberry, Wheat

Moderately Sensitive Crops Include:

Broccoli, Carrot, Lettuce, Pea, Red
Pepper, Radish

Fish

Boron (mg/L)



- Rainbow Trout (Steelhead) Embryo Development 0.75 to 1.0
- Catfish 22 to 155
- Salmon over 100

Summary of Effects on Most Sensitive Beneficial Uses

Boron (mg/L)

- Drinking Water SNARL 0.60
- Sensitive/Mod. Sensitive Crops 0.5 to 2.0
- Rainbow Trout Embryos 0.75 to 1.0

Alternative Water Quality Objectives for Boron

- No Action
- Full Protection

No Action Alternative Boron (mg/L)

<u>Location</u> Season	<u>Mean Monthly Objective</u> (mg/L)
<u>Sack Dam to Merced River:</u>	
15 March to 15 September	2.0 (or 5.8 maximum)
<u>Merced River to Vernalis</u>	
15 March to 15 September	0.8 (or 2.0 maximum)
16 September to 14 March	1.0 (or 2.6 maximum)
Critical Year / Year Around	1.3

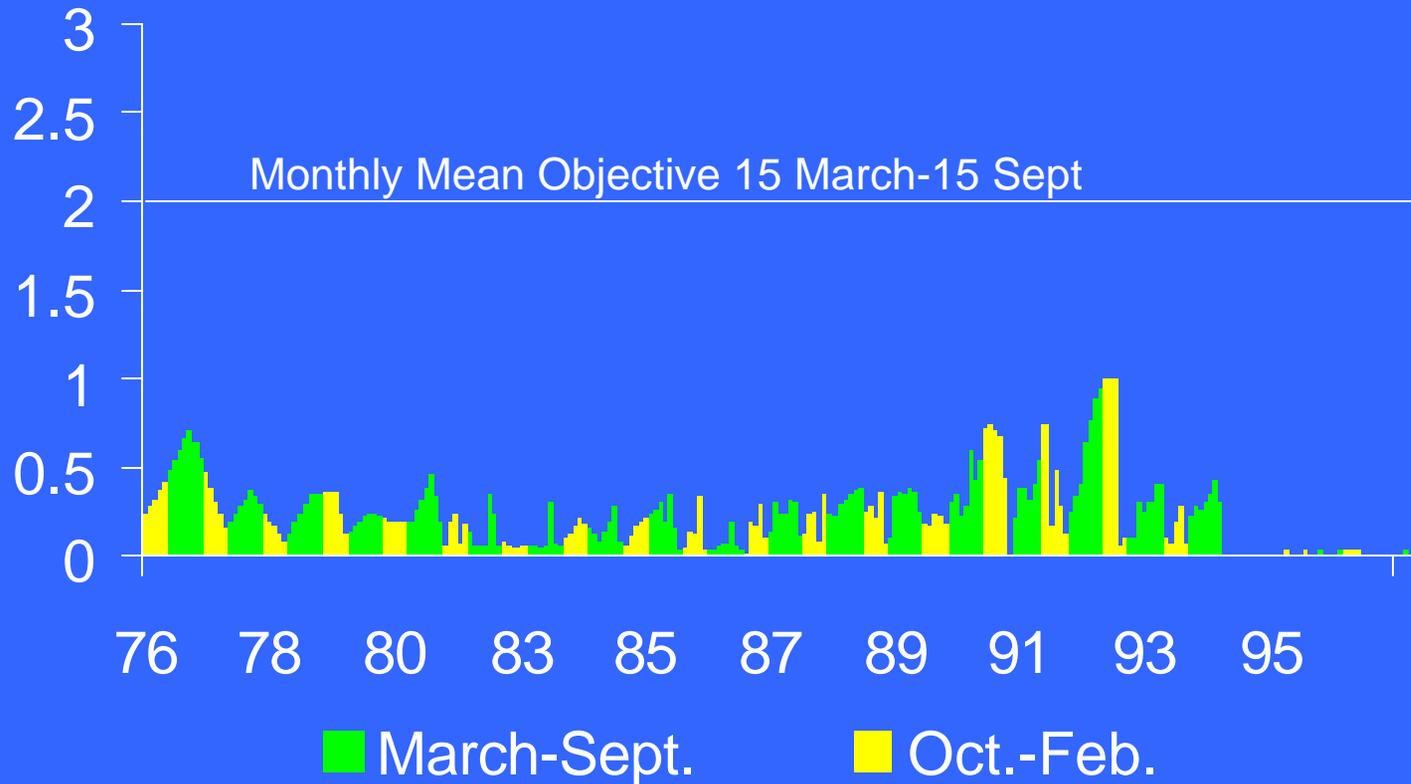
Full Protection Alternative for Boron (mg/L)

Mendota Dam to Vernalis

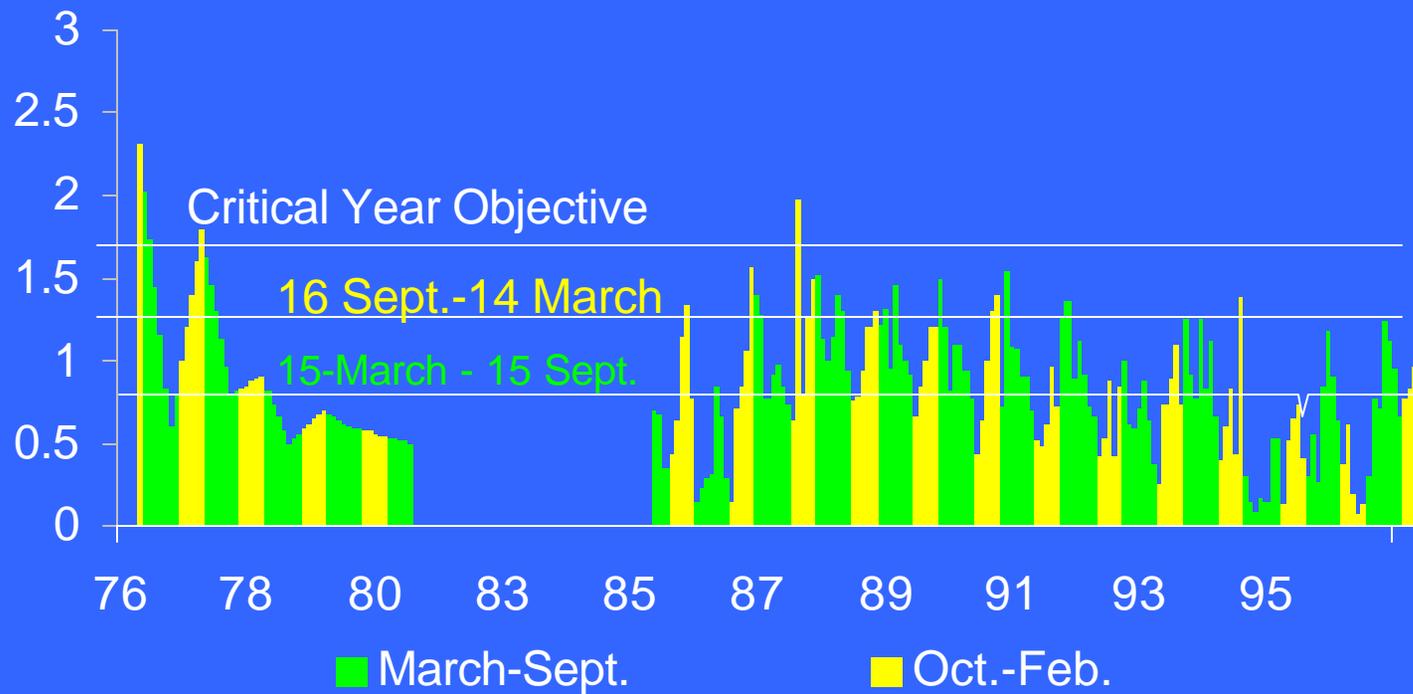
Four-Day Average
Year Around

0.6

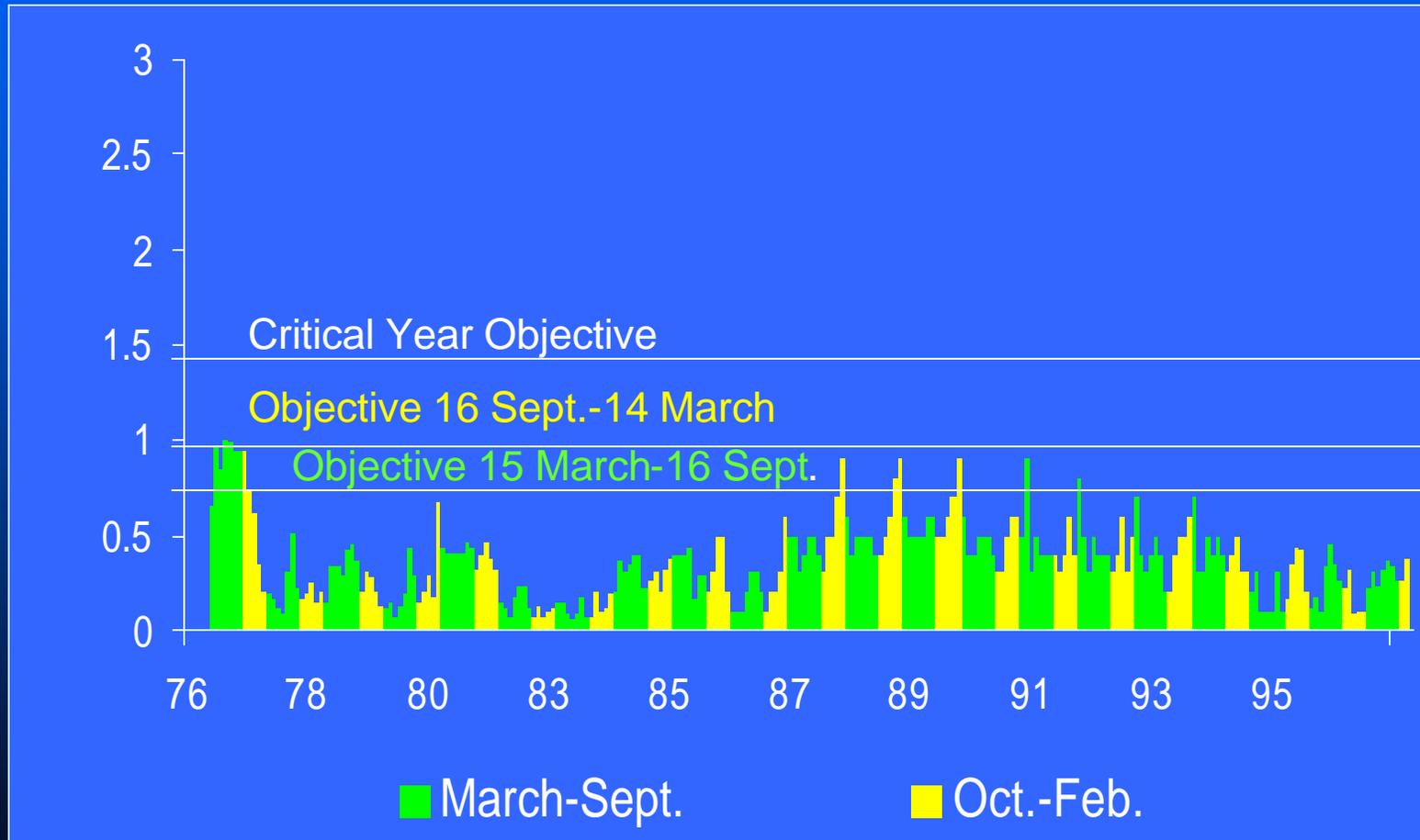
Boron No Action Alternative Lander Avenue, 1976 - 1997



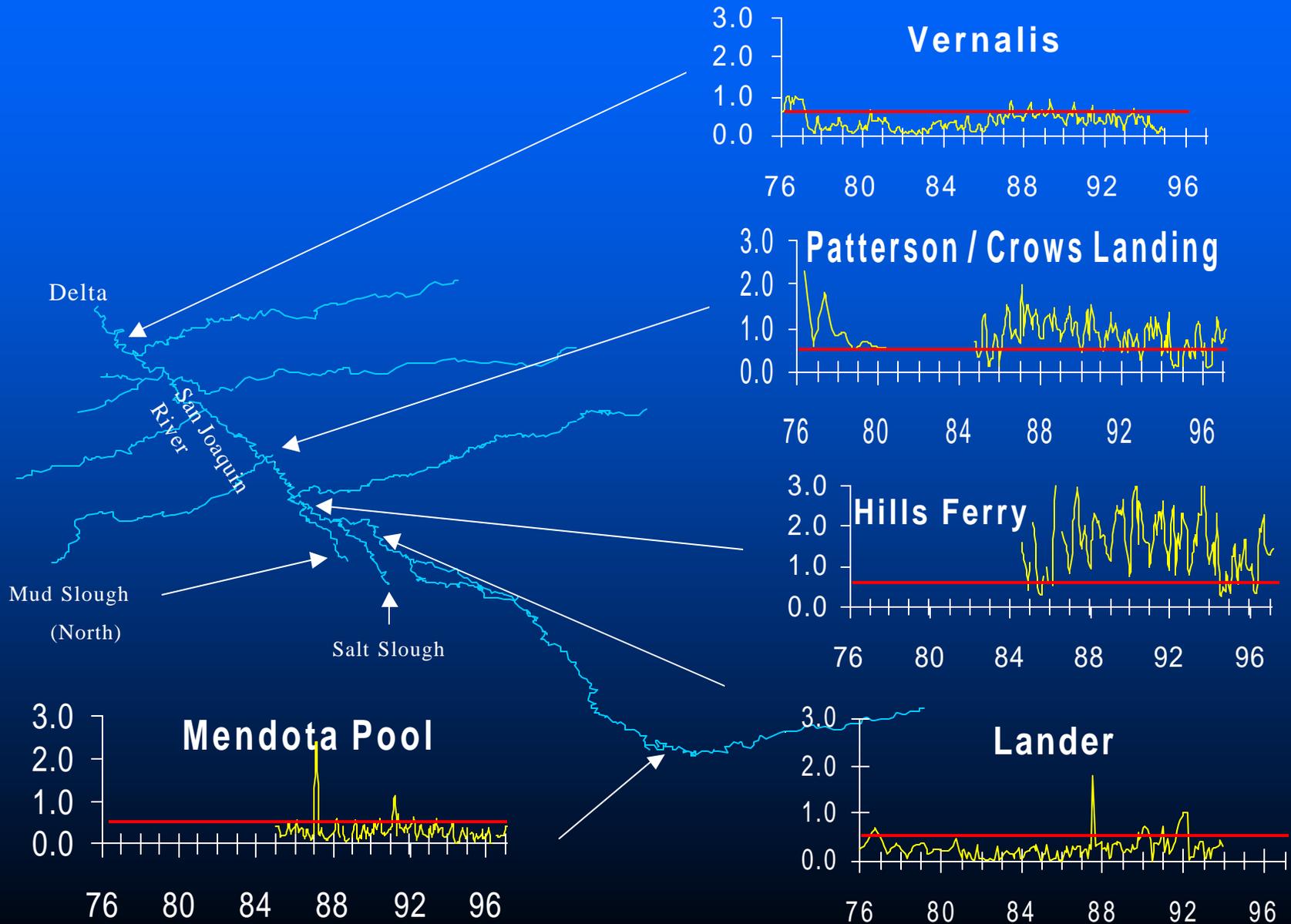
Boron No Action Alternative Patterson/Crows Landing, 1976 -1997



Boron No Action Alternative Vernalis, 1976 - 1997



Boron Full Protection Alternative



Summary of Alternatives

Salinity

- No Action
- Full Protection
- Delta Export

Boron

- No Action
- Full Protection

Flexibility of the Regional Board in Setting Objectives

- Seasonal Variations
- Vary by Sections of the River
- Water Year Considerations
- Meet State and Federal Laws and Policies

What Do We Need From You?

- Alternatives Under or Overly Protective ?
- Suggestions for Other Alternatives?
- Need Formal Comments

Questions and Comments Period

