

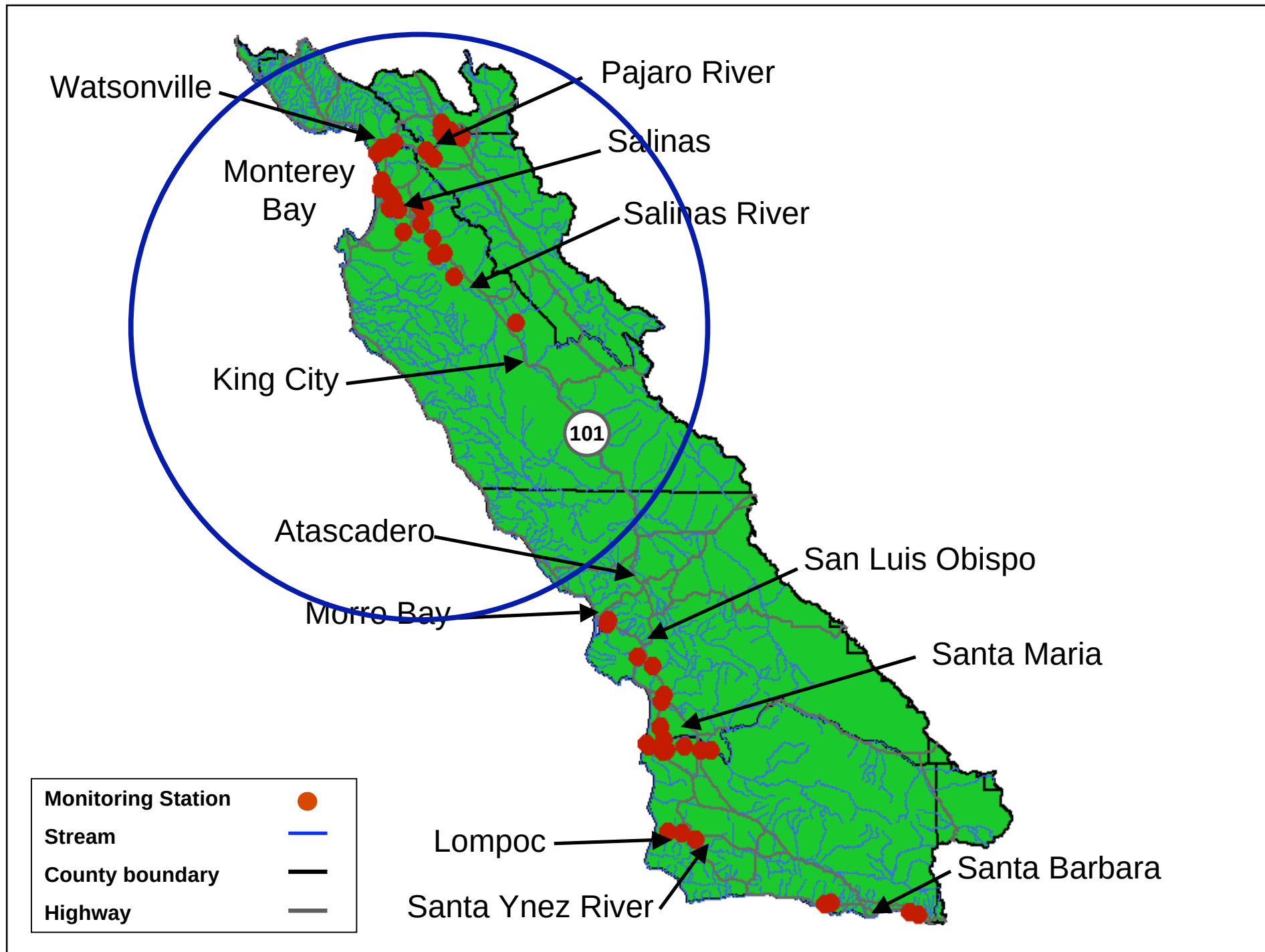
Agricultural Water Quality Central Coast of California

Monterey Bay National Marine Sanctuary Advisory Council

April 18, 2008

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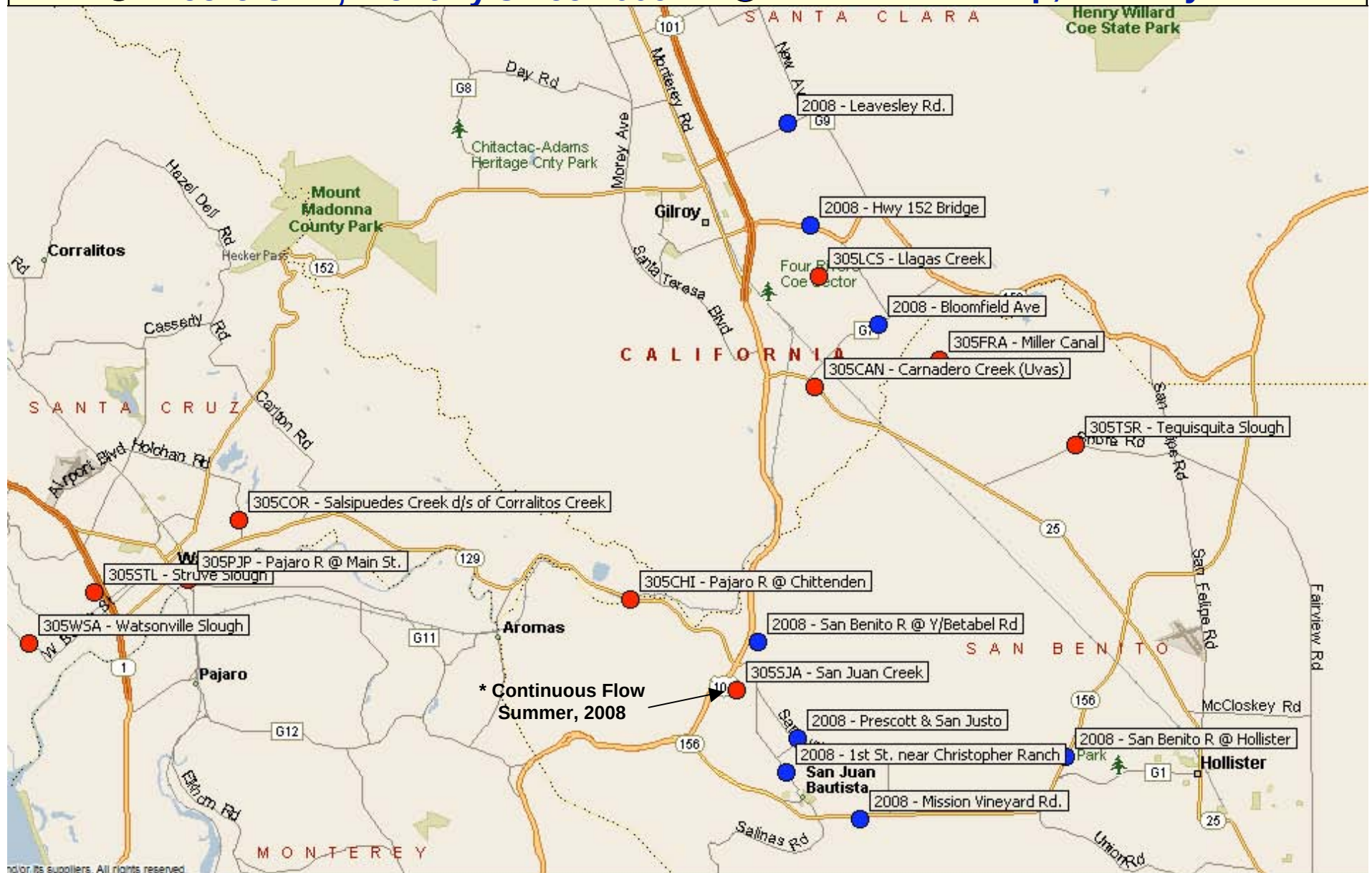


Timeline

- October, 1999: MMNMS Agriculture and Rural Lands Action Plan
 - Central Coast 6 County Farm Bureau Coalition implements
 - Voluntary programs and
 - Watershed groups
- July, 2004: First “Ag Waiver” implemented by Region 3 Water Board
 - Enrollment, Education, On Farm Management and Water Monitoring
- January, 2005: Monitoring began at 25 sites on Salinas and Santa Maria
- January, 2006: Monitoring began at 25 additional sites on the Pajaro, Santa Ynez, SLO creeks, Santa Barbara creeks
- 2006-07: Follow-up monitoring for OP pesticides at first 25 Phase I sites
- January 2008: Follow-up monitoring began at “upstream” sites in several watersheds of concern
- April 2008: Continuous monitoring of flows began in 6 watersheds of concern and watershed outreach to growers in same watersheds.

Pajaro Watershed Sites

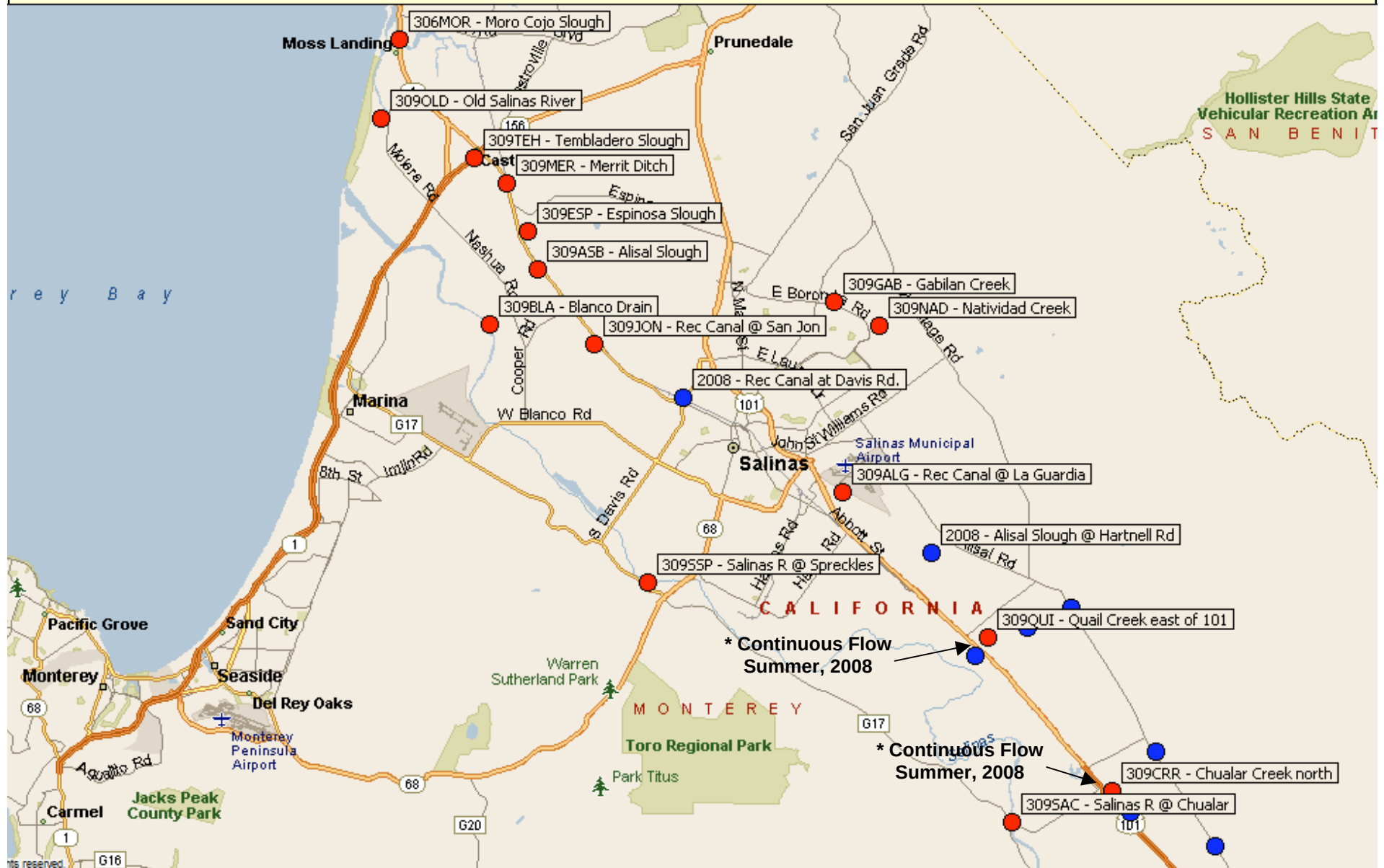
● = core CMP, monthly since 2006 ● = 2008 Follow-up, monthly in '08



Lower Salinas Watershed Sites

● = core CMP, monthly since 2005

● = 2008 Follow-up, monthly in '08





Salinas River



Blanco Drain



Warden Creek



Oso Flaco Creek



Franklin Creek

Water Quality Constituents



Hydrolab instrument

(image from www.hydrolab.com)

- Water temperature
- pH
- Dissolved Oxygen
- Conductivity
- Salinity
- Turbidity
- Chlorophyll
- Dissolved Solids



Water samples to lab

(image from www.co.water.usgs.gov)

- Nitrogen
 - Nitrate
 - Ammonia
 - Ammonium
- Phosphorus
 - Orthophosphate
- Toxicity
 - Water (4x/yr)
 - Sediment (1x/yr)
- Organophosphate pesticides
 - Lower Salinas & Santa Maria only
 - 4x only

Components of Ag Runoff

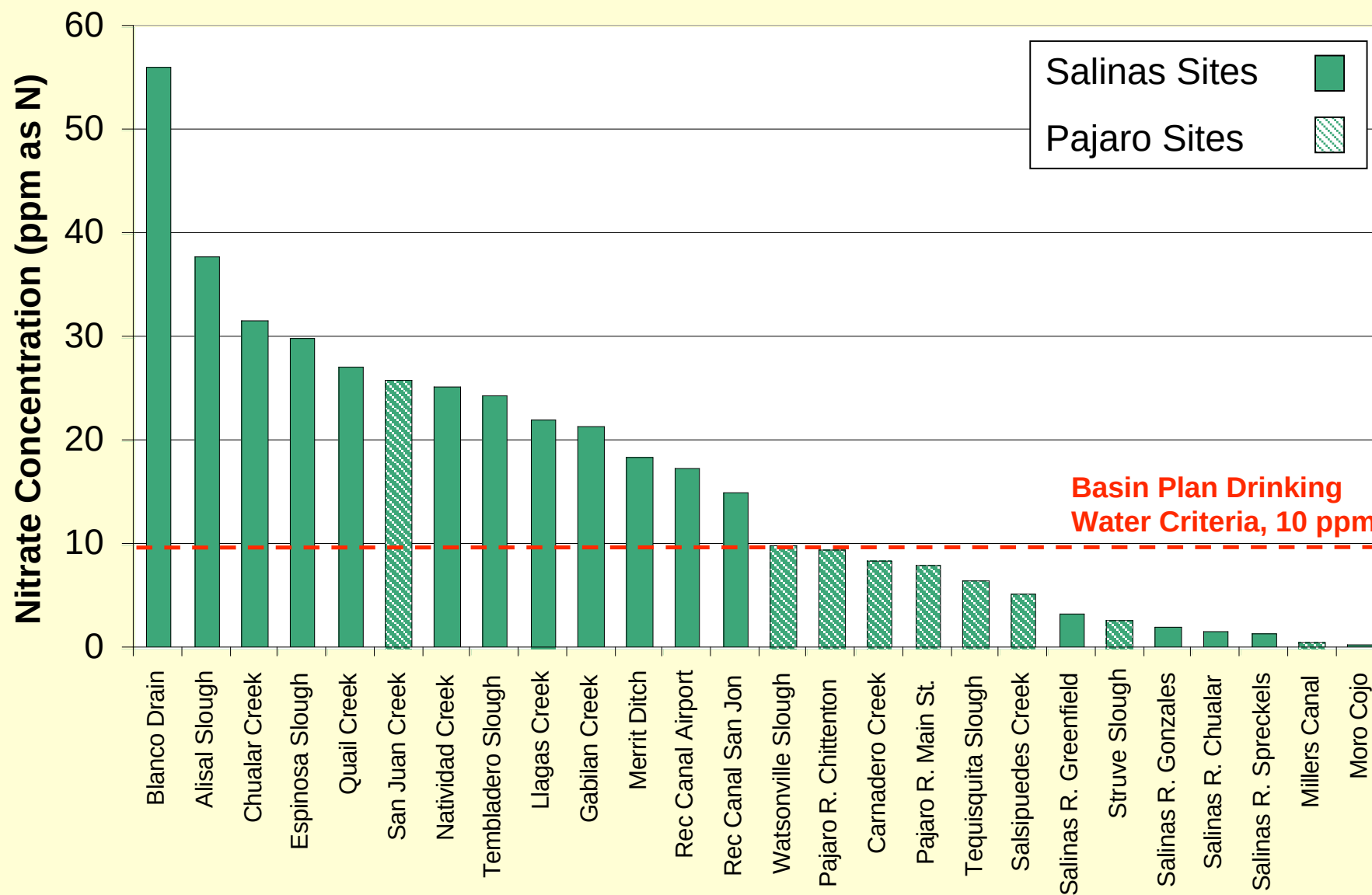
- Fertilizer (*nitrate, ammonium, phosphate*)
 - Pesticides (*toxicity*)
 - Sediment (*turbidity*)
-

Effects of Ag Runoff

- Algae growth (*Chlorophyll, % algal cover*)
- Low oxygen (*dissolved oxygen*)
- Ammonia (*calculated from ammonium & pH*)

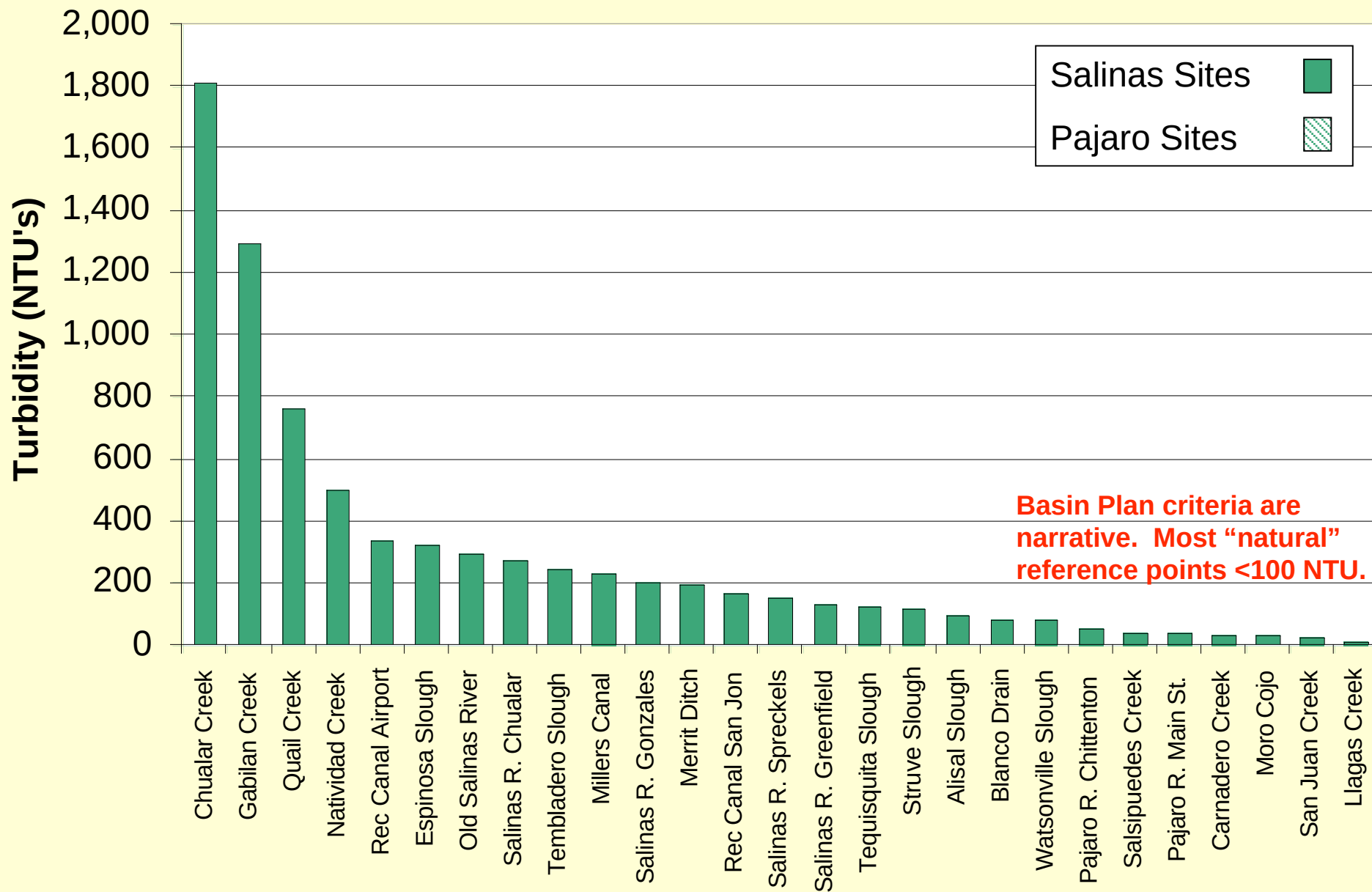
Nitrate Results for Northern Sites

(averages of all monthly samples, Jan '05 or '06 – Dec '07)



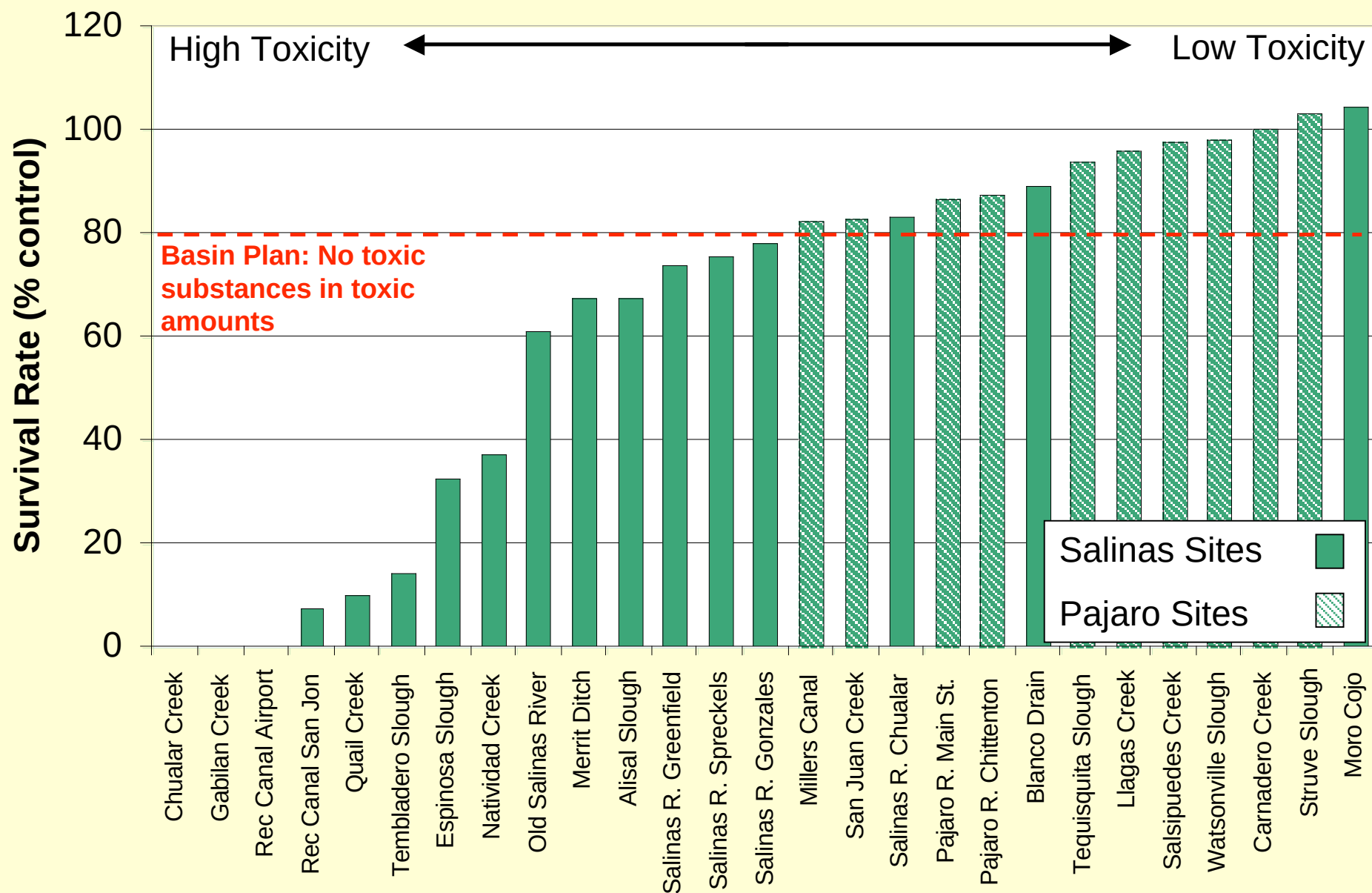
Turbidity Results for Northern Sites

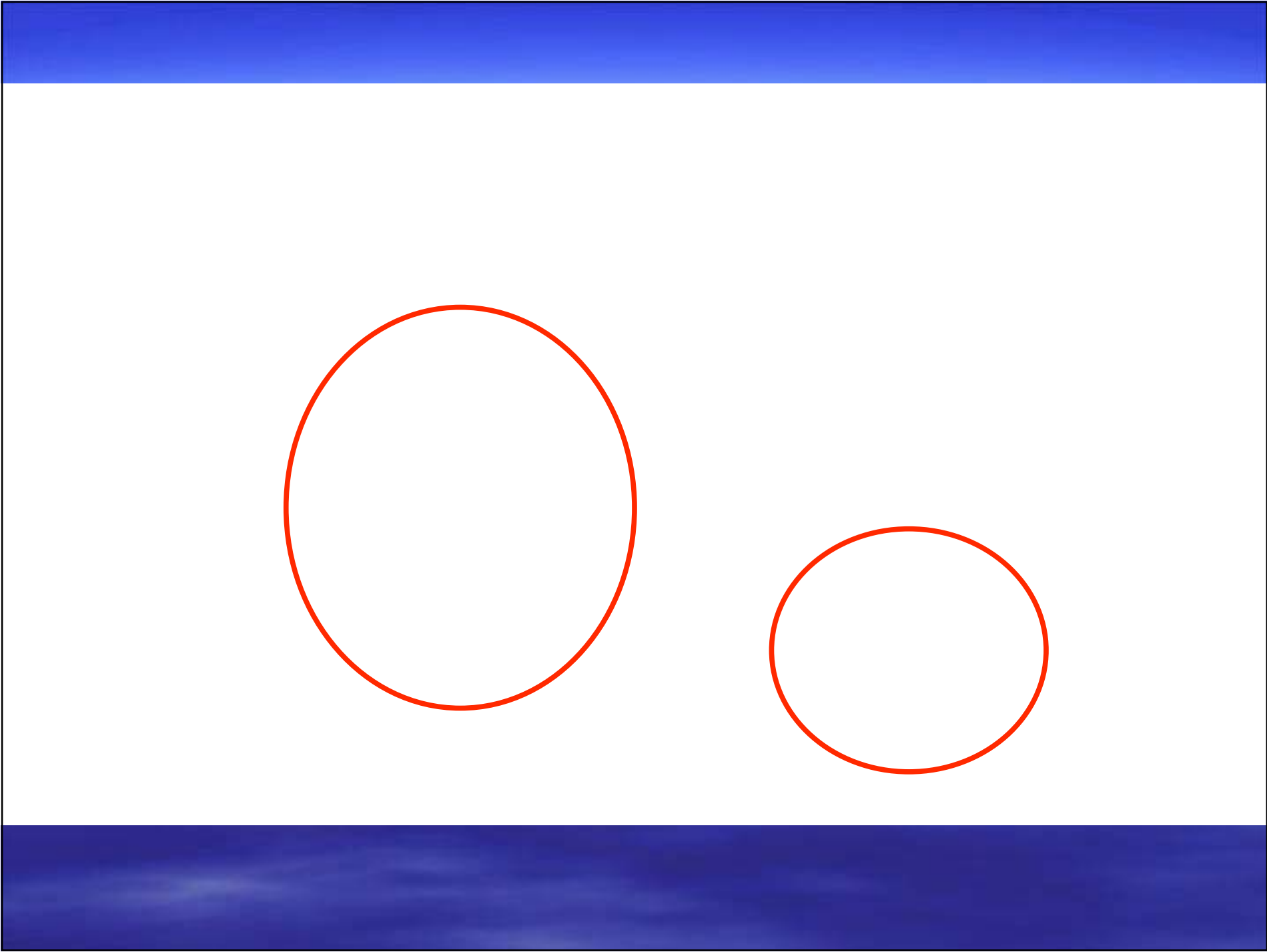
(averages of all monthly samples, Jan '05 or '06 – Dec '07)



Invert. Tox in Water Results for Northern Sites

(averages of 4x/year samples, '05 or '06 – '07)





Central Coast Water Quality Preservation

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Invert Tox/Sediment Results for Northern Sites

(averages of 1x/year samples, '05 or '06 – '07)

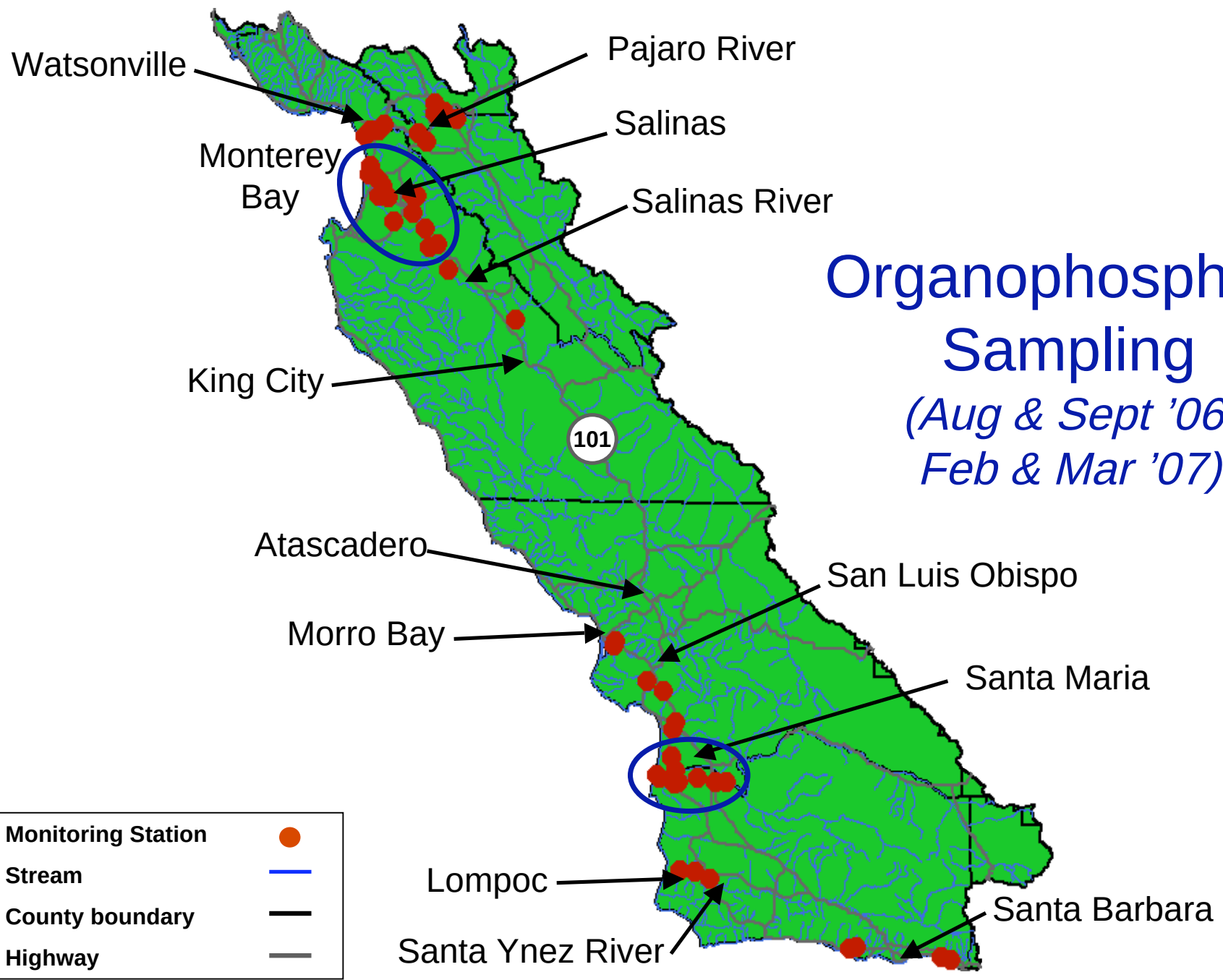
Basin Plan: No toxic
substances in toxic
amounts

Salinas Sites



Pajaro Sites





Organophosphate
Sampling
*(Aug & Sept '06;
Feb & Mar '07)*

Tested for 25 different organophosphate pesticides at Salinas & Santa Maria sites:

Demeton

Fenthion

Chlorpyrifos (Lorsban)

Disulfoton

Merphos

Diazinon

Fensulfothion

Methyl Parathion

Dichlorvos

Fenthion

Mevinphos

Dimethoate

Merphos

Phorate

Ethoprop

Methyl Parathion

Sulprofos

Fenchlorphos

Demeton

Tetrachlorvinphos

Malathion

Disulfoton

Tokuthion

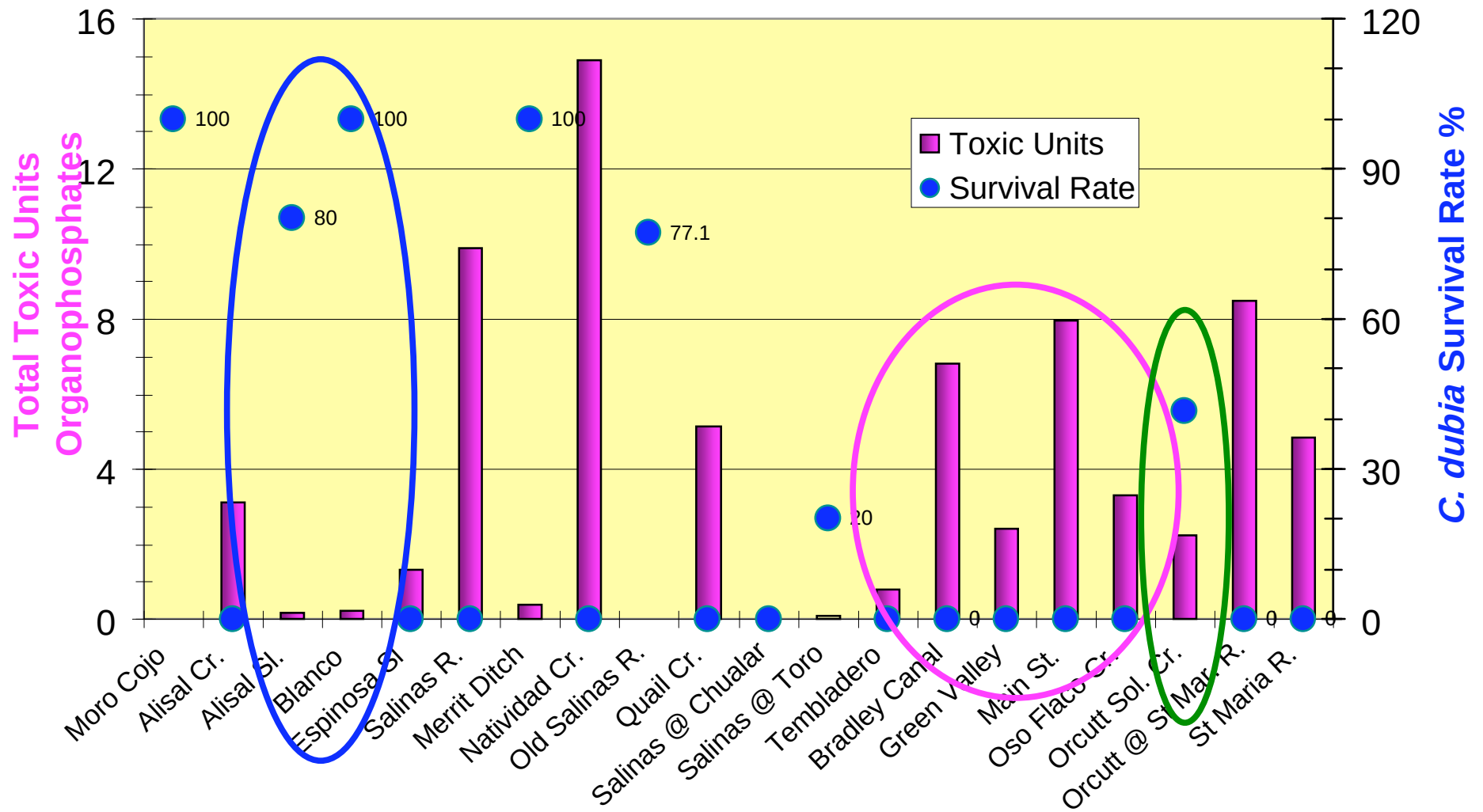
Fensulfothion

Trichloronate

Only 7 OP's detected

*Only 2 detected at
concentrations "lethal" to
aquatic invertebrates*

Survival vs. Toxicity



- “Chlorpyrifos – Toxicity” relationship?
 - Yup. Looks similar to Diazinon.
- “Chlorpyrifos+Diazinon – Toxicity” relationship?
 - How to talk about more than 1 “toxin” at a time?
- “Toxic Units” seem useful, but we didn’t measure all potential “toxins”... only OP’s
 - “OP-related Toxic Units”
 - LC50 = “median lethal concentration” (for *Ceriodaphnia*)
- Examples:
 - Diazinon, 1x its LC50 = 1 OP-related TU
 - Diazinon, 1x its LC50 + Chlorpyrifos at 2x its LC50 = 3 OP-related TU’s

Measured as concentration, nitrate levels are very high at sites where we directly measure ag runoff (like Chualar Creek), compared to sites where any runoff is diluted by a large river (like Greenfield & Gonzales)

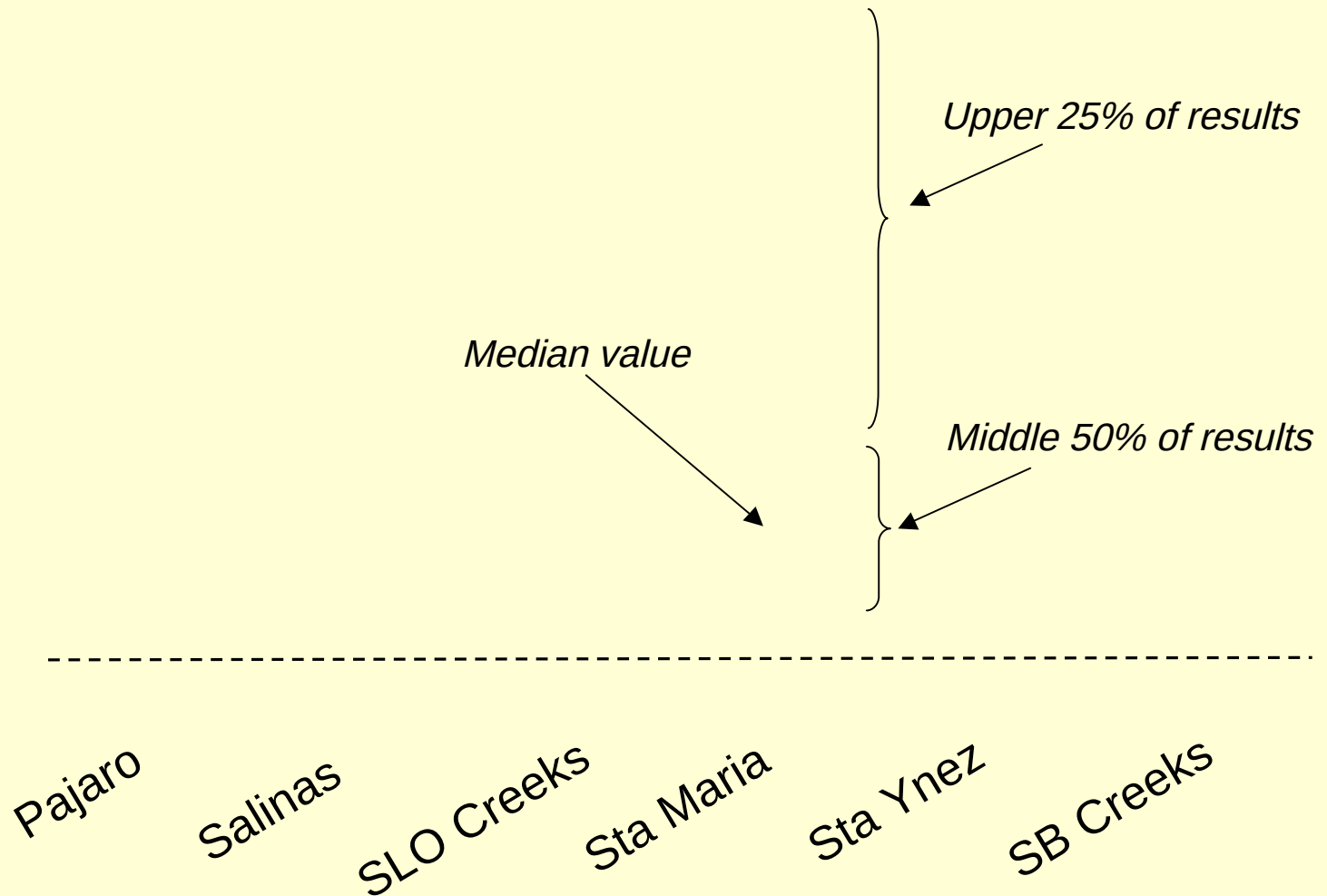


Flows

(Flows for Greenfield & Gonzales are divided by 100)

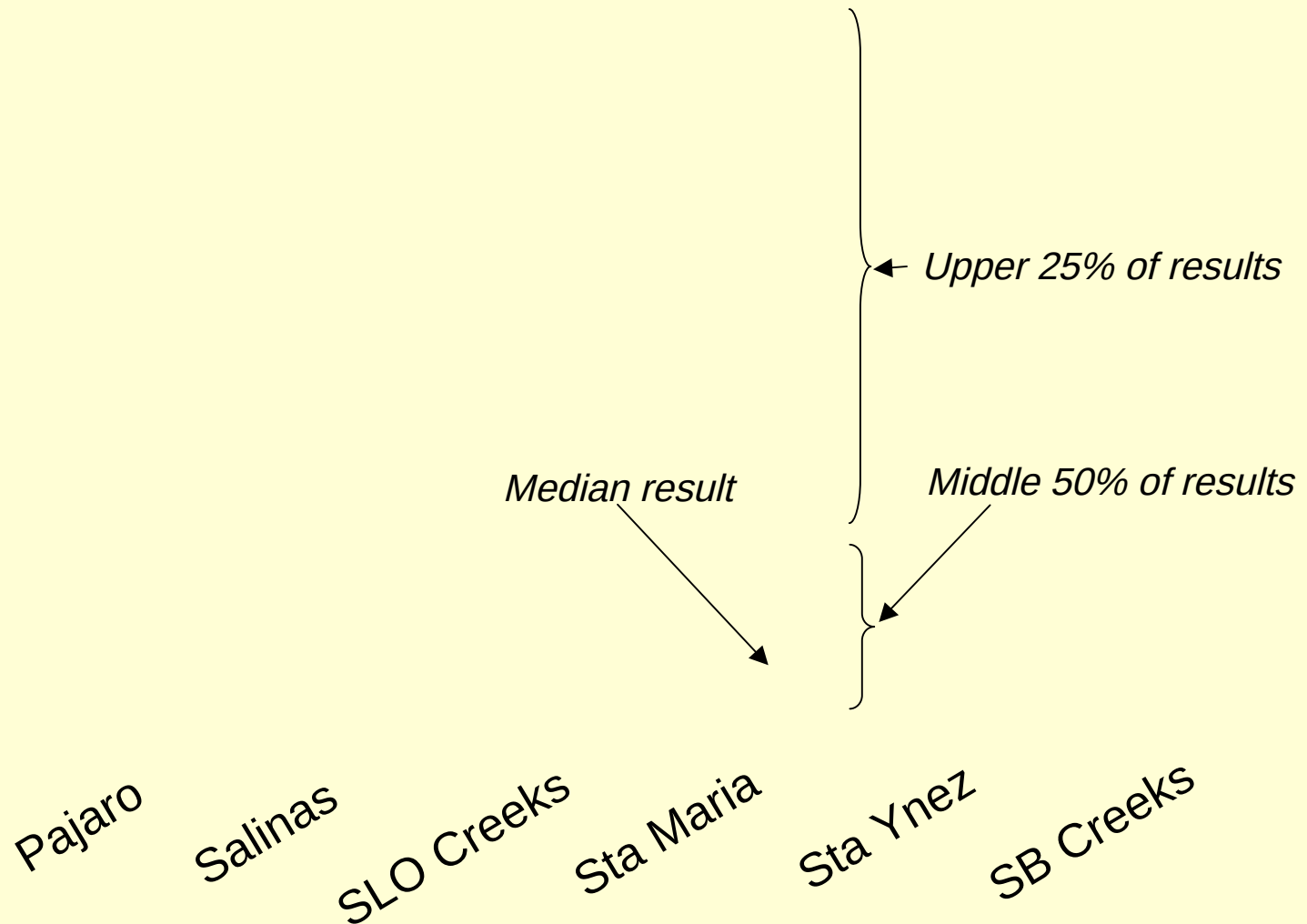
Nitrate Results by Region

*(each “box & whisker” represents all results from
Jan '05 or '06, through Sept '07)*



Turbidity Results by Region

(each "box & whisker" represents all results from Jan '05 or '06, through Sept '07)



Toxicity to Invertebrates in Water by Region

(each "box & whisker" represents all results from Jan '05 or '06, through Sept '07)

Pajaro
Sal. River
Sal. Creeks
SLO Creeks
Sta Maria
Sta Ynez
SB Creeks