

San Joaquin River Water Quality Issues

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Topics

- Summary of San Joaquin River Water Quality Issues
- Constituents of Concern & Water Quality Impacts

Reference as: Lee, G. F., and Jones-Lee, A., "San Joaquin River Water Quality Issues," Invited Paper Presented at Great Valley Conference, "At the Tipping Point," Sacramento, CA, Sponsored by Great Valley Center, Modesto, CA, May 11 (2006).

Acronyms/Definitions

- CALFED California Federal Bay-Delta 303(d) Section of CWA
- CTR California Toxics Rule
- CVP Central Valley Project (Federal Project)
- CVRWQCB CA Central Valley Regional Water Quality Control Board
- CWA Clean Water Act
- DDT Dichlorodiphenyltrichloroethane (a legacy pesticide)
- DMC Delta Mendota Canal
- DO Dissolved Oxygen
- DOC Dissolved Organic Carbon
- DWR CA Department of Water Resources
- DWSC Deep Water Ship Channel
- EC Electrical Conductivity
- HOR Head of Old River
- IEP Interagency Ecological Program
- N Nitrogen
- OCIs Organochlorines including organochlorine legacy pesticides (DDT, chlordane, dieldrin, toxaphene), PCBs, dioxins/furans
- OP Organophosphorus Pesticide

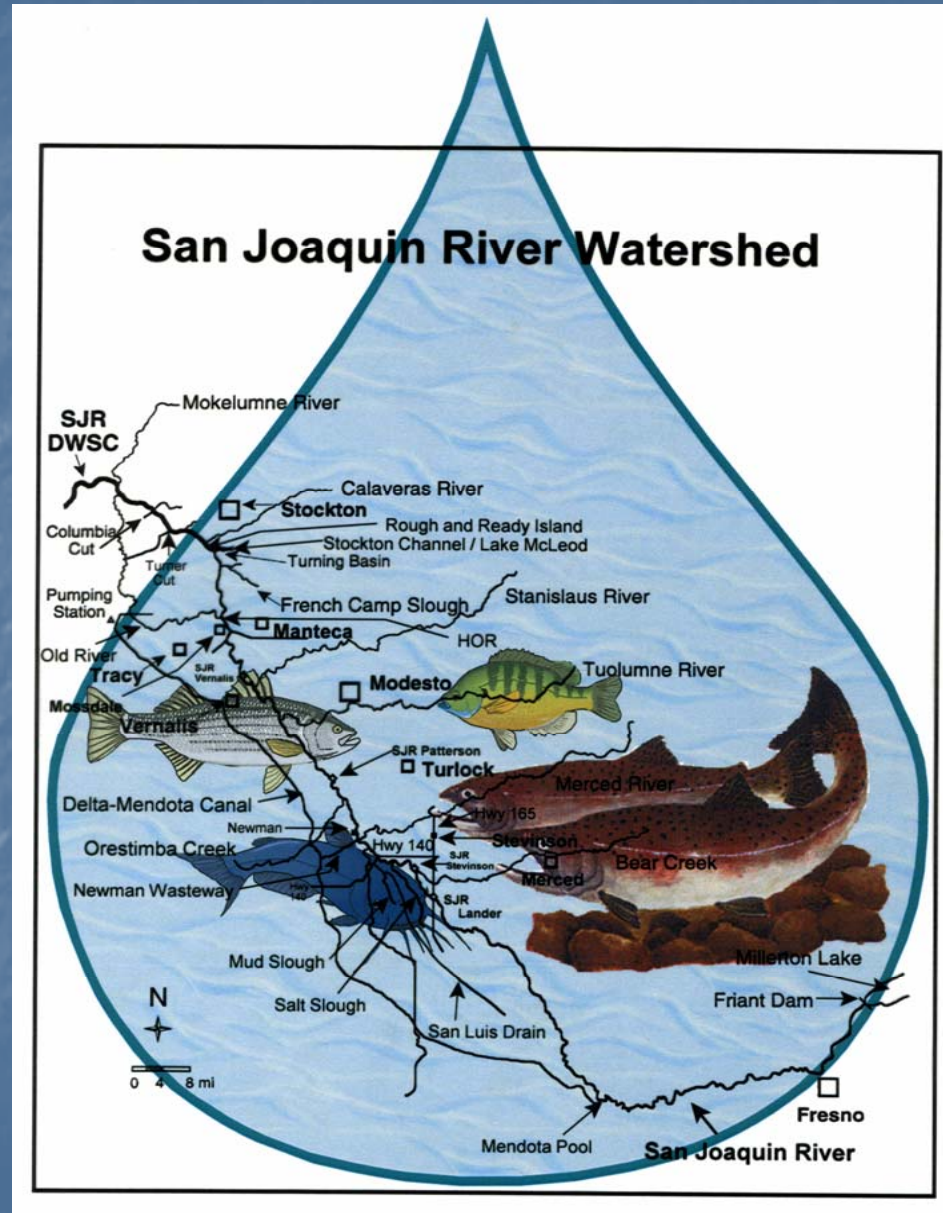
Acronyms/Definitions

- PAHs Polynuclear Aromatic Hydrocarbons
- PBDEs Polybrominated Diphenyl Ethers
- PCBs Polychlorinated Biphenyls
- PPCPs Pharmaceuticals and Personal Care Products
- SDIP South Delta Improvement Program
- SJR San Joaquin River
- SQO Sediment Quality Objective
- SWP State Water Project (State Project)
- SWRCB State Water Resources Control Board
- TDS Total Dissolved Solids
- THMs Trihalomethanes
- TIEs Toxicity Identification Evaluations
- TMDL Total Maximum Daily Load
- TOC Total Organic Carbon
- TUC Toxicity of Unknown Cause
- USBR US Bureau of Reclamation
- US EPA US Environmental Protection Agency
- VAMP Vernalis Adaptive Management Plan
- WQO Water Quality Objective

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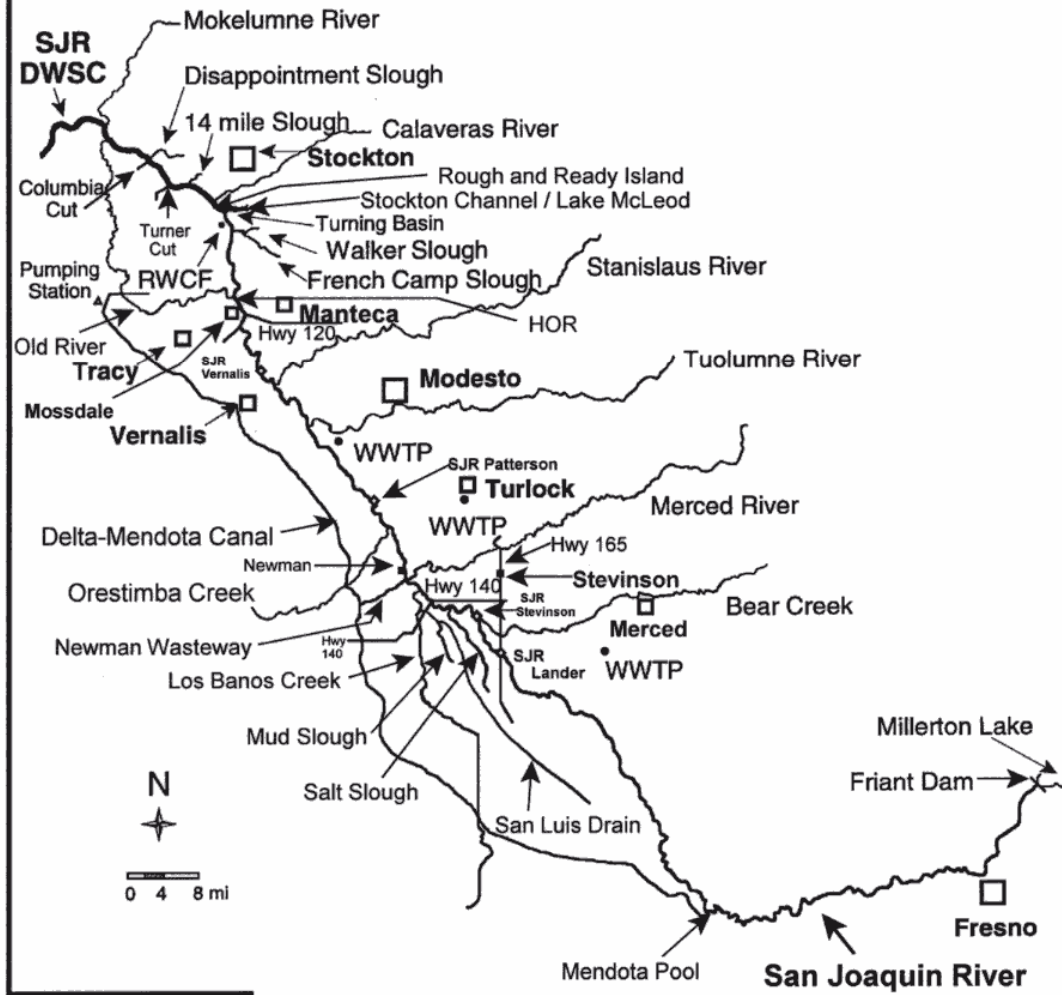
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Background to Developing SJR Water Quality Issues Report

- Involved in Delta Water Quality Issues since 1989
- Involved in SJR Water Quality Issues since 1999
 - Technical Advisor to SJR DO TMDL Steering Committee
 - Coordinating PI for CALFED-Supported \$2-million Study of SJR DWSC Low-DO Problem
- Developed Numerous Papers & Reports Discussing Issues, including:
 - Lee, G. F. & Jones-Lee, A., “[Synthesis and Discussion of Findings on the Causes and Factors Influencing Low DO in the San Joaquin River Deep Water Ship Channel near Stockton, CA: Including 2002 Data](#),” Report Submitted to SJR DO TMDL Steering Committee and CALFED Bay-Delta Program, G. Fred Lee & Associates, El Macero, CA, March (2003).
 - Lee, G. F. & Jones-Lee, A., “[Supplement to Synthesis Report on the Low-DO Problem in the SJR DWSC](#),” Report of G. Fred Lee & Associates, El Macero, CA, June (2004).
<http://www.members.aol.com/duklee2307/SynthRptSupp.pdf>
 - Lee, G. F. & Jones-Lee, A., “[San Joaquin River Water Quality Issues](#),” Preliminary draft Report of G. Fred Lee & Associates, El Macero, CA, February (2006).
<http://www.members.aol.com/annejlee/SJR-WQIssuesPrelimDraft.pdf>
 - See also www.gfredlee.com *Watershed Studies, San Joaquin River Watershed Delta*

San Joaquin River Deep Water Ship Channel Watershed



(Jones-Lee, 2005)

Map of Delta

(CA Dept Fish & Game, 2005)



Chemical Analysis Output as Basis for Evaluation of SJR Water Quality Issues

- 1972 Federal “Clean Water Act” Requires That Each State
 - Establish Water Quality Standards to Protect the Designated Beneficial Uses of State’s Waters
 - Designate the Beneficial Uses of Waterbodies
 - Determine If Its Waterbodies Have Violations of Water Quality Standards
 - List Those Waterbodies with Violations of Water Quality Standards as CWA 303(d) “Impaired”
 - Develop Total Maximum Daily Loads (TMDLs) for All 303(d) Impaired Waterbodies
- Examine Current, Pending, Potential TMDLs for the SJR

Summary of SJR Water Quality Issues

◀ Current (Active) SJR Watershed TMDLs ▶

- **Selenium**
 - Source: Agricultural Drainage
 - Concern: Aquatic Life and Water Fowl
- **Salinity** at Vernalis, Total Dissolved Solids (TDS), Electrical Conductivity (EC)
 - Source: Agricultural Drainage & Other Sources
 - Concern: Adverse to Agriculture & Domestic Water Supplies
- **Boron**
 - Source: Agricultural Runoff/Drainage
 - Concern: Adverse to Agriculture
- **Organophosphorus (OP) Pesticides** (Diazinon, Chlorpyrifos)
 - Source: Agricultural Runoff
 - Concern: Toxic to Aquatic Life
- **Oxygen-Demanding Substances** (BOD/Algae, Ammonia, Organic N)
 - Source: Agricultural Drainage/Runoff
 - Concern: Low DO in DWSC & South Delta; Adverse to Aquatic Life

Summary of SJR Water Quality Issues

◀ Pending TMDLs (to Be Developed) ▶

■ Mercury

- Source: Former Gold & Mercury Mining Activities
- Concern: Bioaccumulation in Edible Fish
Neurotoxin to Fetuses & Young Children
Sulfate Impacts Bioaccumulation of Mercury

■ Organochlorine “Legacy” Pesticides (e.g., DDT, Chlordane, Dieldrin, Toxaphene)

- Source: Agricultural Drainage/Runoff
- Concern: Excessive Bioaccumulation in Edible Fish – Cancer in Humans

■ PCBs - Industrial Chemicals

- Source: Industrial Discharges
- Concern: Excessive Bioaccumulation in Edible Fish – Cancer in Humans

■ Dioxins/Furans

- Source: Industrial Chemicals; Combustion Byproduct
- Concern: Excessive Bioaccumulation in Edible Fish – Cancer in Humans

Summary of SJR Water Quality Issues

◀ Pending TMDLs (to Be Developed) ▶

- **Pathogen-Indicator Organisms** (*E. coli*, Fecal Coliforms)
 - Source: Agricultural & Urban Runoff/Discharges
 - Concern: Diseases (Contracted from Contact Recreation - Swimming)
Drinking Water Quality
- **Toxicity of Unknown Cause**
 - Source/Cause: Unknown
 - Concern: Adverse to Aquatic Life
- **Salinity** Upstream of Vernalis
 - Source: Agricultural Drainage/Runoff
 - Concern: Adverse to Agriculture & Domestic Water Supplies

Summary of SJR Water Quality Issues

◀ Potential Future TMDLs (to Be Evaluated) ▶

Based on Water Quality Problems in SJR, Delta & Downstream, Need Water Quality Objectives for Some Potential Problems

- **Nutrients** – Excessive Fertilization (Nitrogen and Phosphorus Compounds)
 - Source: Agricultural & Urban Drainage & Discharges
 - Concern: High pH, Low DO (Associated with Photosynthesis/Respiration)
 - Impair Recreation, Domestic Water Supplies
- **Alternative Pesticides** to OP Pesticides (Including Pyrethroid-Based Pesticides)
 - Source: Agricultural & Urban Drainage & Discharges
 - Concern: Causing Toxicity to Aquatic Life; Watercolumn & Sediment Toxicity
- **PBDEs** - Fire Retardants
 - Source: Urban Sources - Wastewaters & Stormwater Runoff
 - Concern: Excessive Bioaccumulation in Edible Fish – Cancer in Humans
- **Total Organic Carbon** & Other Chemicals That Develop into Disinfection Byproducts (Trihalomethanes) in Treated Domestic Water Supplies (e.g., **Bromide**)
 - Source: Agricultural, Wetland & Urban Drainage/Discharge
 - Concern: Cancer in People Who Use Treated Domestic Water Supplies

Summary of SJR Water Quality Issues

◀ Potential Future TMDLs (to Be Evaluated) ▶

- **Excessive Sediment, Erosion, Turbidity**
 - Source: Erosion from Agricultural Lands
 - Concern: Shoaling Water Depth
Adverse to Light Penetration
- **Herbicides**
 - Source: Agricultural & Roadside Drainage/Runoff
 - Concern: Toxicity to Algae & Other Aquatic Plants
- **Aquatic Sediment Toxicity** (Pesticides, Nutrients/Algae/Sediment Ammonia, Heavy Metals, PAHs and other Chemicals)
 - Source: Agricultural & Urban Discharges/Runoff
 - Concern: Toxicity to Aquatic Organisms; Human Health Effects
- **Unrecognized Pollutants** (Pharmaceuticals & Other Unregulated Chemicals Discharged by Confined Animal Facilities (e.g., Dairies, Feedlots) & Domestic Wastewaters)
 - Source: Agricultural & Urban Wastewater Discharges
 - Concern: Toxicity / Sublethal Impacts on Aquatic Life
Human Health Effects

Typical Environmental Sample Analysis

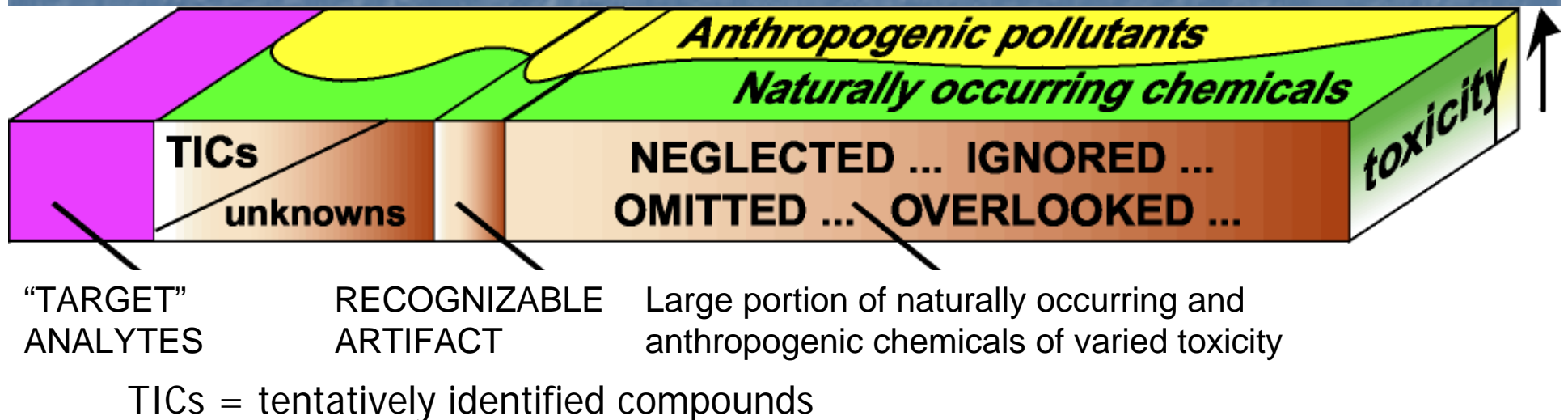


Figure from: Daughton, C. C., “The Critical Role of Analytical Chemistry,” July (2002)

<http://www.epa.gov/nerlesd1/chemistry/pharma/critical.htm>

Impact of Water Diversions & Agricultural Discharges on SJR Water Quality

- Diversions of Water for Agricultural & Domestic Supply Drastically Reduce SJR Flow
 - Less Dilution of Pollutants from Agricultural & Urban Discharge
- Court-Ordered Releases of Water from Friant Dam to SJR Channel
 - Could Have Significant Beneficial Impact on Water Quality in SJR & Delta
 - Could Significantly Reduce Cost of Managing Currently Known & Potential Water Quality Problems in SJR
 - To Optimize Benefit of Friant Releases for SJR & Delta Water Quality
 - Need Adequate Water Release
 - Allow Released Water to Pass through SJR to at Least Turner Cut in DWSC

Conclusions

- **SJR**, Many of Its Tributaries & Parts of Delta That Receive SJR Water – Highly **Impacted By Known Pollutants** from
 - Irrigated Agriculture
 - Other Agricultural Activities Involving Animal Husbandry
 - Public Wetlands, Wildlife Refuges, Private Gun Clubs
 - Urban Stormwater & Wastewater Discharges
- **SWRCB Water Rights Decisions** That Allow Water Diversion/Exports Exacerbate Adverse Impacts on Beneficial Uses of Waters of SJR & Delta
- **Inadequate State & Federal Funding** Hampers Ability of CVRWQCB to Address These Water Quality Problems

Overall

- Need to Develop Focused, Large-Scale Water Quality Monitoring/Evaluation Management Program to
 - Address Known Water Quality Impairments
 - Identify Water Quality Impairments Not Yet Recognized
 - Provide CVRWQCB Technical Basis to Restore Beneficial Uses of SJR, Its Tributaries & Delta
- Funds to Conduct Program Should Be Derived from
 - All Who Discharge Wastewaters & Stormwater Runoff to SJR, Its Tributaries, Including Irrigated Agriculture
 - All Who Derive Benefits from Using SJR Watershed Waters
- Meeting TMDL Requirements Will Require Significant Changes in Agricultural Practices & Urban Stormwater Wastewater Management in SJR & Delta Watersheds

Further Information
Consult Website of
Drs. G. Fred Lee and Anne Jones-Lee



<http://www.gfredlee.com>