**Experience in Reviewing Delta Water Quality Issues**

G. Fred Lee and Anne Jones-Lee

April 3, 2011

Drs. G. Fred Lee and Anne Jones-Lee began work as consultants on Delta water quality issues in 1989 reviewing the water quality that would occur in the Delta Wetlands, Inc. proposed Delta island water supply reservoirs. At that time Drs. Lee and Jones-Lee held graduate faculty positions at the New Jersey Institute of Technology (NJIT) where they taught and conducted research on various aspects of the impacts of chemicals on water quality. At NJIT Dr. Lee held the position of Distinguished Professor of Civil and Environmental Engineering and director of the Site Assessment and Remediation Division of the multi-university Hazardous Waste Research Center. He has spent five decades applying his professional expertise in environmental engineering, aquatic chemistry, and water quality/public health with considerable expertise in domestic water supply water quality investigating and solving water quality problems. Dr. Jones-Lee held the tenured position of Associate Professor of Civil and Environmental Engineering at NJIT. Her professional expertise is in aquatic biology/toxicology.

In their Delta Wetlands project, Drs. Lee and Jones-Lee used data collected by DWR staff and the USGS on Delta water quality characteristics to assess the anticipated utility and quality of proposed Delta island reservoirs as a domestic water supply source. Using those data and their vast experience in the OECD Eutrophication Study and post-OECD study of the nutrient-related water quality in more than 750 waterbodies in many areas of the world, they concluded that the proposed Delta Wetlands island water supply reservoirs would have severely degraded water quality. The quality would be poor due to excessive growths of algae and aquatic plants supported by the substantial amounts of nutrients (N and P compounds) in the Delta channel waters that would be used to fill the reservoirs relative to the morphological and hydraulic residence time of the water in the proposed reservoirs. Lee and Jones-Lee also described the ability to use alum addition to the reservoirs for the control the poor water quality characteristics of the reservoirs, rendering them useful for water supply. While Delta Wetlands, Inc. did not act on their recommendations, several years' later DWR staff developed similar conclusions on the predicted water quality in the Delta Wetlands-proposed water supply reservoirs.

In the summer/fall of 1989 Drs. Lee and Jones-Lee retired/terminated their positions at NJIT and moved from New Jersey to El Macero, CA (near Davis, CA) where they established their environmental quality consulting practice, G. Fred Lee & Associates, that specializes in water quality evaluation and management, hazardous chemical site investigation/remediation, and water quality impacts of solid waste management.

In 1999, Drs. Lee and Jones-Lee became advisors to William Jennings, DeltaKeeper, on the low-DO conditions that occur in the San Joaquin River (SJR) Deep Water Ship Channel (DWSC) near the Port of Stockton. By 2000 their roles on that issue expanded to advising the SJR DWSC Low-DO TMDL Steering Committee on the low-DO problems in the DWSC TMDL. They were selected by that Steering Committee to rewrite the originally rejected proposal for CALFED support to investigate and assess the causes, implications, and potential remedies for the SJR DWSC low-DO issues. Lee and Jones-Lee worked with Dr. C. Foe of the CVRWQCB staff and other proposed project investigators to revise the proposal, and were subsequently selected by the

Steering Committee and CALFED to be the principal investigators for the project. In addition to serving as project coordinators, they developed the reports cited below that synthesized the findings of the 12 project investigators as well as insights derived from the technical literature and their experience and expertise in working on similar issues at other locations.

Lee. G. F., and 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/Technical Advisory Committee and CALFED Bay-Delta Program, G. Fred Lee & Associates, El Macero, CA, March (2003).
http://www.gfredlee.com/SJR-Delta/SynthesisRpt3-21-03.pdf

Supplemental reports included:

Lee, G. F. and 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.gfredlee.com/SJR-Delta/SynthRptSupp.pdf

Lee, G. F. and Jones-Lee, A., "San Joaquin River Deep Water Ship Channel Low DO Problem and Its Control," PowerPoint slides presented at SETAC World Congress Portland, OR, November 2004. Updated December (2004).
http://www.gfredlee.com/SJR-Delta/LowDOSummaryDec2004.pdf

With support of the DeltaKeeper boats, staff, and crew, Lee orchestrated several cruises in several South Delta areas to examine water quality issues. Information pertinent to the impact of flow manipulations/diversions in the Delta and their impacts on the SJR DWSC low-DO situation that was obtained through those cruises was discussed in the following reports:

Lee, G. F.; Jones-Lee, A. and Burr, K., "Summary of Results from the July 17, 2003, and September 17, 2003, Tours of the Central Delta Channels," Report of G. Fred Lee & Associates, El Macero, CA (2004).
http://www.gfredlee.com/SJR-Delta/Central-Delta-Tours.pdf

Lee, G. F.; Jones-Lee, A. and Burr, K., "Results of the August 5, 2003,Tour of the South Delta Channels," Report of G. Fred Lee & Associates, El Macero, CA, February (2004).
http://www.gfredlee.com/SJR-Delta/South-Delta-Tour.pdf

Those and related papers and reports are available on Lee/Jones-Lee website [www.gfredlee.com] in the Watersheds sections (SJR Delta Watershed subsection) at http://www.gfredlee.com/psjriv2.htm

More recently Lee and Jones-Lee have provided guidance on how to assess and address the residual oxygen demand in the DWSC that is caused by algae that develop in the SJR upstream of Vernalis: These issues are discussed in,

Lee, G. F., and Jones-Lee, A., "Issues in Controlling Residual Oxygen Demand in SJR DWSC That Leads to Violations of DO WQO," PowerPoint Slides, G. Fred Lee & Associates, El Macero, CA, February (2011).
http://www.gfredlee.com/SJR-Delta/Issues-Ox-Demand-DWSC-Ppt.pdf

Lee, G. F., and Jones-Lee, A., "Issues in Controlling the Residual Oxygen Demand in the SJR DWSC That Leads to DO WQO Violations," Report of G. Fred Lee & Associates, El Macero, CA, November 3, 2010; updated February 6 (2011). http://www.gfredlee.com/SJR-Delta/Residual-Ox-Demand-DWSC.pdf

Lee, G. F., "Comments on Developing Nutrient Criteria for SJR Delta," email to Christine Joab, Central Valley Regional Water Quality Control Board, Rancho Cordova, CA, March 29 (2011). http://www.gfredlee.com/SJR-Delta/Delta-Nutr-Criteria-Com.pdf

They have also discussed the low DO problems that occur in the South Delta channels in,

Lee, G. F., "Comments on SWRCB Review of South Delta Channel Water Quality," Report of G. Fred Lee & Associates, El Macero, CA, January 15, 2011. http://www.gfredlee.com/SJR-Delta/SoDeltaWQ1-11.pdf

Following the completion of SJR DWSC synthesis report Lee and Jones-Lee developed the first comprehensive overview report on Delta water quality issues:

Lee, G. F. and Jones-Lee, A., "Overview of Sacramento-San Joaquin River Delta Water Quality Issues," Report of G. Fred Lee & Associates, El Macero, CA (2004). http://www.gfredlee.com/SJR-Delta/Delta-WQ-IssuesRpt.pdf

That review was developed over the course of about one year through a series of drafts that were sent to about 100 individuals that are active in Delta water quality issues for review and comment; comments received were addressed/incorporated in the final version.

The water quality synthesis report was dedicated to William Jennings, DeltaKeeper, for his longstanding efforts to try to get DWR IEP/CALFED to more effectively address the impacts on Delta water quality of diversions of South Delta water, especially those of the USBR/DWR, for supplying water to Central Valley, San Francisco Bay area, and Southern California users.

This synthesis report on water quality issues in the Delta is a discussion of the water quality objectives/standards (WQO) in Delta waters based on the CVRWQCB/SWRCB/US EPA listing of Clean Water Act (CWA) section 303(d) violations. These violations require that TMDLs be developed to control the CWA WQO violations.

A key component of this Delta water quality issues is the discussion of the water quality impairment that are occurring in Delta waters that are not listed as a violation of WQOs. This discussion is based on Drs. Lee and Jones-Lee experience in developing water quality criteria/standards and their implementation. This experience is summarized in,

G. Fred Lee and Anne Jones-Lee Expertise and Experience in Water Quality Standards and NPDES Permits Development and Implementation into NPDES Permitted Discharges. http://www.gfredlee.com/exp/wqexp.htm

Their expertise in this topic are is recognized by being requested to develop,

Lee, G. F., and Jones-Lee, A., "Unrecognized Environmental Pollutants," Water Encyclopedia: Surface and Agricultural Water, Wiley, Hoboken, NJ pp 371-373 (2005). http://www.gfredlee.com/SurfaceWQ/WileyUnrecognizedPollutants.pdf

As discussed in their Delta water quality report there is need for the CVRWQCB/SWRCB to develop water quality objectives for all the water quality parameters that are impairing the beneficial uses of Delta waters.

Lee and Jones-Lee have also developed expanded and updated discussions of Delta water quality issues including:

> Lee, G. F., and Jones-Lee, A., "Overview—Sacramento/San Joaquin Delta Water Quality," Presented at CA/NV AWWA Fall Conference, Sacramento, CA, PowerPoint Slides, G. Fred Lee & Associates, El Macero, CA, October (2007). http://www.gfredlee.com/SJR-Delta/DeltaWQCANVAWWAOct07.pdf
>
> Lee, G. F., and Jones-Lee, A., "Comments on 'Draft Environmental Impact Statement Environmental Impact Report, South Delta Improvement Program' Prepared by Bureau of Reclamation for the U .S. Department of the Interior and the Department of Water Resources for the State of California Resources Agency," Report of G. Fred Lee & Associates, El Macero, CA, Submitted to CA Department of Water Resources, Sacramento, CA February 5 (2006). http://www.gfredlee.com/SJR-Delta/SDIP-ComFeb06.pdf
>
> Lee, G. F., and Jones-Lee, A., "Discussion of Water Quality Issues That Should Be Considered in Evaluating the Potential Impact of Delta Water Diversions/Manipulations on Chemical Pollutants on Aquatic Life Resources of the Delta," Report of G. Fred Lee & Associates, El Macero, CA, February 11 (2010). http://www.gfredlee.com/SJR-Delta/Impact_Diversions.pdf

Based on the SWRCB D 1641 water rights decision, the California Interagency Ecological Program (IEP) and CALFED were supposed to address the impacts of diverting Delta water on quality/resource management issues. The synthesis report referenced above, as well as the Lee (2008) comments cited below discussed the CVRWQCB's listing of known water quality criteria violations as well as technical inadequacies in the approach that the IEP monitoring/CALFED followed to evaluate water quality problems associated with exceedances of water quality objectives.

> Lee, G. F., "Comments on CALFED Independent Science Board Review of IEP," Comments submitted to Interagency Ecological Program, February 4 (2008). http://www.gfredlee.com/SJR-Delta/Comments-ISB-Review-IEP.pdf

CALFED and IEP representatives were displeased with comments and concerns about impacts of water diversions on Delta water quality that were raised in the Lee and Jones-Lee (2004) Delta water quality synthesis report. It was therefore interesting to find that associated with the subsequent pelagic organism decline (POD) review, many of the issues that were raised in that synthesis report were listed as key issues relevant to potential causes of POD. Those issues continue to be of key concern in the POD investigations.

The California Water Environmental Modeling Forum (CWEMF) develops peer reviews of modeling approaches and workshops on water modeling issues; Dr. Lee was asked to serve as a member of the CWEMF steering committee. With Dr. Jones-Lee he developed for the CWEMF

a workshop on Overview of Delta Nutrient Water Quality Problems: Nutrient Load - Water Quality Impact Modeling which was presented to an audience of about 100 in March 2008. Information on that workshop is available on the CWEMF website [http://www.cwemf.org] at: http://www.cwemf.org/workshops/NutrientLoadWrkshp.pdf. Additional information on the workshop is available at:

Lee, G. F., and Jones-Lee, A., "Delta Nutrient-Related Water Quality Problems," PowerPoint Slides Presented at CALFED Science Conference, Sacramento, CA, October 24 (2008). http://www.gfredlee.com/SJR-Delta/CALFED_SciConf10-08.pdf

Lee, G. F., and Jones-Lee, A., "Synopsis of CWEMF Delta Nutrient Water Quality Modeling Workshop – March 25, 2008, Sacramento, CA," Report of G. Fred Lee & Associates, El Macero, CA, May 15 (2008). http://www.gfredlee.com/SJR-Delta/CWEMF_WS_synopsis.pdf

"Overview of Delta Nutrient Water Quality Problems: Nutrient Load – Water Quality Impact Modeling," Agenda for Technical Workshop sponsored by California Water and Environmental Modeling Forum (CWEMF), Scheduled for March 25, 2008 in Sacramento, CA (2008).
http://www.gfredlee.com/SJR-Delta/CWEMF_Workshop_Agenda.pdf

Lee, G. F., and Jones-Lee, A., "Delta Nutrient-Related Water Quality Problems," PowerPoint Slides Presented at CALFED Science Conference, Sacramento, CA, October 24 (2008). http://www.gfredlee.com/SJR-Delta/CALFED_SciConf10-08.pdf

Drs. Lee and Jones-Lee have continued to follow the deliberations of various agencies and committees devoted to Delta resource management issues and has submitted comments and other writings to the SWRCB as part its review of Delta Trust tributary and Delta flow and contaminant criteria. including:

Lee, G. F., and Jones-Lee, A., "Comments on Water Quality Issues Associated with SWRCB's Developing Flow Criteria for Protection of the Public Trust Aquatic Life Resources of the Delta," Submitted to CA State Water Resources Control Board as part of Public Trust Delta Flow Criteria Development, by G. Fred Lee & Associates, El Macero, CA, February 11 (2010).
http://www.gfredlee.com/SJR-Delta/Public_Trust_WQ.pdf

Lee, G. F., and Jones-Lee, A., "Impact of SJR & South Delta Flow Diversions on Water Quality," PowerPoint Slides, Presentation to CA Water Resources Control Board, D1641 Water Rights Review, January 24 (2005).
http://www.gfredlee.com/SJR-Delta/D1641SlidesSWRCBJan2005.pdf

Lee, G. F., and Jones-Lee, A, "Review of Impacts of Delta Water Quality and Delta Water Exports on the Decline of Chinook Salmon in the SJR Watershed," Comments submitted to NMFS Southwest Fisheries Science Center, NOAA, Santa Cruz, CA, by G. Fred Lee & Associates, El Macero, CA, August (2008).
http://www.gfredlee.com/SJR-Delta/Salmon-NOAAcom.pdf

Lee, G., F., and Jones-Lee, A., "Need for Reliable Water Quality Monitoring/Evaluation of the Impact of SWRCB Water Rights Decisions on Water Quality in the Delta and Its Tributaries," Submitted to CA Water Resources Control Board Workshop on D-1641 Water Rights, Sacramento, CA, March 22 (2005). http://www.gfredlee.com/SJR-Delta/DeltaWaterExportImpactsPaper.pdf

Lee, G., F., and Jones-Lee, A., "Need for Reliable Water Quality Monitoring/Evaluation of the Impact of SWRCB Water Rights Decisions on Water Quality in the Delta & Its Tributaries," PowerPoint Slides Submitted to CA Water Resources Control Board Workshop on D-1641 Water Rights, Sacramento, CA, March 22 (2005). http://www.gfredlee.com/SJR-Delta/DeltaWaterExportImpactsPowerPoint.pdf

Lee, G. F., "Comments on the CA State Water Resources Control Board Cease and Desist Order to Cause the US Bureau of Reclamation and CA Department of Water Resources to Control Salinity Violations in the South Delta Compliance Points," Testimony presented at CA SWRCB evidentiary hearing, Sacramento, CA, November 7 (2005). http://www.gfredlee.com/SJR-Delta/CeaseDesistSalinity.pdf

Lee, G. F., and Jones-Lee, A., "Water Quality Issues That Could Influence Aquatic Life Resources of the Delta," Comments submitted to CALFED Science Program, Sacramento, CA, by G. Fred Lee & Associates, El Macero, CA, November 28 (2005). http://www.gfredlee.com/SJR-Delta/POD-Com.pdf

Lee, G. F., and Jones-Lee, A., "Review of Need for Modeling of the Impact of Altered Flow through and around the Sacramento San Joaquin Delta on Delta Water Quality Issues," and "Summary: Water Quality Modeling Associated with Altered Sacramento River Flows in & around the Delta," Report to CWEMF Steering Committee, by G. Fred Lee & Associates, El Macero, CA, March (2009). http://www.gfredlee.com/SJR-Delta/Model-Impact-Flow-Delta.pdf

Dr. Lee followed the Delta Vision Blue Ribbon Panel discussions on Delta Water Quality Issues, and has discussed technical inadequacies of those discussions that were of concern in,

Lee, G. F., and Jones-Lee, A., "Comments on 'Delta Vision Strategic Plan Fourth Staff Draft Volume 2: Strategy Descriptions,'" Comments submitted to P. Isenberg, Chair, Delta Vision Blue Ribbon Task Force, Sacramento, CA. Report of G. Fred Lee & Associates, El Macero, CA, September 30 (2008). http://www.gfredlee.com/SJR-Delta/DeltaVisionStaffDraft4.pdf

Lee, G. F., and Jones-Lee, A., "Delta Water Quality Standards Violations" and "Comments on Water Quality Sections of the Delta Vision Strategic Plan, Third Staff Draft – dated August 14, 2008," Submitted to Delta Vision Blue Ribbon Task Force, Sacramento, CA. Report of G. Fred Lee & Associates, El Macero, CA, September 1 (2008). http://www.gfredlee.com/SJR-Delta/DeltaVisionWQViolations.pdf

Lee, G. F., and Jones-Lee, A., "Comments on September 19, 2008 Delta Vision Task Force Meeting Discussion of Nutrient-Related Water Quality Problems in the Delta,"

Comments submitted to P. Isenberg, Chair, Delta Vision Blue Ribbon Task Force, Sacramento, CA. Report of G. Fred Lee & Associates, El Macero, CA, October 14 (2008). http://www.gfredlee.com/SJR-Delta/DeltaVisionCom9-19-08.pdf

Dr. Lee served as an invited peer reviewer DFG biological objectives and flow criteria review that developed,

Gross, E.S., Lee, G. F., Simenstad, C. A., Stacey, M., Williams, J.G., (Expert Panel Members), "Panel Review of the CA Department of Fish and Game's Quantifiable Biological Objectives and Flow Criteria for Aquatic and Terrestrial Species of Concern Dependent on the Delta," DFG Water Rights Program Documents Senate Bill X7 1 DFG Implementation, Submitted to California Department of Fish and Game, October (2010). http://www.dfg.ca.gov/water/water_rights_docs.html

**Comments on SJR Water Quality Issues That Impact Delta Water Quality**

Drs. Lee and Jones-Lee have been active in evaluating the impact agricultural discharges in the SJR watershed on SJR and Delta water quality including developing,

Lee, G. F., and Jones-Lee, A., "Potential Water Quality Impacts of Agriculture Runoff/Discharges in the Central Valley of California," Presented at Central Coast Agricultural Water Quality Coalition's 2007 National Conference on Agriculture & the Environment, Monterey, CA, PowerPoint Slides, G. Fred Lee & Associates, El Macero, CA, November (2007).
http://www.gfredlee.com/SJR-Delta/SJRAgImpactsMontereyNov2007.pdf

Lee, G. F. and Jones-Lee, A., "Agriculture-Related Water Quality Problems in the San Joaquin River," Proceedings of 2006 International Conference on The Future of Agriculture: Science, Stewardship, and Sustainability, Center for Hazardous Substance Research, Kansas State University, Manhattan, KS (2006).
http://www.gfredlee.com/SJR-Delta/SJRAgAug06Paper.pdf

Lee, G. F. and Jones-Lee, A., "Agriculture-Related Water Quality Problems in the San Joaquin River," PowerPoint slides presented at 2006 International Conference on "The Future of Agriculture: Science, Stewardship, and Sustainability," Sacramento, CA, August 7 (2006). http://www.gfredlee.com/SJR-Delta/SJRAgAug06Sli.pdf

**Regulation of Irrigated Agriculture Runoff/Discharges**

In 2001 the CVRWQCB issued a contract to Lee and Jones-Lee to develop several reports on controlling non-point source pollution of surface waters in the Central Valley. They developed the following reports under this contract,

Lee, G. F. and Jones-Lee, A., "Organochlorine Pesticide, PCB and Dioxin/Furan Excessive Bioaccumulation Management Guidance," California Water Institute Report TP 02-06 to the California Water Resources Control Board/Central Valley Regional Water Quality Control Board, 170 pp, California State University Fresno, Fresno, CA, December (2002). http://www.gfredlee.com/SurfaceWQ/OClTMDLRpt12-11-02.pdf

And the following update,

Lee, G. F., and Jones-Lee, A., “Update of Organochlorine (OCl) ‘Legacy’ Pesticide and PCB Concentrations in Delta and Central Valley Fish,” Report of G. Fred Lee & Associates, El Macero, CA, September 10 (2007). http://gfredlee.com/SurfaceWQ/UpdateLegacyPestCVFish.pdf

Lee, G. F. and Jones-Lee, A., "Issues in Developing a Water Quality Monitoring Program for Evaluation of the Water Quality - Beneficial Use Impacts of Stormwater Runoff and Irrigation Water Discharges from Irrigated Agriculture in the Central Valley, CA," California Water Institute Report TP 02-07 to the California Water Resources Control Board/ Central Valley Regional Water Quality Control Board, 157 pp, California State University Fresno, Fresno, CA, December (2002). http://www.gfredlee.com/SurfaceWQ/Agwaivemonitoring-dec.pdf

Lee, G. F. and Jones-Lee, A., "Review of Management Practices for Controlling the Water Quality Impacts of Potential Pollutants in Irrigated Agriculture Stormwater Runoff and Tailwater Discharges," California Water Institute Report TP 02-05 to California Water Resources Control Board/Central Valley Regional Water Quality Control Board, 128 pp, California State University Fresno, Fresno, CA, December (2002). http://www.gfredlee.com/SurfaceWQ/BMP_Rpt.pdf

These reports contain considerable information on the regulation of the water quality impacts of chemicals in agricultural runoff/discharges.

The CVRWQCB has been developing a regulatory program to attempt to control the surface water discharges of irrigated agriculture in stormwater runoff and tailwater discharges that cause violations of water quality objectives. Drs. Lee and Jones-Lee have been involved in reviewing the development of this program and have developed a series of reports on the deficiencies in this program including,

Lee, G. F., and Jones-Lee, A., "Comments on 'Draft Program Environmental Impact Report for a Waste Discharge Regulatory Program for Irrigated Lands within the Central Valley Region,'" Submitted to CVRWQCB ILRP, Sacramento, CA, September 25 (2010). http://www.gfredlee.com/SurfaceWQ/ILRPcomments.pdf

Lee, G. F., and Jones-Lee, A., “Issues in Regulating Water Quality Impacts from Irrigated Agricultural Runoff and Discharges in the Central Valley of California,” Report of G. Fred Lee & Associates, El Macero, CA, February 4 (2009). http://www.gfredlee.com/SurfaceWQ/Impacts-Ag-Runoff.pdf

Other reports are available on their website, www.gfredlee.com in the Surface Water Quality in the Agriculture Impacts on Water Quality subsection at, http://www.gfredlee.com/pwwqual2.htm#agwaiver.

As discussed in these reports the CVRWQCB has thus far failed to require that irrigated agriculture in the Central Valley to adequately monitor stormwater runoff and tail water discharges to evaluate the occurrence of violations of water quality objective in surface waters of the state.

**Pesticide Aquatic Life Toxicity**

Dr. Lee has been involved in investigating the occurrence of pesticides and their impact on aquatic life since the early 1960s. This work has included investigating the organochlorine, organophosphate and pyrethroid based pesticides in several locations in California including the Delta. At the request of the CVRWQCB he conducted a review of pesticide toxicity in several if the city of Stockton sloughs and developed,

> Lee, G. F. and Jones-Lee, A., "City of Stockton Mosher Slough and Five Mile Slough Diazinon and Chlorpyrifos Aquatic Life Toxicity Management Report," California Water Institute Report TP 02-08 to the California State Water Resources Control Board/Central Valley Regional Water Quality Control Board, 44 pp, California State University Fresno, Fresno, CA, December (2002).
> http://www.gfredlee.com/Runoff/StockDiaTMDL12-14-02.pdf

At the request of the DPR staff Dr. Lee presented a seminar,

> Lee, G. F., and Jones-Lee, A., "OP & Pyrethroid Pesticide-Caused Aquatic Life Toxicity: Inadequate Regulation of Urban Use," Abstract of presentation at DPR informal pesticide seminar, organized by Dr. Kean Goh, DPR Surface Water Program Manager, Sacramento, CA, March 9 (2010).
> http://www.gfredlee.com/SurfaceWQ/DPR_WS_PestToxicityAbs.pdf

that summarized their work on pesticide caused aquatic life toxicity.

**Regulating Contaminates in Aquatic Sediments**

Dr. Lee has been active in investigating the water quality significance of chemicals in aquatic sediments since the early 1960s. Since 1990 he has been active in this issue in California including submitting several reports and papers on how chemical contaminants should be evaluate/regulated including,

> Lee, G. F., and Jones-Lee, A., "Comments on 'Draft Staff Report Substitute Environmental Document Proposed Amendments to the Water Quality Control Plan for Enclosed Bays and Estuaries – Part 1 Sediment Quality for the Protection of Fish and Wildlife' Report of State Water Resources Control Board Division of Water Quality, January 28, 2011," Submitted to State Water Resources Control Board, Report of G. Fred Lee & Associates, El Macero, CA, March 14 (2011). [216 kb]
> http://www.gfredlee.com/Sediment/SedQualDraftSubCom.pdf

**Aquatic Chemistry**

Dr Lee pioneered in developing the aquatic chemistry field through his university graduate level teaching and research. He and Dr. Jones-Lee have developed an invited paper,

> Jones-Lee, A., and Lee, G. F., "Modelling Water Quality Impacts of Stormwater Runoff: Why Hydrologic Models Are Insufficient," Chapter 4 IN: Modelling of Pollutants in Complex Environmental Systems, Volume I, ILM Publications, St. Albans, Hertfordshire, UK, pp.83-95 (2009).
> http://www.gfredlee.com/Runoff/HydrologicModelsInadeq.pdf

They received a request to develop a summary paper on this issue as,

Jones-Lee, A. and Lee, G. F., "Modeling Water Quality Impacts of Stormwater Runoff – Why Hydrologic Models Aren't Sufficient," CENews.com Feature Article, January 29 (2008). http://www.cenews.com/article.asp?id=2631
http://www.gfredlee.com/Runoff/CENewsStmWaterModeling.pdf

**Putah Creek Mercury Water Quality Issues**

Putah Creek is a tributary of the Yolo Bypass and is a source of mercury for the Delta. Lee and Jones-Lee discussed the origins and present water quality concerns associated with mercury in Putah Creek in:

Lee, G. F., and Jones-Lee, A, "LEHR Superfund Stormwater Runoff and Putah Creek Mercury Issues," Journal Remediation, 19(2):123-134, Spring (2009).
http://www.gfredlee.com/SJR-Delta/LEHRrunoffHgRemediation.pdf

Lee, G. F., and Jones-Lee, A., "Summary of Slides – Putah Creek Mercury Water Quality Issues," Report of G. Fred Lee & Associates, El Macero, CA, Presented to Delta Tributaries Mercury Council, December 2 (2008).
http://www.gfredlee.com/SJR-Delta/PutahHgMineSummary.pdf

**Regulating Stormwater Runoff Contaminates**

Drs. Lee and Jones-Lee have been issuing their Stormwater Runoff Water Quality Newsletter for the past 14 years. This newsletter is an email based newsletter that is sent at about monthly/quarterly to the over 8,000 on the email list. It discusses issues pertinent to managing water quality including Delta water quality. Past issues of this newsletter devoted to Delta issues are available in NL-10-10/11, 10-12, 11-5, 11-7/8, 12-4, and 12-5 which are available at, http://www.gfredlee.com/newsindex.htm. One of the primary issues of concern is the appropriate regulation of potential pollutants in urban and agricultural stormwater runoff. NL 1-2, 1-3, 1-5, 1-6/7, 2-2, 5-4, 6-8, 6-9, 7-2, 7-3, 7-5, 7-6/7, 8-4, 8-5, 9-1/2, 9-5, 9-6, 9-8, 10-3, 10-8, 11-6, 11-7/8, 11-9, 12-6, 12-7/8, 13-3, and 13-4 discuss the appropriate approach for regulating stormwater runoff with respect to evaluating the water quality impairment of an exceedance of a water quality objective. As discussed the state and federal water quality criteria/standards are not applicable to regulating stormwater runoff associated chemicals at the time and near the runoff point.

**Groundwater Quality Protection**

In many areas of California there is coupling of surface water and groundwater resources and water quality. In drought years when there is curtailed surface availability from the Delta increased use of groundwater occurs. In many areas of the state the groundwaters are polluted by agricultural and land disposal of domestic wastewater and landfills. This pollution restricts the use of groundwaters for domestic water supplies and therefore puts greater pressure to use surface waters as a domestic source. The failure of the SWRCB and the CVRWQCB to protect groundwater quality is discussed in,

Lee, G. F., "Comments on the Draft Groundwater Quality Protection Strategy," Submitted to the Central Valley Regional Water Quality Board, July 16 (2010).
http://www.gfredlee.com/Groundwater/Buford_Comm_GWStrategy.pdf

Lee, G. F., and Jones-Lee, A., "Comments on Developing a Strategy for Protection of Beneficial Uses of Groundwater in the Central Valley, CA," Prepared for CVRWQCB Public Workshop, "Development of a Strategy to Protect the Beneficial Uses of Groundwater in the Central Valley," CVRWQCB, Rancho Cordova, CA, August 24 (2009). http://www.gfredlee.com/Groundwater/GroundwaterProtectionStrategy-sli.pdf

Lee, G. F., and Jones-Lee, A., "Focus on Irrigated Agriculture Pollution of Groundwater," Excerpt from "Groundwater Quality Protection Issues," Report of G. Fred Lee & Associates, El Macero, CA, February 2007; Presented in part at CA/NV AWWA Fall Conference, Sacramento, CA, October (2007). http://www.gfredlee.com/Groundwater/GWProtectionIssuesAg.pdf

Lee, G. F. and Jones-Lee, A., "Groundwater Quality Protection Issues," Report of G. Fred Lee & Associates, El Macero, CA, February 2007; Presented in part at CA/NV AWWA Fall Conference, Sacramento, CA, October (2007). http://www.gfredlee.com/Groundwater/GWProtectionIssues.pdf

Lee, G. F., and Jones-Lee, A., "Flawed Technology of Subtitle D Landfilling of Municipal Solid Waste," Report of G. Fred Lee & Associates, El Macero, CA, December (2004). Updated June (2010). http://www.gfredlee.com/Landfills/SubtitleDFlawedTechnPap.pdf

Additional papers and reports that are pertinent to assessing and managing Delta water quality are available on their website www.gfredlee.com.

Questions and comments on these writings can be directed to Dr. G. Fred Lee at gfredlee33@gmail.com.