

Experience in Working with PCB Pollution Issues

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Pioneering Research on Prevalence & Impacts of PCBs in the Environment

In the 1960s, when he held the position of Professor of Water Chemistry and Director of the Water Chemistry Program at the University of Wisconsin, Madison, Dr. Lee directed the masters thesis and PhD dissertation work of a number of his graduate students on the occurrence, fate, and effects of organochlorine pesticides in aquatic systems. In the 1970s during the course of that work they discovered that what some other investigators had reported to be DDT residues in birds was not in fact DDT, but rather was polychlorinated biphenyls (PCBs). Lee and his graduate students were among the first in the US to investigate the occurrence of PCBs in aquatic systems, and the sources of those PCBs; he directed the work of one of his PhD students specifically on environmental issues associated with PCBs.

Dr. Lee's pioneering work on PCBs gained national recognition, including his being interviewed by Walter Cronkite for the *CBS Evening News*. One of his graduate students whose PhD dissertation was devoted to PCB issues, Dr. Gilman Veith, became employed by the US EPA and directed the Agency's work on PCBs in the 1970s, which led to the PCB regulations that were adopted as part of the Toxic Substances Control Act (TSCA). The Veith and Lee papers on the PCB-pollution of water, sediments, and fish are available on www.gfredlee.com as,

Veith, G., and Lee, G. F., "A Review of Chlorinated Biphenyl Contamination in Natural Waters," *Water Research* 4:265-269 (1970).

<http://www.gfredlee.com/HazChemSites/Veith-Lee-ReviewPCB.pdf>

Veith, G., and Lee, G. F., "PCBs in Fish from the Milwaukee Region," Proc. 14th Conf. Great Lakes Res., Internat. Assoc. Great Lakes Res. pp. 157-169 (1971).

<http://www.gfredlee.com/HazChemSites/Veith-Lee-PCBFishMKE.pdf>

Veith, G., and Lee, G. F., "Chlorobiphenyls (PCBs) in the Milwaukee River," *Water Research* 5:1107-1115 (1971).

<http://www.gfredlee.com/HazChemSites/Veith-Lee-PCB-MKERiver.pdf>

Dube, D. J., Veith, G. D. and Lee, G. F., "Polychlorinated Biphenyls in Treatment Plant Effluents," *Journ. Water Pollut. Control Fed.* 46:966-972 (1974).

http://www.gfredlee.com/HazChemSites/Dube_Veith_Lee_PCB_WWTP.pdf

Because of his pioneering involvement in the investigation of the occurrence and impacts of PCBs in the environment, Dr. Lee's expertise has been sought more recently in reviewing the historical information on the pollution of the Fox River in Wisconsin by PCB-containing paper mill discharges.

Regulatory Experience

In 1970-71 Dr. Lee served as a consultant to the US Public Health Service on the significance of PCBs in drinking water; he served as chairman of a USPHS committee to address the development of drinking water standards for PCBs.

Dr. Lee served as a member of the PCB criterion review panel for the American Fisheries Society's Water Quality Panel review of the US EPA "Red Book" of Water Quality Criteria—1976.

Veith, G. D. (coordinator), Carver, T. C., Jr., Fetterolf, C. M., Lee, G. F., Swanson, D. L., Willford, W. A., and Zeeman, M. G., "Polychlorinated Biphenyls," In: A Review of the EPA Red Book: Quality Criteria for Water, American Fisheries Society, Bethesda, MD, pp 239-246 (1979).

http://www.gfredlee.com/SurfaceWQ/AFS_PCB_RedBookReview.pdf

In connection with reviewing potential environmental and public health hazards of PCBs, Dr. Lee also developed the reports:

Lee, G. F., and Jones-Lee, A., "Comments on 'US Gypsum Draft Environmental Impact Statement for the Development of the US Gypsum Proposed Wallboard Plant to be Located on Port of Stockton West Complex,'" Comments submitted to Lozeau/Drury, Alameda, CA by G. Fred Lee & Associates, El Macero, CA, December 15 (2008).

<http://www.gfredlee.com/HazChemSites/USGypsumDEIR.pdf>

Lee, G.F., and Jones-Lee, A., "TCLP Not Reliable for Evaluation of Potential Public Health and Environmental Hazards of PCBs or Other Chemicals in Wastes: Unreliability of Cement-Based Solidification/Stabilization of Wastes," Report of G. Fred Lee & Associates, El Macero, CA, September (2009).

http://www.gfredlee.com/Landfills/TCLP_Solidification.pdf

Lee, G. F., "Unreliability of SWRCB's Use of "NAS Criteria" to Evaluate Pesticides Impacts on Aquatic Life" excerpt and adapted from, 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/UnreliabilityNASCriteria.pdf>

Lee, G. F., and Jones-Lee, A. "Unreliability of Sediment Co-Occurrence-Based Approaches for Evaluating Aquatic Sediment Quality," Excerpts from 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, updated August (2003).

<http://www.gfredlee.com/Sediment/UnrelSedCooccur.pdf>

Lee, G. F., and Jones-Lee, A., "Need for Funding to Support Studies to Define the Magnitude of the Excessive Bioaccumulation of Organochlorine 'Legacy' Pesticides and PCBs in Edible Fish That Can Cause Cancer in Those Who Use Delta/Central Valley Fish as Food," Report of G. Fred Lee & Associates, El Macero, CA, April 4 (2005)
<http://www.gfredlee.com/Runoff/OCIPProblemProject.pdf>

Lee, G.F, and Jones-Lee, A., "Developing TMDLs for Organochlorine Pesticides and PCBs," Presented at the American Chemical Society Environmental Chemistry Division national meeting in San Diego, California, April (2001).
http://www.gfredlee.com/Runoff/sandiego_030801.pdf

On behalf of the California Water Resources Control Board Drs. Lee and Jones-Lee conducted a comprehensive review of the data base on organochlorine "legacy" pesticides and PCBs in fish in California Central Valley waterbodies from the late 1970s through 2005. Those data showed that while the concentrations of organochlorine pesticides in fish tissue have been decreasing, the PCB content of fish tissue has not. Their findings are available in the following reports:

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/OCITMDLRpt12-11-02.pdf>

Lee, G. F. and Jones-Lee, A., "Excessive Bioaccumulation of Organochlorine Legacy Pesticides & PCBs in CA Central Valley Fish," PowerPoint Slides made available at US EPA National Fish Contaminant Forum, San Diego, CA, January (2004).
<http://www.gfredlee.com/Runoff/OC1-slides-SanDiego.pdf>

Lee, G. F., and Jones-Lee, A., "Update of Organochlorine (OC1) '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>

Dr. Lee has provided guidance on developing TMDLs to control the bioaccumulation of PCBs:
Lee, G.F, and Jones-Lee, A., "Developing TMDLs for Organochlorine Pesticides and PCBs," Presented at the American Chemical Society Environmental Chemistry Division national meeting in San Diego, California, April (2001).
http://www.gfredlee.com/Runoff/sandiego_030801.pdf

Behavior & Impacts of PCBs in Sediment and Associated with Dredging

PCBs were among the organochlorine compounds included in Lee's \$1-million laboratory and field investigation of the release of sediment-associated pollutants during dredging and dredged sediment disposal in the 1970s under contract with the US Army Engineer Waterway Experiment Station. That study examined the behavior of about 30 chemical parameters in sediments from about 100 different sites across the US. The Corps of Engineers reports on that work were released as,

Lee, G. F., Jones, R. A., Saleh, F. Y., Mariani, G. M., Homer, D. H., Butler, J. S. and Bandyopadhyay, P., "Evaluation of the Elutriate Test as a Method of Predicting Contaminant Release during Open Water Disposal of Dredged Sediment and Environmental Impact of Open Water Dredged Materials Disposal, Vol. II: Data Report," Technical Report D-78-45, US Army Engineer Waterway Experiment Station, Vicksburg, MS, 1186 pp., August (1978).

Portions available online:

http://www.gfredlee.com/Sediment/DMRP_VolumeII_Data_Report_Part1_Summary.pdf

http://www.gfredlee.com/Sediment/DMRP_VolumeII_Data_Report_Part2.pdf

Jones, R. A. and Lee, G. F., "Evaluation of the Elutriate Test as a Method of Predicting Contaminant Release during Open Water Disposal of Dredged Sediment and Environmental Impact of Open Water Dredged Material Disposal, Vol. I: Discussion," Tech Report D-78-45, US Army Engineer Waterway Experiment Station, Vicksburg, MS, August (1978).

http://www.gfredlee.com/Sediment/DMRP_VolumeI_Discussion.pdf

Those studies revealed that PCBs associated with sandy sediments tended to be released when the sediments were suspended in water, while the PCBs associated with sediments having high organic content were more tightly bound to the sediments.

Because of the widespread occurrence of PCBs in aquatic sediments, the US Army Corps of Engineers issued a contract to Dr. Lee to develop a review of PCBs in sediments and the potential impact of PCB-contamination of sediments on the Corps' dredging of US waterway sediments to maintain navigation depth. That work resulted in the publication of the report,

Lee, G. F. and Jones, R. A., "Significance of PCBs in Dredged Sediment," Final Report to the US Army Engineer Waterways Experiment Station, Vicksburg, MS, August (1979). [Executive Summary]

http://www.gfredlee.com/Sediment/Lee_Jones_PCBs_Dredged_Sediment.pdf

The advice of Dr. Lee has been sought in the assessment, impacts, and management of PCB-polluted sediments in a number of areas including the Hudson River and Hudson River Estuary near New York City. On several occasions he was asked by the US EPA Region 2 to advise it on the approach that should be used to control excessive PCB accumulation in striped bass in the Hudson River. He was an advisor on issues of PCB accumulation in waterbodies in the state of Wisconsin, including the Milwaukee River. His work on managing PCB-contaminated sediments included serving as an advisor to Outboard Marine Corporation on the PCB-pollution of sediments of Waukegan Harbor, Wisconsin.

On behalf of William Jennings, DeltaKeeper, Dr. Lee and his associates demonstrated an approach that can be used to evaluate the bioavailability of PCBs in contaminated sediments.

Their report on that work is available as:

Lee, G. F., Jones-Lee, A., and Ogle, R. S., "Preliminary Assessment of the Bioaccumulation of PCBs and Organochlorine Pesticides in *Lumbriculus variegatus* from City of Stockton Smith Canal Sediments, and Toxicity of City of Stockton Smith Canal Sediments to *Hyalella azteca*," Report to the DeltaKeeper and the Central Valley

Regional Water Quality Control Board, G. Fred Lee & Associates, El Macero, CA, July (2002). <http://www.gfredlee.com/HazChemSites/SmithCanalReport.pdf>

Dr. Lee investigated the significance of PCBs in causing toxicity in the Colorado Lagoon and reported his findings as:

Lee, G. F., and Jones-Lee, A., "PCBs as an Unlikely Cause of Urban Aquatic Sediment Toxicity: Colorado Lagoon Sediment TMDL," Report of G. Fred Lee & Associates, El Macero, CA, December 3 (2010). <http://www.gfredlee.com/Sediment/PCBs-SedToxicity.pdf>

Significance of PCBs in Landfills & Superfund Sites

In 1988-89 Dr. Lee served as an advisor to EBASCO-Envirosphere REM III Superfund project on the work plan for Solvent Savers Site and Niagara County, NY Refuse site; as reviewer CIC Edison, NJ Site PCB and Dioxin remediation; to rewrite Brick Township Phase I RI/FS report; on Pearch Water Site PCB Treatability Studies; and to develop an RI/FS investigation guidance manual for REM III studies.

PCBs are an issue of concern at the UCD/DOE LEHR National Priority List Superfund site in Davis, CA. For 15 years beginning in the mid-1990s Dr. Lee served as the US EPA-sponsored Technical Assistance Grant advisor to the public on the adequacy of the site investigation and remediation.

Dr. Lee has been involved in evaluating the potential for PCBs in hazardous chemical landfills to pollute groundwaters, including the Wayne Disposal Landfill for the Ypsilanti Township, Michigan, and the BFI/CECOS Landfill in Clermont County, Ohio. Dr. Lee has served as an advisor to the Sierra Club of Canada on approaches for the remediation of PCB-contaminated sediment of the Sydney Tar Ponds located at Sydney, Nova Scotia. Findings from that work are discussed in:

Lee, G. F., "Comments on, 'Remediation of Sydney Tar Ponds and Coke Ovens Sites Environmental Impact Statement, Sydney, Nova Scotia,' dated December 2005," Report of G. Fred Lee & Associates, El Macero, CA, USA, May 15 (2006). <http://www.gfredlee.com/Landfills/SydneyTarPondsReport.pdf>

Lee, G. F. and Jones-Lee, A., "Progress toward Remediation of the Sydney Tar Ponds: A Major Canadian PCB/PAH 'Superfund' Site," *Journal Remediation* 17(1):111-119 (2006). <http://www.gfredlee.com/Landfills/STP-Remediation-pap.pdf>

Dr. Lee has been active in evaluating potential impacts of the disposal of PCB-contaminated sediments in a Chemical Waste Unit landfill in DeWitt County, Illinois. That activity included developing the report,

Lee, G. F., and Jones-Lee, A., "Evaluation of the Potential for Area Disposal Company Proposed Chemical Waste Unit Landfill to Pollute the County Water Resources with Hazardous Chemicals," Report to County Board, DeWitt Co., IL. Report of G. Fred Lee & Associates, El Macero, CA, May 7 (2009). http://www.gfredlee.com/Landfills/Clinton_IL_CWU.pdf

Significance of PCBs in Stormwater Runoff

As part of their work on evaluating impacts of urban stormwater runoff-associated contaminants, Drs. Lee and Jones-Lee developed the following report:

Lee, G. F., and Jones-Lee, A., "PCBs as Contaminants in Construction and Demolition (C&D) Wastes," Report of G. Fred Lee & Associates, El Macero, CA, December 5 (2010). <http://www.gfredlee.com/Landfills/CD-LandfillsPCB.pdf>

Dr. Lee has developed several reviews of PCB pollution that have been published in their Stormwater Runoff Newsletter. These reviews include:

Volume 12 Numbers 7 and 8, December 8, 2009 - Topics: Nutrient criteria; PCBs; Pesticide Toxicity; non-point news; monitoring stormwater runoff at Superfund sites, ATSDR public health - solid waste forum.
<http://www.gfredlee.com/Newsletter/swnewsV12N7-8.pdf>

Volume 11 Numbers 7 and 8, August 4, 2008 Topics: Updates: more legal actions regarding application of water quality standards to urban stormwater runoff NPDES permits, impacts of PPCPs on water quality, Delta water quality, water quality modeling, impacts of pesticide mixtures, water quality standards and goals, fish consumption guidelines for organochlorine legacy pesticides, PCBs, mercury, and selenium; announcements of several newsletters and conferences.
<http://www.gfredlee.com/Newsletter/swnewsV11N7-8.pdf>

Volume 9 Number 4, March 31, 2006 Topics: Structure sealants as a source of PCBs; benzothiazoles as stormwater pollutant; recently proposed OEHHA fish tissue contaminant screening values; BASS modeling of bioaccumulation; US EPA water quality criteria for diazinon; sediment toxicity due to pyrethroid-based pesticides; USGS national pesticide studies. <http://www.gfredlee.com/Newsletter/swnewsV9N4.pdf>

Volume 4 Number 2, March 8, 2001 Topic: Bioaccumulation of organochlorine pesticides & PCBs. <http://www.gfredlee.com/Newsletter/swnewsV4N2.pdf>

Copies of Dr. Lee's reports on these and other studies are available on his website, www.gfredlee.com, in the Landfills-Groundwater Section "Examples of Specific Landfill Studies" subsection [<http://www.gfredlee.com/plandfil2.html#examples>], in the "Hazardous Chemical Sites" section [<http://www.gfredlee.com/phazchem2.html>], as well as in other sections.