IID Exh. 92

ALLEN MATKINS LECK GAMBLE & MALLORY LLP
DAVID L. OSIAS
MARK J. HATTAM
501 West Broadway, Ninth Floor
San Diego, California 92101-3577
Phone: (619) 233-1155
Fax: (619) 233-1158

HORTON, KNOX, CARTER & FOOTE
JOHN PENN CARTER
895 Broadway, Suite 101
El Centro, CA 92243
Telephone (760) 352-2821

Attorneys for Petitioner
Imperial Irrigation District

STATE WATER RESOURCES CONTROL BOARD

STATE OF CALIFORNIA

IMPERIAL IRRIGATION DISTRICT and SAN DIEGO COUNTY WATER AUTHORITY,

Petitioners.

REBUTTAL TESTIMONY OUTLINES OF MR. JESSE SILVA, DR. RODNEY SMITH, MS. LAURA HARNISH, DR. JOHN DICKEY, AND DR. HARRY OHLENDORF IN SUPPORT OF IID-SDCWA JOINT LONG-TERM TRANSFER PETITION

IID REBUTTAL TESTIMONY OUTLINES

1. Mr. Jesse Silva, General Manager of the Imperial Irrigation District ("IID"), will provide rebuttal testimony on the following areas:

a) Salton Sea Elevation Issues: Changes in the elevation of the Salton Sea over the years, and how that changed elevation caused flooding, creating a need for the elevation to drop significantly to protect farms, geothermal facilities, and other land in IID's service area;

b) Diking/Drainage Pumping: The history and scope of IID's diking and drainage operations at the Salton Sea, including the costs and work involved in maintaining and operating the dikes and pumps, and the possible liability risks faced by IID;

c) Entitlement Enforcement: The history and priority requirements pertaining to the Secretary of the Interior's enforcement of California's basic 4.4 million acre-foot entitlement to Colorado River water and of the agricultural districts' basic 3.85 million acre-foot entitlement; and

d) IOP: The proposed Inadvertent Overrun Policy ("IOP") provision, as compared to entitlement enforcement without the IOP.

2. Dr. Rodney Smith will provide rebuttal testimony on the following areas:

a) The economic risks and inadvisability of IID meeting firm, long-term contractual obligations to transfer water by relying on short-term fallowing agreements with landowners;

b) An analysis of the study, "Regional Economic Impacts of the Palo Verde Test Land Fallowing Program", prepared by M. Cubed for the Metropolitan Water District of Southern California, December 1994, concerning the economic impact of the two-year test fallowing program between the Palo Verde Irrigation District and the Metropolitan Water District of Southern California on the local economy in Palo Verde Valley;

c) A meaningful economic analysis of the full economic costs of land fallowing must include the following considerations:

(1) *On-farm costs*: foregone return on land and farm income, compensation for foregone return on stranded capital investment related to improvements installed on fallowed land, and lost apportionment of fixed farm enterprise cost, cost of necessary investments during fallowing to maintain productivity of land, and reasonable economic incentive;

(2) *IID costs*: program administration, value of lost hydropower, foregone revenues from water sales and water availability charges, and environmental mitigation costs;

(3) *Economic Mitigation*: the cost of economic

mitigation to offset the adverse economic impact on the local economy from a switch to land fallowing;

d) An analysis of the "Report to the Salton Sea Authority Economic Development Task Force", prepared by the Rose Institute of State and Local Government, January 7, 1999; and

e) The environmental mitigation costs currently specified in the parties' agreements.

3. Dr. John Dickey will provide rebuttal testimony on the following areas:

a) Dust mitigation analysis for the Salton Sea (along with similarities and differences from Owens Lake and/or Mono Lake), including site characterization and research, challenges in prediction and monitoring, range of potential strategies, time required to develop and implement plan, range of potential costs, technical challenges associated with mitigation measures, and other environmental questions.

4. Ms. Laura Harnish will provide rebuttal testimony on the following areas:

a) EIR/EIS/HCP Status: Ms. Harnish will testify regarding the current state of the EIR/EIS and HCP, negotiations with the wildlife agencies, and overall scope of work being performed by CH2MHill; and

b) Salton Sea Baseline: Ms. Harnish will testify regarding the use of "No Project" and "Project Baseline" Salton Sea projections, and how a "current

snapshot" approach promoted by some would create an inaccurate comparison for CEQA purposes.

5. Dr. Harry Ohlendorf will provide rebuttal testimony on the following areas:

a) Selenium cycling and bioaccumulation effects;

b) Selenium threshold levels; and

c) Selenium analysis for the Salton Sea and wetlands mitigation project.

The above witnesses will also authenticate the various rebuttal exhibits related to their testimony.

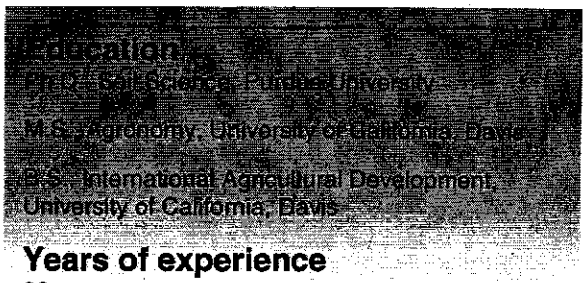
The curriculum vitae of Mr. Silva, Dr. Smith, and Ms. Harnish were provided in Phase I and Phase II of this hearing. The curriculum vitae of Dr. Dickey is attached as Exhibit "A," while that of Dr. Ohlendorf is attached as Exhibit "B."

Dated: May 23, 2002

ALLEN MATKINS LECK GAMBLE & MALLORY LLP

By: _____
MARK J. HATTAM
Attorneys for Petitioner
Imperial Irrigation District

John B. Dickey – Principal Scientist



Project Responsibilities

As a Principal Scientist, Dr. Dickey has over 20 years of domestic and international experience in agronomy and soil science, along with an understanding of application of science to complex problems and projects. For the Owens Lake Dust Mitigation Program, he has served as a liaison with Great Basin UAPCD, coordinated applied research efforts, coordinated program GIS and remote sensing, and provided technical support to implementation and strategic planning of dust mitigation. Dr. Dickey ensures that appropriate technical solutions are created and followed, including a steady seed supply and adequate soil reclamation for managed vegetation dust mitigation. He also provides technical support to dust mitigation facility operations (irrigation, drainage, water quality and ecosystem monitoring).

Unique Qualifications

Successfully led work with Great Basin to focus and refine SB-270 research to respond to the challenges facing the dust mitigation program

Key technical input to and coordination of litigation support, site characterization, feasibility, and arsenic fate evaluation; technical support to permitting and design

Identification and negotiation with Great Basin of key dust control measure compliance issues related to mitigation of water demand, Dust Control Measure (DCM) cost, and regulatory reliability

Principal author of draft Owens Dust Mitigation Program Strategic Plan

Conducted feasibility investigations, evaluated and collaborated in ongoing dust mitigation research design at Owens Lake

Exceptional knowledge of and access to key technical resources inside and outside of CH2M HILL, serving as firm-wide leader of Agricultural Services (irrigation, drainage, soils, and agronomy), and actively involved with major land grant universities

Provided scientific consulting expertise on more than 100 other land and water management projects involving soil surface stabilization, evaluation and management of irrigation, drainage, water recycling and conservation, soil erosion control, soil salinity and trace elements, plant production and cropping system R&D, and complex technical and regulatory settings

Technical proficiencies include water conservation, erosion control, soil evaluation and management, water quality evaluation for irrigation, irrigated and rainfed plant production, soil ecology, degraded soil reclamation and vegetation, trace element mobility and bioaccumulation, root-zone processes (hydrologic, salt, nutrient, and trace element balances, as well as ecological relationships)

Specializes in facilitating solutions to complex scientific, regulatory, and resource stewardship questions; enjoys relationship-collaborative problem solving to develop acceptable, reliable, and technically sound projects

Representative Projects

Technical Support, Owens Lake Dust Mitigation Program, Los Angeles Department of Water and Power, California. Successfully led work with Great Basin to focus and refine SB-270 research to respond to the

challenges facing the dust mitigation program. Provided key technical input to and coordination of litigation, site characterization, feasibility, and arsenic fate evaluation; technical support to permitting and design. Led technically challenging effort to collect and multiply saltgrass seed and rhizomes to produce planting material for future managed vegetation implementation, including procurement of local native seed (per EIR) and female rhizome sources. Provided technical support to Department in contracting with lessee farmer and greenhouses for seed and vegetative propagation and planting.

Irrigation and Drainage Specialist, CALFED Water Quality Team, California. Dr. Dickey provided technical support to CALFED's effort to remediate the San Francisco Bay Delta. He was the principal irrigation and drainage water quality specialist on the water quality technical team, coordinating and distilling stakeholder (irrigation and drainage districts, commodity groups, USBR) and technical resource (research, extension, consultant) input to the CALFED program. He helped plan process and strategy, developed technical water quality databases, acceptable levels of key water quality parameters and a technical paper describing their cycling in plant-soil-water systems, and a program of actions to address water quality issues in the Delta. Facilitated definition of divergent opinion and technical consensus among diverse agency and stakeholder groups. The resultant work provided timely and solid scientific foundation materials for the far-reaching and influential CALFED process, as part of an effort to create robust environmental documentation and action plans for restoration of the Delta's ecosystems.

Project Manager and Senior Consultant, Feather River Watershed Management , California. In 1995, Dr. Dickey authored *Reinvestment Opportunities for the Feather River Watershed* as a technical basis for policy for Plumas County, California. His work presented options for achieving multiple upstream and downstream benefits from aggressive, regenerative stewardship of the major watershed for the California State Water Project. This and subsequent more detailed study of watershed management options formed the technical foundation for more than $3.5 million in funding to the County for innovative watershed restoration projects. One successful proposal authored by Dr. Dickey required resolution of bitter conflict between private landowners, public agencies, and an economic development corporation. He facilitated rapid consensus on areas of shared interest and worked with all stakeholders to develop a project designed to provide objective technical information needed to inform consensus planning by these groups. The County and stakeholders have benefited from resolution of conflict, consensus decisions, and sound technical work through resulting funding, approval, and implementation of watershed management (erosion and sedimentation control, rewatering of meadows, riparian and instream habitat enhancement, streambank protection, improved range animal management, meadow rewatering, and nonpoint source pollution abatement).

Task Manager, Uinta Basin Agricultural Water Quality and Quantity Modeling, California and Utah. Dr. Dickey participated in evaluation of lands for large irrigation project designs and adapted computer models of drainage water salinity to predict agricultural drainage water quality and quantity in Westlands Water District and the Uinta Basin. New models allowed study of soils and waters over many years for areas with diverse soil salinity and groundwater conditions. He developed drainage and chemical criteria for identifying problem soils and for selection of alternative land use. Identical large-scale land use, salt, trace element, and groundwater fate and transport questions exist at Owens Lake.

Senior Consultant. Basin-wide Salt Management, Sacramento Valley, California. Dr. Dickey worked with Sacramento River Settlement Contractors to evaluate salt cycling in Sacramento Valley irrigation systems. Developed a long-term research plan, as well as initial assessment of long-term changes in soil and water salinity, and impacts on crop production.

Visiting Assistant Professor of Agronomy and Soil Science, Applied Agricultural and Natural Resources Management Research, West Africa. Under a USAID-funded contract to Purdue University for the Agricultural Research and Training Support (ARTS) Project, Dr. Dickey was based in Burkina Faso for 26 months, where he provided training and technical leadership with Burkinabè researchers and technicians in farmer-participatory, on-farm research planning and execution, in data analysis and interpretation, and in research presentation. He served as acting Chief of Party, including direction of in-country project administration and principal liaison with USAID and Burkinabè research institutions. Major impacts included 1) Integration of sustainable natural resources management and agricultural production research, 2) Increased quality and quantity of farmer participation and interdisciplinary research, 3) Large-scale farmer adoption of

sustainable and regenerative soil and crop management technology in focus villages, 4) Increased crop production and reduced rate of natural resources degradation in focus villages, including implementation of low-input technologies for reclamation of and crop production on highly eroded lands, 5) Improvement in Burkinabè researcher capacity to plan, implement, analyze, and report on-farm research as demonstrated by the production of numerous scientific communications by program researchers during the project, 6) Increased collaboration of farming systems researchers with extension and thematic researchers, 7) Initiation and development of a GIS as a tool for identifying geographical focus areas of specific resource management and production problems, 8) Implementation of functional E-mail (Internet) links for Burkinabè counterparts, 9) Evaluation of site-specific erosion and changes in cultivated and natural plant communities, working directly with farmers and herdsmen to develop and implement regenerative land management techniques.

Senior Agronomist and Soil Scientist, Swine Waste Nutrient Recycling, Colorado. Provided analysis, research design, and operational recommendations to National Hog Farms' (subsidiary of National Farms) 2,860-acre, state-of-the-art nutrient management system, and supported permitting negotiation and appeal to maintain production in the face of new swine waste management regulations in Kersey, Colorado.

Senior Consultant, Fertilizer Pond Solids Recycling Program, Iowa. Designed, permitted, and implemented beneficial reuse of fertilizer pond waste solids as phosphorus-rich soil amendments on 5,000 acres of land near Fort Madison, Iowa. Designed and analyzed collaborative research with Iowa State University, negotiated successful permitting with Iowa Department of Natural Resources, and worked with local farmers and fertilizer dealers for owner Chevron Chemical.

Harry M Ohlendorf
Senior Environmental Scientist

Education

Ph.D. Wildlife Science - Texas A&M University, 1971
M S Wildlife Science - Texas A&M University, 1969
B S Wildlife Management - Texas A&M University, 1962

Professional Registrations

Certified Wildlife Biologist; The Wildlife Society
Professional Wetland Scientist; Society of Wetland Scientists
Senior Ecologist; Ecological Society of America

Distinguishing Qualifications

- More than 30 years of experience in evaluating the impacts of environmental contaminants on wildlife in aquatic and terrestrial ecosystems, including more than 11 years at CH2M HILL and 18 years with U.S. Fish and Wildlife Service.
- Completed numerous ecological risk assessments and other ecological evaluations in the areas of fisheries biology and wildlife ecology.
- Provides firm-wide technical guidance in the area of ecological risk assessment, maintaining an awareness with current guidance being developed by the U.S. Environmental Protection Agency and other agencies and organizations, and helps clients develop cost-effective risk management strategies.
- Received two U.S. Fish and Wildlife Service Special Achievement Awards for outstanding performance as a research scientist; also received Nelson-Hooper Award for best technical presentation at meeting of the Western Section of The Wildlife Society.
- Recognized as a "Pioneer of Selenium Research" in a book, "Environmental Chemistry of Selenium," edited by W.T. Frankenberger, Jr., and R.A. Engberg and published by Marcel Dekker, Inc. 1998.

Relevant Experience

As an environmental scientist, Dr. Ohlendorf's duties include a wide variety of environmental projects, including the planning, implementation, and reporting of site ecological characterizations and surveys, contaminant exposure and effect analyses, risk characterization, and project impact evaluations. He provides firm-wide technical guidance in the area of ecological risk assessment, maintaining an awareness with current guidance being developed by the U.S. Environmental Protection Agency and other agencies and organizations. Dr. Ohlendorf began his career with the U.S. Fish and Wildlife Service's Patuxent Wildlife Research Center in Laurel, Maryland, where he served for 7 years as assistant director of the Research

Center and was actively involved in pollution ecology research. Subsequently, he was leader of the Pacific Coast Research Station in Davis, California, and studied the pollution ecology of wildlife. For 18 years, Dr. Ohlendorf's research focused on the occurrence and impacts of contaminants in aquatic and terrestrial ecosystems. These studies included the sampling of various wetland and terrestrial food chains and the assessment of the effects observed in higher trophic levels, especially birds; they were conducted in the eastern United States, California, Alaska, and Hawaii. Representative projects for CH2M HILL are summarized below.

- **U.S. Fish and Wildlife Service, Confirmatory Sampling and Ecological Risk Assessment for Bolsa Chica Lowlands, CA.** The main focus of this complex, large ongoing project is to conduct sampling and to perform an ecological risk assessment for the 1,200-acre Bolsa Chica Lowlands in Orange County. Additionally, the project will identify acceptable disposal options (ocean disposal versus on-land disposal) for several restoration plans. This will characterize contamination within the Lowlands and establish cleanup criteria for portions of the property affected by previous activities, primarily oil and gas production, and urban runoff. More than 430 active and abandoned oil wells exist on the property, along with associated pipelines, roads, former tank farms, and other related facilities. Storm drainage enters from nearby urbanized areas. Chemicals of potential ecological concern include metals, polycyclic aromatic hydrocarbons, volatile organic compounds, polychlorinated biphenyls (PCBs), organochlorine insecticides and herbicides, and organophosphate insecticides. Because PCBs were detected in previous sampling, the work includes analyzing and evaluating PCB congeners that may pose an ecological risk, if present. Once contamination is fully characterized and risk assessment-based cleanup levels are established, contaminated areas will be remediated and the Lowlands will be restored to provide a mix of tidal coastal wetland habitats and non-tidal seasonal ponds.

- **U.S. Bureau of Reclamation, Ecological Risk Assessments for Kesterson Reservoir, CA.** Conducted an ecological risk assessment for Kesterson Reservoir, which had become contaminated with selenium through the disposal of agricultural subsurface irrigation drainage water. Assessment was conducted in 1992-1993 to determine whether the client needed to consider other management practices for the site in the foreseeable future. It included analysis of ecological succession, food-chain relationships, dietary exposure, and risk characterization for 20 years into the future, using modeling and Monte Carlo simulations. The assessment indicated that there was no significant risk to terrestrial animals, but aquatic birds could be adversely affected during years of very heavy rainfall when surface water pools (which would be contaminated by selenium dissolved from the soil) would persist into the spring breeding season. Another ecological risk assessment was conducted in 2000 to update previous work based on additional years of biological and hydrological monitoring. The conclusions of this risk assessment validated the earlier predictions and provided much more detail concerning the levels of risk for terrestrial wildlife and aquatic birds. The overall conclusion was that risks of adverse effects were low, and recommended a reduced level of monitoring for the site.

- **U.S. Bureau of Reclamation, Grassland Bypass Project Monitoring, CA.** Developed a detailed monitoring program to enable the project Oversight Committee to determine and assess potential effects of the Grasslands Bypass project in Merced County, CA. This project has removed contaminated agricultural drainage from approximately 90 miles of conveyance channels that supply water to several state and federal wildlife areas. The goal

of the project is to make water from those sources acceptable for use in the wildlife areas by segregating agricultural drainage from good quality water that can be used for wetland management. Agricultural drainage water is routed through the San Luis Drain and Mud Slough to discharge more directly to the San Joaquin River. The monitoring program has documented the effectiveness of the project in meeting its goal.

- **Chevron Refinery, Selenium Management in the Richmond Refinery Water Enhancement Wetland, Richmond, CA.** For this refinery, which treats some of its process water in the Richmond Refinery Water Enhancement Wetland (RRWEW) before discharging to San Francisco Bay, selenium concentrations were high enough for the San Francisco Bay Regional Water Quality Control Board to express concern and require further study. Conducted a study of bird use and reproduction that found the RRWEW received significant bird use and hatching success was better than at reference sites from other studies. This occurred despite elevated levels of selenium in bird eggs. Results of the study supported continued use of the RRWEW for water treatment while conducting further study and monitoring on a reduced scale to identify selenium bioaccumulation pathways. Assisted the refinery in developing a 5-Year Management Plan and currently monitoring the success of changes in operation of the RRWEW. Monitoring results show that selenium exposure of birds has been reduced by more than half as a result of operational changes.

- **U.S. Fish and Wildlife Service, Interpretive Guidelines for Department of the Interior's National Irrigation Water Quality Program, Portland, OR.** At the request of the USFWS, assisted in developing interpretive guidelines for contaminants in wetlands for the Department of the Interior's National Irrigation Water Quality Program. This Program was conducted from 1985 to 1998 in areas throughout the western United States to evaluate the potential impacts of irrigation drainage on downstream wetlands. The Department conducted sampling and analyses of environmental media, including water, sediment, and biota (plants, invertebrates, fish, and wildlife). Reviewed the scientific literature, published reports, and available databases to develop guidelines for arsenic, copper, zinc, DDT-related compounds, and salinity. The main focus of the guidelines is on levels of these chemicals that do not cause adverse effects and on threshold effect levels, especially as related to documented effects under field conditions. The results were presented in text and tables that lend themselves to evaluating the effects of these chemicals under a variety of field settings, and were later published by the Department.

- **U.S. Environmental Protection Agency, Region 9, Ecological Risk Assessment for the Montrose Superfund Site in Los Angeles, CA.** Conducted ecological risk assessment evaluating impacts of the Montrose Chemical Corporation's former pesticide manufacturing plant site in Los Angeles. Assessment included evaluating all available information concerning, primarily, the contaminant levels in the surface drainage pathway to Los Angeles Harbor and identifying further data needed to evaluate impacts to aquatic, semi-aquatic, and terrestrial organisms exposed to contaminants through the surface drainage system and in areas downwind from the site. Subsequently developed a work plan and conducted the follow-up sampling from which results are currently being evaluated. U.S. EPA Region 9 uses this as an example of how information should be collected and used for risk assessment purposes.

- **U.S. Environmental Protection Agency, Region 10, Ecological Risk Assessment for the Coeur d'Alene Basin of Northern Idaho and Eastern Washington.** Recently completed a multi-year, complex ecological risk assessment evaluating impacts of mining within the Coeur d'Alene Basin of northern Idaho. The basin has been subjected to high levels of metals contamination since mining began in the upper basin in the 1880s. The entire basin of the South Fork of the Coeur d'Alene River downstream into Washington is included in the study area. The risk assessment was conducted as part of the remedial investigation / feasibility study to assist the USEPA in determining cleanup requirements for the basin. Habitats range from upper-elevation watersheds to lower-gradient streams, floodplain lakes, Coeur d'Alene Lake, and associated upland and riparian areas. Metals in soils, sediment, and water affect survival, growth, and reproduction of a wide range of terrestrial, aquatic, and semi-aquatic receptors exposed to them. Received an "Outstanding" performance rating from USEPA for this work.

- **U.S. Air Force, Ecological Survey and Ecological Risk Assessment for Elmendorf Air Force Base, Anchorage, AK.** Conducted an ecological survey of the entire base through a reconnaissance-level survey and review of available literature and reports to identify potential ecological receptors for several contaminated sites in various habitats. In addition, conducted an ecological risk assessment for one of the operable units, where petroleum products leaking from a pipeline into the areas along a stream had been identified as the primary concern. The phased approach used in this project proved very cost-effective, and the overall project was considered by reviewers as an example of how risk assessments should be conducted.

- **U.S. Army, Chena River Aquatic Assessment for Fort Wainwright, Fairbanks, AK.** Conducted (with assistance of a subcontractor) the Chena River Aquatic Assessment to evaluate effects on aquatic organisms as a result of fuel seepage from Fort Wainwright into the river. Evaluation included community surveys of benthic invertebrates, generally following Rapid Bioassessment Protocols, supplemented with deployment of artificial substrates to characterize organisms that colonize them as well as laboratory bioassays. Results of the aquatic assessment were used to conduct an ecological risk assessment that is part of the post-wide risk assessment for Fort Wainwright.

- **U.S. Army, Ecological Risk Assessment and Feasibility Study for Eagle River Flats on Fort Richardson, Anchorage, AK.** Led ecological team for work conducted at Eagle River Flats (ERF), located on Fort Richardson. In preparation for Fort Richardson being added to the NPL, CH2M HILL was contracted to prepare a comprehensive evaluation report (CER) for ERF. The ERF site became an OU under CERCLA when the facility was listed and a Federal Facilities Agreement for Fort Richardson was negotiated in 1994. The ERF is an estuarine salt marsh that has been used as the primary ordnance impact area for Fort Richardson since 1949. Past practices at the ERF involving white phosphorus have caused sediment contamination that has contributed to large numbers of waterfowl deaths at the site. The CER reviewed and evaluated various studies and investigations completed from 1982 through 1993. Subsequently, completed the ecological risk assessment for ERF and participated with the feasibility study team to evaluate alternative remediation measures that could be applied to reduce risks to waterfowl resulting from exposure to white phosphorus.

- **U.S. Air Force, Ecological Risk Assessment for Tatalina Long Range Radar Station, near McGrath, AK.** Conducted the ecological risk assessment for several sites within and near this remote radar site in southwestern Alaska as part of the remedial investigation / feasibility study. Work included development of the work plan and sampling plan, conducting field surveys, and evaluating results as part of the overall team. Habitats ranged from high-elevation tundra to lowland riverine areas along the Kuskokwim River; receptors ranged from large mammals (such as caribou and moose) to plants and fish.

- **Atlantic Richfield Company, NPDES Permitting, Prudhoe Bay, AK.** For ARCO Alaska's Prudhoe Bay seawater treatment plant, prepared technical support document, fact sheet, and NPDES permit renewal application, which included review of water quality, sediment quality, and benthic macroinvertebrate monitoring data. Submittal was timely and required minimal revision after being submitted to the client.

- **Central Utah Water Conservancy District, Central Utah Project Potential Impacts of Contaminants on Fish and Wildlife, UT.** At request of the Central Utah Water Conservancy District, prepared a study plan for analysis of potential impacts by toxic substances (especially selenium) and conducted field sampling to implement an environmental contaminants study. The study included the identification of relevant ecological endpoints for evaluating possible impacts of contaminants on fish and wildlife and the appropriate measurements to be made for conducting the evaluation. This study evaluated current levels of environmental contaminants in water, sediment, and biota, and potential impacts to water quality and to the biological community resulting from toxic substances mobilized or redistributed as a result of proposed projects in two areas: the Uinta Basin in northeastern Utah and the Spanish Fork/Nephi area south of Provo. Selenium is of primary concern because it has been found most frequently at elevated levels in western states during the U.S. Department of the Interior's National Irrigation Water Quality Program.

- **U.S. Navy/Southwest Division, Ecological Risk Assessments for Marine Corps Base Camp Pendleton, CA.** Conducted ecological risk assessments at four groups of sites that had been used for various military activities. The objective of these assessments was generally to determine whether environmental contaminants were present at concentrations that were potentially harmful to plants, fish, or wildlife present at the sites. Threatened or endangered species were of particular concern at several sites. In accordance with current guidance, the ecological risk assessments were phased to reduce overall costs while still obtaining all the necessary information. Through careful planning of bioassays at selected sites, it was possible to determine that most sites were unlikely to cause adverse effects. However, the risk assessments indicated a need for remediation at several sites because of high concentrations of herbicides, organochlorine insecticides, diesel fuel, or metals. Remediation has been completed at two sites, and work is ongoing for several others.

- **U.S. Navy/Southwest Division, National Wildlife Refuge Contaminants Study at Seal Beach Naval Weapons Station and National Wildlife Refuge, CA.** Conducted a study to assess levels of contamination in sediments and biota at the Seal Beach National Wildlife Refuge (NWR), which occupies a portion of the Naval Weapons Station. Ecological endpoints identified for the estuarine habitat on the refuge focused mainly on the protection of least terns and clapper rails, two endangered species that feed and nest in the salt marsh habitat of the refuge. Samples of fish, snails, crabs, other invertebrates, and sediment were

collected throughout the refuge and analyzed for inorganic and organic contaminants. Fish and invertebrate species were selected on the basis of their importance in the diet of least terns and clapper rails. Chemical analytical results were evaluated to determine whether contaminant levels in the food chain are likely to cause adverse effects in terns, rails, or other species feeding in the marsh. The results indicate there should be no significant impacts to those species, but monitoring is warranted, especially because of changes in physical oceanography and currents as a result of the construction of mitigation ponds in the NWR.

- **U.S. Army Corps of Engineers, Ecological Consulting Services for Hamilton Army Air Field, Novato, CA.** Providing ecological consulting services for the Hamilton AAF Base Realignment and Closure Ecological Restoration (BRAC-ER) Project and conducting risk assessment for the North Antenna Field (NAF) portion of the Hamilton AAF. Ecological consulting services include reviewing and commenting on technical documents from various sources, providing technical analysis and opinions on toxicological issues related to ecology and to human health, assisting the risk assessment team with advice and information, assisting the team in responding to agency comments, attending meetings between the Army and agencies and providing representation and participation at those meetings, and serving as a spokesman for the technical team. The risk assessment for NAF will evaluate potential risks to ecological and human receptors associated with current or future (wetland restoration) habitats at the site.

- **U.S. Air Force, Ecological Risk Assessments for Travis Air Force Base, near Fairfield, CA.** Conducted ecological risk assessments for one of the operable units as well as Basewide (including three other operable units). Effort included coordinating three contractors on issues related to risk assessment and determination of background inorganic contaminant levels. Again, work was phased to avoid doing unnecessary work at sites having minimal contamination and risk, while focusing more detailed studies only where they were needed. Following completion of the risk assessment, assisted the Base in developing rationale for remediation goals and associated target clean-up concentrations.

- **Chevron Chemical Company, Ecological Support Services for Richmond Facility, CA.** Participated as lead wildlife ecologist on the Richmond Wetlands Creation Project Phase 1 Conceptual Design, in which we evaluated potential conversion of some of the facility's stormwater ponds to constructed wetlands. Designs were developed that provided environmental enhancement of the ponds to create a mosaic of estuarine habitats within several ponds. Served as task leader for the Castro Creek Biological Assessment/Monitoring effort, which included characterization of vegetation along Castro Creek in the vicinity of the site. In the Fertilizer Ponds Wetlands Feasibility Study, evaluated the feasibility of converting the three ponds to wetlands. Lead the Ecological Risk Assessment activities required by the 1996 Site Cleanup Requirements Order and subsequently served as senior reviewer for ecological aspects of the CAR report in 1999-2000.

- **Union Sanitary District, Hayward Marsh Mercury Bioaccumulation Study, CA.** Conducted a study of mercury bioaccumulation in Hayward Marsh, a constructed treatment wetland that receives secondary effluent from a municipal treatment plant and inflow from San Francisco Bay to create estuarine habitat. The study was requested by the San Francisco Bay Regional Water Quality Control Board because measurable levels of mercury were

detected in water. The endpoints defined for this study focused on protection of aquatic wildlife from adverse effects of mercury through dietary exposure. The study examined levels of mercury in various components of the food chain and in bird eggs as well as muskrats to evaluate the probability of adverse effects in wildlife. Results of the study were compared to levels of mercury bioaccumulation in other freshwater and estuarine environments. Conclusions were that mercury in the wastewater was not accumulating to significant levels in wildlife using the marsh. These results allowed the client to reduce further sampling to periodic monitoring, rather than conducting more intensive studies of potential impacts of mercury. Thus, the definition of ecological endpoints and the design of the study plan provided a cost-effective evaluation of the Regional Board's concerns.

- **Imperial Irrigation District, IID/SDCWA Water Conservation and Water Transfer Project, Imperial, CA.** Currently evaluating potential impacts on fisheries and wildlife resources as a result Imperial Irrigation District's conservation of up to an additional 300,000 acre-feet of Colorado River water per year and the subsequent transfer of all or part of that water to the San Diego County Water Authority. Key issues of the evaluation include the potential effects on terrestrial and aquatic habitats and special-status species, especially as related to changes in water quality. Aquatic and terrestrial species can be affected by changes in the amount of aquatic and wetland habitats that are supported by IID's conveyance facilities and also by the quality of water that is available to those habitats.

- **Imperial Irrigation District, IID/MWD Water Conservation and Water Transfer Project, Imperial, CA.** Evaluated potential impacts on fisheries and wildlife resources as a result of the Imperial Irrigation District's implementation of water conservation measures mandated by the State Water Resources Control Board. This evaluation included descriptions of the environmental settings in the Imperial Valley and Salton Sea with a focus on resources that may be affected by changes in surface water flows and associated changes in environmental contaminant concentrations (including salinity/total dissolved solids, and other inorganics and agricultural chemicals). This work was one portion of the overall project that evaluated potential changes in the Salton Sea's southern watershed and their impacts on special status and other fish or wildlife species. Project included effective work with U.S. Fish and Wildlife Service as well as California Department of Fish and Game.

- **California Environmental Protection Agency, Guidelines for Conducting Ecological Risk Assessments in CA.** To promote consistency in conducting and reviewing ecological risk assessments throughout California, the California EPA Office of Environmental Health Hazard Assessment selected CH2M HILL (led by Harry Ohlendorf) to assist its Ecotoxicology Unit in the development of guidelines for conducting these assessments, as well as developing the ecological basis for the guidelines. The work focused on problem formulation for sites where chemical stressors are of concern in relation to ecological receptors (aquatic and terrestrial plants and animals inhabiting ecosystems throughout California). The resulting guidelines are broad in scope and are applicable to a wide range of contaminant situations, such as habitat perturbations, non-point source pollution, and prospective as well as retrospective ecological risk assessments. In addition, they are applicable in diverse ecological settings.

- **U.S. Environmental Protection Agency, Region 9, Ecological Risk Assessment for Iron Mountain Mine, near Redding, CA.** Ecological risk assessment evaluating impacts to

wildlife from Iron Mountain Mine, for the U.S. Environmental Protection Agency. Assessment included analysis of effects on semi-aquatic and terrestrial animals in the vicinity of the site.

- **Confidential Client, Evaluation of Selenium and Arsenic at a Mining Complex, AZ.** Conducted a comprehensive study of selenium and arsenic concentrations for a confidential client in northeastern Arizona. The study evaluated historical as well as recently collected sampling data, and compared selenium and arsenic levels in soils and overburden materials from the site to the general levels in the western U.S., evaluated surface coal mining effects on selenium and arsenic levels in various environmental media (including soil, water, air, plants, and animals), and assessed the potential biological and human health risks of exposure to these elements. Concentrations of selenium and arsenic in native soil and overburden samples from the site were similar to those found in comparable geologic samples from other areas in the western U.S. Sampling of several reclaimed areas, native vegetation in areas downwind from mining activities, and native vegetation in reference areas away from the mining activities, showed that average selenium and arsenic concentrations in plants from all areas were well within acceptable levels for sheep, other livestock, and wildlife diets. Air quality analysis showed no biologically significant effects of selenium or arsenic on the soils or plants, compared to reference soil or washed and unwashed plant samples. Groundwater quality monitoring data indicated that mining has not caused significant impacts to selenium or arsenic concentrations in the alluvial or shallow aquifers. Surface water quality data indicated that mining activities have not significantly affected selenium or arsenic concentrations in any of the surface water bodies, and concentrations in the whole-body largemouth bass and green sunfish studied were within acceptable limits for fish-consuming wildlife. Concentrations of selenium and arsenic detected in soil, surface water, air, plants, fish, and livestock were used to estimate human exposure and potential risks to human health at the mining complex. The results of the risk assessment indicated that even under a "high" exposure scenario, selenium intake by humans would be below the adverse effect level and arsenic intake levels would be similar to those from average drinking water throughout the U.S. In evaluating selenium and arsenic concentrations in blood, muscle, liver, kidney, and heart samples of local sheep and goat herds, no adverse effects were found. Average selenium and arsenic concentrations in forage plants growing downwind from the mining operations and in reclaimed areas were significantly below expected problem-causing levels. Husbandry practices and parasites were observed that could explain the difficulties reported by some animal owners.

- **BHP Hawaii, Inc., Ecotoxicology of Waterborne Vanadium, Kapolei, HI.** A RCRA Facility Investigation (RFI) was being conducted for BHP at its Kapolei, Hawaii, refinery by another consultant. Concentrations of vanadium detected in the surface water at locations in a storm drainage canal adjacent to the refinery (up to 34 µg/L) exceeded an ecological screening level for vanadium in fresh water (19 µg/L). The sampled segment of the canal represents a transition zone from freshwater/brackish conditions (salinity about 2.2 parts per thousand [ppt]) to seawater (salinity >20 ppt). BHP requested that Dr. Harry Ohlendorf of CH2M HILL's Sacramento office evaluate the available data in detail to (1) provide a review of the vanadium data for the storm drainage canal in relation to toxicity information for vanadium in freshwater, estuarine, and marine aquatic organisms, (2) determine if vanadium poses a risk to ecological receptors in the storm drainage canal adjacent to the

refinery, and (3) identify the appropriate benchmark for screening the concentrations of vanadium in the storm drainage canal. The project team for this evaluation included CH2M HILL personnel working under Dr. Ohlendorf's direction and BHP personnel who provided site data and related information. This evaluation lead to the conclusions that (1) the lowest chronic effects value for aquatic species caused no adverse effects but rather was associated with enhanced growth and reproduction of the test fish; (2) the recommended screening value for vanadium in the canal water is 80 µg/L; (3) water birds using the drainage canal as feeding areas or as a source of drinking water should not be adversely affected by the concentrations of vanadium found there; and (4) given the maximum concentration of vanadium found in the storm drainage canal was 34 µg/L, no adverse ecological effects would be expected to occur. These facts and conclusions allowed BHP Hawaii to support its RFI report with strong documentation that vanadium should not pose a significant risk to aquatic organisms or birds using the canal.

- **U.S. Coast Guard (USCG), Ecological Risk Assessment for Former USCG Loran Station, Tern Island, French Frigate Shoals, HI.** The USCG operated a Loran station on Tern Island in the French Frigate Shoals from 1956 to 1979, at which time the island was transferred to the U.S. Fish and Wildlife Service (USFWS). French Frigate Shoals is part of the Hawaiian Islands National Wildlife Refuge and contains many endangered and otherwise protected species of seabirds, seals, and turtles. The seawall on the north side of the island has been almost completely destroyed by waves/weather. The soil behind it is eroding, revealing a large amount of scrap metal, cable, wires, and electrical equipment. An area in the northwest portion of the island is known to have been used as a landfill. Site investigations performed by another contractor determined that the landfill contains two "hot spot" areas of soil contaminated with PCBs and lead. Subsequent to those site investigations, CH2M HILL prepared an ecological risk assessment to determine whether a cleanup was required. The client specifically requested Dr. Ohlendorf be involved in the assessment, which he did as a senior adviser. CH2M HILL staff evaluated the risks from lead and PCBs and determined cleanup levels to protect endangered seals and turtles as well as other marine life and seabirds. Sample habitat and statistical relevancy of sample plots were validated to determine if sample collection could accurately depict the true environmental exposure on the island. We developed a new method for estimation of ecological risks from bioaccumulative compounds to the endangered turtles. We also assisted the Coast Guard with negotiations with natural resource trustees (USFWS and NOAA).

- **U.S. Air Force, Runway 8L Engineering Evaluation/Cost Analysis, Hickam Air Force Base, Honolulu, HI.** The overall objective of the EE/CA project was to expedite investigation and remedial action at Hickam AFB for the restoration of property including and adjacent to Runway 8L, which is an active runway that is shared by Hickam AFB and Honolulu International Airport. The property contains or is adjacent to a number of Installation Restoration Program sites that are known or suspected to have been subject to the historic release of contaminants. Two major drainage canals that convey surface runoff from the Base into offsite estuarine/marine waters were evaluated for contamination in surface water, sediment, and biota tissue (fish and crabs). These water bodies were feeding areas for the endangered Hawaiian stilt and there was high stakeholder interest in these birds. Dr Ohlendorf provided senior review of the work plan for the EE/CA and associated planning documents, served as senior adviser and reviewer for the ecological risk assessment

portions of the project, and reviewed data submittals (such as the Informal Technical Information Report [ITIR]) for the project.

- **Walt Disney World, Discovery Island Ornithological Health Effects Review, Orlando, FL.** Analyses of existing data and the results of a previous study had shown that nutrients contained in stream discharges from Discovery Island could be contributing to a decline in water quality of the Bay Lake and Seven Seas Lagoon (BLSSL) system at Walt Disney World. Discovery Island has a large aviary as well as a number of other exhibits housing numerous kinds of captive and free-living birds. Conducted an ornithological health effects review of the island bird population as part of an overall plan to reduce nutrient discharges to BLSSL by installing a treatment system for water entering the BLSSL from Discovery Island. The focus of the ornithological health effects review was to identify and evaluate avian diseases that might occur within the captive bird population if water is recirculated through a man-made stream that flows through the exhibits. As a result of the review, recommendations were made for modification of feeding practices and habitat/stream flow, as well as water treatment requirements.

Previous Experience

Leader, Pacific Coast Research Station, Davis, CA (Under Patuxent Wildlife Research Center, U.S. Fish and Wildlife Service [USFWS]); 1980- 1990
Served as project coordinator for research on effects of agricultural drainwater on wildlife and leader of a team of scientists conducting research on San Francisco Bay. Conducted studies of the effects of agricultural drainwater contaminants on food chains and aquatic birds, and integrated ecosystem studies to evaluate the effects of agricultural, industrial, and municipal contaminants on migratory waterfowl populations in San Francisco Bay. Discoveries related to agricultural drainwater contamination (especially as related to selenium) led to extensive publicity of the findings (including publication in National Geographic, numerous other magazines and newspapers, as well as national television [including 60 Minutes] and radio [including interview on National Public Radio] coverage). It also inspired a broad field of research on the effects of selenium in fish and wildlife, and caused extensive re-evaluation of water management policies throughout the western United States.

Assistant Director, Patuxent Wildlife Research Center, USFWS, Laurel, MD; 1973-1980
Assisted in the formulation, guidance, and direction of a major facility conducting extensive research in the broad field of wildlife biology, assuming responsibilities as delegated by the Director in both research-related and management-related functions. Reviewed research plans prior to initiation and advised the Director on the validity and pertinence of study areas, experimental design, techniques to be used, and procedures to be followed. Reviewed scientific manuscripts and assisted in their editing as required. Also continued to conduct research on the effects of environmental contaminants on wildlife and published results in scientific journals. Studies were conducted throughout the United States, including Alaska and Hawaii. Represented the Center in its numerous work relationships with other Federal, State, and private research and non-research organizations. For example, I led a delegation of scientists traveling to the Soviet Union for a 2-week scientific exchange visit, and hosted the Soviet delegation for their return visit to the U.S.

Wildlife Research Biologist, Patuxent Wildlife Research Center, USFWS, Laurel, MD; 1971-1973
Conducted research on the effects of environmental contaminants on wildlife and published results in scientific journals. Studies were focused mainly on fish-eating birds, which are highly exposed to many kinds of contaminants, and were conducted throughout the eastern U.S.

Membership/Activities in Professional Organizations

- Cooper Ornithological Society
- NorCal Regional Chapter, Society of Environmental Toxicology and Chemistry (Newsletter Editor 1996-1999; Board of Directors 1999-2001)
- Pacific Seabird Group (Chairman 1982)
- Society of Environmental Toxicology and Chemistry (Editorial Board 1987-1989; Pre-doctoral Fellowship Selection Committee 1989)
- The Wildlife Society (Wildlife Toxicology Working Group member since 1994; Board Member 1996)
- Waterbird Society
- Wilson Ornithological Society

Other Related Activities:

- Editorial Board for Bulletin of Environmental Contamination and Toxicology 1991 to Present
- Peer reviewer for colleagues who send me manuscripts and reports for review (usually several per year) before submitting for publication
- In addition to reviewing manuscripts submitted for publication in the Bulletin of Environmental Contamination and Toxicology, I serve as peer reviewer for manuscripts (usually several per year) submitted to several other scientific journals, including Environmental Toxicology and Chemistry, Archives of Environmental Contamination and Toxicology, Environmental Pollution, Environmental Management, Journal of Wildlife Management, Condor, Colonial Waterbirds, and Pacific Seabirds
- Reviewed proposal for book to be published by Springer-Verlag (Selenium Pollution in Aquatic Ecosystems, by A.D. Lemly; 2001) and peer reviewer for book published by SETAC Press (Ecotoxicology and Risk Assessment for Wetlands, edited by M.A. Lewis et al.; 1999)
- University of California, Ecotoxicology Program; External Advisory Committee member 1990-1995
- Since 1993, have taught eight 3-day classes in ecological risk assessment through University of California Berkeley Extension's Environmental Management Continuing Education Program (along with a USEPA Region 9 risk assessor)

Honors and Recognition

- Received "Outstanding" performance rating from U.S. EPA Region 10 for Ecological Risk Assessment task I led, 2001
- Recognized as a "Pioneer of Selenium Research" in a book, "Environmental Chemistry of Selenium," edited by W.T. Frankenberger, Jr., and R.A. Engberg and published by Marcel Dekker, Inc. 1998
- Regional Business Group recognition for Outstanding Team Initiative on Ecological Risk Assessments for the Eagle River Flats, AK; Travis Air Force Base, CA; Marine Corps Base Camp Pendleton, CA; and Fort Richardson, AK projects, which were done concurrently under my leadership, 1997
- Featured as project manager in article ("Timeless Values Steer Today's Service") in 50th Anniversary CH2M HILL Reports issue for work done for Peabody Western Coal, 1996
- Received commendation letter from U.S. Department of the Interior Assistant Secretary for Water and Science and Assistant Secretary for Fish and Wildlife and Parks for playing "an especially significant role" in the Department's gaining California State Water Resources Control Board approval for proposed cleanup actions at Kesterson Reservoir, 1988
- U.S. Fish and Wildlife Service (USFWS) Special Achievement Award for conducting research of exceptional scientific merit, providing technical services for other units of the USFWS, and representing the Patuxent Wildlife Research Center outside the USFWS, 1986
- Nelson-Hooper Award for best technical presentation at meeting of the Western Section of The Wildlife Society, 1984
- USFWS Special Achievement Award for sustained performance as a research scientist in production of high-quality research products, 1981
- Letter of appreciation from Roger Sumner Babb, Regional Solicitor for the U.S. Department of the Interior, Northeast Region, for technical support on issues related to effects of highways and a waste disposal site adjacent to the Patuxent Wildlife Research Center, 1980
- Letter of appreciation from John M. Murphy, Chairman of U.S. House of Representatives Committee on Merchant Marine and Fisheries, for testimony presented (on behalf of USFWS) pertaining to ocean disposal of dredge spoil at the Committee's hearing held on May 21, 1980

Publications and Presentations

Dr. Ohlendorf is the author of more than 70 papers in the fields of environmental toxicology and vertebrate ecology. He also has presented more than 60 papers at scientific meetings and symposia, many as an invited participant. In addition, he has presented statements concerning effects of contaminants on fish and wildlife at a U.S. House of Representatives, Merchant Marine and Fisheries Committee hearing in 1980 and on the effects of environmental contaminants in San Francisco Bay waterfowl at a 1986 hearing of the House of Representatives Interior and Insular Affairs Committee, Subcommittee on Water and Power.

"Ecotoxicology of Selenium." Chapter in press for second edition of Handbook of Ecotoxicology, edited by D.J. Hoffman et al., to be published by Lewis Publishers in 2002 (invited contribution).

"The Birds of Kesterson Reservoir: A Historical Perspective." Aquatic Toxicology 57:1-10. (invited contribution for a special edition of this journal).

With P.H. Albers and G.H. Heinz. "Environmental Contaminants and Terrestrial Vertebrates: Effects on Populations, Communities, and Ecosystems." Proceedings of a Symposium on that subject held at University of Maryland, College Park, MD, October 19-21, 1998. Co-editor of book published by SETAC Press, Pensacola, FL. 2000.

With W.R. Gala. "Selenium and Chevron Richmond Refinery's Water Enhancement Wetland: A Response to A.D. Lemly, 1999." Human and Ecological Risk Assessment 6:903-905. 2000.

With E.R. Byron, et al. "A Selenium Exposure Model for Waterfowl and Shorebirds Feeding in Seasonal Rainwater Pools at Kesterson Reservoir, CA." Presented at the Annual Meeting of the Society of Environmental Toxicology and Chemistry, Nashville, TN. 2000.

With L. Saban, B.E. Sample, et al. "Calculation of PCB Cleanup Goals Using Future Risk Scenarios at Tern Island, French Frigate Shoals." Presented at the Annual Meeting of the Society of Environmental Toxicology and Chemistry, Nashville, TN. 2000.

With B.E. Sample, et al. "Ecological Risk Assessment for Marine Birds and Mammals at Tern Island, a Former U.S. Coast Guard LORAN Station." Presented at the Annual Meeting of the Society of Environmental Toxicology and Chemistry, Nashville, TN. 2000.

With B.E. Sample, et al. "Evaluation of Risks to the Endangered Green Sea Turtle at a Former U.S. Coast Guard LORAN Station." Presented at the Annual Meeting of the Society of Environmental Toxicology and Chemistry, Nashville, TN. 2000.

"Selenium Was a Time Bomb." Human and Ecological Risk Assessment 5:1181-1185. 1999. (invited contribution).

With R.L. Knight and R.H. Kadlec. "The Use of Treatment Wetlands for Petroleum Industry Effluents." Environmental Science and Technology 33:973-980. 1999.

With M.A. Castleberry, et al. "Ecological Risk Assessment for Restoration of the Bolsa Chica Lowlands, California." Presented at the Annual Meeting of the Society of Environmental Toxicology and Chemistry, Philadelphia, PA. 1999.

"Evaluating Bioaccumulation in Wildlife Food Chains." A. dePeyster and K.E. Day, eds., Ecological Risk Assessment: A Meeting of Policy and Science, Pp. 65-109. Society of Environmental Toxicology and Chemistry. Pergamon Press, New York, NY. 1998.

With D.J. Hoffman, C.M. Marn, and G.W. Pendleton. "Association of Mercury and Selenium with Altered Glutathione Metabolism and Oxidative Stress in Diving Ducks from the San Francisco Bay Region, USA." Environmental Toxicology and Chemistry 17:167-172. 1998.

With R.L. Hothem, D.G. Lonzarich, and J.E. Takekawa. "Contaminants in Wintering Canvasbacks and Scaups from San Francisco Bay, California." Environmental Monitoring and Assessment 50:67-84. 1998.

With R.M. Burgess, et al. "Chena River Aquatic Assessment, Fort Wainwright, Alaska." Presented at the Annual Meeting of the Society of Environmental Toxicology and Chemistry, Charlotte, NC. 1998.

With E.R. Byron, et al. "Selenium Bioaccumulation and Exposure in an Ephemeral Pool Environment." Presented at the Annual Meeting of the Society of Environmental Toxicology and Chemistry, Charlotte, NC. 1998.

With E.R. Byron, et al. "Avian Reproductive Success and Selenium Bioaccumulation in a Constructed Wetland Receiving Treated Refinery Effluent." Presented at the Annual Meeting of the Society of Environmental Toxicology and Chemistry, Charlotte, NC. 1998.

With M.A. Castleberry, et al. "Ecological Risk Assessment for Restoration of the Bolsa Chica Lowlands, California." Presented at the Annual Meeting of the Society of Environmental Toxicology and Chemistry, Charlotte, NC. 1998.

"Toxicological Effects of Selenium on Birds." Presented at symposium on Understanding Selenium in the Aquatic Environment, sponsored by Kennecott Utah Copper, March 6-7, 1997. (invited participant).

With E. Byron and G. Santolo. "Patterns of Selenium Bioaccumulation in Freshwater Invertebrates of Kesterson Reservoir." Presented at the Annual Meeting of the Society of Environmental Toxicology and Chemistry, San Francisco, CA 1997.

With G. Santolo and J. Yamamoto. "Risk Assessment for Terrestrial Birds at Kesterson Reservoir." Presented at the Annual Meeting of the Society of Environmental Toxicology and Chemistry, San Francisco, CA. 1997.

With S. Schwarzbach and R. Hothem. "Mercury in Avian Eggs from San Francisco Bay." Presented at the Annual Meeting of the Society of Environmental Toxicology and Chemistry, San Francisco, CA. 1997.

"Selenium." A. Fairbrother, L.N. Locke, and G.L. Hoff, eds., Noninfectious Diseases of Wildlife, 2nd edition, Pp. 128-140. The Iowa State University Press, Ames. 1996. (invited contribution).

With S.M. Bartell. "Kesterson Reservoir Ecological Risk Assessment: A Case Study." R. V. Kolluru et al., eds., Risk Assessment and Management Handbook for Environmental, Health, & Safety Professionals, Pp. 11.1-11.13. McGraw-Hill Inc., New York, NY. 1996. (invited contribution).

"Ecological Risk Assessment for Constructed Wetlands." Presented at symposium on Constructed Wetlands in Cold Climates: Design, Operation, Performance, held in Niagara-on-the-Lake, Ontario, June 4-5,1996, and published in symposium proceedings. (invited participant).

With G. Santolo and J. Maughan. "Wildlife Toxicology Contributions toward Site Remediation Decision-Making." Presented at the Annual Meeting of the Society of Environmental Toxicology and Chemistry, Washington, DC. 1996. (invited participant).

With S.P. Long and E.R. Byron. "Joint Use of Laboratory Bioassays and Field-Collected Invertebrates to Evaluate Toxicity and Contaminant Bioaccumulation." Presented at the Annual Meeting of the Society of Environmental Toxicology and Chemistry, Washington, DC. 1996.

"Ecological Risk Assessment for Kesterson Reservoir, California." Presented at Workshop on Toxicological Foundations of Ecological Risk Assessment at Annual Meeting of the Society of Toxicology, Anaheim, CA. 1996. (invited participant).

With G.M Santolo. "Kesterson 1985 to Present." Presented at the National Irrigation Water Quality Program Phase 4 Bi-annual Meeting, San Diego, CA. 1996. (invited participant).

"Selenium Toxicity in Waterfowl: The Kesterson Experience." Proceedings of a National Symposium: Selenium in the Environment: Essential Nutrient, Potential Toxicant, Pp. 11-19. Sponsored by University of California Division of Agriculture and Natural Resources, Cooperative Extension; BioTech Associates Limited, Inc.; Schering-Plough Animal Health. Sacramento, CA, May 31 - June 2, 1995. (invited contribution).

With R.L. Hothem. "Agricultural Drainwater Effects on Wildlife in Central California." B.A. Rattner, G.A. Burton, Jr., and J. Cairns, Jr., eds. Handbook of Ecotoxicology, Pp. 577-595. Boca Raton: Lewis Publishers. 1995. (invited contribution).

With E. Byron. "Metal Contamination, Sediment Toxicity, Bioaccumulation, and AVS/SEM in an Industrial Wastewater Treatment Pond." Presented at the Annual Meeting of the Society of Environmental Toxicology and Chemistry, Vancouver, British Columbia, Canada. 1995.

With E. Byron and M. Stanaway. "The Use of Multi-species, Multi-life Stage Tests to Evaluate Soil Toxicity at Camp Pendleton Marine Corps Base, California." Presented at the Annual Meeting of the Society of Environmental Toxicology and Chemistry, Vancouver, British Columbia, Canada. 1995.

With E. Byron, L. Taylor, and R. Cortes. "Mercury Bioaccumulation in Hayward Marsh, California." Presented at the Annual Meeting of the Society of Environmental Toxicology and Chemistry, Vancouver, British Columbia, Canada. 1995.

With G.M. Santolo. "Kesterson Reservoir-Past, Present, and Future: An Ecological Risk Assessment." W.T. Frankenberger, Jr., and S.M. Benson, eds., Selenium in the Environment, Pp. 69-117. New York, NY: Marcel Dekker, Inc. 1994. (invited contribution).

With E.R. Byron, et al. "Environmental Contaminants in the Food Chain, NWS Seal Beach and Seal Beach NWR." Presented at the Annual Meeting of the Society of Environmental Toxicology and Chemistry, Denver, CO. 1994.

"Marine Birds and Trace Elements in the Temperate North Pacific." K. Vermeer, K.T. Briggs, K.H. Morgan, and D. Siegel-Causey, eds., The Status Ecology, and Conservation of Marine Birds of the North Pacific. Ottawa, Canada: Canadian Wildlife Service Special Publication, Pp. 232-240. 1993. (invited contribution).

With J.P. Skorupa, M.K. Saiki, and D.A. Barnum. "Food-Chain Transfer of Trace Elements to Wildlife." R.G. Allen and C.M.U. Neale, eds., Management of Irrigation and Drainage Systems: Integrated Perspectives. Proceedings of the 1993 National Conference on Irrigation and Drainage Engineering. Park City, UT, July 21-23, 1993, Pp. 596-603. American Society of Civil Engineers, New York, NY. 1993. (invited contribution).

"Food-chain Transfer of Trace Elements to Wildlife." Presented at the American Society of Civil Engineers National Conference on Irrigation and Drainage Engineering, Park City, UT. 1993. (invited participant).

With A.K. Miles. "Environmental Contaminants in Canvasbacks Wintering on San Francisco Bay, California." California Fish and Game 79:28-38. 1993.

With M.A. Girts and R.T. Bannerman. "Effects of Nonpoint Source Pollutants on Receiving Waters." Presented at the Annual Meeting of the Society of Environmental Toxicology and Chemistry. Houston, TX. 1993. (invited participant).

With G.M. Santolo. "Ecological Risk Assessment for Kesterson Reservoir, California." Presented at the Annual Meeting of the Society of Environmental Toxicology and Chemistry. Cincinnati, OH. 1992.

Mitigation Monitoring presentation and panel member at California Chapter American Planning Association Conference. Sacramento, CA. 1991.

With K.C. Marois et al. "Trace Elements and Organochlorines in Surf Scoters from San Francisco Bay, 1985." Environmental Monitoring and Assessment 18:105-122. 1991.

With J.P. Skorupa. "Contaminants in Drainage Water and Avian Risk Thresholds." A. Dinar and D. Zilberman, eds., The Economics and Management of Water and Drainage in Agriculture, Pp. 345-368. Boston, MA: Kluwer Academic Publishers 1991. (invited contribution).

With T.W. Custer, B.A. Rattner, and M.J. Melancon. "Herons and Egrets as Proposed Indicators of Estuarine Contamination in the United States." Proceedings of the 20th International Ornithological Congress; Pp. 2474-2479. Christchurch, New Zealand. December 29, 1990.

With T.W. Custer and G. Pendleton. "Within- and Among-clutch Variation of Organochlorine Residues in Eggs of Black-crowned Night-Herons." Environmental Monitoring and Assessment 15:83-89. 1990.

With R.L. Hothem, C.M. Bunck, and K.C. Marois. "Bioaccumulation of Selenium in Birds at Kesterson Reservoir, California." Archives of Environmental Contamination and Toxicology 19:495-508. 1990.

With C.A. Schuler and R.G. Anthony. "Selenium in Wetlands and Waterfowl Foods at Kesterson Reservoir, California, 1984." Archives of Environmental Contamination and Toxicology 19:845-853. 1990.

With K.C. Marois. "Organochlorines and Selenium in California Night-Heron and Egret Eggs." Environmental Monitoring and Assessment 15:91-104. 1990.

"Selenium and Other Trace Elements in Relation to Wildlife." Symposium on Biogeochemistry and Toxicology of Toxic Inorganic Elements. Presented at the Annual Meeting of the Pacific Division, American Association for the Advancement of Science. 1990. (invited participant).

"Marine Birds and Toxic Chemicals in the Temperate North Pacific." Symposium on "Status, Ecology, and Conservation of Marine Birds of the Temperate North Pacific" at the annual meeting of the Pacific Seabird Group. 1990. (invited participant).

"Selenium in Relation to Wildlife and Agricultural Drainage Water." Conference on "Humans, Wildlife & Habitat: Perspectives on Coexistence." Sponsored by Environmental Law Society. University of California, Davis. 1990. (invited participant).

"The U.S. Fish and Wildlife Service San Francisco Bay Research Project." Symposium on "Agricultural Drainage and Implications for the Environment." Sponsored by University of California, Berkeley. 1990. (invited participant).

"Bioaccumulation and Effects of Selenium in Wildlife." Selenium in Agriculture and the Environment. L.W. Jacobs, ed. SSSA Special Publication No. 23:133-177. Madison, WI: American Society of Agronomy and Soil Science Society of America. 1989. (invited contribution).

With R.L. Hothem and D. Welsh. "Nest Success, Cause-Specific Nest Failure, and Hatchability of Aquatic Birds at Selenium-Contaminated Kesterson Reservoir and a Reference Site." Condor 91:787-796. 1989.

With M.L. Williams and R.L. Hothem. "Recruitment Failure in American Avocets and Black-necked Stilts Nesting at Kesterson Reservoir, California, 1984-1985." Condor 91:797-802.

With R.L. Hothem. "Contaminants in Foods of Aquatic Birds at Kesterson Reservoir, California, 1985." Archives of Environmental Contamination and Toxicology 18:773-786. 1989.

With T.W. Custer. "Brain Cholinesterase Activity of Nestling Great Egrets, Snowy Egrets, and Black-crowned Night-Herons." Journal of Wildlife Diseases 25:359-363. 1989.

With D.R. Clark, Jr., P.A. Ogasawara, and G.J. Smith. " Selenium Accumulation by Raccoons Exposed to Irrigation Drainwater at Kesterson National Wildlife Refuge, California, 1986. Archives of Environmental Contamination and Toxicology 18:787-794. 1989.

With J.P. Skorupa. "Selenium in Relation to Wildlife and Agricultural Drainage Water." Proceedings of the Fourth International Symposium on Uses of Selenium and Tellurium; Banff, Alberta, Canada, May 8-10, 1989. S.C. Carapella Jr., ed. Pp. 314-338. Selenium-Tellurium Development Assoc., Darien, CT. 1989. (invited contribution).

With R.L. Hothem. "Aquatic Birds and Selenium in the San Joaquin Valley and San Francisco Bay." Selenium and Agricultural Drainage: Implications for San Francisco Bay and the California Environment. Proceedings of the Third Selenium Symposium, Berkeley, CA, March 15, 1986. A.Q. Howard, ed. Pp. 21-33. The Bay Institute of San Francisco, Sausalito, CA. 1989. (invited contribution).

With K.C. Marois et al. "Environmental Contaminants and Diving Ducks in San Francisco Bay." Selenium and Agricultural Drainage: Implications for San Francisco Bay and the California Environment. Proceedings of the Fourth Selenium Symposium, Berkeley, CA, March 21, 1987. A.Q. Howard, ed. Pp. 60-69. The Bay Institute of San Francisco, Sausalito, CA. 1989. (invited contribution).

"The U.S. Fish and Wildlife Service San Francisco Bay Research Project." San Francisco Bay and Estuarine Association. 1989. (invited participant).

"Selenium in Relation to Wildlife and Agricultural Drainage Water. Fourth International Symposium on Uses of Selenium and Tellurium. 1989. (invited participant).

"The U.S. Fish and Wildlife Service San Francisco Bay Research Project." Santa Clara County Water Forum. Sponsored by Leagues of Women Voters of Santa Clara County. 1989. (invited participant).

With D.E. Boellstorff, D.W. Anderson, and E.J. O'Neill. "Reproductive Effects of Nest-marking Studies in an American White Pelican Colony." Colonial Waterbirds 11:215-219. 1988.

With T.W. Custer et al. "Organochlorines and Mercury in Eggs of Coastal Terns and Herons in California, USA." Colonial Waterbirds 11:85-94. 1988.

With W. J. Fleming. "Birds and Environmental Contaminants in San Francisco and Chesapeake Bays." Marine Pollution Bulletin 19:487-495. 1988. (invited contribution).

With D.J. Hoffman and T.W. Aldrich. "Selenium Teratogenesis in Natural Populations of Aquatic Birds in Central California." Archives of Environmental Contamination and Toxicology 17:519-525. 1988.

With R.L. Hothem and T.W. Aldrich. "Bioaccumulation of Selenium by Snakes and Frogs in the San Joaquin Valley, California." Copeia 1988:704-710. 1988.

With A.W. Kilness et al. "Selenium Toxicosis in Wild Aquatic Birds." Journal of Toxicology and Environmental Health 24:67-92. 1988.

"Reproductive Success and Cause-specific Nest Failure of Aquatic Birds at Two California Sites, 1983-85." Cooper Ornithological Society. 1988.

With R.L. Hothem, T.W. Aldrich, and A.J. Krynitsky. "Selenium Contamination of the Grasslands, a Major California Waterfowl Area." The Science of the Total Environment 66:169-183. 1987.

With T.S. Presser. "Biogeochemical Cycling of Selenium in the San Joaquin Valley, California, USA." Environmental Management 11:805-821. 1987.

"Environmental Contaminants and Diving Ducks in San Francisco Bay." Symposium on "Selenium and Agricultural Drainage." Sponsored by University of California, Berkeley. 1987. (invited participant).

"The Accumulation of Contaminants by Birds of the Bay-Delta and Their Possible Biological Effects." Aquatic Habitat Institute Symposium, "Toxic Contaminants and Their Biological Effects in San Francisco Bay-Delta." Berkeley, CA. 1987. (invited participant).

With C.S. Harrison. "Mercury, Selenium, Cadmium and Organochlorines in Eggs of Three Hawaiian Seabird Species." Environmental Pollution (Series B) 11:169-191. 1986.

With D.J. Hoffman et al. "Association between PCBs and Lower Embryonic Weight in Black-crowned Night Herons in San Francisco Bay." Journal of Toxicology and Environmental Health 19:383-391. 1986.

With D.J. Hoffman et al. "Embryonic Mortality and Abnormalities of Aquatic Birds: Apparent Impacts of Selenium from Irrigation Drainwater." The Science of the Total Environment 52:49-63. 1986.

With R.L. Hothem et al. "Relationships between Selenium Concentrations and Avian Reproduction." Transactions of the North American Wildlife and Natural Resources Conference 51:330-342. 1986.

With R.W. Lowe et al. "Selenium and Heavy Metals in San Francisco Bay Diving Ducks." Journal of Wildlife Management 50:64-71. 1986.

"Aquatic Birds and Selenium in the San Joaquin Valley." Symposium on "Selenium and Agricultural Drainage." Sponsored by University of California, Berkeley. 1986. (invited participant).

"Aquatic Birds and Selenium in the San Joaquin Valley." Selenium and Agricultural Drainage: Implications for San Francisco Bay and the California Environment, Proceedings of the Second

Selenium Symposium, Berkeley, CA, March 23, 1985 A.Q. Howard, ed., Pp. 14-24. The Bay Institute of San Francisco. Tiburon, CA. 1986. (invited contribution).

"Bioaccumulation and Effects of Selenium in Wildlife." American Society of Agronomy Symposium on "Selenium in Irrigated Agriculture." 1986. (invited participant).

Presented a statement concerning environmental contaminants in San Francisco Bay waterfowl. U.S. House of Representatives, Interior and Insular Affairs Committee, Subcommittee on Water and Power Hearing. 1986. (invited participant).

"Selenium Contamination of the Grasslands, a Major California Waterfowl Area." Cooper Ornithological Society, 1986.

With D.W. Anderson, et al. "Tissue Distribution of Trace Elements and DDE in Brown Pelicans." Bulletin of Environmental Contamination and Toxicology 35:183-192. 1985.

With D.E. Boellstorff et al. "Organochlorine Chemical Residues in White Pelicans and Western Grebes from the Klamath Basin, California." Archives of Environmental Contamination and Toxicology 14:485-493. 1985.

With T.W. Custer and E.F. Hill. "Effects on Wildlife of Ethyl and Methyl Parathion Applied to California Rice Fields." California Fish and Game 71:220-224. 1985.

With F.C. Schaffner et al. "Reproduction and Organochlorine Contaminants in Terns at San Diego Bay." Colonial Waterbirds 8:42-53. 1985.

"Aquatic Birds and Selenium in the San Joaquin Valley." Symposium on "Selenium and Agricultural Drainage," sponsored by University of California, Berkeley. 1985. (invited participant).

"Avian and Food Chain Impacts of Selenium." Conference on "Salinity in California's Central Valley." 1985. (invited participant).

"Effects of Selenium on Nesting Aquatic Birds." Society of Environmental Toxicology and Chemistry; Wildlife Toxicology Symposium. 1985. (invited participant).

"Impact on Waterfowl." Society of Environmental Toxicology and Chemistry; short course on "Integrated Hazard Assessment: A Case Study of Disposal of Agricultural Drainage Water in California." 1985. (invited participant).

"Selenium, Heavy Metals and Organochlorines in San Francisco Bay Diving Ducks." San Francisco Bay and Estuarine Association. 1985. (invited participant).

Summary of Research Results in Relation to Selenium in Aquatic Birds of the San Joaquin Valley. National Research Council, National Academy of Sciences; Committee on Irrigation-induced Water Quality Problems. 1985. (invited participant).

With M.R. Miller. "Organochlorine Contaminants in California Waterfowl." Journal of Wildlife Management 48:867-877. 1984.

"Recent Findings and Impacts on Aquatic Birds at Kesterson Reservoir." Agricultural Wastewater Workshop, University of California, Davis. 1984. (invited participant).

"Selenium and Aquatic Birds in the San Joaquin Valley." Bay Area Chapter of the Western Section, The Wildlife Society. 1984. (invited participant).

"Selenium Problems at Kesterson National Wildlife Refuge." American Society of Civil Engineers, San Francisco Section. San Francisco. 1984. (invited participant).

"The Selenium Problem in Western Merced County." San Joaquin Valley Chapter of the Western Section, The Wildlife Society. 1984. (invited participant).

With J.C. Bartonek et al. "Organochlorine Residues in Eggs of Alaskan Seabirds." Special Scientific Report - Wildlife No. 245, U.S. Fish and Wildlife Service. 41 pp. 1982.

With D.M. Swineford and L.N. Locke. "Organochlorine Residues and Mortality of Herons." Pesticides Monitoring Journal 14:125-135. 1981.

"The Chesapeake Bay's Birds and Organochlorine Pollutants." Transactions of the North American Wildlife and Natural Resources Conference 46:259-270. 1981. (invited contribution).

With E.E. Klaas and E. Cromartie. "Organochlorine Residues and Shell Thicknesses in Eggs of the Clapper Rail, Common Gallinule, Purple Gallinule, and Limpkin (Class Aves), Eastern and Southern United States, 1972-74." Pesticides Monitoring Journal 14:90-94. 1980.

"The Effects of Contaminants on Fish and Wildlife." Dredge Spoil Disposal and PCB Contamination. Pp. 499-506. Hearings before the Committee on Merchant Marine and Fisheries, House of Representatives, 96th Congress, second session, on exploring the various aspects related to the dumping of dredged spoil material in the ocean and the PCB contamination issue. March 14, May 21, 1980. USGPO Serial No. 96-43. 1980. (invited participant).

With J.B. Elder et al. "Organochlorine Residues in Young Herons from the Upper Mississippi River." Pesticides Monitoring Journal 13:115-119. 1979.

With E.E. Klaas and T.E. Kaiser. "Environmental Pollutants and Eggshell Thickness: Anhingas and Wading Birds in the Eastern United States." Special Scientific Report - Wildlife No. 216, U.S. Fish and Wildlife Service. 94 pp. 1979.

With D.M. Swineford and L.N. Locke. "Organochlorine Poisoning of Herons." Proceedings 1979 Conference of the Colonial Waterbird Group. Pp. 176-185. W.E. Southern, compiler. 1979.

"Archiving Wildlife Specimens for Future Analysis." N.P. Luepke, ed., Monitoring Environmental Materials and Specimen Banking, Pp. 491-504. Proceedings of the International Workshop, Berlin (West), October 1978. Martinus Niihoff Publishers. The Hague. 1979. (invited participant).

With E.E. Klaas and T.E. Kaiser. "Environmental Pollutants and Eggshell Thinning in the Black-crowned Night Heron." Wading Birds, A. Sprunt, IV, J.C. Ogden, and S. Winckler, eds. National Audubon Society Research Report No. 7:63-82. 1978. (invited contribution).

With E.E. Klaas and T.E. Kaiser. Organochlorine Residues and Eggshell Thinning in Wood Storks and Anhingas. Wilson Bulletin. 90:608-618. 1978.

With E.E. Klaas and T.E. Kaiser. "Organochlorine Residues and Eggshell Thinning in Anhingas and Waders." Proceedings 1977 Conference of the Colonial Waterbird Group, Pp. 185-195. W.E. Southern, compiler. 1978.

With E.E. Klaas, S.N. Wiemeyer, and D.M. Swineford. "Organochlorine Residues, Eggshell Thickness, and Nest Success in Barn Owls from the Chesapeake Bay." Estuaries 1:46-53. 1978.

With R.W. Risebrough and K. Vermeer. "Exposure of Marine Birds to Environmental Pollutants." Wildlife Research Report No. 9, U.S. Fish and Wildlife Service. 40 pp. (Part of the Proceedings of Symposium on Conservation of Marine Birds of Northern North America). 1978. (invited contribution).

With L.J. Blus, et al. "Impact of Estuarine Pollution on Birds." Estuarine Pollution Control and Assessment, Proceedings of a Conference, Vol. 1, Pp 57-71. U.S. Environmental Protection Agency, Washington, D.C. 1977.

With R.C. Stendell, E.E. Klaas, and J.B. Elder. "Mercury in Eggs of Aquatic Birds, Lake St. Clair - 1973." Pesticides Monitoring Journal 10:7-9. 1976.

"Comparative Breeding Ecology of Phoebes in Trans-Pecos Texas." Wilson Bulletin 88:255-271. 1976.

"Environmental Pollutants and Eggshell Thinning in the Black-crowned Night Heron." North American Wading Bird Conference" sponsored by National Audubon Society and U.S. Fish and Wildlife Service, Charleston, SC. 1976. (invited participant)

With E.E. Klaas and R.G. Heath. "Avian Eggshell Thickness: Variability and Sampling." Wilson Bulletin 86:156-164. 1974.

With E.E. Klaas and T.E. Kaiser. "Environmental Pollution in Relation to Estuarine Birds." M.A.Q. Khan and J.P. Bederka, eds., Survival in Toxic Environments, Pp. 53-81. Academic Press, New York, NY. 1974. (invited contribution).

With L.N. Locke, R.B. Shillinger, and T. Jareed. "Salmonellosis in a Captive Heron Colony." Journal of Wildlife Diseases 10:143-145. 1974.

"Competitive Relationships among Kingbirds (*Tyrannus*) in Trans-Pecos Texas." Wilson Bulletin 86:357-373. 1974.

With V. Board. "Nesting Records for Two Species of Birds in Trans-Pecos Texas." Southwestern Naturalist 17:99-100. 1972.

"Observations on a Colony of *Eumops perotis* (Molossidae)." Southwestern Naturalist 17:297-300. 1972.

With R.F. Patton. "Nesting Record of Mexican Duck (*Anas diazi*) in Texas." Wilson Bulletin 83:97. 1971.

"Competitive Relationships among Selected Species of Flycatchers (Tyrannidae) in Trans-Pecos Texas." Ph.D. Dissertation, Texas A&M University, College Station. xii + 121 MS pp. 1971.

"The Ecological Distribution of Vertebrates and Flowering Plants in Capote Canyon, Presidio County, Texas." M.S. Thesis, Texas A&M University, College Station. x + 131 MS pp. 1969.