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Professional Profile

Dr. Fairbrother has more than 30 years of experience in ecotoxicology, wildlife toxicology, contaminated site assessment, and regulatory science. She has conducted large-area (>100 sq mile) risk assessments in tropical, desert, and mountain ecosystems, determining risk thresholds for plants and wildlife. She provided consultation on future development of mine pit lakes, assessed the risks to livestock during mine closure operations, and conducted assessments of risk to terrestrial and aquatic organisms from selenium and mercury. She has assessed risks to wildlife from organic chemicals, including DDT, PCBs, dioxins, and petroleum hydrocarbons.

Dr. Fairbrother has supported industry groups and businesses in product review and registration, particularly for agrichemicals. She has worked in support of U.S., Canadian, and European regulatory processes for both the public and private sectors. Dr. Fairbrother has testified to governmental Boards of Review and Science Advisory Boards, and has briefed Congressional committees. She has prepared expert testimony, been deposed, and served as an expert witness at trials on environmental risks of pollutants in litigation within the U.S.

Dr. Fairbrother has drafted guidance documents for ecological risk assessments, including the EPA's *Framework for Metals Risk Assessment* and the BC Ministry of Environment's guidance for implementing Tier 1 ecological risk assessments and incorporating weight of evidence practices into ecological risk assessments of contaminated sites, and has participated in setting ecological soil screening and clean-up values.

While a scientist with EPA, Dr. Fairbrother led research into the ecological risks of genetically modified crops, methods for assessing risks of nanomaterials, and some of the early guidance for field assessments of Superfund sites and effects of pesticides on birds. She researched and developed methods for assessment of chemical effects on bird immune and endocrine systems.

Dr. Fairbrother has published more than 100 peer-reviewed articles, books, and book chapters that reflect her expertise in wildlife toxicology, immunotoxicology, endocrine-disrupting chemicals, and ecological risk assessment. She has served on several National Academy of Sciences committees, European Research Council review panels, and numerous other scientific boards, expert panels, and editorial boards. A veterinarian and Certified Wildlife Biologist, Dr. Fairbrother served as President of the Society of Environmental Toxicology and Chemistry, American Association of Wildlife Veterinarians, and Wildlife Disease Association. Dr. Fairbrother holds an adjunct professorship at Oregon State University, Department of Environmental and Molecular Toxicology.

Academic Credentials & Professional Honors

Ph.D., Veterinary Science, University of Wisconsin, Madison, 1985

DVM, Veterinary Medicine, University of California, Davis, 1980

M.S., University of Wisconsin, Madison, 1982

B.S., Wildlife and Fisheries Biology, University of California, Davis, 1976

Distinguished Service Award, Wildlife Disease Association, 2002

Gold Medal for Commendable Service, EPA, 2005

Bronze Medal for Commendable Service, EPA, 2006, 2008

Licenses and Certifications

Certified Wildlife Biologist, The Wildlife Society, 1995

40-hour Hazwoper Training and Certification

Academic Appointments

Associate Professor (Adjunct), Department of Environmental and Molecular Toxicology, Oregon State University, 2003-present

Prior Experience

Sr. Consultant and Lead for Environmental Risk Assessment and Toxicology, Parametrix, Inc., 2007-2008

Associate Director for Science, U.S. EPA, National Health and Environmental Effects Research Laboratory, Western Ecology Division, 2006-2007

Chief, Risk Characterization Branch, (Supervisory Life Scientist, hired at the GS-15 level [science promotion to Grade 15, 9/02]); U.S. EPA, National Health and Environmental Effects Research Laboratory, Western Ecology Division, Corvallis, 2002-2006

Director and Senior Ecotoxicologist, Terrestrial Ecotoxicology; Parametrix, Inc., 1999-2002

Sr. Wildlife Ecotoxicologist; Ecological Planning and Toxicology, Inc., 1994-1999

Chief, Ecotoxicology Branch, (Supervisory Ecologist, detailed at the GM-15 level), USEPA Environmental Research Laboratory, 1992-1994

Research Ecologist USEPA Environmental Research Laboratory (GS12 - GS14), 1986-1992

Courtesy Associate Professor, College of Veterinary Medicine, Oregon State University, 1987-2003

Courtesy Professor, Department of Environmental and Molecular Toxicology, Oregon State University, 2003-present

Professional Affiliations

American Veterinary Medical Association — AVMA

- Committee on Environmental Issues, 2001-2003 (Chair, 2002-2003)

American Association of Wildlife Veterinarians — AAWV

- President, 1991-1993

Society of Environmental Toxicology and Chemistry — SETAC

- President SETAC North America, 2002-2003

Society for Risk Analysis — SRA

Wildlife Disease Association — WDA

- President, 1995-1997

Publications

Mayfield DB, Fairbrother A. Examination of rare earth element concentration patterns in freshwater fish tissues. *Chemosphere* 2014. <http://dxdoi.org/10.1016/j.chemosphere.2014.06.010>.

Fairbrother A, Purdy J, Anderson T, Fell R. Risks of neonicotinoid insecticides to honeybees. *Environmental Toxicology and Chemistry* 2014; 33:719-731.

Wentsel R, Fairbrother A. Next steps in the development of ecological soil clean-up values for metals. *Int Environ Assess Manage* 2013; DOI: 10.1002/ieam.1451.

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DeForest DK, Schlekot CE, Brix KV, Fairbrother A. Secondary poisoning risk assessment of terrestrial birds and mammals exposed to nickel. *International Environmental Assessment and Management* 2011; 8(1):107—119.

Palmquist K, Fairbrother A, Salatas J, Guiney P. Environmental fate of pyrethroids in urban and suburban stream sediments and the appropriateness of *Hyaella azteca* model in determining ecological risk. *Int Environ Assess Manage* 2011; 7(3):325—335.

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Solomon KR, Dohmen P, Fairbrother A, Marchand M, McCarty L. Use of (eco) toxicity data as screening criteria for the identification and classification of PBT / POP compounds. *International Environmental Assessment and Management* 2009; 5:680-696.

Menzie CA, Ziccardi LM, Lowney YW, Fairbrother A, Shock SS, Tsuji JS, Hamai D, Proctor D, Henry E, Su SH, Kierski MW, McArdle ME, Yost LJ. Importance of considering the framework principles in risk assessment for metals. *Environmental Science and Technology* 2009; 43(22):8478-8482.

Fairbrother A. Federal environmental legislation in the U.S. for protection of wildlife and regulation of environmental contaminants. *Ecotoxicology* 2009; 18:784-790.

Allard P, Fairbrother A, Hope BK, Hull RN, Johnson MS, Kapustka L, Mann G, McDonald B, Sample BE. Recommendations for the development and application of wildlife toxicity reference values. *International Environmental Assessment and Management* 2009; 6:28-37.

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Suter II GW, Norton SB, Fairbrother A. Individuals versus organisms versus populations in the definition of ecological assessment endpoints. *Integrated Environmental Assessment and Management* 2005; 1:397-400.

Fairbrother A, Turnley JG. Predicting risks of uncharacteristic wildfires: Application of the risk assessment process. *Forest Ecology and Management* 2005; 211:28-35.

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Fowles JR, Kerkvliet N, Fix M, Fairbrother A. Glucocorticoid effects on natural killer cell activity, antibody response, and plasma chemistry in mallards. *Developmental & Comparative Immunology Vector Ecology* 1993; 17:165-177.

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Fairbrother A, Yuill TM, Olson LJ. Effects of ingestion of chlorocholine chloride and cyclophosphamide on Venezuelan equine encephalitis virus infections in deer mice (*Peromyscus maniculatus*). *Toxicology* 1984; 31:67-71.

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Glicken (Fairbrother) A, Kendrick JW. Hoof overgrowth in Holstein Frisian dairy cattle. *Journal of Heredity*

1977; 68:386-390.

Books

McDowell JE, Akcakaya HR, Angelo MJ, Durkin P, Fairbrother A, Fleishman E, Goodman D, Graf WL, Gschwend PM, Hope BK, LeBlanc GA, Quinn TP, Reed, N-MR. *Assessing Risks to Endangered and Threatened Species from Pesticides*. National Academy Press, Washington, DC, 2013.

Clark J, Fairbrother A, Kapustka LA. *Adaptation and acclimation of terrestrial organisms to metals in soil*. International Copper Association Special Publication, SETAC Press, Pensacola, FL, 2001.

Fairbrother A. *Seminars in Avian and Exotic Pet Medicine — Toxicology*. Guest Editor and Introduction for Volume 8(1). WB Saunders Company, Philadelphia, PA, 1999.

Fairbrother A, Kapustka LA. *Hazard classification of inorganic substances in terrestrial systems*. International Council on Metals and the Environment, Ottawa, Canada, 1997.

Glickman L, Fairbrother AA, Guarino M, Bergman HL, Buck WB, Cork LC, Hayes HM, Legator SM, McConnell EE, Mcnelis DN, Temple SA. *The use of animals as sentinels of environmental health hazards*. National Academy Press, Washington, DC, 1991.

Book Chapters

Fairbrother A. Prevention and reduction of chemical contamination on ecosystems. pp. 243—248. In: *Ecosystem Health and Sustainable Agriculture, Volume 2: Ecology and Animal Health*. Norrgren L and Levingood JM (eds), The Baltic University Program, Uppsala University, 2012.

Grim KC, Fairbrother A, Rattner BA. *Wildlife toxicology: Environmental contaminants and their national and international regulation*. In: *New Directions in Conservation Medicine: Applied Cases of Ecological Health*. Aguirre AA, Ostfeld R, Daszak P (eds), Oxford University Press USA, 2012.

Palmquist K, Salatas J, Fairbrother A. *Pyrethroid Insecticides: Use, Environmental Fate, and Ecotoxicology*. pp. 251-278. In: *Insecticides — Advances in Integrated Pest Management* Perveen F (ed), InTech, ISBN: 978-953-307-780-2. Available from: <http://www.intechopen.com/articles/show/title/pyrethroid-insecticides-use-environmental-fate-and-ecotoxicology>, 2012.

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Selected Published Abstracts

International

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Fairbrother A, Wentzel R, Wood W, Sappington K, Noyes P. Framework for inorganic metals risk assessment. Presented at Society of Environmental Toxicology and Chemistry Annual Meeting, Montreal, Canada, November 2006.

Gallagher K, Morris J Willis, J., Alwood A, Bauer D, Boethling R, Brody M, Burgin D, Chow F, Dreher K, Fairbrother A, Henry T, Karn B, Libelo L, Lingle S, Nabholz J, Prothero S, Savage N, Sayre P, Scalera J,

Schoepf W, Street A, Utterback D, Williamson T, Zepp R. Nanotechnology: environmental opportunities and challenges. Presented at Society of Environmental Toxicology and Chemistry Annual Meeting, Montreal, Canada, November 2006; and Society for Risk Analysis Meeting, Baltimore, MD, December 2006.

Schumaker N, Nagy L, Fairbrother A. PATCH: A spatially explicit wildlife population model for assessing risks of pesticides to songbirds. Presented at the Wildlife Disease Association World Congress, Cairns, Australia, June 2005.

Fairbrother A, Wentzel R. Framework for inorganic metals risk assessment. Presented at Society of Environmental Toxicology and Chemistry, European Annual Meeting, Lille, France, May 2005.

Fairbrother A. Communicating probabilistic risk outcomes to risk managers. Presented at Society of Environmental Toxicology and Chemistry, European Annual Meeting, Hamburg, Germany, April 2003.

Clark J, Fairbrother A, Brewer L, Bennett RS. Effects of exogenous estrogen on mate selection of house finches. Presented at Society of Environmental Toxicology and Chemistry, European Annual Meeting, Vienna, Austria, May 2002.

Blanton ML, Driver CJ, Fairbrother A, Touart L. Detailed review paper for an avian two-generation and partial life-cycle reproductive and developmental toxicity test. Presented at Society of Environmental Toxicology and Chemistry, European Annual Meeting, Vienna, Austria, May 2002.

Trust KA, Fairbrother A, Hooper MJ. Effects of 7,12-dimethylbenz[a]anthracene on immune function and mixed-function oxygenase activity in the European starling. Society of Toxicology Annual Meeting, New Orleans, LA, March 1993; and Wildlife Disease Association Annual Meeting, Guelph, Canada, August 1993.

Fairbrother A. Biomarkers in wildlife. Society of Environmental Toxicology and Chemistry Annual Meeting, Toronto, Canada, November, 1989.

Fairbrother A. Immunotoxicology of wild and laboratory birds. Wildlife Disease Association 6th International Meeting, East Berlin, GDR, August, 1990.

Yuill TM, Hinsdill RD, Porter WJ, Fairbrother A. The hidden challenge: determining sublethal effects of wildlife diseases. Wildlife Disease Association 6th International Meeting, East Berlin, GDR, August, 1990.

National (most recent 10 years)

Kashuba R, Fairbrother A, Tinsworth R. Probabilistic methods to address ecological risk of secondary ingestion exposure to chemicals. Presented at the Session: Updates in Ecological Risk Assessment Models, at the Society for Risk Analysis (SRA) 2013 Annual Meeting, Baltimore, MD, December 8-11, 2013.

Anderson T, Fell R, Purdy R, Fairbrother A. Assessment of risk of neonicotinoid pesticides to bees. Presented at the Society of Environmental Toxicology and Chemistry Annual Conference, Nashville, TN, November 2013.

Sample BE, Fairbrother A, Kaiser A, Adams W. Sensitivity of ecological soil screening levels to exposure model parameterization and toxicity reference values. Presented at the Society of Environmental Toxicology and Chemistry Annual Conference, Nashville, TN, November 2013.

Fairbrother A. Recommendations for ecological models to assess risks to endangered and threatened species. Presented at the Society of Environmental Toxicology and Chemistry Annual Conference, Nashville, TN, November 2013.

Fairbrother A. Assessing Risks to Endangered and Threatened Species from Pesticides. CropLife America and RISE annual conference. Washington DC, April 2013.

Fairbrother A, Kaiser A, Driscoll SK, Tinsworth R. Mitigating risk of rodenticides to nontarget wildlife - potential options and unintended consequences. Presented at the Society of Environmental Toxicology and Chemistry Annual Conference, Long Beach, CA, November 2012.

Fairbrother A, Blust R. A critique of the status of knowledge about chemosensory effects of metals in fish. Presented at the American Fisheries Society Annual Conference, St. Paul, MN, August 2012.

Fairbrother A, Burton GA, Klaine SJ. Toxicity of decamethylcyclopentasiloxane (D5) to aquatic and terrestrial environments. Presented at the Society of Environmental Toxicology and Chemistry Annual Conference, Boston, MA, November 2011.

McArdle MS, Kane Driscoll SB, Menzie CA, Fairbrother A. Guidance for a weight-of-evidence approach to ecological risk assessments in British Columbia. Presented at the Society of Environmental Toxicology and Chemistry Annual Conference, Boston, MA, November 2011.

Mayfield DB, Fairbrother A. Standardization of wildlife toxicity reference values proves elusive. Presented at the Society of Environmental Toxicology and Chemistry Annual Conference, Boston, MA, November 2011.

Seminar/Lecture: Introduction to Ecological Risk Assessment. Environmental and Molecular Toxicology Department, Oregon State University, Corvallis, OR April 2011.

Edwards M, Fairbrother A. Surface water quality in the upper Columbia River, Washington. Presented at the Society of Environmental Toxicology and Chemistry Annual Conference, Portland, OR, November 2010.

Fairbrother A, Edwards M, Mayfield D. Contaminant analysis of fish in the upper Columbia River, Washington. Presented at the Society of Environmental Toxicology and Chemistry Annual Conference, Portland, OR, November 2010.

Fairbrother A, Menzie C. Integrated exposure analysis for human health and ecological risks at contaminated site. Presented at the Society of Environmental Toxicology and Chemistry Annual Conference, Portland, OR, November 2010.

Palmquist K, Fairbrother A, Salatas J, Guiney P. Environmental fate of pyrethroids in urban stream sediments and the appropriateness of Hyalella azteca model in determining ecological risk. Presented at the Society of Environmental Toxicology and Chemistry Annual Conference, Portland, OR, November 2010.

Fairbrother A. The art and practice of weighing evidence for environmental assessment. Presented at the Society of Environmental Toxicology and Chemistry Annual Conference, New Orleans, LA, November 2009.

Fairbrother A, Dohmen P, Marchand M, McCarty LS, Solomon K. Use of (Eco) toxicity data as screening criteria for the identification and classification of PBT / POP compounds. Presented at the Society of Environmental Toxicology and Chemistry Annual Conference, Tampa, FL, November 2008.

DeForest D, Fairbrother A, Adams BA. Selenium hormesis in birds — Implications for developing dietary and egg-based toxicity thresholds. Presented at the Society of Environmental Toxicology and Chemistry Annual Conference, Tampa, FL, November 2008.

Fairbrother A, Dohmen P, Marchand M, McCarty LS, Solomon K. Use of (Eco) toxicity data as screening criteria for the identification and classification of PBT / POP compounds. Presented at the Society of Environmental Toxicology and Chemistry Annual Conference, Tampa, FL, November 2007.

DeForest D, Fairbrother A, Adams BA. Selenium hormesis in birds — Implications for developing dietary and egg-based toxicity thresholds. Presented at the Society of Environmental Toxicology and Chemistry Annual Conference, Tampa, FL, November 2007.

Grim KC, Fairbrother A, Monfort S, Tan S, Rattner B, Gerould S, Beasley V, Aguirre A, Rowles T. Results of a wildlife toxicology workshop held by the Smithsonian Institution — Identification and prioritization of problem statements. National Presented at the Society of Environmental Toxicology and Chemistry Annual Conference, Milwaukee, WI, November 2007.

Hope B, Allard P, Fairbrother A, Hull R, Johnson MS, Kapustka LA, McDonald B, Sample BE. Representation and consequences of uncertainty in the toxicity reference value. Presented at the Society of Environmental Toxicology and Chemistry Annual Conference, Milwaukee, WI, November 2007.

Allard P, Hill R, Mann G, Mackintosh C, Hull R, Kapustka LA, McDonald B, Hope B, Sample BE, Fairbrother A, Johnson MS. Using dose-response relationships for wildlife TRVs. Presented at the Society for Risk Analysis Annual Conference, Milwaukee, WI, November 2007.

Kapustka L, Fairbrother A, Sample BE. Linking assessment endpoints and wildlife TRVs. Presented at the Society for Risk Analysis Annual Conference, Milwaukee, WI, November 2007.

Hull RN, Allard P, Fairbrother A, Hope B, Johnson MS, Kapustka LA, McDonald B, Sample BE. Summary of recommendations for wildlife TRV development and use. Presented at the Society of Environmental Toxicology and Chemistry Annual Conference, Milwaukee, WI, November 2007.

Fairbrother A. Environmental immunotoxicants: Human-wildlife relationships. Presented at the Society of Environmental Toxicology and Chemistry Annual Conference, Milwaukee, WI, November 2007.

Fairbrother A, Sappington K, Wentzel R, Menzie C, Bottimore D, Downey P, Haber L, Harding-Barlow I, Nelson M, Thornton K. Principles for Metals Risk Assessment USEPA Framework. Presented at the Society for Risk Analysis Annual Conference, Baltimore, MD, December 2006.

Fairbrother A, Wentzel R, Sappington K, Wood W, P. Noyes. Framework for inorganic metals risk assessment. Presented at Society of Environmental Toxicology and Chemistry Annual Meeting, Montreal, Canada, November 2006.

Morzillo AT, Fairbrother A. Effects of human activities on resident mammals within urban ecosystems. Presented at the 86th Annual Meeting of the American Society of Mammalogists meeting, Amherst, MA, June 2006.

Smith C, Stubblefield W, Clark J, Fairbrother A, Allen H, Schoeters I, Dwyer R. Distribution of soil bioavailability parameters throughout Europe and development of metalloregions. Major Scientific/Technical Contributions. Presented at Society of Environmental Toxicology and Chemistry Annual Meeting, Portland, OR, November 2004.

Wentzel R, Fairbrother A. Overview of the development of the Framework for Metals Risk Assessment. Presented at Society of Environmental Toxicology and Chemistry Annual Meeting, Portland, OR, November 2004.

Fairbrother A. Comparison of European and United States approaches to new and existing substances regulation. Presented at Society of Environmental Toxicology and Chemistry Annual Meeting, Portland, OR, November 2004.

Adams W, Brix K, DeForest D, Toll J, Fairbrother A, Kapustka L. Ecological risk assessment at a copper smelter. Presented at Society of Environmental Toxicology and Chemistry Annual Meeting, Portland, OR, November 2004.

Suter II GW, Fairbrother A, Munns Jr WR, Norton SB, Wentsel R, Kravitz MJ. Individuals versus organisms versus populations in the definition of ecological assessment endpoints. Presented at Society of Environmental Toxicology and Chemistry Annual Meeting, Portland, OR, November 2004.

Smolders E, Fairbrother A, Hale B, Lombi E, McGrath S, McLaughlin M, Rutgers M, Van der Vliet L. Hazard assessment of metals and metal compounds in terrestrial systems. Presented at Society of Environmental Toxicology and Chemistry Annual Meeting, Austin, TX, November 2003.

Invited Presentations

International

Fairbrother A. 50 Years after Silent Spring. Have organophosphate and carbamate pesticides met the challenge? Seminar/Lecture: Toxicology Center, University of Saskatchewan, Saskatoon, SK, December 2012.

Fairbrother A. Environmental effects of manufactured nanomaterials. Invited plenary presentation at SETAC World Conference, Sydney, Australia August 2008.

Fairbrother A. Ecological risk assessment and wildlife toxicology. 1st International Conference on Environmental Issues, Hanoi, Vietnam, March 2004.

Fairbrother A. Genetically modified foods: Technological breakthrough or ecological nightmare? Keynote address at SETAC Asia Pacific conference, Christchurch, New Zealand, September 2003.

Fairbrother A, Turnley JG. Communication of probabilistic risk assessments. Invited presentation in special symposium on Probabilistic Risk Assessment at SETAC Europe 13th annual conference, Hamburg, Germany, April 2003.

Clark J, Fairbrother A, Brewer L, Bennett RS. Effect of exogenous estrogen exposure on mate selection by the female house finch. Invited presentation at SETAC Europe 12th Annual Conference, Vienna, Austria, May 2002.

Robinson S, Fairbrother A. Human health risks from organotins in household products. Proceedings of the Organotin Environmental Programme Association Meeting, Sardinia, Italy, October 2000.

Fairbrother A, Brix KV, DeForest DK, Adams WJ. Critical review of tissue-based selenium toxicity thresholds for fish and birds. Presented at Mine Reclamation Symposium, Williams Lake, British Columbia, June 2000.

Fairbrother A. Fellow of the Crown Research Institute, Wellington, New Zealand. Invited lectures to scientific staff, regulators and academics (University of NZ, Christchurch), October 2000.

Fairbrother A. Keynote speaker and invited lecturer, Zoo and Wildlife Veterinary Medicine, Continuing Education. Western Plains Zoo, Dubbo, Australia. September 1999.

Fairbrother A. Tier 1 (Screening Level) risk assessments in British Columbia. Workshop sponsored by the Ministry of the Environment, Vancouver, BC, November 1998.

National (most recent 10 years)

Invited presentation in Special Symposium: 50 Years after Silent Spring. Have Organophosphate and Carbamate Pesticides Met the Challenge? Society of Environmental Toxicology and Chemistry; Long Beach, CA, November 2012.

Plenary: Federal environmental legislation in the U.S. for protection of wildlife and regulation of environmental contaminants. Smithsonian Wildlife Toxicology Symposium, Washington DC March 2007.

Keynote: History of development and use of bioindicators and biomarkers in the U.S. 14th International Conference on Bioindicators. Baltimore, MD April 2006.

Lecture: RCRA and CERCLA: Environmental containment, contamination, and clean up. School of Veterinary Medicine, University of Illinois, March 2005.

Co-instructor: Introduction to Ecological Risk Assessment. Dept. of Fisheries and Wildlife and Dept. of Environmental and Molecular Toxicology, Oregon State University, Corvallis, OR, Winter 2003-2007.

Lectures: Risk assessment overview and introduction to TSCA and FIFRA. Presented in an upper division graduate level course on environmental studies. Department of Environmental Science, Oregon State University, Corvallis, OR, Fall 2002, Winter 2003, 2004.

Project Experience

Conducted an invitational workshop of international bee experts to use a formal Causal Analysis approach to develop a framework for objectively diagnosing the cause(s) of declines in the health of managed honeybees. Follow-up workshop reports, manuscripts, and educational materials are in preparation.

Conducted an invitational workshop of international experts to develop methods for establishing ecological soil clean-up values for metals at contaminated sites in North America. Follow-up workshop reports, manuscripts, and educational materials are in preparation.

Conducting an RI/FS for 150 miles of the upper Columbia River (Canadian border to the Grand Coulee Dam) and surrounding uplands to assess potential ecological risks of smelter emissions to aquatic life, plants, and wildlife. Studying contaminated sediments to ascertain bioavailable metals, conducting food-chain analyses for fish and wildlife, and evaluating soil and uplands in depositional areas to assess risks to plants and wildlife. Work is being conducted under agreement with EPA following procedures for CERCLA site assessments.

Conducting a natural resource damage assessment (NRDA) for marine wildlife in the Gulf of Mexico following the Mississippi Canyon Block 252 (BP) oil release accident in April 2010.

Providing expert reports and testimony on effects of anticoagulant rodenticides to nontarget wildlife, and the potential efficacy of reducing availability of over-the-counter consumer products based on second-generation anticoagulants. In response to EPA's draft Notice of Intent to cancel multiple products.

Provided expert reports and courtroom testimony on water quality and bioavailability of metals for a case involving surface-water management at a closed and remediated copper mine in Wisconsin.

Provided expert reports and testimony on ecotoxicity and risk for decamethylcyclopentasiloxane (Siloxane D5) to the Canadian Board of Review under the Canadian Environmental Protection Act (CEPA).

Conducted a site audit and provided recommendations for wildlife pest control at a food-grade packaging facility.

Conducted a Detailed Ecological Risk Assessment of the tailings management system of the Gratzburg mine, Irian Jaya, Indonesia. This included assessing risks to plants and wildlife in jungles and estuarine mangrove ecosystems through food-chain analyses, ecological function studies, and floristic composition analyses. Performed extensive plant phytotoxicity and metal uptake studies to determine risk thresholds for tropical species. Detailed report included estimates of current and future (until mine closure in 2034) risks.

Served as an Expert Advisor to Cominco and its contractors for design and conduct of a terrestrial wide-area assessment under the Contaminated Site Regulations of British Columbia. This included development of appropriate assessment endpoints, conceptual site models, sampling and analysis plans, and final risk estimates. The area encompassed the upper Columbia River Valley and associated side valleys that had been subject to past deposition from the zinc-lead smelter plume.

Conducted an Ecological Risk Assessment for 165 square miles of property surrounding the Bingham Canyon, Utah, gold mine. Work included a survey of plants and wildlife on the site, food-chain analysis of potential metal contamination, field measurements of small-mammal populations, nesting surveys of shorebirds, and development of management options for various portions of the site. Included a probabilistic risk assessment of effects of selenium on the local populations of wading birds.

Conducted an assessment of risk to terrestrial and aquatic organisms from an abandoned mercury mine in the Ochoco Mountains, Oregon, and determined risk-based cleanup levels. This was the first risk assessment to follow the newly published Oregon Department of Environmental Quality guidelines.

Assessed the potential for risk to livestock from use of wastewater on irrigated pasture during mine closure. Selenium and thallium were identified as contaminants of concern. Plant uptake studies were conducted to refine risk estimates for thallium, in both laboratory and field situations.

Provided expert consultations on review comments relating to potential future development of pit lakes at gold mines in Nevada. Included interpretation of information on contaminants of concern, potential for bioaccumulation, and wildlife food-chain contamination.

Conducted an assessment of the potential ecological risks posed by use of copper pipes in housing in California. Specific emphasis was on amount of copper discharged to San Francisco Bay. Other areas, such as the Southern California Bight and San Diego Bay, also were assessed. Endpoints included protection of aquatic life, achievement of water quality criteria, and methods for establishing water effect ratios for specific locations.

Collated and reviewed the literature from 2005 to 2010 on environmental effects of lead, in support of the 5-year update of the U.S. national ambient air quality standards (NAAQS) for lead.

Reviewed literature and available toxicity tests for various pesticides to develop other scientifically relevant information (OSRI) in response to EPA's request for endocrine disruptor Tier 1 screening.

Provided technical and managerial support to the organotin industry for submission of a screening information data set (SID) of information on 27 chemicals to the OECD's High Production Volume (HPV) data call-in program. Reviewed the available literature on physical/chemical properties, environmental fate, ecotoxicity, and human health effects for all the chemicals, and entered appropriate data into the IUCLID database system. Tests were placed with contract laboratories to fill data gaps. Structure-activity relationships and chemical categories were developed to reduce the need for testing. Developed test plans, SIARs, and dossiers for submission to the regulatory authorities.

Reviewed entire literature for effects of zinc and phthalate esters on terrestrial organisms (plants, wildlife, soil organisms). Qualified all studies for data quality and summarized the extent of the database. Provided all information in written report and electronic database of endpoints and data quality. Zinc data were used in the continent-wide ecological risk assessment conducted by the European Union (EU) and

subsequently were migrated to IUCLID for use in REACH.

Wrote a Tier I assessment and supervised the conduct of toxicity and exposure studies for registration with the U.S. Fish and Wildlife Service of a new non-toxic shot for waterfowl hunting. Successfully completed the registration process under the new regulations, which allow selected testing rather than a complete battery of tests. Information also was submitted to Environment Canada for review. Shot has been registered and successfully marketed in the U.S. for several years.

Directed studies in a fully compliant GLP laboratory following FIFRA pesticide registration guideline for mallard and bobwhite quail. Included acute, subchronic, and reproduction studies with novel chemical and biological pesticides, conducted for most of the large agrichemical companies. Additional studies included tests specifically tailored to address questions of contaminant uptake from soil, potential food aversion from chemical-treated feed, and other studies to address specific aspects of exposure of wildlife to pesticides.

Conducted and published laboratory studies with the rat as a model of the pica child to determine the uptake efficiency of petroleum hydrocarbons from soils. Soil types included aged soils, treated soils, and lampblack. Information from the study can be used in exposure equations in place of default values when estimating total uptake of PAHs from different soil types during either human or ecological risk assessments of contaminated sites.

Researched effects of estrogen supplementation in house finch breeding behavior, including mate selection, changes in plumage coloration, and reproductive output. Animals were implanted with time-release devices for continual elevation of estrogen levels, and an ELISA method for measurement of fecal/urate estrogens was adapted to the house finch to monitor changes in hormones during the breeding cycle. Used videography to assess effects on nest behaviors.