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W. Theodore Wickwire
Managing Scientist

Professional Profile

Mr. W. Theodore Wickwire is a Managing Scientist in Exponent's EcoSciences practice. Mr. Wickwire has 14 years of experience in evaluating the exposure and effects of contaminants in aquatic and terrestrial ecosystems. He is an ecologist focusing on aquatic and terrestrial ecological risk assessment. He conducts and manages ecological risk assessments including: the development of quality assurance project plans, design and implementation of multi-media field sampling programs, development of conceptual models, application of wildlife exposure models, implementation of weight-of-evidence risk assessment approaches, preparation of final risk characterization reports, development of preliminary remediation goals, and risk communication. Mr. Wickwire incorporates ecological principles in wildlife exposure models and oversees the development of modeling packages to improve the realism of exposure modeling incorporating wildlife behaviors relative to habitat suitability.

Mr. Wickwire supports litigation clients by providing detailed historical research regarding chemical production, fate and transport and risk. He also assists in developing activity time lines, conceptual models, and investigating specific components of complex cases. Mr. Wickwire develops risk communication approaches unique to each Site to improve project outcomes. In addition, Mr. Wickwire identifies opportunities to enhance ecological risk assessment by incorporating population assessment, spatial exposure assessment, and the habitat quality analyses into the exposure and effects assessments. Mr. Wickwire's research interests include the application of risk assessment methods to larger scales. He also designs and implements long-term biomonitoring programs to evaluate baseline conditions and track site conditions after treatment applications.

He has provided peer review comments for journal publications and US Environmental Protection Agency guidance documents. Mr. Wickwire has also prepared ecological risk assessment guidance documents. He presents his work at professional conferences and working groups.

Mr. Wickwire enhances and expands upon his technical skills through continuing education. He has completed short courses in Natural Resource Damage Assessment, Geographic Information Systems, Total Maximum Daily Loads, Applied Statistics, Habitat Evaluation Procedures, and Probabilistic Ecological Risk Assessment Methods. In addition, he co-taught a short-course on spatial wildlife exposure modeling. In graduate school, Mr. Wickwire focused on watershed evaluation. He surveyed forest cover types in order to develop forestry prescriptions to improve the long-term stream habitat for salmon in Alaska.

Academic Credentials and Professional Honors

M.F.S., Forest Science, Yale University School of Forestry and Environmental Studies, 1996
A.B., Biology and Environmental Sciences, Bowdoin College *(summa cum laude)*, 1992

Phi Beta Kappa; James Bowdoin Scholar

Licenses and Certifications

OSHA Certified 40-Hours of Training in Hazardous Waste Operations and Emergency Response, 1998; OSHA Certified Eight-Hour HAZWOPER Annual Refresher Training, yearly

Publications

Wickwire T, Menzie CA. The causal analysis framework: Refining approaches and expanding multidisciplinary applications. Human and Ecological Risk Assessment 2010; 16(1).

Johnson MS, Wickwire WT, Quinn MJ, Ziolkowski DJ, Burmistrov D, Menzie CA, Geraghty C, Minnich M, Parsons PJ. Are songbirds at risk from lead at small arms ranges? An Application of the Spatially Explicit Exposure Model (SEEM). Environmental Toxicology and Chemistry 2007; 26(10):2215–2225.

von Stackelberg K, Wickwire WT, Burmistrov D. Spatially-explicit exposure modeling tools for use in human health and ecological risk assessment: SEEM and FISHRAND-Migration. pp. 279–288. In: Environmental Exposure and Health, 2005. Aral MM, Brebbia CA, Maslia MLand Sinks T (eds), United Kingdom: WIT Press.

Wickwire, WT, Menzie CA, Burmistrov D, Hope BK. Incorporating spatial data into ecological risk assessments: the Spatially Explicit Exposure Model (SEEM) for ARAMS. Landscape Ecology and Wildlife Habitat Evaluation: Critical Information for Ecological Risk Assessment, Land-Use Management Activities, and Biodiversity Enhancement Practices 2004; ASTM STP 1458. Kapustka LA, Galbraith H, Luxon M, and Biddinger GR (eds), ASTM International, West Conshohocken, PA.

Wickwire, WT, Menzie CA. New approaches in ecological risk assessment: Expanding scales, increasing realism, and enhancing causal analysis. Hum Ecol Risk Asses 2003; 9:1411–1414.

Wickwire,WT, and Halberg DE. Developing a community-based silvicultural system: The Chalchijapa case study. In: Community-based approaches to community forest management: A comparison of two communities in Oaxaca, Mexico. Asbjornsen H and Ashton MS (eds), Journal of Sustainability 2002; 15(1):51–66.

Kane Driscoll SB, Wickwire WT, Cura JJ, Vorhees DJ, Butler CL, Moore DW, Bridges TS. A comparative screening-level ecological and human health risk assessment for dredged material management alternatives in New York/New Jersey Harbor. Hum Ecol Risk Asses 2002; 8(3):603–626. HERA “Integrated Risk Assessment Paper of Year.”

Menzie, CA, Wickwire WT. Defining populations: A key step in identifying spatial and temporal scales. Toxicology & Industrial Health 2001; 17:223–229.

Published Abstracts

McArdle ME, Wickwire WT, Menzie CA, Kierski M, Bailey E, Murray D. Applying risk based solutions to target efficient Brownfields redevelopment. Brownfields 2006 Conference, Boston, MA, November 2006.

Wickwire WT, Menzie CA, Burmistrov D, Johnson MS. Applying a Spatially Explicit Wildlife Exposure Model to improve remedial efficiency: The SEEM case study. Annual International Conference on Soils, Sediments and Water, University of Massachusetts, Amherst, MA, October 18–21, 2004.

Wickwire WT, Menzie CA, Johnson MS, Hope BK. Context-specific and population-based spatial exposure modeling. The Ecological Society of America, 87th Annual Meeting, Tucson, AZ, August 4–9, 2002.

Wickwire WT, Menzie CA, Cura JJ, Freshman J. Embayment sensitivity to eutrophication: Integrating risk factors on a watershed scale. Abstract for the Society for Risk Analysis 1999 Annual Meeting, Atlanta, GA, 1999.

Presentations

Wickwire WT, Johnson MS, Parsons PJ, Burmistrov D, Menzie CA. Considering habitat, behaviors and spatial interactions within terrestrial ecological exposure assessment: A case study application of the Spatially Explicit Exposure Model (Seem). North Atlantic Chapter, Society of Environmental Toxicology and Chemistry (NACSETAC) 2006 Annual Meeting, Portland, ME, June 7–9, 2006.

Wickwire WT, von Stackelberg K, Burmistrov D, Bridges TS. Modeling fish tissue body burdens of organic chemicals through time: The FishRand-Migration Model. Maine Coastal Waters Conference 2006, Maine Department Of Marine Resources, Rockland, ME, April 10, 2006 (Poster Presentation).

Famely J, Wickwire WT, Menzie CA. Assessment and planning approaches in watershed assessment: The embayment eutrophication case study. New England Estuarine Research Society, Spring, 2005 Meeting, Eastham, MA, April 27, 2005.

Wickwire WT, Menzie CA, Burmistrov D. Enhancing the realism of wildlife exposure modeling: An introduction and demonstration of the Spatially Explicit Exposure Model (SEEM). Society of Environmental Toxicology and Chemistry (SETAC) 4th World Congress and 25th Annual Meeting, Portland, OR, November 14–18, 2004.

Wickwire WT, Menzie CA, Burmistrov D, Johnson MS. Applying a spatially explicit wildlife exposure model to improve remedial efficiency: The SEEM Case Study (Abstract/Poster

Presentation). Annual International Conference on Soils, Sediments and Water, University of Massachusetts, Amherst, MA, October 18–21, 2004.

Menzie CA, Wickwire WT, Hope BK. An expanded landscape for wildlife exposure assessment tools: The Spatially Explicit Exposure Module (SEEM) for ARAMS. SETAC 24th Annual Meeting in North America, Austin, TX, November 9–13, 2003.

Wickwire WT, Menzie CA, Burmistrov D, Hope BK. Incorporating spatial data into ecological risk assessments: Spatially Explicit Exposure Module (SEEM) for ARAMS. Oral Presentation at ASTM Symposium on Landscape Ecology and Wildlife Habitat Evaluation: Critical Information for Ecological Risk Assessment, Land-Use Management Activities and Biodiversity Enhancement. ASTM Committee E47 Meeting, Kansas City, MO, April 7–9, 2003.

Wickwire WT, Menzie CA, Johnson MS, Hope BK. Context-specific and population-based spatial exposure modeling. The Ecological Society of America, 87th Annual Meeting, Tucson, AZ, August 4–9, 2002.

Menzie CA, Wickwire WT, Kane Driscoll SB. Integrated risk characterization: Applying a weight-of-evidence approach. The Anaconda Smelter case study. Society of Environmental Toxicology and Chemistry, U.S. Environmental Protection Agency, American Society for Testing and Materials, Seattle, WA, August 17–20, 1998.

Prior Experience

Senior Scientist and Project Manager, Menzie-Cura & Associates, Inc, 1997–2006
Technology Manager, Menzie-Cura & Associates, Inc. 1997–2002
Field Ecologist (through Student Conservation Association), United States Forest Service, Alaska Region, Summer 1995
Research Assistant, ICF Kaiser International, Inc., Clement International, Ecotoxicological Services, 1992–1994

Project Experience

Litigation Support

Provided litigation support in a case in which damage to vegetation was alleged from possible airborne sources. Through a weight-of-evidence analysis, farming practices were demonstrated to be the source of vegetation stress. This was an important international case in a unique and challenging desert environment.

In an international litigation support project, provided review of sensitive ecological habitats along a coastline previously subject to oil releases from the Prestige Oil Spill in Spain. This case included an analysis of site-specific habitat characteristics, a review of oil characteristics as they relate to habitat vulnerability and integration of multiple lines of evidence organized around geographic information system maps. As project manager, coordinated completion of

technical arguments focusing on oil movement, economic vulnerability, shoreline characterization, model application and event timeline review.

Provided technical support on a litigation case in South America. Evaluated current habitat conditions and probable future habitat conditions in a large water system. The analysis focused on understanding current conditions and how those current conditions might change based on new development. Analysis focused on evaluating water parameters with respect to the characteristics of eutrophic systems. The analysis helped demonstrate that current conditions were unlikely to change and the any ecosystem stressors were not related to the subject project.

Provided litigation support for a case involving multiple responsible parties. Researched and prepared detailed timelines of historic manufacturing opportunities charting potential pathways for waste streams from each facility. Developed aerial photo summaries of the findings from the review of the history of manufacturing.

For a litigation support case, researched the history of Polychlorinated Biphenyl (PCB) use in aquatic paints. Through this research he developed a timeline of paint use in aquatic structures and likely PCB sources through time.

Provided research support on projects focusing on NPDES Permit renewals. This included evaluating monitoring data trends, researching flow pathways and reviewing biological community monitoring program trends.

Provided technical support in the development of water treatment alternatives for an industrial client. This included detailed research of boron and arsenic water treatment technologies from small-scale up to larger scale systems. Contacted a number of different companies and technical experts in order to develop an understanding of all of the options. Developed a comparative matrix for evaluating the options and provided assistance in developing final recommendations.

Risk Evaluations for Contaminated Sites

Managed a comprehensive assessment at a former manufactured gas plant in Salem, Massachusetts. The project began with the design and implementation of a multi-year sediment monitoring program to evaluate changes in the benthic community over time. Additional assessment was completed under the Massachusetts Contingency Plan and included the development of a scope of work, design and completion of a multi-media field program, research for toxicological benchmarks and toxicity reference values, employment of terrestrial and aquatic bioaccumulation models, completion of food chain models, interpretation of benthic community studies and completion of the ecological risk assessment report. Applied a weight-of-evidence approach to integrate multiple lines of evidence. The project included both a terrestrial and aquatic component. Managed the completion of the human health risk characterization. After completion of the risk assessment, worked closely with the client to evaluate remedial alternatives with a specific focus on bioavailability of remnant historic coal tars and weathered PAHs.

Managed and completed the ecological risk assessment for a manufactured gas plant in Beverly, Massachusetts. The work included the design of a field program to collect sediment, surface

water and biota for analysis. He developed the scope of work and led the field team. In addition, he managed the analysis and integration of data and biological studies using a weight-of-evidence approach, and the completion of the ecological risk assessment report. He worked closely with the site engineer to apply findings to the remedial strategy.

Served as project manager on an aquatic risk assessment focusing on a site within the Mississippi River. This included developing a screening assessment to evaluate site conditions and designing a comprehensive field program to determine the extent of analysis and evaluate the ecological conditions within the area of influence. As project manager, identified experienced river captains to provide a platform for sediment, surface water and fish collection in the high flow waters of the Mississippi River. Working under extremely difficult conditions, the team adapted standard still water methods to the high flow waters. Managed the data evaluation and authored the risk assessment report.

Served as a Project Scientist on a large comparative risk assessment for the Army Corps of Engineers in NY Harbor. The project involved the development of a screening-level human health and ecological assessment that compared risks associated with various dredged material management and disposal alternatives. This project developed models that predicted the fate and transport of metals, PCBs, pesticides, PAHs, and dioxins from five types of disposal facilities. The ecological risk assessment employed a steady state food-chain biomagnification model to estimate exposure of higher trophic-level organisms to contaminants. The human health risk assessment examined exposure to a variety of potential receptors, including dredge workers and recreational anglers. Role included data management, calculation of human health risks, support of the ecological risk assessment, preparation of report sections describing dredging technologies, preparation of the human health subchapters and development of process figures. The project was unusual in its presentation of a qualitative comparative risk matrix that provided Army Corps managers with a framework for choosing among disposal alternatives. Additional work included the examination of two new dredged material treatment technologies: Manufactured soil and sediment solidification. Mr. Wickwire was the second author of a Human and Ecological Risk Assessment publication that was awarded the HERA Integrated Risk Assessment Paper of the Year in 2002.

Developed an assessment approach to evaluate chemical, toxicological and physical impacts on stream biota from a deposit of eye glass lens mounting material. As manager, reviewed site conditions and designed an approach to evaluate the unique material within the guidelines of the Massachusetts Contingency Plan. The results assisted the site engineer develop a remedial strategy that was later evaluated with follow-on a survey.

Provided field support for the collection of sediment, surface water, fish, and invertebrates for assessment of conditions in an industrial waterway impacted by lead. This included operating small boats with grab and core samplers, deploying gill nets for fish collection for scientific analysis and trapping marine invertebrates. In addition, prepared GIS maps summarizing the sample locations and findings.

Provided field support in the assessment of conditions in a large river system impacted by mercury. In his role as a field technician, assisted in the selection of reference locations, sorted

and collected invertebrates, and collected sediment and water samples. Prepared GIS summary maps.

For a small lake system potentially impacted by development runoff, implemented a long-term monitoring program. The program evaluated the input of phosphorus and nitrogen into the system. It also evaluated secchi depths and the amount of chlorophyll in an effort to monitor the development of eutrophic conditions.

Developed the ecological risk assessment for the Big Sunflower River Maintenance Project (BSRMP). Worked with the project team to prepare a comparative risk assessment for the potential aquatic ecological and human health effects from exposures to DDT, DDD, and DDE originating from sediments of the Big Sunflower River Basin. The risk assessment estimated and compared potential exposure and risk under two general long-term conditions (approximately 40 years) with a No Dredging scenario and a Dredging scenario. The probabilistic FISHRAND model was used to model bioaccumulation into aquatic species under both the No Dredging and Dredging scenarios. Ecological receptors included benthic invertebrates, warm water fish species, mallard duck, and mink. Prepared the ecological risk assessment.

Supported a team preparing a risk assessment to compare potential risks associated with open-water disposal of dredged materials from a west coast harbor with the risks of leaving the sediments in place. The open-water site is on the shelf, just above a submarine canyon, and is a sensitive and protected ecological sanctuary. Prepared a comprehensive food chain conceptual model for the different habitats. The models summarized the key species in each component of the marine food web and assisted the modelers with identifying species for tissue collection.

Assisted in the completion of a human health and ecological risk assessment according to Massachusetts Contingency Plan (MCP) guidance for a property on which a former paint pigment factory was located. Elevated levels of lead and chromium were found in upland and wetland soils, sediments of Paintshop Pond, Waban Brook, and Lake Waban, and in groundwater. He authored the terrestrial ecological risk assessment and assisted with the development of the human health risk assessment. As part of the project team, coordinated closely with the client, the client's engineers, and with the Massachusetts Department of Environmental Protection (MADEP) to prepare Scopes of Work for human health and ecological risk assessment that were acceptable to all parties. Helped to develop the human health risk characterization based on acute and chronic exposures to chromium and lead through pathways encountered as a result of recreational activity at the site. Mr. Wickwire was an integral member of the field team as well. The work included the collection of hundreds of soil, biota and sediment samples to characterize potential exposure. Ecological risk characterizations were performed on the pond, lake, wetlands and terrestrial environment surrounding these areas. The work included the collection of aquatic organisms (fish, plants, and invertebrates), exposure pathway analysis, selection of contaminants of concern, fate and transport analysis, and the identification of toxicological endpoints, and combining these elements in a risk characterization based on a weight of evidence approach. The results of the human health and ecological risk assessments were used to develop air monitoring thresholds protective of the

public during subsequent remediation and cleanup goals for soil and sediment. Currently overseeing the assessment of conditions in an adjacent waterbody.

Provided support in the completion of a Baseline Ecological Risk Assessment for a military facility closed under the Base Realignment and Closure process. Provided technical support in developing wildlife exposure models, assembling multiple lines of evidence and developing risk conclusions.

Non-Chemical Ecological Risk Assessment

Provided technical support for the development of an ecological risk assessment to evaluate the risk of non-native oyster introduction to the Chesapeake Bay. This project used a Relative Risk Model to evaluate the potential ecological risk from various oyster introduction approaches as well as a no action alternative.

Guidance Development

Assisted the Science Advisory Board for Contaminated Sites (SAB), in British Columbia, Canada with the development of a Screening Risk Assessment (SRA-Level 1) Guidance. British Columbia is currently modifying a tiered site assessment approach. As part of this modification, the SAB has been charged with writing a prescriptive, qualitative screening guidance for application by Licensed Environmental Professionals (LEPs). The document focuses on determining whether further assessment is required at a site at which contaminant concentrations exceed screening standards. Specifically, the guidance focuses on determining whether any complete exposure pathways and/or receptors are present on the site and require further review. The guidance uses a decision-tree approach. In addition to providing the SRA1 guidance, prepared a document describing the assembly of conceptual models.

Provided input to the US Environmental Protection Agency (EPA), National Center for Environmental Assessment (NCEA) design team for Causal Analysis/Diagnosis Decision Information System (CADDIS) regarding the development of a conceptual modeling tool. He participated in a number of reviews and discussions regarding key components of the program.

For the USEPA NCEA, rewrote a guidance document for the Wildlife Suitability Builder (a wildlife exposure model). This required thorough testing of the software and the translation of complex software inputs to a user-friendly guidance document. He also updated the internal help guide.

Authored portions of the Army Corps of Engineers Upland Testing Manual (UTM). Developed a case study demonstrating the key concepts within each chapter of the manual. In addition, developed figures for the document and organized and reviewed the piece.

Exposure Modeling Tool Development

Project manager for development of a wildlife exposure model for the US Army, working closely with the programmer to design, implement and test the spatially explicit exposure model (SEEM). This population model provides a more realistic evaluation of terrestrial wildlife

exposure by including the influence of species-specific foraging behaviors and habitat suitabilities in determining exposure. Through the model individuals of a population forage across a landscape with the probability of foraging in any given location influenced by habitat suitabilities. Mr. Wickwire has published and presented this model to numerous audiences and is developing the companion guidance, serves as the primary point of contact for the client and is working with the programmers to integrate the model into the Army Risk Assessment Modeling System (ARAMS).

Provided technical support for the development of a probabilistic bioaccumulation model (FISHRAND: Gobas Time-Varying Mechanistic Mode). Developed a step-by-step guidance document and also provided internal model reviews. The mechanistic, time-varying model is based on a modeling approach developed by Frank Gobas of Simon Frasier University. The model relies on solutions of differential equations to describe the uptake of organic compounds over time, and incorporates both sediment and water sources to predict the uptake of organic chemicals based on prey consumption and food web dynamics. The FISHRAND model uses a two-dimensional Monte Carlo simulation. Additional enhancements include the use of habitat quality to further refine fish exposure.

Professional Affiliations

- Ecological Society of America—ESA
- New England Chapter of the Society for Risk Analysis
- Society of Environmental Toxicology and Chemistry—SETAC