

Workshop 1/1A/1B: Benchmark Dose Modeling (BMD) Analysis – an Introduction to BMD Methods and Application of EPA’s Benchmark Dose Software

Registration Workshop 1 – Sunday Full Day: Preregistration: \$300; Onsite \$350

Registration Workshop 1A – Sunday Half Day (8am-Noon) Preregistration: \$175 half; Onsite \$225

Registration Workshop 1B – Sunday Half Day (1-5pm) Preregistration: \$175 half; Onsite \$225

Organizer: J. Allen Davis

Instructors: J. Allen Davis, MSPH, US Environmental Protection Agency (EPA); Jeff Gift, Ph.D.(EPA); Jay Zhao, MD, MPH, PhD (EPA)

This workshop will provide participants with interactive training on the use of the U.S. EPA’s Benchmark Dose Software (BMDS) and its application to risk assessment. The course will provide an overview of the BMD process, including determination of data adequacy, model fitting and comparison, and selection of a benchmark response level. This workshop will cover all BMD models available in BMDS 2.2—including the new MS-COMBO model, which calculates multi-tumor composite risk values. Instruction will also be given in regard to new features that have been implemented in version 2.2.

This interactive training workshop will consist of morning and afternoon sessions. The morning session will include instructor presentations covering the basic science and theory of BMD modeling, and is intended for those with no prior experience in BMD modeling. The afternoon session will expand upon the morning session and will consist of a demonstration of EPA’s BMDS 2.2 through individual and group class modeling exercises. Questions and critical discussions of presentation material and class activities are highly encouraged.

Participants planning to attend the afternoon session need to bring their own laptops to the workshop with BMDS 2.2 installed (with necessary administrative rights). The latest version of the software can be found at: <http://epa.gov/ncea/bmnds/>. To ensure students receive the maximum benefit from participating in the workshop, it is recommended that they examine the online training and tutorial materials prior to the workshop. Training and tutorial materials can be found at: <http://www.epa.gov/ncea/bmnds/training/index.html>.

Workshop 2: Ecological Risk Assessment and Management – Processes and Applications

Registration Sunday Full Day: Preregistration: \$250; Onsite \$300

Organizer: Mala Pattanayek, MS, ARCADIS

Instructors: Ned Black, PhD, USEPA; Bridgette DeShields, MS, ARCADIS; Mala Pattanayek, MS, ARCADIS; Judy Nedoff, MS, ARCADIS

This workshop will cover the science and practice of Ecological Risk Assessment (ERA). The content will include case study exercises to provide hands-on experience for participants in weight-of-evidence ERA and the principles of risk management. While the focus will be primarily on chemical contaminants, multi-stressor issues will also be covered. This workshop is suitable for participants with little ERA experience, as well as those with a moderate level of understanding. The course will be composed of two modules: 1) a broad overview of the ERA process/framework and an introduction to core scientific principles and disciplines, including basic systems ecology, toxicology, population biology, fate and transport, empirical and applied modeling, data collection (design and data quality objectives), and regulatory policy and guidelines, and 2) application of the ERA process to current global environmental issues. Case studies will be used to frame discussion on the broad application of the ERA framework to address environmental issues, and risk management decision-making, the overall goal being to demonstrate how the ERA process/frameworks can be used to evaluate a broad array of environmental issues from localized contaminated sites to global issues such as climate change. Materials will be provided to course participants for follow-up study, including: suggested reading lists (including a focused list of publications on the subject matter), links to relevant

internet sites, terminology/definition sheets, and electronic versions of key ERA regulations, guidance documents, and related materials, as well as workshop slides on a USB drive.

Workshop 3: Application of Web-based Risk Assessment Information System (RAIS) and Free Spatial Analysis and Decision Assistance (SADA) Software

Registration Sunday Full Day: Preregistration: \$300; Onsite \$350

Organizer: Debra Stewart

Instructors: Debra Stewart, University of Tennessee/Oak Ridge National Laboratory ; Fred Dolislager, University of Tennessee/Oak Ridge National Laboratory; Leslie Galloway, University of Tennessee/Oak Ridge National Laboratory; Robert Stewart, Oak Ridge National Laboratory

The first half of this workshop is interactive training on the Risk Assessment Information System (RAIS). The RAIS is a web-based system that provides risk tools and supplies information for both chemicals and radionuclides for human health and ecological risk assessment. Taking advantage of searchable and executable databases, menu-driven queries, and data downloads using the latest web technologies, the RAIS offers essential tools and information for the risk assessment process established by the U.S. EPA and can be tailored to meet site-specific needs for another government agency, the public, or an international user. The course will provide a general overview of the risk assessment process and introduce freely available RAIS tools, including toxicity values, PRGs, forward risk calculations, ecological screening benchmarks, and radionuclide decay. More information can be found at <http://rais.ornl.gov>. The second half of the workshop will present Spatial Analysis and Decision Assistance (SADA). SADA is free software that incorporates tools from environmental assessment fields into an effective problem solving environment. These tools include integrated models for visualization, geospatial analysis, statistical analysis, human health risk assessment, ecological risk assessment, cost/benefit analysis, sampling design, and decision analysis. Instruction will be hands-on and include case studies and exercises. Participants are encouraged to bring their own laptops with wireless internet capability. For SADA, participants are encouraged to visit the SADA website (<http://www.tiem.utk.edu/~sada/index.shtml>) and download the latest copy of SADA prior to the workshop. Approximately 80% of this workshop will be focused on human health risk assessment and 20% on ecological risk assessment.

Workshop 4: Fundamental Concepts of Risk Management, Risk Assessment, and Risk Perception/Communication

Registration Sunday Half Day (1-5 pm): Preregistration: \$300; Onsite \$350

Organizer: Branden B. Johnson

Instructors: Branden B. Johnson, Decision Research, Inc.; Darrell W. Donahue, Maine Maritime Academy

Meetings and publications of the Society for Risk Analysis can be daunting to newcomers. More generally, risk analysis incorporates and spans many disciplines. It is often difficult for people, even those who work on some topic within risk analysis—be it toxicology, terrorist threat assessment or human behavior—to understand how their work fits into the risk analysis “big picture.” Likewise, disciplinary training does not prepare people to understand, much less converse with, fellow practitioners. This workshop, taught by two experts with extensive histories in practice, government and academia, is designed to fill that gap. We introduce fundamental risk analysis concepts and terminology, including elements of risk management, risk assessment, and risk perception and communication. Exercises (microbial risk focused) will be used to allow the participants to apply these basic concepts of risk analysis. Upon completion of this course, students will understand the fundamental concepts of risk analysis. The workshop is suitable for first time Society for Risk Analysis Annual Meeting attendees, as well as all individuals new to risk analysis and those who have been involved in

only a limited aspect of risk analysis. They will be prepared to engage comfortably in the range of conversations that distinguish Society for Risk Analysis Annual Conferences.

Workshop 5: Simplicity in Biocomplexity: Influence Diagrams for Modeling Human-Environment Interactions

Registration Sunday Half Day (8 am-Noon): Preregistration: \$225; Onsite \$275

Organizer: Matteo Convertino

Instructors: Matteo Convertino, Risk and Decision Science Team, Department of Agricultural and Biological Engineering, University of Florida, Environmental Lab, ERDC USACE

This 4-hour workshop will cover the fundamental aspects of influence diagrams for incorporating results of decision models, process-based models, and monitoring data in order to propose solutions of complex issues about human and natural systems. The multifaceted problems of our society require more and more the integration of basic-science (e.g. modeling predictions), stakeholder preferences and decisions, and real time data.

Using an example of a large restoration effort for the Everglades, the workshop will explain the ability of influence diagrams to incorporate spatial and temporal complexities of complex systems into a mental model of ideal environmental managers. The theoretical foundations of influence diagrams will be mentioned; however, the focus will be on the application of these probabilistic decision models. The workshop will start by introducing elementary Bayesian inference techniques (automated and non-automated) for assessing the probabilistic structure of input variables of influence diagrams and of their uncertainty. The assessment of the conditional probabilities among variables and the structuring of the decision problem will be central topics of this workshop. The value of information in Bayesian networks and influence diagrams will be shown as a potential instrument to guide policy-making. A global sensitivity and uncertainty analysis will be explained in order to quantify the importance of each variable and of their uncertainties in the magnitude and uncertainty of the output of influence diagrams. The workshop will address also the role of visualization of influence diagram results. This is important in order to improve the communication of risk and decisions to stakeholders, the general public, and the scientific community at large.

The workshop built on the concepts of transdisciplinarity, system theory and quantitative decision analysis is certainly useful for policy makers that aspire to have a more quantitative preparation about the best use of models in their everyday practice, to basic-scientists who want to find applications of basic science to real problems, and for students (from engineering, life sciences, to management) that are new to these topics. Because of the application focus of the workshop, participation is encouraged for people who do not have background in these topics. All the topics will be introduced in a very interactive way by examples built in Matlab. Participants will receive an electronic copy of the slides and numerical examples used during the workshop (Dropbox folder shared among participants).

Workshop 6: Training Resources for Research Ethics and Cultural Competence in Risk Assessment

Registration Sunday Half Day (1-5 pm): Preregistration: \$65; Onsite \$115

Organizer: Dianne Quigley

Instructors: Dianne Quigley, PhD, Adjunct Assistant Professor, Center for Environmental Studies, Brown University

Risk assessment research recently has been involving more community groups, particularly racially/culturally-diverse groups. Additionally, IRBs are requiring human subjects protections for interviews, surveys, oral histories, etc. Training in human subjects protections is needed both for individual human subjects protections and for respecting individuals as members of place-based communities. Additionally, cultural groups within local communities in the US and internationally have particular histories and traditions, group processes and research

experiences that are important to learn about from case study and applied ethics articles. These group conditions are frequently critical contextual conditions to consider in the design of risk assessments.

At this workshop, we will review basic human subjects protections, new research protections for place-based communities and cultural groups, cultural competence, environmental justice and ethical approaches to justice. Training resources will be shared with interested environmental studies faculty and graduate students including: training curriculum for graduate student mentoring programs, a preview of a faculty/ student mentoring web-based resources (MyCourses and Blackboard), and samples of case studies and digital training slides. Interested faculty and graduate students are invited to attend this discussion to take advantage of these resources and to offer ways that they could bring their expertise and field experience to this collective research ethics/cultural competence training efforts.

Workshop 7: Probabilistic Risk Analysis with Hardly any Data

Organizers: Scott Ferson, Applied Biomathematics and Jack Siegrist, Rutgers University

Registration Sunday Full Day: Preregistration: \$275; Onsite \$325

Instructors: Scott Ferson, Ph.D., Applied Biomathematics and Jack Siegrist, Ph.D., Rutgers University

This full-day tutorial introduces and compares methods for developing a probabilistic risk analysis when little or no empirical data are available to inform the risk model. The talks are organized around the basic problems that risk analysts face: not knowing the input distributions, not knowing their correlations, not being sure about the model itself, or even which variables should be considered. Possible strategies include traditional approximative methods and recent robust and bounding methods. Numerical examples are given that illustrate the use of various methods including traditional moment propagation, PERT, maximum entropy, uniformity principle, probability bounds analysis, confidence boxes, Bayesian model averaging, and sensitivity analysis. All of the approaches can be used to develop a fully probabilistic estimate useful for screening decisions and other planning. The advantages and drawbacks of the various approaches are examined. Essentially, the drawbacks are that bounding approaches may say too little about risks, and the rough and ready approximate methods may say too much. The discussion addresses how defensible decisions can be made even when little information is available, and when one should break down and collect some data and, in that case, what data to look for. The presentation style will be casual and interactive. Participants will receive a handout and CD of the illustrations used during the tutorial.

Workshop 8: Project Risk Management

Registration Sunday Half Day (8am-Noon): Preregistration: \$195; Onsite \$245

Organizer: Ovidiu Cretu

Instructors: Ovidiu Cretu and Vlad Cretu, Cretu Group LLC; Jong-Know Lim, Infrastructure Asset Management Co., LLC

The workshop will focus on the risk management process as an integral part of project management. The instructors will present the Risk Management Cycle, including the fundamentals of integrated project cost and schedule risk assessment, and compare deterministic and probabilistic approaches. The notion of base estimate (for the cost and schedule) is introduced and then the instructors will elaborate on defining the base uncertainty as a combination between base variability and market conditions. Briefly the instructors will present the ISO 31000 definition of risk followed by the dilemma of “How many risks should be assessed?” Two project case studies will be presented to exemplify the controversy between “Professional Sophistication” and “Keep It Short and Simple.” The instructors will cover the characteristics of risk, including (1) probability of occurrence, (2) consequences, and (3) conditionality (dependency and correlation). Risk evaluation tools, including Monte Carlo

analysis, Tornado diagrams, risk matrices, and risk maps also will be discussed. The workshop will conclude with risk management plans and tips for success.

CANCELLED: Workshop 9/9A/9B: Screening-Level Air Dispersion Modeling for Risk Assessors

CANCELLED

Workshop 10: Cumulative Risk Assessment: Addressing Combined Environmental Stressors

Registration Sunday Full Day: Preregistration: \$350; Onsite \$400

Organizer: Linda K. Teuschler, MS, US Environmental Protection Agency (EPA)

Instructors: Amanda Evans, MSPH, Oak Ridge Institute for Science and Education; Richard C. Hertzberg, PhD, Biomathematics Consulting; Margaret MacDonell, PhD, Argonne National Laboratory; Moiz Mumtaz, PhD, Agency for Toxic Substances and Disease Registry; Glenn E. Rice, ScD, EPA; Jane Ellen Simmons, PhD, EPA; J. Michael Wright, PhD, EPA

Cumulative risk assessment (CRA) addresses the impacts of multiple chemical and nonchemical stressors on real world individuals and communities, resulting in complex exposures for individuals and populations with a variety of vulnerabilities, in applications that range from environmental justice and community sustainability to individual health promotion and protection. Nonchemical stressors include biological and physical agents (e.g., microbes and noise) as well as socioeconomic stressors and psychosocial conditions (e.g., associated with natural disasters). Public concerns that can initiate CRAs include (1) elevated environmental measurements or biomonitoring data; (2) multiple sources of pollutants or stressors; and (3) changes in disease rates or patterns (e.g., leukemia cluster) or ecological effects (e.g., loss of wildlife diversity). This workshop focuses on human health and begins with an overview of three CRA elements: analysis, characterization, and quantification (as feasible) of the combined risks from multiple stressors. Teaching methods include lectures and hands-on exercises. Presentations highlight basic concepts, methods, and resources for conducting a population-based CRA. A central theme is integrating exposure and dose-response information with population characteristics during planning and scoping based on initiating factors. Vulnerability factors are addressed, e.g., diet/nutritional status, behaviors, genetic traits, socioeconomic status, sensitivities, and psychosocial stress. Methods for estimating human health risks are discussed and applied, including epidemiologic approaches and assessing the joint toxicity of chemical mixtures. In the exercises, participants develop chemical, biological and physical stressor groups using exposure and toxicity factors, link them with population vulnerability factors and conduct a risk characterization. Participants are asked to bring a calculator.

Workshop 11: An Overview of the Science, Economics and Policy on Climate Change

Registration Sunday Half Day (1-5 pm): Preregistration: \$275; Onsite \$325

Organizer: Elisabeth Gilmore

Instructors: Klaus Keller, Pennsylvania State University; Katherine Calvin, Joint Global Change Research Institute (JGCRI), Pacific Northwest National Laboratory/University of Maryland; Arden Rowell, University of Illinois

The far-reaching implications of climate change ensure that it will remain an important policy issue. This workshop aims to provide participants with an overview of climate change science, economics and policy. First, we provide an overview of the science and risks of climate change, which is designed to be accessible to non-scientists. Second, we provide an assessment of the economics of mitigation and damages. This will include an introduction to integrated assessment models (IAMs), which played a critical role in establishing the US government's social cost of carbon (SCC). Third, we discuss climate policy, focusing on the evolution of US domestic policy through the Clean Air Act and the courts. While this workshop will not directly

address expectations of future domestic or international climate policy, participants should be able to better analyze and critique the effect of future developments on socio-economic systems and climate risks.

Workshop 12: Use of Expert Elicitation to Inform Decisionmaking

Registration Sunday Full Day: Preregistration: \$300; Onsite \$350

Organizer: Aylin Sertkaya

Instructors: Aylin Sertkaya, Eastern Research Group Inc. (ERG); Cristina McLaughlin, Food and Drug Administration

Risk analysis often requires making inferences or estimating parameter values from studies that contain inconsistent or conflicting results or address dissimilar contexts. Such inferences or estimates should be consistent with the weight of evidence. Deciding whether and how to combine information from multiple studies requires thinking carefully about the nature of the problem to be addressed and the characteristics of the available evidence. In the first part of the workshop, we will introduce the range of methods for evaluating and combining evidence and explore three prominent approaches in detail: systematic review, meta-analysis, and expert elicitation. These methods are used widely in the social sciences and medicine as well as in risk assessment. Each begins with a careful review of the research literature, but then the approaches diverge. Systematic review involves a largely qualitative evaluation of available studies against established criteria to identify those that are most appropriate for use in a particular context. Meta-analysis involves selecting studies from the available literature using formal criteria and then using statistical models to calculate summary estimates and explore sources of variation across studies. Expert elicitation uses a structured process to select experts who provide subjective probability distributions that characterize their knowledge about a quantity. The second part of the workshop will focus more on expert judgment elicitation topics ranging from recruitment, elicitation protocol design, different elicitation techniques (e.g., individual elicitations, Delphi method, nominal group technique, etc.) to aggregation methods for combining opinions of multiple individuals and quantifying uncertainty. The role of expert judgment elicitation and its limitations, problems, and risks in policy analysis will also be addressed. The class will conclude with a hands-on exercise designed to better convey challenges with expert calibration.

Workshop 13: Probabilistic Risk Analysis with Hardly any Data

Organizers: Scott Ferson, Applied Biomathematics and Jack Siegrist, Rutgers University

Registration Thursday Full Day: Preregistration: \$275; Onsite \$325

Instructors: Scott Ferson, Ph.D., Applied Biomathematics and Jack Siegrist, Ph.D., Rutgers University

See description for Workshop 7.