

**TUESDAY, NOVEMBER 14**  
**10:45 A.M. - 12:15 P.M.**

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**Fukushima Reactor Accident Impact on the Local Environment**  
**Lory Student Center Room 386**

One of the key factors in evaluating the impact of any noxious substance on an ecosystem is how best to measure environmental impact. CSU is involved in a long-term evaluation of the impact of the Fukushima Daiichi reactor accident impact on the ecosystem, and multiple variables have been selected to study the overall health of the wildlife population. Generally, the higher trophic level organisms will concentrate radioactive materials, and therefore, are utilized as sentinels to provide indication of the movement of radionuclides in an ecosystem. Wild boars are the highest trophic level animal in the Fukushima Prefecture, and the subject of current research. Freshwater and saltwater fish have been sampled as sentinel indicators of the impact of radioactivity on lakes, rivers and the local ocean. Extensive soil, water and plants samples have also been taken. A short presentation will be given on some of the current research on environmental conditions and the overall impact of the reactor accident on the ecosystem. We will discuss how we can use radioactivity to establish models of the ecosystem, as well as how best to measure the impact of radiation on an ecosystem.

**Organizer:** Dr. Tom Johnson, Associate Professor, Environmental and Radiological Health Services, CSU

**Panelists:**

- Dr. Kenji Nanba, Professor, Fukushima University and Director of The Institute of Environmental Radioactivity (Japan)
- Amber Harshman, Ph.D. student, CSU, College of Veterinary Medicine and Biomedical Sciences (CVMBS), Environmental and Radiological Health Sciences (ERHS)
- Joshua Hayes, MS student, CSU, CVMBS, ERHS
- Kelly Cunningham, DVM student, CSU, CVMBS
- Maggie Rollert, DVM student, CSU, CVMBS
- Sami Pederson, DVM, Ophthalmology, CSU

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**Water and Environmental Sustainability in China**

**Lory Student Center Grey Rock Room**

The interaction between water and environmental sustainability are core to the principles of the Natural Resource Ecology Laboratory (NREL). Further, water and environmental sustainability are a key component of the Confucius Institute at Colorado State University (CICSU). This session merges the international research of NREL undertaken in Asia with the focus of the CICSU. It will present some of the water and environmental sustainability challenges being faced by Asian nations, and highlights some of the opportunities for researchers, including collaboration with Chinese and other Asian scientists. While the focus is on China, many of the same water and environmental sustainability issues also face neighboring nations.

**Organizers and Moderators:**

- Dr. Steven Fassnacht, Professor, Ecosystem Science and Sustainability (ESS), CSU; NREL Research Scientist
- Dr. Wei Gao, Associate Provost for China Programs, CSU; NREL Research Scientist; Professor, ESS

**Panelists:**

- Dr. Ryan W. Webb, INSTAAR, University of Colorado
- Vice Dean Professor Zhongjing Wang, Civil Engineering, Tsinghua University (Beijing, China)
- Dr. KuoRay Mao, Assistant Professor, Sociology, CSU
- Dr. Raja Reddy, Professor, Mississippi State University
- Dr. Zhiqiang Gao, China Academy of Sciences (Yantai, China)

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**Critical Knowledge Gaps in Soil Organic Matter Dynamics for Monitoring Soil C**  
**Lory Student Center Room 382**

Our view of soil organic matter dynamics is rapidly changing with new techniques and methods for analyzing soils. A better appreciation of SOM transformations and stabilization have emerged with studies clarifying the role of aggregate dynamics, saturation, pyrogenic carbon, priming, dissolved organic matter, temperature responses, and erosion. Ultimately these advances are creating opportunities to more accurately model and monitor soil C and instill confidence in the policy community that managers can sequester C and mitigate GHG emissions, which has been promised by scientists for years. This panel will explore these concepts and the latest frontiers in an area that could lead to improved understanding in the next decade.

**Organizer:** Dr. Stephen Ogle, Senior Research Scientist, Natural Resource Ecology Laboratory (NREL)

**Panelists:**

- Dr. Jeff Baldock, CSIRO, Australia
- Dr. Francesca Cotrufo, Professor, Soil and Crop Sciences, CSU
- Dr. Serita Frey, Natural Resources, University of New Hampshire
- Dr. Johannes Lehmann, Soil and Crop Sciences, Cornell University
- Dr. Keith Paustian, Professor, Soil and Crop Sciences, CSU; NREL Senior Research Scientist

**12:15 - 1:45 P.M.**

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**Title: Teaching and Learning in the 21<sup>st</sup> Century: Educating the Whole Student for Global Ecological Challenges**

**Lory Student Center Room 376**

**\*Registration required for this session**

Ecology in the 21<sup>st</sup> century requires cross-disciplinary and international collaboration. This session will explore how to prepare students for those collaborative practices while engaging students in their own learning processes. CSU staculty (faculty and staff who sailed on Semester at Sea) will share what they have learned from engaging students in research, co-curricular experiences, collaborating across divisions, and developing cross-national partnerships. While facilitators will share specific examples of

engaged learning, discussion will allow participants to share what methods have worked (or not) as a means of engaging students in global issues and concerns. Lunch will be served. [Registration required.](#)

**Organizer:** Dr. Robert Kling, Associate Professor of Economics, CSU

**Panelists:**

- Dr. Robert Kling, Associate Professor of Economics, CSU
- Dr. Jody Donovan, Assistant Vice President for Student Affairs and Dean of Students, CSU
- Dr. Ursula Quillmann, Assistant Professor, Forest and Rangeland Stewardship, CSU

## **2 - 3:30 P.M.**

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### **Regional Climate Change Effects and Ecosystem Responses in the North Central U.S.**

#### **Lory Student Center Room 386**

Ecosystems and climate change are linked through a number of complex interactions which couple the land and water resources with the atmosphere through cycles of energy, water, and nutrients such as carbon, nitrogen, and phosphorus. Ecosystems respond to climate and alter the manner in which ecosystem services associated with food availability, water cleanliness and availability, and habitat and shelter, which wildlife, fish, and plants depend upon. Human well-being is also affected by these interactions between ecosystems and climate. The rapid nature of climate change in our region of the U.S. are affecting ecosystems in ways that we are not readily able to manage for. In our region, efforts have been established to understand the dynamics of climate change, its impacts and consequences, and how we manage ecosystem services to maintain livelihoods and our natural resources.

This panel will address what we know of these changes through regional understanding of climate impacts to our ecosystem and natural resources in our region, and how we are working with natural resource managers to develop adaptation and coping strategies for these critical set of ecosystem services. The panel will discuss issues related water, rangelands, forests, and water fowl.

**Organizer and Moderator:** Dr. Dennis Ojima, Professor, Ecosystem Science and Sustainability, CSU; Natural Resource Ecology Laboratory (NREL) Senior Research Scientist

**Panelists:**

- Dr. Dannele Peck, Agricultural Economist, USDA/ARS (Fort Collins, CO)
- Robin O'Malley, USGS Director of the North Central Climate Science Center
- James Rattling Leaf, Senior Coordinator, Great Plains Tribal Water Alliance
- Rich Conant, Associate Dean, Warner College of Natural Resources and Professor, Ecosystem Science and Sustainability, CSU; NREL Ecosystem Ecologist

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### **Use of Ecosystem Models at NREL during the Past 50 Years**

#### **Lory Student Center Grey Rock Room**

The use and development of ecosystem models and the system ecological approach are key parts of the research conducted at the Natural Resource Ecology Laboratory (NREL) from the 1960's to present time.

We will trace the historical development of ecological research at NREL and demonstrate the important role that ecological models had in this research. Most of the major research projects included a mixture of ecological model development, field and laboratory research, and the use of ecological models for improving our understanding about ecosystem dynamics. We summarize the development and application of ecosystem models at Colorado State University, because this lab has been a leader in ecosystem modeling. We trace how model complexity, extent of validation and application, interactions between modeling and measurement projects, usefulness of model outputs, and other factors have evolved through time. Panel members will show how the modeling efforts at NREL have influenced ecosystem model development around the world. We close by prioritizing future research efforts needed to reduce uncertainties and better address contemporary issues.

**Organizer and Moderator:** Dr. Bill Parton, Professor Emeritus, CSU; NREL Senior Research Scientist

**Panelists:**

- Steve DelGrosso, US Geological Survey (Fort Collins)
  - Dr. Keith Paustian, Professor, Soil and Crop Sciences, CSU; Senior Research Scientist, NREL
  - Dr. Stephen Ogle, Senior Research Scientist, NREL
  - Dr. Tom Hobbs, Senior Research Scientist, NREL
  - Dr. Will Wieder, Research Scientist, National Center for Atmospheric Research (Boulder, CO)
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**Reinventing Discovery: Ecosystem Science Empowered by Citizen Science**

**Lory Student Center Room 382**

The phenomenon of citizen science in its various forms – ranging from top-down, expert-driven crowdsourced and participatory sensing models, to bottom-up, citizen-driven social and ecological justice initiatives – represents a rich and fast-evolving arena in the production and co-production of scientific knowledge. It raises questions that speak to the core of ecosystem science and systems thinking, such as who sets the research agenda and who can do science and make discoveries. This panel will wrestle with these questions and discuss the potential roles of citizen science related to ecosystem science and sustainability in the 21<sup>st</sup> century. Panelists will present short, disruptive, and thought-provoking presentations for further discussion by those attending the panel session with an aim to situate citizen science within the broader ecosystem science context, and provide a framework for leveraging this movement in effective ways to advance ecosystem science in the 21<sup>st</sup> century. We invite panelists and attendees to help us unpack citizen science’s spoken and unspoken sensibilities, and identify potential future direction for this often difficult to define movement.

**Organizer:** Dr. Greg Newman, Director, CitSci Organization; Natural Resource Ecology Laboratory (NREL) Research Scientist

**Panelists:**

- Dr. Julia Parrish, Professor of Aquatic and Fishery Sciences, University of Washington and Executive Director of COASST (Seattle, WA)
- Dr. Scott Loarie, Co-director, iNaturalist (San Francisco, CA)
- Dr. Stephanie Kampf, Associate Professor, Ecosystem Science and Sustainability, CSU; NREL Research Scientist
- Dr. Jennifer Shirk, Interim Director, Citizen Science Association, Cornell University (Ithaca, NY)

**WEDNESDAY, NOVEMBER 15**

**9 - 10:30 A.M.**

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**Environmental Science Literacy: A framework for addressing 21<sup>st</sup> Century Environmental Challenges**  
**Lory Student Center Room 386**

Society faces a number of environmental challenges connected to the global and local issues (e.g., greenhouse gases, climate change, energy development) that will require collective human action on an unprecedented scale. Responding to these issues will require greater participation in STEM careers and improvements in the environmental literacy of a diverse public to make informed decisions. Environmental science literacy captures the capacity to participate in and make decisions through evidence-based discussions of socio-ecological systems. Environmental science literacy requires citizens to understand, evaluate, and respond to multiple sources of information. Scientists and science educators have worked collaboratively to develop an emerging Environmental Science Literacy Framework that ties together the content and practice skills to affect the development of curricula, instructional practice and communication. This panel will address different dimensions and approaches to study and advance this emerging framework.

**Organizer and Panelist:** Dr. John Moore, Department Head, Ecosystem Science and Sustainability; Natural Resource Ecology Laboratory (NREL) Director

**Panelists:**

- Dr. Charles 'Andy' Anderson, Professor, Department of Teacher Education, Michigan State University
- Dr. Meena Balgopal, Associate Professor, Biology, CSU
- Dr. Alan Berkowitz, Head of Education and Plant Ecologist, Cary Institute of Ecosystem Studies (Millbrook, NY)
- Dr. Carol Brewer, Founder, The Prairie Ecotone Research Group, LLC
- Dr. Scott Denning, Monfort Professor of Atmospheric Science, CSU
- Dr. Beth Covitt, Head of Science Education Research and Evaluation, University of Montana
- Dr. Kristin Gunckel, Associate Professor, Science Education, University of Arizona

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**Ecosystem Approaches to Sustainable Pastoral Development in Mongolia**  
**Lory Student Center Grey Rock Room**

Mongolian pastoral systems have evolved and been maintained over scores of centuries. However, under recent socio-economic and climate changes, these ecosystems are threatened to be dramatically changed. Various studies have implemented numerous aspects of ecosystem research approaches to study the vulnerability of these social-ecological systems, and have provided insights into sustainable ecosystem pathways forward. Panel members will provide different perspectives of emergent

ecosystem approaches to respond to the impacts of various drivers of change, and to suggest some ecosystem approaches to solutions to challenges these communities face.

**Organizer and Moderator:** Dr. Dennis Ojima, Professor, Ecosystem Science and Sustainability; Natural Resource Ecology Laboratory (NREL) Senior Research Scientist

**Panelists:**

- Dr. Chuluun Togtohyun, Professor, National University of Mongolia; NREL Visiting Senior Scientist
- James F. Wagenlander, Honorary Consul General of Mongolia
- Dr. Chris Pague, Senior Conservation Ecologist, The Nature Conservancy (Arlington, VA)
- Dr. Robin Reid, Professor, Ecosystem Science and Sustainability; Director, Center for Collaborative Conservation, CSU

**10:45 A.M. - 12:15 P.M.**

**Integrated Research and Engagement in Africa: Looking to the Past and Designing Innovations for the Future**

**Lory Student Center Grey Rock Room**

Systems and integrated approaches have been a hallmark of Natural Resource Ecology Laboratory (NREL) research and engagement in Africa for over 30 years. Linking social and ecological research to ecosystem level questions began in the 1980's. Social and ecosystems have been coupled through simulation modeling, another hallmark of NREL science. Remote sensing and GIS have also been used by both social scientists and ecologists to study African societal and ecological change. Global environmental change research today demands that systems approaches continue to be used. This type of science values different knowledge systems, is transdisciplinary, and focuses on knowledge for action. Knowledge to inform action on GEC involves local, practical knowledge with contributions from outside scientists and others. Successful efforts to link knowledge with action function dynamically. Collaboration and connection are at the heart of this type of science to address complex environmental challenges. Reward is often in the learning rather than the success. This panel will address past, present and future approaches to integrated research in Africa.

**Organizer and Moderator:** Dr. Kathleen Galvin, Professor, Department of Anthropology; NREL Senior Research Scientist; Director, The Africa Center

**Panelists:**

1. **Dr. Carla Roncoli**, Senior Research Scientist, Department of Anthropology, Emory University

*Title of talk: 'Engaging different knowledge systems in decentralized water governance in Burkina Faso'*

2. **Dr. Colin Thor West**, Associate Professor, Department of Anthropology, University of North Carolina at Chapel Hill

*Title of talk: Sahelian Greening: Integrating Ethnography with Remote Sensing in Burkina Faso*

3. **Dr. D. Layne Coppock**, Professor of Human-Environment Systems, Department of Environment and Society, Utah State University

*Title of talk: 'Sustainable Pastoralism Requires Improved Governance and Asset Diversification'*

4. **Dr. Moffatt K. Ngugi**, Agriculture Development Officer, USAID Advisor on Climate and Environment

*Title of talk: 'Sustainably reducing hunger, malnutrition and poverty in African countries through ecosystem science'*

5. **Dr. Robin Reid**, Professor, Department of Ecosystem Science and Sustainability; Director, Center for Collaborative Conservation, Colorado State University

*Title of talk: 'Out of Africa: Innovations in Science for Socio-Ecological Transformations'*

6. **Randall Boone**, Professor - Ecosystem Science and Sustainability and Research Scientist - Natural Resource Ecology Laboratory, Colorado State University

*Title of talk: 'Using Coupled System Modeling to Enhance Ecosystem Services'*

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### **Applications of Ecosystem Science to Real-world Challenges** **Lory Student Center Room 382**

The systems framework that underlies ecosystem science is more relevant than ever. Today's wicked problems require approaches that consider and address the interactions among system components. In this panel, we will explore how the ecosystem science concept is being applied to manipulate the microbiome and develop solutions to environmental challenges. We will also discuss how this science can be translated into action from experts spanning academia and the private sector.

**Organizer and Moderator:** Dr. Matt Wallenstein, Professor, Ecosystem Science and Sustainability; Natural Resource Ecology Laboratory (NREL) Research Scientist

#### **Panelists:**

- Dr. Wayne Dorband, Center for Ecologic Excellence and Development (CEED)
- Dr. Susan De Long, Assistant Professor, Civil and Environmental Engineering, CSU
- Dr. Bruno Sobral, Director, One Health Institute, CSU
- Dr. Elizabeth Ryan, Associate Professor of Toxicology and Nutrition, Department of Environmental and Radiological Health Science, CSU

**1:30 - 4:50 P.M.**

**NREL Symposium: Ecosystem Science in the 21st Century**  
**Lory Student Center Ballroom A**

- 1:30-1:35 Introduction – John Moore, Department Head, Ecosystem Science and Sustainability; Natural Resource Ecology Laboratory (NREL) Director
- 1:35-2:00 Keynote – Eldor Paul, 2014 Award Co-Recipient; NREL Senior Research Scientist; Professor, Soil and Crop Sciences, CSU
- 2:00-2:15 Advances in Biodiversity Science: Predicting Species in Space and Time, Presenter: Tom Stohlgren, NREL Senior Research Scientist
- 2:15-2:21 The Causes and Consequences of Microbial Biomass, Presenter: Ed Hall, NREL Research Scientist
- 2:21-2:27 Water Realities: a Social-Ecological Assessment of Community-Scale Water Resources on the Border of Kruger National Park, Presenter: Melissa McHale, Associate Professor, Urban Ecology and Sustainability, CSU
- 2:27-2:42 Streamflow Generation in the Southern Rockies, Presenter: Stephanie Kampf, Associate Professor, Ecosystem Science and Sustainability, CSU; NREL Research Scientist
- 2:42-2:57 Developing a Sediment Budget for the Upper Elk River Watershed, Northwestern California: Do Natural or Anthropogenic Sources Dominate? Presenter: Lee H. MacDonald, Professor, Ecosystem Science and Sustainability; NREL Senior Research Scientist
- 2:57-3:03 Putting the WOW into Undergraduate Research Experiences, Presenter: Stacy Lynn, NREL Research Scientist
- 3:03-3:15 Break
- 3:15-3:21 Edge Effects: “Poachers” and Uncanny Animals on the Borders of South Africa’s Kruger National Park, Presenter: David Bunn, NREL Senior Research Scientist
- 3:21-3:36 Different Behavior Requires Different Management: the Difference Between Horses and Burros, Presenter: Sarah R.B. King, PI, NREL
- 3:36-3:42 Causes, Impacts, and Adaptations of Pasture and Climate Change Across Mongolian Ecozones from Integrating Herder and Instrument Observations, Presenter: Steven R. Fassnacht, Professor, Ecosystem Science and Sustainability (ESS), CSU; NREL Research Scientist
- 3:42-3:48 A Biotic Awakening: Soil Biota and Feedbacks in a Changing Arctic, Presenter: John Moore, Department Head, Ecosystem Science and Sustainability; Natural Resource Ecology Laboratory (NREL) Director
- 3:48-3:54 Harnessing the Microbiome for Sustainable Agriculture, Presenter: Matt Wallenstein, Professor, Ecosystem Science and Sustainability; Natural Resource Ecology Laboratory (NREL) Research Scientist
- 3:54-4:09 Understanding Long-Term Ecosystem Dynamics in a World with a Short Attention Span, Presenter: Jill Baron, Ecosystem Ecologist , U.S. Geological Survey; NREL Senior Research



4:10-4:35

Keynote – Bill Schlesinger, 2014 Award Co-Recipient; President Emeritus, The  
Carey Institute of Ecosystem Studies

4:35-4:50

2017 NREL Award of Excellence in Ecosystem Science by John Moore to Mary  
Firestone, Professor, Environmental Science, Policy and Management,  
University of California, Berkeley