

Center for BioEnergy Sustainability
Oak Ridge National Laboratory (ORNL)
Accomplishments and Activities
October 2009 – September 2010

Workshops at ORNL

- A workshop on “A Watershed Perspective on Bioenergy Sustainability” was held February 3-4, 2010, at ORNL. <http://www.ornl.gov/sci/besd/cbes/workshop.shtml>
- Thirty researchers associated with the Chinese Academy of Science visited ORNL for the “China-US Workshop on the Climate-Energy Nexus” on November 11-14. The workshop participants had lively discussions and agreed that the “environment” needed to be included in the nexus as a key factor. Several ORNL research staff participated with presentations and session moderation.

Symposia Organized and Chaired

- April 21: Keith Kline (ORNL) organized and co-chaired (with Joel Velasco, UNICA) a half-day Session on “Biomass Sustainability and Land Use” for SIM’s 32nd Symposium on Biotechnology for Fuels and Chemicals, Clearwater, Florida.
- April 8: Yetta Jager organized an all-day symposium, “Reshaping Landscapes: Bioenergy and Biodiversity,” April 8, for the annual meeting of the International Association of Landscape Ecology in Athens, Georgia: <http://www.usiale.org/athens2010/index.php?id=scheduleSymposia>
- April 7: Keith Kline and Virginia Dale organized a Symposium VIII, “Reshaping Landscapes: Bioenergy and Land-use Change,” held at the U.S. chapter of the International Association of Landscape Ecology in Athens, Georgia.
- Mark Downing is organizing a symposium on policy needs of bioenergy at the 2010 American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America (ASA-CSSA-SSSA) Meeting in October 2010.

New Publications

- CBES (Center for BioEnergy Sustainability, Oak Ridge National Laboratory). 2009. Land-Use Change and Bioenergy: Report from the 2009 workshop, ORNL/CBES-001, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy and Oak Ridge National Laboratory, Center for Bioenergy Sustainability <http://www.ornl.gov/sci/besd/cbes/workshops/LandReportCover.pdf>.
- Dale, V.H., K. Kline, J. Wiens, and J. Fargione. 2010. Biofuels: Implications for Land Use and Biodiversity. Ecological Society of America. <http://esa.org/biofuelsreports/>.
- Dale, V. H., C. Kling, J. L. Meyer, J. Sanders, H. Stallworth, T. Armitage, D. Wangsness, T. S. Bianchi, A. Blumberg, W. Boynton, D. J. Conley, W. Crumpton, M. B. David, D. Gilbert, R.W. Howarth, R. Lowrance, K. Mankin, J. Opaluch, H. Paerl, K. Reckhow, A. N. Sharpley, T.W. Simpson, C. Snyder, and D. Wright. 2010. Hypoxia in the Northern Gulf of Mexico. New York: Springer.
- Dale, V. H., M. L. Tharp, K. O. Lannon and D. G. Hodges. 2010. Modeling Transient Response of Forests to Climate Change. Science of the Total Environment. 408: 1888-1901. <http://dx.doi.org/10.1016/j.scitotenv.2009.11.050>
- Kline, K. L. and M. D. Colman. 2010. Woody Energy Crops in the Southeastern United States: Two Centuries of Practitioner Experience. Biomass & Bioenergy <http://dx.doi.org/10.1016/j.biombioe.2010.05.005>
- Kline, K. L., V. H. Dale, and A. Grainger. 2010. Challenges for Bioenergy Emission Accounting. Science E-Letter (2 March 2010) <http://www.sciencemag.org/cgi/eletters/326/5952/527>

Ongoing Participatory Activities

- Virginia Dale is serving on the National Academy of Sciences (NAS) Committee on Economic and Environmental Impacts of Increasing Biofuel Production and participated in several meetings and

conference calls. The U.S. Congress has called on NAS to conduct a study to assess the effect of the Renewable Fuel Standard (RFS) mandates on other sectors (for example, animal feed, forest products), the environmental impacts of incremental increase in biofuel production, and the policy options for alleviating any adverse impact of the RFS.

- Keith Kline is serving on the California Low-Carbon Fuel Standard (LCFS) Expert Work Group that is charged with “improving the land use and indirect effect analysis of transportation fuels” and contributing to development of “sustainability provisions” for the LCFS (see <http://www.arb.ca.gov/fuels/lcfs/lcfs.htm>). Keith’s participation complements that of Michael Wang (Argonne National Laboratory [ANL]) and Zia Haq (DOE’s Office of the Biomass Program) to support improved approaches for estimating the greenhouse gas effects of biofuels.
- ORNL became a stakeholder in the Council on Sustainable Biomass Production (CSBP) and joined the Forestry Task Force helping guide the rollout and iterative analysis and improvement of the draft Standard over the next two years. Over the year, ORNL staff (Kline, Downing, Langholtz, Dale) participated in CSBP discussions, meetings, and the Forestry Task Force.
- Keith Kline and Martin Keller have been active participants in the Global Bioenergy Sustainability Project concept paper on the scope and process for moving forward into Phase II of the project. March 17-19: Keith participated in the South African continental convention, and Keith and Martin participated in both the inaugural convention in The Netherlands and the synthesis meeting in Minnesota. Initiated by Lee Lynd (Dartmouth) the project goal is to build consensus and cooperative research around a hypothesis on the capacity of bioenergy to meet a substantial fraction of future world energy demand while simultaneously contributing to global needs for food, feed, fiber, improved ecosystem services and greenhouse gas reductions. For information: <http://engineering.dartmouth.edu/gsbproject/index.html>
- The U.S. Technical Advisory Group for the ISO Standard on Sustainability Criteria for Bioenergy (ISO Project Committee 248) convened and approved nominations of U.S. experts for four ISO PC248 work groups. Keith Kline was nominated and approved to serve on the work groups addressing greenhouse gas methods (this group is led by the U.S. and includes Michael Wang, ANL) and Indirect Effects (to be led by the United Kingdom).
- Following several conference calls, ORNL staff and John Ferrell (Office of the Biomass Program [OBP]-DOE) met with USDA counterparts in Atlanta on September 29 to discuss cooperation on bioenergy sustainability research and a potential joint pilot project looking at stover.

Center for BioEnergy Sustainability (CBES) Monthly Forums

- *Managing the Costs of Carbon Release* (September) – Eric Marland, Professor in the Department of Mathematical Sciences at Appalachian State University.
- *Lessons from Modeling the Joint Effects of Climate and Bioenergy Policies* (August) - Chad Hellwinckel, Research Assistant Professor in the Agricultural Policy Analysis Center at the University of Tennessee.
- *National Ecological Observatory Network (NEON) site on the Oak Ridge Reservation: A new collaborative project with NSF for long-term ecosystem measurements and monitoring* (July) - Pat Mulholland and Colleen Iverson of ORNL’s Environmental Sciences Division.
- *Modeling Soil Quality Issues Related to Sustainable Switchgrass and Poplar Production* (June) - Charles Garten, ORNL’s Environmental Sciences Division.
- *Gigaton Problems Require Gigaton Solutions: Urban Systems and Technology Opportunities* (May) - John Crittenden, Director of the Brook Byers Institute for Sustainable Systems and a Georgia Research Alliance Eminent Scholar at the Georgia Institute of Technology.
- *The Global Bioenergy Sustainability (GSB) Project. Is the next revolution at hand?* (April) - Keith Kline and Martin Keller (ORNL), on behalf of Lee Lynd and the GSB Organizing Committee.¹

¹ Lee Rybeck Lynd, Thayer School of Engineering, Dartmouth College and Mascoma Corp.; GSB organizing committee includes: Carlos Enrique de Brito Cruz, FAESP, Sao Paulo, Brazil; Andre Faaij, Copernicus Institute, Utrecht University, Netherlands; Jon Foley, University of Minnesota; Jose Goldemberg, University of Sao Paulo, Brazil; Nathanael Greene, Natural Resources Defense Council; Mark Laser, Dartmouth; Reinhold Mann, Battelle Malaysia; Ramlan Aziz, Universiti Teknologi Malaysia; Patricia Osseweijer, Delft University of Technology, Netherlands; Tom L. Richard, Pennsylvania State University; John Sheehan, Institute on the Environment, University of Minnesota; August Temu, World Agro-forestry Centre; and Emile van Zy, University of Stellenbosch, South Africa.

- *Review of Technical Issues Surrounding EISA's Biofuels Goals, the RFS2* (March) - Brian West from the Energy & Transportation Science Division at ORNL.
- *Shrinking the Carbon Footprint of Metropolitan America* (February) - Marilyn Brown of Georgia Tech (formerly of ORNL).
- *Bioenergy and Changes in Carbon Stocks* (January) - Gregg Marland, Senior Scientist with ESD's Carbon-Climate Simulation Science Group.
- *Sustainable Bioenergy from Production to Use* (December) - A series of short presentations:
 - Modeling Biodiversity in the Arkansas-White-Red River Basin - Peter E. Schweizer (ORNL) and Yetta Jager (ORNL)
 - Biomass Preprocessing as a Supply Chain Component - Mike Hilliard (ORNL)
 - Sustainable Energy Production Using Biological Fuel Cells - Abhijeet P. Borole (ORNL)
 - Observations on Corn Ethanol Production and Distribution Infrastructure - Steve Peterson (ORNL)
 - Hydrological and Geochemical Transformation of Nitrogen and Organic C in the Subsurface beneath Agricultural and Forested Ecosystems - Melanie Mayes (ORNL)
 - Logistics for a Biomass Economy - Jack Britt (Strata-G)
- *A Value Chain Analysis for Bioenergy* (November) - Stuart Daw, Energy & Transportation Science Division at ORNL.
- *Social Dimensions of Sustainable Bioenergy Development* (October) - Kathleen Halvorsen, Michigan Tech.

Presentations by ORNL Staff

- September 22: Keith Kline - *Energy, Ecosystems and Environmental Change* at the China-U.S. Joint Research Center Symposium (2010) in Beijing. (<http://jrceec.utk.edu> and www.RCEES.ac.cn).
- September 21: Esther Parish - *Water Challenges & Opportunities for Tennessee Landscapes*. At the Tennessee Watershed Conference in Nashville.
- September 15: Robin Graham presented on ORNL's approach to resource assessment that accompanies environmental and economic factors influencing biomass supply at the International Energy Agency's (IEA) Bioenergy Roadmap Workshop in Paris, France.
- September 14: Keith Kline, plenary - *The Challenges of Measuring Land Use and Land Use Change* at the North American Convention of the Global Sustainable Bioenergy (GSB) Project in Minneapolis, MN. <http://environment.umn.edu/gsb/about.html>
- August 16: Robin Graham - *Bioenergy Feedstocks and Sustainability* at the ORNL Multi-Directorate Biomass Workshop, providing an introduction to ORNL's new Bioenergy Initiative.
- June 18: Keith Kline - *Land-Use Change, Biofuels and the Precautionary Principle* at UC-Davis sponsored by the California Biomass Collaborative.
- June 9: 'Debo Oladosu - *The Role of Modeling Assumptions and Policy Instruments in Evaluating the Global Implications of U.S. Biofuel Policies* at the International Association of Energy Economics International (IAEE) conference in Rio de Janeiro (<http://ab3e.org.br/rio2010/>). 'Debo also met with Brazilian colleagues and counterparts in context of the Joint Bilateral Work Plan for Sustainability.
- April 19-22: Keith Kline - *Models, Science, and the Precautionary Principle: Land-Use Change and the Sustainability of Biomass Systems* at the 32nd Symposium on Biotechnology for Fuels and Chemicals for the Society for Industrial Microbiology (SIM), Clearwater, Florida.
- April 19: Virginia Dale - *Sustainability: The Issues and the Opportunities* at the Wood-to-Energy Roadmap Sustainability Forum in Hot Springs, Arkansas.
- April 6-8: Several ORNL staff gave presentations at the meeting in Athens, Georgia, of the U.S. Chapter of the International Association of Land Ecology:
 - Gbadebo Oladosu - *Modeling Direct and Indirect Effects of US Bioenergy Policy on Global Land Use*
 - Keith Kline - *Models, Science, and the Precautionary Principle*
 - Laurence Eaton - *Assessing Watershed Benefits of Bioenergy Crops: Recreational and Subsistence Value of Fishes*

- Virginia Dale - *Earth, Wind, & Fire in the 21st Century*
- Peter E. Schweizer - *Forecasting Changes in Water Quality and Aquatic Biodiversity in Response to Future Bioenergy Landscapes in the Arkansas-White-Red River Basin*
- March 29: Mark Downing - *You and Your Automobile: Does It Have to be a Love-Hate Relationship* as part of the ORNL Sustainability Seminar Series.
- March 17: Esther Parish - *Environmental Engineering Seminar Series* at the University of Tennessee's Civil and Environmental Engineering (CEE) Department.
- March 16: Keith Kline – *ORNL Capabilities Related to Land-Use Planning, Bioenergy and Strategies for GCC Adaptation* to the Regional USAID Mission in Southern Africa.
- March 5-6: Virginia Dale - *Indicators for Assessing Environmental Impacts of Biofuels* at the meeting of the National Academy of Sciences Committee on Economic and Environmental Impacts of Increasing Biofuel Production.
- March 3-4: Virginia gave a presentation on *Systems Sustainability for Energy Options* at the U.S. Department of Energy's Office of Biological and Environmental Research Long Term Vision Workshop held in Gaithersburg, Maryland.
- February 25-28: Peter Schweizer and Yetta Jager - *Influences of environmental gradients and land use on fish biodiversity in the Arkansas-White-Red River basin* at the Southern Division of the American Fisheries Society 2010 Spring Meeting in Asheville, North Carolina.
- January 28-29: Virginia Dale - *Bioenergy: The Issue of Sustainability in the Southeastern U.S.*- and Brian Davison - *Recent Progress and Products from the Bioenergy Science Center (BESC)* at the meeting on “Advances in Bioenergy: A Southern States Briefing” in Knoxville, TN.
- January 11: Rebecca Efroymson organized and led a community panel on bioenergy sustainability in Asheville, NC, under the auspices of the Green Monday series sponsored by the Blue Ridge Sustainability Institute (BRSI). This Green Monday was cosponsored by DOE's Office of the Bioenergy Program and the ORNL Center for BioEnergy Sustainability. Rebecca Efroymson gave the introductory presentation - *Sustainable Bioenergy*.
- December 15: Keith Kline - *Ingredients for Success in Addressing Climate Challenges and Sustainability* at the Global South-South Development Expo, at the World Bank in Washington, D.C. Keith also moderated *Innovative Solutions in Climate Change & Environment*.
- December 7: Rebecca Efroymson - *Evaluating bioenergy sustainability: Filling the Gaps* at the Society for Risk Analysis 2009 Annual meeting in Baltimore, MD.
- November 2: Tris West - *Estimating Current and Future Biomass Feedstocks* at the 2009 ASA-CSSA-SSSA International Annual Meeting in Pittsburgh, PA.
- November 9-10: Virginia Dale - *Designing Sustainable Options for Bioenergy Crops* at the 2009 American Institute of Chemical Engineers (AIChE) Annual Meeting in Nashville www.aiche.org/annual/specialevents. Virginia Dale also gave a talk on behalf of Jacques Beadry-Losique - *Shaping Our Energy Future: Advanced Research at the U.S. Department of Energy*.
- October 20-21: Keith Kline - *Energy Inputs for 1st and 2nd Generation Ethanol Feedstocks: Modeling Effects of Cultivation Practices and Crop Selection on GHG Emissions* at the CRC (Coordinating Research Council) Workshop on Life Cycle Analysis of Biofuels at Argonne, IL.
- October 1: Mark Downing - *Providing More than Food from Agricultural Landscapes* at the meeting at Columbia University in New York on “Metrics for Assessing Global Agriculture.

New Factsheet

- A Field Experimental Study of Hydrology and Water Quality Impacts of Intensive Forestry for Biofuel Feedstocks

CBES Website Activity

| Center for BioEnergy Sustainability Web Statistics Report | | | | | | | | | | | |
|--------------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----|
| Site | 2009 | | | 2010 | | | | | | | |
| | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug |
| Monthly & Annual Report | | 61 | 109 | 84 | 99 | 92 | 252 | 185 | 201 | 135 | 136 |
| Symposia | | | | | | 83 | 777 | 442 | 399 | 637 | 213 |
| Factsheets | 200 | 220 | 252 | 180 | 280 | 227 | 872 | 511 | 502 | 391 | 266 |
| Forums | 515 | 496 | 565 | 578 | 723 | 773 | 2,144 | 1,312 | 1,556 | 1,127 | 731 |
| Images | 2,141 | 1,706 | 2,412 | 2,839 | 2,306 | 2,224 | 2,423 | 2,101 | 1,504 | 1,241 | 794 |
| Workshops | | | | | | | | | | | |
| Land-Use | 414 | 299 | 280 | 1,171 | 1,390 | 1,007 | 2,228 | 1,315 | 1,432 | 1,004 | 541 |
| EPA | 191 | 199 | 239 | 136 | 171 | 183 | 316 | 196 | 211 | 143 | 105 |
| Watershed | 89 | 125 | 197 | 151 | 85 | 111 | 207 | 324 | 161 | 121 | 84 |

Posters

- August 11: Carolyn Hoagland- *The Perennial Question: Farmers' Choices and Bioenergy Future* as part of ORNL's 2010 Summer Student Poster Session.
- April 26: Esther Parish - *Assessing the Environmental Impacts of Cellulosic Bioenergy Production: An Ongoing Case Study of Switchgrass Production around Vonore, Tennessee* at the Women In Science Poster Session at ORNL.
- April 14-18: Esther Parish - *Assessing the Environmental Impacts of Cellulosic Bioenergy Production: An Ongoing Case Study of Switchgrass Production around Vonore, Tennessee* at the 2010 Association of American Geographers (AAG) Annual Meeting in Washington, D.C.
- December 8-10: *The Scale-Dependent Metrics for Bioenergy* was on display at ORNL's Main Street as part of the Laboratory Director's Research and Development (LDRD) projects.
- November 20: Rebecca Efrogmson - *Evaluating Bioenergy Sustainability: Filling the Gaps* in the "Biofuels Development: Understanding Environmental Challenges and Opportunities" session at the Society of Environmental Toxicology and Chemistry North America 30th Annual Meeting in New Orleans, LA.
- October 15: The poster that USDA (Mark Coleman) and ORNL (Kline *et al.*) developed on SRWC for bioenergy in the SE was presented by Carl Trettin (USDA Forest Service, Savannah River Research Station) at the South Carolina BioEnergy Summit, in Florence, SC (Clemson).
<http://www.clemson.edu/public/rec/peedee/research/switchgrass/>

Other Noteworthy Activities

- Virginia Dale, Richard Lowrance, Pat Mulholland and Phil Robertson developed a paper titled *Bioenergy Sustainability at the Regional Scale* to be published in *Ecology and Society* that served as a lead-in a presentation for the September 28-30 workshop in Atlanta of the Soil and Water Conservation Society (SWCS) entitled "Sustainable Feedstocks for Advanced Biofuels: A workshop to create regionally specific roadmaps for feedstock supply chains" (organized by the Soil and Water Conservation Society - SWCS). Richard Lowrance presented the paper. Laurence Eaton, Keith Kline, and Virginia Dale attended the workshop.
- September 21: Debo Oladosu participated in a meeting in Washington, D. C., to provide a status report on modeling work that the National Renewable Energy Laboratory (NREL) is doing with John Sheehan at the University of Minnesota on Land Use Change in a systems dynamic framework (Keith Kline met with John one week earlier and provided comments). Virginia Dale and Rebecca Efrogmson participated by phone.
- July 29: At the invitation of Genera Energy, Esther Parish and others attended the groundbreaking of Tennessee's Biomass Innovation Park in Vonore, TN. This world-class R&D campus will integrate the entire biomass supply chain, including harvesting, handling, storage, densification, pre-processing and transportation for multiple feedstocks.

- June 16: Tim Theiss provided a briefing and tour of the ORNL Fuels, Engines, and Emissions Research Center to several members of the Renewable Energy Systems Group.
- In May Virginia Dale worked with Paul Frymier and other University of Tennessee faculty on a National Science Foundation (NSF) GK-12 proposal: www.nsf.gov/pubs/2009/nsf09549/nsf09549.htm called SEEK-12; Sustainable Energy Education in K-12. If successful the program would mean that she would be able to be a faculty advisor and thus eligible to nominate domestic graduate students for a GK-12 fellowship.
- Graham, Langholtz, Webb, Downing, Dale and Kline contributed to the ongoing development of the multi-year program plan (MYPP) of the Office of the Biomass Program of DOE.

Visitors to ORNL

- June 24: A delegation from USDA visited ORNL to discuss opportunities related to data archiving information pertinent to sustainability. The visitors included Jill Auburn (Advisor for Sustainability, Office of the Chief Scientist and Research, Education and Economics [REE] Under Secretary), Susan McCarthy (Scientist, National Agricultural Library), Judy St. John (Associate Administrator, Agricultural Research Service) and Simon Liu (Director, National Agricultural Library).
- June 10: Paul Sloan, Director of the Bureau of Environment of the Tennessee Department of Environment and Conservation visited ORNL and was briefed on bioenergy sustainability and other research topics.
- In May ORNL staff met with Molly Jahn (USDA) at ORNL as well as joined a conference call with Molly Jahn and others from the Office of Management and Budget (OMB) and EPA regarding data sharing activities and explicitly the National Agriculture Library. A collaboration between USDA, EPA and DOE can address food as well as fuel issues and can build from the excellent experience and expertise that ORNL has developed from its 20 plus years with data archiving and distribution.
- In March Dr. Bill Hagy of USDA and Brian Duff (OBP's chief Engineer) visited ORNL. They also visited the plant and switchgrass plantings in Vonore.
- February 18-19: Chris Wright from Idaho National Laboratory (INL) visited to meet with ORNL feedstock researchers working on resource economics, land use, sustainability and related topics. ORNL and INL are collaborating to support biofuel development in China under recent cooperation agreements.
- February 17: Dr. Jason Hill from the University of Minnesota gave a presentation at ORNL and discussed bioenergy research issues with ORNL staff including: Brian Davison, Robin Graham, Keith Kline, Bob Perlack, Laurence Eaton, 'Debo Oladosu, Paul Leiby, Tris West, Yetta Jager, Gregg Marland, and Virginia Dale.
- January 20: Virginia Dale, Mark Downing, 'Debo Oladosu, Keith Kline and Tris West participated in sessions with the National Corn Growers Association Climate Change Task Force (CCTF). Discussion topics included resources assessment, sustainability research, crop energy/emission factors, and land-use change and related modeling.
- In December several representatives from the California Environmental Resources Evaluation System (CERES) visited ORNL to discuss future collaborative efforts.
- October 13: John Houghton of the DOE Office of Science visited ORNL to discuss opportunities for new scientific activities in land-use changes and bioenergy sustainability. Peter Thornton gave a presentation on the new project on "Improving the Representations of Human-Earth System Interactions," and there was a discussion on land-use change issues that included Keith Kline, 'Debo Oladosu, and Virginia Dale. A second topic of the day was field analysis of sustainability, and presentations were made on soils by Charles Garten and on water quality by Pat Mulholland. The third topic of discussion was modeling sustainability within a spatial optimization framework and scaling issues. A presentation was made by Virginia Dale, and Mike Hilliard and Esther Parish joined in the discussion.

Key Reviews

- Langholtz, Kline, Eaton and Downing contributed to a review submitted to OBP regarding carbon accounting of forestry activities for bioenergy in response to a Biomass Sustainability and Carbon Policy Study released by the Manomet Center for Conservation Sciences in Massachusetts.
- Keith Kline and Virginia Dale, in coordination with Helena Chum and Alison Goss-Eng, reviewed and edited draft materials for the Intergovernmental Panel on Climate Change (IPCC) Special Report on Renewable Energy, Chapter 2, Bioenergy. ORNL also contributed a draft chapter summary, synthesis of the section on environmental and social impacts, and a Figure to illustrate the “Climate Change-Land Use-Energy Nexus.”
- Rebecca Efroymsen, Keith Kline and Virginia Dale developed detailed comments on drafts of the report of the Global Bioenergy Partnership (GBEP) on sustainability criteria for bioenergy.
- ORNL staff developed input for the Office of the Biomass Program regarding the International Energy Agency (IEA) on their Bioenergy Roadmap.
- ORNL staff provided comments on the evolving reports of the Roundtable on Sustainable Biofuels (RSB) <http://rsb.epfl.ch/page-42474.html>

Other Meetings Attended

- May 25-26: Virginia Dale participated in the USDA Forest Service workshop “2010 Outlook Dialog: Forestry within a Landscape-Scale Approach to Conservation” in Tempe, AZ. Jonathan Overly from the East Tennessee Clean Fuels Coalition (DOE Clean Cities) gave an overview to the new RFS2 standard and the implications on the use of biofuels in the U.S. at the National Transportation Research Center (NTRC).
- April 29: Virginia Dale and Gregg Marland participated in a workshop organized by the World Resources Institute on “The Time Value of Carbon and Carbon Storage: Implications for GHG Analysis and Policy Design” in Washington, D.C. Virginia Dale provided the end-of-the-day wrap up of the meeting in a presentation titled “Next Steps for Carbon Accounting.”
- April 23: Keith Kline and Gbadebo Oladosu participated in a stakeholder meeting to discuss the “GTAP Model Expansion and LUC Results of Corn Ethanol.” Argonne National Lab organized the event involving DOE-OBP, Purdue University, NREL, California Air Resources Board (CARB), Renewable Fuels Association (RFA), EPA and many others. Keith presented an “Update of ORNL Biomass Feedstock Supply Estimates” on behalf of Mark Downing and Bob Perlack.
- March 4-6: Keith Kline attended the National Science Foundation sponsored workshop on “Landscapes in the ‘Anthropocene:’ Exploring the Human Connections,” held at the University of Oregon. The workshop underscored needs for better indicators of approaching thresholds, multi-disciplinary approaches to understand land-use trends and relationships, and to focus on defining historic and desired systems rather than fictional concepts of “natural systems.”
- March 3-4: Jeff Bielicki, Tom Wilbanks, Paul Gilna, and Virginia Dale participated in the U.S. Department of Energy Office of Biological and Environmental Research Long Term Vision Workshop held in Gaithersburg, Maryland. Jeff Bielicki and Virginia Dale helped develop a report from the workshop that will be a precursor to additional workshops that will lead to specific funding initiatives to address these grand challenges.
- In March Mark Downing went to Colorado to participate in a one-day meeting at NREL with a large Canadian delegation interested in collaborating with the U.S.
- January 14: At their request Virginia Dale visited with Janie Wise, Jetta Wong and others on the House Committee on Science and Technology in their Washington D.C. office to discuss their series of hearings on geoengineering the climate. The focus of this discussion was land use and aggressive afforestation as a potential geoengineering strategy.
- December 1-3: Keith Kline, Helena Chum (NREL) and Michael Wang (ANL) participated in meetings hosted by the Bioethanol S&T Center in Campinas, Brazil, in support of the bilateral agreement on Sustainability of Biofuels. A joint research proposal was developed and shared at the subsequent memorandum of understanding meeting at the U.S. State Department (December 15).
- December 18: Gbadebo Oladosu and Keith Kline participated in a conference call with Michael Wang (ANL), the Purdue GTAP (economic modeling) team and Zia Haq of DOE-Office of the Biomass Program

to discuss the GTAP-BIO-AEZ database and model. The draft ORNL GTAP manuscript was briefly discussed (ORNL responded to comments from Tom Hertel).

- November 9-10: Esther Parish attended the Environmental Carrying Capacity Conference at Carnegie Mellon. The session topics were Non-Food Resource Consumption and Availability, Food Consumption and Availability, and Impact of Population Growth on Resources and Standards of Living.

Other Activities

- Esther Parish, Pat Mulholland and Peter Schweizer completed a GIS analysis of first order stream catchments within the vicinity of Vonore, Tennessee that contain (or are scheduled to contain) switchgrass and may be good locations for taking water quality/quantity and invertebrate samples. The team first narrowed the list of 71 catchments to 26 based upon available land cover, slope, roads, and National Hydrography Dataset (NHD) plus stream and catchment information. The team then redelineated the 26 catchments using 10-meter DEMs and 2008 National Agricultural Imagery Program (NAIP) images and narrowed down the list to 21 potential treatment catchments. In FY2011, the team plans to narrow down these 21 sites to ~8 through field surveys and to select a corresponding number of complementary control catchments with similar characteristics.
- Numerous conference calls have occurred this FY as a follow up from the workshop on “Sustainability of Bioenergy Systems: Cradle to Grave” held September 10-11 for Oak Ridge National Laboratory, the U.S. Environmental Protection Agency, and their collaborators. The workshop created several committees to address gaps and research needs identified in the course of the workshop:
 - Communications
 - Scale Issues
 - Design of a Sustainability Roadmap
 - Uncertainty/Sensitivity
 - Comparative Analysis of Bioenergy Pathways
 - Enablers to Implementation
 - Ecosystem Services
 - Model Integration
 - Indicator Context
 - Scenarios
- ScienceDaily had an article titled "Beyond the Corn Field: Balancing Fuel, Food and Biodiversity" based on the Ecological Society of America (ESA) report by Dale, Kline, Wiens, and Fargione. Here is a link to the full article: <http://www.sciencedaily.com/releases/2010/02/100216140152.htm>
- DOE’s 10/14 Biomass Weekly highlighted Growth Energy’s comments on proposed CARB rules and work presented by ‘Debo Oladosu in the August CBES Forum (among other sources). Biomass Weekly reported, “Growth Energy challenges indirect land use change with flurry of data, and papers (10/13) In Washington, Growth Energy is distributing copies of new reports that it says challenge the ‘flawed, unproven and unscientific’ concept of international indirect land-use change (ILUC). Growth Energy’s package of reports include... new evidence from Oak Ridge National Laboratory, which Growth Energy said contradicts the disputed models and assumptions for ILUC.” Link: <http://www.biofuelsdigest.com/>

Education and Outreach

- Two students, one teacher and staff from National Geographic’s JASON Project, visited ORNL, the DDCE Genera biorefinery, and Vonore switchgrass plantings. They learned how changes over time and space in geological systems can be studied via soil analysis and computer models. ORNL staff involved in the demonstrations and tours included Esther Parish, Chuck Garten, Deanne Brice, Bobby Whitten, Alex Sorokine, Mike Hilliard, and Virginia Dale. The following links show some of the work done by the Jason students while visiting ORNL:
 - <http://www.jason.org/public/whatis/CurrOTFBlog.aspx>
 - <http://www.facebook.com/notes.php?id=17892792514>

- May 7: T. J. Blasing, Ben Preston and Esther Parish conducted a one-hour Skype discussion with 130 ninth graders in the Upper Adams School District of Pennsylvania to discuss climate change, energy alternatives, carbon sequestration and other related concerns that they had. This discussion was a follow-up to a February 2010 visit to ORNL by their earth science teacher, Jennifer Peglow, a member of the current National Geographic JASON project team.
- April 20: Esther Parish participated in a community outreach event organized by Ken Tobin, the Director of ORNL's Measurement Science and Systems Engineering Division. Esther was one of three scientists who judged the first-ever science fair at Dyllis Elementary School in Roane County.
- March 9: Virginia Dale gave a talk on *What Forces Cause Geologic Changes over Space and Time?* at Jefferson Middle School in Oak Ridge.