

Bioenergy, Sustainability, and Land-Use Change Report Oak Ridge National Laboratory (ORNL) February 2016

Publications

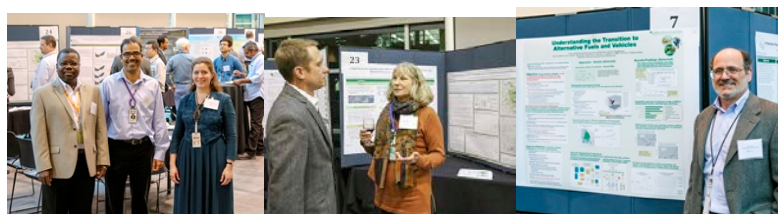
- Baskaran L, Dale VH, Tran L (Submitted) Analyzing aquatic macroinvertebrate taxa richness indices across ecoregions in Tennessee. *American Midland Naturalist*.
- Kanter DR, Musumba M, Wood SLR, Palm C, Antle J, Balvanera P, Dale VH, Havlik P, Kline KL, Scholes RJ, Thornton P, Tittone P, Andelman S (Submitted) Evaluating agricultural trade-offs in the age of sustainable development. *Agricultural Systems*.
- Parish, E. S., V. H. Dale, B. C. English, S. W. Jackson, and D. D. Tyler. 2016. Assessing multimetric aspects of sustainability: Application to a bioenergy crop production system in East Tennessee. *Ecosphere* 7(2):e01206. 10.1002/ecs2.1206

CBES Presentations

Feb 1: Esther Parish, Keith Kline, and Virginia Dale visited the USDA Forest Inventory Analysis (FIA) office in Knoxville, TN, and gave a presentation on their work titled “A landscape design approach for sustainable woody biomass production.”



Feb 2-3: Several members of CBES participated in the review of the new ORNL Urban Dynamics Institute. Paul Leiby’s poster was titled “Understanding the transition to alternative fuels and vehicles.”



Far left: Olufemi Omitaomu, Nagendra Singh, and Esther Parish; **Middle:** Chris DeRolph and Virginia Dale; **Right:** Paul Leiby

Feb 4-5: ORNL staff met with the new Executive Director and staff of the International Research Center for Maize and Wheat (CIMMYT), one of the Consultative Group International Agricultural Research centers, to discuss collaborations including work with CBES-BETO team to apply sustainability assessment and landscape design approach for improving welfare and food security in developing nations.

Feb 9: Yetta Jager (ORNL) and May Wu (ANL) jointly presented Mississippi River Basin modeling research in a Federal multi-agency modeling communication webinar along with representatives from USDA, USGS, USEPA, and USACE. This group will continue meeting as part of an effort to improve interagency coordination.

Feb 25: IEA Bioenergy Webinar held a webinar on "Mobilizing Sustainable Bioenergy Supply Chains" presented by Tat Smith and to which Keith Kline, Esther Parish and Virginia Dale contributed. The webinar can be accessed at <http://www.ieabioenergy.com/iea-publications/webinars/>. Tat Smith's recorded lecture may be viewed at <http://www.ieabioenergy.com/iea-publications/webinars>

Other ORNL Activities

Feb-Apr: Scientists from Oak Ridge National Laboratory are contributing to the Ecology Core class for graduate students in the Department of Ecology and Evolutionary Biology (EEB) at the University of Tennessee in Knoxville. Natalie Griffiths and Colleen Iversen are leading the part of the class on ecosystem ecology, and Virginia Dale is leading the section on landscape ecology and sustainability. Their lectures will occur during the months of February and April.

Dec-Feb: Yetta Jager is serving on a search committee for a new faculty position in Spatial Biology in EEB.

Ongoing through 2016: Many ORNL staff are working on the Billion Ton 2016 reports, both Volume 1, which quantifies potential biomass availability at particular prices and which will be released in July, and Volume 2, which evaluates environmental sustainability of the biomass potential in Volume 1.

Feb 2: The January CBES meeting was held outdoors at a picnic table to appreciate the 65 degree weather.

GLOBAL WARMING?



Feb. 17: Yetta Jager (ORNL) and May Wu (ANL) conducted a follow-up call with Ellen Cooter (EPA) to discuss SWAT modeling approaches in sustainability research

Feb 29: Keith Kline met with Kristen Johnson, Helena Chum, and Jim Spaeth at NREL to discuss collaborations related to international sustainability standards and IEA Bioenergy tasks.

Feb 29: Esther Parish provided an overview of the ORNL Climate Change Science Institute (CCSI) to a group of prospective graduate students applying to the joint ORNL/University of Tennessee Bredesen Center for Interdisciplinary Research and Education with the hopes earning PhDs in Energy Science and Engineering. Several of these incoming students intend to focus on the development of bioenergy.

Upcoming ORNL Visits/Events

Mar: Rebecca Efrogmson is a reviewer for the BETO report "The National Algal Biofuels Technology Roadmap."

Mar: Rebecca Efrogmson is a reviewer for the National Academy of Sciences Report "Gene Drives Research in Non-Human Organisms: Recommendations for Responsible Conduct"

Mar 1-3: Yetta Jager (ORNL) and Christina Negri (ANL) will attend the Mississippi River Basin / Gulf Hypoxia Initiative meeting in Indianapolis. This initiative, led by the USFWS, seeks to provide guidance and also involves developing a decision support modeling framework for farmers.

Mar 8-11: Virginia Dale is invited to participate in a workshop on EcoHealth Metrics for the Gulf of Mexico convened at the Harte Research Institute at Texas A&M University-Corpus Christi.

Mar 14-18: Virginia will serve as the invited opponent at Oskar Englund's public defense of his PhD thesis: "On the sustainability of biomass for energy and the governance thereof" at Chalmers University of Technology. In addition, Chalmers University invited

Mar 15-16: Keith Kline and Virginia Dale will participate in a workshop on "Landscape management and design for food, bioenergy and the bioeconomy: methodology and governance aspects" at Chalmers University in Göthenburg, Sweden: <http://www.focali.se/en/events/workshop-landscape-management-and-design-for-food-bioenergy-and-the-bioeconomy-methodology-and-governance-aspects>. Virginia will give the keynote presentation on "A landscape design approach to assess effects of bioenergy on ecosystem and social services." Keith Kline's talk is "Sustainability standards: a call for reason."

Mar 17-18: Keith Kline and Virginia Dale will participate in meetings with the Swedish University of Agriculture Sciences in Stockholm

Mar 29-Apr 2: Latha Baskaran will attend the 2016 American Association of Geographers (AAG) Annual Meeting in San Francisco, CA, and present on "Identifying opportunities for sustainable bioenergy production in two southern tributary basins of the Mississippi River Basin: focus on water quality, quantity and biodiversity." Her co-authors for this presentation are Yetta Jager, Jasmine Kreig, Gangsheng Wang and Craig Brandt

Apr 4-8: The US Chapter of the International Association of Landscape Ecology (IALE) annual meeting in Asheville, NC, on April 4-6 (<http://www.usiale.org/asheville2016/>) will have three symposia that were organized by ORNL staff as follows: (*Speakers supported by BETO CBES and the title of their talks are listed for each symposia*)



Reshaping Landscapes: Bioenergy and Biodiversity II – organized by Yetta Jager

- **Kristen Johnson** - Introduction
- **Yetta Jager** – Can future US bioenergy production coexist with avian biodiversity?
- **Luciano Verdade** – Vegetation biomass as a surrogate for birds' diversity
- **Colin Phifer** - Bird community responses to afforested eucalyptus plantations in Argentina
- **Elke Brandes** - Subfield profitability analysis reveals an economic case to increase biodiversity
- **Christopher Lituma** -Multi-scale assessment of wildlife sustainability in switchgrass biofuel feedstock production
- **Maria Cristina Negri** -A resource recovering landscape for sustainable bioenergy
- **Gwen White** - Mississippi Basin / Gulf Hypoxia Initiative: Seven LCCs meet large-scale agricultural conservation challenges from grassland birds to Gulf coast shrimp
- **Kevin Craig** - Linking watershed processes to coastal fisheries: effects of nutrient enrichment and hypoxia on the Gulf of Mexico fishery ecosystem
- **Samuel Evans** - The role of economics in understanding biodiversity in bioenergy landscapes
- **A Pouyan Nejadhashemi** - Optimization of bioenergy crop selection and placement based on a stream health indicator

Opportunities and Barriers for Sustainable Bioenergy – organized by Keith Kline

- **Harry Baumes** - Policies, regulations and USDA programs to support opportunities for sustainable bioenergy
- **Hans Langeveld** - Bioenergy opportunities to increase resource management efficiency: effects of direct land use within a landscape perspective
- **Jason Hansen** - Exploring Integrated Landscapes for Bioenergy Feedstock Production
- **Annette Cowie** - How emission accounting and reporting influence perceptions of bioenergy
- **Andre Coleman/Mark Wigmosta/Richard Skagges** - Opportunities and barriers for waste resource utilization in bioenergy production
- **Andy Scott** - Balancing bioenergy benefits on the landscape with sustainable productivity challenges on sites
- **Matt Langholtz/Laurence Eaton** - Landscape implications of US "Billion-Ton" supply assessments; historical review
- **Rebecca Efrogmson** - Investigating sustainability issues in bioenergy resource assessments: The example

of the US 2016 Billion-Ton Report

- **Inge Stupak/Tat Smith/Maha Mansoor** - Creating trust and credibility in sustainability governance of bioenergy supply chains
- **Jeremy Woods** - The role of land and a bio-based economy as mediators of climate mitigation and adaptation
- **Kristen Johnson (BETO)** - Strategies to overcome barriers to a more sustainable bio-economy and moderated discussion on priorities for action
- **Keith Kline** - Synthesis of priorities to realize opportunities for more sustainable landscape designs incorporating bioenergy

Landscapes Designs that Incorporate Sustainable Wood-based Bioenergy: a Focus on the Southeastern United States – organized by Virginia Dale

- **David Wear** - Land use futures in the Southeast: The interaction of urban and rural market forces
- **Cathryn Greenberg** - Natural disturbances shaping the structure and composition of southeastern forests
- **Danny Lee** - Remote tracking of forest dynamics using satellite imagery: Implications for sustainable forest management in the Southeast
- **Art Wiselogle** - DOE's Moves Toward Forest Landscape Design
- **Floor van der Hilst** - Variation in carbon balances of wood pellet production in Southeast US
- **Alisa Coffin** - Landscape considerations of perennial biofuel feedstock production in conservation buffers of the Georgia Coastal Plain, USA
- **Oludunsin Tunrayo Arodudu** - Spatio-temporal assessment of agro-bioenergy systems-a Human appropriation of net primary production (HANPP) approach
- **Brian Kittler** - Environmental Implications of wood pellet trade between the US and Europe
- **Jami Nettles** - Sustainable bioenergy intercropping in pine plantations - results from research to operational-scale trials
- **Esther Parish** - Analysis of US Forest Inventory and Analysis (FIA) Program Data across two Southeastern US fuelsheds.
- **Christopher Moorman** - An experimental approach to assess the effects of woody biomass harvests on wildlife habitat
- **Nathan Tarr** - Modeling the effects of biomass production on landscapes and wildlife habitat
- **Virginia Dale** - Opportunities and constraints for progress toward sustainable bioenergy in the southeastern United States

The following posters by students associated with ORNL will be presented at the IALE meeting:

- **Jasmine Kreig**: Designing bioenergy landscapes to improve water quality through spatial allocation of conservation practices.
- **David Gorelick** (a UNC Chapel Hill student who worked at ORNL): Spatial optimization of bioenergy feedstock introductions in the Arkansas White-Red River Basin: Trade-offs between nutrient loadings and agricultural economic benefits
- **Sarah Eichler Inwood** (a PhD student in The Bredesen Center for Interdisciplinary Research and Graduate Education at the University of Tennessee): Cover crops reduce agricultural nutrient export in a simplified model of land-use change in the Upper Beaver Creek Catchment, Ohio.

Apr 10-14: ORNL and DOE are hosting a bioenergy study tour in the southeastern United States. Participants will include researchers associated with DOE and its national laboratories, the International Energy Agency (IEA), university staff and students, and industry. The goal of the tour is to highlight innovations for the bioeconomy developed by DOE laboratories and to have participants develop a better understanding of bioenergy systems in the southeastern United States.

Apr 11: Yetta Jager has accepted an invitation to speak in a combined session on Renewable Bioenergy and Biodiversity and Riparian Buffers at the National Working Forum: Managing Poplar and Willow for Environmental Benefits and the Renewable Fuels Industry.

April 15: Virginia Dale will give the keynote lecture at the 2nd Annual Women in STEM Research Symposium at the University of Tennessee: <http://cfwstem.weebly.com/symposium.html>. The title of her talk is "From Disturbance to Sustainability: Following Interesting Questions and Fun Opportunities."

May 8-12: Virginia Dale is invited to give a plenary lecture at the International Society of Ecological Modelling Global Conference in Baltimore, Maryland – see <http://www.isemconference.com/>. The title

of her talk is "Tradeoffs in sustainability assessment."

Jasmine Krieg will give a presentation at the Baltimore Ecological Modeling Conference. The title is "Spatial allocation of conservation practices to maximize bioenergy production and water quality at a regional scale".



Jul 17-20: Yetta Jager was invited to the symposium, "Conservation of aquatic ecosystem connectivity: from planning to practice," at the Society of Conservation Biology in Madison, Wisconsin. She will present parallel spatial optimization of new energy generation and eel production with coauthors James Nance (ORNL) and Matt Fuller (Duke).

Jul: The Billion Ton 2016, Volume 1, which quantifies potential biomass availability at particular prices and will be released in July.

Sep 28-29: Virginia Dale has been invited to give a talk at the Symposium on Watershed Scale Sustainability of Forest-Based Bioenergy Production in the Southeastern United States to be held in Raleigh, NC. The goal of this symposium is to synthesize results from the Operational Scale Pine/Switchgrass Intercropping Project, initiated by Catchlight Energy, LLC and Weyerhaeuser Company, with additional funding from DOE; and to put the results into a scientific, operations and policy context.

Nov-Mar: Esther Parish is serving on an ORNL CCSI Strategic Hire search committee to locate an upper-level interdisciplinary scientist to help shape ORNL's climate change impacts, adaptation and vulnerability (IAV) research. More information about the open position may be found through the following link: ORNL IAV Strategic Hire. A 4-minute video overview of CCSI is available through YouTube at <https://youtu.be/Re-8YUOrFzY>