

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

Publications

- Efroymson RA, VH Dale, MH Langholtz. In press. Socioeconomic indicators for sustainable design and commercial development of algal biofuels. *GCB Bioenergy*.
- Volk TA, J Heavey, C Negri, H Ssegane, VH Dale, D Daley, and M Eisenbies. Incorporating shrub willow into multifunctional system using a landscape design approach. Abstract submitted for presentation by Tom Volk at the International Poplar Commission meeting in Germany.
- Kline KL, Msangi S, Dale VH, Woods J, Souza G, Osseweijer P, Clancy J, Hilbert J, Johnson F, McDonnell P, Muger H (Accepted) Reconciling food security and bioenergy: priorities for action. *GCB-Bioenergy*.

CBES Presentations

Mar 4: Valerie Reed, BETO Deputy Office Director, thanked ORNL for talking points quickly prepared in support of her role in the March 6th, Tufts Energy Conference <http://www.tuftsenergyconference.com/agenda.html> biofuels and food security panel. Kristen Johnson assembled background materials based on input from Keith Kline, Gbadebo Oladosu and Virginia Dale. Keith is working with an international research team to develop a fact sheet with additional links and references on this topic.



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

Mar 17-18: Keith Kline and Virginia Dale gave invited seminar presentations for the Swedish University of Agriculture Sciences, Uppsala, and held meetings with IEA Bioenergy Task 40 collaborators in Stockholm.

Mar 29-Apr 2: Latha Baskaran attended the 2016 American Association of Geographers Annual Meeting in San Francisco, CA, and presented “Identifying opportunities for sustainable bioenergy production in two southern tributary basins of the Mississippi River Basin: focus on water quality, quantity and biodiversity” co-authored with Yetta Jager, Jasmine Kreig, Gangsheng Wang and Craig Brandt.

Other ORNL Activities

Mar: The ORNL team continued to work on the Billion Ton Update 2016 Volume 1 (multiple corrective revisions and appendices) and Volume 2 (developing content on sustainability chapters).

Mar: Rebecca Efroymson is a reviewer for the BETO report “The National Algal Biofuels Technology Roadmap.” Efroymson is also a reviewer for the National Academy of Sciences Report “Gene Drives Research in Non-Human Organisms: Recommendations for Responsible Conduct.”

Mar: Keith Kline and Maggie Davis contributed to three webinars and iterative versions of ASTM International Standard Practice for Sustainability Assessment; also introduced additional stakeholders to the process (all interested parties welcome). The draft Standard will be issued for ballot April 29.

Mar 1-3: Yetta Jager (ORNL) attended 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 14: Virginia served 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" Chalmers University of Technology.

Mar 30: Gangsheng Wang and Yetta Jager participated in a conference call with Dale Robertson (USGS) to plan a collaboration to compare SWAT and USGS loadings.

Mar: Ingrid Busch and Latha Baskaran used CPLEX solvers to produce downscaled BT16 \$60/dt 2040 landscape at the resolution of Common Land Unit parcels.

Mar 31: Virginia Dale, Nate Pollesch, Mike Hilliard, Esther Parish and Keith Kline submitted a report to DOE BETO on "Development of a Tool for Visualizing Progress toward Sustainability" in fulfillment of the FY15, Quarter 2 Deliverable for 4.2.2.40 Bioenergy Sustainability: How to define and measure it.



UT graduate student Nate Pollesch, who has been working with Virginia Dale on applying mathematical aggregation to assessment of progress toward bioenergy sustainability, is expecting to complete his PhD in June and has accepted a postdoctoral position with the EPA in Duluth, MN. He will be working with Dr. Matthew Etterson on "Assessing risks of pesticide use in wildlife populations."

Upcoming ORNL Visits/Events

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 Phiher** - 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

- **Todd Campbell, H Baumes** - Policies, regulations and USDA programs to support opportunities for sustainable bioenergy
- **Hans Langeveld, M Breure, P Quist-Wessel, K Kline** - 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
- **A Coleman, M Wigmosta, R Efroymson et al.** - Opportunities and barriers for waste resource utilization in bioenergy production
- **Andy Scott** - Balancing bioenergy benefits on the landscape with sustainable productivity challenges on sites
- **Maggie Davis, M Langholtz, L Eaton, K Kline** - 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, T Smith, M Mansoor** - Creating trust and credibility in sustainability governance of bioenergy supply chains
- **Jeremy Woods and L DiLucia**- The role of land and a bio-based economy as mediators of climate mitigation and adaptation
- **Kristen Johnson** - Strategies to overcome barriers to a more sustainable bio-economy, synthesis of priorities to realize opportunities (Kline) and moderated discussion.

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

- **Jen Costanza and 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 Wiselogel** - 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
- **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.  **#BioenergyTour**

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."

April 21: Virginia Dale will be the invited speaker at the Baker Environment and Energy Forum at the University of Tennessee. The title of her presentation is "Opportunities and costs of wood-based bioenergy."

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 Kreig will present "Spatial allocation of conservation practices to maximize bioenergy production and water quality at a regional scale" at the Baltimore Ecological Modeling Conference



May 11: Rebecca is assisting BETO to organize the peer review workshop for the Billion Ton Sustainability Report (Vol. 2) and many ORNL researchers are contributing.

May 15-21: Keith is invited by Michigan Technological University (NSF grant) to contribute to the Annual Project Meeting, Program for International Research and Education-PIRE, Sustainable Bioenergy in the Americas, in Tabasco, Mexico.

Jun 6-10: Keith hopes to contribute to the Workshop on LUC at EUBCE (pending confirmation of invited travel) <http://www.eubce.com/conference/parallel-events-workshops-and-project-meetings/workshops-project-meetings/the-world-needs-more-land-use-change.html>

Jun 29: Keith will attend ASTM International meeting (Bellevue WA) to help E-48 committee review ballot results and respond to comments on the new Standard Practice for Sustainability Assessment.

Jul 17-20: Yetta Jager is 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, is to be released at Biomass 2016, in July.

Aug: Natalie Griffiths and co-authors will present at the Ecological Society of America meeting on "evaluating the water quality effects of short-rotation pine production for bioenergy using a watershed-scale experiment".

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.

Fall: Presentation by Tom Volk at the International Poplar Commission meeting in Germany on "Incorporating shrub willow into multifunctional system using a landscape design approach" by T.A. Volk, J. Heavey, C. Negri, H. Ssegane, V. Dale, D. Daley, and M. Eisenbies.

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>