Monthly Newsletter for the Biosciences & Environmental Sciences Divisions (B&ESD) February 2014

Pubs and Products

Beall, C. J., Campbell, A. G., Dayeh, D. M., Griffen, A. L., Podar, M., and E. J. Leys. 2014. Single cell genomics of uncultured, health-associated Tannerella BU063 (oral taxon 286) and comparison to the closely related pathogen Tannerella forsythia. *PLOS One* Available online. DOI: 10.1371/journal.pone.0089398

Biswas, R., Prabhu, S., Lynd, L. R., and A. M. Guss. 2014. Increase in ethanol yield via elimination of lactate production in an ethanol-tolerant mutant of *Clostridium thermocellum*. *PLOS One* Available online. DOI: 10.1371/journal.pone.0086389

Derolph, C. R., and M. S. Bevelhimer. 2014. Evaluation of Application Space Expansion for the Sensor Fish. Oak Ridge National Laboratory. ORNL/TM-2014/45

Donovan, P. M., Blum, J. D., Demers, J. D., Gu, B., Brooks, S. C., and J. Peryam. 2014. Identification of multiple mercury sources to stream sediments near Oak Ridge, TN, USA. *Environ. Sci. Technol.* Available online. DOI: 10.1021/es4046549

Fineran, P. C., Cans Iglesias, M. C., Ramsay, J. P., Wilf, N. M., Cossyleon, D., McNeil, M. B., Williamson, N. R., Monson, R. E., Becher, S. A., Stanton, J. L., Brügger, K., Brown, S. D., and G. P. C. Salmond. 2014. Draft genome sequence of Serratia sp. Strain ATCC 39006, a model bacterium for analysis of the biosynthesis and regulation of prodigiosin, a carbapenem, and gas vesicles. *Genome Announc.* Available online. DOI: 10.1128/genomeA.01039-13

Jager, H. I. and R.A. McManamay. 2014. Comment on "Cumulative biophysical impact of small and large hydropower development in Nu River, China" by Kelly M. Kibler and Desiree D. Tullos. *Water Resour. Res.* 50: 758-759.

Jasrotia, P., Green, S., Canion, A., Overholt, W., Prakash, O., Wafula, D., Hubbard, D., Watson, D., Schadt, C., Brooks, S. C., and J. Kostka. 2014. Watershed-scale fungal community characterization along a pH gradient in a subsurface environment cocontaminated with uranium and nitrate. *Appl. Environ. Microbiol*. 80: 1810-1820.

Kang, M., Perfect, E., Cheng, C. L., Bilheux, H. Z., Lee, J., Horita, J., and J. M. Warren. 2014. Multiple pixel-scale water retention curves quantified by neutron radiography. *Adv. Water Resour.* 65: 1-8.

Karpinets, T. V., Park, B. H., Syed, M. H., Klotz, M. G., and E. C. Uberbacher. 2014. Metabolic environments and genomic features associated with pathogenic and mutualistic interactions between bacteria and plants. *Mol. Plant Microbe In.* Available online. DOI: 10.1094/MPMI-12-13-0368-R

Klaus, J., McDonnell, J. J., Jackson, C. R., Du, E., and N.A. Griffiths. 2014. Where does streamwater come from in low relief forested watersheds? A dual isotope approach. *Hydrol. Earth Syst. Sci. Discuss.* 11: 2613-2638.

Li, Y., Xu, T., Tschaplinski, T. J., Engle, N. L., Yang, Y., Graham, D. E., He, Z., and J. Zhou. 2014. Improvement of cellulose catabolism in Clostridium cellulolyticum by sporulation abolishment and carbon alleviation. *Biotechnol. Biofuel.* Available online. DOI: 10.1186/1754-6834-7-25

Li, Z., Czarnecki, O., Chourey, K., Yang, J., Tuskan, G. A., Hurst, G. B., Pan, C., and J. G. Chen. 2014. Strigolactone-regulated proteins revealed by iTRAQ-based quantitative proteomics in Arabidopsis. *J. Proteome Res.* 13: 1359-1372.

Muchero, W., Labbe, J., Ranjan, P., DiFazio, S., and G. A. Tuskan. 2013. Genome resequencing in Populus: revealing large-scale genome variation and implications on specialized-trait genomics. In Trevor Fenning (Ed.), *Forestry sciences: Challenges and opportunities for the world's forests in the 21st century* (Vol. 80, pp. 587-595). Springer Netherlands.

Tschaplinski, T. J., Plett, J. M., Engle, N. L., Deveau, A., Cushman, K., Martin, M. Z., Doktycz, M. J., Tuskan, G. A., Brunm, A., Kohler, A., and F. Martin. 2014. *Populus trichocarpa* and *Populus deltoides* exhibit different metabolomic responses to colonization by the symbiotic fungus *Laccaria bicolor*. *Mol. Plant Microbe In.* Available online. DOI: 10.1094/MPMI-09-13-0286-R

Lukjancenko, O. and D. W. Ussery. 2014. Vibrio chromosome-specific families. *Front. Microbiol.* Available online. DOI: 10.3389/fmicb.2014.00073

Wang, G., Mayes, M. A., Gu, L., and C. W. Schadt. 2014. Representation of dormant and active microbial dynamics for ecosystem modeling. *PLOS One* Available online. DOI: 10.1371/journal.pone.0089252

Zaehle, S., Medlyn, B. E., De Kauwe, M. G., Walker, A. P., Dietze, M. C., Hickler, T., Luo, Y., Wang, Y.-P., El-Masri, B., Thornton, P., Jain, A., Wang, S., Warlind, D., Weng, E., Parton, W., Iversen, C. M., Gallet-Budynek, A., McCarthy, H., Finzi, A., Hanson, P. J., Prentice, I. C., Oren, R. and R. J. Norby. 2014. Evaluation of 11 terrestrial carbon–nitrogen cycle models against observations from two temperate Free-Air CO2 Enrichment studies. *New Phytol.* Available online. DOI: 10.1111/nph.12697

Notable Achievements

Bibi Naz attended the American Meteorological Society 2014 conference in Atlanta, GA, during February 2nd-5th. Bibi presented an abstract entitled "Projecting the potential impacts of climate change on water resources for the Conterminous United States through high resolution hydro-meteorological simulation" in the session on "Regional Climate Modeling" which highlights the research related to "Application of RCMs to hydrological, ecological, agricultural and water resources management problems, including the prediction of hydrologic extremes".

Mike Robeson presented his invited talk, "Understanding the Populus root-microbiome" at the University of Richmond for the Biology Department, during the week of February 3rd. At U. of

Richmond, undergraduates can collaborate with the faculty and have the opportunity to publish their research. Mike discussed that not all research takes place at universities and discussed what types of research takes place at a National Laboratory. Mike also provided a general overview of the Plant-Microbe Interfaces (PMI) project at Oak Ridge National Laboratory (ORNL), and why the Department of Energy (DOE) is interested in this field. Learn more about U. of Richmond online at http://biology.richmond.edu.

Bob Cook, ORNL Distributed Active Archive Center (DAAC) Scientist, attended the Global Vegetation Monitoring and Modeling International Conference in Avignon, France, during February 3rd- 7th. The primary objective of the meeting was to discuss new developments in the use of remote sensing observations and Earth system modeling for understanding forests and agricultural systems. Cook presented a poster on the MODIS land product subsetting tools, including new features for Collection 6. Of particular note, the Moderate Resolution Imaging Spectroradiometer (MODIS) land product science team is evaluating the benefits and approach of developing citations for their products, including identifying authors and assigning DOIs.

Jack D. Fellows, director of the Climate Change Science Institute (CCSI) at Oak Ridge National Laboratory, is among those named to receive National Council for Science and the Environment (NCSE) Lifetime Achievement Award.

During the week of February 3rd-7th, an ORNL team led by Bo Saulsbury and Greg Zimmerman hosted 23 visitors who are participating in a comprehensive environmental review of an Early Site Permit (ESP) application for a new nuclear power plant in New Jersey. The U.S. Nuclear Regulatory Commission (NRC) received the application from PSEG Nuclear, LLC, which currently operates the Salem and Hope Creek nuclear plants. The group of visitors included staff from the NRC and the U.S. Army Corps of Engineers, as well as subject matter experts from Brookhaven National Laboratory and Pacific Northwest National Laboratory. The findings from the review being conducted by the ORNL team will be documented in an Environmental Impact Statement (EIS) that evaluates the potential environmental impacts of constructing and operating the new nuclear power plant. ORNL delivered a preliminary draft version of the 1200-page EIS to NRC for review in December 2013. During the week-long "writing meeting" at ORNL, the ORNL team and its visitors worked in separate breakout sessions designed to finalize the text for the Draft EIS, which is scheduled for publication by the NRC in mid-2014.

During February 4th-5th Patrick O'Connor met with North American Electric Reliability Corporation staff on opportunities for collaboration related to hydropower operations and benchmarking data in Atlanta, GA.

On February 5th Kitty McCracken attended the 5th Annual Meeting of the Tennessee Prescribed Fire Council, Bell Buckle, TN.

Also on February 5th Keith Kline presented an overview of ORNL research and modeling approaches relevant to the "Vital Signs Trade-Offs Workshop" in Oxford, UK.

Dale Kaiser and Jay Gulledge attended the 94th Annual Meeting of the American Meteorological Society in Atlanta, to be involved in presenting the poster "Characterizing Anomalous Mid-tropospheric Ridges and Their Trends." The poster described initial results of a project that Jay, Dale, and others at ORNL (including Shih-Chieh Kao) have been working on with colleagues from

The Weather Channel (TWC), the Center for Climate and Energy Solutions (C2ES), and Rutgers University. The full author list for the poster is: Stu Ostro (TWC), Dale Kaiser, Tom Karnowski (Electrical & Electronics Systems Research [EESR] Division), Vincent Paquit (EESR Division), Shih-Chieh Kao, Dan Huber (C2ES), Joe Casola (C2ES), Jennifer Francis (Rutgers), and Jay Gulledge.

At the invitation of Chris Somerville, Virginia Dale has agreed to serve on the advisory committee for the Energy Biosciences Institute (EBI: www.energybiosciencesinstitute.org). EBI is a research institute of about 500 faculty, students, postdocs and staff located at UC Berkeley and University of Illinois Urbana-Champaign and supported by BP at about $35M/year.

During February 5th-7th Keith Kline was invited to contribute to the Vital Signs Trade-Offs workshop to help assess options available to support more sustainable land management decisions. The workshop also aimed to improve communication of the trade-offs involved when intensification for food, fiber, bioenergy, etc. interacts with other social, environmental and economic aspects of sustainability. A paper is being developed and a report on the workshop was submitted to the Department of Energy (DOE) on February 10th.

Boualem Hadjerioua attended a meeting to discuss Water Quality at Vanderbilt University in Nashville, TN, on February 6th. The meeting was an in-depth discussion of technical progress challenges, end result, implementation, final deliverable, etc. An initial discussion including Vanderbilt contracts people on agreements, schedule, funding and scope.

During the 2014 Genomic Science Contractors-Grantees meeting, February 9th-12th in Arlington, VA, ORNL had a significant presence, including the following presentations and posters:

- Xiaohan Yang, Henfu Yin, Jonathan Plett, Ting Li, Rick Chen, Annegret Kohler, Emilie Tisserant, Gregory B. Hurst, Jessy Labbé, Andrey Gorin, Wellington Muchero, Priya Ranjan, Sara Jawdy, Timothy Tschaplinski, Claire Veneault-Fourrey, Francis Martin, Mitchel Doktycz and Gerald Tuskan. Plant-Microbe Interfaces: Discovery of small secreted proteins in *Populus* in response to symbiotic fungus *Laccaria bicolor*.
- David Weston, Jeremiah Henning, Collin Timm, Sara Jawdy, Dale Pelletier, Mitchel Doktycz and Gerald Tuskan. Plant-Microbe Interfaces: Bacterial community effects on host plant biomass allocation through experimentation and modeling.
- Michael Roberson, Migun Shakya, Zamin Yang, Marilyn Kerley, Mircea Podar, Gregory Bonito, Sarah Tringe, Wellington Muchero, Rytas Vilgalys, Mitchel Doktycz, Gerald Tuskan and Christopher Schadt. Plant-Microbe Interfaces: Understanding the factors shaping microbial community structure within root and rhizosphere microbiomes of *Populus*.
- Dale Pelletier, W. Nathan Cude, Michael Robeson, Zamin Yang, Steve Allman, Mircea Podar, Tse-Yuan Lu, Christopher Schadt, David Ussery, Gerald Tuskan and Mitchel Doktycz. Plant-Microbe Interfaces: Defining the functional diversity of the *Populus* root microbiome.
- Jessy Labbé, Rytas Vilgalys, Gregory Bonito, Jessie Uehling, Claire Veneault-Fourrey, Aurelie Deveau, Cora Guennoc, Wellington Muchero, François Le Tacon, Olaf Czarnecki, Jay Chen, Clément Pellegrin, Jonathan Plett, Yohan Daguerre, Sebastian Wittulsky, Sarah Melton, Annegret Kohler, Jennifer Morrell-Falvey, Annick Brun, Francis Martin, Mitchel Doktycz and Gerald Tuskan. Plant-Microbe Interfaces: Tripartite plant-fungal-bacterial interactions.

- Amber Bible, Yasu Oda, Dale Pelletier, Amy Schaefer, E. Peter Greenberg, Jennifer Morrell-Falvey, Caroline Harwodd and Mitchel Doktycz. Plant-Microbe Interfaces: Probing the molecular mechanisms of plant-microbe interactions.
- David Ussery, Miriam Land, Doug Hyatt, Guruprasad Kora, Michael Leuze, Se-Ran Jun, Juanjuan Chai, Loren Hauser, Gerald Tuskan, and Mitchel Doktycz. Plant-Microbe Interfaces: Quality & handling of large datasets.
- Greg Hurst, Zhou Li, Olaf Czarnecki, Karuna Chourey, Jun Yang, Chongle Pan, Jin-Gui Chen, Dale Pelletier, Sara Jawdy, David Weston, Jennifer Morrell-Falvey, Amber Bible, Shen Lu, Keiji Asano, Jessy Labbé, Tatiana Karpinets, Gerald Tuskan, and Mitchel Doktycz. Plant-Microbe Interfaces: Proteomic characterization of endophyte and rhizosphere microorganisms and their impacts on plants.
- Rachel Masyuko, Sarah Melton, Amber Bible, Eric Lanni, Callan Driscoll, Joshua Shrout, Jonathan Sweedler, Jennifer Morrell-Falvey, Mitchel Doktycz, and Paul Bohn. Multidimensional chemical analysis of microbial communities by integrating fluorescence, vibrational and mass spectrometric imaging techniques.
- Andrea M. Rocha, Mark Smith, Christopher Smillie, Julian L. Fortney, Stephen M. Techtmann, Dominique Joyner, Tonia L. Mehlhorn, Jennifer E. Earles, Kenneth A. Lowe, Jana Phillips, David B. Watson, James H. Campbell, Susan Pfiffner, Kati Ayers, Charlie Paradis, Joy D. Van Nostrand, Liyou Wu, Ping Zhang, Zhili He, Jizhong Zhou, Michael W. W. Adams, Andrew Lancaster, Paul D. Adams, Adam P. Arkin, Eric J. Alm and Terry C. Hazen. Microbial Community Structure Predicts Groundwater Geochemistry.

Juan Wang, a visiting doctoral student from the Institute of Molecular Ecology at Lanzhou University in China that spent some time working and studying in Wellington Muchero's lab, returned to her university and successfully defended her doctoral dissertation. She will be working as a post-doctoral fellow at the Institute of Molecular Ecology at Lanzhou University.

Eric Pierce hosted a breakout session for ORNL's Natural Gas Workshop that was held on February 10th. Baohua Gu, Scott Brooks and Dave Watson also attended the ORNL Natural Gas Workshop.

During a technology session on Bioenergy Resources and Sustainability at the Agricultural Equipment Technology Conference, February 10th-12th in Louisville KY, Esther Parish presented "Sustainability Metrics" and Maggie Davis delivered a talk on "International Standards on Sustainability."

The ORNL DAAC released the Winter 2014 issue. Read it online at http://daac.ornl.gov/news/DAAC_newsletter_Winter14.pdf.

During February 10th-11th Yetta Jager and Gangsheng Wang attended a meeting of the South Fork Watershed Alliance and presented research plans at a United States Department of Agriculture (USDA)-sponsored workshop to kick-off our multi-lab collaborative Pathways project in Ames, IA.

During February 10th – 14th Erin Webb and Mike Hilliard attended a week of training on the ExtendSim simulation software. ExtendSim is the software used to develop the Integrated Biomass Supply Analysis and Logistics Model (IBSAL). As a part of the course, they began initial designs for some biomass logistics models at the field and regional scale.

During February 11th-12th Matt Langholtz and Laurence Eaton travelled to Washington for a quarterly review.

Boualem Hadjerioua met with the Tennessee Valley Authority (TVA) in Chattanooga, TN, on February 14th. The meeting was about TVA potential collaboration with the ORNL Modular Pumped Storage hydro (M-PSH) project.

During February 17th-21st Maggie Davis participated in meetings in Berlin Germany for developing the next iteration of the draft standard for ISO 13065, Sustainability Criteria for Bioenergy.

During February 17th-18th André Faaij and Floor van der Hilst from the Copernicus Institute of Sustainable Development, Utrecht University, The Netherlands, visited ORNL, hosted by Keith Kline and Maggie Davis, to discuss potential collaborations on integrated impact analysis of biomass production and application of sustainability metrics to the US forest sector in in the Southeast. A team from Utrecht is assessing sustainability aspects of bioenergy expansion in Brazil under the Be-Basic Program, a public-private partnership aiming at building a sustainable bio-based economy in the European Union.

Scott Brooks attended a University of Tennessee (UT) Watershed Symposium on February 18th.

On February 18th Esther Parish and Zachariah Seiden presented recent research at the University of Tennessee's 3rd Annual Watershed Symposium. Esther presented, "Designing Bioenergy Cropping Systems to Optimize Sustainability Objectives," and Zachariah presented, "A Water Quality Model Comparison of Potential Impacts from Bioenergy Crop Land Conversations: Switchgrass versus Hardwood."

During February 18th-19th Laurence Eaton attended the Yield mapping workshop on Miscanthus x Giganteus which included participants from the Sungrant Project in Chicago, IL.

Brennan Smith went to the Hydropower Resource input to TVA Integrated Resource Plan (IRP) process meeting in Chattanooga, TN, on February 19th.

The following presentations were given at the Tennessee Valley Renewable Information Exchange (TV-RIX) meeting in Chattanooga, TN, on February 20th:
Presentations:

- Brennan Smith presented on Hydropower Advancement Studies (HAP); New Hydropower Innovation Collaborative; Quantification of Reliability and Cost Impacts for Hydropower; Hydropower Flow Measurement; and International Collaboration.
- Shih-Chieh Kao presented on National Hydropower Asset Assessment Program (HAAP) Existing Hydro Fleet – Database and Analysis; 9505 Water Use Analysis; and National Hydropower Asset Assessment Program (NHAAP) – New Hydro Assessment.
- Boualem Hadjerioua presented on Water Quality Modeling Improvements at Columbia and Cumberland River Basins.
- Qin Fen (Katherine) Zhang presented on Cost Data Collection and Modeling for Hydropower.
- Rocio Uria Martinez presented on Annual Hydropower Market and Trends Report.

- Mark Bevelhimer presented on Biological Design Criteria for New Hydropower Turbines; Basin Scale Opportunity Assessments; Alden/ORNL Strike Flume Studies; and Acoustics Experimentation and Characterization.
- Shelaine Hetrick and Patrick O'Connor were participants at the meeting.

Posters:

- Cada, G., and Schweizer, P. 2014. Improving Downstream Passage Using Fish Morphological Characterists to Re-Design Hydroelectric Turbines.
- Bevelhimer, M., Stewart, A., Fortner, A., Phillips, J., and Mosher, J. 2014. Greenhouse Gas Emissions fromHydropower Reservoirs.
- McManamay, R., and Bevelhimer, M. 2014. Environmental Flows Determination for Hydropower Dams.
- Bevelhimer, M., Fortner, A., Riemer, K., Scherelis, C., and Cada, G. 2014. Behavioral Responses of Representative Freshwater Fish Species to Electromagnetic Fields.
- Greeley, M., Glass-Mattie, D., Morris, G. and Bevelhimer, M. 2014. Relative Toxicity of Protective Coatings for Controlling Biofouling on Hydrokinetic Energy.
- Bevelhimer, M., Schweizer, P. and Scherelis, C. 2014. Assessing Benthic Habitat Alteration Caused by Hydrokinetic Turbine Operation in a Large River.
- Cada, G., Bevelhimer, M., Schweizer, P. and Amaral, S. 2014. Physical Interactions of Aquatic Organisms with Hydrokinetic Turbines.

On February 20th-21st Dale Pelletier and Dave Weston traveled to the University of North Carolina at Chapel Hill, and met with researchers from Jeff Dangl's group for discussions and updates on jointly funded DOE plant feed stocks genomics project titled "Functional manipulation of root endophyte populations for feedstock improvement."

On February 21st Trent Jett guided a nature walk hosted by the Oak Ridge Research Park at Freels Bend. 37 participants from the surrounding communities came out to Freels Bend to see falcons and owls that local falconers and rehabilitators where on hand to discuss. After sunset Jim Evans of the Tennessee Wildlife Resources Agency (TWRA) discussed American woodcock and habitat management on the Oak Ridge Reservation, all while the woodcock were singing and flying in the fields around the area.

On February 21st Jeremy Smith presented the Departmental Colloquium entitled, "Computational Chemistry for Energy, the Environment and Health" to the Department of Chemical Engineering at Florida State University.

Natalie Griffiths volunteered as a Science Judge for the Tennessee Science Bowl on February 22nd.

The ORNL Workshop on Biomembranes, organized by John Katsaras (Biology & Soft Matter Division) and Bob Standaert, was held on February 24th. Biosciences and Environmental Sciences Division (BESD) participants included Martin Keller, Paul Gilna, Mitch Doktycz, Jenny Morrell-Falvey, Xiaolin Cheng, Jim Elkins and Bob Standaert, and talk were given by other ORNL staff including Dean Myles, Paul Langan, Bob Hettich, and others.

Anthony Walker organized and chaired, and Rich Norby participated in, a workshop on: "Model-Experiment Synthesis of Terrestrial Ecosystem Responses to Elevated CO_2." The workshop was

attended by experimentalists from elevated CO_2 experiments in forests, woodlands, prairie, and desert and by modelers who are working with their data. The workshop was held at Big Bear Lake, CA, during February 24th-28th.

Also during February 24th-28th Keith Kline presented, "Biomass, Bioenergy and Land Use" as invited speaker in the "Pathways to Climate Solutions: Assessing Energy Technology and Policy Innovation Workshop" organized by the Aspen Global Change Institute and Energy Innovation Policy and Technology, LLC.

On February 25th Virginia Dale gave a talk on "Incorporating Bioenergy into Sustainable Landscape Designs" at the National Institute for Mathematics and Biological Synthesis (NIMBioS) at the University of Tennessee, Knoxville.

David Watson attended the Federal Interagency Steering Committee on Multimedia Environmental Modeling (ISCMEM) a consortium of Federal agencies on February 25th.

ORNL DAAC manager, Suresh K. SanthanaVannan, and deputy manager, Tammy Beaty, participated in the DAAC Managers meeting at the National Snow and Ice Data Center (NSIDC) in Boulder, CO, during February 25th-27th.

On February 26th Jeremy Smith presented a lecture entitled "Macromolecular Simulation in Subsurface Biogeochemistry and Bioenergy" to the Biological and Environmental Research (BER) division of the DOE Office of Science at Germantown, MD.

Jessy Labbé has been granted a joint research associate professorship in the Biochemistry and Molecular Biology (BCMB) Department at the University of Tennessee. He will be working closely with Gladys Alexandre and other research scientists there on PMI bacterial-fungal interactions.

Natalie Griffiths gave an invited seminar at Indiana University's School of Public and Environmental Affairs titled, "Utilizing long-term experiments to examine the effects of human activities on hydrology and biogeochemical cycling" on February 27th. The presentation discussed both the short-rotation woody biomass sustainability project and the Spruce and Peatland Responses Under Climatic and Environmental Change (SPRUCE) project.

Mark Bevelhimer and Ryan McManamay presented a webinar entitled "The Integrated Basin-Scale Opportunity Assessment Initiative: Phase 1 Methodology and Preliminary Scoping Assessment for the Roanoke River Basin" on February 28th.

BESD New Arrivals

Bryan Crable arrived in February to work as a post-doctoral research associate with David Graham in BSD's Microbial Ecology & Physiology group.

Erik Green reported to work in February, working as a Developer with Raymond McCord in ESD's Environmental Data Science & Systems group.

Cora Guennoc has joined the PMI project. Cora is a new doctoral student from Nancy, France, and will be mentored by Jessy Labbé at ORNL and Aurélie Deveau at INRA, France. This is the first example of a collaborative doctoral program between the two institutions.

Megan Johnson arrived in February to work as a post-Masters research associate with Rocio Uria Martinez in ESD's Renewable Energy Systems group. Megan will support research on hydropower technology and markets and participate in a Department of Energy funded research project to study the evolution of the market for hydropower technologies in the United States, and interact with interdisciplinary researchers in hydrology, power systems, generation efficiency, economics, environment, aquatic biology and informatics.

Nicole Samu reported to work in February, working with Brennan Smith in ESD's Energy-Water Resource Systems group.

Jessie Uehling, a current graduate student at Duke University in Rytas Vilglays' lab will also be working with Jessy Labbé here at ORNL while earning her doctorate.

Connor Waldoch arrived in February to work as a post-Masters research associate with Patrick O'Connor in ESD's Energy-Water Resource Systems group.

Visanu Wanchai arrived in February to work as a post-Masters research associate with Dave Ussery in BSD's Comparative Genomics group.