

# Sarah C. Davis

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## RESEARCH INTERESTS

- Biogeochemical cycling and physiological ecology of plant ecosystems responding to land use and global change
- Ecosystem modeling of carbon and nitrogen cycling in changing plant-soil-microbe communities to reconstruct historical dynamics and project future changes
- Environmental impacts of biofuel production

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## PUBLICATIONS

- Davis, S.C.**, R. Boddey, B. Alves, A. Cowie, B. George, S.M. Ogle, P. Smith, M. van Noordwijk, M.T. van Wijk. 2012. Management swing potential for bioenergy crops. *Global Change Biology Bioenergy* *accepted and in press*.
- Mao, Y., A.C. Yannarell, **S.C. Davis**, R.I. Mackie. 2012. Impact of different bioenergy crops on N-cycling bacterial and archaeal communities in soil. *Environmental Microbiology* *in press: published online 4 AUG 2012*, DOI: 10.1111/j.1462-2920.2012.02844.x.
- Davis, S.C.**, M. Dietze, E. DeLucia, C. Field, S. Hamburg, S. Loarie, W. Parton, M. Potts, B. Ramage, D. Wang, H. Youngs, S. Long. 2012. Harvesting carbon from eastern US forests: opportunities and impacts of an expanding bioenergy industry. *Forests (Special Issue: The Role of Forests for Carbon Capture and Storage)* 3:370-397.
- Smith P., Davies C.A., Ogle S., Zanchi G., Bellarby J., Bird N., Boddey R.M., McNamara N.P., Powlson D., Cowie A., van Noordwijk M., **Davis, S.C.**, Richter D.D., Kryzanowski L., van Wijk M.T., Stuart J., Kirton A., Eggar D., Newton-Cross G., Adhya T.K., Braimoh A.K. 2012. Towards an integrated global framework to assess the impacts of land use and management change on soil carbon; current capability and future vision. *Global Change Biology* 18:2089-2101.
- Davis, S.C.**, W.J. Parton, S.J. Del Grosso, C. Keough, E. Marx, P. Adler, E.H. DeLucia. 2012. Impacts of second-generation biofuel agriculture on greenhouse gas emissions in the corn-growing regions of the US. *Frontiers in Ecology and the Environment* 10: 69-74 *doi:10.1890/110003*.
- Del Grosso S.J., W.J. Parton, P.R. Adler, **S.C. Davis**, C. Keough, E. Marx. 2012. DayCent model simulations for estimating soil carbon dynamics and greenhouse gas fluxes from agricultural production systems. In: *Managing Agricultural Greenhouse Gases*, eds. M.A. Liebig, A.J. Franzluebbers, R.F. Follett; Academic Press (Elsevier); p.341-353.
- Davis, S.C.** 2011. Ecological Dimensions of Biofuel Production. *ESA Bulletin. July Reports*: 303-308.
- Davis, S.C.**, J.I. House, R.A. Diaz-Chavez, A. Molnar, H. Valin, E.H. DeLucia. 2011. How can land-use modelling tools inform bioenergy policies? *Journal of the Royal Society Interface Focus* 1:212-223. *doi:10.1098/rsfs.2010.0023*.
- Davis, S.C.**, F.G. Dohleman, S.P. Long. 2011. The global potential for *Agave* as a bioenergy

- feedstock. *Global Change Biology Bioenergy* 3: 68-78.
- Davis, S.C.**, H. Griffiths, J. Holtum, A. Larque Saavedra, S.P. Long. 2011. The evaluation of feedstocks in GCBB continues with a special issue on agave for bioenergy. *Global Change Biology Bioenergy* 3:1-3.
- Drake, J.E., **S.C. Davis**, L.M. Raetz, E.H. DeLucia. 2010. Mechanisms of age-related changes in forest production: the influence of physiological and successional changes. *Global Change Biology*, **17**: 1522-1535.
- Somerville, C., H. Youngs, C. Taylor, **S.C. Davis**, S.P. Long. 2010. Feedstocks for lignocellulosic biofuels. *Science* 329: 790-792.
- Davis, S.C.**, W.J. Parton, F.G. Dohleman, C.M. Smith, S. Del Grosso, A.D. Kent and E.H. DeLucia. 2010. Comparative biogeochemical cycles of bioenergy crops reveal nitrogen-fixation and low GHG emissions in a *Miscanthus x giganteus* agro-ecosystem. *Ecosystems* 13: 144-156.
- Drake, J.E., L.M. Raetz, **S.C. Davis**, E.H. DeLucia. 2010. Hydraulic limitation not declining nitrogen availability causes the age-related photosynthetic decline in loblolly pine (*Pinus taeda* L.). *Plant, Cell & Environment* **33**: 1756-1766.
- Davis, S.C.**, K.J. Anderson-Teixeira, E.H. DeLucia. 2009. Life-cycle analysis and the ecology of biofuels. *Trends in Plant Science* 14: 140-146.
- Davis, S.C.**, A.E. Hessel, C. Scott, M.B. Adams and R.B. Thomas. 2009. Forest carbon sequestration changes in response to harvest. *Forest Ecology and Management* 258: 2101-2109.
- Davis, S.C.**, K. E. Dragan, C. R. Buyarski, and R.B. Thomas. 2009. High foliar and soil nitrogen concentrations in Central Appalachian forests. *Ecosystems* 12: 46-56.
- Anderson-Teixeira, K.J., **S.C. Davis**, M.D. Masters, and E.H. DeLucia. 2009. Changes in soil organic carbon storage under potential biofuel crops. *Global Change Biology BioEnergy* 1:75-96.
- Davis, S.C.**, A.H. Hessel, and R.B. Thomas. 2008. A modified nitrogen budget for temperate deciduous forests in an advanced stage of nitrogen saturation. *Global Biogeochemical Cycles*, 22, GB4006, doi:10.1029/2008GB003187.
- Parker, D.C., A.H. Hessel, and **S.C. Davis**. 2008. Complexity, land-use modeling, and the human dimension: fundamental challenges for mapping unknown outcome spaces. *Geoforum* 39: 789-804.

*Works in progress:*

- Duval B.D., **S.C. Davis**, K.J. Anderson-Teixeira, C. Keough, W.J. Parton, S.P. Long, E.H. DeLucia. 2012. Conversion of pasture to energy cane for bioenergy is predicted to alter greenhouse gas exchange and soil carbon. *in review*.
- Davis, S.C.**, A. Yannarell, M. Masters, K.J. Anderson-Teixeira, J. Drake, R. Darmody, R. Mackie, M. David and E. H. DeLucia. Restoration of soil organic carbon with cultivation of perennial biofuel crops. *in preparation*
- Davis, S.C.**, J.E. Drake, E.H. DeLucia. Physiological legacy of past atmospheric carbon dioxide concentrations in aging forests. *in preparation*.

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PROFESSIONAL APPOINTMENTS

Assistant Professor

Voinovich School for Leadership and Public Affairs,

Bioenergy Analyst	Ohio University Energy Biosciences Institute, University of Illinois at Urbana-Champaign	<i>Current</i> 2010-2012
Adj. Assistant Professor	Department of Plant Biology, University of Illinois at Urbana-Champaign	2010-2012
Post-doctoral Researcher	Department of Plant Biology, University of Illinois at Urbana-Champaign	2007-2009
Research & Teaching Asst.	Department of Biology, West Virginia University	2003-2007
Assistant Director	Regional Math/Science Center, Frostburg State University	1999-2003
Lab Research Intern	USDA, Beltsville, MD	1994-1995

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#### TEACHING EXPERIENCE

University of Illinois, Department of Plant Biology, Urbana-Champaign, IL	
<i>Guest Debate Coach for IB 440 Plants and Global Change</i>	2011
<i>Guest lecturer for CPSC 415 Bioenergy Crops</i>	2010
<i>Lecturer for IB 452 Ecosystem Ecology</i>	2009
<i>Lecturer for IB 100/101 Integrative Biology</i>	2007-2008
West Virginia University, Department of Biology, Morgantown, WV	
<i>Guest Lecturer for Biol 361 Plant Ecology</i>	2006
<i>Teaching Assistant for Biol 361 Plant Ecology</i>	2006
<i>Teaching Assistant for Biol 321 Total Science Experience in Ecology</i>	2005
<i>Teaching Assistant for Biol 106 Environmental Biology</i>	2005
<i>Teaching Assistant for Biol 115 Introduction to Biology</i>	2004-2005
Frostburg State University, Regional Math/Science Center, Frostburg, MD	
<i>Science Teacher</i>	2004
<i>Curriculum Coordinator</i>	1999-2003

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#### EDUCATION

Ph.D. in Biology, West Virginia University	2003-2007
Specialization: Environmental and Evolutionary Biology	
Dissertation: Land use and forest productivity in the Central Appalachian region	
B.A. / B.S. in Wildlife and Fisheries, Frostburg State University	1995-1999
Major: Wildlife Management	
Minors: Biology, Spanish	
<i>Extra studies:</i> Environmental Issues in Ecuador (1998), Meteorology for Weather Education (2000), Web page design (2001), Ecological and Environmental Science Issues (2002)	
<i>Honors/Award:</i> Magna Cum Laude, English Colloquium invitation, Service Leadership Award Nomination, 3 undergraduate academic scholarships, 1 study abroad scholarship	

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#### SERVICE ACTIVITIES

<i>Grant Reviewer:</i>	National Science Foundation; National Institute for Climate Change Research; Agriculture and Food Research Initiative, USDA; BBSRC, UK
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- Editorial Service:* Editorial Board member for PLOS ONE  
Guest Associate Editor for Global Change Biology –Bioenergy
- Journal Reviewer:* Nature Climate Change; Global Change Biology; Journal of Environmental Quality; Environmental Research Letters; Plant and Soil; Functional Ecology; GCB-BioEnergy; Journal of Environmental Management; Ecological Modeling; Tree Physiology; Applied Energy; Resources, Conservation & Recycling
- Consultation:* Energy Technology Institute LLP; BP
- Outreach:* Energy Farm Open House, UIUC-EBI; Technology-Enhanced Teaching, Center for Teaching Excellence, UIUC, Illinois; Expanding Your Horizons- Outreach education for motivating young scientists, West Virginia; Energizing Schools (NESEA)- Conference for renewable energy design in schools, Maryland; Nature Conservancy, Maryland; Wildlife Society FSU Chapter, Maryland; Americorps Read to Succeed, Maryland
- Committees:* Graduate Affairs Committee, Dept. of Plant Biology, UIUC; Retreat Planning Committee, Energy Biosciences Institute, UC Berkeley; PhD Candidate Committees, UIUC, George Mason University
- Professional Memberships:*  
American Association for the Advancement of Sciences  
Ecological Society of America  
American Geophysical Union  
American Society of Plant Biologists
- Recent Conference Leadership:*
- Water in Bioenergy Agroecosystems Workshop, June 12-13, 2012, Chicago, IL – *organizer and discussion facilitator*
  - International Soil Carbon Monitoring Standards and Methodologies Workshop, March 21-24, 2011, London, UK –*wrote synthesis paper (in press)*
  - Harvesting Carbon from Eastern US Forests Workshop, December 10, 2010, San Francisco, CA. –*organizer, discussion facilitator, and lead author of synthesis paper (published)*
  - Ecological Dimensions of Biofuel Production Session, Ecological Society of America, August 1-6, 2010, Pittsburgh, PA, USA –*lead organizer and session moderator*
  - Agave and Bioenergy Workshop, Guadalajara, Mexico, May 12-13, 2010
  - –*lead organizer, guest editor for synthesis in journal special issue (published)*
  - Resolving land use change: Can biofuels be part of the solution for climate change? April 15-16, 2010, London, UK. –*lead author of synthesis paper (published)*

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FUNDED AWARDS

2012-2017    *Agave* as a feedstock crop in the southwestern US (EBI): \$415,695

- 2011-2012 Assessing the Carbon Footprint of Combined Corn and Cellulose Ethanol Production (EPA): \$15,000
- 2010 Harvesting Carbon from Eastern US Forests workshop (EBI): \$8000
- 2010 Agave for Bioenergy workshop (EBI): \$21,000
- 2008, 2010 American Society of Plant Biologists Travel Award: \$2000
- 2006-2007 Eberly College Doctoral Stipend Enhancement Award: \$8000
- 2004-2007 Eberly College Doctoral Student Research Grant: \$1500
- 2003 US Dept of Education TRIO Upward Bound/ Math Science Competition Award co-authored with Project Director, Rita Hegeman, ED Grant Number P047M030035: \$294, 375 annual budget through 2007

#### RECENT PRESENTATIONS

- Davis S.C.** Managing bioenergy for ecological benefits. UC Berkeley Energy Biosciences Institute Seminar Series, Berkeley, CA, November 13, 2012. (invited)
- Davis S.C.** Effects of management choices on the ecological impact of biofuel crops. Ecological Society of America 97<sup>th</sup> Annual Meeting, Portland, OR, August 5-10, 2012. (invited)
- Black C. K., **Davis S.C.**, Bernacchi C.J., DeLucia E.H. Elevated temperature and carbon dioxide prime soil-specific increases in heterotrophic respiration. Ecological Society of America 97<sup>th</sup> Annual Meeting, Portland, OR, August 5-10, 2012.
- DeLucia E.H., Anderson-Teixeira K.J., Duval B.D., **Davis S.C.**, Bernacchi C.J., Parton W.J. Impacts of growing perennial grasses for biofuel in the U.S. corn belt. Ecological Society of America 97<sup>th</sup> Annual Meeting, Portland, OR, August 5-10, 2012. (invited)
- Davis S.C.** Managing bioenergy agro-ecosystems for negative carbon emissions. GCEP Workshop on Energy Supply with Negative Carbon Emissions, Stanford University, June 15, 2012. (invited)
- Davis S.C.** Perspective on water cycling in ecosystem models. Water in Bioenergy Agro-ecosystems Workshop, Gleacher Center, Chicago, June 12-13, 2012. (invited)
- Davis S.C.** Managing bioenergy to mitigate climate change. IDEAS Bioenergy Symposium, UNC Charlotte, March 13-14, 2012. (invited)
- Parton W.J., **Davis S.C.**, Del Grosso S., Adler P.R., DeLucia E.H. Ecological modeling of bioenergy production systems using DayCent. Ecological Society of America 96<sup>th</sup> Annual Meeting, Austin, TX, August 7-12, 2011.
- Black C.K., **Davis S.C.**, Bernacchi C.J., DeLucia E.H. Heterotrophic respiration from soil increases with atmospheric carbon dioxide and temperature. Ecological Society of America 96<sup>th</sup> Annual Meeting, Austin, TX, August 7-12, 2011.
- Duval, B.D., **Davis S.C.**, Parton W.J., Long S.P., DeLucia E.H. Greenhouse gas reduction with conversion from pasture to energy cane production. Ecological Society of America 96<sup>th</sup> Annual Meeting, Austin, TX, August 7-12, 2011.
- Davis S.C.**, Dohleman F.G., Long S.P. Global potential for *Agave* as a biofuel feedstock. Berkeley Bioeconomy Conference, March 24-25, 2011. (invited)
- Davis S.C.** Carbon dynamics: perspectives from ecosystem models. NSF INTERFACE Meeting: How do we improve earth system models? March 2-3, 2011. Captiva Island, FL. (invited)
- Davis S.C.**, Drake J.E., DeLucia E.H. Carbon sequestration in response to rising atmospheric CO<sub>2</sub> in active and abandoned pine plantations of the southeastern US. American Geophysical Union Fall Meeting. December 13-17, 2010. San Francisco, CA.
- Davis S.C.**, W.J. Parton, S.J. Del Grosso, C. Keough, E. Marx, E. H. DeLucia. 2010. Second-

- generation biofuel feedstocks improve greenhouse gas economics of agriculture in the Mississippi watershed. 2<sup>nd</sup> Pan American Congress on Plants and Bioenergy, August 8-11, 2010, São Pedro, Brazil.
- Davis, S.C.** 2010 Carbon budgets of harvested ecosystems that vary in form and function: from monocultures to diverse deciduous forests. Ecological Society of America, August 1-6, 2010, Pittsburgh, PA, USA.
- Black C.K., **S.C. Davis**, C.J. Bernacchi, E. H. DeLucia. 2010. Response of soil respiration to ecosystem warming and elevated atmospheric carbon dioxide. Ecological Society of America, August 1-6, 2010, Pittsburgh, PA, USA.
- Davis, S.** 2010. Greenhouse gas mitigation potential of bioenergy feedstock crops. Seventh Annual Bioenergy feedstocks symposium. Champaign, IL, January 11-12, 2010. (invited)
- Davis, S.**, T. Yannarell, M. Masters, K. Anderson-Teixeira, J. Drake, R. Darmody, R. Mackie, M. David, E. DeLucia. 2009. Restoration of soil organic carbon with cultivation of perennial biofuel crops. American Geophysical Union. December 14-18, 2009. San Francisco, CA.
- Davis, S. C.** Tony C. Yannarell, Evan H. DeLucia. 2009. Carbon sequestration mediated by plant-soil-microbe interactions in tallgrass prairie communities. American Society of Plant Biologists. Honolulu, HI, July 18-22, 2009.
- Kent, A. D., **S. C. Davis**, D. P. Keymer, N. R. Gottel. 2009. Ecology and exploitation of endophytic diazotrophic bacteria in biofuel crops. Energy Biosciences Institute Retreat. Champaign, IL, June 19-22, 2009.
- Yannarell, A. C., **S. C. Davis**, R. I. Mackie. 2009. Assessing the influence of two perennial grass biofuel crops on soil bacterial community composition. ASM, May 17-21, 2009.
- Davis, S. C.** Nitrogen budgets in a carbon-based economy. Department of Plant Biology Colloquium, Urbana, IL, April 3, 2009. (invited)
- Davis, S. C.** Sustainability of nutrient budgets in bioenergy agro-ecosystems. EBI Internal Discussion Seminar Series. March 6, 2009.
- Davis, S. C.** Nitrogen budgets in carbon based economy. Cary Institute of Ecosystem Studies, Millbrook, NY February 19, 2009. (invited)
- Davis, S.C.**, W.J. Parton, F.G. Dohleman, N R. Gottel, C. M. Smith, M. David, A. D. Kent and E.H. DeLucia. 2008. Projections of biofuel growth patterns reveal the potential importance of nitrogen fixation in *Miscanthus* productivity. American Geophysical Union Fall Meeting, San Fransisco, CA, December 2008. (invited)
- Davis, S.C.**, K.J. Anderson-Teixeira, E.H. DeLucia. 2008. Ecology, bioenergy, and life cycle analyses. Ecological Society of America. Milwaukee, WI, August 2008.
- Davis, S.C.**, K.J. Anderson-Teixeira, E.H. DeLucia. 2008. Ecology, bioenergy, and life cycle analyses. American Society of Plant Biologists Pan American Congress on Plants and BioEnergy. Merida, Mexico, June 2008.
- Davis, S.C.**, A.E. Hessel, R.B. Thomas. 2007. Productivity estimates of nitrogen-saturated forests with different harvesting histories: an adaptation of the PnET-CN model. Ecological Society of America Meeting, San Jose, CA, August 2007
- Davis, S.C.**, A. E. Hessel, R B. Thomas. 2007. Productivity of nitrogen saturated forests in the Central Appalachian region: an adaptation of the PnET-CN model. Eberly College Poster Session, Morgantown, WV, May 2007.
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