

Deborah Sills

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EDUCATION

B.S. (Honors), Civil Engineering, 2001, Montana State University–Bozeman
Concentration: Bio-resources

M.S., Environmental Engineering, 2005, Cornell University, Ithaca, NY
Concentration: Environmental Processes
Thesis: *Search for vinyl chloride degrading organisms at Moody Air Force Base*
Advisor: James M. Gossett

Ph.D., Environmental Engineering, 2011, Cornell University, Ithaca, NY
Concentration: Environmental Processes
Dissertation Topic: *Enzymatic hydrolysis of alkaline pretreated biomasses: Assessment of hemi-cellulase mixtures and the use of FTIR to predict saccharification*
Advisor: [James M. Gossett](#)

Postdoc, Cornell Energy Institute, 2012–2013, Cornell University, Ithaca, NY
Concentration: Life Cycle Assessment (LCA) of Algal Biofuels
Advisors: [Jefferson W. Tester](#) & [Charles H. Greene](#)

RESEARCH INTERESTS

Biomass conversion; Bioenergy and bio-based chemicals; Life Cycle Assessment; Technoeconomic analysis

PROFESSIONAL EXPERIENCE

Assistant Professor, Department of Civil and Environmental Engineering, Bucknell University, Lewisburg, PA [8/2013 to present]

Visiting Assistant Professor, Industrial Processs and Energy Systems Engineering (IPESE), Department of Mechanical Engineering, Swiss Technical Institute of Technology (EPFL–Valais), Sion, Switzerland [9/2015 to 5/2016]
Conducted research on spatial temporal life cycle assessment.

Visiting Assistant Professor, Department Chemical & Biomolecular Engineering, Cornell University, Ithaca, NY [6/2015 to 8/2015].
Conducted research on heat integration among biological and hydrothermal processing of bioenergy feedstocks.

Visiting Assistant Professor, Department of Earth and Atmospheric Sciences, Cornell University, Ithaca, NY [6/2014 to 8/2014].
Conducted research on technoeconomic analysis of algal fuel and feed production.

Postdoctoral Researcher and Instructor, Cornell Energy Institute and Department of Earth and Atmospheric Sciences, Cornell University, Ithaca, NY [2011 to 2013]
Conducted research on life cycle assessment of algal biofuel production. Taught Freshman Writing Seminar.

Graduate Research Assistant, Biofuels Research Laboratory, Cornell University, Ithaca, NY [2005 to 2011]
Completed Ph.D research on converting non-edible plant biomass to fermentable sugars.

Instructor, School of Civil and Environmental Engineering, Cornell University, Ithaca NY
Cornell University, Ithaca, NY [2010 to 2011]
Taught two environmental engineering courses.

Graduate Research Assistant, School of Civil and Environmental Engineering, Cornell University, Ithaca NY [2002 to 2004]
Completed Master's research on bioremediation of vinyl chloride. Designed and co-taught (with high school teachers) inquiry-based curriculum for K-12 environmental science classes.

PEER REVIEWED PUBLICATIONS

*Indicates Bucknell undergraduate or Master's student

L. G. Van Doren, R. Posmanik, F.A. Bicalho*, J.W. Tester, J. W., & **D. L. Sills**, "Prospects for energy recovery during hydrothermal and biological processing of waste biomass", *Bioresource Technology*, vol. 225, pp. 67-74, 2017.

R. Posmanik, D. A. Cantero, A. Malkani, **D. L. Sills** & J.W. Tester, "Biomass conversion to bio-oil using sub-critical water: Study of model compounds for food processing waste", *The Journal of Supercritical Fluids*, vol. 119, pp. 26-35, 2017.

M. J. Walsh, L. Gerber, **D. L. Sills**, C. Beal, M. Huntley, C. H. Greene "Large-scale reductions in emissions, land-use, and water through algal food and fuel co-production", *Environmental Research Letters*, vol.11, pp. 114006, 2016.

D. L. Sills, V. L. Wade*, T. Distefano, "Comparative life-cycle and technoeconomic assessment for energy recovery from dilute wastewater", *Environmental Engineering Science*, vol. 33, pp. 861-872, 2016.

L. Gerber, J. W. Tester, C. Beal, M. Huntley, **D. L. Sills**, "Target cultivation and financing parameters for sustainable production of fuel and feed from micro-algae", *Environmental Science & Technology*, vol. pp. 3333-3341, 2016.

C. Beal, L. Gerber, **D. L. Sills**, S. Machesky, C. H. Greene, I. Archibald, J. W. Tester, and M. Huntley, "Algal biofuel production for fuels and feed in a 100-ha facility: A comprehensive techno-economic analysis and life cycle assessment", *Algal Research*, vol. 10, pp. 266-271, 2015.

M. Huntley, Z. Johnson, S. Brown, C. H. Greene, **D. L. Sills**, L. Gerber, S. Machesky, I. Archibald, J. Granados, and C. Beal, "Demonstrated large-scale production of marine microalgae for fuels and feed", *Algal Research*, vol. 10, pp. 249-265, 2015.

D. L. Sills, V. Paramita, M. J. Franke, M. C. Johnson, T. M. Akabas, C. H. Greene, and J. W. Tester, "Quantitative uncertainty analysis of life cycle assessment for algal biofuel production", *Environmental Science & Technology*, vol. 47, pp. 687-694, 2013.

D. L. Sills and J. M. Gossett, "Using FTIR spectroscopy to model alkaline pretreatment and enzymatic saccharification of six lignocellulosic biomasses", *Biotechnology & Bioengineering*, vol.

109, pp. 894-903, 2012.

D. L. Sills and J. M. Gossett, “Using FTIR to predict saccharification from enzymatic hydrolysis of alkali-pretreated biomasses”, *Biotechnology & Bioengineering*, vol. 109, pp. 353-362, 2012.

D. L. Sills and J. M. Gossett, “Assessment of commercial hemicellulases for saccharification of alkaline pretreated perennial biomass”, *Bioresource Technology*, vol. 102, pp. 1389-1398, 2011.

PEER REVIEWED PUBLICATIONS (Under review & in preparation)

D. L. Sills, L.G. Van-Doren, & C.A. Whealton, “Choosing the correct functional unit: Life cycle assessment of algal biorefineries”, *in preparation*.

D. L. Sills, L. Lessard, F. Marechal, “Life cycle impacts of perovskite solar cells”, *in preparation*.

REPORTS

Gossett, J. M., T. E. Mattes, **D. L. Sills**, J. C. Spain, S. F. Nishino, and N. V. Coleman, *Characterization of the Aerobic Oxidation of cis-Dichloroethene and Vinyl Chloride in Support of Bioremediation of Chloroethene-Contaminated Sites, Final Technical Report, CU 1168*. Strategic Environmental Research and Development Program, Washington D.C. 143 pp. Nov. 5, 2004.

GUEST LECTURES and INVITED TALKS

“Green Crude? Improvements needed for sustainable production of algal biofuels”, Invited talk: *Mechanical and Environmental Engineering Seminar Series*, Tel Aviv University, December, 2015.

“Introduction to Life Cycle Assessment applied to a lignocellulosic biorefinery”, Invited lecture: *Energy Systems, Ph.D. Course*, Swiss Technical Institute of Technology (EPFL, Valais), December, 2015.

“Target Parameters for sustainable production of algal fuel and feed”, Invited talk: *Environmental Engineering Seminar*, Swiss Technical Institute of Technology (ETH Zurich), November, 2015.

“Green crude or brown crud? Environomic assessment of algal biofuel”, Invited talk: *Environmental Engineering Seminar Series*, The Pennsylvania State University, February, 2014.

“Is algal biofuel sustainable?”, Invited talk: *Bioenergy & Bioproducts Education Programs*, Boyce Thompson Institute, Ithaca, NY, July 2013 & July 2012.

“Sustainable bioenergy production”, Invited lecture: *Climate Change Senior Seminar*, Cornell University, Ithaca, NY, April 2012.

“Using FTIR to model pretreatment and enzymatic hydrolysis of lignocellulosic biomass”, Invited talk: *Environmental Engineering Seminar Series*, Cornell University, Ithaca, NY, March 2012.

“Life cycle assessment of algal biofuels,” Invited lecture: *Biofuels Module class*, Cornell University, Ithaca, NY, February 2012.

PRESENTATIONS & POSTERS

D. L. Sills, “Climate energy and food Security from the Sea”, Oral Presentation, *Computer Assisted Process Engineering (CAPE) Forum*, Swiss Technical Institute of Technology (EPFL, Valais), Sion, Switzerland, March, 2016.

D. L. Sills, V. L. Wade, and T DiStefano, “Low-energy wastewater treatment: Life cycle comparison of an anaerobic baffled reactor and a trickling filter”, Oral Presentation, *Association for Environmental Engineering & Science Professors*, Yale University, New Haven, CT, June 2015.

D. L. Sills, L. Gerber, C. H. Greene, and J. W. Tester, “Uncertainty of foreground and background processes parameters for algal fuel and feed production—100 ha Case Study”, *Algae Biomass Organization*, San Diego, CA, September 2014.

D. L. Sills, L. Gerber, C. H. Greene, and J. W. Tester, “Uncertainty of economics and environmental impacts for algal biofuel production”, *DOE — Biomass 2013*, Washington, DC, August 2013.

D. L. Sills, V. Paramita, M. J. Franke, M. C. Johnson, T. M. Akabas, C. H. Greene, and J. W. Tester, “Uncertainty of life cycle assessment for algal biofuel”, *The Third International Conference on Biomass, Biofuel and Bioproducts*, Toronto, Canada, June 2013.

D. L. Sills and J. M. Gossett, “Assessment of commercial hemicellulases for saccharification of alkaline pretreated perennial biomass”, *Northeast Sungrant Regional Conference*, Syracuse, NY, June, 2010.

D. L. Sills and J. M. Gossett, “Effect of hemicellulase addition during hydrolysis of pretreated switchgrass and mixed prairie biomass”, Invited talk: *Sungrant Renewable Energy Conference*, Washington, DC, 2009.

RESEARCH GRANTS

DOE— \$50,000 — April 2016—18, *Targeted Algal Biofuels and Bioproducts*, Marine AlGae Industrialization Consortium (MAGIC) DE-FOA-001162, PI – Zachary Johnson, Duke University.

The Fisher Center Discovery Program, \$5000 — May 2016–August 2016, *Mapping High Density Poultry Operations*, , PI–Brian Schwartz, The John Hopkins University.

RESEARCH ADVISING AT BUCKNELL

Undergraduate and Summer Research

Summer 2015

Mona Mohammed’16 & Ray Abbiatici’17–Nutrient management for animal feeding operations in Pennsylvania, funded by the McKenna Program and the Chiloro Fund

Summer 2014

Jared Fallt’15–Using FTIR to predict enzymatic hydrolysis of ball-milled lignocellulosic biomass, funded by the Jamie Hendry Sustainable Studies Program

Sarah Emrich’16–Assessment of using manure-based biochar to reduce nutrient loads in sensitive watersheds, funded by PUR

2013–2014

Victoria Caudullo’15–Biomethane potential of defatted marine algae, CENG 481—Undergraduate Research Spring 2014.

Graduate Students—Primary Advisor

Valerie Wade, *Energy Recovery for Anaerobic and Aerobic Treatment of Municipal*

Wastewater, 2013–2015, Master's Thesis Advisor.

HONORS AND AWARDS

Swanson Fellowship in Science and Engineering, Bucknell University (2013 to 2016).

Second Place, Oral Presentation Competition, Cornell University, School of Civil and Environmental Engineering, 3rd Graduate Research Symposium (January 28, 2011, Ithaca, NY).

Graduate Teaching Fellowship—National Science Foundation (2003 to 2004)

GAANN Fellowship, focused on computational aspects of in-situ bioremediation for the detoxification of groundwater (2001 to 2003)

Highest Grade Point Average, Bio-resources Concentration, Civil Engineering, Montana State University (2001)

Best Student All-Around, Bio-resources Concentration, Civil Engineering, Montana State University (2001)

PROFESSIONAL SERVICES and MEMBERSHIPS

Journal reviewer: *Environmental Science & Technology*, *Environmental Science & Technology Letters*, *Bioresource Technology*, *Industrial Biotechnology*, *Algal Research*, *Journal of Chemical Technology & Biotechnology*, *Sustainable Chemistry & Engineering*, *Environmental Development & Sustainability*

Participant, Algae–Wastewater Working Group, WEFTEC, 2013.

World Congress on Industrial Biotechnology and Bioprocessing

- Advances in Bioprocessing track recorder, 2007
- Bioprocessing of Agricultural Feedstocks track recorder, 2008

Member: Association of Environmental Engineering & Science Professors, American Society of Civil Engineers.

TEACHING EXPERIENCE

Department of Civil and Environmental Engineering, Bucknell University, August 2013 to present

ENGR 222L—Fluid Mechanics Laboratory

Sophomore-level, hands-on laboratory exercises that reinforce material learned in lecture. Labs include visualizations of fluid mechanics phenomena and measurement methods in fluid mechanics. Students acquire skills needed for effective teamwork and practice writing engineering reports.

CENG 340—Introduction to Environmental Engineering

Junior-level course that introduces fundamentals of environmental engineering, such as chemistry, microbiology, mass balance, and reactor theory. Applications include water quality, water and wastewater treatment, and sustainability. Includes hands-on laboratory exercises that reinforce materials learned in lecture and introduce students to standard laboratory methods in environmental engineering.

Department of Earth and Atmospheric Sciences, Cornell University, August 2010 to December 2012

EAS 1420—Sustainable Earth Energy and Environmental Systems

Freshman writing seminar that focuses on the intertwined challenges of energy and the environment.

School of Civil and Environmental Engineering, Cornell University, August 2009 to May 2010

CEE 3510—Environmental Quality Engineering

Sophomore-level course that introduced students to physical and chemical principles that govern the fate and transport of pollutants in the environment.

CEE 4530—Laboratory Studies in Environmental Engineering

Senior-level course that introduced students to standard laboratory methods in environmental engineering; included capstone research and design project.

PEDAGOGICAL ACTIVITIES

- American Society of Civil Engineering (ASCE) Excellence in Civil Engineering Education (ExCEED), United States Military Academy, West Point, NY, 2014
- National Effective Teaching Institute (NETI) workshop, Washington, DC, 2014
- Sustainability Studio Workshop, Bucknell University, led by Peter Wilshusen, 2014
- KEEN Interdisciplinary Senior Design Workshop, Bucknell University, led by Charles Kim, 2014
- Teaching of Writing Workshop, Bucknell University, led by the Writing Center, 2013
- Engineering an Education, Bucknell University, led by Michael Prince, 2013
- Teaching Writing, Cornell University Writing Center, 2010.

LANGUAGE & PROGRAMMING SKILLS

Language Skills: English (native speaker) and Hebrew (native speaker)

Programming Skills: R, Matlab, L^AT_EX