

# Deborah Sills

## Professional Address:

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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; Waste Valorization, 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 Institute of Technology (EPFL–Valais), Sion, Switzerland [9/2015 to 5/2016]  
Conducted research on life cycle assessment and techno-economic analysis applied to biomass conversion.

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

**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 current or former Bucknell student

R. Posmanik, C. M. Martinez, B. Cantero-Tubilla, D. Cantero, **D. L. Sills**, M. J. Cocero, & J. W. Tester, "Acid and alkali catalyzed hydrothermal liquefaction of dairy manure digestate and food waste" *ACS Sustainable Chemistry & Engineering*, vol. 6 , pp. 2724-2732, 2018.

M. N. Poulsen, J. Pollak, J., **D.L. Sills**, D. L., J. A. Casey, S. G. Rasmussen, K.E. Nachman, D. W. Stewart\*, & B. S. Schwartz, "Residential proximity to high-density poultry operations associated with campylobacteriosis and infectious diarrhea", *International journal of hygiene and environmental health*, vol.221 , pp. 323-333, 2018.

L. G. Van Doren, R. Posmanik, F.A. Bicalho\*, J.W. Tester & **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.

C. H. Greene, M. E. Huntley, I. Archibald, L.N. Gerber, **D.L. Sills**, J Granados, C. Beal & M. J. Walsh, "Geoengineering, marine microalgae, and climate stabilization in the 21st century", *Earth's Future*, vol. 5, pp. 278-284, 2017.

**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. N. 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.50 pp. 3333-3341, 2016.

M. J. Walsh, L. Gerber, **D. L. Sills**, C. Beal, M. Huntley, C. H. Greene, "Algal food and fuel coproduction can mitigate greenhouse gas emissions while improving land and water-use efficiency", *Environmental Research Letters*, vol.11, pp. 114006, 2016. C. H. Greene, M. E.

Huntley, I. Archibald, I., L. N. Gerber, **D. L. Sills**, J. Granados, J.W. Tester, C. M. Beal, M. J. Walsh, R. R. Bidigare, R.R. & S. L. Brown, “Marine microalgae: climate, energy, and food security from the sea”, *Oceanography*, vol. 29, pp. 10-15, 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.

## 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.

## INVITED TALKS and GUEST LECTURES

“Biological and thermochemical conversion of waste biomass: Experimental and life cycle modeling results”, Invited talk: *Energy Seminar, Department of Chemical and Biomolecular Engineering*, Cornell University, Ithaca NY, September 27, 2018.

“Introduction to Life Cycle Assessment”, Invited talk: *Weekly Seminar, Vulcani Institute*, Neve Yaar, Israel, December 2017

“Environmental and economic impacts of producing fuel and food from marine microalgae”, Invited talk: *Energy Seminar, Department of Chemical and Biomolecular Engineering*, Cornell University, Ithaca NY, May 2017.

“Can marine algae enhance climate, energy, and food security?”, Invited talk: *Civil and Environmental Engineering Seminar Series*, Clarkson University, Potsdam NY, January, 2017.

“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: *Life Cycle Assessment Group*, Swiss Technical Institute of Technology (ETH Zurich), November, 2015.

“Environomic assessment of algal biofuel”, Invited talk: *Environmental Engineering Seminar Series*, The Pennsylvania State University, February, 2014.

“Is algal biofuel sustainable?”, Invited lecture: *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.

## CONFERENCE PRESENTATIONS & POSTERS

**D. L. Sills**, “Can marine algae enhance climate, energy, and food security?”, Oral Presentation, *Association for Environmental Engineering & Science Professors*, Michigan State University, Ann Arbor MI, June, 2017.

**D. L. Sills**, R. Posmanik, L. G. Van Doren, and J. W. Tester, “Prospects for heat recovery and techno-economic analysis for energy generation using biological and hydrothermal processing of biomass”, Oral Presentation, *NYSAWWA/NYWEA Joint Energy Specialty Conference*, Albany NY, November, 2016.

**D. L. Sills**, R. Posmanik, J. G. Usack, M. C. Moore, T. R. Overton, L. T. Angenent, and J. W. Tester, “Process integration of anaerobic digestion and hydrothermal liquefaction for sustainable energy generation and waste recovery in dairy operations”, Oral Presentation, *NYSAWWA/NYWEA Joint Energy Specialty Conference*, Albany NY, November, 2016.

**D. L. Sills**, V. L. Wade, and D. Cowell, “Soluble Methane in an Anaerobic Baffled Reactor”, Poster presentation, *Gordon Research Conference—Water & Environmental Science*, Holderness NH, June, 2016.

**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”, Poster Presentation, *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”, Poster Presentation, *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”, Poster Presentation *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

US Department of Energy, \$47,933 — April 2016–18, *Targeted Algal Biofuels and Bioproducts*, Marine AlGae Industrialization Consortium (MAGIC) DE-FOA-001162, PI – Zachary Johnson, Duke University.

The Fisher Center for Environmental Infectious Disease, \$5000 — May 2016–August 2016, *High-density poultry operations and associated infectious disease risks*, , PI–Brian Schwartz, The John Hopkins University.

## RESEARCH ADVISING AT BUCKNELL

### *Undergraduate and Summer Research*

Summer 2017

**Kenzie Burns’20**–Aqueous and oil phase products from hydrothermal liquefaction of waste biomasses, funded by the McKenna Program

**Muxi You’20**–Using FTIR to predict enzymatic hydrolysis of ball-milled lignocellulosic biomass, funded by PUR

**Alyssa Dedrickson’19**–Uncertain LCA parameter for algal biofuel, funded by the US Department of Energy

Summer 2016

**Dalton Stewart’19, Shai Gerstle ’18 & Matthew Geiger ’19**–Concentrated poultry operations in Central PA, funded by the The Fisher Center for Environmental Infectious Disease and PUR

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

**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***

**Mona Mohammed**, *Environmental performance of a rotating biological contactor treating anaerobic effluent*, Fall 2016–present, Master’s Thesis 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*

Associate Editor, *Industrial Biotechnology*, 2016–present

Reviewer, National Science Career Award Panel, 2016.

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**

*CEEG 445L—Environmental Engineering Chemistry*

Upper-level, hands-on laboratory exercises that reinforce material learned in lecture. Labs include gas transfer, acid-base reactions, chemical kinetics, and metal speciation. Students conduct open-ended project that requires them to be proficient with environmental engineering laboratory analyses.

*CEEG 443—Sustainable Design on Engineering Technology*

Upper-level course on quantitative sustainable design. Students apply economic and environmental assessment models, and link these tools to engineering design decisions under uncertainty. Students design engineered technologies individually and in teams, with special attention to bio based chemical production. Students also complete a semester-long design project.

*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.

*CEEG 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<sup>A</sup>T<sub>E</sub>X