

# Joel A. Biederman

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[http://www.researchgate.net/profile/Joel\\_Biederman](http://www.researchgate.net/profile/Joel_Biederman)

## Education

- Ph.D. Hydrology and Water Resources. December 2013. University of Arizona, Tucson.  
Dissertation: *Catchment scale coupling between hydrology and biogeochemistry in disturbed forests.*
- M.S. Environmental Engineering. 1999. Montana State University, Bozeman. Thesis:  
*Temperature and plant effects on wastewater treatment in model constructed wetlands.*
- B.S. Civil Engineering with Highest Honors. 1997. Montana State University, Bozeman.

## Employment

- **Assoc. Research Hydrologist (GS-12).** Southwest Watershed Research Center, USDA-ARS, Tucson, AZ. Includes supervision of students 2014-
- **Associate Research Scientist.** School of Natural Resources and the Environment. University of Arizona, Tucson. 2018-
- **Graduate Research Assistant.** Hydrology and Water Resources. University of Arizona, Tucson. Included supervision & mentoring of research students and contribution to classroom and field teaching. 2010-2013
- **Visiting Scientist.** Nat'l Center for Atmospheric Research. Boulder, CO. Model development and field campaign leadership. 2011+ 2012
- **Faculty in Mathematics and Physics,** grades 9-12, Suffield Academy, CT 2004-10
- **English Instructor** for engineers. PowerTalk Inc. Montpellier & Nimes, France 2003-04
- **Project Manager and Research Engineer.** NSF Center for Biofilm Engineering. Bozeman, MT. Included supervision & mentoring of students. 1999-2001
- **Lecturer.** Montana State University College of Engineering. Bozeman, MT. 2000
- **Graduate Research Fellow** for wastewater treatment wetlands 1997-1999

## Professional Affiliations and Continuing Education

- American Geophysical Union , American Meteorological Soc., Arizona Hydrological Soc.
- Grantsmanship Fundamentals, Agricultural Research Service (12 hours, 2015)
- Applications of Remote Sensing to Soil Moisture and ET (NASA, 6 hours, 2016).
- Big Data in Hydrologic and Climate Sciences. Wrote NSF pre-proposal and received panelist reviews (ICOS-NEON, 100 hours, France, 2015)

**Fellowships, Honors and Awards**

- Water Resources Research Editor’s Choice Award for Biederman *et al.*, 2015 “Recent tree die-off has little effect on streamflow. . . “ 2016
- USDA-ARS Southwest Watershed Research Center Contribution of the Year for Biederman *et al.*, 2016 Global Change Biology “Terrestrial carbon balance in a drier world. . . “ 2016
- EOS.org Research Spotlight in Climate Change [EOS.org](http://EOS.org) 2016
- Profiled on Fluxnet as a notable early-career scientist: 2016  
<http://fluxnet.fluxdata.org/2016/01/14/interview-with-fluxnet-scientist-joel-biederman/>
- USDA Spot Award for Research Initiative and Innovation 2015
- Water Sustainability Project Research Fellowship 2012-13
- Science Foundation Arizona Teaching and Outreach Fellowship 2012
- Science Foundation Arizona Graduate Research Fellowship 2010-11
- USEPA Science to Achieve Results (STAR) Graduate Research Fellowship 1997-99
- Centennial Doctoral Award for growth, integrity, and contributions to UA 2013
- Outstanding Student Presentation. American Geophysical Union Meeting 2010
- Outstanding Oral Presentation. Univ. of AZ SEES Earth Week Plenary 2012 + 2013
- Galileo Circle Scholar. Univ. of AZ College of Science 2012
- Montgomery & Associates Oral Presentation Prize in Hydrology 2013
- 1<sup>st</sup> Place Presentation and/or Poster. El Dia Del Agua, UA Earth Week, UA Graduate Research Blitz, and Water Sustainability Project Forum 2010-13

**Professional Service and Stakeholder Engagement**

- Technical advisor to USFS on water rights adjudication for Arizona Wilderness areas (2018)
- Co-leading a collaboration among ARS, USFS, Salt River Project (Arizona water utility) and university partners on hydrologic response to forest thinning treatments (since Oct. 2015).
- 8-10 reviews annually: *Global Change Biology, Biogeochemistry, Water Resources Research, Journal of Hydrometeorology, JGR-Atmospheres, JGR-Biogeosciences, Hydrological Processes, Hydrology Research, Hydrology, Agricultural and Forest Meteorology, JAWRA, Ecohydrology, Soil Biology and Biochemistry, Science of the Total Environment, Ecosystems*
- Proposal reviews for United States NSF and Swiss NSF.
- Session Convener/Chair, American Geophysical Union Fall Meeting
- Outstanding student presentation award judge for American Geophysical Union Meetings
- Arizona Project WET middle school education in water cycle and groundwater hydrology

**Peer-Reviewed Publications** (Google Scholar h-index = 15 as of 6/11/18)

Scott, R.L. and **J.A. Biederman**. Critical zone water balance over thirteen years in a semiarid savanna. In Review. *Water Resources Research*.

Zhou, C., **Biederman, J.A.**, Zhang, H., Cui, X., Wang, Y., and Hao, Y.B. Extreme-duration drought impacts on soil CO<sub>2</sub> efflux are regulated by plant species composition. In Review. *Functional Ecology*.

Broxton, P. D., van Leeuwen, J.D. and **Biederman, J.A.** Improving snow water equivalent maps with machine learning of snow survey and LiDAR measurements. In Review. *Water Resources Research*.

Yan, D., Scott, R.L., Moore, D.J.P., **Biederman, J.A.** and Smith, W.K. Understanding the relationship between vegetation greenness and productivity across dryland ecosystems through the integration of PhenoCam, satellite, and eddy covariance data. In Review. *Remote Sensing of the Environment*.

Hinojo-Hinojo, C., Castellanos, A., Huxman, T., Rodriguez, J., Vargas, R., Romo-Leon, J., and **Biederman, J.A.** Native shrubland and managed bufflegass savanna in drylands: implications on ecosystem carbon and water fluxes. In Review. *Agricultural and Forest Meteorology*.

Hao, Y.B., **Biederman, J.A.**, Zhang, H., Li, L., Cui, X., Xue, K., Du, J., and Wang, Y. Seasonal timing regulates extreme drought impacts on CO<sub>2</sub> and H<sub>2</sub>O exchanges over semiarid steppes in Inner Mongolia, China. In Review. *Agriculture, Ecosystems and Environment*.

**Biederman, J.A.**, R.L. Scott, M. Litvak, E. Vivoni, J. Arnone, R. Jasoni, M.T. Moreo, S.A. Papuga, G.E. Ponce-Campos, E. R. Vivoni and A. Schreiner-McGraw. Shrubland carbon sink depends on winter water availability in the warm deserts of North America. 2018. *Agricultural and Forest Meteorology*, Special Issue: 20<sup>th</sup> Anniversary of Ameriflux.

Smith, W.K., **Biederman, J.A.**, Scott, R.L., Moore, D.J.P., He, M., Kimball, J.S., Hudson, A., Barnes, M.L., MacBean, N., Fox, A., Litvak, M.E. Chlorophyll fluorescence better captures seasonal and interannual gross primary productivity dynamics across dryland ecosystems of southwestern North America . 2018. *Geophysical Research Lett.* 10.1002/2017GL075922.

Novick, K., **J.A. Biederman**, A. Desai, D. Moore, R. Scott and M. Torn. Ameriflux's bottom-up approach to network-enabled ecosystem science. 2018. *Agricultural and Forest Meteorology*, Special Issue: 20<sup>th</sup> Anniversary of Ameriflux.

Scott, R.L. and **J.A. Biederman**. Partitioning evapotranspiration using long-term carbon dioxide and water vapor fluxes. 2017 *Geophysical Research Lett.* 44, 10.1002/2017GL074324.

- Biederman, J.A.**, Russell L. Scott, Tom W. Bell, David R. Bowling, Sabina Dore, Jaime Garatuza-Payan, Thomas E. Kolb, Praveena Krishnan, Dan J. Krofcheck, Marcy E. Litvak, Gregory E. Maurer, Tilden P. Meyers, Walter C. Oechel, Shirley A. Papuga, Guillermo E. Ponce-Campos, Julio C. Rodriguez, Rodrigo Vargas, Christopher J. Watts, Enrico A. Yepez, and Michael L. Goulden. 2017. Carbon and water exchange across dryland ecosystems of southwestern North America. *Global Change Biology*. 10.1111/gcb.13686.
- W.J. Liu, L.F. Li, **J.A. Biederman**, Y.B. Hao, H. Zhang, X.M.Kang, , X.Y. Cui, Y.F. Wang, M.W. Li, Z.H. Xu, K. L. Griffin, C.Y. Xu. 2017. Repackaging precipitation into fewer, larger storms reduces ecosystem exchanges of CO<sub>2</sub> and H<sub>2</sub>O in semiarid steppes. *Agricultural and Forest Meteorology*. 10.1016/j.agrformet.2017.08.029
- Hao, Y. B., L. Li, **J.A. Biederman**, H. Zhang, W. Fan, C. Zhou, Y. Zhang, Y. Rui, X. Cui, and Y. Wang. **In Revision**. Physiological and resource complementarity in hierarchical organization maintain the stability of a grassland under multi-type extreme precipitation. *New Phytologist*.
- Biederman, J.A.**, T. Meixner, A.A. Harpold., D.E. Reed, E. Gutmann, J.A. Gaun, P.D. Brooks. Riparian zones attenuate nitrogen loss following bark beetle-induced lodgepole pine mortality. 2016. *Journal of Geophysical Research – Biogeosciences*. 10.1002/2015JG003284
- Biederman, J.A.**, R.L. Scott, M.Goulden, R. Vargas, M. Litvak, T.E. Kolb, P.Blanken, W. Oechel., E. Yepez, J. Garatuza, G. Maurer, S. Dore, T. Bell, S.P. Burns. 2016. Terrestrial carbon balance in a drier world: the effects of water availability in southwestern North America. *Global Change Biology*. 10.1111/gcb.13222. **Outstanding Contribution of the Year**, USDA-ARS Southwest Watershed Research Center.
- Biederman, J.A.**, A. Somor, A.A. Harpold, E. Gutmann, A. Meddens, D.J. Gochis, P.A. Troch, R.L. Scott, D. Breshears, and P.D. Brooks. 2015. Recent tree die-off has little effect on streamflow in contrast to expected increases from historical studies. *Water Resources Research*. 10.1002/2015WR017401. **WRR Editor’s Choice Award. EOS Research Spotlight** <https://eos.org/research-spotlights/bark-beetles-cause-big-tree-die-offs-but-streams-flow-steadily>
- Scott, R.L., **Biederman, J.A.**, G. Barron-Gafford, E. Hamerlynck. The carbon balance pivot point of southwestern US ecosystems: insights from the 21st century drought. 2015. *Journal of Geophysical Research - Biogeosciences* 10.1002/2015JG003181.
- Biederman, J.A.**, A.A. Harpold, D. J. Gochis, D. E. Reed, B. Ewers, S. Papuga and P.D. Brooks. 2014. Increased evaporation following widespread tree mortality limits streamflow response. *Water Resources Research*. 10.1002/2013WR014994

- Biederman, J.A., P.D. Brooks, A.A. Harpold, D.J. Gochis, E. Gutmann, E. Pendall D.E. Reed and B. Ewers.** 2014. Multiscale Observations of Snowpack Accumulation and Abalation Following Insect-induced Tree Mortality. *Ecohydrology*. DOI: 10.1002/eco.1342.
- Broxton, P., A. Harpold, J.A. **Biederman**, P. Troch, N. Molotch, and P.D. Brooks. 2014. Quantifying the effects of vegetation structure on snow accumulation and ablation in mixed-conifer forests. *Ecohydrology*. DOI: 10.1002/eco.1565
- Harpold, A.A., J.A. **Biederman**, P.D. Brooks, K. Condon, M. Merino, and Y. Korgaonkar. 2013. Changes in Snow Accumulation and Ablation Following the Las Conchas Fire, N.M., USA. *Ecohydrology*. DOI 10.1002/eco.1363.
- Borch, T., A.K. Camper, J.A. **Biederman**, P.W. Butterfield, R. Gerlach and J.E. Amonette. 2008. Evaluation of Characterization Techniques for Iron Pipe Corrosion Products and Iron Oxide Thin Films. *Journal of Environmental Engineering* 134 (10), 835-844.
- Stein, O.R., B.W. Towler, P.B. Hook and J.A. **Biederman**. 2007. On Fitting the k-C\* First Order Model to Batch Loaded SSF Wetlands. *Water Science and Technology*. 56 (3): 93-99.
- Stein, O.R., J.A. **Biederman**, P.B. Hook and W.C. Allen. 2006. Plant Species and Temperature Effects on the k-C\* First Order Model for Chemical Oxygen Demand Removal in Batch Loaded SSF Wetlands. *Ecological Engineering*. 26(2): 100-112.
- Stein, O.R., P.B. Hook, J.A. **Biederman**, W.C. Allen and D.J. Borden. 2003. Does Batch Operation Enhance Oxidation in Subsurface Constructed Wetlands? *Water Science and Technology*. 48(5): 149-156.
- Hook, P.B., O.R. Stein, W.C. Allen and J.A. **Biederman**. 2003. Plant Species Effects on Seasonal Performance Patterns in Model Subsurface Wetlands. Chap. 5 IN: Constructed Wetlands for Wastewater Treatment in Cold Climates Ü. Mander and P.D. Jenssen, eds. 87-106. WTI Press, England.
- Allen, W.C., P.B. Hook, J.A. **Biederman** and O.R. Stein. 2002. Temperature and Wetland Plant Species Effects on Wastewater Treatment and Root-zone Oxidation. *Journal of Environmental Quality*. 31(3): 1011-1016.
- P.W. Butterfield, A.M. Bargmeyer, A.K. Camper, J.A. **Biederman**. 2002. Modified Enzyme Activity Assay to Determine Biofilm Biomass. *Journal of Microbiological Methods*. 50(1): 23-31.

### **Manuscripts in Preparation**

- Li, L.F., **J.A. Biederman**, Y.B. Hao. Ecological response to heavy rainfall depends on event timing and frequency. Targeted to *New Phytologist*.

**Biederman, J.A., Robles, M., and Scott, R. L.** Streamflow impacts of large wildfires over multiple years and across spatial scales. Targeted to *Journal of American Water Resources Association*.

**Biederman, J.A., P.A. Broxton, D. Goodrich, W. Van Leuween and R.S. Scott.** Interactions of topography, vegetation management and climate regulate snowpack and water resources in semiarid watersheds. Targeted to *Hydrological Processes*

Barnes, M.L., Scott, R.L., Moore, D.J.P, Ponce Campos, G.E., **Biederman, J. A.,** Macbean, N., Breshears, D.D. “Flashy, patchy and coupled: refined dryland carbon flux predictions developed from the North American Southwest reveal altered global dryland dynamics”. Targeted to *Science*.

Reed, D.E, Frank, J., **Biederman, J.A.,** Millar, D. and A. A. Harpold. Impacts of the North American bark beetle epidemic on cycling of water, carbon and nutrients: a synthesis. Targeted to *Biogeochemistry: Synthesis and Emerging Ideas*

Naito, A., T. Swetnam, **J.A. Biederman.** Converging estimates of mesquite savanna aboveground biomass from point clouds and ground-based morphometrics. Targeted to *Remote Sensing of the Environment*.

Templeton, N.P., Vivoni, E.R., Scott, R.L., Archer, S.R., **Biederman, J.A.,** and Naito, A.T. Spatial Heterogeneity in Long-Term Meteorological Fluxes at Two Nearby Sites in a Woody Savanna of the Sonoran Desert. Targeted to *Agricultural and Forest Meteorology*.

### **Outreach Publications**

Harpold, A.A., J.A. **Biederman,** and P.D. Brooks, 2013. Where did all that snow go? Compensating vapor losses following forest disturbance in the Rocky Mountains. Brevia Article. *Mountain Views: The Newsletter of CIRMOUNT*. 7(1):22-25.  
[http://www.fs.fed.us/psw/cirmount/publications/pdf/Mtn\\_Views\\_jun\\_13.pdf](http://www.fs.fed.us/psw/cirmount/publications/pdf/Mtn_Views_jun_13.pdf)

### **Invited Oral Presentations**

Biederman, J.A., Scott, R.L., Smith, W.K., Litvak, M.E., and MacBean, N. Expanding dryland ecosystem flux datasets enable novel quantification of water availability and carbon exchange in Southwestern North America. *American Geophysical Union Fall Meeting*. New Orleans, LA. December 16, 2017.

Biederman, J.A. Terrestrial carbon balance in a drier world. *Biennial Conference of Science and Management on the Colorado Plateau and in the Southwest*. Flagstaff, AZ. Sept. 12, 2017.

Biederman, J.A. Water and plants interact to regulate water supply and carbon cycling semi-arid ecosystems. University of Chinese Academy of Sciences. August 2, 2017.

## Joel A. Biederman

- Biederman, J.A., R.L. Scott, P.D. Broxton, W. Van Leeuwen, M. L. Litvak, M. Goulden. How water and plants interact to regulate water supply, water quality, and carbon sequestration in the water-limited Southwest. *UA Hydrology and Atmospheric Sciences Seminar*. Tucson, AZ. January 27, 2017
- Biederman, J.A., R.L. Scott, G. Ponce-Campos, D. Krofcheck. Semiarid ecosystem water and carbon balance during the early 21<sup>st</sup>-century drought: a data-model comparison. *Research Insights in Semiarid Ecosystems*. Tucson, AZ. October 8, 2016
- Biederman, J.A. Should we expect more water after forest thinning treatments? *Arizona Association of Conservation Districts (NRCs) Annual Meeting*. Flagstaff, AZ. Aug. 2016
- Biederman, J.A. Interactions of climate, disturbance, and vegetation management regulate water supply and quality. *Oregon State University*. Corvallis, OR, June 1, 2016.
- Biederman, J.A. Interactions of climate, disturbance, and vegetation management regulate water supply and quality. *Montana State University*. Bozeman, MT, June 10, 2016.
- Biederman, J.A., Broxton, P.A., and Goodrich, D. Opportunities to learn how topography, vegetation and climate regulate hydrologic response to forest thinning treatments in the Four Forests Restoration Initiative. *The Salt River Project*. Tempe, AZ, November 19, 2015.
- Biederman, J.A. & Broxton, P.A. Interactions of topography, vegetation and climate regulate partitioning of water and energy following forest thinning treatments. *The Nature Conservancy*. Tucson, AZ, November 17, 2015.
- Biederman, J.A., R.L. Scott, P. Blanken, M. Goulden, and M. Litvak. Fast and Slow Processes in Terrestrial Biosphere Carbon Exchange across a Water Availability Gradient. *AmeriFlux Principal Investigators Meeting conjunct with North American Carbon Program Meeting*. Washington, DC, January 29, 2015.
- Biederman, J.A., A.A. Harpold, D.J. Gochis, D.E. Reed, B. Ewers, E. Gutmann and P.D. Brooks. Headwater catchments respond to insect-induced forest mortality with reduced streamflow and multi-scale attenuation of carbon and nitrogen. *Proc. of the American Geological Society*. Denver, CO. October 30, 2013.
- Biederman, J.A., A.A. Harpold, D.J. Gochis, D.E. Reed, P.D. Brooks. Water balance in a warmer world: Will forest die-off help us beat the heat? *School of Earth and Environmental Sciences Earth Week Plenary Session*. University of Arizona. **Outstanding Presentation Award**. April 12, 2013
- Biederman, J.A., A.A. Harpold, A. Somor, D.J. Gochis, and P.D. Brooks. Will Changes in Climate and Montane Vegetation Impact Water Availability in the Arid West? *Arizona Hydrological Society Symposium*. Phoenix, AZ. September 20, 2012.

Biederman, J.A., P.D. Brooks and A.A. Harpold. Consequences of Insect-Induced Tree Die-Off for Hydrologic Partitioning and Water Resources. *School of Earth and Environmental Sciences Earthweek Plenary Session*. University of Arizona. **Outstanding Presentation Award**. April 3, 2012.

### **Contributed Oral Presentations**

Biederman, J.A. and R.L. Scott. Quantifying the fraction of precipitation available for primary production across a range of water-limited to energy-limited eddy covariance sites in the western United States. *American Meteorological Society – Agricultural and Forest Meteorology*. Boise, ID, May 15, 2018.

Biederman, J.A., R.L. Scott, M.L. Litvak, G.E. Maurer, D.E. Krofcheck, S.A. Papuga, T. Meyers, T. Kolb, E. Yopez, J. Garatuza, R. Vargas, G. Ponce-Campos, W. Oechel, D. Bowling, and M. Goulden. Carbon and water exchange across dryland ecosystems of southwestern North America. *Proc. of the American Geophysical Union*. San Francisco, CA, December 14, 2016.

Biederman, J.A., R.L. Scott, M.L. Litvak, G.E. Maurer, D.E. Krofcheck, S.A. Papuga, T. Meyers, T. Kolb, E. Yopez, J. Garatuza, R. Vargas, G. Ponce-Campos, W. Oechel, D. Bowling, and M. Goulden. Terrestrial ecosystem carbon exchange across semiarid southwestern North America. *AmeriFlux Principal Investigators*. Golden, CO. September 22, 2016.

Biederman, J.A., R.L. Scott and M. Goulden. Quantifying Fast and Slow Responses of Terrestrial Carbon Exchange across a Water Availability Gradient in North American Flux Sites. *Proc. of the American Geophysical Union*. San Francisco, CA, December 17, 2014.

Biederman, J.A., A.A. Harpold, D.J. Gochis, D.E Reed, E. Gutmann, B. Ewers, R. L. Scott and P.D. Brooks. Hydrologic Partitioning Response to Severe Forest Disturbance Quantified by Eddy Covariance, Streamflow, Snow Surveys and Stable Isotope Fractionation. *American Meteorological Society's 31<sup>st</sup> Conference on Agricultural and Forest Meteorology*. Portland, OR, May 12-15, 2014.

Biederman, J.A., A.A. Harpold, D.J. Gochis, D.E Reed, E. Gutmann, B. Ewers, and P.D. Brooks. Compensatory vapor loss and biogeochemical attenuation along flowpaths mute the water resources impacts of insect-induced forest mortality. *Proc. of the American Geophysical Union*. San Francisco, CA, December 9, 2013.

Biederman, J.A., A.A. Harpold, D.J. Gochis, D.E Reed, P.D. Brooks. Compensatory processes dampen hydrologic response to forest die-off in headwater catchment. *27<sup>th</sup> Annual El Dia del Agua, University of Arizona Earth Week*. Tucson, AZ. April 10, 2013. **Montgomery & Associates Award for Outstanding Hydrology Presentation**.



Biederman, J.A. The impacts of pine tree die-off on snow processes: from tree to watershed scales. *The Institute of the Environment Graduate Research Blitz*. University of Arizona. **Outstanding Presentation Award**. November 8, 2011.

Biederman, J. A. Water Future Uncertain as Pine Beetle Epidemic Continues. 2010. *Presentation to Water Resources Policy Group*. Udall Center for Public Policy, Tucson, AZ. November 10, 2010.

### **Poster Presentations**

Biederman, J.A., R.L. Scott, M.Goulden, S. Papuga, T. Meyers, R. Vargas, M. Litvak, T.E. Kolb, P.Blanken, W. Oechel., E. Yepez, J. Garatuza, G. Maurer, S. Dore, T. Bell, S.P. Burns. Ecosystem carbon balance in a drier future: land-atmosphere exchanges of CO<sub>2</sub>, water and energy across semiarid southwestern North America. *Proc. of the American Geophysical Union*. San Francisco, CA, December 15, 2015.

David C. Goodrich, Phil Heilman, Russell L Scott, Mark Almon Nearing, M. Susan Moran, Mary Nichols, Enrique R. Vivoni, Steven R. Archer, Joel Biederman and Adam T. Naito. The Walnut Gulch – Santa Rita Wildland Watershed-Scale LTAR Sites. *Proc. of the American Geophysical Union*. San Francisco, CA, December 15, 2015.

Biederman, J.A., R.L. Scott, M. Litvak, T.E. Kolb, M. Goulden, P. Blanken, D. Bowling, W. Oeschel, E. Yepez, C. Watts, E. Vivoni, J. Rodriguez, J. Garatuza, S. Dore, T. Bell, and S.P. Burns. Maturing flux datasets reveal ecosystem carbon uptake sensitivity to temporal climate variability across a summer-rainfall gradient in the Southwest. *AmeriFlux Principal Investigator's Meeting*. Potomac, MD, May 4-5, 2014.

Biederman, J.A., A.A. Harpold, D.J. Gochis, D.E. Reed, B. Ewers, and P.D. Brooks, Multiscale observations of water balance response to insect-induced pine forest die-off in headwater catchments. Poster. *Gordon Research Conference on Catchment Science*. Andover, NH. June 17-21, 2013.

Biederman, J.A., P. Broxton, A.A. Harpold, and P.D. Brooks. The shifting nature of vegetation controls on peak snowpack with variable slope and aspect. *Proc. of the American Geophysical Union*. San Francisco, CA, December 5, 2012.

Biederman, J.A., A.A. Harpold, D.J. Gochis, D.E Reed, E. Gutmann, and P.D. Brooks. 2011. The impacts of pine tree die-off on snow accumulation and distribution at plot to catchment scales. *Proc. of the American Geophysical Union*. San Francisco, CA, December 7, 2011.

Biederman, J.A., A.A. Harpold, D.J. Gochis, D.E Reed, P.D. Brooks. 2011. Variability in Snowpack Associated with Mountain Pine Beetle in Western Forests. *Annual Meeting of the University Council on Water Resources*. Boulder, CO, July 11-14, 2011.

## Joel A. Biederman

- Biederman, J.A., D.J. Gochis, A.A. Harpold, D.E Reed, P.D. Brooks. 2011. Variability in Snowpack Input to Water Resources in Disturbed Florests. *Science Foundation Arizona Grand Challenges Summit*. Flagstaff, AZ, May 22-24, 2011.
- Biederman, J.A., A.A. Harpold, D.J. Gochis, D.E. Reed, P.D. Brooks. 2011. Changes in Snowpack Accumulation and Ablation Associated With Mountain Pine Beetle Infestation. *25<sup>th</sup> Annual El Dia Del Agua: University of Arizona Earth Week*. **Outstanding Poster Award**. March 30, 2011.
- Biederman, J.A., D.J. Gochis, A.A. Harpold, D.E Reed, P.D. Brooks. Variability in Snowpack Accumulation and Ablation Associated With Mountain Pine Beetle Infestation in Western Forests. *The Institute of the Environment Graduate Research Blitz*. University of Arizona. **Outstanding Poster Award** February 1, 2011.
- Biederman, J.A.; A. A. Harpold; D. J. Gochis; D.E. Reed; P. D. Brooks. 2010. Variability in snowpack accumulation and ablation associated with mountain pine beetle infestation in western forests. Poster in Cryosphere Section, *Fall Meeting of the American Geophysical Union*, San Francisco, CA. December 5-9, 2010. Poster. **AGU Outstanding Student Presentation Award**.

### Competitive Funding Awarded

- Collaborative Research: Hydrological Tipping Points and Desertification of Semiarid Woodlands, PI Marcy Litvak. Biederman serves as Senior Personnel. Source: NSF. \$1,234,148 2016-2019
- Snow Water with Artificial Neural Network (SWANN), PI Willem van Leeuwen. Biederman serves as Co-Investigator. Source: Salt River Project. \$845,000 2015-2018
- NSF-NCALM Seed grant for LiDAR mapping, approx. value \$40,000 (PI) 2011
- Water Sustainability Program Graduate Fellowship \$18,000 2012-13
- Carson Fellowship of the Institute of the Environment. \$2,500 2012
- Various student travel grants. \$2500 2010- 2013
- Science Foundation Arizona Graduate Fellowship, \$30,000 2010-11
- USEPA STAR Graduate Fellowship, approx. value \$100,000 1997-1999

### Teaching Experience

- Bureau of Indian Affairs Water Resources Technician Program. Guest lecturer 2015-16
- GC 572 Global Biogeochemical Cycles, Teaching assistant 2013
- HWRS 513A Field Hydrology. Guest lecturer and snow hydrology field leader 2012-17

- High school physics, math & leadership faculty (full time, Suffield Academy) 2004-2010
- CE 340 Principles of Environmental Engineering, Lecturer (MSU-Bozeman) 2000

**Students & Technicians Supervised/Mentored with last known occupation**

**While at USDA-ARS (current employer)**

Adam Belmonte – M.S. Candidate, Northern Arizona University

Laura Nakolan – M.S. Candidate in Hydrology and Water Resources at Univ. of Arizona

Leland Sutter – NSF graduate fellow, School of Natural Resources, University of Arizona

Abreeza Zegeer – Technician at University of Arizona

Theodore Jones – Technician at USDA-ARS and undergraduate at University of Arizona

**While at University of Arizona for Ph.D.**

Traeger Meyer – Center for Severe Weather Research, Colorado

Nicholas Ludolph – GIS specialist at Parallel, Inc.

Gary Gold – NSF Graduate Research Fellow at U. Texas

Chris Ferlin - Research Technician at Bridgestone, Americas, Eloy AZ

Janelle Gaun, First Place El Dia del Agua poster presentation (2014), co-author on peer-reviewed journal manuscript – Graduate in Hydrology and Water Resources, University of Arizona

**While at NSF Center for Biofilm Engineering**

Kate Riley – Program Manager at Snohomish NRCO, Snohomish, Washington.

Alex Bargmeyer – Environmental Engineer at Murray, Smith & Associates, Oregon.

Deborah Stewart- Environmental Engineer at Natural Systems Design, Inc., Oregon.

**Skills**

- **Communications:** Numerous presentations and invited presentations to a variety of scientific, applied and non-technical audiences of all ages, including fundraising and outreach for Science Foundation Arizona, the UA College of Science, the Institute of the Environment, and Suffield Academy. Fluent in French.
- **Analysis and Modeling:** Development of Physics And LiDAR Mapping (PALM) distributed energy and water balance model with application for multi-stakeholder forest management, Automated Geospatial Watershed Assessment (AGWA) modeling for post-fire and post-thinning hydrologic sensitivity analysis and multi-objective collaborative decision-making, SM-hsB & HYMOD hydrologic models, systems analysis, sensitivity and uncertainty analysis, spatial analysis and modeling (ARC-GIS), MATLAB, analysis of hydrometeorological , flux and other time-series data, synthesis of large, multi-site datasets, terrestrial and airborne LiDAR, stable isotopes, and remote sensing.

## Joel A. Biederman

- **Field Work:** Operation of hydrologic and micrometeorological observation networks in desert and montane (snow-covered) environments including eddy covariance carbon and water measurements, soil profile observations, and stage and discharge measurements for groundwater and stream water. Design and implementation of water sampling for biogeochemistry at multiple scales. Design and oversight of snow surveys of depth, density and chemistry. Ecosystem-scale assays of plant community structure, soil biogeochemistry, and carbon stocks. Backcountry travel in diverse climates, including safe oversight of students and volunteers.
- **Laboratory:** Biophysical characterization of soils, water, wastewater and sludge, instrumentation of reactors for continuous monitoring, hydraulic operation of experimental systems, microbiological assays of water and surfaces. Biogeochemical and microbiological assays.
- **Mentoring & Teaching:** Mentoring of undergraduate and graduate students in field and laboratory settings. Lecturing in undergraduate engineering (MSU) & assistance with graduate classroom and field courses (UA). Six years' experience full-time classroom teaching, coaching athletic teams, leading off-campus student trips, and one-on-one advising of more than a dozen high school students over their four-year education (Suffield Academy). Oversight and mentoring of students and technicians in field, laboratory, and professional presentation environments (ARS).