

# Joel A. Biederman

Southwest Watershed Research Center, USDA-ARS, Tucson, AZ

Ph. 520.305.1424 • joel.biederman@usda.gov

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## 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

- **Research Hydrologist.** Southwest Watershed Research Center, USDA-ARS, Tucson, AZ. 2018-
- **Adjunct Faculty.** School of Natural Resources and the Environment. University of Arizona, Tucson. 2018-
- **Associate Research Hydrologist.** Southwest Watershed Research Center, USDA-ARS, Tucson, AZ. 2014-2018
- **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

## Professional Affiliations and Continuing Education

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

**Fellowships, Honors and Awards**

- USDA Spot Award for Research Initiative and Innovation – Established climate change experimental facility under Covid-19 lockdown conditions 2020
- USDA-ARS-Pacific West Area Outreach Award 2019
- Water Resources Research Editor’s Choice Award for “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](https://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

**Professional Service and Stakeholder Engagement**

- Stakeholder engagement leader within ARID, a one-year scoping study and finalist to guide the next NASA Terrestrial Field Campaign towards improved remote sensing tools for ecohydrology in global drylands. <https://aridscoping.arizona.edu>
- Developed a stakeholder-focused Snowtopography Handbook <https://www.ars.usda.gov/pacific-west-area/tucson-az/southwest-watershed-research-center/research/snowtopography/> (2021)
- Presented the Snowtopography Handbook to 100 stakeholders of the Western Water Assessment, Boulder, CO (2022).
- Represented the US at the Procinorte North American summit on agricultural impacts of climate change (2021, 2024)
- Representative for Tucson USDA-ARS to the Grasscast productivity forecast team

- Panelist for American Geophysical Union Fall Meeting on “Career options for earth scientists beyond academia.” (2020)
- Co-leader of collaboration among ARS, USFS, TNC, Salt River Project (Arizona water & hydropower utility) and universities: hydrologic response to forest thinning (since 2015).
- Subject Matter Editor for *Ecosphere*
- 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, Swiss NSF, Czech NSF.
- Session Convener/Chair, American Geophysical Union Fall Meeting: 2015, 2023
- Student presentation judge for American Geophysical Union Meetings

### **Manuscripts in Review and Revision**

**Biederman, J.A.**, Bart, R.K., Goeking, S.A., and Stevens-Rumann, C., Ecohydrologic impacts of forest die-off, management, and change. Invited synthesis and perspective for the Handbook of Terrestrial Ecohydrology, Edited by B.P. Wilcox, H. Asbjornsen, K. Smettem, I. Creed, and L. Wang. To be submitted May 1, 2024.

Feldman, A.F., Konings, A.G., Gentine, P., Asadollahi, M., Wang, L., Smith, W.K., **Biederman, J.A.**, Chatterjee, A., Joiner, J., and Poulter, B. Less frequent but more intense rainfall events drive major shifts in global vegetation. In Revision. *Nature*.

Gallo, E.L., Scott, R.L., and **Biederman, J.A.** Two decades of riparian woodland water and carbon flux responses to environmental variability. In Revision. *Agricultural and Forest Meteorology*.

Zhang, F., **Biederman, J.A.**, Pierce, N.A., Potts, D.L., and Smith, W.K. Legacies of winter drought in productivity of a summer-active desert grassland. In Review. *Journal of Ecology*.

Zhang, F., **Biederman, J.A.**, Schlaepfer, D.R., Bradford, J.B., Reed, S.C., and Smith, W.K. Escalating soil water deficit under meteorological drought across the western United States. In Review. *Global Change Biology*.

Dwivedi, R., **Biederman, J.A.**, Broxton, P.D., Pearl, J.K., Lee, K., Svoma, B.M., van Leeuwen, W.J.D., and Robles, M. How three-dimensional forest structure regulates the amount and timing of snowmelt across a climatic gradient of snow stability. In Review. *Frontiers in Water*.

Zheng, Z.Z., Li, L.F., **Biederman, J.A.**, Wang, Y.F., Guan, S.T., LI, C., Wen, F.Q., Lv, M.B., Liu, Y., Qian, R.Y., Xu., S., Du, J.Q., Xue, K., Cui, X.Y., and Hao, Y.B., *Ecosystem CO2*

flux responses to extreme droughts depend on interaction of seasonal timing and plant community composition. In Review. *New Phytologist*.

Johnston, M.R., Priesler, Y., Barnes, M.L., Smith, W.K., **Biederman, J.A.**, Scott, R.L., and Dannenberg, M.P. Effects of hot vs dry vapor pressure deficit on ecosystem carbon and water fluxes. In Review. *American Geophysical Union Advances*.

Pisani, O., Kautz, M.A., **Biederman, J.A.**, Goodrich, D.C., and Strickland, T.C. Storm-driven changes in dissolved organic matter composition during a monsoon season in dryland ephemeral streams of the southwestern US. In Revision. *Aquatic Sciences*.

**Peer-Reviewed Publications (Google Scholar h-index = 31 as of 2/1/2024)**

Feldman, A.F.; Fang, X., Felton, A.J., Knapp, A.K., **Biederman, J.A.**, and Poulter, B. Global plant response to changing rainfall frequency and magnitude. Invited commentary for *Nature Reviews Earth and Environment*. Accepted.

Zheng, Z.Z., Wen, F.Q., **Biederman, J.A.**, Tudi, M. Lv, M.B., Xu, S.R., Cui, X.Y., Wang, Y.F., Hao, Y.B., and Li, L.F., Methane uptake responses to extreme droughts regulated by seasonal timing and plant composition. 2024. *Catena*. 10.1016/j.catena.2024.107822

Wen, F.Q., **Biederman, J.A.**, Hao, Y.B., Qian, R.Y., Zheng, Z.Z., Cui, X.Y., Zhao, T., Xue, K., Wang, R.F., Extreme drought alters methane uptake but not methane sink in semi-arid steppes of Inner Mongolia. 2024. *Science of the Total Environment*. 10.1016/j.scitotenv.2023.169834.

**Biederman, J.A.**, Smith, W.K., Zhang, F.Y., Dannenberg, M.P., Reed, S.C., and Yan, D., Reply to Comment on “Five decades of observed daily precipitation reveal longer and more variable drought events across much of the western United States (pub. 2021)”. 2024. *Geophysical Research Letters*. 10.1029/2023GL105124

Li, L.F., Hao, Y.B., Wang, W.J., **Biederman, J.A.**, Zheng, Z.Z., Wang, Y.F., Tudi, M., Qian, R., Zhang, B., Che, R.X., Song, X., Cui, X.Y., and Xu, Z.H. Effects of extra-extreme precipitation variability on multi-year cumulative nitrous oxide emission in a semiarid grassland. 2023. *Agricultural and Forest Meteorology*. 10.1016/j.agrformet.2023.109761

Javadian, M., Scott, R.L., **Biederman, J.A.**, Zhang, F., Fisher, J.B., Reed, S.C., Potts, D.L., Villareal, M., and Smith, W.K. High frequency thermal imaging reveals the sensitivity of key dryland plant functional groups to future more intense, less frequent rainfall pulses in semiarid grasslands. 2023. *New Phytologist*. 10.1111/nph.19127

Broxton, P.D., van Leeuwen, W.J.D., Svoma, B., Walter, J., and **Biederman, J.A.** Sub-seasonal to seasonal streamflow forecasting in a semiarid watershed. 2023. *Journal of the American Water Resources Association*. 10.1111/1752-1688.13147

Dwivedi, R., **Biederman, J.A.**, Broxton, P.D., Lee, K., Van Leeuwen, W.J.D, and Pearl, J.K.

Forest density regulates root zone water stress and percolation differently at sites with contrasting ephemeral or stable seasonal snowpacks. 2023. *Journal of Hydrology*. 10.1016/j.jhydrol.2023.129915

Li, Linfeng, Hao, Y.B., Wang, W.J., Biederman, J.A., Zheng, Z.Z., Zhang, B., Wang, Y.F., Song, X.N. Cui, X.Y., Xu, Z.H. Seasonal timing of extreme drought regulates N<sub>2</sub>O fluxes in a semiarid grassland. 2023. *Geoderma*. 10.1016/j.geoderma.2023.116530

Zhang, F., **Biederman, J.A.**, Devine, C.D., Pierce, N.A., Yan, D., Javadian, M., Potts, D.L., and Smith, W.K. Using high frequency digital repeat photography to quantify the sensitivity of a semi-arid grassland ecosystem to the temporal repackaging of precipitation. 2023. *Agricultural and Forest Meteorology*. 10.1016/j.agrformet.2023.109539

Knowles, J., Badger, A.M., Berkelhammer, M., **Biederman, J.A.**, Bjarke, N.R., Blanken, P.D., Bretfeld, M., Burns, S.P., Ewers, B.E., Frank, J.M., Hicke, J.A, Lestak, L., Livneh, B., Reed, D.E., Scott, R.L., and Molotch, N.P. Bark beetle impacts on forest evapotranspiration and its partitioning. 2023. *Science of the Total Environment*. 10.1016/j.scitotenv.2023.163260

McDowell, N.D., Anderson-Teixeira, K., **Biederman, J.A.**, Breshears, D.D., Fang, Y., Fernandez-de-Una, L., Graham, E., Mackay, D.S., McDonnell, J.J., Nehemy, M.F., Stevens-Rumann, C., S.Stegen, J., Tague, N., Turner, M.G. and Chen, X.Y., Ecohydrological decoupling under changing disturbances and climate. 2023. *One Earth*. 10.1016/j.oneear.2023.02.007

Hoover, DL Abendroth, LJ, Browning, DM, Saha, A, Snyder, K, Wagle, P, Witthaus, L, Baffaut, C, **Biederman, JA**, Bosch, DD, Bracho, R, Busch, D, Clark, P, Ellsworth, P, Fay, PA, Flerchinger, G, Kearney, S, Levers, L, Saliendra, N, Schmer, M, Schomberg, H, and Scott, RL. Indicators of water use efficiency across diverse agroecosystems and spatiotemporal scales. 2023. *Science of the Total Environment*. 10.1016/j.scitotenv.2022.160992

Dannenberg, M.P., Barnes, M.L., Smith, W.K., Johnston, M.R., Meerdink, S.K., Wang, X.W., Scott, R.L., and **Biederman, J.A.**, Upscaling dryland carbon and water fluxes with artificial neural networks of optical, thermal, and microwave satellite remote sensing. 2022. *Biogeosciences*. 10.5194/bg-20-383-2023

Dwivedi, R., **Biederman, J.A.**, Broxton, P.D., Lee, K., Van Leeuwen, W.J.D. Snowtopography quantifies effects of forest cover on net water input to soil at ephemeral and seasonal snowpack sites in Arizona, USA. 2023. *Ecohydrology*. 10.1002/eco.2494

Roby, M.C., Scott, R.L., **Biederman, J.A.**, Smith, W.K., and Moore, D.J.P. Response of soil carbon dioxide efflux to temporal repackaging of rainfall into fewer, larger events in a

- semiarid grassland. 2022. *Frontiers in Environmental Science*.  
10.3389/fenvs.2022.940943
- Dannenberg, M.P., Yan, D., Barnes, M.L., Smith, W.K., Johnston, M.R., Scott, R.L.,  
**Biederman, J.A.**, Knowles, J.F., Wang, X., Duman, T., Litvak, M.E., Kimball, J.,  
Williams, P., Zhang, Y. Exceptional heat and atmospheric dryness amplified losses of  
primary production during the 2020 U.S. Southwest hot drought. 2022. *Global Change  
Biology*. 10.1111/gcb.16214
- Biederman, J.A.**, Robles, M., Scott, R. L. and Knowles, J.F. Streamflow response to wildfire  
differs with season and elevation in the Lower Colorado River Basin. 2022. *Water  
Resources Research*. 10.1029/2021WR030687
- Castellanos, A., Hinojo-Hinojo, C., Rodriguez, J., Romo-Leon, J.R., Wilcox, B.D., **Biederman,  
J.A.**, and Penuelas, J. Plant functional diversity influences water and carbon fluxes and use  
efficiencies in native and disturbed dryland ecosystems. 2022. *Ecohydrology*.  
10.1002/eco.2415
- Belmonte, A., Sankey, T., **Biederman, J.A.**, Bradford, J., and Kolb, T. Soil moisture response  
to seasonal drought conditions and forest structure in a thinned semi-arid forest. 2022.  
*Ecohydrology*. 10.1002/eco.2406
- Li, L.F., Qian, R., Liu, W., Wang, W., **Biederman, J.A.**, Zhang, B., Kang, X.M., Wn, F.Q., Ran,  
Q.W., Zheng, Z.Z., Xu, C., Che, R.X., Xu, Z.H., Cui, X.Y., Hao, Y.B., and Wang, Y.F.  
Drought timing influences the sensitivity of a semiarid grassland to drought. 2022.  
*Geoderma*. 10.1016/j.geoderma.2022.115714
- Li, L.F., Hao, Y.B., Wang, W.J., **Biederman, J.A.**, Wang, Y.F., Zheng, Z.Z., Wen, F., Qian,  
R.Y., Zhang, B., Song, X.N., Cui, X.Y., and Xu, Z.H. Joint control of soil functional genes  
and substrate on resistance and resilience of N<sub>2</sub>O flux to climate extremes in a semiarid  
grassland. 2022. *Agricultural and Forest Meteorology*. 10.1016/j.agrformet.2022.108854
- Wang, X., **Biederman, J.A.**, Knowles, J.F., Scott, R.L., Turner, A.J., Koehler, P., Frankenberg,  
C., Litvak, M.E., Flerchinger, G.E., Law, B.E., Kwon, H.J., Reed, S.C., Parton, W.J.,  
Barron-Gafford, G.A., and Smith, W.K. Satellite solar-induced chlorophyll fluorescence  
and near-infrared reflectance capture complementary aspects of dryland vegetation  
dynamics. 2022. *Remote Sensing of Environment*. 10.1016/j.rse.2021.112858
- Vivoni, E.R., Templeton, N.P., 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. 2022. *Agricultural and Forest Meteorology*.  
10.1016/j.agrformet.2021.108763 R
- Zhang, F., **Biederman, J.A.**, Pierce, N.A., Potts, D.L., Devine, C.J., Hao, Y.B., and Smith, W.K.  
Precipitation temporal repackaging into fewer, larger storms delayed seasonal timing of

- peak photosynthesis in a semi-arid grassland. 2022. *Functional Ecology*. 10.1111/1365-2435.13980
- Li, L.F., Hao, Y.B., Zheng, Z.Z., Wang, W.J., **Biederman, J.A.**, Wang, Y.F., Wen, F.Q., Qian, R.Y., Xu, C., Zhang, B., Song, X.N., Cui, X.Y., Xu, Z.H. and Heavy rainfall in peak growing season had larger effects on soil nitrogen flux and pool than in the late season in a semiarid grassland. 2022. *Agriculture, Ecosystems and Environment*. 10.1016/j.agee.2021.107785
- Barnes, M.L., Farella, M.M., Scott, R.L., Moore, D.J.P., Ponce-Campos, G.E., **Biederman, J.A.**, MacBean, N., Litvak, M.E., Breshears, D.D. Ecohydrological water-carbon coupling improves dryland carbon flux prediction of average uptake, interannual variability, and drought. 2021. *Nature Communications Earth and Environment*. 10.1038/s43247-021-00308-2
- Mahmud, K., Scott, R.L., **Biederman, J.A.**, Litvak, M.E., Kolb, T., Meyers, T.P., Krishnan, P., Bastrikov, V., and MacBean, N. Optimizing Carbon Cycle Parameters Drastically Improves Terrestrial Biosphere Model Underestimates of Dryland Mean Net CO<sub>2</sub> Flux and its Inter-Annual Variability. 2021. *JGR Biogeosciences*. 10.1029/2021JG006400
- Goodrich, D., Heilman, P., Nearing, M., Nichols, M., Scott, R., Williams, J., and **J.A. Biederman**. The USDA-Agricultural Research Service's Long Term Agro-ecosystems Walnut Gulch Experimental Watershed (WGEA), Arizona, USA. 2021. *Hydrological Processes*. 10.1002/hyp.14349
- MacBean, N., Scott, R.L., **Biederman, J.A.**, Peylin, P., Kolb, T., Litvak, M., Krishnan, P., Meyers, T.P., Arora, V., Bastrikov, V., Goll, D., Lombardozzi, D.L., Nabel, J., Pongratz, J., Sitch, S., Walker, A.P., Zaehle, S., and Moore, D.J.P. Dynamic global vegetation models underestimate net CO<sub>2</sub> flux mean and inter-annual variability in dryland ecosystems. 2021. *Environmental Research Letters*. 10.1088/1748-9326/ac1a38
- Li, L.F., Z. Z. Zheng, **J.A. Biederman**, C. Xu, Z.H. Xu, R.X. Che, Y.F. Wang, X.Y. Cui and Y.B. Hao. Nonlinear carbon cycling responses to precipitation variability in a semiarid grassland. 2021. *Science of the Total Environment*. 10.1016/j.scitotenv.2021.147062
- Zhang, F.Y., **Biederman, J.A.**, Dannenberg, M.P., Yan, D., Reed, S.C., and Smith, W.K. Five decades of observed daily precipitation reveal longer and more variable drought events across much of the western United States. 2021. *Geophysical Research Letters*.
- Robles, M., Hammond, J., Kampf, S., **Biederman, J.A.**, and Demaria, E. Winter inputs buffer streamflow sensitivity to snowpack losses in the Salt River watershed in the Lower Colorado River Basin. 2021. *Water*. 10.3390/w13010003

- Belmonte, A., Sankey, T., **Biederman, J.A.**, Bradford, J., Goetz, S. and Kolb., T. UAV-derived snow cover and persistence: implications for dry forest management and forest structure. 2021. *Remote Sensing*. 10.3390/rs13051036
- Scott, R.L., Knowles, J.F., Nelson, J., Gentine, P., Li, X., Bryant, R.B., **Biederman, J.A.** 2021. Water availability impacts on evapotranspiration partitioning. *Agricultural and Forest Meteorology*. 297. 10.1016/j.agrformet.2020.108251.
- Knowles, J., R.L. Scott, **J.A. Biederman**, P. Blanken, S.P. Burns, S. Dore, T.E. Kolb, M.Litvak and G. Barron-Gafford. Montane forest productivity across a semi-arid climatic gradient. 2020. *Global Change Biology*. <https://doi.org/10.1111/gcb.15335>
- MacBean, N., Scott, R.L., **Biederman, J.A.**, Otle, C., Vuichard, N., Kolb, T., Dore, S., Litvak, M., Ducharne, A., and Moore, D.J.P. Multi-variable, multi-configuration testing of ORCHIDEE land surface model water flux and storage estimates across semi-arid sites in the southwestern US. 2020. *Hydrology and Earth System Sciences*. 10.5194/hess-24-5203-2020
- Baffaut, C., J. Baker, **J. A. Biederman**, D. Bosch, A. Buda, E. Brooks, E. Demaria, E. Elias, G. Flerchinger, D. Goodrich, S. Hamilton, S. Hardegree, D. Harmel, D. Hoover, K. King, P. Kleinman, M. Liebig, G. McCarty, G. Moglen, T. Moorman, D. Moriasi, F. Pierson, E. Russell, A. Saha, D. Smith, L. Yasarer. Comparative analysis of water budgets across the U.S. Long-Term Agroecosystem Research network. 2020. *Journal of Hydrology*. 10.1016/j.jhydrol.2020.125021
- Li, Linfeng; Zheng, Zhenzhen; **Biederman, J.A.**; Qian, Ruyan; Zhang, Biao; Che, Rongxiao; Wang, Fang; Xu, Zhi Hong; Cui, Xiaoyong; Hao, YanBin; Wang, Yanfen. Drought and heat wave impacts on grassland carbon cycling across hierarchical levels. 2021. *Plant, Cell and Environment*. 10.1111/pce.13767
- Fellows, A.W., Flerchinger, G.N., Seyfried, M.S., **Biederman, J.A.**, and Lohse, K.A. Winter CO<sub>2</sub> efflux from cold sagebrush shrublands distributed across the rain-to-snow transition zone. 2020. *Journal of Geophysical Research - Biogeosciences*. 10.1029/2019JG005325
- Broxton, P. D., van Leeuwen, J.D. and **Biederman, J.A.** Forest cover and topography regulate the thin, ephemeral snowpacks of the semiarid Southwest United States. 2020. *Ecohydrology*. 10.1002/eco.2202
- Belmonte, A., Sankey, T., **Biederman, J.A.**, Bradford, J., Goetz, S., Kolb., T. and Woolley, T. UAV-derived Estimates of Forest Structure to inform Ponderosa Pine Forest Restoration. 2019. *Remote Sensing in Ecology and Conservation*. 10.1002/rse2.137
- Li, L., Zheng, Z., Wang, W., **Biederman, J.A.**, Xu, X., Ran, Q., Qian, R., Xu, C., Zhang, B., Wang, F., Zhou, S., Cui, L., Che, R., Hao, Y.B., Cui, X., Xu, Z.H., and Wang, Y.F. Nitrous

- oxide emissions in terrestrial ecosystems under climate change: a global meta-analysis. 2019. *Global Change Biology*. 10.1111/gcb.14847
- Smith, W.K., M.P. Dannenberg; D. Yan; S. Herrmann; M.L. Barnes; G.A. Barron-Gafford; **J. A. Biederman**; S. Ferrenberg; A.M. Fox; A.R. Hudson; J.F. Knowles; N. MacBean; D.J. Moore; P.L. Nagler; S.C. Reed; W.A. Rutherford; R.L. Scott; X. Wang; and J. Yang. Remote sensing of dryland ecosystem structure and function: Progress, challenges and opportunities. 2019. *Remote Sensing of Environment*. 10.1016/j.rse.2019.111401
- Li, L.F., Z. Z. Zheng, **J.A. Biederman**, C. Xu, Z.H. xu, R.X. Che, Y.F. Wang, X.Y. Cui and Y.B. Hao. Ecological response to heavy rainfall depends on seasonal timing and recurrence. 2019. *New Phytologist*. 10.1111/nph.15832
- 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. 2019. *Water Resources Research*. 10.1029/2018WR024146
- Scott, R.L. and **J.A. Biederman**. Critical zone water balance over thirteen years in a semiarid savanna. 2019. *Water Resources Research*. 10.1029/2018WR023477
- Zhou, C., **Biederman, J.A.**, Zhang, H., L. Li, 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. 2019. *Plant and Soil*. 10.1007/s11104-019-04025-w
- 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. 2019. *Remote Sensing of the Environment*. 10.1016/j.rse.2018.12.029
- 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. 2019. *Agricultural and Forest Meteorology*. 10.1016/j.agrformet.2019.01.030
- Turpin-Jelfs, T., Michaelides, K., **Biederman, J.A.**, and Anesio, A.M. The distribution and speciation of nitrogen in a degrading semiarid grassland of the Southwestern USA. 2019. *Biogeosciences* 16.2: 369-381. 10.5194/bg-16-369-2019
- Hao, Y.B., Zhang, H., **Biederman, J.A.**, 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. 2018. *Agriculture, Ecosystems and Environment*. 10.1016/j.agee.2018.06.010
- 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. 2019. *Agricultural and Forest Meteorology*, Special Issue: 20th Anniversary of Ameriflux. 10.1016/j.agrformet.2017.11.005
- 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.
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- 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.
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- 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
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- Biederman, J.A.**, R.L. Scott, M.Goulden, R. Vargas, M. Litvak, T.E. Kolb, P.Blanken, W. Oechel., E. Yopez, 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.
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- 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 Ablation 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. 2014. Changes in Snow Accumulation and Ablation Following the Las Conchas Fire, N.M., USA. *Ecohydrology*. DOI 10.1002/eco.1363.
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- Stein, O.R., J.A. **Biederman**, P.B. Hook and W.C. Allen. Performance data from model constructed wetlands for wastewater treatment. 1998. Engineering approaches to ecosystem restoration. 949 – 954. 10.1061/40382(1998)158
- Biederman, J.A.** and O.R. Stein. Physical modeling of constructed wetlands for wastewater treatment. 1997. Proceedings of the American Society of Civil Engineers. *Environmental and coastal hydraulics: protecting the aquatic habitat*. 901-906.

### **Outreach Publications and News Media Coverage**

- Regarding Snowtography: Invited by USDA Office of Communications to record a TED talk at USDA headquarters April 23, 2024
- Regarding Snowpack: “How snowmelt affects Arizona’s water supply”, Arizona Public Media Radio, March 17, 2023. <https://news.azpm.org/p/news-npr/2023/3/17/215291-the-buzz-how-snowmelt-affects-arizonas-water-supply/>
- Regarding Snowtography: “Scientists use simple cameras to answer complex questions about forests and snowpack”, The Water Desk, Boulder, CO, Nov. 14, 2023. <https://waterdesk.org/2023/11/scientists-use-simple-cameras-to-answer-complex-questions-about-forests-and-the-snowpack/>
- Regarding Snowtography: “Unpacking Snowpack: Links between forests and water”, The Wyoming Truth, September 17, 2023. <https://wyomingtruth.org/unpacking-snowpack-new-study-aims-to-better-understand-links-between-forests-and-water/>
- Regarding Snowtography: “Sticks in Snow”, The Durango Herald (CO), Oct. 16, 2023. <https://www.durangoherald.com/articles/sticks-in-snow/>
- Regarding Payton, Biederman and Robles Snowtography Handbook: A new snowtography handbook puts water data into the hands of small farmers and ranchers. 2022. Tellus: revolutionary research for a growing world (USDA). [Tellus | | USDA-ARS](#)
- Payton, E., Biederman, J.A., and Robles, M. Snowtography: Snowpack and Soil Moisture Monitoring Handbook. Manual produced jointly by USDA-ARS, The Nature Conservancy, and The Western Water Assessment. 2021. [Snowtography : USDA ARS. 10.25810/r9s7-4t28.](#)

Regarding Zhang, Biederman et al., 2021 GRL Paper: Radio and television interviews for NPR Morning Edition, Colorado Public Radio, USDA Radio, California Capitol Radio, KNX-Los Angeles, Wyoming Public Radio and Fox10-Phoenix. Press interviews/coverage by the Associated Press, Western Livestock Journal, Arizona Daily Star, Arizona Republic, and 200 other news outlets. <https://apnews.com/general-news-2d7b41dc82318f850617554b927d90e8>

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. How 3-dimensional forest structure regulates the amount and timing of snowmelt across a climatic gradient of snow stability. Northern Arizona University College of Forestry. April 10, 2024.

Biederman, J.A. How temporal repackaging of precipitation into fewer, larger storms impacts carbon balance in North American rangelands. Procinorte Summit (Canada, US, Mexico). March 14, 2024.

Biederman, J.A. RainMan SR: An experimental rainfall manipulation facility to assess how changing rainfall timing affects desert grasslands. Research Insights in Semiarid Ecosystems. University of Arizona. October 21, 2023

Biederman, J.A. How climate and forests jointly regulate the ephemeral snowpacks of the US Southwest. School of Natural Resources and the Environment Fall Speaker Series, University of Arizona. October 4, 2023.

Biederman, J.A. A long-term rainfall manipulation field experiment illustrates desert grassland responses to fewer, larger rainfall events. Conservation and Adaptation Resources Toolbox (CART) Seminar (A joint program of US Fish and Wildlife, US Bureau of Reclamation, and USDA Southwest Climate Hub). June 8, 2023.

Biederman, J.A. Proximal remote sensing enhances a global change experiment & tests assumptions of large-scale approaches. GrassCast monthly seminar on Advances in Remote Sensing-based Products and Tools for Rangelands. April 14, 2022.

Biederman, J.A. Snowtography: needs for continuous snowpack monitoring distributed across vegetation gradients. Western Water Assessment webinar. January 21, 2022. [Snowtography: Snowpack & Soil Moisture Monitoring Handbook - YouTube](#)

- Biederman, J.A. Temporal Packaging of Rainfall: Fewer, Larger Storms with Longer Dry Intervals Alter Arizona Grassland Structure and Function. Arizona Section – Society for Range Management Winter Meeting. January 20, 2022.
- Biederman, J.A. Ecosystems and water balance in the Semiarid Southwest: from mountains to deserts. Water Connections: Annual meeting of the Southwest Water Conservation District. Fort Lewis College, Durango, CO. September 21, 2021.
- Biederman, J.A., Smith, W.K. et al. Changing rainfall timing in the Desert Southwest and ARS experiments to determine future impacts on rangeland. Arizona Land and Water Trust. Tucson, AZ. July 30, 2021.
- Biederman, J.A., Smith, W.K. et al. Manipulating rainfall to simulate future hydroclimate in the Santa Rita Experimental Range. Pima County Flood Control. Tucson, AZ. December 9, 2020.
- Biederman, J.A. Connections among ecosystems, climate and water balance in the Semiarid Southwest. Appalachian State University. October 18, 2020
- Biederman, J.A. Opportunities to conserve and enhance water availability through forest management in the Southwest. US Forest Service Region 3 Watershed Meeting. Tucson, Arizona. November 6, 2019.
- Biederman, J.A., M. Robles, S. Kampf, J. Hammond, E. DeMaria and R. L. Scott. Combined impacts of warming climate and landscape-scale wildfire on long-term water resources in central Arizona. *Arizona Hydrological Society Annual Symposium*. Tucson, AZ. September 27, 2019.
- Biederman, J.A., Scott, R.L., Smith, W.K. Every Drop Counts: What part of precipitation drives productivity in drylands? *Ecological Society of America*. Louisville, KY. August 14, 2019.
- Biederman, J.A. Coupled water and carbon cycling in dryland ecosystems. *Invited Seminar at the University of Chinese Academy of Sciences, Ecology*. Beijing, China. June 17, 2019. Canceled due to failure of USDA-ARS travel office to deliver visa.
- 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.

- 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 (lead author only)**

Biederman, J.A., Zhang, F., Pierce, N., Javadian, M., Devine, C., Potts, D., Roby, M., Blais, J., Reed, S., Song, Y., Hu, T., Dannenberg, M., Barnes, M., Johnston, M., and Smith, W. RainManSR: A global change experiment integrating proximal remote sensing with direct measures of semiarid grassland structure and function. Proc. of the American Geophysical Union. San Francisco, CA, December 14, 2022.

Biederman, J.A., Dwivedi, R., Broxton, P.D., Lee, K., Van Leeuwen, WJD, Leonard, J., Remke, M., Robles, MD, Peark, JK, and Svoma, BM. Snowtopography: A growing network of flexible, low-cost snow and soil moisture monitoring quantifies hydrologic impacts of forest management and disturbance. Biennial Conference of Science and Management on the Colorado Plateau. Flagstaff, AZ. Sept. 14, 2022.

Biederman, J.A., Zhang, F., Pierce, N, Potts, D., Roby, M., Blais, J., Reed, S, Smith, W. RainManSR: An in-situ rainfall manipulation experiment linking above- and below-ground responses to temporal repackaging of precipitation in a semiarid grassland. Biennial Conference of Science and Management on the Colorado Plateau. Flagstaff, AZ. Sept. 13, 2022.

Biederman, J.A., Zhang, F., Pierce, N, Devine, C., Potts, D., Roby, M., Dashti, H., Wang, X., Hu, J. and Smith, W. Linking above- and below-ground responses to temporal repackaging of precipitation in a semiarid grassland agroecosystem. Proc. of the American Geophysical Union. San Francisco, CA, December 12, 2020.

Biederman, J.A., Robles, M., and Scott, R. L. Contrasting seasonal responses attenuate long-term streamflow changes following landscape-scale wildfire in Arizona. Biennial Conference of Science and Management on the Colorado Plateau. Flagstaff, AZ. Sept. 10, 2019.

Biederman, J.A., N. Pierce, Y.B. Hao, W.K. Smith., L.F. Li, W.J. Liu, C.T. Zhou, and R. L. Scott. Rainfall manipulation quantifies ecosystem sensitivity to hydroclimatic change in Mongolian steppes and Arizona rangelands. *Biennial Conference of Science and Management on the Colorado Plateau*. Flagstaff, AZ. Sept. 11, 2019.

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 (lead author only)

- Biederman, J.A., Robles, M., and Scott, R. L. Streamflow is resilient to landscape-scale wildfires in the Lower Colorado River Basin. *American Geophysical Union Fall Meeting*. San Francisco, CA. December 11, 2019.
- 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.
- 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.
- 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.**

### **Funding Awarded**

- A novel geospatial approach to assess climate change impacts on grasslands. Biederman is Federal Collaborator consulting on experimental design for new rainfall manipulation facility in Perth, Australia. Funding by University of Western Australia to cover travel, research development workshop. \$25,000. 2024-25
- Wyoming Expansion: Assessing impacts of forest structure changes on snow water resources in the Colorado River Basin. Biederman is sole PI. Funding by The Nature Conservancy Colorado River Program. \$161,809 2023-24
- Workman Creek Snowtopography: Assessing legacies of forest management and wildfire on snow water resources. Biederman is sole PI. US Forest Service Rocky Mountain Research Station. \$30,000 2024
- Ecohydrological monitoring of Upper Verde thinning impacts. Biederman is Federal Collaborator overseeing snow and soil moisture monitoring network design and installation. The Salt River Project. \$354,159 2023-24
- Snowtopography station for the Four Forests Restoration Monitoring Board. Biederman is sole PI. \$5,000. 2023
- Assessing impacts of forest structure changes on snow water resources in the Colorado River Basin. Biederman is sole PI. Funding by The Nature Conservancy Colorado River Program. \$136,072 2022-23
- Leveraging SMAP soil moisture and multi-source Earth observations to quantify variability and drivers of global dryland carbon and water fluxes. Source: NASA. PI: Matthew P. Dannenberg. Biederman is Federal Collaborator. \$502,893. 2020-23
- Forest Management to Conserve and Enhance Water Supply. USDA-ARS headquarters grant to fund a two-year snow hydrology postdoctoral scientist. Biederman is sole PI. \$140,000 2020-22
- Assessing the direct effects of extended periods of drought on soil 2022

microbial diversity and community composition, PI Laura Meredith.  
Biederman is Federal Collaborator. Source: University of Arizona  
Research, Innovation and Impact. \$14,983

- Assessing resilience of Arizona grasslands to changes in the North  
American Monsoon: fewer, larger rainfall events with longer-duration  
dry intervals, PI Yang Song. Biederman is Federal Collaborator. Source:  
Arizona Institutes for Resilience. \$78,239 2021
- Collaborative Research: Hydrological Tipping Points and Desertification of  
Semiarid Woodlands, PI Marcy Litvak. Biederman is Federal  
Collaborator. Source: NSF. \$1,234,148 2017-2-019
- Snow Water with Artificial Neural Network (SWANN), PI Willem van  
Leeuwen. Biederman is Federal Collaborator. 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
- Science Foundation Arizona Graduate Fellowship, \$30,000 2010-11
- USEPA STAR Graduate Fellowship, approx. value \$100,000 1997-1999

### **Teaching Experience**

- Field Experience in Snow Hydrology (guest lecturer and field trip leader),  
University of Arizona Dept. of Hydrology and Atmospheric Sciences 2012-2022
- 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 2012-21
- High school physics, math & leadership faculty (full time, Suffield Academy) 2004-2010

### **Postdocs, Students & Technicians Supervised/Mentored - last known occupation**

#### **While at USDA-ARS**

Ravindra Dwivedi – Postdoctoral Scientist, USDA-ARS, Tucson, Arizona (current)

Fangyue Zhang – Postdoctoral Scientist, University of Arizona (current)

Nathan Pierce – Hydrologist, USDA-ARS, Tucson (current)

Jessica Guo – Postdoctoral Scientist, University of Arizona- now Faculty at Harvey Mudd  
College

Daphna Uni – Bard Fellow, Univeristy of Arizona (current)

Zheng Fu - Postdoctoral Scientist, Laboratoire des Sciences du Climat et l'Environnement (LSCE  
Paris) – now faculty at University of Chinese Academy of Sciences.

Haley Farwell – Ph.D. student at N. AZ Univ (current)

Madelynne Masterson – Undergraduate Student, University of AZ, now being hired as Hydrologic Technician at USDA-ARS, Tucson, Arizona.

Robin Bradley – Hydrologic Technician – now applying to M.S. programs

Aaron Peretz – Hydrologic Technician – now Range Technician US-BLM

Nick Tennes – Hydrologic Technician – now applying to M.S. programs

Jacob Blais – Undergraduate Student, University of Arizona – now Ph.D. student at N. AZ Univ.

John Perkins – Graduate Student, University of Arizona Hydrology and Atmospheric Sciences.

Adam Belmonte – Ph.D. from Northern Arizona University, now consulting in Portland, OR

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

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

David Adams – Work study program for US Veterans at SWRC. Undergraduate at Pima CC

Alonso de La O – Work study program for US veterans at SWRC. Undergraduate at U. of AZ

Abreeza Zegeer – Technician at University of Arizona (retired)

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 NRCD, 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.

- **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 locally and across western US States (ARS).