

Todd G. Caldwell

Professional Summary

October 18, 2018

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Professional Preparation

Academic Background

Ph.D. Hydrogeology, University of Nevada Reno, 2011
M.S. Hydrogeology, University of Nevada Reno, 1999
B.S. Geology, University of New Mexico, 1997

Professional Appointments

Present Position: Research Associate, Bureau of Economic Geology, The University of Texas at Austin (September 2012 - Present).
Assistant Research Professor, Desert Research Institute, Reno, Nevada (2011 - 2012).
Associate Research Soil Scientist, Desert Research Institute, Reno, Nevada (2009-2011)
Assistant Research Soil Scientist, Desert Research Institute, Reno, Nevada (2004-2010)
Instrumentation Technician, Desert Research Institute, Reno, Nevada (2001 - 2004).
Hydrologist, Pacific Northwest National Lab Richland, WA (2000 - 2001).

Theses

Prescription Fire and Nutrient Dynamics in Tahoe Soils

Dissertations

Soil Heterogeneity in Arid Shrublands: Biotic and Abiotic Processes

Areas of Expertise

Areas of Expertise

Advanced numerical modeling
Data acquisition systems
Field characterization
Soil systems and its coupling to the water cycle and landscape processes, including ecosystem services
Soil-moisture validation

Awards

Awards and Honorary Societies

Vadose Zone Journal Editor's Citations for Excellence in Review:
<https://www.soils.org/about-society/committees/reports/S303/2017>, 2017
Western Association of Agricultural Experiment Station Directors Award for Excellence, 2011
Runner-Up Graduate Student Poster Competition (S1), ASA-CSSA, SSSA Annual Meeting,

2011

The Colin Warden Memorial Endowment, 2010

NSF Student Travel Grant, European Geosciences Union, 2008

UNR Graduate Student Association Poster of the Year, 1999

Service

University Committees

Coordinator, Technical Seminar Series, The University of Texas at Austin, Bureau of Economic Geology, Austin, Tex., September 1, 2016-May 31, 2017

Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI), The University of Texas at Austin, Representative, January 1, 2014-Present

External Committees Participation

Committee Member, Don and Betty Kirkham Soil Physics Award (S483), Soil Science Society of America, January 1, 2019-December 31, 2020

Associate Editor, Vadose Zone Journal, Soil Science Society of America, January 1, 2018-December 31, 2020

UT-Austin Representative, Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI), January, 2013 - present

Associate Editor, Geoderma, January 1, 2016-December 31, 2018

Associate Editor, Vadose Zone Journal, Soil Science Society of America, January 1, 2015-December 31, 2017

Committee Member, Early Career Members Committee, Soil Science Society of America, January 1, 2014-December 31, 2016

Outreach Activities

From Drought to Flood: Soil Moisture's Unsung Role in Hill County Hydrology: presented to CAPCOG Homeland Security Task Force Flood Forecast Subcommittee, presented at Kyle Fire Station 1, Kyle, Tex., September 26, 2018.

How Much Water Can Soil Hold? Explore Soil Moisture and Texas Floods: presented to Environmental Science Institute, presented at Hot Science, Cool Activities, Austin, Tex., September 14, 2018.

National Drought Mitigation Center Texas Technical Workshop 2017;
<http://drought.unl.edu/NewsOutreach/Outreach/Workshops/TexasTechnical2017.aspx>:
presented to state and local water agencies across Texas, presented at Texas Advanced Computing Center, Austin, Tex., December 6, 2017.

KLRN Virtual Classroom seminar: presented at <https://ovee.itvs.org/screenings/48tac>, August 19, 2015.

Teaching and Advising

University Courses Taught

GEO 391: Advanced Vadose Zone Processes, Jackson School of Geosciences, The University of Texas at Austin: January 1-May 15, 2016.

GEO 376L, Field Methods in Hydrogeology, The University of Texas at Austin: May 20-June 6, 2015.

Soil Physics (NRES 422/622): presented at University of Nevada, Reno, Nevada, spring 2012.

Continuing Education Courses Taught

Implementation of a SMAP Core Cal/Val Site within the LCRA Hydromet network: presented to Lower Colorado River Authority, Austin, Texas, January 2014.

Observations on the 2011 Drought, Soil Moisture, and Water Supply in Texas: presented to the Lower Colorado River Authority, Austin, Texas, November 2013.

Observations on the 2011 Drought, Soil Moisture, and Water Supply in Texas: presented to the Texas Commission on Environmental Quality, Austin, Texas, November 2013.

Student Committee Supervision

Ph.D. committee member, Marcelo M. Azevedo, Performance of Geotextiles with Enhanced Drainage, The University of Texas at Austin, 2016

Student advisor, Master of Science in Energy and Earth Resources, co-supervisor with Michael Young, Chelsea Halley, Laboratory Calibration of the CS655 Soil Moisture Sensor, The University of Texas at Austin, Austin, Tex., 2016

Co-Advisor, M.S. Thesis Committee, Raquel Flinker, Modeling soil moisture dynamics of grasslands in response to CO₂ and biodiversity manipulations at BioCON, The University of Texas at Austin, 2014

Supervisor, M.S. Honors Thesis, Ryan Sutter, The University of Texas at Austin, 2014

Student Committee Participation

Student advisor, Ph.D. committee member, Gaston Quaglia, Hydro-Mechanical Characterization of Unsaturated Clays Using Centrifuge Technology, The University of Texas at Austin, Austin, Tex., 2017

Student advisor, Ph.D. committee member, Marcelo Moraes de Azevedo, Performance of Geotextiles with Enhanced Drainage, The University of Texas at Austin, Austin, Tex., 2016

Member, Ph.D. Dissertation Committee, Matthew S. Gore, The University of Texas at Austin, 2015

Presentations

Invited Presentations

Validation and application of the Soil Moisture Active Passive Satellite Mission in Texas: presented to Bureau of Economic Geology, presented at BEG Friday Seminar Series, Austin, Tex., November 3, 2017.

Drought, flood and everywhere in between: a hydrologic view of Texas from satellites and sensors: presented to Collectors' Society Seminar Series, presented at San Angelo Museum of Fine Art, San Angelo, Tex., March 2, 2017.

Validation and application of the Soil Moisture Active Passive Satellite Mission: presented to Graduate Program of Hydrologic Sciences Colloquia, presented at University of Nevada, Reno, September 9, 2016.

Soil moisture, recharge and runoff in central Texas: presented to Texas Water Development Board, presented at NASA SMAP Applications Workshop and Tutorial, Austin, Tex., April 4-5, 2016.

The validation of soil moisture from sensors, satellites and simulations: presented to The University of Texas at Austin, presented at UT Climate Forum, Austin, Tex., November 23, 2015.

The Texas Soil Observation Network: presented to Texas Groundwater Summit, San Marcos, Tex., August 25-27, 2015.

Texas droughts and floods: presented to Grace Museum of Modern Art, Abilene, Tex., March 19, 2015.

Presentations

Quantifying diffuse recharge to the Edwards Aquifer using micrometeorology and remote sensing: presented at 2018 MOISST Workshop: From Soil Moisture Observations to Actionable Decisions, Lincoln, Nebr., June 4-7, 2018.

Outcomes from using digital soil mapping data and updates on TxSON: presented to Soil Information and Modeling Workshop, presented at Texas A&M University, College Station, Tex., April 18, 2018.

Quantifying diffuse recharge to the Edwards Aquifer using micro-meteorology and remote sensing: presented to Geological Society of America, presented at Annual Meeting, Seattle, Wash., October 22-25, 2017.

A posterior designed soil moisture network for the validation of SMAP products: the Texas Soil Observation Network-one year in: presented at ASA-CSA-SSSA Annual Meeting, Phoenix, Ariz., November 8, 2016.

Validation of soil moisture data from sensors, satellites and simulations using the Texas Soil Observation Network: presented to International Soil Modeling Consortium, presented at Austin International Conference on Soil Modeling, Austin, Tex., March 29-April 1, 2016.

Soil moisture network assessment using the Passive and Active L- and S-Band System in Texas: presented at ASA, CSSA, and SSSA Annual Meeting, Minneapolis, Minn., November 15-18, 2015.

Soil stratigraphy and water content estimation within the active layer of a tundra soil using ground penetrating radar, North Slope, Alaska: presented at Symposium on the Application of Geophysics to Environmental and Engineering Problems, Austin, Tex., March 22-26, 2015.

Linking soil water storage to long-term outlooks of water supply anomalies in Texas: presented at Geological Society of America Annual Meeting, Vancouver, BC, September 19-22, 2014.

Soil moisture, drought and water resources in Texas: presented at MOISST Workshop: Advancing Soil Moisture Science and Application, Stillwater, Okla., June 4-5, 2014.

Linking soil moisture to water resources in the Texas Hill Country: presented at Third In-situ and Remote Soil Moisture Sensing Technology Conference, Houston, Tex., March 12-14, 2014.

Soil moisture from ground-based networks and the North American Land Data Assimilation System Phase 2 Model: Are the right values somewhere in between?: presented at American Geophysical Union Fall Meeting, San Francisco, California, December 2013.

Invited lecture: Transitional biomes and the vertical flux of water in semiarid rangelands: presented at Geological Society of America Annual Meeting, Denver, Colorado, October 2013.

Soil development, time, and ecosystem function in water-limited systems: presented at AGU Chapman Conference, Tucson, Arizona, October 2013.

Soil moisture and drought in Texas: presented at Water Forum III: Droughts and Other Extreme Weather Events, Austin, Texas, October 2013.

Soil Moisture and the Drought in Texas: presented at Hydrology Brown Bag, Jackson School, Austin, Texas, September 2013.

Soil Water Storage in Texas: What we are measuring and how it compares to model predictions: presented to Texas Water Development Board, Austin, Texas, December 2012.

Ground-based measurements of soil water storage in Texas: presented at Water Forum II: Texas Drought and Beyond, Austin, Texas, October 2012.

Soil development and the ecohydrology of arid lands: presented at Geological Society of America South-Central Section Annual Meeting, Austin, Texas, April 2012.

Soil Heterogeneity and its Linkage to Ecosystems, Landscape Dynamics, and Geologic Hazards: presented at BEG Seminar Series, Austin, Texas, April 2012.

Inverse modeling water contents of semiarid soils using multi-objective parameter optimization to obtain the compromise solution: presented at ASA-CSA-SSSA Annual Conference, San Antonio, Texas, October 16-19 2011.

Cleared circles: anthropogenic or biogenic? Use of non-invasive geophysical techniques to determine origin: presented at Symposium on the Application of Geophysics to Environmental and Engineering Problems (SAGEEP), Charleston, South Carolina, April 10-14, 2011.

Paleoclimate simulations and nitrate accumulation in a hyper-arid desert soil: presented at ASA-CSA-SSSA Annual Conference, Pittsburgh, Pennsylvania, November 2-6, 2010.

Arid soil evolution and pedologic development: Process considerations and applications to engineered barrier design: invited talk presented at U.S. Nuclear Regulatory Commission, Workshop on Engineered Barrier Performance Related to Low-Level Radioactive Waste, Decommissioning and Uranium Mill Tailings Facilities, Charleston, South Carolina, August 3-5, 2010.

Hydraulic gradient and dust emissivity along a playa to distal fan transect: presented at American Geophysical Union Fall Meeting, San Francisco, California, December 14-18, 2009.

Characterizing hydraulic properties in an arid watershed to aid in flood control and uncertainty analysis: invited talk presented at Joint Meeting of the Geological Society of America and ASA-CSA-SSSA, Houston, Texas, October 6-10, 2008.

Numerical simulations of salt accumulation in a hyper-arid soil chronosequence in the Sonoran Desert: presented at Joint Meeting of the Geological Society of America and ASA-CSA-SSSA, Houston, Texas, October 6-10, 2008.

Hydropedology of canopy-interspace ecosystems in the Mojave Desert: biotic and abiotic processes: invited talk presented at Ecological Society of America Annual Meeting, Milwaukee, Wisconsin, August 4-8, 2008.

Hydrologic prediction of runoff potential using terrain forecasting, Bunkerville, Nevada: invited talk presented to American Society of Flood Plain Managers: Tools for Arid Regions Flood Damage Reduction and Restoration, Reno, Nevada, May 18-23, 2008.

Gradation of soil hydraulic properties from canopy to interspace on a Mojave Desert soil chronosequence: presented at European Geosciences Union, Vienna, Austria, April 14-18, 2008.

Heterogeneity of soils and hydraulic properties from canopy to interspace in the Mojave Desert: presented at NWRA Recharge Symposium, Las Vegas, Nevada, April 9-11, 2008.

Scaling heterogeneous soil hydraulic properties using canopy/interspace distributions in a Mojave Desert Ecosystem: presented at American Geophysical Union Annual Meeting, San Francisco, California, December 10-14, 2007.

Impact of small-scale heterogeneity of soil hydraulic properties on the large-scale water balance: presented at ASA-SSSA-CSA Annual Meeting, New Orleans, Louisiana, November 5-9, 2007.

Heterogeneities of soil hydraulic properties from canopy to interspace: invited talk presented at NSF EPSCoR Symposium on Scaling Environmental Processes in Heterogeneous Arid Soils, Las Vegas, Nevada, August 30, 2007.

Soil development and hydrology of an arid soil chronosequence in the Sonoran Desert: presented at Unsaturated Zone Interest Group Meeting, Los Alamos, New Mexico, August 27-30, 2007.

Performance of vehicle dust courses for desert military testing: realistic test setting or gone with the wind?: presented at International Society of Terrain-Vehicle Systems Conference, Fairbanks, Alaska, June 23-26, 2007.

Numerical models for the active restoration of arid lands: parameterization, optimization and sensitivity analysis: invited talk presented at ARO Terrestrial Sciences Soil Moisture Review Meeting, Colorado Springs, Colorado, March 5-6, 2007.

Hillslope soils, microclimate and hydrology: influence of slope and aspect: invited talk presented at Oak Ecosystem Restoration Workshop, Catalina Island, California, February 2-4, 2007.

Parameter optimization of Hydrus-1D: single and multi-objective functions: presented at W-1188 Soil Physics Multi-State Research Group Annual Meeting, Las Vegas, Nevada, January 2-4, 2007.

Ecology of an arid soil chronosequence in the Sonoran Desert, Yuma Proving Ground: presented at American Geophysical Union Fall Meeting, San Francisco, California, December 11-15, 2006.

The integration of soils and hydrology for restoration planning on military lands: presented at ASA-CSSA-SSSA Annual Meeting, Indianapolis, Indiana, November 12-16, 2006.

Linking soils, landscape and geomorphology: Catalina Island, CA: invited talk presented at Oak Researchers Workshop, Long Beach, California, March 22, 2006.

Coupling hydrology and root distributions in arid soils: numerical simulations: presented at W-1188 Soil Physics Multi-State Research Group Annual Meeting, Las Vegas, Nevada, January 3-4, 2006.

Modeling the interdependence of hydrology and root distributions of *Larrea tridentata* in the Mojave Desert: presented at American Geophysical Union Fall Meeting, San Francisco, California, December 5-9, 2005.

Soil disturbance and hydrologic response at the National Training Center, Ft. Irwin, California: presented at Desert Surficial Processes and Landscape Dynamics on Military Lands, Zzyzx, California, September 18-22, 2005.

Activities of a Professional Nature

Professional Societies

American Association of State Climatologists

American Geophysical Union

Geological Society of America

Soil Science Society of America

W-2188 Multi-State Soil Physics Group

Major Field Campaigns

Texas Soil Observation Network (TxSON). TxSON is the state-of-the-science soil moisture monitoring network in the Texas Hill Country. TxSON covers a 500-sq-mi area near Fredericksburg, Texas, along the Pedernales River and within the middle reaches of the Colorado River. The network consists of 36 soil moisture monitoring stations and 7 Lower Colorado River Authority (LCRA) HydroMet stations supplemented with soil moisture sensors.
<http://www.beg.utexas.edu/txson/>

Activities of a Professional Nature

Referee (ad hoc): Vadose Zone Journal, Water Resources Research, Geophysical Research Letters, Soil Science Society of America Journal, Geoderma, Journal of Arid Environments, Journal of Soil and Water Conservation, Hydrological Processes, Journal of Terramechanics,

Publications

Peer Reviewed Journal Articles

Abolt, C., Caldwell, T., Wolaver, B., and Pai, H., 2018, Unmanned aerial vehicle-based monitoring of groundwater inputs to surface waters using an economical thermal infrared camera: *Optical Engineering*, v. 57, no. 5, p. 053113-1--053113-9, <http://doi.org/10.1117/1.OE.57.5.053113>.

Blindish, R., Cosh, M. H., Jackson, T. J., Koike, T., Fujii, H., Chan, S. K., Asanuma, J., Berg, A., Bosch, D. D., Caldwell, T. G., Holifield Collins, C., McNairn, H., Martínez-Fernández, J., Prueger, J., Rowlandson, T., Seyfried, M., Starks, P., Thibeault, M., Van Der Velde, R., Walker, J. P., and Coopersmith, E. J., 2018, GCOM-W AMSR2 soil moisture product validation using core validation sites: *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, v. 11, no. 1, p. 209-219, <http://doi.org/10.1109/JSTARS.2017.2754293>.

Caldwell, T. G., Bongiovanni, T., Cosh, M. H., Halley, C., and Young, M. H., 2018, Field and laboratory evaluation of the CS655 soil water content sensor: *Vadose Zone Journal*, v. 17, no. 1, 16 p., <http://doi.org/10.2136/vzj2017.12.0214>.

Chan, S. K., Blindish, R., O'Neill, P. E., Jackson, T. J., Njoku, E., Dunbar, S., Chaubell, J., Piepmeier, J., Yueh, S., Entekhabi, D., Colliander, A., Chen, F., Cosh, M. H., Caldwell, T. G., Walker, J. P., Berg, A., McNairn, H., Thibeault, M., Martínez-Fernández, J., Uldall, F., Seyfried, M., Bosch, D. D., Sparks, P. J., Holifield-Collins, C., Prueger, J., van der Velde, R., Asanuma, J., Pelecki, M., Small, E. E., M. Zreda, Calvet, J., Crow, W. T., and Kerr, Y., 2018, Development and assessment of the SMAP enhanced passive soil moisture product: *Remote Sensing of Environment*, v. 204, p. 931-941, <http://doi.org/10.1016/j.rse.2017.08.025>.

Colliander, A., Jackson, T. J., Chan, S. K., O'Neill, P. E., Bindlish, R., Cosh, M. H., Caldwell, T. G., Walker, J. P., Berg, A., McNairn, H., Thibeault, M., Martinez-Fernandez, J., Jensen, K. H., Asanuma, J., Seyfried, M. S., Bosch, D. D., Starks, P. J., Holifield Collins, C., Prueger, J. H., Su, Z., Lopez-Baeza, E., and Yueh, S. H., 2018, An assessment of the differences between spatial resolution and grid size for the SMAP enhanced soil moisture product over homogeneous sites: *Remote Sensing of Environment*, v. 207, p. 65-70, <http://doi.org/10.1016/j.rse.2018.02.006>.

Das, N. N., Entekhabi, D., Dunbar, R. S., Colliander, A., Chen, F., Crow, W., Jackson, T. J., Berg, A., Bosch, D. D., Caldwell, T., Cosh, M. H., Collins, C. H., Lopez-Baeza, E., Moghaddam, M., Rowlandson, T., Starks, P. J., Thibeault, M., Walker, J. P., Wu, X., O'Neill, P. E., Yueh, S., and Njoku, E. G., 2018, The SMAP mission combined active-passive soil moisture product at 9 km and 3 km spatial resolutions: *Remote Sensing of Environment*, v. 211, p. 204-217, <http://doi.org/10.1016/j.rse.2018.04.011>.

Kolassa, J., Reichle, R. H., Lui, Q., Alemohammad, S. H., Gentine, P., Aida, K., Asanuma, J., Bircher, S., Caldwell, T. G., Colliander, A., Cosh, M., Holifield-Collins, C., Jackson, T. J., Martínez-Fernández, J., McNairn, H., Pacheco, A., Thibeault, M., and Walker, J. P., 2018, Estimating surface soil moisture from SMAP observations using a Neural Network technique: *Remote Sensing of Environment*, v. 204, p. 43-59, <http://doi.org/10.1016/j.rse.2017.10.045>.

Sun, A. Y., Xia, Y., Caldwell, T., and Hao, Z., 2018, Patterns of precipitation and soil moisture extremes in Texas, US: a complex network analysis: *Advances in Water Resources*, v. 112, p. 203-213, <http://doi.org/10.1016/j.advwatres.2017.12.019>.

Abolt, C. J., Young, M. H., and Caldwell, T., 2017, Numerical modelling of ice-wedge polygon geomorphic transition: *Permafrost and Periglacial Processes*, v. 28, no. 1, p. 347-355, <http://doi.org/10.1002/ppp.1909>.

Clewley, D., Whitcomb, J. B., Akbar, R., Silva, A. R., Berg, A., Adams, J. R., Caldwell, T. G., Entekhabi, D., and Moghaddam, M., 2017, A method for upscaling in situ soil moisture measurements to satellite footprint scale using random forests: *IEEE Journal of Selected Topics*

in *Applied Earth Observations and Remote Sensing*, v. 10, no. 6, p. 2663-2673, <http://doi.org/10.1109/JSTARS.2017.2690220>.

Colliander, A., Jackson, T. J., Bindlish, R., Chan, S., Das, N., Kim, S. B., Cosh, M. H., Dunbar, R. S., Dang, L., Pashaian, L., Asanuma, J., Aida, K., Berg, A., Rowlandson, T., Bosch, D., Caldwell, T. G., and others, 2017, Validation of SMAP surface soil moisture products with core validation sites: *Remote Sensing of Environment*, v. 191, p. 215-231, <http://doi.org/10.1016/j.rse.2017.01.021>.

Degré, A., van der Ploeg, M. J., Caldwell, T. G., and Gooren, H. P. A., 2017, Comparison of soil water potential sensors: A drying experiment: *Vadose Zone Journal*, v. 16, no. 4, 8 p., <http://doi.org/10.2136/vzj2016.08.0067>.

Kim, S. B., van Zyl, J. J., Johnson, J. T., Moghaddam, M., Tsang, L., Colliander, A., Dunbar, R. S., Jackson, T. J., Jaruwatanadilok, S., West, R., Berg, A., Caldwell, T. G., Cosh, M. H., Goodrich, D. C., Livingston, S., López-Baeza, E., Rowlandson, T., Thibeault, M., Walker, J. P., Entekhabi, D., Njoku, E. G., O' Neill, P. E., and Yueh, S. H., 2017, Surface soil moisture retrieval using the L-band synthetic aperture radar onboard the soil moisture active-passive satellite and evaluation at core validation sites: *IEEE Transactions on Geoscience and Remote Sensing*, v. 55, no. 4, p. 1897-1914, <http://doi.org/10.1109/TGRS.2016.2631126>.

Kolassa, J., Reichle, R. H., Lui, Q., Cosh, M. H., Bosch, D. D., Caldwell, T. G., Colliander, A., Holifield-Collins, C., Jackson, T. J., Livingston, S. J., Moghaddam, M., and Sparks, P. J., 2017, Data assimilation to extract soil moisture information from SMAP observations: *Remote Sensing*, v. 9, no. 11, 24 p., <http://doi.org/10.3390/rs9111179>.

Ouellette, J. D., Johnson, J. T., Balenzano, A., Mattia, F., Satalino, G., Kim, S.-B., Dunbar, R. S., Colliander, A., Cosh, M. H., Caldwell, T. G., Walker, J. P., and Berg, A. A., 2017, A time-series approach to estimating soil moisture from vegetated surfaces using L-band radar backscatter: *IEEE Transactions on Geoscience and Remote Sensing*, v. 55, no. 6, p. 3186-3193, <http://doi.org/10.1109/TGRS.2017.2663768>.

Reichle, R. H., De Lannoy, G. J. M., Liu, Q., Caldwell, T. G., and others, 2017, Assessment of the SMAP Level-4 Surface and Root-Zone Soil Moisture product using in situ measurements: *Journal of Hydrometeorology*, v. 18, p. 2621-2645, <http://doi.org/10.1175/JHM-D-17-0063.1>.

Young, M. H., Andrews, J. H., Caldwell, T. G., and Saylam, K., 2017, Airborne LiDAR and aerial imagery to assess potential habitats for the desert tortoise (*Gopherus agassizii*): *Remote Sensing*, v. 9, no. 458, 16 p., <http://doi.org/10.3390/rs9050458>.

Chan, S. K., Bindlish, R., O'Neill, P. E., Njoku, E., Jackson, T., Colliander, A., Chen, F., Burgin, M., Dunbar, S., Piepmeier, J., Yueh, S., Entekhabi, D., Cosh, M. H., Caldwell, T., Walker, J. P., Wu, X., Berg, A. A., Rowlandson, T., Pacheco, A., McNairn, H., Thibeault, M., Martinez-Fernandez, J., Gonzalez-Zamora, A., Seyfried, M., Bosch, D., Starks, P. J., Goodrich, D. C., Prueger, J. H., Palecki, M., Small, E. E., Zreda, M., Calvet, J., Crow, W. T., and Kerr, Y., 2016, Assessment of the SMAP Passive Soil Moisture Product: *IEEE Transactions on Geoscience and Remote Sensing*, v. 54, no. 8, p. 4994-5007, <http://doi.org/10.1109/TGRS.2016.2561938>.

Shellito, P. J., Small, E. E., Colliander, A., Bindlish, R., Cosh, M. H., Berg, A. A., Bosch, D. D., Caldwell, T., Goodrich, D. C., McNairn, H., Prueger, J. H., Starks, P. J., van der Velde, R., and Walker, J. P., 2016, SMAP soil moisture drying more rapid than observed in situ following rainfall events: *Geophysical Research Letters*, v. 43, no. 15, p. 8068-8075, <http://doi.org/10.1002/2016GL069946>.

Zhu, J., Sun, D., Young, M. H., Caldwell, T., and Pan, F., 2015, Shrub spatial organization and partitioning of evaporation and transpiration in arid environments: *Ecohydrology*, v. 8, p. 1218-1228, <http://doi.org/10.1002/eco.1576>.

Rau, B.M., Chambers, J.C., Pyke, D.A., Roundy, B.A., Schuur, E.W., Doescher, P., and

- Caldwell, T., 2014, Soil resources influence vegetation and response to fire and fire-surrogate treatments in sagebrush-steppe ecosystems: *Rangeland Ecology and Management*, v. 67, no. 5, p. 506-521, <http://doi.org/10.2111/REM-D-14-00027.1>.
- Caldwell, T., Wöhling, T., Young, M. H., Boyle, D. P., and McDonald, E. V., 2013, Characterizing disturbed desert soils using multiobjective parameter optimization: *Vadose Zone Journal*, v. 12, p. 1-23, <http://doi.org/10.2136/vzj2012.0083>.
- Caldwell, T., Young, M. H., McDonald, E. V., and Zhu, J., 2012, Soil heterogeneity in Mojave Desert shrublands: biotic and abiotic processes: *Water Resources Research*, v. 48, W09551, 12 p., <http://doi.org/10.1029/2012WR011963>.
- Flerchinger, G. N., Caldwell, T., Cho, J., and Hardegree, S. P., 2012, Simultaneous Heat and Water Model: Model use, calibration and validation: *Transactions of the ASABE*, 55, 1395-1411.
- Rau, B. M., Johnson, D. W., Blank, R. R., Lucchesi, A., Caldwell, T. G., and Schupp, E. W., 2011, Transition from sagebrush steppe to annual grass (*Bromus tectorum*): influence on below-ground carbon and nitrogen: *Rangeland Ecology & Management*, v. 64, p. 139-147.
- Rau, B. M., Johnson, D. W., Blank, R. R., Tausch, R. J., Roundy, B. A., Miller, R. F., Caldwell, T. G., and Lucchesi, A., 2011, Woodland expansion's influence on below-ground carbon and nitrogen in the Great Basin U.S: *Journal of Arid Environment*, doi:10.1016/j.jaridenv.2011.04.005.
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- Bacon, S. N., McDonald, E. V., Caldwell, T. G., and Dalldorf, G. K., 2010, Timing and distribution of alluvial fan sedimentation in response to strengthening of the late Holocene ENSO variability in the Sonoran Desert, southwestern Arizona, USA: *Quaternary Research*, v. 73, p. 425-438.
- Caldwell, T. G., Johnson, D. W., Miller, W. W., Qualls, R. G., and Blank, R. R., 2009, Prescription fire and anion retention in Tahoe forest soils: *Soil Science*, v. 174, p. 594-600.
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