

## CURRICULUM VITAE

William K. Smith, Associate Professor  
School of Natural Resources and the Environment  
N417, Environment and Natural Resources 2  
The University of Arizona  
Email: wksmith@arizona.edu // Phone: (520) 621-1056

### CHRONOLOGY OF EDUCATION

- 2009–2013** Ph.D., Department of Ecosystem and Conservation Sciences,  
University of Montana
- 2006–2008** M.S., Graduate Degree Program in Ecology, Colorado State  
University
- 2000–2005** B.S. (Distinction and Honors), Applied Mathematics and  
Biology, Western Carolina University

### CHRONOLOGY OF EMPLOYMENT

- 2021-Present** Associate Professor, School of Natural Resources and the  
Environment, University of Arizona, Tucson, AZ
- 2016-2021** Assistant Professor, School of Natural Resources and the  
Environment, University of Arizona, Tucson, AZ
- 2014–2016** Luc Hoffmann Postdoctoral Fellow, University of Minnesota,  
St. Paul, MN
- 2013–2014** Postdoctoral Research Associate, University of Montana,  
Missoula, MT

### HONORS AND AWARDS

- 2023** ALVSCE Early Career Research Award This award honors outstanding achievement in research by an early career faculty member in the Division of Agriculture, Life and Veterinary Sciences and Cooperative Extension (ALVSCE). College of Agriculture, Life, and Environmental Sciences, The University of Arizona, Tucson, AZ.

2019	GDPE Distinguished Alumni Award	Honored Alumni, Distinguished Ecologist Lecture: Remote sensing of the terrestrial carbon cycling: current status and future opportunities. Graduate Degree Program in Ecology, Colorado State University, Fort Collins, CO.
------	---------------------------------------	--

## SERVICE AND OUTREACH

### National/International Service and Outreach

2024	AGU Townhall Organizer and presenter	TH33D - Drylands in the Earth System: A Community Assembly to Discuss, Inform, and Celebrate the ARID (Adaptation and Response in Drylands) NASA Field Campaign Scoping Study Actionable Science Plan, Washington, D.C.
2024	NASA Science and Applications Team Meeting	NASA Earth Venture EMIT and ECOSTRESS Science and Applications Team Meeting, Pasadena, CA.
2024	UxS Session Organizer and Panel Member	Scoping a NASA Terrestrial Ecology Field Campaign in Drylands, Southwestern Indian Polytechnic Institute, Albuquerque, NM
2024	NASA ARID Workshop Organizer and convener	Scoping a NASA Terrestrial Ecology Field Campaign in Drylands, University of New Mexico, Albuquerque, NM.
2023	AGU Townhall Organizer and presenter	Drylands in the Earth System: A Community Discussion for Field Campaigns and Emerging Remote Sensing Tools. American Geophysical Union Annual Meeting, San Francisco, CA.
2023	NASA ARID Workshop Organizer and convener	The NASA Adaptation and Response in Drylands (ARID) Scoping Study kick-off workshop. University of Arizona, Tucson, AZ.
2023	ESA Townhall Organizer and convener	Drylands in the Earth System: A Community Discussion for Field Campaigns and Emerging Remote Sensing

		Tools. Ecological Society of America Annual Meeting, Portland, OR.
2023	ESA Hyperwall Organizer and convener	A case for NASA's next field campaign in dryland ecosystems. Ecological Society of America Annual Meeting, Portland, OR.
2023	Session Organizer and convener	Advances and Applications of Unoccupied Aerial Systems (UAS) Research in Landscape Ecology. International Association of Landscape Ecologists Annual Meeting, Riverside, CA.
2021-2022	Grass-Cast Seminar Series organizer and convener	"Advances in Remote Sensing-based Products and Tools for Rangeland Management, Monitoring, and Planning," hosted by the Grass-Cast Productivity Forecasting Science Team
2021	AIR workshop co-lead organizer	RainManSR desert grassland rainfall manipulation experimental facility, a joint venture of USDA-ARS and the University of Arizona
2020	Stakeholder Workshop USDA Farm Service Agency co-lead	Grassland Productivity Forecast ("Grass-Cast") Virtual Workshop, USDA Southwest and Northern Plains Climate Hubs, the University of Arizona, Colorado State University, the Agricultural Research Service
2020	Stakeholder Workshop USDA National Resources Conservation Service co-lead	Grassland Productivity Forecast ("Grass-Cast") Virtual Workshop, USDA Southwest and Northern Plains Climate Hubs, the University of Arizona, Colorado State University, the Agricultural Research Service
2020	SRM annual meeting session organizer	Symposium: Engaging Rangeland Managers in Grass-Cast to Improve Translation & Transfer. Society for Range Management Annual Meeting. Denver, CO.
2019	NASA Above Science Team Meeting	The 5 <sup>th</sup> NASA ABOVE Science Team Meeting, Scripps Seaside Forum, La Jolla, CA.

2019	BioSphere2 Rainforest Workshop	Biosphere 2 Tropical Rainforest Isotope Labeling Experiment pre-campaign workshop to make detailed plans for the core Fall 2019 project.
2018	AGU annual meeting session convener	B040: Integrated Understanding of Climate, Carbon, Nutrient Cycles, Human Activities, and their Interactions in Terrestrial Ecosystems. American Geophysical Union Annual Meeting, Washington, D.C.
2018	ICOFEST	Workshop: Integrating CO2 Fertilization Evidence Streams and Theory: Global Terrestrial Carbon Sink, Oak Ridge National Laboratory.
2018	ESA Session Organizer	Oral Session: Vegetation Dynamics and Ecosystem Resilience Under Global Climate Change. Ecological Society of America Annual Meeting, New Orleans, LA.
2018	NASA Panel Member	NASA Earth and Space Science Fellowship (NESSF) Program Carbon Cycle & Ecosystem (CC&E).
2018	EDO Annual Workshop, Co- Convener	Earth Dynamics Observatory (EDO): Opportunities for interdisciplinary collaboration and external funding, University of Arizona.

### **Memberships in Professional Societies**

2017 – present, American Association for the Advancement of Science (AAAS)  
2009 – present, American Geophysical Union (AGU)  
2008 – present, Ecological Society of America (ESA)

### **Departmental Committees**

2021 – Present, Chair, McGinnies Selection Committee  
2016 – Present, Member, The Natural Resources Studies Committee  
2016 – 2024, Member, SNRE Curriculum Committee  
2019 – 2023, Member, Information Technologies (IT) Committee

### **University Committees**

2021 – Present, Chair, Remote Sensing & Spatial Analysis GIDP  
2016 – Present, Member, Global Change GIDP  
2016 – Present, Member, Earth Dynamics Observatory Executive Committee

2021 – 2023, Member, CALS Dean’s Research Advisory Committee (DRAC)  
2021 – 2023, Member, Carter Travel Grant Selection Committee

## **TEACHING, ADVISING, AND MENTORSHIP**

### **Primary Advisor**

2024 – Present, Research Scientist, Stefanie Herrmann, SNRE, UA  
2023 – Present, Research Scientist, Fangyue Zhang, SNRE, UA  
2023 – Present, Postdoc, Daphna Uni, SNRE, UA  
2021 – Present, PhD, Wen Zhang, SNRE, UA

2020 – 2024, PhD, Charles Devine, SNRE, UA  
2023 – 2024, Postdoc, Jessica Guo, SNRE, UA  
2023 – 2024, Postdoc, Zheng Fu, SNRE, UA  
2021 – 2023, MSc, Emilio Cubilla, SNRE, UA  
2022 – 2023, Postdoc, Mostafa Javadian, SNRE, UA  
2019 – 2023, Postdoc, Fangyue Zhang, SNRE, UA  
2019 – 2023, Research Technician, Nathan Pierce, SNRE, UA  
2019 – 2022, Postdoc, Xueli Huo, SNRE, UA  
2019 – 2021, Postdoc, Hamid Dashti, SNRE, UA  
2017 – 2021, PhD, Xian Wang, SNRE, UA  
2017 – 2020, Postdoc, Dong Yan, SNRE, UA  
2017 – 2019, Postdoc, Matt Dannenberg, SNRE, UA  
2017 – 2019, MSc, Cynthia Norton, SNRE, UA

### **Graduate Committee**

2024 – Present, Yang Chen, University of Western Australia  
2024 – Present, Tegan Lengyel, University of Utah  
2020 – Present, PhD, Kai Lepley, GDE, UA  
2019 – Present, PhD, Kangsan Lee, SNRE, UA  
2019 – 2024, PhD, Eduardo Jimenez Hernandez, BE, UA  
2017 – 2024, PhD, Shuli Chen, EEB, UA  
2017 – 2022, PhD, Matthew Katterman, SNRE, UA  
2018 – 2022, PhD, Mostafa Javadian, HAS, UA  
2016 – 2021, PhD, Christoforus Bayu Risanto, HAS, UA  
2016 – 2021, PhD, Shambhu Paudel, SNRE, UA  
2016 – 2019, PhD, Amy Hudson, SNRE, UA  
2017 – 2019, MS, Julia Yang, SNRE, UA  
2017 – 2019, MS, Baishali Barua, BE, UA  
2016 – 2018, MS, Leland Sutter, SNRE, UA

## Undergraduate Mentoring

2023-2024 Lily Pendleton Casto  
2023-2024 Isaac Kim  
2023-2024 Mariia Romanchenko  
2023-2024 Caroline Margaret Bailey  
2022-2023 Hannah Runyon  
2022-2023 Juan Salas  
2022-2023 Alex Cataudella  
2021-2023 Julia Olson  
2020-2023 Jacob Blais  
2020-2023 Nick Tennes

## PUBLICATIONS (<sup>Δ</sup>Postdoc; <sup>δ</sup>PhD Student; <sup>ο</sup>MS Student, \*Senior Author)

Google Scholar career statistics – citations: 9458; h-index: 43; i10-index: 62

### 2024

98. Wang, X., Ciais, P., Wang L., Keenan, T., De Kauwe, M., Penuelas, J., Chen, G., Gong, X., Xiao, J., Xie, Q., Stoy, P., Makowski, D., **Smith, W.K.**, Wang, H., Wang, S., **Zhang, F.<sup>Δ</sup>**, Niu, S. Global patterns of leaf-level intrinsic water use efficiency over the last 20 years (*in review*).
97. **Zhang, F.<sup>Δ</sup>**, Biederman, J.A., ..., **Smith, W.K.\*** Differential plant functional type phenological responses to the temporal repackaging of precipitation imply major shifts in dryland function with climate change (*in review*).
96. Pierrat, Z., Magney, T., Richardson, W.P., Runkle, B.R.K., Diehl, J.L., Yang, X., Woodgate, W., **Smith, W.K.**, Johnston, M.R., Ginting, Y.R.S., Koren, G., Albert, L., Kibler, C.L., Morgan, B.E., Barnes, M., Uscanga, A., **Devine, C.<sup>δ</sup>**, **Javadian, M.<sup>Δ</sup>**, Meza, K., Julitta, T., Tagliabue, G., Dannenberg, M.P., Antala, M., Wong, C.Y.S, Santos, A.L.D., Hufkens, K., Marrs, J.K., Stovall, A.E.L., Liu, Y., Fisher, J.B., Gamon, J., Cawse-Nicholson, K. Proximal Remote Sensing: An essential tool for bridging the gap between high resolution ecosystem monitoring and global ecology. [Tansley Review] Proximal Remote Sensing: An essential tool for bridging the gap between high resolution ecosystem monitoring and global ecology. *New Phytologist* (*in review*).
95. Johnston, M., Barnes, M., Priesler, Y., **Smith, W.K.**, Biederman, J., Scott, R., William, A.P., Dannenberg, D. Effects of Hot vs. Dry Vapor Pressure Deficit on Ecosystem Carbon and Water Fluxes *Journal of Geophysical Research–Biogeosciences* (*in revision*).

94. **Zhang, W.<sup>δ</sup>, Smith W.K.\***, Keenan, T.F., Dannenberg, M.P., Li, Y., Wang, S., Kimball, J.S., Moore, D.J.P.\* Seasonal stabilization effects slowed the greening of the Northern Hemisphere. *Nature Communications* (in revision).
93. **Wang, X.<sup>δ</sup>, Yan, D.<sup>Δ</sup>**, Scott, R.L., Dannenberg, M.P., Zhang, Y., Yang, X., Magney, T., **Smith, W.K.\*** Integrated measurements of SIF, NIRvP, and PRI provide mechanistic insights into the drought response of a semiarid grassland ecosystem. *Remote Sensing of Environment* (in revision).
92. Sun, M., Wang, L., Kannenberg, S., Liu, H., Schwalm, C., Ciais, P., Gentine, P., **Smith, W.K.**, Yu, K., Zhang, W., Li, Y., Yang, Y., Li, X., Chen, X., Chen, D., Zhang P. Hydraulic traits control seasonal wood growth variability in northern forests. *Earth's Future* (in revision).
91. Villarreal, M., Bishop, T.B., Sankey, T.T., **Smith, W.K.** Burgess, M.A., Caughlin, T., Gillan, J.K., Havrilla, C.A., Huang, T., Lebeau, R., Norton, C., Sankey, J.B., Scholl, V., von Nonn, J., Yao, E.H. **2024**. Applications of Unoccupied Aerial Systems (UAS) in Landscape Ecology: A review of recent research, challenges, and emerging opportunities. *Landscape Ecology* (in revision).
90. **Jordan, S.<sup>δ</sup>, Smith, W.K.**, Sala, O. **2024**. Ecosystem services of military-managed drylands in the western United States. *Ecological Applications* (accepted).
89. **Zhang, F.<sup>Δ</sup>**, Biederman, J.A., Schlaepfer, D.R., Bradford, J.B., Reed, S.C., **Smith, W.K.\*** **2024**. Escalating soil water deficit under meteorological drought across the western United States *Ecohydrology* (accepted).
88. Feldman, A.F., Konings, A.G., Gentine, P., Asadollahi, M., Wang, L., **Smith, W.K.**, Biederman, J.A., Chatterjee, A., Jointer, J., Poulter, B. **2024**. Less frequent but more intense rainfall events as a driver of major shifts in global vegetation. *Nature* (accepted).
87. Du, J., Kimball, J.S., **Guo<sup>Δ</sup>, J.S.**, Kannenberg, S.A., **Smith, W.K.**, Feldman, A.F., Endsley, A. **2024**. Enhanced satellite monitoring of dryland vegetation water potential through multi-source sensor fusion. *Geophysical Research Letters* DOI: 10.1029/2024GL110385.

86. **Zhang, F.<sup>A</sup>**, Biederman, J.A., Pierce, N.A., Potts, D.L., Reed, S.C., **Smith, W.K.\*** 2024. Direct and legacy effects of varying cool-season precipitation totals on ecosystem carbon flux in a semi-arid mixed grassland *Plant Cell and Environment* DOI: 10.1111/pce.15175.
85. Feldman, A.F., Reed, S.C., ..., **Smith, W.K.**, ... 2024. Community Insights for scoping a NASA Terrestrial Ecology field campaign in drylands: ARID. *Earth's Future*, DOI: 10.1029/2024EF004811.
84. **Huo, X.<sup>A</sup>**, Fox, A.M., **Dashti, H.<sup>A</sup>**, **Devine, C.J.<sup>δ</sup>**, Gallery, W., Smith, W.K., Raczka, B., Anderson, J.L., Rogers, A., Moore, D.J.P. 2024. Integrating state data assimilation and innovative model parameterization reduces simulated carbon uptake in the Arctic and Boreal region. *Journal of Geophysical Research–Biogeosciences*, DOI: 10.1029/2024JG008004.
83. **Dashti, H.<sup>A</sup>**, Chen, M., **Smith, W.K.**, Zhao, K., Moore, D.J.P. 2024. Disturbance recovery under climate change: what it was or what it could have been? *Geophysical Research Letters* DOI: 10.1029/2024GL109219.
82. **Javadian, M.<sup>A</sup>**, Scott, R.L., Woodgate, W., Richardson, A.D., Dannenberg, M.P., **Smith, W.K.\*** 2024. Canopy temperature dynamics are closely aligned with ecosystem water availability across a water- to energy-limited gradient *Agricultural and Forest Meteorology* 357, 110206.
81. **Yan, D.<sup>A</sup>**, Reed, S.C., **Rutherford, W.A.<sup>δ</sup>**, **Javadian, M.<sup>A</sup>**, Reibold, R.H., Vallarreal, M., Poulter, B., Song, S., **Smith, W.K.\*** 2024. Hyperspectral imaging predicts differences in carbon and nitrogen status among representative biocrust functional groups of the Colorado Plateau. *Journal of Geophysical Research–Biogeosciences* DOI: 10.1029/2024JG008089.
80. Meng, F., Felton, A.J., Mao, J., Cong, M., **Smith, W.K.**, Korner, C., Hu, Z., Hong, S., Knott, J., Yan, Y., Guo, B., Deng, Y., Leisz, S., Dorji, T., Wang, S., Chen, A. 2024. Consistent time allocation fraction to vegetation green-up versus senescence across northern ecosystems despite recent climate change. *Science Advances* DOI: 10.1126/sciadv.adn2487.
79. **Fu, Z.<sup>A</sup>**, Ciais, P., Wigneron, J., Prentice, C., Gentine, P., Feldman, A.F., Yakir, D., Makowski, D., Kemanian, A., Liu, L., Viovy, N., Stoy, P., Ma, H., Li, X., Huang, Y., Yu, K., Zhu, P., Li X., Zhu, Z., Lian, J., **Smith, W.K.** 2024. Global



critical soil moisture thresholds of plant water stress. *Nature Communications* 15, 4826.

78. **Guo, J.S.<sup>A</sup>**, Barnes, M.L., **Smith, W.K.**, Anderegg, W.R.L., Kannenberg, S.A. **2024**. Dynamic regulation of water potential in *Juniperus osteosperma* mediates ecosystem carbon fluxes. *New Phytologist* DOI: 10.1111/nph.19805.

77. Wu, B., **Smith, W.K.**, Zeng, H. **2024**. Dryland Dynamics and Driving Forces. In: Fu, B., Stafford-Smith, M. (eds) Dryland Social-Ecological Systems in Changing Environments. Springer, Singapore.

76. Biederman J.A., **Zhang, F.<sup>A</sup>**, Dannenberg, M.P., Reed, S.C., **Yan, D.<sup>A</sup>**, **Smith, W.K.\* 2024**. Reply to Comment on “Five Decades of Observed Daily Precipitation Reveal Longer and More Variable Drought Events Across Much of the Western United States”. *Geophysical Research Letters* 51, e2023GL105124.

## 2023

75. **Javadian, M.<sup>A</sup>**, Scott, R.L., Biederman, J.A., **Zhang, F.<sup>A</sup>**, Fisher, J., Reed, S., Potts, D., Villarreal, M., **Feldman, A.<sup>A</sup>**, **Smith, W.K.\* 2023**. Thermography captures the differential sensitivity of dryland functional types to changes in rainfall event timing and magnitude. *New Phytologist* DOI: 10.1111/nph.19127.

74. **Zhang, F.<sup>A</sup>**, Biederman, J.A., **Devine, C.J.<sup>δ</sup>**, Pierce, N.A., **Yan, D.<sup>A</sup>**, **Javadian, M.<sup>A</sup>**, Potts, D.L., **Smith, W.K.\* 2023**. Using high frequency digital repeat photography to quantify the sensitivity of a semi-arid grassland ecosystem to the temporal repackaging of precipitation. *Agricultural and Forest Meteorology* 338 109539.

73. Zhang, Y., Fang, J., **Smith, W.K.**, **Wang, X.<sup>δ</sup>**, Gentine, P., Scott, R., Migliavacca, M., Jeong, S., Litvak, M., Piao, S., Zhou, S. **2023**. Satellite solar-induced chlorophyll fluorescence tracks physiological drought stress development during 2020 southwest US drought. *Global Change Biology* DOI: 10.1111/gcb.16683.

72. Poulter, B. Currey, B., Calle, L., Shiklomanov, A.N., Amaral, C.H., Brookshire, J., Campbell, P., Chlus, A., Cawse-Nicholson, K., Huemmrich, F., Miller, C.E., Miner, K., Pierrat, Z., Raiho, A.M., Schimel, D., Serbin, S., **Smith, W.K.**, Stavros, N., Stutz, J., Townsend, P., Thompson, D.R., Zhang, Z. **2023**. Simulating global dynamic surface reflectances for imaging spectroscopy spaceborne missions - LPJ-PROSAIL. *Journal of Geophysical Research–*

*Biogeosciences* DOI: 10.1029/2022JG006935. [Special Issue: The Earth in Living Color: Spectroscopic and Thermal Imaging of the Earth: NASA's Decadal Survey Surface.](#)

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

70. Yang, L., **Zhang, W.**<sup>δ</sup>, Schwalm, C.R., Gentine, P., **Smith, W.K.**, Ciais, P., Kimball, J.S., Gazol, A., Kannenberg, S.A., Chen, A., Piao, S., Liu, H. Chen, D., Wu, X. **2023**. Widespread vegetation phenology effects on drought recovery. *Nature Climate Change* DOI: 10.1038/s41558-022-01584-2. [Research Highlight.](#)

## 2022

70. Dannenberg, M.P., Barnes, M.L., **Smith, W.K.**, **Johnston, M.R.**<sup>A</sup>, Meerdink, S.K., **Wang, X.**<sup>δ</sup>, Scott, R.L., Biederman, J.A., Litvak, M.E., Kimball, J.S. **2022**. Upscaling dryland carbon and water fluxes with artificial neural networks of optical, thermal, and microwave satellite remote sensing. *Biogeosciences Discussions* DOI: 105194/bg-2022-186.

69. **Roby, M.C.**<sup>δ</sup>, Scott, R.L., Biederman, J.A., **Smith, W.K.**, Moore, D.J.P. **2022**. Response of soil carbon dioxide efflux in a semiarid grassland under temporal repackaging of rainfall into fewer, larger events. *Frontiers in Environmental Science* DOI: 10.3389/fenvs.2022.940943.

68. **Dashti, H.**<sup>A</sup>, **Smith, W.K.**<sup>\*</sup>, Huo, Xueli, Fox, A.M., **Javadian, M.**<sup>δ</sup>, **Devine, C.J.**<sup>δ</sup>, Behrang, A., Moore, D.J.P. **2022**. Underestimation of the impact of land cover change on the biophysical environment of the Arctic and Boreal Region of North America *Environmental Research Letters* DOI: 10.1088/1748-9326/ac8da7.

67. Fox, A.M., **Huo, X.**<sup>A</sup>, Hoar, T.J., **Dashti, H.**<sup>A</sup>, **Smith, W.K.**, MacBean, N., Anderson, J.L., Roby, M., Moore, D.J.P. **2022**. Assimilation of global satellite leaf area estimates reduces global carbon uptake and energy loss by terrestrial ecosystems. *Journal of Geophysical Research–Biogeosciences* DOI: 10.1029/2022JG006830.

66. Dannenberg, M.P., Yan, D., Barnes, M.L., **Smith, W.K.**, **Johnston, M.R.**<sup>A</sup>, Scott, R.L., Biederman, J.A., Knowles, J.F., **Wang, X.**<sup>δ</sup>, Durnan, T., Litvak, M.E., Kimball, J.S., Williams, A.P., Zhang, Y. **2022**. Exceptional heat and atmospheric dryness amplified losses of primary production during the 2020 U.S. Southwest hot drought. *Global Change Biology* DOI: 10.1111/gcb.16214.
65. **Javadian, M.**<sup>δ</sup>, **Smith, W.K.**<sup>\*</sup>, **Kangsan, L.**<sup>δ</sup>, Knowles, J.F., Scott, R.L., Fisher, J.B. Moore, D.J.P., van Leeuwen, W.J.D., Behrangi, A. **2022**. Canopy temperature is regulated by ecosystem structural traits and captures the ecohydrologic dynamics of a semiarid mixed conifer forest site. *Journal of Geophysical Research–Biogeosciences* DOI: 10.1029/2021JG006617. [Special Issue: The Earth in Living Color: Spectroscopic and Thermal Imaging of the Earth: NASA's Decadal Survey Surface.](#)
64. **Hudson, A.**<sup>δ</sup>, **Smith, W.K.**, Moore, D.J.P., Trouet, V. **2022**. Length of growing season is modulated by Northern Hemisphere jet stream variability. *International Journal of Climatology* DOI: 10.1002/joc.7553.
63. **Wang, X.**<sup>δ</sup>, Biederman, J.A., Knowles, J.F., Scott, R.L., Turner, A.J., Koehler, P., Frankenberg, C., Litvak, M.E., Flerchinger, G.N., Law, B.E., Kwon, H., Reed, S.C., Parton, W.J., Barron-Gafford G.A., **Smith, W.K.**<sup>\*</sup> **2022**. Satellite solar-induced chlorophyll fluorescence and near-infrared reflectance capture complementary aspects of dryland vegetation dynamics. *Remote Sensing of Environment* DOI: 10.1016/j.rse.2021.112858.
62. Bastos, A., Naipal, V., Ahlstrom, A., MacBean, N., **Smith, W.K.**, Poulter, B. **2022**. Semi-arid Ecosystems. In Poulter, B., Canadell, J., Hayes, D., Thompson, R. (Eds.). *Balancing Greenhouse Gas Budgets: Accounting for Natural and Anthropogenic Flows of CO<sub>2</sub> and other Trace Gases*. Elsevier. ISBN: 9780128149522.

## 2021

61. **Zhang, F.**<sup>A</sup>, Biederman, J.A, Pierce, N., Potts, D., **Devine, C.**<sup>δ</sup>, Yanbin, H., **Smith, W.K.**<sup>\*</sup> **2021**. Precipitation temporal repackaging into fewer, larger storms delayed seasonal timing of peak photosynthesis in a semi-arid grassland. *Functional Ecology* DOI: 10.1111/1365-2435.13980.
60. Wang, S., Zhang, Y., Ju, W., Chen, J.M., Ciais, P., Cescatti, A., Sardans, J., Janssens, I.A., Wu, M., Berry, J.A., Campbell, E., Fernandez-Martinez, M., Alkama, R., Sitch, S., Friedlingstein, P., **Smith, W.K.**, Yuan, W., He, W.,

Lombardozi, D., Kautz, M., Zhu, D., Lienert, S., Kato, E., Poulter, B., Sanders, T.G.M., Krüger, I., Wang, R., Zeng, N., Tian, H., Vuichard, N., Jain, A.K., Wiltshire, A., Haverd, V., Goll, D.S., Peñuelas J. **2021**. Response to Comments on “Recent global decline of CO<sub>2</sub> fertilization effects on vegetation photosynthesis.” *Science* DOI: 10.1126/science.abg7484.

59. Gampe, D., Zscheischler, J., Reichstein, M., O’Sullivan, M., **Smith, W.K.**, Sitch, S., Buermann, W. **2021**. Increasing impact of warm droughts on northern ecosystem productivity over recent decades. *Nature Climate Change* DOI: 10.1038/s41558-021-01112-8.
58. Jiao, W., Wang, L., **Smith, W.K.**, Chang, Q., Wang, H. **2021**. Observed increasing water constraint on vegetation growth over the last three decades. *Nature Communications* DOI: 10.1038/s41467-021-24016-9.
57. **Norton, C.<sup>σ</sup>, Dannenberg, M.P.<sup>Δ</sup>, Yan, D.<sup>Δ</sup>**, Van Leeuwen, W.J.D., Wallace, C.S.A., **Smith, W.K.\*** **2021**. Drought and socioeconomic factors mediate irrigation dynamics in the Colorado River Basin. *Remote Sensing* DOI: 10.3390/rs13091659.
56. **Zhang, F.<sup>Δ</sup>, Biederman, J.A, Dannenberg, M.P. <sup>Δ</sup>, Yan, D. <sup>Δ</sup>, Reed, S.C., Smith, W.K.\*** **2021**. Five Decades of Observed Daily Precipitation Reveal Longer and More Variable Drought Events Across Much of the Western United States. *Geophysical Research Letters* DOI: 10.1029/2020GL092293.
55. **Dannenberg, M.P.<sup>Δ</sup>, Smith, W.K.\***, Zhang, Y., Song, C., Huntzinger, D., Moore, D.J.P. **2021**. Different responses of the global terrestrial carbon cycle to central vs. eastern Pacific ENSO events. *Geophysical Research Letters* DOI: 10.1029/2020GL092367.
54. Walker, A.P., De Kauwe, M.G., Bastos, A., Belmecheri, S., Georgiou, K., Keeling, R., McMahon, S., Medlyn, B.E., Moore, D.J.P., Norby R.J., Zaehle, S., ..., **Smith, W.K.**, ... **2021**. Integrating the evidence for a terrestrial carbon sink caused by increasing atmospheric CO<sub>2</sub>. *New Phytologist* DOI: 10.1111/nph.16866 ([Faculty of 1000 Ecology](#)).

## 2020

53. Wang, S., Zhang, Y., Ju, W., Chen, J.M., Ciais, P., Cescatti, A., Sardans, J., Janssens, I.A., Wu, M., Berry, J.A., Campbell, E., Fernandez-Martinez, M., Alkama, R., Sitch, S., Friedlingstein, P., **Smith, W.K.**, Yuan, W., He, W.,

- Lombardozi, D., Kautz, M., Zhu, D., Lienert, S., Kato, E., Poulter, B., Sanders, T.G.M., Krüger, I., Wang, R., Zeng, N., Tian, H., Vuichard, N., Jain, A.K., Wiltshire, A., Haverd, V., Goll, D.S., Peñuelas J. **2020**. Recent global decline of CO<sub>2</sub> fertilization effects on vegetation photosynthesis. *Science* 370, 1295-1300 ([Faculty of 1000 Ecology](#)).
52. O'Sullivan, M., **Smith, W.K.**, Sitch, S., Friedlingstein, P., Arora, V.K., Haverd, V., Jain, A., Kato, E., Kautz, M., Lombardozi, D., Nabel, J., Tian, H., Vuichard, N., Wiltshire, A., Zhu, D., Buermann W. **2020**. Climate-driven variability and trends in plant productivity over recent decades based on three global products. *Global Biogeochemical Cycles* DOI: 10.1029/2020GB006613.
51. **Yang, J.<sup>σ</sup>**, Magney, T., **Yan, D.<sup>Δ</sup>**, Knowles, J., **Smith, W.K.**, Scott, R., Barron-Gafford, G. **2020**. The photochemical reflectance index (PRI) captures the ecohydrologic sensitivity of a semi-arid mixed conifer forest. *Journal of Geophysical Research–Biogeosciences* DOI: 10.1029/2019JG005624.
50. Hartman, M.D., Parton, W.J., Peck, D., Derner, J.D., Fuchs, B., Schulte, D., **Smith, W.K.**, Chen, M., Day, K.A., Del Grosso, S.J., Lutz, S., Gao, W. **2020**. Seasonal Grassland Productivity Forecast for the U.S. Great Plains using Grass-Cast. *Ecosphere* DOI: 10.1002/ecs2.3280.
49. **Wang, X.<sup>δ</sup>**, **Dannenberg, M.P.<sup>Δ</sup>**, **Yan, D.<sup>Δ</sup>**, Jones, M.O., Kimball, J.S., Moore, D.J.P., van Leeuwen, W.J.D., Didan, K., **Smith, W.K.\*** **2020**. Globally consistent patterns of asynchrony in the phenology of optical, microwave, and fluorescence satellite data. *Journal of Geophysical Research–Biogeosciences* DOI: 10.1029/2020JG005732.
48. **Javadian, M.<sup>σ</sup>**, Behrangi, A., **Smith, W.K.**, Fisher, J.B. **2020**. Global Trends in Evapotranspiration Dominated by Increases across Large Cropland Regions. *Remote Sensing* DOI: 10.3390/rs12071221.
47. **Dannenberg, M.P.<sup>Δ</sup>**, **Wang, X.<sup>δ</sup>**, **Yan, D.<sup>Δ</sup>**, **Smith, W.K.\*** **2020**. Phenological characteristics of global ecosystems based on optical, fluorescence, and microwave remote sensing. *Remote Sensing* DOI: 10.3390/rs12040671.
46. **Smith, W.K.\***, Fox, A.M., MacBean, N.L., Moore, D.J.P., Parazoo, N.C. **2020**. [Invited] Tansley Insight: Constraining estimates of terrestrial carbon uptake: New opportunities using long-term satellite observations and data assimilation. *New Phytologist* DOI: 10.1111/nph.16055. [Special Issue: Innovations](#)

[in plant science from integrative remote sensing research.](#)

2019

45. Yu, K., **Smith, W.K.**, Trugman, A.T., Condit, R., Hubbell, S.P., Sardans, J., Peng, C., Penuelas, J., Anderegg, W.R.L. **2019**. Pervasive decreases in living vegetation carbon turnover time across forest climate zones. *Proceedings of the National Academy of Sciences of the USA* DOI: 10.1073/pnas.1821387116.
44. Chen, M., Parton, W.J., Hartman, M.D., Del Grosso, S.J., **Smith, W.K.**, Knapp, A.K., Lutz, S., Derner, J.D., Tucker, C.J., Ojima, D.S., Volesky, J.D., Stephenson, M.B., Gao, W. **2019**. Assessing Precipitation, Evapotranspiration, and NDVI as Controls of U.S. Great Plains Plant Production. *Ecosphere* 10, e02889.
43. **Dannenber, M.P.**<sup>Δ</sup>, Wise, E.K., **Smith, W.K.**\* **2019**. Reduced forest growth due to asymmetric responses to intensifying precipitation extremes. *Science Advances* 5, eaaw0667.
42. **Smith, W.K.**\*, **Dannenber, M.P.**<sup>Δ</sup>, **Yan, D.**<sup>Δ</sup>, Herrmann, S., Barnes, M.L., Barron-Gafford, G.A., Biederman, J.A., Ferrenberg, S., Fox, A.M., Hudson, A., Knowles, J.F., MacBean, N., Moore, D.J.P., Nagler, P.L., Reed, S.C., Rutherford, W.A., Scott, R.L., **Wang, X.**<sup>δ</sup>, Yang, J. **2019**. Remote sensing of dryland ecosystem structure and function: Progress, challenges, and opportunities. *Remote Sensing of Environment* 233, 111401. [Special Issue: 50 Years of Environmental Remote Sensing Research.](#)
41. Yuan, W., Zheng, Y., Piao, S., Ciais, P., Lombardozzi, D., Wang, Y., Ryu, Y., Chen, G., Cox, P., Dong, W., Hu, Z., Jain, A.K., Jiang, C., Kato, E., Li, S., Lienert, S., Liu, S., Nabel, J., Qin, Z., Quine, T., Sitch, S., **Smith, W.K.**, Wang, F., Wu, C., Xiao, Z., Yang, S. **2019**. Increased atmospheric vapor pressure deficit reduces global vegetation growth. *Science Advances* 5, eaax1396 ([Faculty of 1000 Ecology](#)).
40. Renwick, K.M., Fellows, A., Flerchinger, G.N., Lohse, K.A., Clark, P.E., **Smith, W.K.**, Emmett, K., Poulter, B. **2019**. Modeling phenological controls on carbon dynamics in dryland sagebrush ecosystems. *Agriculture & Forest Meteorology* 274, 85-94.
39. Bastos, A., Ciais, P., Chevallier, F., Rödenbeck, C., Ballantyne, A.P., Maignan, F., Yin, Y., Fernandez-Martinez, M., Friedlstein, P., Peñuelas, J., Piao, S.L.,

Sitch, S., **Smith W.K.**, Wang, X., Zhu, Z. *et al.* **2019**. Contrasting effects of CO<sub>2</sub> fertilisation, land-use change and warming on seasonal amplitude of northern hemisphere CO<sub>2</sub> exchange. *Atmospheric Chemistry and Physics* DOI: 10.5194/acp-2019-252.

38. Shiklomanov, A.N., Bradley, B.A., Dahlin, K., Fox, A., Gough, C., Hoffman, F.M., Middleton, E., Serbin, S., Smallman, L., **Smith, W.K.** **2019**. Enhancing global change experiments through integration of remote sensing techniques. *Frontiers in Ecology and the Environment* DOI: 10.1002/fee.2031.
37. Levesque, M., Andreu-Hayles, L., **Smith, W.K.**, Williams, A.P., Hobi, M.L., Pederson, N. **2019**. Tree-ring isotopes capture interannual vegetation productivity dynamics at the biome scale. *Nature Communications* 10, 742.
36. **Smith, W.K.\***, Pennington, D.N., Johnson, J.A., Nelson, E., Polasky, S., Milder, J.C., Gerber, J.S., West, P.C., Siebert, S., Brauman, K.A., Carlson, K.M., Arbutnot, M. **2019**. Voluntary sustainability standards could significantly reduce detrimental impacts of global agriculture. *Proceedings of the National Academy of Sciences of the USA* DOI: 10.1073/pnas.1707812116.
35. **Yan, D.<sup>Δ</sup>**, Scott, R.L., Moore, D.J.P., Biederman, J.A., **Smith, W.K.\*** **2019**. Understanding the relationship between vegetation greenness and productivity across dryland ecosystems through the integration of PhenoCam, satellite, and eddy covariance data. *Remote Sensing of Environment* DOI: 10.1016/j.rse.2018.12.029.

## 2018

34. Fox, A.M., Hoar, T.J., Anderson, J.L., Arellano, A.F., **Smith, W.K.**, Litvak, M.E., MacBean, N., Schimel, D.S., Moore, D.J.P. **2018**. Evaluation of a Data Assimilation System for Land Surface Models using CLM4.5. *Journal of Advances in Modeling Earth Systems* DOI: 10.1029/2018MS001362.
33. Buermann, W., Forkel, M., O'Sullivan, M., Sitch, S.S., Friedlingstein, P., Haverd, V., Jain, A.K., Kato, E., Kautz, M., Lienert, S., Lombardozzi, D., Nabel, J.E.M.S, Tian, H., Wiltshire, A.J., Zhu, D., **Smith, W.K.**, Richardson, A.D. **2018**. Widespread seasonal compensation effects of spring warming on northern plant productivity. *Nature* 562, 110-114.

32. Tucker, C., Yan, D.<sup>Δ</sup>, Dannenberg, M.P.<sup>Δ</sup>, Reed, S.C., Smith, W.K.\* 2018. Science at the Frontier: Multi-method research to evaluate ecosystem change across multiple scales. *New Phytologist* DOI: 10.1111/nph.15195.
31. Robinson, N.P., Allred, B.W., Smith, W.K., Jones, M.O., Moreno, A., Erickson, T.A., Naugle, D.E., Running, S.W.: Landsat 30 m and MODIS 250 m derived terrestrial primary production for the conterminous United States. 2018. *Remote Sensing in Ecology and Conservation* DOI: 10.1002/rse2.74.
30. Sloat, L.L., Gerber, J.S., Samberg, L.H., Smith, W.K., Herrero, M., Ferreira, L.G., Godde, C.M., Power, B., Waha, K., West, P.C. 2018. Increasing importance of precipitation variability on global livestock grazing lands. *Nature Climate Change* 8, 214-218.
29. Dannenberg, M.P.<sup>Δ</sup>, Wise, E.K., Janko, M., Hwang, T., Smith, W.K.\* Atmospheric influence on North American land surface phenology and productivity. 2018. *Environmental Research Letters* DOI: 10.1088/1748-9326/aaa85a.
28. Smith, W.K.\*, Biederman, J.A., Scott, R.L., Moore, D.J.P., He, M., Kimball, J.S., Yan, D.<sup>Δ</sup>, 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 Letters* DOI: 10.1002/2017GL075922.
27. Wood, S.L., Jones, S.K., Johnson J.A, Brauman, K., Chaplin-Kramer, B., Smith, W.K., Fremier, A., Mulligan, M., Naeem, S., O'Farrel, P., Willemen, L., Zheng, W., DeClerck F.A. 2018. Distilling the role of ecosystem services in the Sustainable Development Goals. *Ecological Services* 29, 70-82.
- 2017**
26. Chen, M., Parton, W.J., Del Grosso S.J., Hartman, M.D., Day, K., Tucker, C.J., Derner, J.D., Knapp, A.K., Smith, W.K., Ojima, D.S., Gao, W. 2017. The signature of sea surface temperature anomalies on the dynamics of semiarid grassland productivity. *Ecosphere* DOI: 10.1002/ecs2.2069.
25. Liu, Y., Piao, S., Xu, L., Ciais, P., Smith, W.K. Seasonal responses of terrestrial carbon cycle to climate variation in the CMIP5 models: evaluation and projection. 2017. *Journal of Climate* DOI: 10.1175/JCLI-D-16-0555.1.



24. Biederman, J.A., Scott, R.L., Bell, T.W., Bowling, D.R., Dore, S., Garatuza-Payan, J., Kolb, T.E., Krishnan, P., Krofcheck, D.J., Litvak, M.E., Maurer, G.E., Meyers, T.P., Oechel, W.C., Papuga, S.A., Ponce-Campos, G.E., Rodriguez, J.C., **Smith, W.K.**, Vargas, R., Watts, C.J., Yepez, E.A., Goulden, M.L. Carbon and water exchange across dryland ecosystems of southwestern North America. **2017**. *Global Change Biology* DOI: 10.1111/gcb.13686.
23. Wang, J., Dong, J., Yu, G., Wang, S., Li, G., Yi, Y., Lu, G., Li, Y., Zhang, F., Oyler, J., **Smith, W.K.**, Zhao, M., Liu, J., Running, S.W. **2017**. Decreasing net primary production due to drought and slight decreases in solar radiation in China from 2000 to 2012. *Journal of Geophysical Research – Biogeosciences* DOI: 10.1002/2016JG003417.
22. Ballantyne, A.P., **Smith, W.K.**, Anderegg, W.R.L., Kauppi, P., Sarmiento, J., Tans, P., Shevliakova, E., Pan, Y., Poulter, B., Anav, A., Friedlingstein, P., Houghton, R., Running, S.W. **2017**. Accelerating net terrestrial carbon uptake during the warming hiatus due to reduced respiration. *Nature Climate Change* 7, 148-52.
- 2016**
21. Ahrestani, F.S., **Smith, W.K.**, Hebblewhite, M., Running, S.W., Post, E. **2016**. Variation in stability of elk and red deer populations with abiotic and biotic factors at the species-distribution scale. *Ecology* 97, 3184-94.
20. **Smith, W.K.\***, Reed, S.C., Ballantyne A.P., Cleveland, C.C., Anderegg, W.R.L., Wieder W.R., Running, S.W. **2016**. Large divergence of satellite and Earth system model estimates of global terrestrial CO<sub>2</sub> fertilization. *Nature Climate Change* 6, 306–310 ([Faculty of 1000 Ecology](#)).
- 2015**
19. Anderegg, W.R.L., Ballantyne, A.P., **Smith, W.K.**, Majkut, J., Rabin, S., Kauppi, P., Beaulieu, C., Birdsey, R., Dunne, J, Houghton, R, Myneni, R., Pan, Y., Sarmiento, J., Serota, N., Shevliakova, E., Tans, P., Pacala S. **2015**. Sensitivity of respiration to tropical nighttime warming drives increasing variability in the terrestrial carbon sink. *Proceedings of the National Academy of Sciences of the USA* 112, 15591–6.

18. Wieder, W.R., Cleveland, C.C., **Smith, W.K.**, Todd-Brown, K. 2015. Land unlikely to become large carbon source-Response. *Nature Geoscience* 8, 893–894.
17. Cleveland, C.C., Taylor, P., Chadwick, D.K., Dahlin, K., Doughty, C.E., Malhi, Y., **Smith, W.K.**, Sullivan, B.W., Wieder, W.R., Townsend, A.R. 2015. An inter-comparison of plot-scale, satellite and earth system model estimates of tropical net primary production. *Global Biogeochemical Cycles* 29, 626-644.
16. Allred, B.W., **Smith, W.K.**, Twidwell, D., Haggerty, J.H., Running, S.W., Naugle, D.E., Fuhlenforf, S.D. 2015. Ecosystem services lost to oil and gas in North America. *Science*, 328, 401-403.
15. Wieder, W.R., Cleveland, C.C., **Smith, W.K.**, Todd-Brown, K. 2015. Nutrient availability strongly constrains future terrestrial productivity and carbon storage. *Nature Geoscience* 8, 441-444.
14. Cavaleri, M.A., Reed, S.C., **Smith, W.K.**, Wood, T.E. 2015. Urgent need for warming experiments in tropical forests. *Global Change Biology*, DOI: 10.1111/gcb.12860.

## 2014

13. Small, E.E., Larson K.M, **Smith, W.K.** 2014. Normalized Microwave Reflectance Index: Validation of Water Content Estimates from Montana Grasslands. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing* DOI: 10.1109/JSTARS.2014.2320597.
12. Sullivan, B.W., **Smith, W.K.**, Nasto, M.K., Reed, S.C., Townsend, A.R., Chazdon, R., Cleveland, C.C. 2014. Spatially robust estimates of biological nitrogen (N) fixation imply substantial human alteration of the tropical N cycle. *Proceedings of the National Academy of Sciences of the USA* 111, 8101-8106.
11. Hurley, M.A., Hebblewhite, M., Gaillard, J., Dray, S., Taylor, K.A., **Smith, W.K.**, Zager, P., Bonenfant, C. 2014. Functional analysis of NDVI curves reveals overwinter mule deer survival is driven by both spring and fall phenology. *Philosophical Transactions of the Royal Society B* 369, 20130196.
10. Wang, J., Dong, J., Liu, J., Huang, M., Li, G., Running, S.W., **Smith, W.K.**, Harris, W., Fujinuma, Y., Kondo, H., Lui, Y., Hirano, T., Gamo, M., Xiao, X. 2014. Comparison of Gross Primary Productivity Estimates derived from

GIMMS NDVI3g, GIMMS, and MODIS in Southeast Asia. *Remote Sensing* 6, 2108-2133.

9. **Smith, W.K.**, Cleveland, C.C., Reed, S.C., Running, S.W. 2014. Agricultural conversion without external water and nutrient inputs reduces terrestrial vegetation productivity. *Geophysical Research Letters* 41, 449-455.

#### 2013

8. Haberl, H., Erb, K.H., Krausmann, F., Running, S.W., Searchinger, T.D., **Smith, W.K.** 2013. Bioenergy: how much can we expect for 2050? *Environmental Research Letters* 8, 031004.
7. Cleveland, C.C., Houlton, B.Z., **Smith, W.K.**, Marklein, A.R., Reed, S.C., Parton, W.J., Del Grosso, S.J., Running, S.W. 2013. Patterns of new versus recycled primary production in the terrestrial biosphere. *Proceedings of the National Academy of Sciences of the USA* 110, 12733-12737.

#### 2012

6. Running, S.W., **Smith, W.K.** 2012. Pushing the Planetary Boundaries-Response. *Science* 338, 1420-1420.
5. **Smith, W.K.**, Zhao, M., Running, S.W. 2012. Global bioenergy capacity as constrained by observed biospheric productivity rates. *BioScience* 62, 911-922.
4. **Smith, W.K.**, Cleveland, C.C., Reed, S.C., Miller, N.L., Running, S.W. 2012. Bioenergy potential of the United States constrained by satellite observations of existing productivity. *Environmental Science & Technology* 46, 3536-3544.
3. Rout, M.E., Chrzanowski, T.H., **Smith, W.K.**, Gough L. 2012. Ecological impacts of the invasive grass *Sorghum halepense* on native tallgrass prairie. *Biological Invasions* 15, 327-339.

#### 2009-2011

2. **Smith, W.K.**, Gao, W., Steltzer, H., Wallenstein, M.D., Tree, R. 2010. Moisture availability influences the effect of ultraviolet-B radiation on leaf litter decomposition. *Global Change Biology* 16, 484-495.
1. **Smith, W.K.**, Gao, W., Steltzer, H. 2009. Current and future impacts of ultraviolet radiation on the terrestrial carbon balance. *Frontiers of Earth Science* 3, 34-41.

## CONFERENCES AND SCHOLARLY PRESENTATIONS

- 2024** American Geophysical Union Annual Meeting, Washington, DC, “Multi-scale hyperspectral and thermal imaging reveals a novel biocrust degradation - climate warming amplification feedback”.
- 2024** American Geophysical Union Annual Meeting, Washington, DC, “Townhall: Drylands in the Earth System: A Community Assembly to Discuss, Inform, and Celebrate the ARID (Adaptation and Response in Drylands) NASA Field Campaign Scoping Study Actionable Science Plan”.
- 2024** Department Seminar, the Geospatial Spatial Sciences Center of Excellence (GSCE), Department of Geography & Geospatial Sciences, South Dakota State University, “Multiscale remote sensing of drought impacts on ecosystem structure and function of drylands of the Western US”.
- 2024** NASA EMIT Science and Application Team Meeting, Pasadena, CA, “Mapping biocrust community composition and functional diversity across global drylands”.
- 2023** American Geophysical Union Annual Meeting, San Francisco, CA, “Multi-scale remote sensing of spectral and structural traits captures climate change-driven state shifts in biocrust communities of the Colorado Plateau”.
- 2023** American Geophysical Union Annual Meeting, San Francisco, CA, “Drylands in the Earth System: A Community Discussion for Field Campaigns and Emerging Remote Sensing Tools”.
- 2023** Ecological Society of America Annual Meeting, Portland, OR, “Drylands in the Earth System: A Community Discussion for Field Campaigns and Emerging Remote Sensing Tools”.
- 2023** International Association from Landscape Ecology – North American Regional Chapter (IALE-NA) annual meeting, Riverside, CA, “Multi-scale remote sensing of spectral and structural traits captures climate change-driven state shifts in biocrust communities of the Colorado Plateau”.

- 2023** USGS National Uncrewed Systems Office seminar series, “Multi-scale remote sensing of spectral and structural traits captures climate change-driven state shifts in biocrust communities of the Colorado Plateau”.
- 2023** iLEAPS-OzFluz Joint Conference, Auckland, NZ, “Multi-scale remote sensing of extreme drought impacts on vegetation productivity across drylands of the southwestern US”.
- 2022** American Geophysical Union annual meeting, Chicago, IL. “Multi-scale remote sensing of extreme drought impacts on vegetation productivity across drylands of the southwestern US”.
- 2022** Department Seminar, Hawkesbury Institute for the Environment, Sydney, AU. “Multiscale remote sensing of drought impacts on ecosystem structure and function of drylands of the Western US”.
- 2022** Ecological Society of America annual meeting, Montreal, CA. “Remote sensing of extreme drought impacts on Western US vegetation productivity from site to ecosystem”.
- 2021** RISE Symposium, University of Arizona, Tucson, AZ. “Rainfall pulses drive coordinated responses in hyperspectral leaf traits”.
- 2020** Department Seminar, Northern Arizona University, Flagstaff, AZ. “Multi-scale remote sensing of dryland ecosystems: Progress, challenges, and opportunities”.
- 2020** Department Seminar, Biosystems Engineering, University of Arizona, Tucson, AZ. “Multi-scale remote sensing of dryland ecosystems: Progress, challenges, and opportunities”.
- 2019** American Geophysical Union annual meeting, San Francisco, CA. “Improved understanding of land cover and land use change impacts on ecosystem functioning using high spatiotemporal resolution satellite observations”.
- 2019** American Geophysical Union Chapman Conference, San Diego, CA. “Constraining the terrestrial CO<sub>2</sub> fertilization effect using satellite observations: Challenges and Opportunities”.

- 2019** Graduate Degree Program in Ecology Honored Alumni Visiting Distinguished Ecologist Lecture, Colorado State University, Fort Collins, CO. “Current trends in terrestrial carbon cycling: Insights from satellite, field, and model data”.
- 2019** Ecological Society of America annual meeting, Louisville, KY. “Monitoring photosynthesis from leaf to canopy using high frequency measurements of chlorophyll fluorescence and photochemical reflectivity from near-surface remote sensing platforms”.
- 2018** Department of Biology Seminar Series, New Mexico State University, Las Cruces, New Mexico. “Understanding dryland vegetation dynamics through integration of novel remote sensing techniques”.
- 2018** RISE Symposium, University of Arizona, Tucson, AZ. “Understanding dryland vegetation dynamics through integration of novel remote sensing techniques”.
- 2018** Ecological Society of America annual meeting, New Orleans, LA. “Satellite-based constrains on terrestrial CO2 fertilization: Challenges and opportunities”.
- 2018** Ecological Society of America annual meeting, New Orleans, LA. “Exploring the relationship between solar-induced chlorophyll fluorescence and vegetation productivity across drylands of southwestern North America”.
- 2018** Earth Science Information Partners (ESIP) Annual Meeting, Tucson, AZ. “Earth Remote Sensing Research Initiatives at the University of Arizona”.
- 2018** Soil, Water, and Environmental Science Departmental Seminar Series, University of Arizona, Tucson, AZ. “Advances in remote sensing-based monitoring of vegetation growth dynamics across North American ecosystems”.

#### AWARDED GRANTS AND CONTRACTS

Year	Role	Source	Title	Total Award
2024-2027	PI	NASA EMIT	Mapping biocrust community composition and functional diversity across global drylands	\$560K

2024-2027	PI	USDA USFS	Quantifying critical fuel thresholds across rangelands of the western US	\$132K
2023-2028	PI	USDA ARS	New Remote Sensing Techniques for Ecosystem Water and Carbon Flux Estimation	\$186K
2023-2024	Co-I	NASA SSNTEFC	Scoping the Adaptation and Response In Drylands (ARID) Field Experiment	\$250K
2023-2026	PI	NASA CCS	Leveraging Field Experiments, Satellite Data and Models to Improve Understanding of the Role of Semi-Arid Eco-systems in the Global Carbon Cycle	\$800K
2021-2024	Co-I	NASA CCS	Global Photosynthesis, CO <sub>2</sub> , and Carbon-climate Feedbacks	\$800K
2019-2024	PI	USGS COOP	Implementing a Grassland Productivity Forecast for the US Southwest	\$113K
2020-2023	Co-I	NASA SMAP	Leveraging SMAP soil moisture and multi-source Earth observations to quantify variability and drivers of global dryland carbon and water fluxes	\$500K
2019-2023	Co-I	NASA TE	Improving Mechanistic Representation of Arctic Carbon Dynamics Using Data Assimilation	\$815K
2019-2023	PI	USDA ARS	Grass-Cast and the Living Labs framework: creating a user-driven and co-developed product for working lands	\$89K
2018-2023	PI	USDA ARS	Defining the relationship of productivity with water availability across the semiarid western U.S.	\$427K

2018-2023	Co-I	DOD SERDP	Forecasting dryland ecosystem vulnerability to change: a cross-system assessment of vegetation and process responses to climate change on Department of Defense lands	\$2.27M
2019-2022	PI	NASA FINESST	Understanding Dryland Carbon Uptake Using Novel Remote Sensing Techniques	\$135K
2018	PI	UA WEES	LiDAR and hyperspectral fusion for wide ranging applications across the water-environment-energy nexus	\$113K
2018	PI	USDA NDMC	Drought Information Services and Research for Agriculture across the United States	\$25K
<b>Total Funding 2016-2024</b>				<b>\$7.2M</b>