

**TYSON LEE SWETNAM**  
The University of Arizona, BIO5 Institute  
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## EDUCATION

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- 2013 School of Natural Resources and Environment, The University of Arizona Tucson, AZ
- Doctor of Philosophy, Watershed Management
  - Remote Sensing & Spatial Analysis Minor
  - Dissertation title: “*Cordilleran forest scaling dynamics and disturbance regimes quantified by aerial LiDAR.*”
- 2006 School of Natural Resources and Environment, The University of Arizona Tucson, AZ
- Master of Science, Watershed Management
  - GIS Technical Certificate
  - Thesis title: “*Fire Regime Condition Class Accuracy: A comparison to tree-ring fire histories.*”
- 2002 Ecology and Evolutionary Biology, The University of Arizona Tucson, AZ
- Bachelor of Science

## PROFESSIONAL PREPARATION

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- 2019 BIO5 Institute, The University of Arizona Tucson, AZ
- *Research Assistant Professor of Geoinformatics*
  - Joint appointment in School of Natural Resources and Environment
- 2016 – 2018 BIO5 Institute, The University of Arizona Tucson, AZ
- *Science Informatician, CyVerse*
- 2015 – 2016 School of Natural Resources and Environment, The University of Arizona Tucson, AZ
- *Associate Research Scientist, Remote Sensing & Ecohydrology*
- 2015 Department of Geology and Geophysics, University of Utah Salt Lake City, UT
- *Research Associate, Remote Sensing & Ecohydrology*
- 2014 – 2015 Department of Geosciences, The University of Arizona Tucson, AZ
- *Postdoctoral Associate, Santa Catalina-Jemez Critical Zone Observatory*
- 2012 – 2013 School of Natural Resources and Environment, The University of Arizona Tucson, AZ
- *Graduate Research Assistant, Remote Sensing*
- 2008 – 2012 Coronado National Forest, The United States Forest Service Tucson, AZ
- *Fire Management Specialist, Supervisor’s Office*
- 2008 – 2012 Laboratory of Tree Ring Research, The University of Arizona Tucson, AZ
- *Graduate Research Assistant, Dendroecology, Fire History*
- 2006 – 2008 School of Natural Resources and Environment, The University of Arizona Tucson, AZ
- *Graduate Teaching Assistant, Introduction to Wildland Fire*

2005 – 2006	Ecology and Evolutionary Biology, University of Arizona ➤ <i>Graduate Teaching Assistant</i> , Introductory Biology	Tucson, AZ
2005 – 2006	Rocky Mountain Tree Ring Research ➤ <i>Research technician</i> , Fire History	Fort Collins, CO
2002 – 2005	Saguaro National Park ➤ <i>Forestry Technician</i> , Fire Crew and Fire Use Module	Tucson, AZ

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## AWARDS

➤ Scholarly Achievement Award, School of Natural Resources and Environment	5/2014
➤ Kel M. Fox Award Outstanding Graduate in Watershed Management	9/2012
➤ President's award UA Grad. & Professional Student Council: Best graduate exhibit	12/2009
➤ School of Natural Resources and Environment Graduate Teaching Assistant of the Year	5/2009

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## PROFESSIONAL SOCIETIES

- American Geophysical Union (AGU), Ecological Society of America (ESA), Critical Zone Exploration Network (CZEN), Association for Fire Ecology (AFE), Earth Science Information Partners (ESIP).

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## PEER-REVIEWED PUBLICATIONS

20. Gillan, J., M.P. McClaran, T.L. Swetnam, P. Heilman (2019) Estimating forage utilization with drone-based photogrammetric point clouds. *Journal of Rangeland Ecology & Management*.  
<https://doi.org/10.1016/j.rama.2019.02.009>
19. Norman, L.M., J.B. Callegary, L. Lacher, N.R. Wilson, C. Fandel, B.T. Forbes, T.L. Swetnam (2019) Modeling Riparian Restoration Impacts on the Hydrologic Cycle at the Babacomari Ranch, SE Arizona, USA. *Water*, 11, 381. <https://doi.org/10.3390/w11020381>
18. Hancock, D., C. Stewart, M. Vaughn, J. Fischer, J.M. Lowe, G. Turner, T.L. Swetnam, T.K. Chafin, E. Afgan M.E. Pierce, & W. Snapp-Childs (2018) Jetstream—Early operations performance, adoption, and impacts. *Concurrency and Computation: Practice and Experience* <https://doi.org/10.1002/cpe.4683>
17. Perdrial, J., P.D. Brooks, T.L. Swetnam, K.A. Lohse, C. Rasmussen, M. Litvak, A.A. Harpold, X. Zapata-Rios, P. Broxton, B. Mitra, T. Meixner, K. Condon, D. Huckle, C. Stielstra, A. Vázquez-Ortega, R. Lybrand, M. Holleran, C. Orem, J.D. Pelletier, J. Chorover (2018) A net ecosystem carbon budget for snow dominated forested headwater catchments: linking water and carbon fluxes to critical zone carbon storage. *Biogeochemistry* (2018) 138: 225. <https://doi.org/10.1007/s10533-018-0440-3>
16. Swetnam, T.L., J.K. Gillan, T.T. Sankey, M.P. McClaran, M.H. Nichols, P. Heilman, J. McVay (2018) Considerations for Achieving Cross-Platform Point Cloud Data Fusion across Different Dryland Ecosystem Structural States. *Front. Plant Sci.* 8:2144. doi:10.3389/fpls.2017.02144
15. Pelletier J.D., G.A. Barron-Gafford, H. Guttierrez-Jurado, E.L.S. Hinckley, E. Istanbuluoglu, L.A. McGuire, G.Y. Niu, M.J. Poulos, C. Rasmussen, P. Richardson, T.L. Swetnam, G.E. Tucker (2018) Which way do you lean? Using slope aspect variations to understand Critical Zone processes and feedbacks. *Earth Surf. Process. Landforms*, doi:10.1002/esp.4306.
14. Evans, M.E.K., D.A. Falk, A. Arizpe, T.L. Swetnam, F. Babst, and K.E. Holsinger (2017) Fusing tree-ring and forest inventory data to infer influences on tree growth. *Ecosphere* 8(7):e01889. doi:10.1002/ecs2.1889

13. Swetnam, T.L., P.D. Brooks, H.R. Barnard, A.A. Harpold, & E.L. Gallo (2017) Topographically driven differences in energy and water constrain climatic control on forest carbon sequestration. *Ecosphere* 8(4):e01797. doi:10.1002/ecs2.1797
12. Pelletier, J.D., & T.L. Swetnam (2017) Asymmetry of weathering-limited hillslopes: the importance of diurnal covariation in solar insolation and temperature. *Earth Surf. Process. Landforms*, 42: 1408–1418. doi:10.1002/esp.4136.
11. Sankey, T.T., J. McVay, T.L. Swetnam, M.P. McClaran, P. Heilman & M. Nichols (2017) UAV hyperspectral and lidar data and their fusion for arid and semi-arid land vegetation monitoring. *Remote Sens Ecol Conserv.* doi:10.1002/rse2.44
10. Swetnam T.L., C.D. O'Connor, & A.M. Lynch (2016) Tree morphologic plasticity explains deviation from metabolic scaling theory in semi-arid conifer forests, southwestern USA. *PLoS One* 11(7):e0157582. <https://doi.org/10.1371/journal.pone.0157582>
9. Swetnam, T.L., A.M. Lynch, D.A. Falk, D.P. Guertin & S.R. Yool (2015) Discriminating disturbance from natural variation with LiDAR in semi-arid forests, Southwestern USA. *Ecosphere* 6(6):97. <http://dx.doi.org/10.1890/ES14-00384.1>
8. Harpold, A.A., J.A. Marshall, S.W. Lyon, T.B. Barnhart, B. Fisher, M. Donovan, K.M. Brubaker, C.J. Crosby, N.F. Glenn, C.L. Glennie, P.B. Kirchner, N. Lam, K.D. Mankoff, J.L. McCreight, N.P. Molotch, K.N. Musselman, J.D. Pelletier, T. Russo, H. Sangireddy, Y. Sjöberg, T.L. Swetnam & N. West (2015) Laser vision: lidar as a transformative tool to advance critical zone science. *Hydrology & Earth System Science* 19, 2881-2897. doi:10.5194/hess-19-2881-2015
7. Rasmussen, C., J.D. Pelletier, P.A. Troch, T.L. Swetnam & J. Chorover (2015) Quantifying topographic, vegetation, and disturbance effects on the transfer of energy and mass to the critical zone. *Vadose Zone* doi:10.2136/vzj2014.07.0102
6. Swetnam, T.L., D.A. Falk, A.M. Lynch & S.R. Yool (2014) Estimating individual tree mid-and understory rank-size distributions from airborne laser scanning in semi-arid forests. *Forest Ecology and Management* 330, 271-282. doi:10.1016/j.foreco.2014.07.011
5. Swetnam, T.L. & D.A. Falk (2014) Allometric scaling rules to limit commission error in aerial LiDAR forest inventories. *Forest Ecology and Management* 323, 158-167. doi: 10.1016/j.foreco.2014.03.016
4. Harpold, A.A., Q. Guo, N. Molotch, P.D. Brooks, R. Bales, J.C. Fernandez-Diaz, K.N. Musselman, and T.L. Swetnam, P. Kirchner, M. Meadows, J. Flanagan & R. Lucas (2014) LiDAR-Derived Snowpack Datasets from Mixed Conifer Forests Across the Western US. *Water Resources Research* 50(3), 2749-2755. doi:10.1002/2013WR013935
3. Pelletier, J.D., G.A. Barron-Gafford, D.D. Breshears, P.D. Brooks, J. Chorover, M. Durcik, C.J. Harman, T.E. Huxman, K.A. Lohse, R. Lybrand, T. Meixner, J.C. McIntosh, S.A. Papuga, C. Rasmussen, M. Schaap, T.L. Swetnam & P.A. Troch (2013) Coevolution of nonlinear trends in vegetation, soils, and topography with elevation and slope aspect: A case study in the sky islands of southern Arizona. *Journal of Geophysical Research: Earth Surface* 1-18. doi:10.1002/jgrf.20046
2. Swetnam, T.L., D.A. Falk, A. Hessl & C. Farris (2011) Reconstructing landscape pattern of historic fires and fire regimes. In *The Landscape Ecology of Fire*, editors D MacKenzie, D.A. Falk, C. Miller. pp. 165-192. Springer Netherlands, 2011. doi:10.1007/978-94-007-0301-8\_7
1. Swetnam, T.L. & P.M. Brown (2010) Comparing Fire Regime Condition Class (FRCC) Vegetation Models to Tree Ring Data. *International Journal of Wildland Fire* 19, 1-13. <http://dx.doi.org/10.1071/WF08001>

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#### THESES, PROCEEDINGS, WORKING PAPERS, & TECHNICAL REPORTS

Martínez-Meyer E., A. González-Bernal, J.A. Velasco, T.L. Swetnam, Z.Y. González-Saucedo, J. Servín, C.A. López González, N.E. Lara Díaz, C. Aguilar Miguel, C. Chávez García, and J.K. Oakleaf (2017) Mexican wolf

- habitat suitability analysis in historical range in the Southwestern US and Mexico. U.S. Fish and Wildlife Service, Region 2, Albuquerque, New Mexico, USA.
- Swetnam, T.L., J.D. Pelletier, C. Rasmussen, N.R. Callahan, N. Merchant, E. Lyons, M. Rynge, Y. Liu, V. Nandigam & C Crosby (2016) Scaling GIS analysis tasks from the desktop to the cloud utilizing contemporary distributed computing and data management approaches: A case study of project-based learning and cyberinfrastructure concepts. In Proceedings of the XSEDE16 Conference on Diversity, Big Data, and Science at Scale, p. 21. ACM, 2016.
- Swetnam, T.L. & D.A. Falk (2015) Carbon Cycling in Southwestern Forests: Reservoirs, Fluxes, and the Effects of Fire and Management. ERI Working Paper #35. Flagstaff, AZ: Ecological Restoration Institute and Southwest Fire Science Consortium, Northern Arizona University. 15 p.
- Swetnam, TL (2013) Cordilleran forest scaling dynamics and disturbance regimes quantified by aerial LiDAR. (Doctoral Dissertation, University of Arizona) 277 p.
- Swetnam, T.L., D.P. Guertin, E. Canfield, & A. Kimoto (2013) Riparian vegetation characterization of the Lower Santa Cruz River and Ciénega Creek through remotely sensed multi-sensor data fusion. Addendum to the ‘Historical Conditions of the Effluent-Dependent Santa Cruz River’ Pima County.
- O'Connor C.D., D.A. Falk, A.M. Lynch, C.P. Wilcox, T.W. Swetnam, & T.L. Swetnam. (2013) Growth and Demography of Pinaleno High Elevation Forests. RJVA 07-JV-11221615317. Rocky Mountain Research Station, Ft. Collins, CO.
- Swetnam, T.L., & B. Powell (2010) Example of the use of LiDAR for monitoring vegetation characteristics: An example from the Ciénega Creek Nature Preserve. Supplement to the Pima County Ecological Monitoring Program: Phase II Monitoring Plan Summary.
- Swetnam, T.L. (2006) Fire Regime Condition Class Accuracy: A comparison to tree-ring fire histories. (M.S. Thesis, University of Arizona. 111 p.)

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#### **SELECT INVITED ORAL PRESENTATIONS**

- “Vertical Scaling of Remote Sensing: From handheld cameras to Earth Observation Systems.” July 12, 2018. National Ecological Observatory Network, Battelle Inc. Boulder CO.
- “CyVerse Data Commons: lessons learned in cyberinfrastructure management and data hosting from the Life Sciences” December 12<sup>th</sup>, 2017. IN12B American Geophysical Union (AGU) Fall Meeting, New Orleans, Louisiana.
- “A gentle introduction to forestry science workflows in the era of cloud computing” August 10<sup>th</sup>, 2017. Society of American Foresters Sectional Meeting. Flagstaff, Arizona.
- “Cyber-Cowboys on the Range: Arid Lands Management in the Digital Age” March 17<sup>th</sup>, 2017. Friends of the Santa Rita. Florida Station, Santa Rita Experimental Range, Arizona.
- “A primer on next generation remote sensing techniques for Natural Resource Management in the arid Southwest: laser scanning, hyperspectral cameras, and UAV platforms” April 15<sup>th</sup>, 2015. Agricultural Research Service. Southwest Watershed Research Center.

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#### **SELECT CONFERENCE PROCEEDINGS**

- Swetnam, D.A. Falk, S.R. Yool (2018) The Ecosystem Moisture Stress Index. The Madrean Conference, Tucson AZ, 17 May.
- Swetnam, T.L., R. Walls, N. Merchant (2017) CyVerse Data Commons: lessons learned in cyberinfrastructure management and data hosting from the Life Sciences. American Geophysical Union (AGU) Abstract IN12B-07. New Orleans, LA, 12 Dec.
- Swetnam, T.L., R. Walls, B. Joyce, U. Devisetty (2017) Analyzing and managing ecological data with CyVerse. Ecological Society of America. Portland, OR, 10 Aug.

- Swetnam, T.L., P.D. Brooks, E. Gallo, & A. Harpold (2015) Topographic Control of Aboveground Carbon Pools Across an Environmental Gradient, Eastern Slope of the Rocky Mountains, Colorado. AGU Abstract H033-61411. San Francisco, CA, 15 Dec.
- Swetnam, T.L., J.D. Pelletier, & N. Merchant (2015) Scaling Critical Zone analysis tasks from desktop to the cloud utilizing contemporary distributed computing and data management approaches: A case study for project based learning of Cyberinfrastructure concepts. AGU Abstract IN014-82342. San Francisco, CA, 16 Dec.
- Swetnam, T.L., A.M. Lynch, D.A. Falk, S.R. Yool & D.P. Guertin (2014) Discriminating disturbance from natural variation with LiDAR in semi-arid forests, Southwestern USA. Abstract GC33D-0543 presented at 2014 Fall Meeting, AGU, San Francisco, CA, 15-19 Dec.
- Swetnam, T.L., D.A. Falk (2008) High Resolution Paleo Fire Regime Reconstruction. International Association of Landscape Ecologists, Madison WI, March 2008.

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#### PROFESSIONAL SERVICE

- Journal Reviewer: Canadian Journal of Forest Research, Ecological Applications, Ecosphere, International Journal of Wildland Fire, Journal of Environmental Informatics, PLOS One, Remote Sensing, Remote Sensing of Environment.
- NEON Lidar Technical Working Group 2018-Present
- NEON Data Institute 2018, Quantitative Undergraduate Biology Education and Synthesis (QUBES)
- The Carpentries Instructor and Lessons Maintainer 2017-Present
- Standing committee member on NSF EarthCube project

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#### TEACHING AND STUDENT MENTORSHIP

##### Courses Taught:

- Introductory Biology Lab (ECOL 181/182), fall, spring, and summer semester 8/2005 – 7/2006
- Introduction to Wildland Fire (RNR 355/455), fall semester. 8/2006 – 12/2008

##### Guest Lectures:

- Artificial Intelligence for Health Medicine SIE578, The University of Arizona 2/2019
- NEON Data Institute on Reproducible Workflows, Boulder CO 7/2018
- Open Source GIS GIST604B, The University of Arizona 11/2018
- Resource Mapping RNR422/522, The University of Arizona 8/2015 - 5/2017
- Remote Sensing GEOG330, The University of Arizona 10/2017

##### Workshops Led:

- Foundations of Open Source Science, CyVerse, The University of Arizona 6/2019
- NEON Science with CyVerse, Boulder CO 2/2019
- Geospatial Carpentry, The University of Arizona 11/2018
- Software Carpentry, The University of Arizona 2017 - 2018
- CyVerse Container Camp, The University of Arizona 2018 - 2019

##### Student Mentees and Committee Member:

- Graduate: L Carpenter (Masters-GIST, 2012), J Kennedy (Masters-GIST, 2014), A Ruff (Masters-GIST, 2017), A Brischke (MS, School of Natural Resources and Environment, 2015), S Hendryx (MS, Geography, 2017), J Gillan (PhD, School of Natural Resources and Environment, 2019), PL Narayan (MS, Computer Science, 2018), D Slovikosky (MS, Computer Science, 2018).

- Undergraduate: J Mack (NASA Space-Grant intern, 2010), D Wilcox (NASA Space-Grant intern, 2014), N Callahan (Computer Science, 2016), K Pope (NSF UWIN, 2017).
- High School: DS Lee (BASIS Oro Valley High School, 2018).

## VOLUNTEER WORK

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- Faculty Advisor, Coach, University of Arizona Men's and Women's Rugby. 2004 - 2018
- Research Bazaar, Tucson AZ 2016 - Present
- The Carpentries 2016 - Present

## TECHNICAL SKILLS

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- Operating Systems: Windows, Mac OS X, Linux
- Cluster Computing, HPC, Open Science Grid HTC, and Cloud Computing
- Containers and orchestration: Docker, Singularity, Kubernetes, OpenStack
- Workflow Managers: Makeflow, WorkQueue, Dask
- Structure from Motion Photogrammetry: Agisoft PhotoScan, WebODM, VisualSFM
- Point cloud analysis: PDAL, FUSION, LAStools, CloudCompare, lidR
- Databases: Elasticsearch, MongoDB, PostGIS/Postgres
- I prefer to code in Python or R, but also work in JavaScript, HTML, Bash, and Matlab
- Code Maintainer: <https://github.com/cyverse-gis/>, <https://github.com/tyson-swetnam>
- GIS Software: R, QGIS, GDAL, GRASS, SAGA, GeoServer, PostGIS, & ESRI
- The Carpentries Instructor and Lessons Maintainer
- Trained in terrestrial lidar and GNSS-RTK survey
- FAA sUAS Remote Pilot Certificate S107
- Traditional field-based forest mensuration, chainsaws and increment borers
- Previous (lapsed pending refreshers) wildland fire incident qualifications (Red Card): Firefighter-1, Faller B, Helicopter Crew Member, Fire Effects Monitor

## FUNDING HISTORY

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TRIPODS-X Innovation Lab	\$199,000	10/2018 – 10/2019
➤ NSF 18-542. Senior personnel for data science pathways for a vibrant TRIPODS commons at scale. (Investigator, PI: N Merchant)		
CyVerse, National Science Foundation	\$14,000,000	7/2018 – 7/2023
➤ NSF DBI-1743442. Salary as investigator on the CyVerse sustaining grant. I am the spatial data infrastructure lead (Investigator, PI: P Antin).		
The iPlant Collaborative	\$50,300,000	8/2013 - 10/2018
➤ NSF DBI-1265383. Salary as investigator on CyVerse (formerly iPlant Collaborative) (Investigator, PI: P Antin).		
USDA Agricultural Research Service	\$187,000	10/2015 – Present
➤ Salary as investigator, student salaries, equipment, and contracted lidar data acquisition in Southeastern Arizona. (Investigator, PI: M McClaran).		
Arizona Game and Fish Department	\$10,000	5/2016 - 12/2016

US Department of Energy	\$13,125	6/2015 – 9/2015
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- Salary for research on topographic complexity and its influence on forest net primary production and carbon reservoirs administered by the University of Utah. (Investigator, PI: PD Brooks).

DOI National Park Service	\$35,224	1/2015 – 8/2015
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- Salary for post-doctoral research on predictive models of burn severity and erosion in a post African Buffel grass (*Cenchrus ciliaris*) invaded Saguaro National Park (Investigator, PI: JD Pelletier).

Southwest Fire Science Consortium	\$419,335	8/2014 – 9/2015
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- Salary in the writing of a working paper on carbon cycling in the southwestern USA (Investigator, PI: DA Falk).

Santa Catalina-Jemez Critical Zone Observatory	\$5,600,000	1/2014-12/2014
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- NSF EAR-1331408. Salary for postdoctoral work as a part of the CZO (Investigator, PI: J Chorover).

Pima County Regional Flood Control District	\$17,186	9/2012 – 9/2013
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- Salary for assessment of “Sediment Transport Analysis and Assessment of Vegetation Characteristics in the Santa Cruz River” (Principal Investigator).

USDA Forest Service Region 3	\$120,000	4/2008 – 5/2012
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- Student Temporary Experience Program. Salary, student salaries, research equipment. (Principal Investigator).

Pima County Department of Sustainability	\$2,500	6/2010 – 9/2010
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- LiDAR analysis related to Pima County's Ecological Monitoring Program Plan Summary (Principal Investigator).

Joint Fire Sciences Program	\$224,989	6/2007 – 4/2008
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- Salary as investigator for a fire history reconstruction of the Valles Caldera, and the writing of a book chapter, *The Landscape Ecology of Fire* (Investigator, PI: DA Falk).

National Interagency Fuels Transfer Team.	\$81,000	7/2005 – 6/2007
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- Salary as Co-I, research equipment, studying reference conditions of LANDFIRE and Fire Regime and Condition Class efforts. (Co-Principal Investigator, PI: PM Brown).

## RESEARCH COMPUTING AWARDS

XSEDE Renewal Allocation	\$25,107	10/2017 - 10/2018
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- Virtualized remote sensing analysis, GIS, and distributed geospatial data processing using a hybrid cloud resource

XSEDE Startup Allocation	\$25,107	10/2016 - 10/2017
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- Virtualized remote sensing analysis, GIS, and distributed geospatial data processing using a hybrid cloud resource

XSEDE Research Allocation	\$27,208	7/2016– 12/2017
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| KSEDE Startup Allocation                                 | \$12,100 | 5/2015– 5/2016 |
| ➤ Implementation of Sol in OpenTopography   TG-GEO150003 |          |                |

- NSF SI2-S2I2 Conceptualization GSI workshop 3 2019: \$1,000
- Battelle Inc. NEON Data Institute 2018: \$1500 honorarium
- NSF SI2-S2I2 Conceptualization GSI workshop 2 2018: \$1,000
- NSF SI2-S2I2 Conceptualization GSI workshop 1 2018: \$1,000
- Critical Zone Observatory Travel to American Geophysical Union 2014: \$1,200
- Earth Cube, 2014 All Hands Meeting Washington DC, Arizona Geological Survey: \$2,000
- Institute of Environment Travel Grant to American Association of Geographers: \$1,000
- Kel M. Fox Scholarship in Watershed Management: \$500
- President's Award Best Graduate Exhibit (Graduate Student Professional Council): \$500.
- International Association of Landscape Ecologists Travel to Annual Meeting, Madison WI: \$800

- Mexican Wolf Recovery Project, Mexico City, Mexico. 6/2016
- NASA Fire History, Climate, and Carbon Dynamics, Yakutia, Russian Federation. 7/2011