Tyson Lee Swetnam
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Education

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

2019 – Present 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 — Tucson, AZ
- ➢ *Graduate Teaching Assistant,* Introductory Biology

2005 – 2006 Rocky Mountain Tree Ring Research — Fort Collins, CO
- ➢ *Research technician,* Fire History

2002 – 2005 Saguaro National Park — Tucson, AZ
- ➢ *Forestry Technician,* Fire Crew and Fire Use Module

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

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).

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. Guttierez-Jurado, E.L.S. Hinckley, E. Istanbulluoglu, 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, DA 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

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 Pinaleño 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.)

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 12th, 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 10th, 2017. Society of American Foresters Sectional Meeting. Flagstaff, Arizona.

"Cyber-Cowboys on the Range: Arid Lands Management in the Digital Age" March 17th, 2017. Friends of the Santa Ritas. 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 15th, 2015. Agricultural Research Service. Southwest Watershed Research Center.

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.

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

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

- 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

- 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

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

➢ Consultation on the recovery of the Mexican Wolf. GIS habitat suitability modelling in R. (Principal Investigator).

US Department of Energy $13,125 6/2015 – 9/2015
➢ 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
➢ 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
➢ 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
➢ 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
➢ 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
➢ Student Temporary Experience Program. Salary, student salaries, research equipment. (Principal Investigator).

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

Joint Fire Sciences Program $224,989 6/2007 – 4/2008
➢ 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
➢ 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
➢ Virtualized remote sensing analysis, GIS, and distributed geospatial data processing using a hybrid cloud resource | TG-EAR160036

XSEDE Startup Allocation $25,107 10/2016 - 10/2017
➢ Virtualized remote sensing analysis, GIS, and distributed geospatial data processing using a hybrid cloud resource | TG-EAR160036

XSEDE Research Allocation $27,208 7/2016– 12/2017

- Modeling the Effective Energy and Mass Transfer input to Earth's Critical Zone from sub-meter to global spatial scales and daily to millennial time scales | TG-EAR160016

XSEDE Startup Allocation $12,100 5/2015– 5/2016

- Implementation of Sol in OpenTopography | TG-GEO150003

Travel Grants and Awards

- 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

International Work

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