

# Michael J Campbell, PhD

Research Assistant Professor

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## Research Interests

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Remote sensing of vegetation and fire

Forest ecology and biometry

Lidar remote sensing

GIS modeling of wildland firefighter safety

Land use and land cover change mapping

Data science and visualization

## Education

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2018 PhD, Geography, *University of Utah*

2012 MS, Natural Resources, *University of New Hampshire*

2009 BA, Geography (Environmental Studies Minor), *State University of New York at Geneseo*

## Research

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### Thesis/Dissertation

2018 Remote sensing and geospatial modeling of wildland firefighter safety. PhD Dissertation. PhD Dissertation, *University of Utah* (advisor: Dr. Philip Dennison)

2012 Remote sensing of land cover change in response to timber harvesting patterns and trends in Oregon. MS Thesis, *University of New Hampshire* (advisor: Dr. Russell Congalton)

### Refereed Publications

2022 Mistick KA, Dennison PE, **Campbell MJ**, Thompson MP. [Using geographic information to analyze wildland firefighter situational awareness: Impacts of spatial resolution on visibility assessment](#). *Fire* 5(5): 151.

2022 **Campbell MJ**, Dennison PE, Thompson MP. [Predicting the variability in pedestrian travel rates and times using crowdsourced GPS data](#). *Computers, Environment and Urban Systems* 97: 101866.

- 2022 **Campbell MJ**, Dennison PE, Thompson MP, Butler BW. [Assessing potential safety zone suitability using a new online mapping tool](#). *Fire* 5(1): 5.
- 2022 Saltiel TM, Dennison PE, **Campbell MJ**, Thompson TR, Hambrecht KR. [Tradeoffs between UAS spatial resolution and accuracy for deep learning semantic segmentation applied to wetland vegetation species mapping](#). *Remote Sensing* 14(11): 2703.
- 2021 **Campbell MJ**, Dennison PE, Kerr KL, Anderegg WRL. [Scaled biomass estimation in woodland ecosystems: Testing the individual and combined capacities of satellite multispectral and lidar data](#). *Remote Sensing of Environment* 262: 112511.
- 2020 **Campbell MJ**, Dennison PE, Kerr KL, Kannenberg SA, Coddling BF, Anderegg WRL. [A multi-sensor, multi-scale approach to mapping tree mortality woodland ecosystems](#). *Remote Sensing of Environment* 245: 111853.
- 2020 Sullivan PR, **Campbell MJ**, Dennison PE, Brewer SC, Butler BW. [Modeling wildland firefighter travel rates by terrain slope: Results from GPS-tracking of Type 1 crew movement](#). *Fire* 3(3): 52.
- 2019 **Campbell MJ**, Dennison PE, Butler BW, Page WG. [Using crowdsourced fitness tracker data to model the relationship between slope and travel rates](#). *Applied Geography* 106: 93-107.
- 2019 **Campbell MJ**, Page WG, Dennison, PE, Butler BW. [Escape Route Index: A spatially-explicit measure of wildland firefighter egress capacity](#). *Fire* 2(3): 40.
- 2018 **Campbell MJ**, Dennison PE, Hudak AT, Parham LM, Butler BW. [Quantifying understory vegetation density using small-footprint airborne lidar](#). *Remote Sensing of Environment* 215: 330-342.
- 2017 **Campbell MJ**, Dennison PE, Butler BW. [Safe separation distance score: A new metric for evaluating wildland firefighter safety zones using lidar](#). *International Journal of Geographical Information Science* 31(7): 1448-1466.
- 2017 **Campbell MJ**, Dennison PE, Butler BW. [A LiDAR-based analysis of the effects of slope, vegetation density, and ground surface roughness on travel rates for wildland firefighter escape route mapping](#). *International Journal of Wildland Fire* 26(10): 884-895.
- 2015 **Campbell MJ**, Congalton RG, Hartter JN, Ducey MJ. [Optimal land cover mapping and change analysis in Northeastern Oregon using Landsat imagery](#). *Photogrammetric Engineering & Remote Sensing* 81(1): 37-47.
- 2013 MacLean MG, **Campbell MJ**, Maynard DS, Ducey MJ, Congalton RG. [Requirements for labelling forest polygons in an object-based image analysis classification](#). *International Journal of Remote Sensing* 34(7): 2531-2547.

## Other Publications

- 2015 Dennison PE, Fryer GK, **Campbell MJ**, Cova TJ, Butler BW. Assessing firefighter safety zones using lidar remote sensing. *Fire Management Today* 74(4): 33-36.

- 2012 **Campbell MJ**, Congalton RG. Landsat-based land cover change analysis in Northeastern Oregon's timber resource-dependent communities. *Proceedings of the ASPRS Annual Conference*, Sacramento, CA, March 19-23.
- 2012 Hamilton LC, Hartter JN, Stevens FR, Congalton RG, Ducey MJ, **Campbell MJ**, Maynard DS, Staunton MS. Forest views: Northeast Oregon survey looks at community and environment. *UNH Carsey Institute Brief 47*: 12pp.

## Funding Awards

- 2022 – 2023 **Campbell MJ (PI)**, Dennison PE (Co-I). Using mobile and airborne laser scanner data to quantify and map fuel consumption. *USDA Forest Service*, Challenge Cost Share Agreement #22-CS-11221633-163 (\$50,000).
- 2021 – 2025 **Campbell MJ (PI)**, Dennison PE (Co-I). Improving wildland firefighter safety through geospatial modeling of lookouts, communications, escape routes, and safety zones. *NSF Human-Environment and Geographical Sciences Program*, Award #BCS-2117865 (\$392,554).
- 2021 – 2025 Dennison PE (PI), **Campbell MJ (Co-I)**. Lookouts, Communication, Escape Routes, and Safety Zones (LCES): Developing geospatial analytics to improve LCES implementation and enhance wildland firefighter safety. *USDA Forest Service*, Challenge Cost Share Agreement #21-CS-11221636-120 (\$500,151).
- 2021 – 2024 **Campbell MJ (PI)**. Piñon-juniper biomass over space and time. *NASA New (Early Career) Investigator Program in Earth Science*, Award #80NSSC21K0948 (\$300,568).
- 2021 – 2023 **Campbell MJ (PI)**. Mapping the extent and severity of balsam woolly adelgid infestation in subalpine fir stands of Northern Utah over time. *USDA Forest Service Forest Health Monitoring program*, Award #21-DG-11046000-609 (\$107,049).
- 2019 – 2020 **Campbell MJ (Co-PI)**, Harvey JE (Co-PI). Developing open educational resources for GEOG 315: GIS Programming and Web Mapping. *Fort Lewis College* (\$3,000).
- 2018 – 2020 **Campbell MJ (PI)**. Use of vegetation cover and topography to determine optimum escape route location and travel time for wildland firefighters, *USDA Forest Service*, Cooperative Agreement #18JV11221637154 (\$30,522).

## Professional Presentations (\* indicates invited talk)

- 2022 **Campbell MJ**, Dennison PE, Thompson MP, Butler BW. Safe Separation Distance Evaluator (SSDE): A new online mapping tool for assessing firefighter safety zone suitability. *Fire and Climate, International Association of Wildland Fire*, Pasadena, CA.
- 2021 **Campbell MJ**, Dennison PE, Mistick K, Sullivan PR, Monedero S, Ramirez J. Geospatial modeling of wildland firefighter evacuation. *LAWF Safety Summit, International Association of Wildland Fire*, virtual.
- 2021 Dunn CJ, O'Connor CD, **Campbell MJ**. The Responder Exposure Index: Co-producing analytics to assess hazards to fire responders. *LAWF Safety Summit, International Association of Wildland Fire*, virtual.

- 2020 **Campbell MJ**, Dennison PE, Coddling BF, Kerr KL, Kannenberg SA, Anderegg WRL. Using multi-scale remote sensing to map piñon-juniper woodland biomass: A comparison between Landsat and GEDI. *AGU Fall Meeting*, virtual.
- 2020\* **Campbell MJ**. Mapping Woodland Tree Mortality using Multi-Scale Remote Sensing. *Invited talk – NASA Student Airborne Research Program*, virtual.
- 2019 **Campbell MJ**, Dennison PE, Kerr KL, Kannenberg SA, Anderegg WRL. Mapping the extent and severity of drought-induced tree mortality in pinyon-juniper woodlands. *AGU Fall Meeting*, San Francisco, CA.
- 2019 **Campbell MJ**. Escape Route Index: A new geospatial measure of wildland firefighter evacuation potential. *GIS in the Rockies*, Denver, CO.
- 2018 **Campbell MJ**. How fast can you get to the safety zone? Crowdsourcing fitness tracker data to improve travel rate estimates. *LAWF Safety Summit, International Association of Wildland Fire*, Asheville, NC.
- 2018\* **Campbell MJ**. Image regression and classification workshop. *Durango Area GIS User Group*, Durango, CO.
- 2018 **Campbell MJ**, Dennison PE, Hudak AT, Parham LM, Butler BW. Mapping the density of forest understory vegetation using discrete return airborne lidar. *GIS in the Rockies*, Denver, CO.
- 2018\* **Campbell MJ**. An overview of lidar technology and LAsTools workshop. *Durango Area GIS User Group*, Durango, CO.
- 2017 **Campbell MJ**, Dennison PE, Butler BW. Mapping travel rates along firefighter escape routes using LiDAR data. *7<sup>th</sup> International Fire Ecology and Management Congress, Association for Fire Ecology*, Orlando, FL.
- 2016\* **Campbell MJ**, Dennison PE, Butler BW. Using lidar to map wildland firefighter escape routes. *SLUG Quarterly Meeting, Salt Lake Area GIS Users Group*, Salt Lake City, UT.
- 2016\* **Campbell MJ**. Wildland firefighter safety: Incorporating GIS and remote sensing into safety zone and escape route mapping. *Department of Earth Sciences Seminar Series, Utah Valley University*, Orem, UT.
- 2015 **Campbell MJ**, Dennison PE, Butler BW. Using lidar to determine firefighter safety zone size in Tahoe National Forest. *6<sup>th</sup> International Fire Ecology and Management Congress, Association for Fire Ecology*, San Antonio, TX.
- 2015 **Campbell MJ**, Dennison PE, Butler BW. Wildland firefighter safety zone suitability analysis. *LAWF Safety Summit, International Association of Wildland Fire*, Boise, ID.
- 2014\* **Campbell MJ**, Dennison PE, Butler BW. Mapping wildland firefighter safety zones using lidar. *SLUG Quarterly Meeting, Salt Lake Area GIS Users Group*, Salt Lake City, UT.
- 2013 **Campbell MJ**, Goetz W. Land cover change in Ethiopia. *Brownbag Series, US Forest Service Remote Sensing Applications Center*, West Valley City, UT.

- 2011 **Campbell MJ**, Congalton RG. Landsat-based land cover change analysis in Northeastern Oregon's timber resource-dependent communities. *ASPRS Fall Conference, American Society for Photogrammetry and Remote Sensing*, Sacramento, CA.
- 2011 **Campbell MJ**, Congalton RG. Landsat-based land cover change analysis in Northeastern Oregon's timber resource-dependent communities. Poster. *Graduate Research Conference, University of New Hampshire*, Durham, NH.
- 2010\* **Campbell MJ**. GIS at Timucuan Ecological & Historic Preserve. *GIS Day, National Park Service Southeast Regional Headquarters*, Atlanta, GA.
- 2009 **Campbell MJ**. An analysis of wind power potential in New York State. Poster. *GREAT Day, State University of New York at Geneseo*, Geneseo, NY.

### Selected Media Coverage

- 2019 [Wildfire escape routes? There's \(almost\) an app for that.](#) *High Country News*.
- 2019 [How Your Strava-Recorded Hill Climbs Can Help Firefighters Battle Wildfires.](#) *Runner's World*.
- 2019 [More precise and accurate travel time for firefighters crossing rough terrain.](#) *Utah Public Radio*.
- 2019 [Geographers use big data to predict how slope affects human travel rates.](#) *Pys.org*.
- 2019 [The mathematics of hill walking.](#) *Cosmos Magazine*.
- 2018 [Colorado professor developing app for firefighters battling wildfires.](#) *Fox 31 Denver*.
- 2018 [Fort Lewis College professor developing an app for firefighter safety.](#) *The Durango Herald*.
- 2018 [Geosciences professor helps public keep tabs on wildfire.](#) *Fort Lewis College News*.
- 2018 [Interactive map shows evacuation status of homes, proximity to 416 Fire.](#) *The Durango Herald*.
- 2017 [This mapping tool could help wilderness firefighters plan escape routes.](#) *Smithsonian*.
- 2017 [Researchers working on new technology to help firefighters plan escape route.](#) *KJZZ*.
- 2017 [U of U study maps out escape route for wildland firefighters.](#) *ABC 4 Utah*.
- 2017 [New study the first to map escape routes for wildland firefighters from the air.](#) *Phys.org*.
- 2017 [Wildfire dangers.](#) *KSL News*.

### Professional

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- 2020 – pres. Research Assistant Professor, Department of Geography, *University of Utah*
- 2018 – 2020 Assistant Professor, Department of Geosciences, *Fort Lewis College*

- 2017 – 2018 Research Associate, Dynamic Impacts of Environmental Change and Biomass Harvesting on Woodland Ecosystems and Traditional Livelihoods (NSF CNH-L award #1714972), *University of Utah*
- 2014 – 2017 Graduate Research Assistant, GIS & Remote Sensing of Wildland Firefighter Safety Zones (USFS Cooperative Agreements #14JV11221637123 & #15CR11221637105), *University of Utah*
- 2014 – 2016 Graduate Assistant (GIS Analyst), *DIGIT Lab, University of Utah*
- 2012 – 2014 Remote Sensing Analyst (Vegetation Mapping Specialist), *RedCastle Resources, USFS Remote Sensing Applications Center*
- 2010 – 2012 Graduate Research Assistant, Communities and Forests of Oregon (USDA award #2010-67023-21705), *University of New Hampshire*
- 2010 – 2011 GIS Lab Administrator, *University of New Hampshire*
- 2009 – 2010 GIS/GPS Technician, *Student Conservation Association, Timucuan Ecological & Historic Preserve, National Park Service*

## Teaching

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### Instructor of Record

- 2018 – 2020 *Fort Lewis College*
- FLC 100: First Year Launch: The Earth from Above
  - GEOG 310: Introduction to Computer Mapping & GIS (4x)
  - GEOG 315: GIS Programming & Web Mapping
  - GEOG 400: Advanced GIS (2x)
  - GEOG 480: Internship in GIS
  - GEOG 499: GIS Independent Study (5x)
  - GEOG 325: Introduction to Remote Sensing (3x)
- 2017 *University of Utah*
- GEOG 3230/5230: Pyrogeography

### Teaching Assistant

- 2011 – 2012 *University of New Hampshire*
- NR 658: Introduction to GIS (2x)
  - NR 401: Introduction to Natural Resources
- 2008 *State University of New York at Geneseo*
- GEOG 110: Physical Geography
  - GEOG 220: Meteorology

# Mentoring

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## Graduate Committee Membership

2018 – pres. *University of Utah*

Chelsea Ackroyd, “Retrieving snow optical properties using lidar intensity”, PhD Dissertation

Savannah Bommarito, “A paleoenvironmental and cultural assessment of the West Desert of Utah”, PhD Dissertation

Jessie Eastburn, “Transferability of lidar-derived biomass models of piñon-juniper woodlands in the Western United States”, MS Thesis

Luis Garcia, “Examining fire radiative power (FRP) retrievals using shortwave and mid-infrared radiance from FIREX-AQ”, MS Thesis

Alex Heeren, TBD MS Thesis

Katherine Mistick, “Assessing methods for determining visibility of an active wildfire to provide recommendations to firefighter lookouts”, MS Thesis

Troy Saltiel, “Invasive species monitoring with fine-resolution multispectral UAS-acquired imagery and a deep neural network classifier”, MS Thesis

Allison Smith, TBD MS Thesis

Patrick Sullivan, “Modeling wildland firefighter travel rates using slope and load weight”, MS Thesis

Patrick Sullivan, “Methane plume detection with deep learning”, PhD Dissertation

## Undergraduate GIS Capstone Study Mentor

2018 – 2020 *Fort Lewis College*

Tyler Blais, “An analysis of the effects of ski resort expansion on lynx habitat in Colorado”

Carson Broaddus, “Using lidar to map surface bedrock fractures in the San Juan Mountains, CO”

Connor Broaddus, “Developing an algorithm to map scale-independent river sinuosity: A case study on the Animas River, CO”

Shinya Burck, “The 416 fire vs. the Missionary Ridge fire: A burn severity comparison”

Blake Busby, “Assessing wolf habitat suitability in Colorado”

Matthew Cecil, “Developing a web mapping interface to facilitate guided outdoor adventures for Fort Lewis College”

Jade Colbert, “Automating the calculation of ground surface roughness for geomorphologic mapping”

James Connacher, “Mapping fuel type and condition within gold medal fishery watersheds in Colorado”

Lea Crowley, “Mapping crop health and phenology using Sentinel 2 imagery”

Paul Dohm, “Mapping the structure of riparian vegetation as a function of distance from the San Rafael River, Utah”

Kyle Drew, “Using reverse hydrologic flow modeling on a UAV-derived elevation model to determine cultural artifact source locations”

Benjamin Gould, “An interactive web mapping interface for Sailing Hawks bouldering area, Durango, CO”

Bryce Hardin, “Assessing the effects of wildland fire severity on subsequent winter snowpack albedo”

Oliver Hoogendorn, “Mapping the effect of land cover on macroinvertebrate concentrations in the Animas River”

Nicolette Iron Shell, “Developing a land cover map to facilitate the placement of water wells in Nicaragua”

Emily Harris, “Mapping vegetation recovery trajectory as a function of fire severity on the Missionary Ridge Fire using MODIS”

Hailee McOmber, “Developing a Python script to automate the geometry editing of field plots in Bayfield, CO”

Randy Poyer, “Mapping equine water access using GIS”

Jackson Radcliffe, “Detecting wildland fire fuels mitigation activities in the wildland-urban interface using lidar”

Rebecca Reath, “Mapping changes in riparian vegetation before and after damming on the Dolores River”

Mateo Sanabria, “Using Landsat 8 imagery to map geologic unit type in the Henry Mountains, UT”

Steen Shober, “Modeling solar power generation potential in downtown Durango, CO using lidar and high-resolution aerial imagery”

Emily Swindell, “Mapping the habitat suitability of osha (*Ligusticum porteri*) in the San Juan National Forest”

Eric Wzientek, “Mapping surface bedrock fractures using hydrologic modeling of high resolution aerial imagery”

## Awards, Honors, and Achievements

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2022	Superior Research Award for Career-Line Faculty, <i>College of Social and Behavioral Sciences, University of Utah</i>
2019	Completed NSF-UNAVCO Whole Student Mentoring and STEM Resource Workshop training
2017	Excellence in Research Award, <i>Department of Geography, University of Utah</i>
2016	ERDAS Best Scientific Paper in Remote Sensing Award (1 <sup>st</sup> place), <i>American Society of Photogrammetry and Remote Sensing</i>
2015	Elected Graduate Student Representative, <i>Department of Geography, University of Utah</i>
2009	Susan K. Walker Memorial Prize for Excellence in Geography, <i>Department of Geography, State University of New York at Geneseo</i>
2009	Best of GREAT Day Award, <i>State University of New York at Geneseo</i>
2008	Inducted into Gamma Theta Upsilon, Geographic Honor Society

## Service Activities

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2020 – pres.	Grant Proposal Reviewer, <i>National Science Foundation, SwissForestLab</i>
2012 – pres.	Reviewer, <i>Forest Ecology and Management, Forests, Geosciences, International Journal of Applied Earth Observation and Geoinformation, Photogrammetric Engineering &amp; Remote Sensing, Rangeland Ecology and Management, Remote Sensing, Remote Sensing of Environment, Sensors, Sustainability</i>
2018 – 2020	Member, Liberal Arts Core Committee, <i>Fort Lewis College</i>