

ANNIE COOPER SMITH

Department of Forestry
Spatial and Community Ecology Lab (NR 213)
Michigan State University
220 Trowbridge Rd.
East Lansing, MI 48824

phone: 509.432.9911
email: coope378@msu.edu
orcid: 0000-0003-0578-9402

EDUCATION

2018 PhD, Systems Ecology, University of Montana
2012 BA, Biology, Mathematics Minor, Whitman College

WORK EXPERIENCE

2018 – present Research Associate, Michigan State University
2013 – 2018 PhD Candidate and NASA Graduate Research Fellow, University of Montana
2015 Teaching Assistant (Soils, Water, and Climate), University of Montana
2015 Research Technician, University of Montana
2012 Biological Technician, Eastern Nevada Landscape Coalition
2011 – 2012 Undergraduate Research Assistant, Whitman College
2011 Biological Science Technician, United States Geological Survey
2010 Web Development Summer Intern, Whitman College Tech Services
2008 – 2012 Technology Services Consultant, Whitman College Tech Services

SCHOLARSHIPS AND AWARDS

2015 – 2018 NASA Earth and Space Science Fellowship (\$103,324.40)
2013 – 2014 Montana Institute on Ecosystems Fellowship (\$8000)
2017 – 2018 Bertha Morton Scholarship (\$3000)
2017 – 2018 George E. Bright Scholarship (\$2000)
2016 – 2017 Systems for Environmental Management Scholarship (\$1500)
2015 – 2016 George E. Bright Scholarship (\$2125)
2014 – 2015 Systems for Environmental Management Scholarship (\$2500)

PUBLICATIONS

2018 Z. Liu, A.P. Ballantyne, **L.A. Cooper**. Increases in land surface temperature in response to fire in Siberian boreal forests and their attribution to biophysical processes. *Geophysical Research Letters* 45, no. 13: 6485-6494.
2018 **L.A. Cooper**, C.C. Reed, A.P. Ballantyne. Mountain pine beetle attack faster growing lodgepole pine at low elevations in western Montana, USA. *Forest Ecology and Management* 427: 200-207.
2018 C.C. Reed, A.P. Ballantyne, **L.A. Cooper**, A. Sala. Limited evidence for CO₂-related growth enhancement in northern Rocky Mountain lodgepole pine populations across climate gradients. *Global Change Biology* 24, no. 9: 3922-3937.
2017 W. Li, P. Ciais, Y. Wang, Y. Yin, S. Peng, Z. Zhu, A. Bastos, C. Yue, A.P. Ballantyne, G. Broquet, J.G. Canadell, A. Cescatti, C. Chen, **L. Cooper**, P. Friedlingstein, C. Le

- Quere, R.B. Myneni, S. Piao. Recent changes in global photosynthesis and terrestrial ecosystem respiration constrained from multiple observations. *Geophysical Research Letters* 45, no. 2: 1058-1068.
- 2017 **L. A. Cooper**, A. P. Ballantyne, E. L. Landguth, and Z. A. Holden. Disturbance impacts on land surface temperature and gross primary productivity in the western United States. *Journal of Geophysical Research – Biogeosciences* 122, no. 4: 930-946.
- 2016 A. Hursh, A. Ballantyne, **L. A. Cooper**, M. Maneta, J. Kimball, J. Watts. The sensitivity of soil respiration to soil temperature, moisture, and carbon supply at the global scale. *Global Change Biology* 23, no. 5: 2090-2103.
- 2016 W. Li, P. Ciais, Y. Wang, S. Peng, G. Broquet, A. Ballantyne, J. Canadell, **L. Cooper**, P. Friedlingstein, C. Le Quere, R. B. Myneni, G.P. Peters, S. Piao, J. Pongratz. Reducing uncertainties in decadal variability of the global carbon budget with multiple datasets. *PNAS* 113, no. 46: 13104-13108.
- 2015 A. P. Ballantyne, R. Andres, R. Houghton, B. D. Stocker, R. Wanninkhof, W. Anderegg, **L. A. Cooper**, M. DeGrandpre, P. P. Tans, J. C. Miller, C. Alden, and J. W. C. White. Audit of the global carbon budget: estimate errors and their impact on uptake uncertainty. *Biogeosciences* 12, no. 8: 2565-2584.
- In review* Z. Liu, **L. A. Cooper**, and A. P. Ballantyne. Biophysical climate impacts due to fire across biomes. In review at *Nature Communications*.
- In prep* **L. A. Cooper**, and A. P. Ballantyne. Testing a machine learning approach for the detection and attribution of forest disturbances. In preparation for submission to *Remote Sensing of the Environment*.

INVITED TALKS

- 2018 Guest lecture in Ecological Climatology (NRSM 418), University of Montana (2/23/2018)
- 2015 Guest lecture in The Science of Climate Change (NRSM 281), University of Montana (11/13/2015)

CONFERENCE PRESENTATIONS

- 2018 **L. A. Cooper**, Z. Liu, A. P. Ballantyne. Application of random forest for the detection and attribution of forest disturbance. *ESA Annual Meeting*, August 8, New Orleans, LA.
- 2017 **L. A. Cooper**, C. Reed, A. P. Ballantyne. Differences in growth between mortality categories of lodgepole pine (*Pinus contorta*) following a severe mountain pine beetle (*Dendroctonus ponderosae*) outbreak across elevations and aspects. *ESA Annual Meeting*. August 8, Portland, OR.
- 2015 **L. A. Cooper**, A. P. Ballantyne, E. L. Landguth, Z. A. Holden. Ecosystem Disturbance Effects on Land Surface Temperature, Forest Carbon Stocks, and Primary Productivity in the Western United States. *AGU Fall Meeting*. December 16, San Francisco, CA.
- 2014 **L. A. Cooper**, A. P. Ballantyne, E. L. Landguth, Z. A. Holden. Observing and Modeling the Impact of Biological Disturbances Using MODIS EVI and Forest Inventory Data. *AGU Fall Meeting*. December 16, San Francisco, CA.

2014 **L. A. Cooper**, A. P. Ballantyne. 2014. Carbon Vulnerability and Bioenergy Potential of Biomass in Disturbed Forest Areas in Helena National Forest, MT. *Harvesting Clean Energy Conference*. February 3, Helena, MT.

WORKSHOPS AND TRAINING

2017 NEON Data Science Institute, Boulder, CO (50 hours)

2015 Earth Engine at AGU Workshop, Expert section, San Francisco, CA (5 hours)

FIELD EXPERIENCE

Beaverhead-Deerlodge National Forest, (2016). Increment core samples, soil samples, needle collection, tree identification, ground cover description (basic plant identification).

Helena National Forest, (2014). Increment core samples, soil classification and sampling, tree identification, disturbance characterization.

Eastern Nevada rangelands, (2012). Line-intercept sampling, identification of grasses, forbs, and shrubs, soil classification, invasive species monitoring.

Wind Cave, Jewel Cave, and Devil's Tower National Monuments, (2011). Invasive species monitoring, fuels surveys, canopy cover measurements, vegetation cover estimates.

Eastern Washington and Oregon (varied during classes), (2010-2012). Vegetation identification, bird identification, herpetological identification. Vegetation cover estimates.

VOLUNTEER EXPERIENCE

2017 Lead Mentor, Montana Code Girls

2014, 2015, 2017 Judge, Montana State Science Fair

2014 Volunteer Educator, SpectrUM Science Museum

2009 Outdoor Educator, Whitman College Freshman Orientation 'Scramble'

TECHNICAL SKILLS

Statistical Methods:

time series analysis, linear and nonlinear models, hypothesis testing and confidence intervals, dimensionality reduction, mixed effects linear models, random forest, sampling theory, spatial statistics, MCMC, change detection, machine learning (e.g., classification, clustering)

Software and Programming Languages:

R, Python (scikit-learn, pandas, numpy, scipy, matplotlib), Google Earth Engine (JavaScript, Python), Matlab, Unix shell (Bash), QGIS, ArcGIS, SQL, Microsoft Excel, GitHub (AnnieCooper; Access to private repositories available on request.)

Data:

Landsat, MODIS, NEON hyperspectral and LiDAR data, USFS Aerial Detection Surveys, Monitoring Trends in Burn Severity (MTBS) fire data, USFS Forest Inventory and Analysis (FIA) data, dendrochronology data, PRISM, TopoWx

Relevant Coursework:

Spatial Statistics, Applied Sampling, Applied Statistical Modeling in Ecology, Statistics for Scientists, Calculus I-III, Linear Algebra, Differential Equations, Mathematical Modeling, Analysis in Google Earth Engine, Ecology, Natural History, Herpetology, Ecosystem

Climatology, Ecosystem Ecology, Evolutionary Biology, Physiological Plant Ecology,
Disturbance Ecology, Integrated Systems Ecology

PROFESSIONAL MEMBERSHIPS

American Geophysical Union
Ecological Society of America