

SARAH J. HART

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EDUCATION

- 2014** Ph.D. Geography, University of Colorado, Boulder
Dissertation: *Climate variability and the susceptibility of Engelmann spruce to spruce beetle outbreak in northwestern Colorado.*
- 2009** M.S. Geography, University of Victoria
Thesis: *A dendrochronological investigation of paraglacial activity and streamflow in the vicinity of the Homathko Icefield, British Columbia Coast Mountains, Canada.*
- 2007** B.S. Environmental Science, Mount Allison University
Thesis: *Examining tree island growth patterns in Cavell Meadows, Jasper National Park*

APPOINTMENTS

- 2017-** Assistant professor, School of the Environment, Washington State University
- 2016-17** Postdoctoral Researcher, Northern Plant Ecology Lab, University of Saskatchewan
- 2016-17** Courtesy Faculty, Oregon State University
- 2014-17** Postdoctoral Researcher, Biogeography Lab, University of Colorado, Boulder

RESEARCH INTERESTS

My research interests are in the areas of forest ecology, landscape ecology, biogeography, and global change ecology. Much of my research focuses on understanding the causes and consequences of forest disturbance, including wildfire, bark beetle outbreaks, and blowdown. I am motivated by both fundamental ecology questions and forest management needs to understand historic and future disturbance regimes. To address these research needs, I merge techniques from ecology (collection and analysis of field-based forest structure and composition data, field experiments, simulation modeling) and geography (GIS, remote sensing, dendrochronology, spatial statistics) and work across a range of spatial and temporal scales.

RESEARCH GRANTS AND AWARDS

- 2016-18** NASA New Investigator Program in Earth Science. *Drought-sensitive disturbance in the Southern Rocky Mountains and the ecologic and hydrologic consequences.* (Total \$250,993; P.I. – **S.J. Hart**)
- 2015** University of Colorado Undergraduate Opportunities Team Grant (Total \$3,000. P.I.s – with J.J. Hicks)
- 2014** First Annual Department of Geography Student Mentoring Award

- University of Colorado Undergraduate Opportunities Team Grant. (Total \$3,000; with J.J. Hicks & R. Andrus)
- 2013** National Science Foundation Geography and Spatial Sciences Program. *Collaborative Research: Spruce beetle and wildfire interactions under varying climate in the Rockies*. (Total \$347,191; P.I.s T.T. Veblen & D. Kulakowski; co-written by **S.J. Hart**)
- 2012** National Science Foundation Doctoral Dissertation Improvement Grant (Total \$11,727)
British Ecological Society Field Experience Grant (Total \$5,000)
University of Colorado Undergraduate Opportunities Team Grant (Total \$3000; with C. Naficy)
- 2011** National Geographic Young Explorers Research Grant (Total \$4,896;)
John Marr Ecology Fund Research Grant (Total \$500)
Colorado Mountain Club Academic Fellowship (Total \$2,000)
University of Colorado Undergraduate Opportunities Team Grant (Total \$3,000; with T.B. Chapman)
- 2010** Digital Globe WorldView-2 Imagery Challenge (satellite imagery)
- 2009** University of Victoria Faculty of Graduate Studies Travel Grant (\$600)
- 2008** University of Victoria Faculty of Graduate Studies Travel Grant (Total \$400)
- 2007** University of Victoria Entrance Award (Total \$15,000)
- 2006** Royal Canadian Geographic Society Research Grant Recipient (Total \$3,000)
Atlantic Centre for Global Change and Ecosystem Research (ACGCR) Research Grant Recipient (Total \$4,000; P.I. – C.P. Laroque; Student lead. - **S.J. Hart**)

PUBLICATIONS

Peer-reviewed

- Hart, S.J.**, Veblen, T.T., Schneider, D., & Molotch, N.P. *in press*. Summer and winter drought drive the initiation and spread of spruce beetle outbreak. *Ecology*. doi: 10.1002/ecy.1963
- Andrus, R.A., Veblen, T.T., Harvey, B.J. & **Hart, S.J.** 2016. Fire severity unaffected by spruce beetle outbreak in spruce-fir forests in southwestern Colorado. *Ecological Applications*. doi: 10.1890/15-1121.1
- Preston, D.L., Caine, N., McKnight, D.M., Williams, M.W., Hell, K., Miller, M.P., **Hart, S.J.**, and Johnson, P.T.J. 2016. Climate regulates alpine lake ice cover phenology and aquatic ecosystem structure. *Geophysical Research Letters*. doi: 10.1002/2016GL069036
- Temperli, C., Veblen, T.T, **Hart, S.J.**, Kulakowski, D., & Tepley, A.J. 2015. Interactions among spruce beetle disturbance, climate change and forest dynamics captured by a forest landscape model. *Ecosphere*. Ecosphere 6:art231. doi: 10.1890/ES15-00394.1
- Hart, S.J.**, Schoennegal, T., Veblen, T.T., & Chapman, T.B. 2015. Area burned in the western United States is not influenced by recent mountain pine beetle outbreaks. 2015. *Proceedings of the National Academy of Science* 112. 4375-4380.

- Hart, S.J.**, & Veblen, T.T. 2015. Detection of spruce beetle-induced tree mortality using high- and medium-resolution remotely sensed imagery. 2015. *Remote Sensing of Environment* 168. 134-145. doi: 10.1016/j.rse.2015.06.015.
- Hart, S.J.**, Veblen, T.T., Mietkiewicz, N., & Kulakowski, D. 2015. Negative feedbacks on bark beetle outbreaks: widespread severe spruce beetle outbreak may restrict future outbreak. *PLoS One* 10. doi: 10.1371/journal.pone.0127975.
- Hart, S.J.**, Veblen, T.T., & Kulakowski, D. 2014. Do tree and stand-level attributes determine susceptibility of spruce-fir forests to spruce beetle outbreaks? *Forest Ecology and Management* 318. 44-53.
- Temperli, C., **Hart, S.J.**, Veblen, T.T., Kulakowski, D., Hicks, J.J., Andrus, R. 2014. Are density reduction treatments effective at managing for resistance or resilience to spruce beetle disturbance in the southern Rocky Mountains? *Forest Ecology and Management* 334. 53-63.
- Hart, S.J.**, Veblen, T.T., Eisenhart, E., Jarvis, D., & Kulakowski, D. 2014. Drought limits spruce beetle outbreaks. *Ecology* 4. 930-939.
- Hart, S.J.**, Laroque, C.P. 2013. Searching for thresholds in the dendroclimatic response of subalpine fir and Engelmann spruce. *Dendrochronologia* 31. 9-15.
- Anderson, F., Brunt, J. Cameron, R.P., Caverhill, B., Clapp, D., Clapp, H., Coulthard, B.L., **Hart, S.J.**, Helmer, L., Hulburt, D., Imlay, T., Jameson, R., Kidd, P., Laroque, C.P., Marrotte, R., Marshall, K., Mitchell, S.C., Neily, T., Nickerson, K., O'Neill, N., Phillips, B., Pross, C., Proulx, G., Proulx, L., Reardon, C., Todd, J., & Towers, J. 2013. BioBlitz of the Lake Rossignol Wilderness Area. *Proceedings of the Nova Scotian Institute of Science* 47: 33-57.
- Smith, J.M., **Hart, S.J.**, Chapman, T., & Veblen, T.T. 2012. Dendroecological reconstruction of 1980s mountain pine beetle outbreak in lodgepole pine forests in northwestern Colorado. *Ecoscience* 19, 113-126.
- Hart, S.J.**, Smith, D.J., & Clague, J.J. 2010. A multi-species dendroclimatic reconstruction of Chilko River streamflow, British Columbia, Canada. *Hydrological Processes* 24, 2752-2761.
- Hart, S.J.**, Clague, J.J., & Smith, D.J. 2010. Dendrogeomorphic reconstruction of Little Ice Age paraglacial activity in the vicinity of the Homathko Icefield, British Columbia Coast Mountains, Canada. *Geomorphology* 121, 197-205.
- Reports and reviews**
- Hart, S.J.** 2011. A Review of "Fundamentals of Tree-Ring Research" -- James H. Speer. Tucson, AZ: The University of Arizona Press, 2010. xxii and 360 pp, 99 b/w photos, 58 illus., 9 tables, and 1 map. \$59.95 hardcover (ISBN: 978-0-8165-2684-0), *The Professional Geographer*.
- Hart, S.J.**, Coulthard, B., O'Neill, N., Reardon, C., Phillips, B., Robichaud, A., & Laroque, C.P. 2007. Examining Eastern Hemlock Old-Growth Forest at the 2006 Bio-Blitz, Southwestern Nova Scotia. Mount Allison University Dendrochronology Lab Report 2007-04. Prepared for: Nova Scotia Department of Environment and Labour, Protected Areas.
- Hart, S.J.** & Laroque, C.P. 2007. Examining tree island growth patterns in Cavell Meadows, Jasper National Park. Mount Allison University Dendrochronology Report 2007-03. Prepared for: Jasper National Park, Parks Canada.

Hart, S.J. & Laroque, C.P. 2006. Evaluating Old Growth Forest at Sixth and Silver Lake. Mount Allison University Dendrochronology Lab Report 2006-25. Prepared for: Nova Scotia Department of Environment and Labour, Protected Areas.

Manuscripts under review

Holz, A., **S.J. Hart**, G.J. Williamson, T.T. Veblen, J.C. Aravena. Latitudinal patterns in tree radial growth and vegetation productivity as bioindicators of ecosystem response to recent warming in southern South America.

REVIEWS

Grant reviewer: NASA Terrestrial Hydrology Program; National Science Foundation, Geography and Spatial Sciences Program; American Association of Geographers, Biogeography Specialty Group Student Research Grants

Manuscript reviewer: *Forest Ecology and Management; Hydrological Processes; Ecosphere; Regional Environmental Change; Canadian Journal of Forest Research; Forests; Ecosystems; Dendrochronologia; The Holocene; PLoS One; Ecological Applications; Remote Sensing of Environment; Ecology*

TEACHING EXPERIENCE

Instructor positions

Oregon State University, Department of Forest Engineering, Resources and Management

Forestry/Fisheries and Wildlife/Rangeland Sciences 446 – Wildland Fire Ecology (Winter 2016): This course was designed to provide students with the principles required to evaluate the impacts of fire on vegetation, soils, and wildlife across a broad range of ecosystems and landscape conditions. Students were exposed to concepts associated with fire regimes/histories and the ecology of major forest, rangeland and wetland ecosystems as they relate to natural and anthropogenic fire and/or fire exclusion.

University of Colorado Boulder

Geography/Geology 4093 - Remote Sensing of the Environment (Spring 2013)

GEOG/GEOL 4093 is an upper division techniques course that covers acquisition and interpretation of environmental data by remote sensing. In this course, I sought to develop a new generation of scientists capable of applying remotely sensed imagery to a variety of environmental issues. To accomplish this goal, I equipped students with both a foundational understanding of energy transfer and computer-based analysis skills.

Geography 3251 - Mountain Geography (Fall 2014, May 2011 & 2012)

GEOG 3251 is an upper division physical geography course that surveys mountain environments and their human use with illustrations from temperate and tropical mountain areas. My overarching goal in this course was to facilitate the development of a new generation capable of thinking critically and creatively about issues in mountain systems. To achieve this goal, I used a hands-on, active learning approach to understanding mountain environments.

Teaching assistant positions

University of Colorado, Boulder

2011-12 Geography/Geology 4093/5093 - Remote Sensing of the Environment

2010 Geography 1011 - Climate and Vegetation

University of Victoria

2009 Geography 101A - Environment, Society, and Sustainability

Geography 472 - Disaster Planning

2008 Geography 274 – Biogeography

Geography 377 - Applied Geomorphology

2007 Earth and Ocean Systems 110 - Oceans and Atmosphere

Mount Allison University

2006 Geography 2421 - Weather and Climate

2005 Geography 1401 - Introduction to Physical Geography

Mentees

2014-15 Xiwei Guo (*CU Undergraduate Research Opportunities Program*)

2013-14 Benjamin Parsons (*Boulder Valley School District High School Science Research Seminar*)

2012-14 Alexandra Todorovic-Jones (*CU Undergraduate Research Opportunities Program; Howard Hughes Medical Institute Biological Laboratory Research Program; Honors Thesis; NSF REU*)

2012 Mary Craig (*CU Undergraduate Research Opportunities Program*)

Jason Sauer (*CU Undergraduate Research Opportunities Program*)

2011 Christopher Giersch (*CU Undergraduate Research Opportunities Program*)

Owen Lamb (*CU Undergraduate Research Opportunities Program*)

Davis Miller (*CU Undergraduate Research Opportunities Program*)

SELECTED CONFERENCE PRESENTATIONS

Hart, S.J., Veblen, T.T., Schneider, D., & Molotch, N.P. 2017. Summer and winter drought drive the initiation and spread of spruce beetle infestation. Annual Meeting of the Ecological Society of America. Portland, OR.

Hart, S.J. and Veblen, T.T. 2016. The influence of snow water equivalent, summer drought, and habitat quality on spatiotemporal patterns of spruce beetle infestation in the Southern Rocky Mountains. Mountain Climate Conference 2016. Leavenworth, WA.

Preston, D.L., Caine, N., McKnight, D.M., Williams, M.W., Hell, K., Miller, M.P., **Hart, S.J.**, and Johnson, P.T.J. 2016. Climatic controls on hydrologic, geochemical, and biological processes in an

alpine lake. Mountain Climate Conference 2016. Leavenworth, WA.

Temperli, C., **Hart, S.J.**, & Veblen, T.T. 2014. Modeling Spruce Beetle And Fire Disturbance Under Climate Change And Adaptive Management In Subalpine Forests Of Northern Colorado, USA. International Union of Forest Research Organizations World Congress, Salt Lake City, Utah.

Hart, S.J., Chapman, T., Schoennagel, T., & Veblen, T.T. 2014. Impacts of spruce beetle kill on fire severity in the West Fork Fire Complex, Southwestern Colorado. North American Congress on Conservation Biology. Missoula, MT.

Schoennagel, T., **Hart, S.J.**, Veblen, T.T., & Chapman, T.B. 2014. Linked and compound disturbances in subalpine forests: Bark beetles and fire. Annual Meeting of the Ecological Society of America. Sacramento, CA.

Hart, S.J., Veblen, T.T., & Todorovic-Jones, A. 2013. Variability in bark beetle induced tree mortality and its relationship to climate and forest dynamics. AmeriDendro 2013. Tucson, AZ.

Hart, S.J., Eisenhart, K.S., Jarvis, D., Kulakowski, D., & Veblen, T.T. 2012. Associating interannual to multidecadal climate variability with spruce beetle outbreaks in Northwestern Colorado. Poster presentation. MntClim 2012. Estes Park, CO.

Hart, S.J., Eisenhart, K.S., Jarvis, D., Kulakowski, D., & Veblen, T.T. 2012. Climate variability and historical spruce beetle outbreaks across northwestern Colorado. Annual Meeting of the Ecological Society of America. Portland, OR.

Hart, S.J., Smith, D.J., & Clague, J.J. 2009. A 232-year dendroclimatic-inferred reconstruction of streamflow in the Chilko River, British Columbia Coast Mountains, Canada. Annual Meeting of the Canadian Association of Geographers. Carleton University, Ottawa, ON.

Hart, S.J., Smith, D.J., & Clague, J.J. 2009. Dendrogeomorphological insights into Late Holocene paraglacial activity in the vicinity of the Homathko Icefield, British Columbia Coast Mountains. Annual Meeting of the American Association of Geographers. Las Vegas, Nevada.

Hart, S.J., C.P. Laroque, & D.J. Smith. 2008. A dendroecological assessment of tree island growth trends and patterns in the Cavell Meadows, Jasper National Park, Canadian Rocky Mountains. Western Division of the Canadian Association of Geographers, Bellingham, WA.

Hart, S.J. & Laroque, C.P. 2006. Extending tree-ring chronologies in southwest Nova Scotia through old-growth forest sampling. 2nd Annual Conference of Atlantic Centre for Global Change and Ecosystem Research (ACGCER). K.C Irving Centre, Wolfville, Nova Scotia.

PROFESSIONAL DEVELOPMENT

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| 2016 | Bayesian Statistics, Duke University, Coursera course |
| 2014 | Scientific Teaching and Learning Workshop, Department of Ecology and Evolutionary Biology, University of Colorado |
| 2009-14 | University of Colorado Graduate Teacher Program Workshops |
| 2012 | Early Career GFDA Workshop, Geography Faculty Development Alliance, American Association of Geographers |
| 2005-06 | Mount Allison General Electric Teaching Internship Programme |

SERVICE AND OUTREACH

- 2015** Volunteer naturalist **Greenbelt Land Trust**. Provided information about natural history and forest management to visitors of Bald Hill Farm.
- Invited speaker for **Northwest Fire Consortium** webinar on bark beetle outbreaks and wildfire
- 2009-14** Volunteer trip leader with the **Sierra Club Boulder Valley Inner City Outings Group**. Organized and facilitated overnight camping trips for lower income middle school children in the Boulder Valley, Colorado
- 2013** Invited science fair judge for **Boulder County elementary schools**
- 2012** Volunteer scientist for the **National Geographic Rocky Mountain National Park BioBlitz**. Worked with public to survey plant species.
- 2010-12** Invited mentor for the **CU Geography Department**. Provided guidance for incoming graduate students.
- 2007-08** Volunteer science mentor for the **University of Victoria's Field Methods in Physical Geography** undergraduate course.
- 2006** Invited scientist for the **Nova Scotia Protected Areas Lake Rossignol Bioblitz**. Assisted governmental officials in determining areas for provincial protection by assessing forest stand quality.

SELECTED PRESS COVERAGE

- 2015** *Area burned in the western United States is not influenced by recent mountain pine beetle outbreaks*: published in Proceedings of the National Academy of Science and covered by many news sources including High Country News, ClimateWire, Science Magazine. See:
- <http://www.hcn.org/articles/dont-blame-the-bark-beetles-for-fire-risk>
 - <http://news.sciencemag.org/environment/2015/03/tiny-beetles-don-t-cause-big-fires-study-finds-raising-policy-questions>
- 2013** *Drought limits spruce beetle outbreak*: published in Ecology and covered by many news sources including ClimateWire, Mother Jones, the Huffington Post, Science Daily, Daily Camera, Science World Report. See:
- <http://www.sciencedaily.com/releases/2013/10/131010124736.htm>
 - <http://www.motherjones.com/blue-marble/2013/10/growing-spruce-beetle-outbreak-tied-drought-colorado>
- 2007** Discovery of Nova Scotia's oldest eastern hemlock (*Tsuga canadensis*). Covered in many new sources including: the Halifax Chronicle Herald, CBC Radio, and the Globe and Mail in 2007. See:
- <http://www.theglobeandmail.com/news/national/student-finds-418-year-old-tree/article1354196/>