

Shelly A. Rayback

Professor and Chair

Department of Geography & Geosciences

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Education

University of British Columbia, Vancouver, British Columbia, Canada

Ph.D. November 2003, Department of Geography

University of Texas, Austin, Texas, USA

M.A., June 1997, Department of Geography

Wellesley College, Wellesley, Massachusetts, USA

B.A. (*cum laude*), May 1993, Departments of French and English

Academic Appointments

University of Vermont, Burlington, Vermont USA

Professor, September 2021- present

Associate Professor 2012-2021

Assistant Professor 2005-2012

Department of Geography & Geosciences, 2022-present

Department of Geography, 2005-2022

Environmental Sciences Program, 2015-present

Graduate School Faculty, 2005-present

University of Vermont, Burlington, Vermont, USA

Chair, Department of Geography & Geosciences, July 2022-present

Environmental Sciences Program Co-Director, 2020-present

University of British Columbia, Vancouver, British Columbia, Canada

Post-doctoral Research Associate, September 2004 - August 2005

Publications

- Stern, R.,* Schaberg, P.G., **Rayback, S.A.**, Hansen, C.F., Murakami, P.F., and Hawley, G.J. Growth trends and environmental drivers of major tree species of the northern hardwood Forest. *Journal of Forestry Research*. Accepted: August 2022.
- Evans, M.E.K., DeRose, R. J., Klesse, S., Girardin, M.P., Heilman, K.A., Alexander, M.R., Arsenault, A., Babst, F., Bouchard, M., Cahoon, S.M.P., Campbell, E., Dietz, M., Duchesne, L., Frank, D., Giebink, C., Gomez-Guerrero, A., Gutierrez Garcia G., Hogg, E., Metsaranta J., Ols, C., **Rayback, S.A.**, Reid, A., Ricker, M., Schaberg, P.G., Shaw, J.D., Sullivan, P.F., and Gaytán, S.A.V. 2022. Adding tree rings to North America's national forest inventories: an essential tool to guide drawdown of atmospheric CO₂. *BioScience*.
- Heeter, K.J.*, Harley, G.L., Maxwell, J.T., Wilson, R.J., Abatzoglou, J.T., **Rayback, S. A.** Rochner, M.L., Kitchens, K.A. 2021. Tree-ring blue intensity-based temperature reconstructions for the low-to-mid latitude temperate zones of western North America. *Quaternary Science Reviews*. 10.1016/j.quascirev.2021.107064
- Stern, R.*, Schaberg, P.G., **Rayback, S.A.**, Murakami, P., Hansen, C., Hawley, G. 2021. Eastern white pine and eastern hemlock growth: possible tradeoffs in response of canopy trees to climate and pollution. *Canadian Journal of Forest Research*. 10.1139/cjfr-2020-0512.
- Belmecheri, S. Maxwell, R.S., Taylor, A.H., Davis, K.J., Guerrieri, R., Moore, D.J., and **Rayback, S.A.** 2021. Precipitation alters temperate forest response to rising CO₂. *Global Change Biology*. <https://doi.org/10.1111/gcb.15491>
- Rayback, S. A.**, Belmecheri, S., Gagen, M. H., Lini, A., Gregory, R.**, and Jenkins, C.** 2020. North American conifer (*Tsuga canadensis*) reveals the complex physiological influences of climate and anthropogenic stressors in mid-latitude forests. *New Phytologist*. <https://doi.org/10.1111/nph.16811>
- Rayback, S. A.**, Duncan, J., Schaberg, P.G., Kosiba, A., Hansen, C. and Murakami, P. 2020. The Dendroecological Network: a cyberinfrastructure for the storage, discovery and sharing of tree-ring and associated ecological data. *Dendrochronologia*. 60: 125678. <https://doi.org/10.1016/j.dendro.2020.125678>
- Harley, G.L., Heeter, K.J.*, Maxwell, J.T., **Rayback, S.A.**, Maxwell, R.S., Reinemann, T.E.P., and Taylor, A. 2020. Towards broad-scale, long-term temperature reconstructions for Eastern North America using blue light intensity from tree rings. *International Journal of Climatology*. <https://doi.org/10.1002/joc.6910>

- Stern, R.*, Schaberg, P.G., **Rayback, S.A.**, Murakami, P., Hansen, C., and Hawley, G. 2020. Red oak growth near its northern range limit: current trends, potential drivers and implications for the future. *Canadian Journal of Forest Research*.
<https://doi.org/10.1139/cjfr-2019-0200>
- Hansen, C.F.*, Schaberg, P.G., Strong, A.M., **Rayback, S.A.**, and Hawley, G.J., 2020. LiDAR helps differentiate stand health and productivity levels within a northern hardwood forest. *Open Journal of Forestry*. 10:66-80.
<https://doi.org/10.4236/ojf.2020.101006>
- Kosiba, A.M.*, Schaberg, P.G. **Rayback, S.A.**, and Hawley, G.J. 2018. The surprising recovery of red spruce shows links to decreased acid deposition and elevated temperatures. *Science of the Total Environment*. 637-638: 1480-1491.
<https://doi.org/10.1016/j.scitotenv.2018.05.010>
- Oswald, E., Pontius, J., **Rayback, S. A.**, Schaberg, P.S., Wilmot, S. and Dupigny-Giroux, L-A. 2018. The complex relationship between climate and sugar maple health. *Forest Ecology and Management*. 422: 303-312.
<https://doi.org/10.1016/j.foreco.2018.04.014>
- D'Orangeville, L., Maxwell, J., Kneeshaw, D., Pederson, N., Duchesne, L., Logan, T., Houle, D., Arseneault, D., Bishop, D.A., Druckenbrod, D., Fraver, S., Girard, F., Halman, J., Hansen, C., Hart, J.L., Hartmann, H., Kaye, M., Leblanc, D., Manzoni, S., **Rayback, S.A.**, Rollinson, C., and Phillips, R.P. 2018. Drought timing and local climate determine the sensitivity of eastern temperate forests to drought. *Global Change Biology*. <https://doi.org/10.1111/gcb.14096>
- Rayback, S. A.**, Shrestha, K.*, and Hofgaard, A. 2017. Moisture limits growth in co-occurring alpine tree and dwarf shrub species in the central Himalayas, Nepal. *Dendrochronologia*. 44:193-202. <http://dx.doi.org/10.1016/j.dendro.2017.06.00>
- Maxwell, R. S., Harley, G., Maxwell, J., **Rayback, S.A.**, Pederson, N., Cook, E.R., Barclay, Li, L., Rayburn, J. 2017. An interbasin comparison of tree-ring reconstructed streamflow in the eastern United States. *Hydrological Processes*. 31:2381-2394. DOI: 10.1002/hyp.11188
- Kosiba, A. M.*, Schaberg, P.G., **Rayback, S.A.** and Hawley, G.J. 2017. Comparative growth trends of five Northern hardwood and montane species reveal divergent trajectories and response to climate. *Canadian Journal of Forest Research*. 47: 743-754. (CJFR 2017 Editor's Choice Award).
- Coleman, K.*, Murdoch, J., **Rayback, S.**, Seidl, A., and Wallin, K. 2017 Student's understanding of sustainability and climate change across linked service-learning courses. *Journal of Geoscience Education*. 65:158-167.

- Engel, B.J.*, Schaberg, P.G., Hawley, G. J., **Rayback, S. A.**, Pontius, J. P., Kosiba, A. M.*, and Miller, E. K. 2016. Assessing relationships between red spruce woody radial growth and pollution critical load exceedance values. *Forest Ecology and Management*. 359: 83-91.
- Myers-Smith, I.H., Elendorf, S., Beck, P., Wilmking, M., Hallinger, M., Blok, D., Tape, K.D., **Rayback, S. A.**, Macias-Fauria, M., Forbes, B.C., Speed, J.D.M., Boulanger-Lapointe, N., Rixen, C., Levesque, E., Martin Schmidt, N., Baittinger, C., Trant, A. J., Dawes, M., Lantz, T., Weijers, S., Halfdan Jørgensen, R., Buchwal, A., Buras, A., Naito, A., Ravolainen, V., Schaepman-Strub, G., Wheeler, J., Wipf, S., Hik, D., Guay K., and Vellend M. 2015. Climate sensitivity of shrub growth across the tundra biome. *Nature Climate Change*. doi: 10.1038/NCLIMATE2697
- Myers-Smith, I.H., Hallinger, M., Wilmking, M., Blok, D., Sass Klaassen, U., **Rayback, S.A.**, Weijers, S.A., Trant, A., Tape, K.T., Naito, A. T., Dawes, M., Rixen, C., Wipf, S., Wheeler, J., Buchwal, A., Baittinger, C., Macias Fauria, M., Forbes, B., Levesque, E., Boulanger-Lapointe, N., Beil, I., Ravolainen, V. and F. H. Schweingruber. 2014. Methods for measuring arctic and alpine shrub growth: A review. *Earth-Science Reviews*. 2015. doi: 10.1016/j.earscirev.2014.10.004
- Schaberg, P.S., G. J. Hawley, **S. A. Rayback**, J. M. Halman, and Kosiba, A.M.*. 2014. Letter. Inconclusive evidence of *Juniperus virginiana* recovery following sulfur pollution reductions. *Proceedings of the National Academy of Sciences*. doi: 10.1073/pnas.1320526111.
- Rayback, S. A.**, A. Lini, and G. H. R. Henry. 2012. Multiproxy reconstructions: Combining stable isotope analysis and dendrochronological techniques to reconstruct recent climate in the Eastern Canadian Arctic. *Climatic Change*. 114:593-619. doi: 10.1007/S10584-012-0431-7.
- Rayback, S. A.**, A. Lini and D. L. Berg**. 2012. *Cassiope mertensiana* (white mountain heather) and the potential for multiproxy reconstruction of past climate on Mount Rainier, WA. *Geografiska Annaler-Series A, Physical Geography*. 94:413-427. doi:10.1111/j.1468-0459.2012.00463.x
- Rayback, S. A.**, A. Lini, and G. H. R. Henry. 2011. Spatial variability of the dominant climate signal in *Cassiope tetragona* from sites in Arctic Canada. *Arctic*. 64: 98-114.
- Meyers-Smith, I., Forbes, B.C., Wilmking, M., Hallinger, M., Lantz, T., Blok, D., Tape, K.D., Fauria, M.M, Sass-Klaassen, U., Lévesque, E., Boudreau, S., Ropars, P., Hermanutz, L., Trant, A., Collier, L.S., Weijers, S., Rozema, J., **Rayback, S.A.**, Schmidt, M., Schaepman-Strub, G., Wipf, S., Rixen, C., Ménard, C., Venn, S., Goetz, S., Andreu-Hayles, L., Elmendorf, S., Epstein, H.E., Welker, J., Grogan, P., and Hik, D. 2011. Shrub expansion in tundra ecosystems: Dynamics, impacts and research priorities. *Environmental Research Letters*. 6: 1-15. doi: 10.1088/1748-9326/6/4/045509

- Rayback, S. A., A. Lini, and D. L. Berg**.** 2010. Multiple climate signals characterize *Cassiope mertensiana* chronologies for a site on Mount Rainier, Washington, USA. *Physical Geography*. 31: 79-106.
- Rayback, S. A., and G. H. R. Henry.** 2006. Reconstruction of summer temperature for a Canadian High Arctic site from retrospective analysis of the dwarf-shrub, *Cassiope tetragona*. *Arctic, Antarctic, and Alpine Research*. 38: 2: 228-238.
- Ericksen, B., M. Bölter, K. J. Breen**, G. H. R. Henry, E. Lévesque, J-E. Mattsson, C. L. Parker and **S. A. Rayback.** 2006. Environment and site descriptions of an ecological baseline study in the Canadian Arctic: The Tundra Northwest Expedition 1999 (Nunavut and Northwest Territories, Canada). *Polarforschung*. 73: 77-88.
- Welker, J. M., **S. A. Rayback,** and G. H. R. Henry. 2005. Arctic and North Atlantic Oscillation phase changes are recorded in the isotopes ($\delta^{18}\text{O}$ & $\delta^{13}\text{C}$) in *Cassiope tetragona*. *Global Change Biology*. 11: 997-1002.
- Rayback, S. A., and G. H. R. Henry.** 2005. Dendrochronological potential of the arctic dwarf-shrub, *Cassiope tetragona*. *Tree-Ring Research*. 61: 43-53.
- Rayback, S. A.** 1998. A dendrogeomorphological analysis of snow avalanches in the Colorado Front Range, USA. *Physical Geography*. 19: 502-515.

Works in non-peer reviewed publications

- Rayback, S. A.** 2016. Making Observations and Measurements in the Field. In *Key Methods in Geography*. Clifford, N., Cope, M., French, S. and Gillespie, T. (eds.). London: Sage Publishers. pp. 335-335.
- Kosiba, A.*, Schaberg, P.G., Hawley, G.J., and **Rayback, S.A.** 2014. Using dendroecological techniques to interpret the response of trees to environmental change at Vermont Monitoring Cooperative's Mount Mansfield study site. Final Report, July 2014. Vermont Monitoring Cooperative.

* Denotes a graduate student author.

** Denotes an undergraduate student author.

Synergistic Activities

Dendroecological Network, Co-director. 2018-present

Responsible for the initiation, development, promotion and sustainability of the dendroecological database. The database was developed as part of a partnership with the Forest Ecosystem Monitoring Cooperative and the USDA Forest Service and is

housed on the FEMC website. The database was made publicly available to the larger academic, management and conservation communities in November 2018.

Teaching

University of Vermont

GEOG 002: World Natural Environments

GEOG 040: Weather, Climate and Landscapes

GEOG 081: Geotechniques

GEOG 140: Biogeography

GEOG 153: Arctic Canada

GEOG 153: The Circumpolar Arctic

GEOG 148/ENSC 148: Global Environmental Change

GEOG 197: Independent study: The Arctic

GEOG 244: Advanced Topics in Global Change: Dendrochronology

GEOG 246: Advanced Topics in Climate and Water Resources: Paleoclimatology

HCOL 186: Evolving Earth: Anthropogenic Changes to the Environment (S2017)

ENSC 009: Orientation to Environmental Sciences (S2022)