

## TREVOR QUENTIN MURDOCK

Place of Birth: Trail, Canada Citizenship: Canadian

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### **EDUCATION SUMMARY:** (list of 18 awards and scholarships available upon request)

1997 M.Sc. Earth and Ocean Sciences, University of Victoria  
Thesis title: Paleoclimatic Response of the Closure of the Isthmus of Panama in a Coupled Ocean-Atmosphere Model

1995 B.Sc. Physics, Honours Co-op with Distinction, University of Victoria

**LANGUAGES:** English and Swedish (fluent), some French

### **EMPLOYMENT SUMMARY:**

**Climate Scientist and Lead, Regional Climate Impacts** at the Pacific Climate Impacts Consortium (PCIC; current). My focus is on using climate projections from multiple sources to assist regional land use and community decision making by improving both stakeholder capacity to use climate model projections and PCIC knowledge of users' adaptation needs.

During three years (May 2005 – April 2008) as **Associate Director**, I focused on long-term visioning, obtaining grants and contracts, hiring and management of personnel, and completion of projects. I played a vital part in the transformation of the Canadian Institute for Climate Studies (CICS) into PCIC.

From August 2004 to March 2005, I was a part-time Research Associate at the Canadian Centre for Climate Modelling and Analysis (CCCma) with Drs. Slava Kharin, George Boer, and Greg Flato on an investigation of the predictability of weather under climate change, and part-time at CICS.

I started at CICS in May 1997 as Programmer Analyst and Webmaster. I contributed to a wide range of products, publications, climate application projects, and proposals on both scientific and managerial levels with steadily increasing levels of responsibility.

As a co-op student during my B.Sc., I completed four work terms including April to September 1994 at CCCma on climate data analysis for research on the Pacific North America pattern, as well as statistical analysis at BC Ministry of Environment, National Centre of Excellence for laser spectroscopy, and TRIUMF particle accelerator.

**ACHIEVEMENTS:**

- Contributed to formation and launch of the Pacific Climate Impacts Consortium.
- Authored and contributed to dozens of analyses of BC historical and future climate resulting in use of climate information for planning and decision-making.
- Developed applied climate scenarios including online climate scenarios mapping tools (such as Plan2Adapt), the BC Water Balance Model, Climate Severity Index, permanent exhibit at the Royal BC Museum, several BC and Federal climate change indicators reports.
- Development, analysis, and improvement of regional seasonal climate predictions.
- Documenting strengths and weaknesses of various methods of downscaling and developing robust methods for use in areas of complex topography.
- Contributions to several guidance documents for professional associations on the use of climate information.
- Presentations at workshops to wide range of audiences: laypersons, decision makers, climate science and impacts and adaptation researchers.

**PUBLICATIONS – REFERREED JOURNALS AND BOOKS:**

- Li, G., X. Zhang, A. Cannon, **T.Q. Murdock**, S. Sobie, F.W. Zwiers, K. Anderson, B. Qian, 2017: Indices of Canada's future climate for general and agricultural adaptation applications. *In revision*, Climatic Change.
- Sobie, S.R. and **T.Q. Murdock**, 2017: High-Resolution Statistical Downscaling in Southwestern British Columbia. *Journal of Applied Meteorology and Climatology*, 56, 6, 1625–1641, doi:10.1175/JAMC-D-16-0287.1
- Eum, H.I, A.J. Cannon, **T.Q. Murdock**, 2016: Intercomparison of multiple statistical downscaling methods: multi-criteria model selection for South Korea, *Stoch Environ Res Risk Assess.* doi:10.1007/s00477-016-1312-9
- Cannon, A.J., Sobie, S.R., **Murdock, T.Q.**, 2015: Bias correction of simulated precipitation by quantile mapping: how well do methods preserve relative changes in quantiles and extremes? *Journal of Climate*, 28(17): 6938-6959. doi:10.1175/JCLI-D-14-00754.1
- Alfaro, R.I., B. Fady, G.G. Vendramin, I.K. Dawson, R.A. Fleming, C. Sáenz-Romero, R.A. Lindig-Cisneros, **T.Q. Murdock**, B. Vinceti, C.M. Navarro, T. Skrøppa, G. Baldinelli, Y.A. El-Kassaby, J. Loo, 2014: The role of forest genetic resources in responding to biotic and abiotic factors in the context of anthropogenic climate change, *Forest Ecol. and Manage.*, doi: 10.1016/j.foreco.2014.04.006.
- Hamann, A., T. Wang, D.L. Spittlehouse, **T.Q. Murdock**, 2013: A Comprehensive, High-Resolution Database of Historical and Projected Climate Surfaces for Western North America. *Bull. Amer. Meteor. Soc.*, 94, 1307–1309. doi: <http://dx.doi.org/10.1175/BAMS-D-12-00145.1>
- Murdock, T.Q.**, S.R. Sobie, F.W. Zwiers, and H.D. Eckstrand, 2013: Climate change and extremes in the Canadian Columbia Basin, *Atmosphere-Ocean*, doi:0.1080/07055900.2013.816932.
- Cohen, S., M. Laurie, I. Liepa, **T.Q. Murdock**, C. Pearce, E. Pond, O. Schroth, J. Zukiwsky, 2013: Shared Learning on Adapting to Climate Change: Experiences

- from Columbia Basin Trust - Communities Adapting to Climate Change Initiative. In: Climate Adaptation Futures, John Wiley & Sons, Oxford.
- Flower, A. **T.Q. Murdock**, S.W. Taylor and F.W. Zwiers, 2013: Using an ensemble of downscaled climate model projections to assess impacts of climate change on the potential distribution of spruce and Douglas-fir forests in British Columbia, in “Rethinking Integrated Assessments and Management Projects in the Americas” special issue of Environmental Science & Policy, 26, 63–74, doi:10.1016/j.envsci.2012.07.024.
- Murdock, T.Q.**, S.W. Taylor, A. Flower, A. Mehlenbacher, A. Montenegro, F.W. Zwiers, R. Alfaro and D.L. Spittlehouse, 2013: Pest outbreak distribution and forest management impacts in a changing climate in British Columbia, in “Rethinking Integrated Assessments and Management Projects in the Americas” special issue of Environmental Science & Policy, 26, 75–89, doi:10.1016/j.envsci.2012.07.026.
- Bürger, G., S.R. Sobie, A.J. Cannon, A.T. Werner, and **T.Q. Murdock** 2013: Downscaling Extremes - An Intercomparison of Multiple Statistical Methods for Future Climate, Journal of Climate, 26, 10, 3429-3449. doi:http://dx.doi.org/10.1175/JCLI-D-12-00249.1
- Alfaro, R., B. Fady, G. G. Vendramin, I. Dawson, R.A. Fleming, C. Sáenz-Romero, R.A. Lindig-Cisneros, **T.Q. Murdock**, B. Vinceti, C.M. Navarro, T. Skrøppa, G. Baldinelli, Y.A. El-Kassaby and J. Loo, 2013: Thematic study 5: Role of forest genetic resources in adaptation to biotic and abiotic factors in a changing climate, chapter in State of World Forest Genetic Resources report, United Nations Food and Agriculture Organization.
- Bürger, G., **T.Q. Murdock**, A.T. Werner, S.R. Sobie, 2012: Downscaling Extremes - An Intercomparison of Multiple Statistical Methods for Present Climate, Journal of Climate, 25, 4366-4388 doi:http://dx.doi.org/10.1175/JCLI-D-11-00408.1
- Picketts, I.M., A.T. Werner, **T.Q. Murdock**, J. Curry, S.J. Dery, D. Dyer, 2012: Planning for climate change adaptation: lessons learned from a community-based workshop. Journal of Environmental Science and Policy, 17, 82-93.
- Wang, T., A. Hamann, D. L. Spittlehouse, and **T. Q. Murdock**, 2012: ClimateWNA—High-Resolution Spatial Climate Data for Western North America. Journal of Applied Meteorology and Climatology, 51, 16–29, doi:10.1175/JAMC-D-11-043.1.
- Murdock, T.Q.**, 2012: Climate Impacts Science for Adaptation, Journal of Climate Impacts and Adaptation Science, 1, 197-211.
- Murdock, T.Q.** 2010: Box 4 in B. Locatelli, Ch. 2 in Future of Forests: Responding to Global Changes, Future Forests – Responding to Global Changes. International Union of Forest Research Organizations.
- Pike, R.G., D.L. Spittlehouse, K.E. Bennett, V.N. Egginton, P.J. Tschaplinski, **T.Q. Murdock** and A.T. Werner, 2008. Climate Change and Watershed Hydrology. Streamline Watershed Management Bulletin. Vol 11. No 2.
- Murdock, T.Q.**, K. Bennett and J. Runnells, Chapter 8: British Columbia, Section 2: Indicators of Climate Variability and Change *in* Lemmen, D.S., Warren, F.J.,

- Lacroix, J., and Bush, E., editors, 2008: From Impacts to Adaptation: Canada in a Changing Climate 2007; Government of Canada, 448 p.
- Murdock, T.Q.**, and R.J. Lee, 2000: Carbon - the heart of climate change, Canadian Meteorological and Oceanographic Society Bulletin, 28 (1), 7-8.
- Murdock, T.Q.**, A.J. Weaver, and A.F. Fanning, 1997: Paleoclimatic response of the closing of the Isthmus of Panama in a coupled ocean-atmosphere model, Geophysical Research Letters, 24, 253-256.
- Barnes, J.A., T.E. Gough, **T.Q. Murdock**, and M. Stoer, 1995: Absolute intensities in photo-acoustic spectroscopy, Review of Scientific Instruments, 67, F '96, 371-374.

**PUBLICATIONS – REPORTS, POSTERS, BRIEFING NOTES, CONFERENCE PROCEEDINGS, ONLINE COURSES, PODCASTS:**

- Cowichan Valley Regional District [Contributing Author], 2017: Climate projections for the Cowichan Valley District, 56 pp.
- Capital Regional District [Contributing Author], 2017: Climate projections for the Capital Regional District, 66 pp.
- Canadian Broadcasting Corporation [Contributor and Interviewee], 2017: 2050s – Degrees of Change, Podcast Mini-Series.
- Metro Vancouver Regional District [Contributing Author], 2016: Climate projections for Metro Vancouver, 80 pp.
- PCIC memo [Contributing Author], 2016: Summary of 2050s climate projections for Whistler area
- PCIC memo [Contributing Author], 2016: City of Vancouver climate projections summary
- PCIC memo [Contributing Author], 2017: District of North Vancouver climate projections summary
- Sobie, S.R., Murdock, T.Q., 2016: Experiences with collaborative climate impacts assessments for regional governments in southwestern British Columbia, Poster presentation at the American Geophysical Union Fall Meeting, 12-16 December 2016, San Francisco, California.
- Shumlich, M., Murdock, T.Q., 2016: Approaches for Communicating Climate Science That Work for Users, Poster presentation at 7th Annual Northwest Climate Conference in Stevenson, Washington, November 14-16, 2016.
- Spittlehouse, D., Murdock, T.Q., Assessing the Risks of a Changing Climate to Forest Management, 2016: Poster presentation at the 13th International Meeting on Statistical Climatology, June 2016.
- Murdock, T.Q. and F.W. Zwiers, 2015: Regional Climate Impacts, Research Plan for 2015 – 2019, Pacific Climate Impacts Consortium
- Murdock, T.Q., S.R. Sobie, H.D. Eckstrand, E. Jackson, revised 2016: Georgia Basin Projected Climate Change, Extremes, and Historical Analysis, Pacific Climate Impacts Consortium, 63 pp.
- PCIC, [Contributing Author], 2015: Resource Region Summaries, Series of 8 plain language summaries for the 8 resource regions of BC, Pacific Climate Impacts Consortium extension notes, 4 pp each.

- Picketts, I. [Contributing Author], 2015: Backgrounder: Future Climate in Northeastern British Columbia, Natural Resources Canada report, 24 pp.
- Pacific Climate Impacts Consortium [Contributing Author], 2014: Regional Climate Impacts Meeting Report, Pacific Climate Impacts Consortium Report, 6pp.
- Murdock, T.Q.**, A.J. Cannon, S.R. Sobie, and F.W. Zwiers, 2014: Evaluation of influence of spatial resolution on precipitation extremes, Poster at RCM 2014 conference, Lund Sweden
- Nodelman, J. and co-authors [Contributing Author], 2014: Climate Change Engineering Vulnerability Assessment of Three British Columbia Highway Segments, Public Infrastructure Engineering Vulnerability Committee (PIEVC) Project report, 91pp.
- Nodelman, J. and co-authors [Contributing Author], 2014: Towards Effective Dialogue between Engineering Practitioners and Climate Scientists: A Primer to Define Common Language, Public Infrastructure Engineering Vulnerability Committee (PIEVC) Project report, 29 pp.
- Murdock, T. Q.**, A. J. Cannon, and S. R. Sobie, 2014: Statistical downscaling of future climate projections for North America. PCIC Project Report for Environment Canada, University of Victoria, Victoria BC.
- Pacific Institute for Climate Solutions [Contributing Author], 2014: Climate Insights 101 online course: Module 2 – BC Impacts and Adaptation, <http://pics.uvic.ca/education/climate-insights-101>
- Murdock, T.Q.**, A.J. Cannon, S.R. Sobie, B. Veerman, F. Anslow, and F.W. Zwiers, 2014: Workshop Primer: Projected precipitation extremes for Coastal British Columbia. Pacific Climate Impacts Consortium, University of Victoria, Victoria, BC, 8 pp.
- Sobie, S.R., **Murdock, T.Q.**, 2014: Analysis of climate change projections for the Ministry of Transportation and Infrastructure highways risk assessment. Pacific Climate Impacts Consortium Report, 27 pp.
- Sobie, S.R., R.R. Shrestha, **T.Q. Murdock**, M.A. Schnorbus, 2014: Columbia Basin regional climate change analysis for Teck Resources Limited. Pacific Climate Impacts Consortium Report, 130 pp.
- Murdock, T.Q.**, Sobie, S.R., R.R. Shrestha, M.A. Schnorbus, 2014: Concepts and approaches for regional climate change analysis. Pacific Climate Impacts Consortium Report, 41 pp.
- Sobie, S.R., Cannon, A.J., **Murdock, T.Q.**, 2014: Evaluation of increasing spatial resolution in downscaled climate projections and the effect on extreme precipitation, Poster presentation at the American Geophysical Union Fall Meeting, 15-19 December 2014: San Francisco, California.
- Murdock, T.Q.**, A.J. Cannon, and S.R. Sobie, 2013: Downscaling extremes – a new set of climate change projections for Canada, American Geophysical Union poster #GC43C-1069
- Murdock, T.Q.** and Sobie, S.R., 2013: Climate Extremes in the Canadian Columbia Basin: A Preliminary Assessment, Pacific Climate Impacts Consortium Report, University of Victoria, Victoria, BC, 54 pp.

- Murdock, T. Q.**, A. J. Cannon, and S. R. Sobie, 2013: Statistical downscaling of future climate projections. PCIC Project Report for Environment Canada, University of Victoria, Victoria BC.
- Picketts, I.M, **T.Q. Murdock**, 2012: Using climate models to inform community adaptation in BC, Pacific Institute for Climate Solutions Briefing Note 2012-39.
- Murdock, T.Q.** and F.W. Zwiers, 2012: Regional Climate Impacts, Research Plan for 2012 – 2016, Pacific Climate Impacts Consortium
- Murdock, T.Q.**, D.S. Spittlehouse, 2011: Selecting and using climate change scenarios for British Columbia, Pacific Climate Impacts Consortium.
- Lane, O., S. Cohen, **T.Q. Murdock**, 2011: Climate Change Impacts and Adaptation in the Canadian Columbia River Basin: A Literature Review, University of British Columbia/Environment Canada
- Murdock, T.Q.**, A.T. Werner, 2011: Canadian Columbia Basin Climate Trends and Projections: 2007-2010 Update, Pacific Climate Impacts Consortium.
- Moore, R.D., G. Jost, G.K.C. Clarke, F. Anslow, V. Radic, B. Menounos, R. Wheate, A.T. Werner, **T.Q. Murdock**, 2011: Glacier and Streamflow Response to Future Climate Scenarios, Mica Basin, British Columbia, Final Report Prepared for BC Hydro
- Werner, A, H. Jaswal, and **T.Q. Murdock**, 2009: Climate Change in Dawson City, YT: Summary of Past Trends and Future Projections. Pacific Climate Impacts Consortium Report, 40 pp.
- Picketts, I. A. Werner, and **T.Q. Murdock**, 2009: Climate Change in Prince George: Summary of Past Trends and Future Projections. Pacific Climate Impacts Consortium Report, 48 pp.
- Murdock, T.Q.** and A. Flower, 2009: Final Technical Report Forest Science Program Project # Y093061: Development and analysis of forest health databases, models, and economic impacts for BC: Spruce bark beetle & spruce; western spruce budworm and Douglas fir. Pacific Climate Impacts Consortium Report, 43 pp.
- Dawson, R., A. Werner, and **T.Q. Murdock**, 2008: Cariboo-Chilcotin: Climate change analysis suggests future work needed to assess vulnerabilities, LINK Fall 2008 Vol 10 Issue 3, FORREX.
- Flower, A., **T.Q. Murdock**, K. Campbell, 2008: Projected Changes in Climatic Suitability for Douglas Fir and Spruce Forests in British Columbia, American Geophysical Union Fall Meeting 2008 poster #GC51A-0657, San Francisco,
- Flower, A., and **T.Q. Murdock**, 2008: Symposium addresses science of researching forest pests, climate change, LINK Fall 2008 Vol 10 Issue 3, FORREX.
- Dawson, R. A. Werner, and **T.Q. Murdock**, 2008: Preliminary Analysis of Climate Change in the Cariboo-Chilcotin Area of British Columbia. Pacific Climate Impacts Consortium Report, 49 pp.
- Pike, R.G., D.L. Spittlehouse, K.E. Bennett, V.N. Egginton, P.J. Tschaplinski, **T.Q. Murdock** and A.T. Werner, 2008: A Summary of Climate Change Effects on Watershed Hydrology. Ministry of Forests and Range Extension Note.
- C. Abbott, K.E. Bennett, K. Campbell, **T.Q. Murdock**, H.S. Swain, 2008: Forest Pest and Climate Change Symposium: Forest Science Program project report, 13 pp.

- Werner, A.T. and **T.Q. Murdock**, 2008: Summary Report: Changes in Past Hydro-climatology and Projected Future Change for the City of Whitehorse, Pacific Climate Impacts Consortium report, 23 pp.
- Rodenhuis, D.R., K.E. Bennett, A.T. Werner, **T.Q. Murdock**, and D. Bronaugh, 2007: Hydro-climatology and future climate impacts in British Columbia, Pacific Climate Impacts Consortium report, 131 pp.
- Rodenhuis, D.R., A.T. Werner, K.E. Bennett, **T.Q. Murdock**, 2007: Research Plan for Hydrologic Impacts: Program Definition (2007 – 2010), Pacific Climate Impacts Consortium report, 34 pp.
- Rodenhuis, D.R. and **T.Q. Murdock**, 2007: Pacific Climate Impacts Consortium: Themes and Products, Pacific Climate Impacts Consortium report, 10 pp.
- Murdock, T.Q.**, R.J. Lee and D.R. Rodenhuis, 2007: Regional empirical seasonal climate prediction in Western Canada, Proc. 5th Climate Prediction Science Workshop, University of Washington, 13 pp.
- Murdock, T.Q.**, A.T. Werner and D. Bronaugh, 2007: Preliminary analysis of BC climate trends for biodiversity, Pacific Climate Impacts Consortium report, 24 pp.
- Murdock, T.Q.**, K.E. Bennett and A.T. Werner, 2007: GVRD historical and future rainfall analysis update, Pacific Climate Impacts Consortium report, 52 pp.
- Murdock, T.Q.**, J. Fraser and C. Pearce (editors), 2007: Preliminary analysis of climate variability and change in the Canadian Columbia River Basin: Focus on water resources, Pacific Climate Impacts Consortium report, 57 pp.
- Murdock, T.Q.** and K.E. Bennett, 2007, Appendix in K. Sandiford and M. Westlake, Preparing for change: Managing climate change risks in the Atlin area, Northern Climate Exchange report, 32 pp.
- Sandford, R., **Murdock, T.Q.**, C. Pearce and K. Gosal, 2006: Climate change in the Canadian Columbia Basin: Starting the dialogue, Columbia Basin Trust report, 19 pp.
- Murdock, T.Q.**, 2005: Climate model scenarios for impacts on forestry, popular summary, in Science Forum Proceedings: Forests and Natural Resources in the 21<sup>st</sup> Century, BC Journal of Ecosystems and Management, 6 (2).
- Murdock, T.Q.**, 2005: Climate model scenarios, in Columbia Mountains Institute of Applied Ecology Proceedings: Implications of Climate Change in British Columbia's Southern Interior forests.
- Murdock, T.Q.**, R.J. Lee, E. Barrow, F. Zwiers, and I. Rutherford, 2001: Methodology and Technical Report for Scenarios of the Climate Severity Index, Canadian Institute for Climate Studies report, 69 pp.
- Lee, R.J., **T.Q. Murdock**, and R. Davidson, 1999, Extreme Precipitation Episodes at Hartland Landfill Site, Canadian Institute for Climate Studies report, 22 pp.
- Lee, R.J., and **T.Q. Murdock**, 1998, Alfalfa Crop Yield Model, Canadian Institute for Climate Studies report, 132 pp.

**PRESENTATIONS:** List of ~20 per year available upon request