

TETL'IT GWICH'IN CLIMATE CHANGE ADAPTATION PLAN ENVIRONMENTAL SCAN

This scan is based on the research and process of writing the Climate Change Adaptation Plan for the community of Fort McPherson, NWT. The scan outlines research completed into background issues related to climate change impacts that may be affecting the community and more broadly the Gwich'in region.

The following document is organized as a simple annotated bibliography. The references are categorized according to **subject matter (in green)**, and to help the reader they are rated (top to bottom - in each category) in terms of usefulness to the author in developing the Climate Change Adaptation Plan for Fort McPherson. This is a subjective rating, which is meant as a starting point for the reader to help follow-up on issues of interest. When possible the location the **document was sourced (in blue)** has been included, to help the reader follow-up. A very brief **description of the document (in red)** is provided to help the reader determine whether they wish to follow-up on this source.

This scan is not intended to be exhaustive, but is targeted towards information related to the Gwich'in Settlement Area and Fort McPherson and climate change adaptation. Hopefully this document will provide a starting point for the reader to get some further information, or just provide a quick overview of the issues and potential resources related to climate change in the Gwich'in Settlement Area.

CLIMATE CHANGE GENERAL:

ACIA. 2004. Impacts of a Warming Arctic. Arctic Climate Impacts Assessment. Cambridge University Press: Cambridge, UK.
<http://www.acia.uaf.edu/>

The Arctic Climate Impact Assessment Report was a major international undertaking to outline the impacts of climate change on the Arctic Environment.

Ecology North. (2006). Standing Up To Climate Change: Northern Problems and Possibilities.

This booklet was produced for the Northern Leaders Summit on Climate Change held in January 2006 in Yellowknife, NWT, and is full of local observations and information on climate change and adaptation.

National Roundtable on the Environment and the Economy. True North Adapting Infrastructure to Climate Change in Northern Canada. 2009.
<http://nrtee-trnee.ca/>

This report was developed for the International Polar Year, and provides recommendations to reduce the impact on Canada's North from climate change.

Bastedo, Jamie. (2007). On the Frontlines of Climate Change – What’s Really Happening in the Northwest Territories. Prepared for the Honourable Nick Sibbeston, Senator for the NWT.
<http://sen.parl.gc.ca/nsibbeston/Final%20for%20WEB%20or%20Email.pdf>

This booklet provides an excellent overview of climate change in the NWT with lots of photos and examples of impacts, many of which are substantiated by quotes from elders.

Environment and Natural Resources, GNWT. NWT Climate Change Impacts and Adaptation Report. 2008.
http://www.enr.gov.nt.ca/live/documents/content/NWT_Climate_Change_Impacts_and_Adaptation_Report.pdf

Background report produced by the Government of NWT that outlines some of the impacts in the NWT.

NORTHERN CLIMATE CHANGE ADAPTATION PLANS:

Northern Climate Exchange. Dawson Community Adaptation Project Community Climate Change Adaptation Plan. 2009.
<http://www.taiga.net/nce/>

Dawson City Adaptation Plan was important to developing the methodology for the Fort McPherson Plan.

Arctic North Consulting. Climate Change Adaptation Action Plan for Ulukhaktok. 2010.
<http://arctic-north.com/>

Ulukhaktok plan which is similar but has different issues mostly related to sea ice and the ocean.

Arctic North Consulting. Climate Change Adaptation Action Plan for Paulatuk. 2010.
<http://arctic-north.com/>

Paulatuk plan which is similar but has different issues mostly related to sea ice and the ocean.

Hemmera & Compass Resource Management. Hall Beach Climate Change Summary Adaptation Action Plan. 2008.

Hall Beach Plan, shows a different approach to adaptation.

Pryor, Jake. Pembina Institute. Creating A More Resilient Yellowknife - Climate Change Impacts & Municipal Decision Making. 2007.
<http://www.pembina.org/pub/1694>

Yellowknife plan, which is more complex for a larger city, that has fewer impacts from climate change.

Canadian Institute of Planners. Climate Change Priority Issues in Nunavut. 2008.
<http://www.planningforclimatechange.ca/wwwroot/Docs/Climate%20Change%20Priority%20Issues%20in%20Nunavut%5B1%5D.pdf>

This discussion paper looks at some of the major climate change issues in Nunavut and what has been done to date to tackle these issues.

COMMUNITY PLANNING:

Fort McPherson Hamlet. 2010. Integrated Community Sustainability Plan.
[Hamlet of Fort McPherson](#)

An important, March 2010 plan that has 8 goals, and 46 strategies to accomplish these goals. This includes the energy strategy and capital planning components.

Hamlet of Fort McPherson Emergency Response Plan.
[Hamlet of Fort McPherson](#)

An outline of the response plan in case of emergencies.

Gwich'in Land Use Plan. Gwich'in Land Use Planning Board. 2003.
<http://www.gwichinplanning.nt.ca/landUsePlan.html>

Good background information on the Gwich'in Settlement Area and the land.

Fort McPherson Water Licence. G03L3- 001. Gwich'in Land and Water Board
[Hamlet of Fort McPherson](#)

Information on water and wastewater usage, and the lagoon sampling protocol.

CLIMATE:

Canadian Climate Change Scenarios Network: Ensemble Scenarios for Canada 2009.

<http://www.cccsn.ca/ensemblescenarios/ensembles-e.html>

Environment Canada has developed Climate Scenarios which can be broken down by area and timeline that are based on the best estimates of global climate models.

Climate Observations in the Northwest Territories. 2008.

GNWT Environment and natural Resources

This paper provides proof that climate is warming in Inuvik by looking at temperature and precipitation records, and charting them.

WILDLIFE:

Arctic Borderlands Ecological Knowledge Society. Arctic Borderlands Ecological Knowledge Co-op Community Reports 1996-2009.

<http://www.taiga.net/coop/>

The Borderlands Co-op has collected and published community-based ecological monitoring that is based on traditional observation gathered through interviews with harvesters and elders in eight northern communities.

Johnston, Brian. (2007). Wildlife and Land Use Data Collection for the Peel Watershed. Peel Watershed Planning Commission.

Identified and mapped key wildlife and harvesting areas within the Peel Watershed that are important to the Gwich'in of Fort McPherson.

Porcupine Caribou Management Board. 2008-2009 Annual Report

Outline the health of the herd, and the management techniques being used to ensure a healthy population into the future.

INVASIVE SPECIES:

Catling, P. M. (2005). Additions to the flora of the continental Northwest Territories from the Great Slave Lake area. *Canadian Field-Naturalist*, 119(3), 437-440.

Aurora Research Institute <http://www.nwtresearch.com/resources/publications/Compendia.aspx>

Eleven species are reported as new to the flora of the continental Northwest Territories, There may be several reasons for this, but climate change is one.

Carriere, S. 2009. An Assessment of Invasive Alien Species in the NWT. Slide show AIS National Meeting, January 2009.

This slideshow highlights alien invasive plant species in the NWT and what the government is doing to reduce the harm from these species.

FORESTS:

Gwich'in Forest Management Plan: a framework for Forest Management. Gwich'in Tribal Council. 2008.

A planning framework for forest management in the GSA.

Bhatti, Jagtar. (2008). Changing Forests and Peatlands along the Mackenzie Valley, Northwest Territories. Natural Resources Canada – International Polar Year.

Aurora Research Institute <http://www.nwtresearch.com/resources/publications/Compendia.aspx>

The Mackenzie Valley region of northwestern Canada is undergoing the most warming of any region, which is causing important changes in forests and peatlands.

Ball, T. F. (1986). Historical evidence and climatic implications of a shift in the boreal forest tundra transition in central Canada. *Climatic Change*, 8(2), 121-134.

Aurora Research Institute <http://www.nwtresearch.com/resources/publications/Compendia.aspx>

This paper looks at historical evidence to suggest the treeline can move fairly quickly, and the change between forest and tundra can be fairly fluid.

FOREST FIRES:

National Forestry Database - Canadian Council of Forest Ministers

http://nfdp.ccfm.org/dynamic_report/dynamic_report_ui_e.php

This website has searchable charts detailing forest fires annual burned areas in the NWT.

Fauria, M. M., & Johnson, E. A. (2008). Climate and wildfires in the North American boreal forest. *Philosophical Transactions of the Royal Society of London B Biological Sciences*, 363(1501), 2317-2329.

Aurora Research Institute <http://www.nwtresearch.com/resources/publications/Compendia.aspx>

High level analysis of the underlying causes of forest fires in the Boreal suggest the climate has been warmer and wetter than in the past leading to less fires. It's unknown whether this trend will continue.

Kochtubajda, B., Flannigan, M.D., Gyakum, J.R., Stewart, R.E., Logan, K.A., Nguyen, T.V. (2004). Lightning and Fires in the Northwest Territories and Responses to Future Climate Change. *Arctic*. 59(2). 211-221.

Aurora Research Institute <http://www.nwtresearch.com/resources/publications/Compendia.aspx>

The longer, warmer, and drier summer seasons projected to result from climate change are expected to increase lightening and thus the potential for forest fires by the end of the 21st century.

FLOODING:

Arora, Vivek. 2007. The Potential Impact of Climate Change of Mackenzie River Basin Hydrology. CWRA BC Branch 2001 Conference – Changing Water Environments: Research and Practice.

http://www.cccma.ec.gc.ca/papers/varora/cwra_bc_conference_paper_2001.pdf

This paper indicates that the Mackenzie River runoff regime will change with climate change. Generally having smaller, earlier spring floods, lower summer flows and higher fall and winter flows.

Kokelj, Shawne, 2001. Hydrological Overview of the Gwich'in and Sahtu Areas. Water Resources Division: Indian and Northern Affairs.

A brief outline of the flow regime of the Peel River (and other rivers), that shows graphically the minimum, average and maximum flow years.

Kerr, J. Future Water Levels and Flows for Great Slave and Great Bear Lakes, Mackenzie River, and Mackenzie Delta. Mackenzie Basin Impact Study.

Aurora Research Institute <http://www.nwtresearch.com/resources/publications/Compendia.aspx>

Predictions of lower water levels due to increased evaporation, earlier spring breakup and higher spring flows. With the exception of the delta where higher Ocean levels may cause problems.

Department of Transportation. 2004. Ferry Crossings and Ice Road Information (Updated April 24, 2004). From Rob Thom, personal correspondence.

Information on ferry and ice crossing seasons of the Peel River crossing dating back to 1975.

Woo, M., Thorne, R., Szeto, K., & Yang, D. (2008). Streamflow hydrology in the boreal region under the influences of climate and human interference. *Philosophical Transactions of the Royal Society of London B Biological Sciences*, 363(1501), 2251-2260.

Aurora Research Institute <http://www.nwtresearch.com/resources/publications/Compendia.aspx>

Generalization of streamflow in the Boreal Forest with climate change suggest that winter flow will increase, spring freshets will be earlier and smaller and summer flow will decrease due to evaporation.

WATER QUALITY:

Schindler, D. W., & Smol, J. P. (2006). Cumulative effects of climate warming and other human activities on freshwaters of arctic and subarctic North America. *AMBIO: A Journal of the Human Environment*, 35(4), 160-168.

Aurora Research Institute <http://www.nwtresearch.com/resources/publications/Compendia.aspx>

A detailed scientific paper that highlights the vulnerability of the North's waterways to a variety of changes caused by climate change.

PERMAFROST:

Hoeve, E. et al. 2006. Potential Cost Impacts for Adaptation of Building Foundations in the Northwest Territories. Natural Resources Canada.

This paper describes the development of cost estimates for six NWT communities to adapt existing building foundation infrastructure in the NWT to climate change impact. The "best guess" adaptation cost, considering the thermal and physical sensitivity of each community, is in the range of \$200 to \$250 million.

Canadian Standards Association. Technical Guide Infrastructure foundations in permafrost. 2010.

A guide for decision makers to determine how to proceed with infrastructure decision when permafrost is present.

Passive Techniques for Ground Temperature Control. C. E. Heuer, E.L. Long, J. P. Zarling. Portion of Technical Council on Cold Regions Engineering Monogram. 1985.

[Public Works and Services Library](#)

An excellent resource for understanding permafrost and soil responses to thermal changes.

Introduction to Foundation Engineering in Northern Canada. Course prepared for the GNWT. Bruce Smith. 1984.

[Public Works and Services Library](#)

This is an outline of a course, developed to teach foundation engineering, which outlines the basics of different building piling set-ups.

Field Survey and Sub-Soil Investigation of Fort McPherson, NWT. J. A. Hull, AESL Associated engineering Services Ltd. Dept of Public Works. 1978.

[Public Works and Services Library](#)

Excellent source of general soil and subsoil information, as well as hydrographs of the Peel River.

Subsoil Investigation Fort McPherson, NWT. Kholn leonoff Consultants Ltd.. 1978

[Public Works and Services Library](#)

A good outline of the general subsoil information in Fort McPherson.

AGRA Earth & Environmental Limited. (2000). Residential Foundation Systems for Permafrost Regions.

This report presents the results of a literature review, interviews and onsite visits to assess feasible foundation systems for residential construction in permafrost regions.

Engineering Site Report for Development of Proposed Landing Strip. Dept of Transport – Air Services. Construction Engineering and Architectural Branch. Ottawa. 1966.
[Public Works and Services Library](#)

Plans for the construction of the airstrip, may be useful if permafrost problems occur at airport.

The Pile Inspection of the Health Centre, Fort McPherson. John, Ruddick, Mychem Wood Protection Consultants Ltd. 2008.
[Public Works and Services Library](#)

Inspection of the piles at the Health Centre

Smith, Sharon. 2007. Enhancement of Permafrost Monitoring Network and Collection of Baseline Terrain Information in Mackenzie Valley Corridor, NWT. Geological Survey of Canada
[Aurora Research Institute http://www.nwtresearch.com/resources/publications/Compendia.aspx](http://www.nwtresearch.com/resources/publications/Compendia.aspx)

Highlights the field program that was conducted in 2007 to collect baseline environmental information and establish permafrost temperature monitoring sites in the Mackenzie corridor.

LANDSLIDES:

Couture, Rejean. Regional Terrain Hazards Mapping. Natural Resources Canada. (2007).

This project attempted to set up baseline inventories of landslide activity in the Mackenzie Valley, and learn more about why they are happening and in what type of soil.

Denis Lacelle, et al. Climatic and Geomorphic Factors Affecting Contemporary (1950–2004) Activity of Retrogressive Thaw Slumps on the Aklavik Plateau, Richardson Mountains, NWT, Canada. PERMAFROST AND PERIGLACIAL PROCESSES. 21: 1–15 (2010)
www.interscience.wiley.com DOI: 10.1002/ppp.666
[Aurora Research Institute http://www.nwtresearch.com/resources/publications/Compendia.aspx](http://www.nwtresearch.com/resources/publications/Compendia.aspx)

A high level look at the number and size of landslides between 1950's and 2004. While cross-referencing rainfall and temperature trends.