A SUMMARY OF RESULTS FROM CLIMATE CHANGE RESEARCH UNDERTAKEN IN NUNAVUT DURING 2001

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Note: This compendium of research results was compiled almost exclusively from the annual summary reports submitted to the Nunavut Research Institute by researchers licensed under the *Nunavut Scientists Act*. The results of projects licensed under other legislation (e.g. the *Fisheries Act* and *NWT Wildlife Act*) are not included in this report. Please gain permission of the study proponent before quoting or citing the results reported below as may reflect preliminary findings from ongoing research.

Proponent and Affiliation	*Project Title*	*Research Location and Category*	*2001 Results*
Moorman, B.; University of Calgary	***Glacier-Permafrost-Climate interactions on Bylot Island***	Qikiqtani (North Baffin); Glaciology (mass balance)	**Researchers tested the hypothesis that variability in glacier retreat on Bylot Island can be explained by the distribution of a glacier's area over its altitudinal range. The area and elevation distribution of a glacier were found to have an important influence on short-term (50 year) response of its margin to temperature change. These results demonstrate that rapid glacier retreat over a short time period (e.g. 50 years) may often be determined principally by topography and may not always be an appropriate indicator of climactic warming.**
Hamilton, J.; Bedford Institute of Oceanography	***Arctic Oceans Climate Change Study***	Arctic Ocean; Marine (oceanography)	**Nine deep-sea moorings in Barrow Strait measuring current, temperature, and salinity every two hours were serviced and upgraded in 2001. The study collects baseline data to explain heat and salt exchange between the Arctic Ocean and the Western North Atlantic, and to model the future impacts of climate change on Arctic ocean chemistry and circulation. 2001 was the fourth season of the project.**
Forbes, D.; Bedford Institute of Oceanography	***Relative Sea Level Change and Associated Climate Impacts on Northern Coasts and Waterways***	Kitikmeot and Qikiqtani; Coastal zone (coastal terrain studies)	**GPS stations were established at Holman, Inuvik, Kugluktuk, and Resolute to measure rates of crustal uplift or coastal subsidence. Beach overtopping by waves was noted at sites near Resolute (unclear if this is a regular occurrence or due to unusually open sea ice conditions in 1998). Extensive beach overwashing and limited shore erosion problem on low bluffs were observed near Kugluktuk. The potential for subsidence might accelerate regional sea level rise in the Kugluktuk area and should not be overlooked in future shorefront development plans for this area. Storm surge flooding may increase in future. This project is in its 2nd year.**

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Warwick, V.; Laval University	***Microbial Responses to global climate change in Arctic lakes and rivers***	Qikiqtani (Ellesmere Island); Freshwater (lake chemsitry / ecology)	**Researchers discovered evidence of near-surface mixing in the last few years of some previously stratified (unmixed) lakes; this is a "compelling indication" of the onset of rapid climate change in the high Arctic. A bio-optical study showed High Arctic lakes to be highly transparent to light penetration (particularly UVB) and thus particularly vulnerable to continuing ozone depletion. A 2001 survey of Ellesmere ice shelves found that they have declined in extent but that large areas of thick ice still exist along the Ellesmere coast. Melt water pools on several ice shelves were found to contain rich communities of cold tolerant micro-organisms.**
Bright, D; Royal Roads University	***Fish From High Arctic Lakes as Cumulative Effects Indicators of Long Range Atmospheric Contaminant Transport and Climate Change***	Qikiqtani (Resolute Bay); Freshwater (lake chemistry / ecology)	**This long term study explores how temperature and other water quality parameters influence the accumulation of metals in the soft tissue of land locked fish in Arctic lakes. The concentration of cadmium in fish kidney and liver increased in char from Resolute Lake when the lake water temperature increased seasonally, and decreased again in the samples collected just before freeze up. The increase in metal uptake was attributed to an increase in char metabolism during warmer conditions. Year-to-year variability was noted in metal uptake by land-locked char; high uptake levels in 1998 were attributed to strong warming El Nino influences. The temperature-related uptake of metal in char is expected to be more pronounced in acidic, low alkalinity lakes than in well-buffered lakes.**
Smol, J.; Queens University	***Water Quality and Environmental Change in Arctic Lakes and Ponds***	Qikiqtani (Ellesmere Island); Freshwater (lake ecology)	**A database of water quality variables and an inventory of algae and invertebrates for Arctic lakes is being assembled. 50 lakes on Ellesmere Island were sampled in 2001. Water quality appeared to be very good in all lakes sampled.**

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Henry, G; University of British Columbia	***Causes and Consequences of Biodiversity Change in Arctic Tundra***	Qikiqtani (Ellesmere Island); Tundra (terrestrial vegetation)	**This study simulates the effects of climate change on tundra ecosystems. Open-top greenhouses (OTCs) are used to warm the ground by 2-3°C causing most plants to grow faster and larger and to produce larger and better seeds. Plant species diversity in some (not all) of the experimental plots has changed, however the warming has not affected soil nutrient levels as strongly as predicted. Fertilizer addition stimulated plant growth in the warmed plots. Tests indicate that wet tundra vegetation types take in more CO2 during photosynthesis than they release during respiration, conversely some dry tundra produce a net release C02 to the atmosphere during growth. Each tundra plant species will respond differently to the changing climate. Soil nutrient supply will be important in determining how tundra systems respond to climate change.**
Ring, R.; University of Victoria	***Arctic Insects, Global Warming and the ITEX Program***	Qikiqtani (Ellesmere Island); Tundra (terrestrial entomology)	**Insect collections from within and without experimental warming enclosures (OTCs) at Alexandra Fiord (Ellesmere Island) indicate a consistent trend for larger numbers of insects to be trapped within control plots relative to OTCs. Differences among insect pollinators from both within and without the OTCs will have confounding effects on the results of the ITEX plant ecologists. Soil micro-organisms (arctic thrips or *Thysanoptera*) were found to mature faster inside OTCs than in the control plots, probably as a direct result of the increased temperature inside the OTCs. This increased maturation could have an effect on the reproductive abilities of thrips. If climate change causes significantly drier conditions in the High Arctic, mites might be expected to become more abundant in the soil.**

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Eccelstone, M; Trent University	***Glacial Research on Axel Heiberg Island, NU***	Qikiqtani (Axel Heiberg Island); Glaciology (mass balance studies)	**The project has produced one of the longest records on standard glacier mass balance (accumulation and melt) in the Arctic. The 10-year trend indicates more melt than accumulation for the White and Baby glaciers. Techniques are being developed to reduce the error in glacier mass balance measurement by accounting for snow and ice that melts but does not in fact leave the glacier.**
England, J.; University of Alberta	***Glaciation, sea level change, and environmental variability, western Arctic Canada and Nunavut***	Qikitani (High Arctic - Ellef Ringes and Melville Islands); Coastal (glacial retreat and historic sea level change)	**Research on Ellef Ringes Island indicates that the sea level at the time of the local ice cap retreat was 60meters higher than today demonstrating extensive post-glacial terrain rebound. Low elevation driftwood collected along the coast of Melville Island may be evidence that Melville is undergoing renewed submergence. The age of the driftwood (modern or older) will test this hypothesis. If coastal submergence is occurring, this will be its first documentation in this sector of the Western Arctic, and it would have implications for the region (e.g. coastal development, land use planning).**
Bradley, R; University of Massachusetts See project website at www.geo.umass.edu/climate/hazen.html	***Weather Stations To Study Climate Change***	Qikiqtani (Ellesmere Island); Baseline Climate Data (Glaciology)	**Data were collected from weather stations established at high elevations on a plateau between Murray and Simons Ice Caps. The temperature record from these stations for August 1999 through May 2000 indicate much warmer conditions than anticipated (daily max temps were rarely lower than –30C and reached –12C on 1 Jan. 2000). Snowcover thickness was considerably more variable in 2000 due to greater wind redistribution. Net ablation (size reduction) was found to have occurred over the entire Simmons Ice Cap from 1999 to 2000. The study results quantitatively confirmed a 27.5% reduction of the Murray Ice Cap spatial extent between 1959 and 2000.**

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Pollard, W; McGill University	***Impact of Climate Change on Permafrost in High Arctic Polar Desert Ecosystems***	Qikiqtani (Ellesmere and Axel Heiberg Islands); Tundra (permafrost)	**The project involves mapping of ground ice and thermokarst (slumping and instability) area distribution, and the analysis of the sensitivity of polar desert landscapes to change using high resolution GPS technology. Warm and dry conditions during much of the summer of 2001 caused active terrain thermokarst at several study sites. Cool temperatures and rain in July 2001 reduced permafrost thaw processes during this period. Rock weathering and erosion studies indicated the presence of cyanobacteria in the sandstone. Further studies will be undertaken to determine the role that bacteria play in rock weathering.**
Couture, N.; McGill University	***Sensitivity of Permafrost Terrain in a High Arctic Polar Desert: An evaluation of response to disturbance near Eureka***	Qikiqtani (Ellesmere Island); Tundra (permafrost)	**Ground ice makes up 30.8% of the top 5.9m of permafrost at the study site and has an important effect on terrain stability. The level of terrain disturbance is directly related to the excess ice present. A doubling of C02 will lengthen the thaw season from 11 to 26 days. Active layer detachment slides are anticipated where massive ground ice is present.**
Retelle, M.; Bates College	***Paleoclimactic Reconstruction of the Last Millennia using Laminated Sediments in High Arctic Lakes***	Qikiqtani (Devon Island); Freshwater (paleolimnology)	**The project seeks to develop a detailed reconstruction of long term changes in climate and impacts in the Canadian Arctic islands. Analysis of sediment cores show that the thickness of annual sediment layers has increased over the past 100 years. This may be associated with thinning ice cover and enhanced runoff, perhaps related to regional warming trends.**

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Henshaw, A.; Bowdoin College	***Baffin Island Photographic Identification and Oral History Project***	Qikiqtani (Cape Dorset); Traditional Knowledge	**The research addresses methodological issues involved in documenting and recording local knowledge and integrating local and scientific modes of inquiry to address climate change. Site visits and interviews conducted in Kinngait (Cape Dorset, Nunavut) with local hunters seem to indicate that climate change as it relates to sea ice in the Kinngait area is less pronounced compared to other areas in the central Arctic.**
Wakelyn, L.; Beverly and Qamanirjuaq Caribou Management Board (BQCMB)	***Monitoring Beverly and Qamanirjuaq caribou, habitat, and community use in relation to changing climate and land use activities***	Kivalliq (Baker Lake and Arviat); Traditional Knowledge	**The project is developing and piloting a community based long term caribou monitoring system for the Beverly and Qamanirjuaq herds. The project will integrate scientific data but relies principally on annual interviews with hunters in Arviat and Baker Lake to provide information about ongoing changes in caribou abundance, distribution, productivity and health, and caribou range conditions. 20 hunters in each community were selected by the local HTO and interviewed in 2001 by trained local project coordinators. Summary findings (currently being compiled and reviewed by project staff and participant HTOs) present a record of the years observations and hunters' explanations of observed changes. HTO reviewers have stressed the importance of interviewing knowledgeable, unbiased local hunters, and of using skilled bilingual interviewers who fully understand technical language used by elders.**

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Fox, S.; University of Colorado	***Inuit Knowledge of Climate and Climate Change in the Eastern Canadian Arctic***	Nunavut (Baker Lake, Iqaluit, Igloolik, Clyde River);Traditional Knowledge	**The project seeks to examine Inuit climate knowledge and Inuit responses to climate change, and attempts to develop a model for cooperative sharing of northern climate change information. Interviewees in all participating communities report changes in weather patterns, ice conditions, vegetation growth, and wildlife, all of which fall outside of oral histories and personal experience on the land. Interviewees from Iqaluit, Igloolik, and Clyde River report that: weather has become more variable and unpredictable, especially in the last 10 years; that traditional methods of weather prediction now sometimes fail; and that the sun's rays feel stronger. Permanent snow patches are reportedly disappearing in three study communities. Baker Lake residents are experiencing shorter winters, earlier and quick spring melt, warmer springs and summers, longer summers, and increased weather variability. Inuit observations agree with instrumented scientific records that weather variability has increased over the last five year period (Fox 2002: 32 *in* Krupnick and Jolly 2002)**