Kluane Lake Research Station
NEWSLETTER

ISSUE #1 FALL 2004

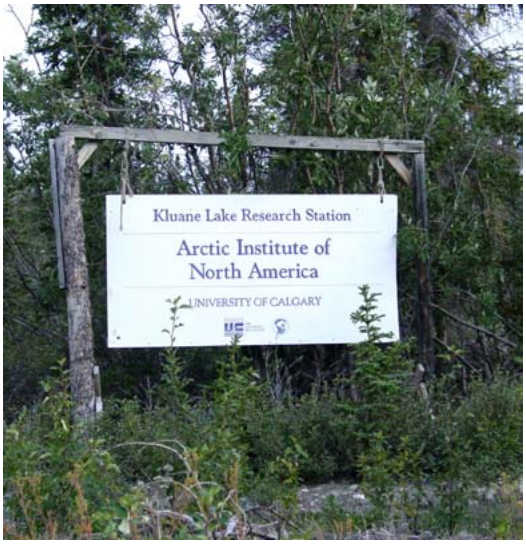
INSIDE

Welcome to the first issue of the newsletter of the Arctic Institute of North America's Kluane Lake Research Station (KLRS). Located just off the Alaska Highway on the south shore of Kluane Lake, the research station has fostered the activities of scientists conducting fieldwork in the southwest Yukon for more than 40 years. This work has spanned the disciplines of glaciology, geomorphology, geology, biology, botany, zoology, hydrology, limnology, climatology, high-altitude physiology, anthropology and archaeology. This diversity, as well as the high calibre of work accomplished, has created a legacy unique in all of Canada, and one that continues to today.

The idea for this newsletter came about as we drafted a paper describing the history of science in the Yukon's St. Elias Mountains for a special issue of the Royal Geographical Society's *Geographical Journal*. Coauthored with Scott Slocombe (Wilfrid Laurier University) and KLRS manager Andy Williams, we argue for a more complete integration of the process of science - as well as its results - in the planning and management of the Kluane Region. As part of this process, it's important that scientists working in the region communicate with each other, with regional authorities and agencies like the Territorial Government, First Nations, and Parks Canada, and with local communities and residents. Hopefully this newsletter can act as a forum for such communication. It's not intended to be a specialized technical publication; scientists already have a variety of fora for disseminating results to their scientific peers. Instead, the newsletter is intended to foster cross-disciplinary communication among researchers and to help inform others on the type of work going on in the region.

The second motivation for the newsletter came over the past year as we attended several meetings and pursued projects related to promoting and improving research in Canada's North. Amongst all of this we saw a clear need to improve communication between scientists and northern communities. Particularly evident is the need to improve the dissemination of results and findings amongst communities and to inform and educate the general public on the work we do. This newsletter will not fill this gap entirely in the Kluane region, nor is it meant to replace the personal contact which is critical for this to occur in a meaningful manner. It is our hope, however, that it will contribute in some small way.

We're open to any ideas for future directions for the newsletter and welcome suggestions or submissions for future issues. And, feel free to get in touch with us if you see a section that you would like to contribute.



Entrance to the Kluane Lake Research Station, Mile 1054 Alaska Highway

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The Kluane Lake Research Station: A Brief History

Andy Williams, Manager, Kluane Lake Research Station

Scientific exploration in the Saint Elias Mountains began in 1935 with the Wood Expeditions, and were an annual event until 1940. These expeditions were led by Dr. Walter Wood, a mountain geographer, and were based out of Burwash Landing, a community on the northwest shore of Kluane Lake in Canada's Yukon Territory. The expeditions travelled overland across the Donjek River flood plain and into the Steele Glacier and Hodgson Glacier complex. Horse transport, guiding, and local expertise was provided to these expeditions by the residents of Burwash.

Wood was to become a principal of The Arctic Institute of North America (AINA), constituted by Act of Parliament in 1945, serving as a Director and member of the Board of Governors. From 1949 to 1951 he initiated and led Project Snow Cornice, an AINA science project on the Seward Glacier south of the Mount Logan massife. This project was fully dependent on air support, and was based out of Yakutat on the southeast coast of Alaska.

In 1961 Wood, and AINA, returned to the Yukon to explore the eastern side of the range. AINA established a base camp at the abandoned airstrip at Silver City and a major field facility at 2800m in the interior of the range on the hydrological divide between the easterly and westerly flowing glaciers. A number of subsidiary camps were established across the range to investigate glaciology, climatology, and geomorphology. Although the initial effort was devoted to the physical sciences, Wood had further objectives. The first was to provide an opportunity for researchers to be trained in working in an Arctic environment without having to meet the extraordinary costs of travelling to the High Arctic. His second observation was that the proximity of the Silver City facility to a variety of landscapes, ranging from boreal forest to tundra, would attract further research opportunities.

In the latter 1960's there was a considerable interest in Canada and the United States in the study of human physiology at high altitude. In 1968 AINA proved a capability in operating and maintaining a facility at the 5300m level on Mount Logan (Logan High) and thus supported the High Altitude Physiology Study until 1981. It was a large study with demanding logistics, and absorbed much of the capacity of the Kluane Lake Research Station (KLRS) during those years. It was not a "northern" project as such, but the clinical discoveries were to the benefit of all Canadians.

The establishment of a research facility at Logan High further enabled AINA to drill and extract the first ice core in the northwest of the continent to investigate historical climate data and the incidence of airborne pollutants.

Meanwhile the biological sciences, zoology and botany, had also been attracted to the Kluane region. A number of small projects developed into the Boreal Forest Research Project which investigated the dynamics and interrelationships of plants and animals in the forest ecosystem. It was an ambitious project, the largest of its kind in Canada, and was the dominant theme at KLRS from 1988 – 1998.

Principal Investigators and Institutions using the Kluane Lake Research Station in 2004

- Dr. P. Johnson. University of Ottawa. Geography and glaciology field school.
- Dr. K. Gajewski. University of Ottawa. Lake bed coring to investigate past environments.
- Dr. R. Turkington. University of British Columbia. Investigations into plant competition and adaptation to climate change.
- Dr. C. Krebs. University of British Columbia. Continuation of the Kluane Ecological Monitoring Project.
- Dr. R. Boonstra. University of Toronto. Physiological ecology of small mammals.
- Dr. G. Clarke. University of BC. Glacier ice dynamics.
- Dr. M. Vetter. University of Regina. Botany field school.
- Dr. D. Coxyn. University of Northern British Columbia. Lichenology.
- Dr. J. Clague. Simon Fraser University. Geomorphology and earth sciences.
- Dr. B. Luckman. University of Western Ontario. Dendrochronology.
- Dr. T. Hutchinson. Trent University. Revegetation of abandoned mine sites.
- Dr. D. Silverberg. Institute of Environmental Learning. Environmental field course.
- Dr. G. Holdsworth. AINA. Snow sampling and maintenance of automatic weather stations.
- Dr. D. Hik. University of Alberta. Impacts and adaptation of alpine plants and animals to climate change.

In recent years, Canada, Japan, and the United States initiated further ice coring projects using the logistical support of KLRS. A review of the programmes that were supported in 2004 demonstrates the multi-disciplinary nature of KLRS with a broad range of investigations representing the natural and engineering sciences.

KLRS is managed and operated by AINA. It should be noted that AINA provides support and access to a field research facility, but does not design or supervise the research effort. KLRS is financed in part by a grant from the Natural Sciences and Engineering Research Council and contributions from a number of engaged Canadian universities.

Over its forty year history KLRS has made a significant contribution to scientific knowledge and in the education and training of highly qualified personnel. The latter value is more immediately measurable, and can be gauged by the large number of graduates employed by the private sector, government, and academia. (acwilliams@yknet.ca)

The current location of KLRS was the site of a cooperative military exercise between U.S. and Canadian forces known as "Exercise Eager Beaver" in the early 1950s. In fact, the airstip at KLRS was constructed as part of this exercise. Some buildings at KLRS, including the dining hall and the old project hut/interpretive building date to this time and can be seen in the photos above.

Did you know?

The Arctic Institute of North America was created by an Act of Parliament in 1945. Its mandate is "to advance the study of the North American and circumpolar Arctic through the natural and social sciences, the arts and humanities and to acquire, preserve and disseminate information on physical, environmental and social conditions in the North."

Northern Alpine Environments in a Warming Climate

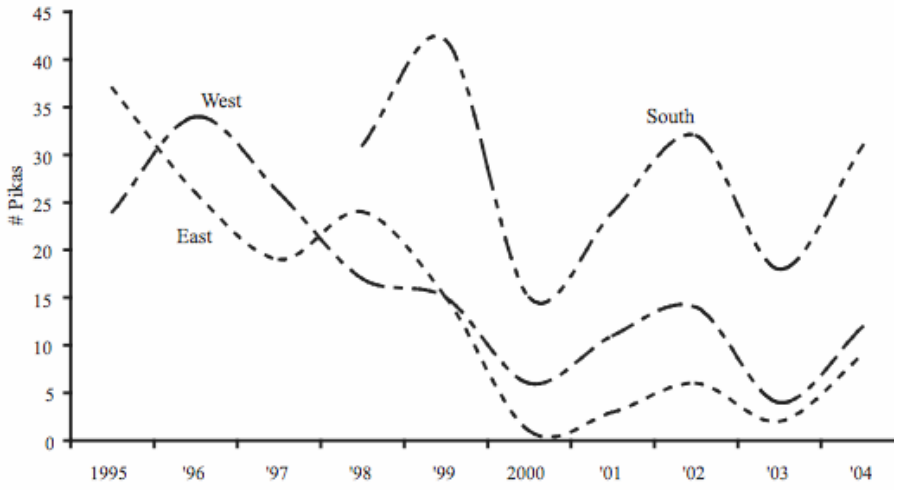
David Hik, Department of Biological Sciences, University of Alberta

In Iceland this month, the Arctic Climate Impact Assessment will be formally released by the Arctic Council. The results of this intensive study will show that the Arctic is already warming much faster than the rest of the world. And most computer projections show that over the next 100 years the average increase in temperatures will be at least double the global average, and that the bulk of the warming is taking place in the winter. Among the many consequences of warming, some of the most dramatic include shifting vegetation zones - forests will replace a significant amount of the tundra; and the range and distribution of animal species will shift along with the changes in temperature, water and vegetation.

In the Kluane region, one species that may be affected by climate warming is the collared pika, or rock rabbit. Pikas are herbivores that live in alpine boulderfields. They are territorial animals and do not hibernate during the winter but, rather, forage below the snow and on vegetation that was collected and stored in a haypile at the end of the summer. There is high over-winter mortality of pikas especially in their first winter. Very little is known about this species, and most of what we infer has come from work on its southern relative, the American pika.

Collared Pika. Graph below illustrates their late summer abundance (adults and juveniles) in the southwest Yukon study area from 1995-2004 (from Shawn Morrison and David Hik, manuscript).

Ten years ago, my students and I began a study of one population living in a valley above Swanson Creek in the Ruby Range. We live-trapped pikas from mid-June to the end of August from 1995-2004 using Tomahawk live traps baited with fresh native vegetation and placed adjacent to haypiles used by pikas. Pikas are active during the day, have distinctive territorial calls, are highly visible and have distinguishable haypiles, permitting us to identify and capture all pikas resident within the study area. Animals trapped for the first time were marked with numbered metal ear tags and a unique color combination of thin wire allowing us to observe them again without having to capture them. At each capture age, sex, and weight were recorded - age (adult or juvenile) was determined based on weight, as well as fur color and molt patterns.



The figure at right shows the change in the number of pikas on three slopes in the valley over the past decade. In general, the populations declined dramatically during warm winters will little or no snow cover, beginning in 1999. Curiously, two other species of pikas have declined over the past decade as well. The Ili pika lives on high cliff habitat within a restricted range in the remote Tien Shan of the Xinjiang Uygur Autonomous Region, China. This pika was only discovered in the 1980s, but by 2003 had disappeared from eight of 14 known sites. The more common American pika may also be in trouble - last year it was reported that pikas living on isolated mountains in the Great Basin of the western United States had disappeared from seven of 25 known sites; a remarkable 28% loss.

Those of us who study pikas in their high remote environs do not know exactly what is happening, but in these three isolated cases there is a consistent pattern of loss. In all these cases, the dramatic decline or loss of pika populations is undoubtedly complex and may be due to a variety of inter-

related factors. But, one cause consistently jumps out – increased temperatures resulting from global climate change may be at play. Pikas are notoriously sensitive to high ambient temperatures and could easily be affected by slight changes in atmospheric temperatures, now on the rise due to climate change. The Ili and American pikas may be forced upslope by warming during summer, and simply may run out of suitable rock or talus habitat. In the Yukon, lack of a snowpack that normally serves an insulating function during winter, may cause collared pikas to expend too much energy during this critical season. Much remains to be discovered concerning this relationship, but it appears that the pikas could be a litmus paper for faunal loss due to global climate change. (dhik@ualberta.ca)

Alpine areas in the Ruby Range east of Kluane Lake, the location of David Hik's field camp known as "Pika Camp".

The Kluane Lake Research Station Bibliography

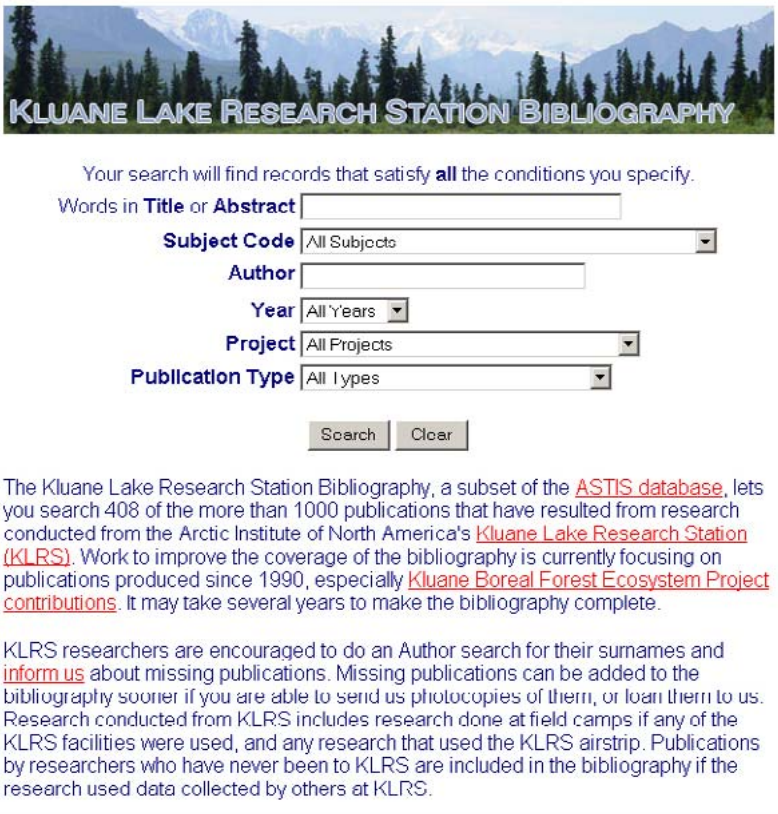
Ross Goodwin, Arctic Institute of North America, University of Calgary

In early 2004 the Arctic Institute of North America's Arctic Science and Technology Information System (ASTIS) began work on a Kluane Lake Research Station Bibliography. The bibliography is available as a searchable database from a website at: http://www.aina.ucalgary.ca/scripts/minisa.dll/144/klrs?DIRECTSEARCH

The bibliography is currently far from comprehensive, describing 408 of the more than 1000 publications that have resulted from research conducted from KLRS. Because ASTIS is funded through contract work we are only able to devote a small amount of staff time to free projects such as the KLRS Bibliography. It may take several years to make the bibliography complete.

KLRS researchers are encouraged to do an Author search for their surnames and inform us about missing publications. Missing publications can be added to the bibliography sooner if you are able to send us photocopies of them, or loan them to us. Research conducted from KLRS includes research done at field camps if any of the KLRS facilities were used, and any research that used the KLRS airstrip. Publications by researchers who have never been to KLRS are included in the bibliography if the research used data collected by others at KLRS.

Please consider the KLRS Bibliography to be a project of the KLRS research community. ASTIS would appreciate any suggestions that you can give us on everything from what the bibliography should cover, to the search capabilities, to the graphic design of the website. (rgoodwin@ucalgary.ca)



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The White River Ash, Microorganisms and Yukon Lakes

Joan Bunbury, PhD student, Laboratory for Paleoclimatology and Climatology, Department of Geography, University of Ottawa

Recent climate change scenarios suggest that arctic and subarctic regions will suffer the greatest and most rapid temperature increases in the near future. These climate changes will affect lake water and potentially alter species composition within arctic and subarctic lakes. One method that can help us to understand how climate change will impact these sensitive northern ecosystems is to study how past changes have affected them.

Sediments at the bottom of freshwater lakes contain information that can be used to infer what lake environments were like in the past. In order to obtain these sediments for analysis, a sample is extracted from the bottom of a lake. These "sediment cores" are approximately 5 cm in diameter and a core roughly one metre long can represent lake-bottom accumulation spanning more than 2,000 years. Changes through time can be interpreted from the remains of fossilized organisms found in the sediment core. If species that prefer cooler conditions are found at a certain layer within the core then, presumably, cooler conditions existed at that time.

In addition to investigating regional climate change over the past 2,000 years, one specific component of my research project is to shed light on the impact of a volcanic eruption that occurred on Mount Churchill, Alaska (in the Icefield Ranges near the Yukon border) 1200 years ago. The eruption deposited a large layer of volcanic ash, known as the White River Ash, across much of southcentral Yukon. To understand the effects of the event on aquatic ecosystems, multiple lake-sediment cores will be collected from a series of lakes along a transect at increasing distances from Mount Churchill. It has been observed that the ash layer ranges from a millimetre to almost a metre in thickness in lake sediments. This must have been catastrophic for some aquatic systems, yet potentially beneficial for others as a small amount of ash would have provided nutrients to low-nutrient lakes. By studying this rare but significant event, we can begin to understand how such a rapid environmental stress affected aquatic ecosystems in the region.

My research uses a *multi-proxy approach,* meaning that several aspects of the sediment cores will be examined. This allows for ecosystem-level parameters (eg. nutrients and productivity) as well as animal population responses to be assessed. Physical properties such as magnetic susceptibility and sediment organic content of sample cores will be analyzed. High magnetic susceptibility suggests that inputs to the lake are from outside sources. For example, the White River Ash will cause the magnetic susceptibility to be significantly higher. The composition of the aquatic animal communities (specifically ostracodes and chironomids) found at various intervals in the cores will also be investigated. Ostracodes are small, bivalved crustaceans that live at the sediment-water interface. Chironomids are the larval stage of non-biting midge flies. Both of these organisms have parts that fossilize in lake sediments and can be identified to either the species or genus level.

Obtaining a sediment core.

Stable oxygen isotopes of the ostracode shells reveals information about the temperature and the hydrological balance of the environment in which the ostracodes lived. The ratio between two different oxygen isotopes varies in relation to the amount of evaporation and precipitation in the region. Ostracodes will be sampled at consistent intervals in the lake cores to create an oxygen isotope record over the past 2000

years, and changes in the above climatic variables can then be interpreted from this record. In turn, this record can be compared to the organisms found at different levels in the core and to paleoclimate records derived from the Mount Logan ice cores and sediment cores previously obtained from other lakes in the region.

Volcanic events are abrupt, and in some cases catastrophic, and climate changes occur on many timescales. It is not clear how aquatic systems respond to different stresses, nor multiple stresses. This research will increase our knowledge of ecosystem reaction and response times to different environmental stresses on aquatic ecosystems, and contribute further information on climate change in northern regions. (jbunbury@uottawa.ca)

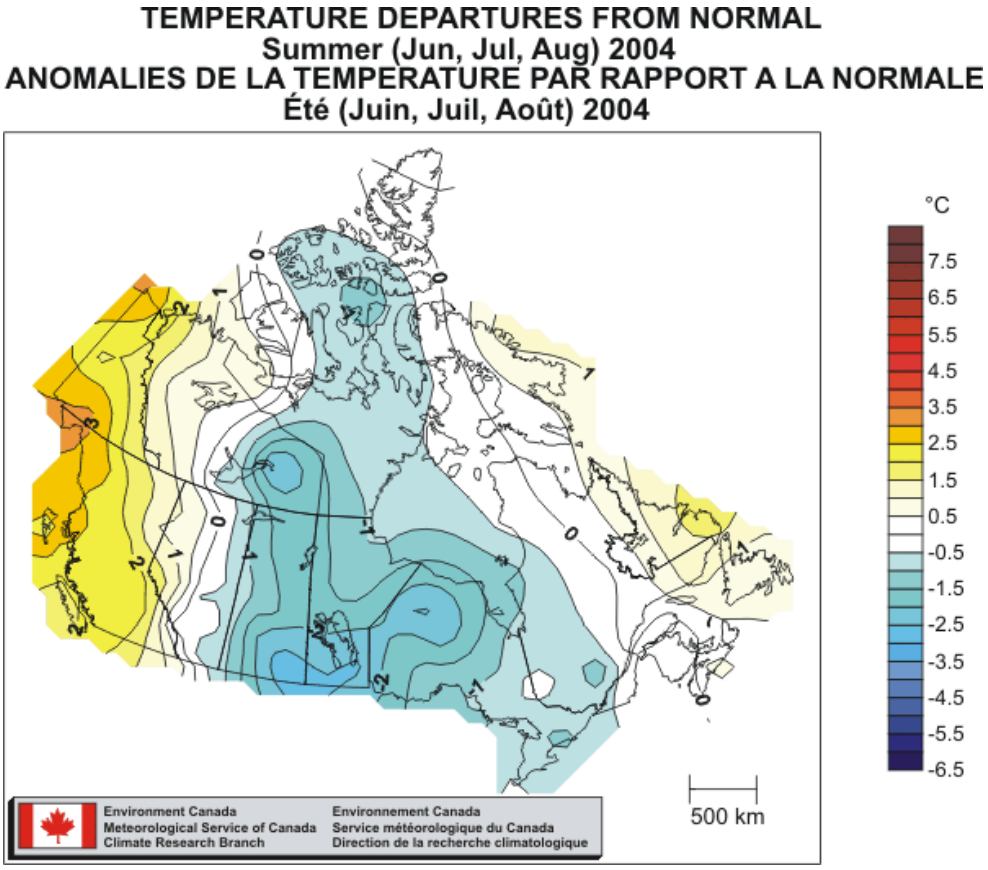
Ostracodes (right)

Climate Corner: Summer 2004 the Warmest on Record

Climate change is a 'hot' topic for many researchers at KLRS. Southwest Yukon has seen significant changes in climate over the past 30 years and several researchers are examining the glacial, geomorphological, and ecological aspects of these changes. In response to this interest, the KLRS newsletter is devoting a section of each issue to exploring recent changes and deviations in the climate of southwest Yukon.

Summer 2004

This past summer was the warmest on record in the Yukon. Temperatures across the territory averaged 2.5 degrees warmer than normal for the months of June, July and August. Temperatures in Whitehorse, parts of the Kluane region, and the Haines Triangle of British Columbia averaged roughly 3 degrees warmer than normal (see figure at right). Precipitation was slightly lower than normal in Summer 2004, but the difference is not considered to be significant.



(from http://www.msc-smc.ec.gc.ca/ccrm/bulletin/national_e.cfm).

Arctic Ground Squirrels of Kluane Lake and Ice-age Beringia

Grant Zazula, Department of Biological Sciences, Simon Fraser University

Arctic ground squirrels (*Spermophilus parryii*) are a ubiquitous part of the regional Kluane ecosystem and found throughout arctic and subarctic environments in northern North America. Anyone who has visited the AINA research station has surely seen them scurrying back and forth between their holes, carefully scanning their surroundings for predators, and eating a cornucopia of plants to fatten up for winter. Although most people think of Arctic ground squirrels in their present context, fossil and genetic evidence indicates they thrived in Beringia, the Pleistocene unglaciated refugium of Yukon and Alaska, for much of the last million years. Recent phylogenetic research has demonstrated that ancestral populations differentiated into several regional subspecies in response to several stages of cold climate with open, treeless conditions during Pleistocene glacials.

The relationship between present day Arctic ground squirrels in the Kluane ecosystem and their presence in the Beringian paleoenvironment is the focus for my doctoral research at Simon Fraser University. Some of the best evidence for Pleistocene squirrel behavior in Beringia is found in frozen sediments exposed by hydraulic hoses of placer gold miners in the Klondike district, near Dawson City. This permafrost contains frozen burrows with grassy nests and seed caches that were built by Pleistocene Arctic ground squirrels in underground winter hibernacula. Radiocarbon ages on the nests indicate that these rodents were very common in central Yukon between 25,000 and 12,000 years ago when large ice sheets covered the rest of Canada. The analysis of the burrow contents is revealing a unique fossil record of plant communities that once blanketed the Klondike valleys and is leading the search for modern environments that may present clues to how the extinct Beringian ecosystem functioned.

Analysis of the Pleistocene fossil caches has revealed evidence of ancient foraging and environmental conditions during the height of the last ice-age. The esteemed Yukon paleontologist Richard Harington once described the ice-age squirrels as "…furry botanists, industriously sampling vegetation within a limited range of their nests and storing it away in underground herbaria". Many of the plants found in the fossil nests and caches from the Klondike are present day components of the unique grasslands of southwest Yukon and have never been recovered previously in the Beringian fossil record. Fossil seeds, fruits and leaves indicate a mix of forb-rich steppe or grassland and tundra plants that lived on well-drained silty soils. This picture is a stark contrast with the black spruce (*Picea mariana*), shrub and moss boreal forest communities that are widespread on poorly drained permafrost in the Klondike and the rest of interior Yukon and Alaska at present.

Although caching is a critical component of Arctic ground squirrel life history and population sustenance, very little work has been conducted to determine how and what they cache. Early work suggested they cached food to sustain themselves during periodic arousals from winter hibernation. However, more recent studies have demonstrated that only males cache food for consumption during a short (1-2 week) interval when they awake from hibernation and before emergence from their nests. This spring buffet is critical for males to regain weight lost during hibernation, ensure sexual maturation and give them a competitive advantage for reproduction.

In order to better interpret data obtained from the Pleistocene ground squirrels in Beringia, I commenced work in the Kluane lake region on forage selectivity and caching by present-day squirrels. In summer of 2004, I excavated two burrow systems near Cultus Bay and mapped the surrounding vegetation. At the first site, several tunnel entrances led to a nest with two large caches of fruits and seeds. The caches

were dominated by berries of the northern comandra (*Geocaulon lividum*) with smaller amounts of plants that are also common in the Pleistocene samples, including cinquefoil (Potentilla), sage (*Artemisia frigida*), legumes (*Astragalus*), pygmyflower (*Androsace septentrionalis*), and beard-tongue (*Penstemon gormanii*). At the second site, I recovered three individual caches dominated by fruits and seeds of prickly rose (*Rosa acicularis*) with similar minor components. These caches suggest that the male ground squirrels in the boreal grasslands are highly selective and predominantly cache locally available seeds from large, fleshy fruits. Foraging on shrubs for berries along the forest edge may offer protection from predators during the crucial late growing season when they must protect themselves and cache at all cost.

My work will continue in the summer of 2005 with focus on ground squirrel foraging and caching in alpine environments around Pika Camp in the Ruby Range east of Kluane Lake. Recent studies by Elizabeth Gillis and David Hik of the Kluane Alpine Ecosystem Project has suggested that ground squirrel populations are better adapted to open alpine than boreal ecosystems, further testifying to their long evolutionary adaptation to steppe-tundra conditions of ice-age Beringia. (gdzazula@sfu.ca)

Then and now. Fossil nest (c. 25,000 years old) melting out from ice-rich Pleistocene sediments in Klondike goldfields (left) and a nest and cache excavated from a current-day site near Cultus Bay, Kluane Lake (right) (photos by G. Zazula).

Websites of Interest

If you know of a website useful or relevant to the KLRS community, contact rdanby@ualberta.ca to have it summarized in a subsequent issue.

Arctic Institute of North America
http://www.ucalgary.ca/AINA/index.html
The Institute's own website. Areas of interest include recent news, research information, and publications. From this site you can access the Arctic Science and Technology Information System (ASTIS) bibliographic database and it's subsets, including the Kluane Lake Research Station bibliography (see Ross Goodwin's article in this issue). The homepage for AINA's multidisciplinary journal, Arctic, is also here.

National Climate Data and Information Archive
http://www.climate.weatheroffice.ec.gc.ca/Welcome_e.html
The website for the National Climate Data and Information Archive makes official climate and weather observations available on-line. Data is available in hourly, daily and monthly intervals and you can create a CD of daily climate for the entire history of each weather station. Data from Environment Canada weather stations most relevant to the Kluane Region include Burwash Landing, Haines Junction, and Whitehorse. Data from the old Snag and Aishihik weather stations is also available.

World Data Center for Paleoclimatology
http://www.ngdc.noaa.gov/paleo/paleo.html
Maintained by the United States National Oceanic and Atmospheric Administration, this site acts as a repository of paleoclimatic data from all over the world. Particularly relevant to Kluane are downloadable data from the Mount Logan ice cores as well as tree-ring data sets from across Yukon and Alaska.

Recent Publications from the KLRS Community

A page of each future newsletter issue will be devoted to highlighting recent publications produced as a result of research based out of the KLRS. You can submit citations and very brief summaries to rdanby@ualberta.ca for inclusion in subsequent issues.

Clarke, G.K.C. and G. Holdsworth. 2002 Glaciers of the St. Elias Mountains. In; R.S. Williams and J.G. Ferrigno (eds) *Satellite Image Atlas of Glaciers of the World.* pp. J301-J328. U.S. Geological Survey, Washington, DC.
The authoritative summary of the glaciers of the St. Elias Mountains with data on their extent, features, and classification. Particular attention is given to the region's surging glaciers with an entire section devoted to analyzing flow in the Tweedsmuir and Lowell Glaciers from aerial and satellite imagery.

Danby, R.K., D.S. Hik, D.S. Slocombe, and A. Williams. 2003. Science and the St. Elias: an evolving framework for sustainability in North America's highest mountains. *The Geographical Journal*, 169 (3): 191-204.
The past, present, and future contributions of science in the greater Kluane region is examined. Collaborative endeavours such as long-term ecological monitoring, adaptive management, and information integration can help integrate science and traditional knowledge into regional planning and management and contribute to truly ecosystem-based management of the region.

Franken R.J. and D.S. Hik. 2004. Influence of habitat quality, patch size and connectivity on colonization and extinction dynamics of collared pikas (*Ochotona collaris*). *Journal of Animal Ecology*, 73(5): 889-896.
An index of habitat quality and patch connectivity was found to be the best predictor of pika extinction, while connectivity, solar aspect, amount of vegetation, and habitat quality (based on survival) had significant influences on patch recolonization.

Krebs C.J., T.N. Zimmerling, C. Jardine, K.A. Trostel, A.J. Kenney, S. Gilbert and E.J. Hofer. 2002. Cyclic dynamics of snowshoe hares on a small island in the Yukon. *Canadian Journal of Zoology*, 80(8): 1442-1450.
Jacquot Island hares averaged twice the density of mainland control populations and, although they show 10-year cycles, fluctuate with much lower amplitude than mainland populations. Improved survival on the island is correlated with a reduction in the numbers and types of predators compared with the mainland.

Moore G.W.K., G. Holdsworth, and K. Alverson, K. 2002. Climate change in the North Pacific region over the past three centuries. *Nature,* 420: 401-403.
A 301-year snow accumulation record from the Mount Logan ice core is presented. The data show a positive, accelerating trend in snow accumulation after the middle of the nineteenth century paralleled by a warming over northwestern North America associated with changes in both the Pacific North America pattern and the Pacific Decadal Oscillation.

Morrison, S., L. Barton, P. Caputa, and D.S. Hik. 2004. Forage selection by collared pikas, Ochotona collaris, under varying degrees of predation risk. *Canadian Journal of Zoology*, 82(4): 533-540.
Contrary to theory, collared pikas did not switch preference for forage species of different nutritional quality when predation risk was experimentally manipulated. However, the total amount of forage removed was inversely related to risk.

Turkington, R., E. John, S. Watson, and P. Seccombe-Hett. 2002. The effects of fertilization and herbivory on the herbaceous vegetation of the boreal forest in northwestern Canada: a 10-year study. *Journal of Ecology*, 90 (2): 325-337.
Fertilization caused a decline in species diversity, a reduction in the proportion of woody species, and an increase in herbaceous dicotyledons and grasses. Herbivore exclusion had little impact on abundance or species diversity. This suggests that cover and composition of herbaceous vegetation are determined by the productivity of the site and that activities of mammalian herbivores (snowshoe hares) may be important only during peaks in population densities.

Wake C.P., K. Yalcin and N.S. Gundestrup. 2002. The climate signal recorded in the oxygen-isotope, accumulation and major-ion time series from the Eclipse ice core, Yukon Territory, Canada. *Annals of Glaciology*, 35: 416-422.
Cross-correlation analysis reveals a significant positive relationship between summer delta(18)O at Eclipse and summer temperatures in northwestern North America and indicates that the Eclipse time series provides a better proxy for regional temperature than does the delta(18)O time series from the Mount Logan ice-core.

Calendar of Events

UPCOMING EVENTS
If you are aware of an upcoming event that would be of interest to the KLRS community, please let us know.

June 15-17, 2005—Whitehorse, Yukon
Rapid Landscape Change and Human Response in the Arctic
A 3-day conference to review current research on the effects of climate and landscape change in the Arctic. It will bring together an interdisciplinary forum of geologists, geographers, archaeologists, climate scientists, ecologists, historians, anthropologists, and sociologists to examine the past and present impacts of rapid environmental change on northern people and ecosystems. Further information from Dr. Antony Berger, Co-Director IUGS Geoindicators Initiative (bergerar@telus.net).

September 5-9, 2005—Lanzhou, China
International Symposium on High-Elevation Glaciers and Climate Records
This symposium will focus on glacier variations, processes and their consequences, snow cover and related processes, and climate records from glaciers. Sponsored by the International Glaciological Society. Information and registration at http://www.igsoc.org/symposia/2005/lanzhou/

RECENT EVENTS
If you attended an event that would be of interest to the KLRS community, please let us know.

The Association of Canadian Universities for Northern Studies, 7th Students' Conference, was hosted by the University of Alberta, Edmonton on October 24-26, 2003. The event was attended by nearly 200 persons and several students conducting research in the Kluane Region - including Shawn Morrison, Liz Gillis, Christophe Kinnard, Ian Seiferling, Reid Van Brabant, and Ryan Danby - presented their results. A set of proceedings is being released in November. http://www.acuns.ca

The 3rd Northern Research Forum took place in Yellowknife, September 15-18, 2004. The theme for the meeting was "The Resilient North: Human Responses to Global Change". Participants came from across the Circumpolar North and included several foreign dignitaries KLRS users in attendance included Peter Johnson, David Hik and Ryan Danby. http://www.nrf.is

News and Notes

Charles Krebs to be awarded the Centenary Medal
The Northern Science Award is presented annually to an individual or a group of indigenous people who have made a significant contribution to meritorious knowledge and understanding of the Canadian North. It is awarded by the Department of Indian Affairs and Northern Development to give prominence to the importance of scientific knowledge and its applications to Canada's North. This year's recipient is our own Charley Krebs. Charley will receive his award this November in Ottawa. Congratulations!

Kluane Lake Research Station
NEWSLETTER

ISSUE #1 FALL 2004

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