

CLIMATE CHANGE IN OUR BACKYARD



**2006 Conference Report
Haines Junction, Yukon**



**Champagne & Aishihik
First Nations**



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Overview:

The Climate Change in Our Backyard conference, held in the spring of 2006, was the first of its kind in the Yukon. It brought together scientific and local experts to share common concerns about climate change and work together on solutions. Outcomes will be used by local managers to guide on-going management.

The first section of this report, “Presentation Summaries” is made up of summaries of all the formal presentations made at the conference. The second section, “Local Observations of Change,” is a summary of the changes observed by residents recorded during the round table discussions. Section Three, “Local Directions: Impacts of Change and Adapting to Change”, summarizes round table discussions of future impacts of climate change and acceptable ways of dealing with those impacts.

Local Observations of Change

Fish: Local experts shared many of the same concerns about fish. In general, the meat condition is worse. Many said softer, less tasty, and more wormy. Many said there were fewer fish overall and fewer “spawners” in particular. Some had witnessed increased incidence of “mass die-offs”.

Wildlife: Overall observations were that there are more predators, which is impacting smaller species and big game. Some noted that there is more movement due to pressure from other animals or decreased food availability. Many said there is animal interaction with humans and they are less cautious of humans. Some observed new deformities (horns and antlers) and increased parasites.

Boreal Forest: People said treeline is moving up, many forms of vegetation are drying out, the spruce beetle epidemic is continuing to spread, and other insects and parasites are attacking trees. Some said trees are getting smaller.

Weather and Environment: The most common changes mentioned were less snow, more variable weather and temperatures, more rain in winter, warmer winters, more wind, more weather “events”, poorer water quality, and overall dryer conditions.

Landscapes and Glaciers: Most frequently noted were shrinking glaciers, ice patches, summer snow in mountains, increased erosion, and melting permafrost.

People: A huge range of changes in people were noted, ranging from lifestyle changes to overall health. Most prominently, people mentioned that they were less active, less healthy, and getting sick more often.

Local Direction:

Impacts of Change & Adapting to Change

Fish and Wildlife: Some said all animals are equally affected, while others mentioned fish, predators (including bears, birds and furbearers), big game, and rodents specifically. There was optimism that animals are quite adaptable and resilient. Some mentioned that northern species, animals that hibernate, and less mobile species may be more sensitive to change. To adapt, people suggested collaboration, relying on local input, and careful planning. Others said change is inevitable so it is better for people to “let mother nature take its course”. Many said there must be conservative and sensitive planning with heavy local involvement. Monitoring should utilize local people to observe and record change.

Fire: Traditional uses most likely to be impacted included wildlife, berry picking, traditional medicine harvesting, firewood availability, recreation/tourism, and personal loss. A number of tools for preventing and managing forest fires were suggested, including education, prevention, fuel abatement, prescribed burning, and emergency preparedness. Community involvement was key to all of the above.

Boreal Forest: Predicted impacts on plant and tree growth included reduced growth, death of some trees, reduced reproductive success, loss of some species, and new species moving in. The general theme in managing forests for climate change was to take a cautious approach. Discussions included replanting, introducing new species, allowing natural regeneration, and removing beetle kill. Ensuring economic benefits was also a priority for some.

Introduction:

In late 2005 the Champagne and Aishihik First Nations (CAFN) and Alsek Renewable Resource Council (ARRC) decided to jointly host a conference called “Climate Change in Our Backyard”. The goal was to provide a forum for local people, resource managers and researchers to share their knowledge and experience related to climate change. The workshop was held March 30—April 2, 2006 in Haines Junction, Yukon and was attended by more than 130 people. The conference was the first and largest of its kind in this region and was a great success in terms of bringing greater understanding of climate change and the value of local knowledge.

The goals of the workshop were to:

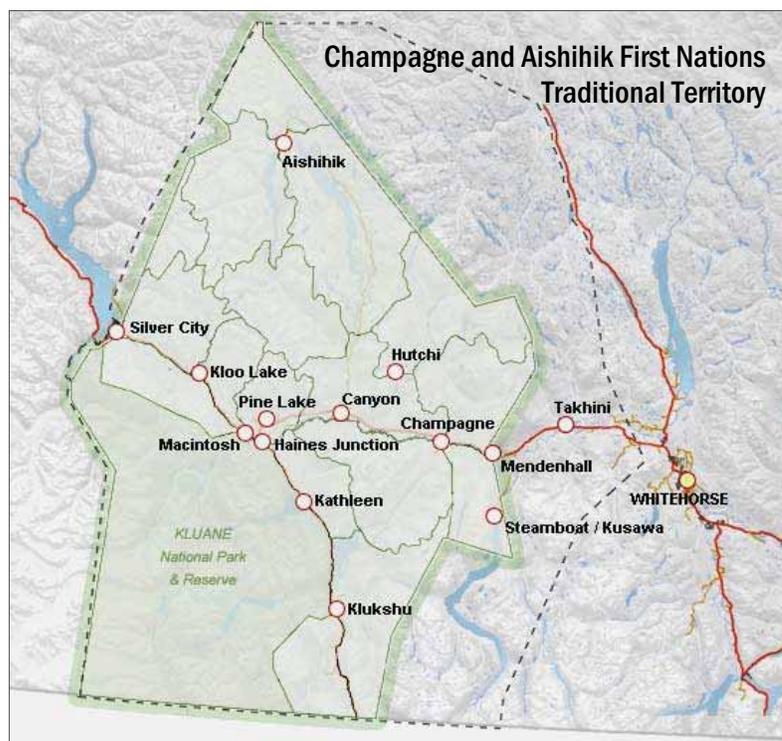
- Introduce an understanding of climate change and its effects globally and locally, along with providing information on mitigative measures.
- Gather from local people their views, experiences, and concerns with the changes occurring in the Champagne Aishihik Traditional Territory (CATT), and to feed this into a larger information bank for the use of local and outside managers and researchers.
- Raise awareness of the importance of combining local, traditional and scientific knowledge in our future planning exercises and endeavors as resource managers.
- Introduce research and monitoring plans and activities in the CATT from the Strategic Forest Management Plan (SFMP).

Each presentation topic was followed by round table discussions with residents from of many communities in the CATT. Each round table group discussed the same questions and their responses were recorded using a prepared form. The information gathered is

compiled in this report for various agencies to utilize in planning processes, and as a resource for local residents.

Participants included representatives of many communities in the CATT: Takhini River Subdivision, Mendenhall, Champagne, Canyon Creek, Aishihik, Haines Junction, Haines Road, Nygren Subdivision, Kloo Lake and Silver City. Many Whitehorse residents also attended. Presenters included local experts, researchers and scientific experts from many parts of Canada, and local managers with Government of Yukon, CAFN and the ARRC.

This session would not have been possible without the help of the Council for Yukon First Nations, Northern Climate Exchange, Northern Ecosystem Initiative, ANCAP, INAC C-CIARN North, Alsek Renewable Resource Council. Your contributions are greatly appreciated. Most of all, we would like to thank all the local experts to made time to fit the workshop into their busy lives. And finally, thanks to the CAFN Government for deciding it was a priority for people who live in the CAFN Traditional Territory to come together to talk about climate change.



Presentation Summaries:

What is Climate Change?

What's Happening in the World?

Michael Westlake with the Northern Climate ExChange explained what the term climate change means and explained the changes observed around the world. He also shared a film on the Arctic Climate Impact Assessment.

Michael begin explaining climate change by defining weather, climate, and atmosphere. Weather is the precipitation and temperature fluctuations we see on a daily basis. Climate is the changes in weather over a longer period, a year or more. And the atmosphere is a layer of gases that protects the earth by holding in heat. Without the atmosphere, the earth would be about minus 20 Celcius on average, and minus 60 in the Yukon!

The climate is always changing, so what's different now? Something called the "greenhouse effect" is occurring. Normally, the sun emits radiation, some passes through the atmosphere, some is absorbed by the earth, and some is reflected. With an increase in greenhouse gases like carbon dioxide in the atmosphere, the earth is warming more. The greenhouse gases in the atmosphere cause it to re-radiate the sun's radiation back down the earth, instead of allowing it to go back out into space.

The effects are seen in temperature fluctuations and carbon dioxide levels, which parallel each other. There has been a fairly regular pattern of fluctuation over the past 450,000 years, but in recent years there is a new trend where carbon dioxide is rising above the normal pattern. If carbon dioxide levels continue to rise at this rate, there will be many global impacts, many of which are already being felt. These include spread of disease, like tropical disease, spread of pests, coral reef bleaching due to rising ocean temperatures, more frequent extreme weather events, changes in precipitation, and rapid landscape change.



A major world-wide impact of these changes is a general warming trend. Warming occurs more on the earth's surface than in the ocean because the ocean takes longer to heat up. The massive build-up of sea ice is melting and could be gone by 2050 if it continues at the current rate. Melting sea ice does not raise sea levels, but the ice melting on land does. This melting land ice, like the rapidly shrinking Greenland ice sheet, adds fresh water to the ocean, which decreases the "conveyor belt" of ocean currents which would normally move heat around the earth. This is changing the climate, and this is why the Arctic is experiencing the most rapid climate change on earth.

Greenhouse gas emissions are produced by most activities in the industrialized world, like operating factories and driving cars. Even if we stopped doing those things today, the effects would continue to increase over the next 100 to 300 years.

Arctic Climate Impact Assessment

Since 2000, 15 northern countries have compiled input from more than 300 scientific, indigenous and other experts, resulting in 10 key findings.

1. The Arctic climate is now warming rapidly and much larger changes are projected.
2. Arctic warming and its consequences have worldwide implications.
3. Arctic vegetation zones are projected to shift, bringing wide-ranging impacts.
4. Animal species' diversity, ranges, and distribution will change.
5. Many coastal communities and facilities face increasing exposure to storms.
6. Reduced sea ice is very likely to increase marine transport and access to resources.
7. Thawing ground will disrupt transportation, buildings and other infrastructure.
8. Indigenous communities are facing major economic and cultural impacts.
9. Elevated ultraviolet radiation levels will affect people, plants and animals.
10. Multiple influences interact to cause impacts to people and ecosystems.

Changes From A Local Perspective: Elder Moose Jackson

Moose Jackson is the son of Hutchi Jackson. He shared his observations of changes over the last 60-70 years.

Moose talked most about seeing changes in the weather, especially in winter. "Old days we used to get five feet of snow around here, but that we haven't gotten for a long time. Since just after the highway came through," he said. He spoke of rapidly fluctuating temperatures and increased rainfall in winter. The summers are also getting hotter and conditions are drier. Many of the little lakes and ponds in the bush are drying up, and he can no longer read the moose tracks near the ponds, because they are gone.

He mentioned that traditional meats from moose and fish are not as good anymore.

He concluded that he could talk all day and not cover all the changes, but urged us to "get together and start teaching the kids". He believes they need to be unified by relearning the traditional Southern Tutchone language.



Photo from Brad Hawkes workshop presentation

Presentation Summaries cont.

Through Arctic Eyes: Athabaskan Observations on Climate Change

Cindy Dickson and Bob VanDijken with the Council for Yukon First Nations (CYFN) introduced the DVD completed by CYFN last year to address concerns about changes First Nations elders have been talking about for more than 20 years. This DVD includes input from Athabaskan people from the Yukon and Alaska, and is available by contacting CYFN.

“Through Arctic Eyes” recognizes the value of traditional aboriginal knowledge and parallels it with scientific research on climate change. Many First Nations individuals and elders are interviewed, as well as scientific experts, throughout the region occupied by Athabaskan people. They speak of changes in traditional foods, weather, vegetation, pests, increased ultraviolet radiation, a drying climate, melting glaciers and ice patches, and rising water levels. The DVD concludes that individuals can help stop and reverse climate change by convincing policy makers of the need for change.

The movie was introduced in Montreal last year on Arctic Day. Last year CYFN participated during the United Nations convention on climate change and brought many delegates, including chiefs, students, and other representatives of Yukon First Nations. They worked with other indigenous leaders to generate a statement on climate change, and continue to work with the Arctic Athabaskan Council. The UN’s next report on the state of the world will be released in 2007-08 and its first chapter will focus on climate changes, including indigenous knowledge.

Changes of Lifestyle: A Local Perspective

Long-term Haines Road resident Doris Papineau shared some of the changes she has experienced in lifestyle over the years. During her childhood and younger years, she worked hard, learned to value what she had and didn’t waste anything. Today, that is significantly different, she says. Everything is easier and faster now, and as a result, there is a lot more waste. Some of those wastes fill our landfills, like disposable diapers, and others result in harmful pollution.



Traditional Knowledge and Science

Paula Banks of the heritage, lands and resources department of CAFN contrasted traditional knowledge (TK) and science, and made suggestions on how the two can complement each other.

She began by explaining some important principles about TK. It is fundamental to the identity of First Nations people, “it’s who we are”. It is very applicable and useful knowledge for First Nations people, as well as others. However, it also must be protected. CAFN is responsible to safeguard TK so it is used appropriately and respectfully. There is some disparity between how First Nations’ believe TK should be used and how others view TK.

Science and traditional knowledge come from two different world views. Science is quantitative, so it tends to count or measure things. TK is qualitative and looks more at the quality of things, like good, bad, fat, skinny, etc. Science views people and animals as separate, with humans as masters of the environment, while First Nations view themselves and animals more holistically as part of nature.



Scientific knowledge is conveyed formally through teaching and publications, and a knowledgeable scientist has a PhD. Traditional knowledge is learned through stories and doing, and gained through life experience.

One thing the two systems have in common is observation. Both science and TK rely heavily on observations.

Paula pointed out that when gathering traditional knowledge, it is better to look more at what is important to people about an area. For example: which plants and animals do you harvest, what makes them healthy/unhealthy, where are special areas, what has medicinal or spiritual value, etc.

First Nations people also have beliefs that may make some forms of scientific research unacceptable, such as: people shouldn’t interfere with fish and wildlife, some plants and animals have cultural or spiritual significance and should be left alone, bear scat should not be touched, etc. She suggests that quantitative measurements (science) often aren’t necessary to answer the questions we are asking. Qualitative (TK) answers are sufficient in many cases and doesn’t need to be measured. Trying to measure TK is like trying to measure common sense.

Though some aspects of TK can be relevant to conventional research and monitoring, she cautions against squeezing TK “into the science box.” Instead we can use it to help develop better questions about the health of the land that are more relevant to the people who live there.

Presentation Summaries Cont.

The Importance of Local Peoples' Observations and Values

Douglas Clark, a biologist and PhD student at Wilfrid Laurier University, shared his experiences while gathering information for his thesis. He began his work in the Kluane region with Parks Canada which was working with other agencies toward building a regional co-management plan for grizzlies. The process failed. Doug's research is to learn "why". He has conducted interviews, focus groups and participant observation in a number of northern Canadian communities, including Haines Junction.

Doug has found some disparate views in his research. The conservation approach is "the vulnerability of this bear population requires action. Locals who say bears are abundant are jumping to conclusions." A more common local view is, "I see lots of bears but the government tries to preserve everything, and keeps making it harder for me to protect my family and my property."

His outcomes so far:

- Common interests let us address issues collaboratively.
- Traditional knowledge and practices have been shared.



Photo from workshop presentation by Douglas Clark



Photo from workshop presentation by Douglas Clark

- Values and governance preferences have been better clarified.
- The problem is not "fixed", but people will be better prepared to address bear management issues in the future.

Doug explained that there are many examples in the north where "scientific management" is being replaced with "adaptive governance". This means people are working together toward common goals by "integrating" knowledge and participatory decision-making. The outcome may not be a hybrid of science and traditional knowledge, rather a redefined decision process.

Some concerns he has with this newly evolving process are the power and politicization traditional knowledge and the reliability of local and traditional knowledge, and how it relates to the task at hand.

He cited four strategies for coping with change in social-ecological systems (Berkes et al. 2003). They are:

1. Learning to live with change and uncertainty.
2. Nurturing diversity for change and renewal.
3. Combining different types of knowledge for learning.
4. Creating opportunity for self-organization.

Forest Management in a Changing Climate: Building the Environmental Informa- tion Base for the Southwest Yukon

Aynslie Ogden is completing a collaborative project pulling together existing information and research needs related to climate change and forest management. Aynslie currently works for the YTG forest management branch.

Aynslie explained that, in the project, she and many others worked together to address the questions, “Should we be thinking about climate change in the forest management process? And, if so, how should we do that?”

Report objectives were to:

- Synthesize available information on climate change.
- Explore forest management considerations.
- Improve access to existing climate and environmental change information.

The Strategic Forest Management Plan (SFMP) recently completed in this area was developed with years of gathering community direction, but its implementation has not yet factored in climate change. So how can we consider climate change in implementing the SFMP? Simply by keeping it in mind when asking the same questions we would ask otherwise when making forest management decisions, like: How many trees can be harvested? Where can trees be harvested? Where and how should roads be built? Etc.

Four management considerations related to climate change to keep in mind during decision making are: mitigation, reducing greenhouse gases and enhancing carbon dioxide absorption, research needs, and monitoring and monitoring needs.

Though Aynslie’s project is mostly complete, it was only the first step in a longer-term process to evaluate climate impacts, assess risks to

ecosystem and community values, and develop scenarios for adaptation.

The next steps are to get more detailed information from local sources. So far most of the available information is published reports, so there is further need for local knowledge and perspectives. This workshop is helping meet some of those needs.

During work on the project, more than 500 sources of information were gathered. A number of other co-authors assisted in preparing backgrounders for the report on topics related to climate change in the Southwest Yukon including: climate variability and change, the changing physical environment, forest disturbance, ecosystem dynamics, social/cultural values, and the local economy.

The report, an overview booklet, and a poster summarizing her work are all available. They can be viewed on the web at www.yukon.taiga.net/swyukon/.



Photo from workshop presentation by Aynslie Ogden

Presentation Summaries cont.

Changes from a Local Perspective

Chuck Hume, a CAFN citizen, trapper, hunter, great-grandfather and former park warden, spoke about many changes he has witnessed in wildlife and their habitat over his lifetime.

Sheep hunting has changed. There is a great deal of wind erosion of clump grass and it is slowly disappearing, so sheep can be found much lower now as their feed is disappearing. Both sheep and mountain goat are harder to hunt now because new vegetation has grown over the top of the mountain, so a hunter has to go farther back to find them.

Moose populations are also changing. When Chuck was younger and raising his children, he sometimes hunted two moose during a year. Now moose populations are smaller and the moose are harder to find. The small lakes that were once moose habitat are drying out, and moose calving areas are being disrupted by activities like mining, woodcutting, and logging. He sees evidence of moose heading north right past their former calving grounds now.

Trapping has gotten more difficult. Chuck recalls as a young man trapping was very, very easy. There was deep enough snow, and cold enough weather, so the fur primed quickly.

Today, most furbearer populations are down, and fur quality is down, with the exception of the wolverine in beetle kill areas. Mining activity is also impacting trapping.

Chuck looks at the forest as a huge canopy over small growth like sedges and willow. The old growth forest prevents other plants from growing, so bark beetle opens up the canopy and builds the soil for new growth. He anticipates that a natural forest fire will likely occur, and though some logging is acceptable, it will do little to prevent fire.

Chuck concluded that young people still need to learn survival skills and the best way to learn is to go to the elders.



Spruce Bark Beetle

Rod Garbett of the Canadian Forest Service has been surveying spruce bark beetle in this area since 1994. He gave some background on spruce bark beetle as it relates to climate change, and shared the latest information gathered on the beetles here last summer (July 2005).

Rod said there is no doubt the infestation is directly related to climate change. Spruce beetles typically attack trees under stress, usually from logging, road building or blowdown. Here there was no obvious trigger at the beginning, but it became evident through weather data that the trees were under stress due to drought. A typical infestation lasts three to four years. This infestation probably started around 1990 and is still active, so it is into its 16th year.

The 2005 survey was done in early July because the trees were fading so quickly because in 2004 some of the beetles cycled in one year, instead of the usual two, due to an early spring and warm summer. They mapped 82,000 hectares of forest, not all of which were killed, but all had beetle activity. The three main areas of beetle activity were: the central valley, south valley and north near Sekulmun Lake. The south valley was wiped out, the central filling in, and more activity was moving north toward of Dezadeash Lake and River, and toward Kusawa. The most significant movement is into the Aishihik area and there is concern the beetles could move into the Nisling River Area, which contains prime timber. The same areas will be mapped again in the next three to four years.

Pheromone traps were also set to get the current population, and indicate that the population seems to be on a significant decline. The flight period was later due to marginal temperatures and a later flight period in 2005, which makes it more difficult for a large group to successfully mount an attack. However, if

temperatures are warmer in 2006, there may be movement into new areas.

Rod also responded to many questions about ips beetles, spruce beetles and forest fire, and how to destroy spruce beetles.

Spruce beetle is typically accompanied by ips beetles, which has been the case here. The ips attack both small and large trees, but are not doing as much damage as the spruce beetle because they do not survive as well during winter.

During forest fire, spruce beetles do not move in response to fire, so if it is a hot fire, they will be destroyed. If not, they will survive. A controlled burn might be successful in killing some beetle, but they are so widely dispersed it would not affect the overall population, and there would be risk of others flying into the burn area afterward.

When asked how he expects to destroy the beetles, Rod explained that there has never been a possibility of controlling the beetles. The infestation was already too large when it was discovered. The only questions have been, how much damage it will do, how healthy the population is, and what it is likely to do in the next year.



Presentation summaries cont.

Climate Change Impacts on Boreal Forest Wildlife

John Innes of the University of British Columbia has done wildlife work in Europe and China as well as Canada, and was able to share a comprehensive view of climate change impacts on wildlife in many parts of the world.

John began by explaining that the boreal forest occupies about 14.5% of the earth's land surface, which is about 16 million square kilometers. One third of that lies in North America. Canada, Alaska and Russia are the only places with large tracts of surviving forest left, but disturbance is increasing.

Problems in the boreal forest include climate change as well as oil and gas development, forestry, conversion of forest to agricultural lands, and access. Biological cycles in the boreal forest are very complex and migration occurs on a large scale.

In Scotland, forests have been completely eliminated, so there are missing species like wolves, bear and beaver. In Scandinavia there has been a long history of exploitation and fragmentation of the forest, so it is also difficult to tell the affects of climate change. Many birds have suffered, especially those that nest in trees. Some wildlife species are changing, like the European badger, lynx and wolverine, but these appear to be more related to reduced hunting. Deer populations have increased, especially reindeer, but they are mainly domesticated and herded.

The impacts of climate change can be seen in Russia. Many furbearers have disappeared. Russian wetlands are drying out, and birds and amphibians are being affected. Conservation efforts are needed for many species. A lot of change has also been due to exploitation and environmental destruction there as well. Very



little information is available about Siberia.

Here in North America, a great deal of the boreal forest remains intact, however, development is occurring rapidly. Oil and gas is developing incredibly quickly. It now cuts more timber than the forestry industry in BC. Similar growth in oil and gas is occurring in Alberta and Alaska. With oil and gas comes pollution. Animals don't drink the water. It makes discerning changes due to climate change much more difficult. There is also no comprehensive monitoring program for biodiversity across the boreal forests, and huge information gaps.

John had four conclusions:

1. We lack much of the basic information we need.
2. Local observers could help us build a picture of what is really happening.
3. Scientists will need to learn to listen.
4. The ability of systems to adapt is being compromised by other developments.



Local Observations of Changes in Fish and Wildlife

Linaya Workman, CAFN Renewable Resources Manager, and Bob Hayes, long-time resident and biologist, looked at changes during the last 200 years in local fish and wildlife populations.

The CATT and Kluane region have large mountains and are in the sub-arctic, which makes them very susceptible to change. Bob and Linaya discussed species that might disappear in this area due to climate change. They focused on locations that are very sensitive to change and addressed several species that have gone or are likely to go through changes related to climate and weather.

In 1997 an in-depth mapping exercise was carried out to learn more about moose in the Alsek Valley. During the interview process they quickly learned that moose were relatively new to the area and caribou were once the predominant species numbering in the thousands. This changed in the 1890s, not long after the last Little Ice Age, when moose began coming into the area and caribou began leaving. Linaya pointed out that caribou are a cold species and need cold weather, especially in the summer months.

Local salmon populations have also changed. In the Klukshu River, people are observing fewer fish returning to spawn, as well as in the Takhini and Hutchi rivers. Elders also speak of seeing salmon in rivers where the younger generation has never seen salmon. Salmon spawning near Turnback Canyon also indicate change. The Tweedsmuir Glacier surged and blocked the Alsek River, but salmon are still seen bumping up against the ice trying to follow the old route to their spawning grounds. When the glacier recedes with warmer temperatures, spawning will reopen again.

Trout in Dezadeash Lake are another species

that is very susceptible to climate change. Dezadeash Lake is very shallow, sometimes only eight to 10 feet. Fish there rely on glacially-fed cold water creeks near the highway for spawning. Temperatures have been rising over the last 100 years and have had a really rapid increase over the last 10 years. If all the glaciers that feed the creeks disappear, the trout probably won't be able to live there.

Sheep in the Ruby Range near Printers Creek (Kluane Lake) may also be displaced. As precipitation is increasing and temperatures are going up, the forest appears to be moving up the mountains, including the shrubs that moose eat. Is this going to push sheep out of their range?

Sheep on Decolai Mountain also appear to have been impacted by increasing winter rain. In 1999 three to four inches of rain fell on Christmas Day, then froze. A resident who watched the mountain and counted sheep every day noticed that the population dropped from about 50 to about 10 during the middle of that winter. Biologists counted half as many sheep there in 2000 as were there in 1985. Too much snowfall and too much rain at the wrong time has strong implications for sheep.

Gophers are a favorite First Nations food in the spring. Following the 1999-2000 winter rain, residents noticed there were few or no gophers on the highway in the spring. Golden eagles also eat gophers, and the largest population of golden eagles in the world is in this region. Without gophers as a food source, they and other predators that rely on gophers will not survive.

Bob concluded, the species and environment are all interconnected, so changes like these examples will have far-reaching consequences. And if climate change occurs rapidly, the animals can't adapt as well. People will also be affected and have to adapt.

Presentation summaries cont.

Climate Change and Forest Fires

Brad Hawkes of the Canadian Forest Service has been studying fires in this area since 1981 when he participated during the Fire History and Ecology Study in Kluane National Park.

Fire history of the area is recorded in the forest. Some spruce here are 300 years old. Some examples of fires in the last century include fires near Mush and Bates lakes in 1900, a fire at Kathleen Lake in the 1920s, the 1940 Dezadeash Lake Fire, and the 1980 Canyon Creek fire. Most areas in the region have burned at least once during the last 200 years.

There are a number of factors to consider that make fires different and have different impacts on the forest.

- How frequent are the fires?
- What size and shape are the fires?
- When in the fire season do they mainly occur?
- What parts of the forest are consumed in the fire?

Fire frequency can impact which plants and animals will survive. If fire occurs too frequently, seed producing plants will not survive because they won't have enough time to seed, so sprouting plants would dominate the forest.

Fire size and shape dictates how far seeds have to travel to germinate and grow in burns. If the fire jumps and is in small patches, they can revegetate easily, but if the fire consumes a large, continuous area, regrowth is more difficult and animals have to go farther for food.

Season also affects revegetation. For some species, the best regrowth is if fire occurs in spring, because at that time their food is still stored in their roots. In summer, their food is in their twigs and leaves, so an aboveground fire does more damage.

The parts of the forest consumed by the fire also have many implications on regrowth. The time it takes for regrowth depends on whether and how deep the fire burns into the forest floor. A deeper fire gets to roots and buried seeds. How much aboveground vegetation is consumed is also a factor.

The fire season is increasing here. One model projects that the Yukon will have 38-50 more days of fire by 2100. The overall size (area) of burns has also increased throughout Canada over the last 80 years. As the temperature has gone up, so has the number of fires. Different models project 3-4 times more area burned by 2100, or 2 times more area burned by 2069. Models vary a great deal because there are so many different potential variables in the future.

Brad reviewed some fire adaptation strategies and said our area is doing a great job of dealing with fire here. The strategies include:

- Landscape fuels management: fuel conversion, fuel reduction, or fuel isolation.
- "FireSmart" landscapes: strategically located firebreaks, education/prevention, and emergency planning.

He concluded that a concern for the future is the impact of fire on traditional uses.



Photo from Brad Hawkes workshop presentation

Fire Management in Kluane National Park and Reserve

Tanya Letcher, a fire management technician with Parks Canada in Alberta reviewed the fire environment, fire history, effects of climate change on fire management, and fire management in Kluane National Park and Reserve (KNPR).

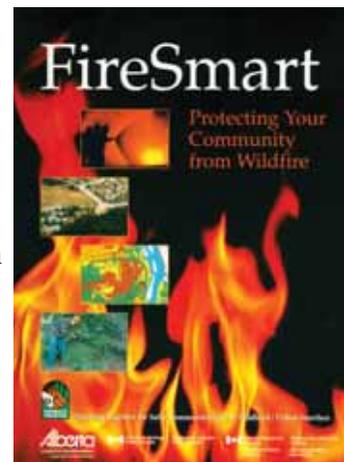
The fire environment within Kluane is a small portion of the Park. KNPR is 22,000 square kilometers, only three percent of which is spruce forest. Under current weather conditions, the fire season begins in May, however, the annual temperature is increasing and there are less prolonged periods of severe cold. Prevailing winds blow from the south out of the Park. On average there is one lightning-caused fire every 20 years in the Park.

The average fire size is about 1,600 hectares (from 1850-1940) in Kluane. Most fires are human-caused and start in areas with access. The last lightning-caused fire in Kluane was at Shaft Creek in 1996. The typical fire burns about 80 percent of the vegetation.

Climate change is compounding the likelihood of fire in KNPR. Due to having few fires in recent history (fire exclusion) and the higher temperatures and dryer weather of climate change, there are higher severity fires. White spruce in burn areas are not regenerating well because of the high severity fires and the



slopes and angles resulting in land slides. These fires down to the mineral soil are also impacting animal habitat. With more storms an increase in lightning is also likely. The conditions are also ideal for spruce bark beetle attacks, which again compounds the likelihood of fire.



Parks Canada is in the process of writing the fire management plan for KNPR. It proposes fire management zones where fires will be allowed to burn, limited some, or full suppression will occur. The proposed zones line up with YTG's zones around Haines Junction. Kluane is also carrying out FireSmart projects around Kathleen Lake Campground and the Visitor Reception Centre in Haines Junction. Another possibility for discussion is prescribed burning to reduce fuel loading, alter the forest structure and maintain unique habitats. The planning process for prescribed burning is extensive and takes three years with many opportunities for community input before any action occurs. Wildfire response is another fire management tool for Kluane. Safety is the first priority and many tactics may be used. Parks Canada also has quick access to a wide range of resources, both equipment and crews.

Tanya concluded with Parks' fire management priorities:

- Recognize the role of fire in restoring or maintaining ecological integrity.
- Ensure appropriate response to wildfire and phased approach to fire use.
- Engage stakeholders in development of fire management strategies.

Presentation summaries cont.

Operational Forester's Perspective on Climate Change, Forest Renewal and Forest Management

Myles Thorp, a forest management planner with YTG, shared some ideas for thought and discussion on forest renewal and management in response to climate change.

Myles began by asking, “What’s the point of all these plans?” To people like himself and other managers, they provide a lot of direction, he explained. He referred to the Strategic Forest Management Plan section on silviculture, and asked participants to consider, “When we’re out there harvesting or after a fire, what sort of reforestation strategies would we want to employ?”

There are many factors to consider before reforestation. They include the physical environment, sunlight, temperature, wind, soil type, nutrients, fire, shrubs and herbs on site, impacts of fire on soils, etc. The forest we currently have is dominated by white spruce.

White spruce prefers relatively consistent air temperature and climate, relatively moist areas, fresh water, are moderately shade tolerant, have a shallow rooting system, blow over easily, often need help to regenerate, can handle moderate flooding, and are sensitive to frost early in the growing season.

Myles questioned whether replanting with white spruce is ideal with the changing climate. He is aware of northern movement of ponderosa pine far north of where they would typically grow. He has also observed movement of lodgepole pine into portions of the CATT around Blanchard Lake and Goat Creek above tree level. The area also has conditions that are suitable to lodgepole pine, like relatively well drained soils, a dry and cool late season, thin organic (duff) layers, etc. In Watson Lake, regeneration is favoring lodgepole pine in an area that would usually favor white spruce.

With the northward movement of pine and changing conditions, he questioned whether lodgepole pine might be a suitable tree to consider for reforestation in the CATT.



Overview of Research Results on Climate Change and Forest Renewal from Yukon, Alaska and Elsewhere in the Boreal Forest

Jill Johnstone of Carleton University is currently in residence at Yukon College. She talked about regrowth of trees after fire and other disturbance.

As a researcher, the southwest Yukon stands out to her as a special place that may make it more vulnerable to climate change for three reasons: tree diversity (lack of), slow growth, and dry conditions.

There is only one dominant species here, white spruce, and two sub-dominant species, trembling aspen and balsam poplar.

When studying the tree rings of 100-200 year-old white spruce in interior Alaska, she found that the last 30 years have had very poor growth (thin rings). Since then, samples from white spruce in Takhini, Mendenhall and Carmacks have all shown the same thing. The years that have been really bad have been the driest.

The southwest Yukon is already very dry, and with warmer and drier conditions and declining growth, how healthy will our trees be if this dry spell continues? The trees most vulnerable to drought are the seedlings trying to grow after a fire or logging, not the older trees with good root systems. This can already be observed at the Takhini Burn and near Fox Lake and Braeburn. There are very few seedlings on south facing, dryer slopes.

Dry places are very sensitive to regrowth after disturbance, she concluded.

Our Changing Boreal Forest in the CATT

Gord Allison, CAFN, and Gary Miltenberger, YTG, introduced a press release announcing that one million cubic meters of timber have been identified for harvest in the beetle-affected forest of southwest Yukon for a 10-year period. The two governments also accepted the final draft Integrated Landscape Plan for the area, which can be viewed at www.caforestry.ca.

Participants had questions and concerns on the following:

- Have specific areas have been designated for harvest? *Not yet, specific places will be identified during harvest development planning.*
- Where did the number (one million hectares) come from? *Based on mapping, then analyzed for inventory and possible net-downs. Rationale will be posted on the web site.*
- How sustainable will this million cubic metres be? *There will be sustainability in terms of impacts, but not sustained yield. A salvage situation.*
- Not taking only dead trees? *True, taking green trees too.*
- Trapper compensation needed.
- Timber harvest agreements or tenure should be available to local residents.
- Will a relatively stable amount be logged each year to keep the economic benefit stable? *Not built in, but will be preferred during review of proposals.*

Presentation summaries cont.

Changes from a Local Perspective

Paddy Jim, a CAFN elder, spoke of a number of things he has learned, observed and experienced in his lifetime.

“Reading the weather” has been very important in his life. He explained how various indicators are signs of coming weather:

- a ring around the sun means snow is coming,
- a cloud coming means it will be cloudy,
- blue trees on the mountain on winter mornings means it’s going to be cold,
- a red cloud to the south in morning means a south wind is coming, and
- a red cloud in the north in evening means it’s going to be really cold tomorrow.

He also spoke of changes in travel since the highway was built. Before its construction he traveled by dogsled from Champagne to Bear Creek and return in one day. After construction began, Haines Junction was created and new things were available at the Army canteen.

He told a story about the discovery of Klukshu. A man was tracking a moose, and it led him to a creek full of a kind of fish he had never seen before. The man went back to Dezadeash and sent word to others that fish had been discovered. The way to Klukshu was marked by breaking a willow “every little way”, so others could see the way.

Glaciers: What’s Going On Around the World?

John Innes, with the Sustainable Forest Management Laboratory at UBC, spoke again. This time he presented on the status of glaciers in the world. His work on glaciers began in the 1970s in the southern Alps. They stopped researching because the glaciers were all melting. The purpose of their work had been to see if we were headed toward another ice age. Because of that research we now have useful information about climate change.

Alpine areas are melting faster than other parts of the earth’s surface, global temperatures are increasing, and northern temperatures are increasing. This has a tremendous impact on glaciers. To determine the status of a glacier, the “mass balance”, or balance between what accumulates in winter and what melts in summer, is measured. Old paintings and photographs are also valuable tools to track glacial recession.

In Norway, they have been surveying glaciers since the 1900s. A few are advancing, but the majority are retreating. The only ones advancing are doing so because they are on the coast and, though they are retreating in summer, they are getting a lot more snowfall in winter.

Most small glaciers in the European Alps will disappear in the next 100 years.





Photo from John Innes workshop presentation

Riggs Glacier, Alaska, 1941

In Alaska, Glacier Bay will soon be gone, which will have a huge impact on tourism. Photos of Glacier Bay from 1906 to 2004 show that some glaciers are gone or are nearly gone.

In Africa, Kenya has lost 40 percent of its glaciers and Mount Kilimanjaro will have lost all ice by 2018.

Glaciers in tropical and temperate South America are also shrinking rapidly. San Rafael Glacier in Chile is one of the fastest moving (receding) glaciers in the world.

In central Asia, the same trend of overall recession is occurring. A very small number of glaciers are advancing, but most are getting smaller.

Glaciers in New Zealand have been very well studied and most are shrinking. The majority of their small glaciers will be gone in the next 15 years.

The Arctic is generally melting.



Photo from John Innes workshop presentation

Riggs Glacier, Alaska, 2004

The Antarctic does not show a lot of trend in the Dry Valleys, but other glaciers are retreating. Some in the sub-Antarctic Islands have retreated up to 65 percent.

Overall, glaciers around the world have been melting steadily, with a huge loss in the last 10-15 years. A quarter of all glaciers may be gone by 2050, and half by 2100. In 50 to 100 years there will be very few glaciers left in the world.

Presentation summaries cont.

What Are Our Glaciers Saying Locally?

Chris Zdanowicz with the Geological Survey of Canada has worked in this region's ice fields for many years.

Chris talked about how we can use glaciers like “elders with very long memories” to help us find out more about how climate operates on very long time scales. For example, the Antarctic ice core is three kilometres long, and holds history of the climate over nearly a million years. The information found in ice cores tells us where we fit in the climate.

Overall, ice cores show it is far more common for the earth to be in a cold climate than in a warm climate. Inevitably we will move into another ice age. Many say climate change is part of bigger trends that happen routinely, and nothing to be concerned about. Scientists are making the case that what is happening now is an anomaly, not routine, to convince politicians to act. Though a lot was known from ice cores collected in the Arctic, not much was known yet about the northwest Pacific, so three cores were taken on Mount Logan. Chris discussed the core taken by Canadian researchers, which measures 180 meters in length and holds 20,000 years of ice layers.

When looking at the Mount Logan core, it tells us about temperature, as well as where moisture was from and circulation of winds in this region over thousands of years. A lot of precipitation on Logan comes from cyclones that stall in Alaska, then dump precipitation in the St. Elias mountains. These powerful cyclones can suck water vapor from the ocean very far away, so snow on Mount Logan can be from as far away as the tropics.

By studying the gases and ancient air trapped in the ice and reading it for subtle changes, the core shows that at the end of the Little Ice Age,



Photo from Chris Zdanowicz workshop presentation

around 1870, there was a fairly sudden change in where the clouds came from. When temperatures were colder, moisture came from fairly close places, like the Gulf of Alaska, but during warmer periods like the present, moisture comes from farther away. The glacier tells us that the jet stream, which circulates air and moisture around the earth, is changing. During cold periods, the jet stream is fairly flat and air movement is mostly east-west. During warmer periods, like the present, the jet stream goes up and down, and we get warm air from much farther south coming up into the mountains more often. Quite often the moisture goes around the mountains, which means they are also getting dryer.

Chris explained that researchers like himself are concerned because the rapid change in climate at the end of the Little Ice Age happened far more quickly than normal. With the greenhouse gases being pumped into the atmosphere, there may be even more rapid switches.

In conclusion he asked, “So why are researchers still monitoring glaciers?” Because without watching we wouldn't know about these and other changes, like accumulating levels of carbon dioxide. It is to help us detect the problems and figure out how to adapt.

Learning, the “Southern Tutchone Way”

Sheila Greer is an anthropologist who has been working with CAFN for many years. Diane Strand is “her partner” within CAFN, and works closely with Sheila on many projects. The two talked about Southern Tutchone ways of learning, and shared tips for working with Southern Tutchone people.

The key skill Sheila has learned is listening. Over the years her understanding has increased greatly, and she has started to hear better, and can now ask better questions. Outside researchers probably will not start the right questions.

Learning is very “hands on”, getting out on the land and learning. If you ask a question, Southern Tutchone people will get you out there and doing whatever you wanted to learn about.

A lot of teaching is done through stories. In many cases when you ask a question, you will get a story in response, and it may not be clear how it relates right away. Stories are also told differently depending on the audience.

Southern Tutchone learning is also learning by mistake, always in a gentle way. It is also very individual. Some societies have very strict rules on protocol and etiquette. Though Southern Tutchone do have cultural practices, they are often carried out slightly differently in different places, and that’s accepted and respected.

There is a very strong connection between elders and youth. Elders always ask how youth can be involved in activities on the land. It’s an important way of passing down knowledge.

So how can researchers learn from Southern Tutchone people? The old way would have been to show up with an interviewer and an assistant to help you meet people and ask questions. But today it is not so simple. First you

need to go through the First Nations government and get permission. CAFN people are much more aware of their intellectual property rights, are being pressured by so many outsiders, and want to be sure the information they share is used respectfully, so are developing a traditional knowledge policy to help address those things. It is also important to be aware that different people will have very different understandings of the information received. So it is important to not try to fit the information you get “into the boxes” you are trying to fill. Though the scientific way is not the Southern Tutchone way, they are aware it is coming and are preparing to be partners with scientists.

In conclusion, the best way for a win/win situation for scientists and the community is by involving CAFN youth so they will have an understanding of both the scientific way and the traditional way. They are the people with the greatest responsibility because they have to “walk both roads”. Diane’s analogy is youth today “have to have one hand on the computer and one foot on the land.”



Ice Patch Presentation

Diane Strand, CAFN, and Sheila Greer, anthropologist, talked about the history of caribou here, and the many discoveries in the shrinking ice patches of the southwest Yukon.

Diane began by telling stories shared by elders like her grandmother about how plentiful caribou once were in this area. Her grandmother told a story of seeing an entire mountain by Kusawa Lake covered with so many caribou that it looked like the mountain was moving. Aishihik and Kluane people talk about seeing the lake so full of caribou that it was black. Ice patch finds also indicate that there were a huge number of caribou. Massive fields of dung have been exposed, caribou fences with up to 150 snares, and as many as seven hunting blinds in a row have been found overlooking ice patches.

So what happened to the caribou? Overharvesting? Loss of their food source? Habitat? Predation? Poor management? Climate?

Oral history tells of an animal mother who took care of all the animals, made sure things were done right, and ensured there was balance in the animal world. Sometimes an animal was “recalled” so she could bring balance by improving them. Aduli teachings also dictated how animals killed for food should be treated. Not all young people are following those teachings, so elders are concerned. Diane said we need to make sure First Nations youth are learning both the scientific and traditional Southern Tutchone ways to bring the caribou back.

Sheila described the ongoing work in the ice patches, which is carried out in partnership with the Yukon government and six First Nations. Ice patch is the term for patches of snow and ice on mountain tops, which are preferred habitat for caribou to escape from heat and insects. The ice patches in this region are found primarily between Haines Junction, Carcross

and Whitehorse. The first ice patch discovery was in 1997, when a huge patch of caribou dung and a hunting dart more than 4,000 years old were found. Since then, many exceptionally well-preserved artifacts, dung, and animal parts have been found, and about 100 ice patches. Artifacts have included stone points for atlatls (older hunting technology, 1,200 to 8,000 years ago), and arrows (90 to 1,000 years ago). All show excellent workmanship and many are so well-preserved they still have ochre paint, feathers, sinew, and even caribou hair from the kill still attached. One bow has been found (made of maple), and one 1,400 year-old moccasin. The ice patches are shrinking rapidly, so there is pressure to find artifacts right away, otherwise they begin to lose information. Bison bones and other small and large mammal bones have also been found. Caribou DNA studies and biological studies on pollen, parasites, etc. are also underway.

Diane explained that a major objective of the ice patch research is connecting the project with the community. Elders from all six First Nations help provide direction, and scientists, elders, and students all work together in the ice patches in summer. Science camps for youth have been held for the past five years, and include trips into the ice patches to learn how to look and what to look for. Many students have located artifacts and learned to appreciate the skill their ancestors needed in order to survive. The national aboriginal science camp held in 2005 in the CATT also included a trip into an ice patch. Diane concluded that the youth are the key, so it is a goal to allow as many as possible to be part of the project.



Northern Contaminants

Jody Walker of the Northern Contaminants Program presented on contaminant levels in traditional foods in the Yukon and specific areas of concern in the CATT.

Jody started the presentation with a very important message. In the Yukon with very few exceptions traditional foods are safe to eat.

Jody explained to the group that contaminants can be naturally occurring like arsenic or man made. All of the north is influenced by the activities of the rest of the world, as we are connected by air and water currents. Before the 1980's the Arctic was thought to be too far away to be affected by contaminants from the rest of the world, but a study by Michael Wong proved different.

Since then the Northern Contaminants Program has been established with representation from DIAND, Environment Canada, Health Canada, Department of Fisheries and Oceans, Government of Yukon, Northwest Territory Government, Government of Nunavut, Council of Yukon First Nations and the Dene Nation. From this there is also a Northern Contaminants Committee made up of members from INAC, Environment Canada, Yukon Governments Departments of Health and Social Services and Environment, Council of Yukon First Nations, Yukon Conservation Society, and Yukon College. This committee facilitates monitoring in the Yukon and reports their findings to the Northern Contaminants Program.

A study completed in 1995 (Yukon First Nations Assessment of Dietary Benefits and Risks) found that traditional foods are nutritious. They also promote physical activity, cultural and traditional activities, and are rich in calcium and Vitamin A (especially moose liver and caribou).

In the CATT there are a number of sites that still cause concern for residents - Dezadeash

Lake oil spill from 1968, deformed fish found in Kloo Lake, DDT at Rainy Hollow and hydrocarbons at Blanchard. Kloo Lake was sampled for deformed fish and none were found by YTG. Jody suggested that if local people catch a deformed fish to freeze it as soon as possible and submit it for testing. A 1999 a study of the pipeline area at Klukshu found that the soils had been affected by contaminants, and that the wood in that area should not be used for smoking fish.

Other contaminants found in wildlife were cadmium in moose and caribou. Jody explained that cadmium accumulates as a result of emissions from industrial use. It is absorbed into the lichen that caribou eat. Surprisingly enough cadmium levels were higher in caribou 2,000-6,000 years ago as cadmium is also a naturally occurring contaminant. Lead levels were also higher in the past, but since its removal from gasoline, levels have subsequently dropped.

Fish were studied during the 1990's. Fish in Lake Laberge were found to be higher in mercury and the lake itself also had higher levels of contaminants. Kusawa Lake was also studied and since 1999 contaminant levels have declined. Overall, contaminant numbers are lower in the CATT as compared to other areas in the Yukon.

The Northern Contaminants Committee has been conducting a hunter survey focused on contaminants in moose and caribou. They have requested kidneys, muscle tissue, portions of liver and the incisor bar of these two species to test. Results are expected to be available in April 2006.

More information on northern contaminants can be found at www.contaminants.ca.

Local Observations of Change:

Fish

Local experts shared many of the same concerns about fish. In general, the meat condition is worse. Many said softer, less tasty, and more wormy. Many said there were fewer fish overall and fewer “spawners” in particular. Some had witnessed increased incidence of “mass die-offs”.

Fish habitat was also seen to be changing. The most prevalent change mentioned is that there is less and warmer water. Increased erosion of river banks and increased sediment and debris were also noted. In lakes (Dezadeash), filling in with weeds was also a concern. The biggest concern for most with these changes is the impact it has on spawning.

Specific locations of concern with regard to fish were Aishihik Lake, Dezadeash Lake, Lake Laberge, Jarvis Creek and Kluane Lake.

Some species-specific changes were also noted. These include: trout at Kathleen Lake are bigger, there are red worms in burbot (ling cod), burbot are digging holes at Laberge, pike are smaller and easier to catch, sucker populations are increasing and replacing other fish, there are fewer whitefish, and grayling spawning beds are being damaged by erosion and debris.

Salmon were of special concern to a number of people. They noted the following changes: there are no more really big kings, spawning time is getting later (dog and pink salmon), Kokanees are dying out, the weir and beavers are impacting spawning, there are increased pollutants in salmon, there are no salmon at Jarvis Creek anymore, and chum salmon at Kluane Lake are changing (harder to get, fewer, smaller, spawning grounds changed).

Wildlife

Changes in wildlife populations were many and far-ranging. Overall observations were that there are more predators, which is impacting smaller species and big game. Some noted that there is more movement due to pressure from other animals or decreased food availability. Many commented on changes in animal interaction with humans, in that there are more wildlife coming into communities, they are less cautious of humans, and some are “tracking people”. Some observed new deformities (horns and antlers) and increased parasites.

Another change observed by many local experts is the number of new species. There were reports of numerous sightings of cougars, white tail deer, and hummingbirds. New bird species and wood pack rat sightings were also mentioned.

Bears

Quite a few people observed that there are more bears and they are getting bigger (grizzlies). More bears were seen near humans in search of food. Some said that bear hibernation is now shorter.

Birds

A number of changes were noted in birds.

Some said waterfowl migration is changing in that they are returning sooner, leaving sooner, and taking different routes. Some said waterfowl nesting areas have been disturbed or washed out (dam). One comment was that ducks are less edible, or less safe to eat.

There were more sightings of some bird species, but others were noted to be declining. Some observed more “southern” birds, like cowbirds and blackbirds. A new “red bird” resembling a budgie was sighted. Several noted that there are more woodpeckers and more swallows. More robin activity in winter was also observed. A goshawk sighting was mentioned.

Some said there are fewer birds in general and fewer birds overwintering, like chickadees and juncos. Specific species of concern were grouse (noted by many), ptarmigan, bluebirds, and hawks.

Big Game

General concerns with big game animals were meat quality, displacement by other species, and that some (moose and caribou) are smaller and fewer in numbers. Some said meat quality is poorer now, and others said it has not changed.

Caribou were observed to be smaller, fewer in number, and disappearing in some areas. Moose were noted to be fewer, “not as fat”, smaller, and “sick”. Moose rutting season was observed to be later. More were seen near communities.

Some First Nations elders were concerned with bison. They said their numbers are increasing, and they are destroying muskrat, moose and caribou habitat and food, personal property. Some said they were scared to harvest berries near bison.

Elk were observed to be moving east toward Whitehorse, and having fewer calves. They were said to be displacing free-ranging horses between Takhini and Canyon.

There were few comments about Dall sheep, although mention was made that there appear to be more large rams in recent years.

Small Mammals

Many mentioned a decrease in gophers, and that gophers are smaller and less tasty. Snowshoe hare numbers are down and do not appear to be recovering as quickly as usual. Porcupines were observed to be down, but now improving. Otters and bats were said to be more numerous in certain areas. Some observed that muskrat habitat is drying up.

Furbearers

Local experts said there is poorer fur quality for

all species and less trapping in general. Many mentioned that there are more wolves. Some said more and some said fewer fox and coyote. Several mentioned that fox, coyote, and wolf appear more “tame” and are being sighted more frequently. Wolverine were said to be doing better.

Insects

A number of local experts observed that new and more numerous insects are appearing. They noted more sandflies, and larger wasps, mosquitoes and horseflies. Particularly bad mosquito years were also observed to occur sporadically. Two new types of insects appeared in the last decade.



Local Observations of Change: Boreal Forest

A transformation of the boreal forest as we know it was observed. People said treeline is moving up, many forms of vegetation are drying out, the spruce beetle epidemic is continuing to spread, and other insects and parasites are attacking trees. Some thought trees are getting smaller. Several observed that trees are budding during winter warm spells (December pussy willows).

New types of growth are occurring in new places. Many said treeline and other plants, like dandelions, are moving higher on the mountains. Some observed new types of flowers (blue and yellow). New black vegetation was also noted on the forest floor.

Many plant species are drying out, including lichens and mosses. Some said wetlands and lakes are turning into meadows, and existing meadows are drying.

Berries were noted to be much smaller and drier due to insufficient moisture and less snow cover. Soapberries, black (moss) berries and blueberries were mentioned as the greatest concern. It was also mentioned that some berries are becoming more wormy.

Many parts of the forest are dead or dying due to the ongoing spruce beetle infestation. Participants noted that the infestation is still growing, more trees die every year, and new attacks on white spruce have been sighted near Whitehorse.

A number of other insects and parasites are also affecting trees. Local experts mentioned the leaf miners on poplars, little green worms (tent caterpillar?) killing willow leaves, a new fungus on cottonwood trees, and a new mold growth on trees.

Weather and Environment

A number of major changes in the weather and the environment were observed. The most common changes mentioned were less snow, more variable weather and temperatures, more rain in winter, warmer winters, more wind, more weather “events”, poorer water quality, and overall dryer conditions.

Several said First Nations ways of predicting weather no longer work or are not as effective. The most common example was Naday Gän (Decolai Mountain). Leaf position, sky color, and moon light and shape were other weather indicators noted to be less effective.

People said that winters in general have been “strange”. Many observed less snowfall overall, although occasional heavy snowfalls that melt right away were noted. Winters were said to be generally warmer (longer warm spells) with more rain. Winter ice conditions were also said to be different. Lake and river ice was noted to be thinner and to freeze later in winter.

Springs was observed to be shorter with less run-off. Some thought hotter summers, others said cooler.

Several people observed changes in wind. Many said more there are and stronger winds. Some mentioned less wind in areas that are typically windy, like Destruction Bay. Different wind direction and patterns were also observed resulting in tree blowdowns and different snowdrifts.

One predominant change was dryer conditions. Creeks, rivers, lakes and ponds were all noted to have less water, and some were said to be “drying up”, although it was noted that the water is higher on hotter days from glacial melt. Increased fire risk, poorer plant growth, and



changing fish and wildlife habitat were all linked to much dryer conditions.

Water quality was observed to be poorer with lower water levels and more sediment from erosion. Some said safe drinking water is not as available. Water conditions were also mentioned in relation to the Aishihik dam (later thaw of dammed water) and Dezadeash Lake (oil spill).

Many mentioned a greater incidence of lightning. Funnel clouds were also noted as new to the area and more frequent.

Several mentioned that the northern lights are less visible, less bright, or less colorful.

Landscapes and Glaciers

Some observed changes to landscapes and glaciers, though not all agreed. Most frequently noted was shrinking glaciers, ice patches, summer snow in mountains, increased erosion, and melting permafrost.

Several people commented that glaciers are receding and look “dirtier” now. Some noted that hanging glaciers are moving particularly rapidly.

Some mentioned that ice patches are disappearing, like the large one above Kusawa, and observed that there is less snow on the mountains in summer.

Several observed increased erosion, including the 1988 mudslides. Several mentioned more erosion along river banks and lake shores, resulting in more sediment, more debris (trees), more blockages and changing channels.

Many mentioned that permafrost is melting more rapidly, particularly under and in proximity to highways. Comments were that the highway gets sink holes more quickly and permafrost is disrupted by highway construction.

Flooding coastal areas due to rising sea levels were also noted.

Local Observations of Change:

People

A huge range of changes in people were noted, ranging from lifestyle changes to overall health. Most prominently, people mentioned that they were less active, less healthy, and getting sick more often.

Quite a few mentioned that children are bigger now, growing and maturing at a faster rate. Some also mentioned that kids less active and more hyper. Others thought children needed to spend more time focusing on the “three Rs” in school and that young adults needed better training before entering the workforce.

Some elders also noted that people are dying younger. One said, “People used to get old right down to the ground before they die. Now they die young.”

Overall poorer health was a common theme, especially in relation to diet, inactivity, and more numerous illnesses. An increase in allergies was noted. More cancer and diabetes were mentioned by many, as well as more flu viruses, colds, multiple sclerosis, tuberculosis, obesity, arthritis, heart attacks and strokes. A rise in drug and alcohol dependence was also noted. Many mentioned that people are eating a lot more “fast food” and fatty foods, because they are cooking and hunting less. Many also said that people are less active and “lazier”.



Hunting less was linked to both diet and inactivity. Elders said hunting and harvesting was once a year-round activity that kept people busy and active, but now people are eating less traditional food overall. And when people do harvest, they often use trucks or four-wheelers. Some liked that ATVs “spread out” the harvest, while other said it led to more “highway hunting”. Some said traditional foods are less available (berries, fish and wild meat), and some are no longer considered safe (spring ducks and duck eggs). It was also mentioned that more non-First Nations hunters and fishers from “outside” are coming to the area.

Peoples’ movement in general was noticed to be different. People travel more by air and many more visitors are coming to the area. Local people also noted they don’t visit as much as they used to through communal activities, like sharing the hunt. A resulting loss of community and support from friends and neighbors was observed.

The mental state of people was also noted to be different by some. They said people are more “cranky”, more confused, more disappointed, and have less respect for themselves.

People also mentioned increased awareness of environmental concerns, like sunburns (UV), smoke, and pollution and toxic chemicals in the air and in food. Several mentioned that they now get rashes when they spend time outside in the sun, but didn’t when they were younger. On the other side, people said they are becoming more aware in general of healthy diet and lifestyle habits, and it is often the kids teaching their older family members.

Impacts of Change:

Fish & Wildlife

When asked, “What fish and wildlife species are likely to be sensitive to change?”, participants gave a wide range of answers. Some said all animals are equally affected, while others mentioned fish, predators (including bears, birds and furbearers), big game, and rodents specifically.

There was optimism that animals are quite adaptable and resilient. Some mentioned that northern species, animals that hibernate, and less mobile species may be more sensitive to change.

Fish were considered very sensitive to change by many. This was attributed to declining fish populations, smaller fish, poorer spawning conditions, less water, and warmer water.

Some predators were thought susceptible to changing climate. Bears were mentioned because they could injure more people through increased contact, and in relation to later hibernation. Furbearers were mentioned to be more sensitive as indicated by poorer fur quality and increasing wolf, fox and coyote populations. Other predators like hawks, eagles and lynx were concerns due to their reliance on rodents and small game.



Moose, caribou, and sheep were the big game species thought to be most impacted. Mountain goats and elk were also mentioned. Concerns included snow conditions making food and movement more difficult (snow crusts), reproductive success (weather and temperature), increased predation, and changing migration patterns.

Small mammals (rodents) were viewed by many as particularly sensitive, especially gophers (ground squirrels). Picas, groundhogs, marmots, squirrels, shrews, mice, rabbits and porcupines were also mentioned. The main reason for concern was winter melting and freezing rains killing animals in their holes or making snow conditions impassable. Increased predation and changing treeline as factors that impact rodents.

Adapting to Change:

A wide range of ways to adapt to change were expressed. Many suggested collaboration, relying on local input, and careful planning are good ways to adapt. Others thought that change is inevitable so it is better for people to “let mother nature take its course”.

Maintaining Fish and Wildlife

One way to adapt is by maintaining fish and wildlife populations. Many shared the view that in order to maintain local resources, there must be conservative and sensitive planning with heavy local involvement. Those in favor of taking action suggested limiting harvest by humans and other predators, decreasing competition between species, and protecting or improving habitat. Others suggested that animals are naturally resilient (“survival of the fittest”) and strongest without human intervention. And others said loss may be inevitable, in which case we will be managing for losses.

To maintain big game species, people suggested many alternatives to reduce harvest. They included: eating less meat, eating more locally grown produce or planting your own garden, hunting different species like sheep, cut back on all hunting in general, and opening different seasons for some species (waterfowl). Predator control was also suggested by several participants. A First Nations predator control technique was mentioned, which meant killing young animals and hibernating females in their dens.

Several ways to protect or enhance habitat were also suggested. Some said in general the air, water and environment need to be protected. More specific suggestions included improving planning and consultation for road and other construction, better dump and garbage maintenance (no burning or plastic bags), reducing dog sledding impacts on lakes, reducing water level variations at Aishihik dam, clearing trees around Aishihik Lake, and using controlled burns.

Reducing competition among species was also suggested. Some side bison need to be controlled to reduce impacts on moose, gopher, caribou and sheep. Others noted that elk may be also be “taking over” moose range.

Specific tactics to protect fish and fish habitat included: reducing or eliminating catch and release fishing, removing the weir at Dalton Post, and protecting cold water creeks for spawning (at Klukshu Creek and Dezadeash specifically).

Monitoring Change

Part of adapting to change is being aware of the changes taking place (monitoring). Many participants said the best way to monitor is by sharing information and utilizing local people to observe and record change.

Suggestions included: supplying observation journals to locals, utilizing local outfitters and other users, having a call-in number and incentives to report observations, take a voice recorder when you go out on the land, and simply paying closer attention when on the land. People also noted it is important to have a central repository for these observations. Ensuring young people are aware and involved was another priority.

In terms of research, there were a few specific directions: establish a model forest, conduct adaptive forest experiments, conduct wildlife studies to observe changes, and make more of the Arctic Institute research results available to the community.

Impacts of Change:

Fire and Traditional Uses

Traditional uses most likely to be impacted by increasing fire risk included wildlife, berry picking, traditional medicine harvesting, firewood availability, recreation and tourism, and personal loss.

Though fire can be a threat to humans and other species, many observed its importance to generate new growth.

Many potential impacts of fire were related to wildlife. Some immediate impacts mentioned are that during a fire wildlife panic and some will die. Fire was said to eliminate habitat and food sources in the short term, but create new food over the long term. Some participants mentioned that First Nations people once used fire to create habitat. Species likely to be most affected by fire were furbearers, caribou, and moose.

Other harvesting needs were also mentioned. Some said fire leads to good morel mushroom and labrador tea growth. However, medicinal plants and berries will be less available immediately following a fire. Several also mentioned firewood harvesting. If there are small fires, firewood access may be better, but in the incidence of a large fire, people will have to go farther to get firewood.

Some said fire will be beneficial in terms of creating easier access for recreation and tourism. Others pointed out that there will be impacts on individuals, including loss or damage of personal property, and feelings of emotional trauma and loss.

Some also noted that fire may compound other effects of climate change, like increased soil and water temperature, decreased permafrost coverage, and local microclimate change.

Adapting to Change:

Managing Forests and Forest Fires

A number of tools for preventing and managing forest fires were commented on by workshop participants, including education, prevention, fuel abatement, prescribed burning, and emergency preparedness. Community involvement was a critical element in all of the above.

Education and prevention were mentioned as important tools. Some said youth should learn more about fire safety and be more involved in fuel abatement and other fire control work. Other said it is important to get the message to all people to be careful with fires when camping and be aware of wind during any burning.

Several acceptable fuel abatement techniques were suggested. One participant said, “clear out timber” to reduce the spruce beetle impact. Others thought private individuals should Fire Smart their property, and buffer zones should be created around residential development. Logging was another fuel abatement tool suggested. Comments included that logging up to 75% was acceptable, timber should be used for value-added products, and selective logging should be carried out to protect private property. Encourage deciduous tree growth was another suggestion.

Prescribed burning was a new fuel abatement idea for many people. Several thought it was a good tool to prevent uncontrolled wildfire. A few said there should be no controlled burning in this area. Many had questions and thought more communication about prescribed burning was needed.

Emergency preparedness was also a priority. Some said communication at the community level was a priority. Some residents said more fire suppression resources were needed. The level of preparedness in remote areas was questioned.

Impacts of Change:

Plant and Tree Growth

Predictions of impacts on plant and tree growth included reduced growth, death of some trees, reduced reproductive success, loss of some species, and new species moving in.

Many factors were thought likely to impact growth and reproduction. A dryer climate and cooler springs were said to be likely to slow growth and result in smaller trees. Temperature and dryer conditions may also impact seed release and germination. The increasing incidence of winter pussy willows was an example. Additional stress will also make trees more susceptible to beetle and other pests. Some residents said increasing pests, storms, and dry conditions will kill some trees and may result in the temporary or permanent loss of some species.

New or “invasive”, and introduced plant and tree species were predicted. Some may move in with the changing climate, and others will come following fire. Examples of this sort of movement included purple lustrite and other new flowers and the lodgepole pine already moving this direction. It was suggested that investigating squirrel caches may hold information about future plant growth.

Adapting to Change:

Climate Change and Forest Renewal

The general theme from most local experts in managing our forests for climate change was to take a cautious approach. Discussions included replanting, introducing new species, allowing natural regeneration, and removing beetle kill. Ensuring economic benefits are an outcome was also a priority for some.

Many said the first step should be observation. “Be careful with what we have,” was repeated by several. Some said we need a better idea of temperature changes, effects of increased UV on seedlings and buds, and soil and climate condi-

tions before reforesting. They suggested using test patches and creating a model forest as options. In terms of using trees, participants cautioned that uses should be diverse in order to maintain diversity, and done carefully because we have slow growth trees.

There were many comments regarding replanting, some for, some against. Considerations were that we need to project future conditions before replanting because we don’t want to replant today with trees that won’t survive if conditions change. Participants also advised replanting with economically beneficial species. Some said don’t plant more spruce, while others suggested that medicinal trees, spruce and poplar were good choices for replanting. They also said species successfully replanted at Burwash and Marshall Creek would be good options.

When considering new species people said we must proceed very cautiously. One commented that lodge pole pine will not survive here and strongly opposed planting with new species. Others thought it was an interesting question that could be tested and monitored before going forward with full replanting. And some like the idea of replanting with bigger, more lush vegetation. Suggestions included birch, tamarack and lodgepole pine.

Some residents strongly preferred natural regeneration. They said we should allow the natural succession of the forest to continue. Another said “our white spruce forest is rare and special,” so we should not plant species not native to the region.

A final recommendation was to remove all beetle-kill. They said cut it, thin it, use it for firewood, chip it for mulch, etc .

Conference Participants:

John Adamson
 Kevin Adamson
 Virginia Allen
 Barb Allen
 James Allen
 Chris Allen
 Jamie Allen
 Azriel Allen
 Gord Allison
 Roberta Austin
 Paula Banks
 Kathy Belisle
 Al Biggs
 Valerie Binder
 Stella Boss
 Daniel Boudoin
 Louise Bouvier
 Candice Boyle
 Nigel Boyle
 Roger Brown
 Fred Brown
 Ben Campbell
 Boyd Campbell
 Tim Cant
 Ron Chambers
 Ann Chillibeck
 Marc Chouinard
 Doug Clark
 Mike Crawshe
 Danielle Daffe
 Betty Darbyshire
 Earl Darbyshire
 Mary Deguerre
 Patt Delaney
 Susan Desjardins
 Jessie Devost
 Jessie Devost
 Cindy Dickson
 Remie Dionne
 Claud Dulac
 John Fingland
 Gail Fraser
 Marion Fraser
 Loyd Freese
 Sylvia Frisch
 Ray Fuchs
 Rod Garbett
 Jim Gibson
 Peggy Godson
 Richard Godson
 Chloe Godson
 Sophie Green
 Sheila Greer

Brad Hawkes
 Bob Hayes
 David Henry
 Scott Heron
 Elizabeth Hofer
 Chuck Hume
 Barb Hume
 Susie Hume
 Jayden Hume
 John Innes
 Marge Jackson
 Jackie Jackson Jr.
 Daren Jacobs
 Martin Jahr
 Jason Jim
 Mary Jane Jim
 Paddy Jim
 Mike Jim
 Mundy Joe
 Jill Johnstone
 Ken Kane
 Marissa Kane
 Sue Kemmet
 Rose Kushniruk
 Sheila Kushniruk
 Johnny Kushniruk
 Tanya Letcher
 Val Lowen
 Ian MacDonald
 Bobby MacLeod
 Larry MacLeod
 Andrew MacLeod
 Johana Martin
 Rose Mazur
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 Craig McKinnon
 Amy McKinnon
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 Gary Miltenberger
 Rob Moore
 Kate Moylan
 Bob Nicholas
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Katherine Sandiford
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 Morey Smith
 Julie Smith
 Francine Smith
 Phyllis Smith
 Sheila Smith
 Nancy Steffan
 Diane Strand
 Bruce Sundbo
 Karen Svec
 Shawn Taylor
 Myles Thorpe
 Kathy VanBibber
 Bob VanDijken
 Rosalie Washington
 Michael Westlake
 Chris Williams
 Shan Williams
 Bronwyn Williams
 Debbie Workman
 Linaya Workman
 Sally Wright
 Chris Zdanovicz

*A small number of additional participants attended whose names were not obtained for the record.

Round Table Discussion Questions:

Observations of Change:

What changes have you noticed in our fish, wildlife, forest environment, weather, landscape, glaciers and people?

Climate Change and Fish and Wildlife-Our Food:

- In the Yukon, what fish and wildlife species are likely to be sensitive to change?
- What can we do to maintain fish and wildlife populations in our changing climate?
- How should we monitor these changes and how can local people be involved?

Climate Change and Fire:

- How would a fire affect different traditional uses of the forest?
- How should we consider changing fire tactics in how we manage forests and forest fires?

Climate Change and Forest Renewal:

- How might climate change affect the growth of plants and trees?
- How should we consider climate change in reforestation programs?