

**2007 Yukon North Slope Conference**

**Keeping Track:**

*Environmental Monitoring and  
Reporting in Wildlife Management*

**Summary Report**

**January 30 – February 1, 2007**

**Whitehorse, Yukon**

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**For additional copies, contact:**

**IFA Land Claims Analyst  
Environment Yukon  
PO Box 2703  
Whitehorse, Yukon Y1A 2C6**

**(867) 667-8553  
environmentyukon@gov.yk.ca**



### **Dedication**

These Proceedings are dedicated to the memory of Danny A. Gordon.

Danny enjoyed his life out on the land and was well known for his skills and his knowledge of the Inuvialuit traditions and culture in which he was raised.



**2007 Yukon North Slope Conference**  
**Meeting the Challenges of Environmental Monitoring  
and Reporting in Wildlife Management**

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## Foreword

In 1984, the Inuvialuit Final Agreement (IFA) was proclaimed. It provided new mechanisms for protecting the environment of the Yukon North Slope. Section 12 of the Agreement led to the creation of Ivvavik National Park and Herschel Island – Qikiqtaruk Territorial Park. It also established the Wildlife Management Advisory Council (North Slope). The entire Yukon North Slope is designated as having a special conservation regime with protection of wildlife, habitat and traditional native use considered paramount.

As an explicit part of the new management regime, section 12(57) of the IFA calls for a Yukon North Slope Conference, to promote public discussion among native organizations, government and the private sector with respect to management coordination for the North Slope.

This report summarizes the proceedings of the eighth Yukon North Slope Conference, which was held in Whitehorse, Yukon January 30 – February 1, 2007. It is not intended to serve as an official or formal record of the proceedings. This report is based on transcripts. Where necessary the material has been edited for clarification.

Appendix I is a summary of the keynote presentations. Appendix II is the conference agenda. Appendix III is a list of conference participants. Appendix IV is a copy of section 12 of the Inuvialuit Final Agreement. Appendix V is a list of acronyms. Appendix VI is a list of related websites.

As stipulated in the Inuvialuit Final Agreement, the Yukon Government hosted the Yukon North Slope Conference. A very special thanks to Mr. John Donihee, who generously agreed to chair the conference. Appreciation is also extended to the Wildlife Management Advisory Council (North Slope) and the many other people who made the conference a success.

## Day 1: Tuesday, January 30

### *Welcome and Opening*

#### ***Lindsay Staples, Chair, Wildlife Management Advisory Council (North Slope)***

I would like to welcome everybody to the eighth Yukon North Slope Conference. This conference is a unique creature, in that it's a creation of a land claim agreement. There are not many land claim agreements that provide for this type of event as a legal requirement. It is the uniqueness of the Yukon North Slope and the people who use the area that lead the negotiators of the Inuvialuit Final Agreement in 1984 to create this conference and provide funding for its implementation.

The first conference was in 1989 in Dawson City. Some of us in the room were at that conference. It was quite a special conference in that it laid out a vision of future conferences. It was at that conference that Andy Carpenter, who many people know as one of the great Inuvialuit leaders from Sachs Harbour on Banks Island, said:

"When the Inuvialuit think of the North Slope, there is one word that comes to mind- conservation. Conservation is the fundamental principle for management of all renewable resources in the Inuvialuit Settlement Region.

Conservation to us means long-term protection of our land and its resources so that we can continue to depend on them for our food and our way of life. Conservation means thinking of our children so that they can have the same option that we do for living off the land. Conservation means integration, or looking at the land as a whole, rather than as a bunch of parts, with a different management agency for each part. It means the Inuvialuit and all levels of government working together to achieve a common goal."



The purpose of the North Slope conferences is to bring people together from many walks of life, from many different backgrounds, and to, over the course of several days, share their views, share their knowledge and share their experience with respect to the larger work of conservation management. And that work, as Andy articulated, means people coming together, and finding common ground with one another to achieve common objectives. Since the first conference, we've looked at conservation planning on the Yukon North Slope and ways to achieve cooperation in an area that is jurisdictionally complex. We've also looked at the work of managing and preparing for large-scale and small-scale development, both in the region broadly speaking and in the adjacent areas off the Yukon North Slope.

We know that the North is experiencing profound changes, both on land and in our communities. This year's conference focuses on environmental monitoring and ways of seeing change. It focuses on how we look at change, how we document or record it, how we communicate it, how we understand it and how we incorporate it into our decision making. But monitoring is more than just documenting change. It is about keeping track of things and making sure that things are okay; and if they are not, pushing us to understand where actions are required.

When we look at what our achievements are, in some cases we can hold our heads high, and in other cases I think we'd suggest we've still got a lot of work to do.

I am the Chair of the Wildlife Management Advisory Council North Slope, the co-management body mandated with conservation management responsibilities on the Yukon North Slope. For over 20 years, our Council has put a great deal of time and effort into the work of monitoring. For example, our Wildlife Conservation and Management Plan for the Yukon North Slope recognizes the importance of ecosystem monitoring. It was the early work that we did on implementing that plan, along with support from government agencies, and other parties, that gave rise to the Arctic Borderlands Ecological Knowledge Co-op.

In 2000, the Council co-ordinated several workshops that brought together academics, research scientists and local people from across the north, as well as from other parts of Canada, and created a Long-term Research and Monitoring Plan for the Yukon North Slope. This plan identifies priorities for the area and encourages people to work together. We have also spent a great deal of time supporting other community-based and ecosystem monitoring initiatives in the circumpolar Arctic.

There are many people in southern Canada who are amazed at the time, effort and money we in the North put into our wildlife-related research and monitoring programs. When I meet these people I try to explain that the financial contributions and the commitments to this type of work is an indication of how important our environment and our land are to all of us who live in the North. It's a very special relationship, and if that relationship wasn't important to us, we wouldn't invest in it as we do.

This conference is not just about looking in at the Yukon North Slope; it's about looking out. It's important to look at the work from

other parts of the circumpolar world so we can learn from it, and vice-versa. When we look at the range of topics and panels that you are going to hear from over the next couple of days, we see a wonderful mix of very experienced academic and government researchers from many parts of Canada. We will also hear the very strong voice of the traditional users of the land and sea.

In developing this conference, we've tried to create an environment that's collaborative. The registration of 170 people has far exceeded the attendance at past conferences and we are delighted with the turnout. We have a lot of very talented people here who have a lifetime of tremendous work to share. Thank you all for coming.

***The Honourable Dennis Fentie,  
Premier of Yukon***

Good morning, ladies and gentlemen. Welcome to the eighth Yukon North Slope Conference. A very special greeting to all those who have travelled from afar to participate in what is a very important initiative for us in the North.



This is a gathering of some of the North's finest representatives, from governments, aboriginal organizations, communities, the scientific community, industry and youth.

These conferences are provided for in the Inuvialuit Final Agreement. This land claim agreement sets out the cooperative management regime for the Yukon North Slope and involves the Inuvialuit, Canada and the Yukon.

This year's conference theme is about meeting the challenges of environmental monitoring and reporting and wildlife management. It couldn't be timelier. Never has it been more important to monitor environmental changes and their impact on land, water, plants, animals, and of course, people. However, we must be vigilant. The Yukon North Slope Conference is a perfect opportunity to discuss ways to tackle the logistical and financial challenges that are posed by this need for vigilance. It also gives us pause to reflect on our need to work together on this highly complex issue. It is our hope that the conference will build on the collective wisdom, both traditional and scientific, by drawing on the contributions of the delegates from all walks of life. Through collaboration and cooperation, we will adapt to a greater need for monitoring and reporting on the ever-changing Yukon North Slope environment.

I want to introduce our very highly-qualified chair, Mr. John Donihee. After a career start



as a wildlife biologist in the North, Mr. Donihee worked in environmental impact assessment and land claims co-management. Mr. Donihee holds a Masters in

Environmental Studies and has taught environment and wildlife law at the University of Calgary. He now practices northern environmental, aboriginal and resource development law in his home city of Calgary. I extend to all of you good deliberations, and I hope your time spent with us at this conference will be fruitful.

### ***John Donihee, 2007 Yukon North Slope Conference Chair***

It's a great honour to have been asked to chair this conference. I have been looking forward to this for some time. I am anticipating a real learning opportunity for everyone. The list of speakers indicates that it's going to be a lively three days. There should be a tremendous exchange of information, and hopefully, we will all leave with a better understanding of our responsibilities and the things that we can do to protect this important area.

I want to open this conference by picking up on some of the things that Lindsay said and by placing a little bit more emphasis on the Inuvialuit Final Agreement, without which the conference wouldn't exist. In his opening comments, Lindsay talked about ways of seeing change. I think that's a very perceptive way to describe what monitoring is all about. We can all learn, in a technical sense, new ways to see change or ways to measure it better. But the focus of my comments suggests that who we see the changes with can really make a difference to what we actually see in the end.

It's appropriate to do some thinking – and perhaps I'll do some talking, as well – about the Inuvialuit Final Agreement. It's a co-management agreement, and it's an agreement that provides for rights for Inuvialuit people, not just to harvest, but to participate in the decision making framework that applies to the North Slope and to the Western Arctic region, as well.

That's a very important and hard-won opportunity for Inuvialuit people. It was won at the negotiating table and agreed to by Canada and the two territories in 1984 when the land claim was ratified and came into the force of law.

I am proposing to start off a conference on North Slope science and monitoring with a bit of a historical legal analysis because I think that there are some things about the legal framework that bear repeating. I do so in the hope that when you think about North Slope science and monitoring and collaborative decision making, that you understand that this system, this framework for the future of the North Slope, is a deliberate result of the Inuvialuit Final Agreement.

In preparing for my talk, I had the opportunity to read the Yukon North Slope Wildlife Conservation and Management Plan. If you haven't seen it or haven't read it, I recommend it to you. It is a thorough, far-reaching document. Goal D of the plan talks about the involvement of all user groups, and in particular, Inuvialuit, in the management of the North Slope. This is a topic I want to address today.

The successful management of wildlife populations depends on partnerships among the parties with an interest in the future of the resource. And north of 60, such partnerships must involve aboriginal rights holders, governments and others committed to the future of wildlife on our landscapes. We live in an era when threats to wildlife populations may be the result not only of natural forces, such as climate change, but of development and even over-harvesting. Rapid changes in wildlife population status can thus result from both the direct and cumulative forces of natural forces and human activities. Careful husbanding of our wildlife is clearly in the interests of northerners and all Canadians. Working together is the only way to achieve this goal. The wildlife management framework of the North Slope is based on the co-management

regime set out in the IFA, and the approaches taken to wildlife management and monitoring in this area must be inclusive.

There are more reasons than just legal ones for an inclusive and collaborative approach to this kind of monitoring. First of all, government resources are limited, and secondly, wildlife users themselves can influence the future of the resource. So, the approach to the management, to solving these problems when they arise or to preventing them through forward-looking monitoring, has to be collaborative.

It's been well over 20 years since the IFA was ratified. It's important to remember that among its central purposes, as set out in Section 1 of the Agreement, were both the involvement of Inuvialuit in the northern economy and the long-term protection of wildlife and habitat as a part of their culture and their future. The IFA was the first comprehensive claim settled north of 60. It's a modern treaty that sets up a unique relationship between governments and Inuvialuit rights holders, as well as important processes for the management of wildlife on the North Slope and in the Western Arctic region.

Those of you who are present at this conference may be used to working in a co-management context, but such collaboration was not always government's preferred approach to wildlife management. I want to step back from 1984 and talk a little bit about the two fundamentally different worldviews that existed before co-management was established through the IFA.

Before the arrival of modern government in the North and the imposition of the state's wildlife management system on them, aboriginal societies managed their own harvesting and utilization of game. Peter Usher has described the indigenous system of wildlife management as follows:

“Indigenous system rests on communal property arrangements in which the local harvesting group is responsible for management by consensus. Management and harvesting are conceptually and practically inseparable. Knowledge comes from the experience of every aspect of harvesting itself: travelling, searching, hunting, skinning, butchering, and eating. It is accumulated by every individual and shared intimately and constantly within the household, the family or whatever is the social unit of production. It is also shared and exchanged within the larger society and handed down in the form of traditional knowledge from one generation to the next.”

As part of its promotion of development and the expansion of Euro-Canadian institutions into the prairies and the North in the late nineteenth century, Canada adopted a policy of settling treaties. Although not an issue here in the Yukon or for the Inuvialuit, the experience with treaties is worth a few moments of your time. It’s clear from the record of negotiation of all 11 of the numbered treaties, that the First Nation participants present at the treaty making expressed their concerns regarding both the status of game in their territories, and their desire to ensure a continuation of their traditional lifestyles, especially with respect to wildlife harvesting. For these and other reasons, the numbered treaties all recognize and make provisions for the continuation of aboriginal harvesting rights and activities. It appears that there was little discussion of the Crown’s authority to regulate these activities at the time the treaties were negotiated. The courts, however, have subsequently interpreted the treaties to provide the authority necessary for the Crown to both regulate and limit the exercise of the harvesting rights that they recognized. Thus, the stage was set for a clash, which inevitably occurred between the indigenous system of values in wildlife harvesting and management and those of the dominant Euro-Canadian culture.

This struggle over wildlife rights continued for over a hundred years. As new provinces and territories were carved out of Canada’s northwest, they began to assert their legislative authorities with respect to game management. Through their enactments, all these governments imposed a wildlife management system that had English roots and focused on game management that favoured sportsmen’s interests. This regime was fundamentally at odds with the aboriginal wildlife management and harvesting systems.

I have some suggested criteria for distinguishing between the two systems of wildlife management. First, the state paradigm, enforced by our laws, can be characterized as follows. Controls over the regulation of the hunting of wildlife were a central part. They include things like bag limits, seasons, and restrictions on hunting gear. The state controls access to wildlife harvesting areas, through zones and wildlife management units, as well as possession of wildlife and distribution of the products of the hunt, including possession limits and controls on the sale and transportation of wildlife. All this is done through a licensing system with a reliance on a coercive sanction, essentially prosecution, enforced by wildlife officers, officials, and the courts. Management and enforcement in this system are generally done by officials from outside the community.

By contrast, the indigenous system was based on local and consensual decision making, and the harvesting group itself was responsible for managing wildlife and the community’s interests in the harvest. This system was generally limited to the community’s hunting territory, which might also represent the geographical limit for the group’s harvesting activities. It was communal in both the use of hunting territory, and also, in relation to the internal distribution and use of the products of the hunt. People shared. It was enforced on the basis of social and cultural controls, including sanctions exerted by the

community itself, and it was community-based in the sense that management, through harvesting by users and by the community itself, was the way that things were done.

Historically, what happened was that when the state moved north and, as development occurred particularly in the post-World War II era, its system was enforced at the expense of the communal or aboriginal system. As a result, there were a number of clashes in the courts and elsewhere regarding rights. This clash was resolved through the negotiation of aboriginal land claims, and/or, where there are no land claims, it was resolved – after 1982 – by the enshrinement of section 35 in the *Constitution Act*, which protects aboriginal harvesting activities. There have been many cases – not just based on land claims – but many cases from southern Canada, from areas like British Columbia, for example, which have, since 1982, stemmed or prevented the continuing erosion of aboriginal harvesting activities and rights and communal approaches to aboriginal harvesting.

I'll come back now to the Inuvialuit Final Agreement. When they got to the land claims table the Inuvialuit negotiators focused on Inuvialuit rights to wildlife and wildlife management. The agreement is almost dominated by considerations related to wildlife. Section 12 creates a special conservation regime for the Yukon North Slope, whose dominant purpose is the conservation of wildlife habitat, and traditional native use. Section 13, which deals with compensation, is wildlife-dominated, and section 14 is entirely about wildlife management and wildlife management institutions.

When you look at the historically dominant system for the management of wildlife and compare it to what's in the IFA, you'll see that Inuvialuit set about systematically solving the difficulties that the imposition of this state paradigm had created with respect to their rights. The provisions in sections 12

and 14 address Inuvialuit access to harvesting areas, they address Inuvialuit harvesting rights, providing exclusive and preferential rights, and they also address a number of the other specifics that you find in most wildlife management regimes, including allocation of wildlife harvest. They address such things as gear restrictions. Inuvialuit are allowed to harvest using any means. And they also address the state's authority to limit harvesting activities by saying that conservation is the only basis upon which those activities can be limited.

The substance of the Inuvialuit Final Agreement wildlife provisions makes perfect sense in a historical context. Inuvialuit sat down at the negotiating table and solved a lot of problems that had been imposed on them over the years by an external system. They didn't go back to an indigenous system; instead they went forward into a co-management system. The ultimate authority of the state to regulate wildlife in the best interests of all is recognized in the claim. The IFA's co-management bodies, such as the Wildlife Management Advisory Council for the NWT and North Slope make recommendations to ministers – not final decisions. These recommendations come forward from the co-management institutions that see Inuvialuit nominees and nominees from government work together, combining western science and community-based knowledge to try to make the best decisions possible.

The most interesting part about the Inuvialuit Final Agreement is the co-management system. This is the mechanism that lets the people who have always lived here share their knowledge with the people who have come here or have an interest in the North. This is a way for them to work together.

As we spend the next couple of days talking about monitoring and wildlife management in the North Slope area, give some thought to this historical evolution that led to the

system that we all take for granted, now that it has been 20 years-plus since the IFA was settled. It's a unique system. It has worked very well over the years. It provides an opportunity to capitalize on the strengths of all participants in a way that maintains Inuvialuit roles in the decision making process. That's a considerable accomplishment emerging from the Inuvialuit Final Agreement and a fine basis for planning future monitoring and scientific activities in the area.

The Inuvialuit, as users of this resource since time immemorial, negotiated a framework that would bring them into partnership with government and would guarantee them the opportunity to play a central role in the management of the North Slope and the Inuvialuit Settlement Region. Through their negotiated land claim, they overcame the restrictions imposed by the state system. They did it because access to and use of wildlife is central to their culture and to their future. Keep this short history lesson uppermost in your minds if you can over the next few days as you talk about the management of the wildlife and environment of North Slope. As you talk about monitoring and the search for solutions to environment problems, I urge you to plan those activities in the most inclusive way and to make room for Inuvialuit rights holders as central players in these efforts. I think we would all agree that only by working together can the best possible future for the resources of the North Slope be ensured.

## ***Plenary Session: Environmental Science, Monitoring & Management***

**John Donihee, 2007 Yukon North Slope Conference Chair**  
***Introduction of the Speaker***

Dr. Chris Burn holds the NSERC Northern Research Chair in Permafrost in the Yukon and Northwest Territories in the Departments of Geography and Environmental Studies at Carleton University. He has published over 75 articles relating to permafrost conditions in northwest Canada. His emphasis has been on the response of permafrost to climate change and to surface disturbances. His research program is distinctive in the extent of his collaboration with northern agencies. Through the Northern Research Chair, there are formal partnerships with the Village of Mayo and the First Nation of Na Cho Nyak Dun in central Yukon, and with Yukon and Aurora Colleges, Yukon Parks and the Water Resources Division of DIAND. He also has a joint community monitoring project with the Vuntut Gwitchin First Nation.

***Dr. Chris Burn, Carleton University***  
**Environmental Science, Monitoring and Management**

Dr. Chris Burn  
Department of Geography  
Carleton University  
1125 Colonel By Drive  
Ottawa ON, K1S 5B6  
crburn@ccs.carleton.ca

Good morning, ladies and gentlemen. I would like to thank Lindsay Staples and the organizing committee for the invitation to speak at this first plenary session. Our research on the North Slope is hosted by Herschel Island Qikiqtaruk Territorial Park. I would like to thank the Park Rangers,

especially Chief Ranger Richard Gordon, and Park Rangers Pierre Foisy and LeeJohn Meyook for their friendly welcome every time that we arrive, and for their partnership with environment monitoring at the study sites.



More recently, as a result of an invitation extended in 2003, we've begun a partnership with the Vuntut Gwitchin First Nation in the Old Crow area. So slowly, I am being introduced to more and more of the Northern Yukon. I would also like to thank the people of Old Crow for their warm welcome, especially my field companions, Robert Kaye, Erika Tisya, and Douglas Esagok, as well as Sonya Frost, who has been very helpful as a collaboration officer.

Some of you may know that we have a long-term monitoring program in the central Yukon in partnership with the Village of Mayo and the Nacho Nyak Dun First Nation. We've also collected data on permafrost in the Takhini Valley – about 50 kilometres west of here – since 1982.

We are all aware that the environment is changing and that this poses particular problems for environmental decision makers, especially when development is proposed. Data compiled from Environment Canada's regular air temperature records shows that on average, the mean annual temperature of the North Slope and Delta area have been warming at over three-quarters of a degree Celsius per decade since 1970. Since 1970, the mean annual

temperature has risen by more than two-and-a-half degrees. This is the fastest rate of warming in North America, and it is one of the reasons for the beautiful weather in Whitehorse today. But climate change creates a problem for how we describe and understand our environment, and for how we manage it.

This morning I will talk to you about the relations between environmental science and environmental monitoring. The *Concise Oxford Dictionary* defines the action of monitoring to mean: first, to maintain regular surveillance, and second, to regulate the strength of something. Right at the start then, we have echoes of the comments Lindsay Staples made earlier on today, and we notice that the meaning of this word doesn't just carry a sense of passive observation, but also, includes consequential action. That means the activity of monitoring must involve decision making and decision taking, and therefore, that monitoring is being conducted for a purpose.

The *Oxford Dictionary* also includes eight definitions for the word "monitor". I was sorry to see that none of these eight describe the big hoses and water jets used by placer miners that we also call "monitors". I was also interested to learn that there is a tropical lizard, called a monitor that can warn you when a crocodile is approaching. But the first definition of a monitor is: one who admonishes; and to admonish means: to urge, to give advice, or to warn. Notice how the definition of a monitor is again about a person involved with decision making. Like the lizard, the function of a monitor is to warn or make us aware of danger that is approaching. Many camps have a bear monitor whose job is to warn the camp about the bears or to warn the bears about the camp. But this position is very different from the view held by some people that monitoring is a passive and routine activity of little consequence. I am going to argue that monitoring is at the core at the science of the environment.

Western science seeks to understand and explain the state of the environment, and how changes to that state occur. It is an activity that is concerned with developing general statements about the way nature works. Sometimes, we call these general statements “laws”, like the law of gravity, which operates wherever we are. The forces, which are described by these laws, are of different strength or importance in different places. We call this “the configuration of an environment”. So, when the Apollo astronauts walked on the moon, they experienced only one-sixth of the gravity we feel, because the moon is smaller than the earth. The force of gravity on the moon obeys the law, but its magnitude is governed by the configuration of the system, that is, the smaller planet. The application of scientific laws depends on configuration, and configuration is the local environment. The monitoring activities that we discuss in this conference are all aimed at describing the local environment and its behaviour.

Western science is a remarkably successful activity, as events, like the journeys to the moon and safe returns to earth, even for Apollo 13, demonstrate. Its power comes from the ability to predict, and its authority – and there's a difference between power and authority – the authority comes from its replicability. It is a public or open process and any person using its methods should obtain the same result. But notice that western science only deals with explanation and prediction. It does not answer questions about the purpose of events.

I am sure you will remember that November was bitterly cold. Each day last November, I logged onto the Environment Canada website and looked at the air pressure systems and the position of the jet stream on a map of Canada. From this information, I understood how the Yukon remained really cold. But nothing on the website told me the purpose of the cold weather. It just happened, and its happening was part of the natural variation of the conditions in our environment. And when the cold weather

eased up, it just did. It wasn't because it was time for Christmas shopping, or the end of Ramadan. The warming simply occurred.

A hundred and fifty years ago, Charles Darwin introduced us to a very important idea in his Theory of Evolution. Natural variation in the species that inhabit the earth - evolution - just happens. It is not driven by an external force that science can find. It doesn't happen, according to science, for any particular purpose. It just occurs by chance. Darwin's great contribution was to show that species change over time. In showing this, he demonstrated that the world changes continually. Now, we all recognize this part of Darwin's great idea - the changes in the environment - but the purpose of this change cannot be located by science.

Science does not ask and cannot answer the question: For what purpose did human beings evolve, or for what purpose is the climate changing? Science can ask and can try to answer the question: How did human beings evolve, or what is causing the climate to change? This distinction between the two types of questions is critical when we consider the relations between environmental science and environmental management.

You may remember the uproar created by the Pope's lecture in Germany last September that annoyed so many Muslims. If you read the whole text of the Pope's lecture, you will see that the Pope was not arguing against Islam but about the common ground shared by Christians and Muslims in a particular battle. His argument was that in Western Europe, science has become an authority, which has replaced religion as the reference that people use to guide their decisions. He pointed out that all faiths deal with purpose and in adopting science as an authority, Europe has diminished its ability to understand towards what purpose its political, economic and technological development is contributing. Just because we can do something, it doesn't mean that we should. Decisions regarding purpose are

management or policy decisions. We often use science as a camouflage for management decisions, that is, for decisions which are really political decisions. I am sure that you have heard justifications for controversial resource management decisions, which state that “the decision is science based, and therefore, it must be the right decision”.

In this context, you may recognize quite a distinction between western science and traditional knowledge. I know that in some circles, it is considered inappropriate – and perhaps impossible – to fully understand traditional knowledge without adopting a First Nation’s perspective and language. And so, I speak to today with respect, and I am mindful of this concern. Recently, my colleague at Carleton, Doctor Francis Abel, has pointed out three aspects of traditional knowledge that are commonly recognized. First, it may be a distinctive, political and social perspective and set of interests, rooted in a shared history. Second, it may refer to local knowledge of a particular place. And third, it may be an understanding of how to live in the world, how best to be human and of responsibilities that we have to others and to the world. Traditional knowledge, then, as a full part of itself, has ideas about purpose and fits observations of nature into a purpose-driven framework. For me, this is the principal reason why traditional knowledge is integral to resource management in the north.

I’ve already indicated that science derives its authority from replicability - its ability to provide consistent answers to questions, no matter who is conducting the analysis or where the analysis is taking place. The authority of traditional knowledge is because it is accumulated understanding about a place, held by the people who live there. In contrast, science is not associated with a unique culture and is not able to address matters of purpose. Instead, science helps us to do best what we have already decided to do. Science allows us to make predictions, and resource management is all about decisions regarding the future. But

both science and traditional knowledge are greatly concerned with understanding the local environment.

I have never liked the term “environmental management”, because really, the environment doesn’t need managing. It got along pretty well for millions of years until humans arrived. Very recently, human activity has become the most important environmental stimulation on our planet. Our loaders and backhoes now move more soil and rock than any other geological process. We have changed the gases in the atmosphere to a state they have not been in over 20 million years. We have entered a new geological era, which some have called the “anthropocene”. It is not the environment that needs managing, but humans and the use of their environment that does.

So, environmental management is all about influencing human behaviour and management decisions must always be policy decisions or political decisions. We may receive these decisions as regulations, recommendations, guidelines or best practices. But in a democracy, these decisions only survive if we understand their purpose and the reasons on which they are based. Science is almost always part of such reasoning. The evidence that science uses to build its ideas and arguments is from observations collected over time. Both scientists and traditional knowledge holders need observations to fuel their thinking.

Because science is replicable, its methods have a well-known structure that any scientist can recognize. In environmental science, we commonly think of the environment as a system consisting of a series of stores of energy with flows in between them. A caribou is a walking tank of energy. It receives energy from the sun and from its food, while it loses energy as it moves and breathes. A caribou herd is a similar tank of energy, but the ways the herd receives and loses energy are more diverse and complicated than for an individual

animal. We also think of the systems in the environment changing as the flows of energy between their parts vary. So, as the number of hares increases, the lynx population rises.

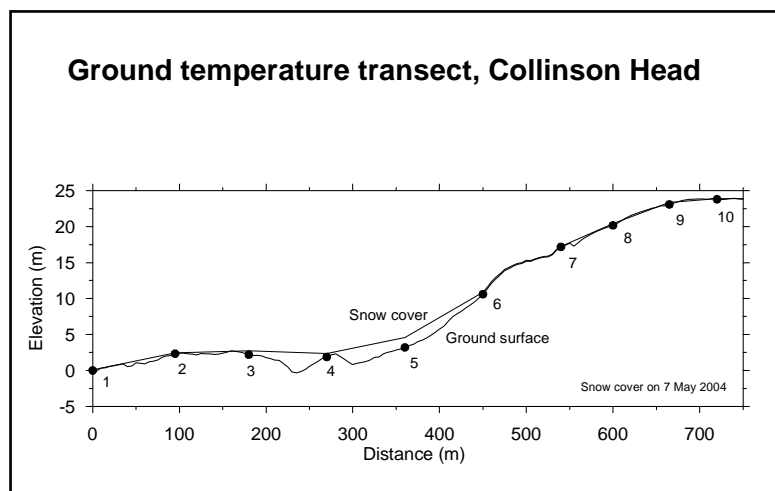
We have a strong tendency in science to see changes over time as a pattern of cause-and-effect. Sometimes this is easy to understand, such as the burst of pine seedlings that appear after a forest fire. This happens because the heat of the fire is needed to open the cones and release the seeds. But sometimes it is not so easy, as illustrated by the discussions of the numbers in the caribou herds we hear about in the news so often these days.

One of the features of the environment that we've only learned about in the last 30 years or so is that very small changes in some factors can have a very large influence on environmental behaviour. We call this "complex response" and it occurs because many parts of the environment are related to each other. So a change in one part may influence many others, each of which has its own further effects. Where the causes and effects are simple, we can see the connections, and understand the system, in what we call a "deterministic way", which is that one factor determines another. But in complex systems, we are left to try to understand the environment by observing it, describing it, and then, characterizing its behaviour, which at present we may only understand a bit.

One of the principal ways we find out about environmental behaviour is to conduct experiments. These are controlled activities designed to answer a question or test an idea that we have proposed for our understanding of the environment. Answering questions is at the root of science and has to be a clear part of any data collection program. We must know why we are making a set of observations. Normally, an experiment

considers the response of the environment to a range of values, all of which are meant to be causing the response. As such, normally, experiments are deterministic.

Experiments are difficult to conduct in the environment, because they involve control of the factors we are examining. This control can be achieved either by manipulating the environment – that is, we change it – or by carefully picking our study sites so that the environment provides us with the range of conditions that we seek. Environmental experiments almost always take a long because the two dominant cycles in the environment are over a day and over a year. Management issues are rarely associated with day-to-day changes, but rather, focus on the long term. With a long-time scale, the experiment involves monitoring of the environment.



Let me illustrate how monitoring may contribute to an experiment by returning to Herschel Island and a transect of ground temperature sites we have established about two kilometres uphill from Pauline Cove. Commonly, there is little snow on the tops of the hills at Herschel, because the storm winds blow it away. Snow accumulates in the valleys, so the island has a range of snow depths. We are interested in how the snow depth changes the ground temperature. We all know that the ground is warmer in winter beneath deep snow than it is beneath

shallow snow. But it is not quite as clear how the ground warming depends on snow depth or the snow density or the length of the snow cover. As well, while we know how snow cover affects permafrost, we don't know how snow cover affects how permafrost will respond to climate change – that is, whether the snow protects the ground from climate change, just as it protects it from the climate.

At Herschel, we have a series of data loggers that monitor ground temperature throughout the year. They're all placed at sites where the rangers can come and measure the snow depth. These sites are along the slope of a hill where there is a valley. Over the winter, snow accumulates in the valley and is blown from the hills. The soil materials are all similar along the transect of the data loggers and the vegetation is about the same height. By controlling our sites of study, our experiment is finding out how snow depth changes the ground temperature. At some sites there is a large amount of snow while at others there is much less.

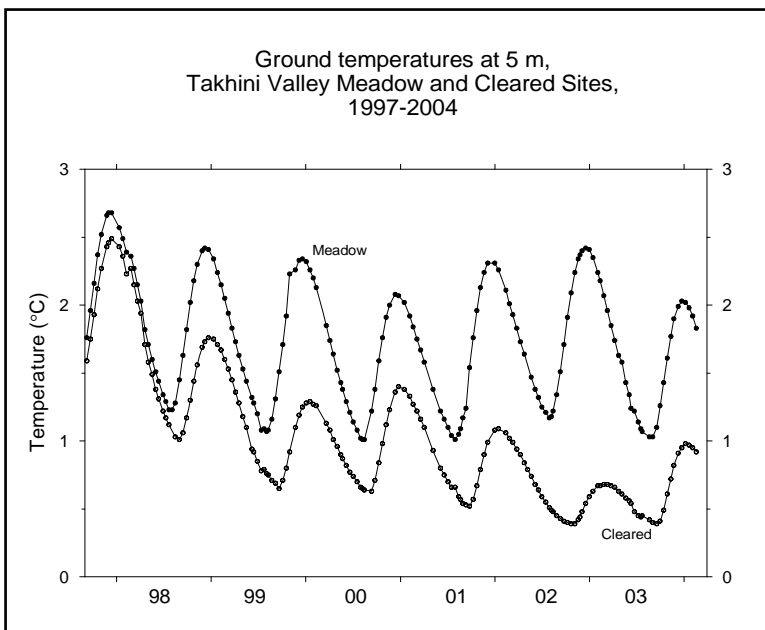
This next graph shows the ground temperatures over a year at those sites on Herschel Island. The graph shows the temperature in permafrost at one metre

depth and the measurements taken over a year. Site 1 has the lowest snow and the coolest conditions. Site 5 has the deepest snow and the highest temperature. It was interesting for me to notice that the ground at site 5 did not freeze back until well into December, even at a relatively cold place like Herschel Island. Over several years, we will find out how the ground temperatures respond to climate variability and whether the snow influences this.

This is an example of what I call a “passive experiment”, where the experiment is created by the field design and conditions, and not by our field activities.

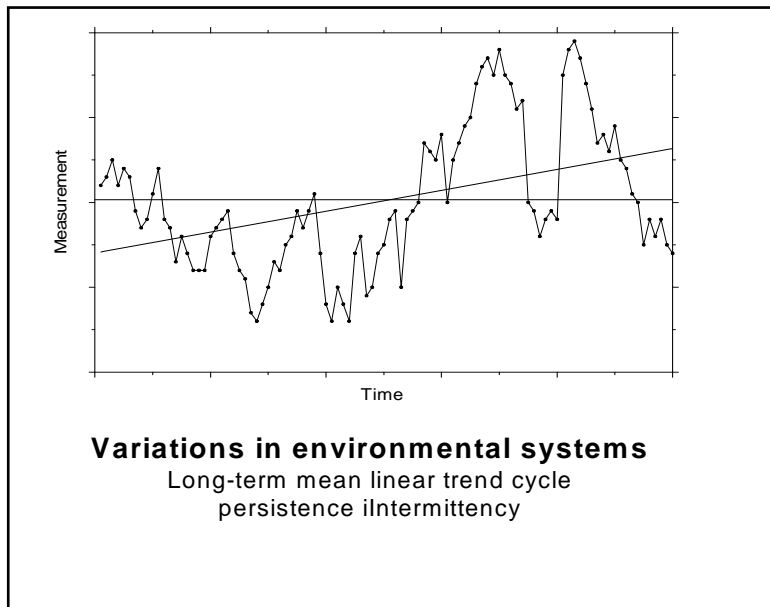
For a contrast, let us look at another long-term field experiment in the Takhini Valley. The site is about 50 kilometres west of Whitehorse towards Haines Junction. The area was burned in 1958 by the severe Takhini Valley fire, but some stands of trees escaped. About 20 percent of Takhini Valley has permafrost. There is permafrost in the forested areas but it is degrading or absent from the burned area. For several years, because I am a permafrostologist, I tried to grow permafrost by shovelling the snow from an area without permafrost every two weeks in the winter. This is an active experiment, or a manipulation. I was lucky

that during the time of the experiment, there was little disturbance to this area, and we could compare the natural conditions at the undisturbed site with conditions where we cleared the snow. This winter, the work would have been a disaster from an experimental point of view, because there is a herd of elk in the area, and they have trampled the snow and probably used our installations as scratching posts. We have also been very fortunate that over the duration of the experiment, as well as before and afterwards, we have had a series of local monitors, who have been very reliable and have collected



the data every two weeks on time, on schedule and on budget. It would not be possible to conduct field investigations of this kind without the assistance of families, such as the White's and Eamer's of Whitehorse. These monitors have kept to a regular schedule of measurements

The graph of results shows the years on the bottom and the ground temperatures at five-meter depths on the vertical axis. The even spacing of the data points shows that the data collection has covered the variation in the system. Notice also the temperatures at the undisturbed, or meadow site, remained relatively consistent from year-to-year; but at the cleared site, the temperatures have become lower over time. After six winters of clearing, the ground had cooled by one degree Celsius, and the change was levelling off.



Our data collection tells us two things. First, and unfortunately for me, there was no permafrost. This tells us that snow is not the controlling influence on permafrost in Takhini Valley. And second, that a change in ground conditions, even as abrupt as the snow shovelling, takes about six years to have full impact on the system. This “response time”, as we call it, is an important value for management purposes, because it gives an idea of the time

following a change before the full impact of the change occurs.

I have presented two examples of field experiments to illustrate three points about a good monitoring program or good environmental investigation. First, the purpose of the observations is clear. There is a question to be answered and one that likely can be answered in a few years. This is very important to keep our funding agencies on side. They need to know that we are making progress, and for them – and for us – progress is the solution of problems. Second, the measurements are made according to a formal schedule. This means that they are not just made as and when we feel like it or just because we happen to be in the vicinity. There is no doubt that it's important to double up opportunities when they arise, and I have no doubt that observations made by

chance are often very important. But if we are to understand the variation in the environment, we have to approach this systematically. And third, the measurements we make must be of the same entities and must be comparable. If we are on a caribou survey, counting rabbits just because we saw them will not help us understand the variations in the caribou herds, unless we have always counted rabbits on our caribou surveys, and we know of a link between these species.

These are lessons we can learn from experiments. However, I mentioned that many environmental systems are not easily investigated by experiment. Instead, we must build up a long-term record to characterize the behaviour of the system. This is a historical approach and slightly different from an experimental one.

Long-term monitoring is the principal field investigation that people think about when they are concerned with environmental change. The objective is to search for

patterns of variation in the environment, because these will indicate the range of conditions to be anticipated. Notice that in looking for variation, we assume the environment is not static. Indeed, our concepts of equilibrium really suggest that there is a balance in the environment, not that it doesn't change. We all recognize natural cycles, such as the annual cycle, but do not become worried if the flowers are not blooming in January. But from a management perspective, it's important to recognize when the environment is changing. This is not easy when natural cycles occur at frequencies that are beyond our memory or beyond our sensitivity. So, characterizing variation is one of the key functions when we assemble long-term data sets.

Another concerns the description and identification of unusual events. These are sometimes called "extreme events". The summer of 1998 was unusually warm in the western Arctic, perhaps the warmest for 300 years. Sometimes these extreme events are very important for the evolution of the environment, because more work is done in one of them than in many smaller events put together. Finally, we also conduct long-term monitoring to establish natural baselines against which we can chart the effects of human activity.

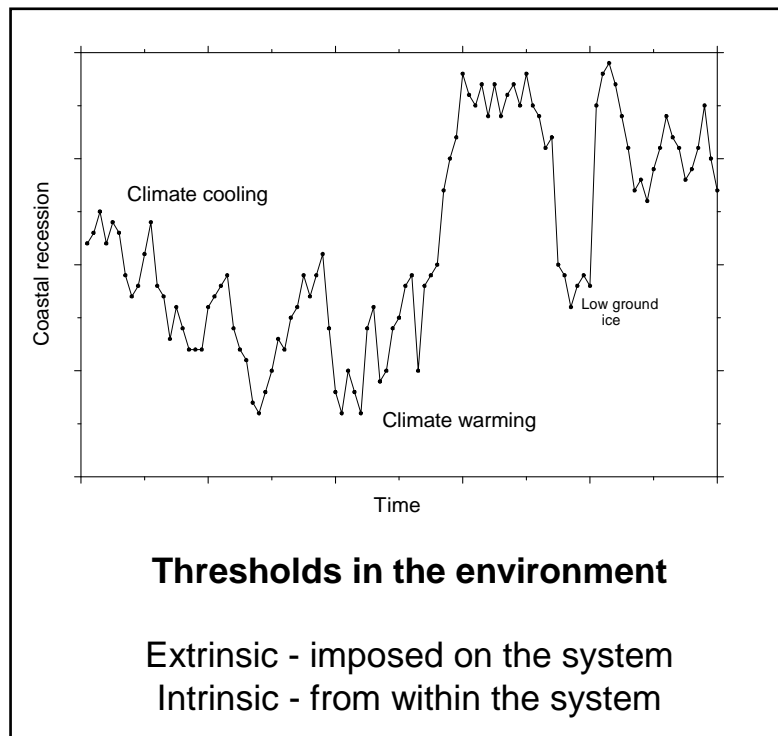
I would now like to consider the nature of natural variation. I've made up this diagram to illustrate several aspects of variation on the same slide. All of these factors are included in most time series from landscape phenomena and sometimes in biological systems.

It's a graph with time on the horizontal axis and the measurement on the vertical axis.

The points represent individual measurements, taken over many

years. There is a mean, or average, for this whole series. That's the straight line that goes straight across the graph. And there's variation about that mean. And then, there is a trend, which is the line that goes up across the graph. We're all familiar with that sort of summary.

The data have also been plotted to show a cycle in the measurement of the variable, but notice two other sorts of variation. The first is persistence or the tendency for values to remain close to each other over short times. When values at one point influence other values nearby it is sometimes called a "conservative aspect" of the environment. For example, when a herd of musk ox are small, they cannot produce many calves, and so likely, the herd will be of a similar size the next year. The second type of variation is what we call "intermittency". Intermittency is the occurrence of variations at low frequency – that is, not very often. We have intermittent behaviour in that part of the slide where you see a big change that took place once over the whole of this simulation.



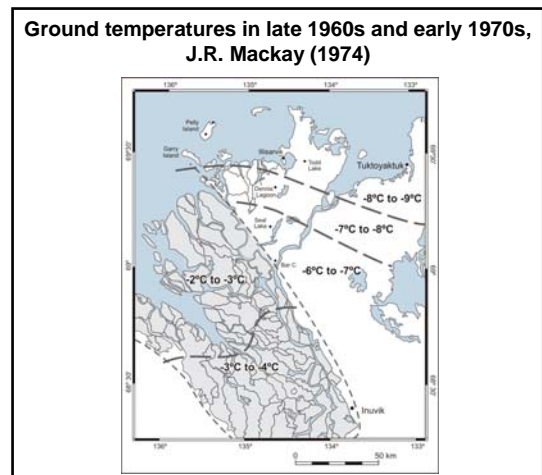
These five forms of variation are all required to summarize the behaviour of the system: the mean, the trend, the cycles, the persistence and the intermittency. You will notice that if the sampling period is too short, we may miss parts of the behaviour. If we only sampled at the beginning of this series, we would miss that big jump at the end of it. We might then think that the intermittent behaviour was the normal behaviour. So, in order to capture the operation of a system, we must collect data over the long run. If we don't, we will under sample the system and our understandings will be biased away from the true nature of variation.

Fortunately, we do have some understanding of how the coverage of variation increases with time. This understanding is due to work in the early 1950's, which showed that the scale of variation for natural time series increases with the number of observations, but more slowly over time. Where there is a great deal of persistence, the scale of variation increases with about the square root of time. For double the variation, we need four times the length of observation. This is called the Hurst phenomenon, after the engineer who discovered it. It is a very useful tool for deciding how much variation can be expected over different time scales. If we have a particular length of time that we know about and our management horizon is longer, we may be able to predict how much extra variation we should encounter. What this doesn't do, though, is tell us when significant changes are likely to occur. We refer to these changes as "thresholds". They describe sudden changes in behaviour that occur and can change the system.

Some thresholds in some of the systems are being discussed at this conference. We will be hearing about coastal erosion from Wayne Pollard and the other members of the panel on coastal processes. Coastal erosion is rapid along the Beaufort Sea, especially where the coastal bluffs have much ground ice. Coastal erosion has been going on for thousands of years. At the end of the last ice

age, the coast was much further out to sea, perhaps as far as a hundred kilometres off the Tuk Peninsula. I expect the presentation this afternoon will point out that as the open water season increases and the sea ice is further from the land, storms may cause more erosion of the coast.

I have tried to show this on this graph, with time on the horizontal axis and erosion on the vertical. With climate warming, we would expect the erosion rate to pick up and perhaps, have very rapid erosion if the storms remove all the sediment that falls down. This is what we call an "extrinsic threshold", forced by a change outside the system. Climate change is extrinsic to our system, and we all wonder if at some time, there will be a threshold, forced by climate, that drastically changes the operation of our environment. Some people have suggested that this might happen with the melting of the Greenland icecap, and subsequent alterations to the circulation of the North Atlantic.



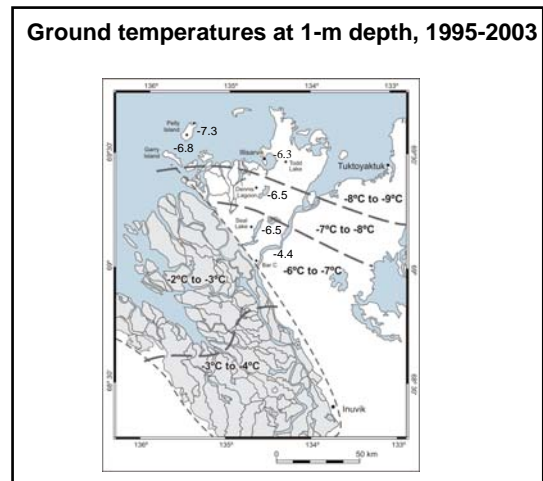
But there are other thresholds, and these may occur within the system. So in coastal erosion, the erosion may expose ground that has very little ground ice, and for a while, the rate of erosion drops. Of course, the intrinsic – or internal – thresholds may act to magnify the change, rather than reduce it, and this is the sort of behaviour I referred to earlier as "complex".

How then do we develop a monitoring program that addresses these factors and will be of best benefit to managers and decision makers? First, we need data collection at regular intervals and at a frequency that will not miss the variations we are trying to understand. Second, we need to measure factors that are helpful in describing the environment. Third, we need to look after the observations, record them carefully, keep them in order and have them available for people to inspect and use. And fourth, we must include in all our monitoring programs time for analysis of the data. There is no point in collecting information and having it sit unattended, collecting dust. Our observations must be part of an ongoing analysis, because it's the thoughtful understanding of data that is useful in management decisions, not just a deluge of numbers and facts and figures. In other words, thinking is as much a part of a monitoring program as is doing.

A monitoring program must also exhibit certain characteristics. First, the data collection must be simple. It should not need sophisticated equipment that may break down at 30 below and it does not require very detailed work where you have to take your gloves off. The reason for this is that the staff on the program may change. Some have good hands and others don't. Second, the program must keep measuring the same variables. It's no use changing the objects of our interest, because then, we, in effect, create lots of short-term observations. Third, we must measure variables in which we can notice changes and which we think are likely to respond to environmental changes. And fourth, we must be able to continue the program of measurements for a considerable time in a consistent and comparable way. So, for example, it's important to make the measurements at places we know we will be able to revisit.

Let me finish off by providing some examples from our own work, which I hope will illustrate these points. All of them are in the context I mentioned earlier, that is the

rapid warming currently occurring in the western Arctic and Yukon. Around 1970, the mean annual air temperature at Inuvik began to increase, especially the minimum temperatures. The trend has continued. This is a map compiled from several hundred measurements collected Dr. Ross Mackay from shot holes drilled by industry for seismic exploration in the 1960's and '70's. The map is of the ground temperature distribution in the Mackenzie Delta and Tuk Peninsula area. You can see the general distribution of ground temperatures and the state of permafrost at that time, the beginning of the warming period. This is our baseline data.



On the next map I have added data we have collected in the last 10 years. These are measurements that we made over several years, also to obtain the mean ground temperature. You see that at Gary Island the temperature is about one-and-a-half degrees higher than it was in 1970 and similarly, at other sites on northern Richards Island. This is the identification of a disturbance associated with climate change. It's valuable because we can go back to Dr. Mackay's baseline. However, in some cases we don't have a baseline, so we must concentrate on our monitoring program.

Next is a picture of the Ilisagvik experiment site, on Richards Island. This is a lake drained by Dr. Mackay in 1978. Every year

since 1983, we have measured the depth of the active layer on a transect across the hill behind the lake. The active layer is the ground above permafrost, which thaws in the summer. There are 12 points on the active layer profile that include sites with a range of snow depths in winter and a range of ground temperatures.



The sites on the top of the hill are cold and usually have a thin active layer. Other sites have a thick snow pack and are warmer in winter and have a deep active layer. All of the sites are on hummocks. All our measurements are taken in the middle of the hummocks. We make our measurements every August, usually around the 20th, when the active layer is fully developed.

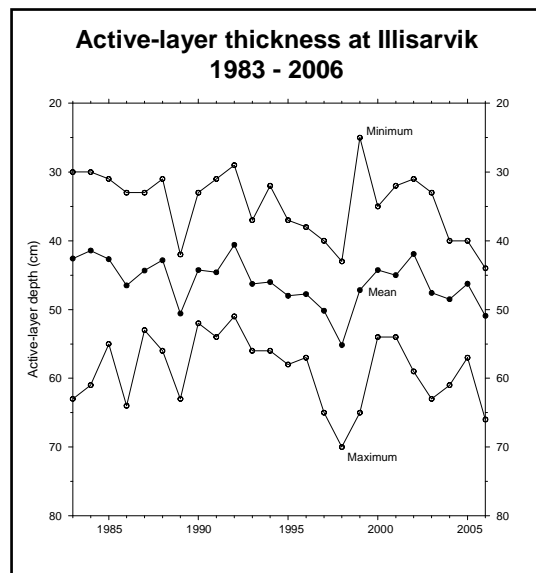
This graph shows how the active layer has become deeper over the transect since 1983. The horizontal axis shows the year, and the vertical axis shows the depth. The depth increases downwards.

The top line is the minimum depth along the transect, and the bottom line is the maximum depth. The middle line is the average at the 12 sites.

This record has been kept up steadily for 23 years. The measurements are simple – all we do is push a probe into the ground – and replicable. They are informative, because they tell us how the summer has affected the ground. Notice that these data show a trend of increasing active layer depth. They also

contain some special events, which might be considered intermittent. For example, in 1998 – the very warm year – the active layer was deeper than it has been before or since.

Another location where we have a monitoring program is in central Yukon at the Village of Mayo. In 2001, Mayo decided that it needed to prepare itself for the effects of climate change, and so, established a ground temperature monitoring program. Village councillors were becoming concerned about the impacts of thawing ground on infrastructure. We have one site in the cemetery. This is because we do expect the equipment there to be secure, and because it is a place that doesn't change very much. Our measurement of ground temperatures collected at five meters depth in the cemetery shows the temperature rises and falls each year as the summer heat goes into the ground, and then, is removed in winter. The data are collected at regular intervals, every month, and clearly give the variation in the series. We must thank the dedicated staff of the village for this, especially William Hummel. Over the last five years, the ground has warmed by about two degrees, as the climate has warmed. This has happened at this site,

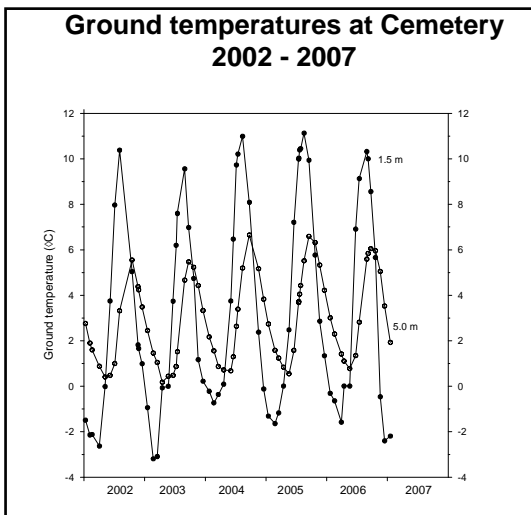


because it is dry gravel without permafrost. No ice has had to be melted.

The village monitoring program at Mayo has another site, which is near the Mayo River, near the road that goes to the sewage lagoon. I want to show you that sometimes a structured set of measurements, which are effectively analyzed, can be a resource to answer new questions, perhaps questions that were not being asked when the monitoring program was set up.

The Mayo River was dammed in 1951 for a power plant, and as a result, the flow has changed. The Mayo River Delta, near its confluence with the big Stewart River used to have many channels, but the dam has restricted the flow to just one. Three years ago, Nacho Nyak Dun First Nation proposed to excavate some of these old channels to create over-wintering habitat for salmon fingerlings during their first year before they swim off to the Pacific Ocean. But the Water Board was reluctant to issue a licence for digging near the river, because they were not sure the deepened channels would fill in with water. When we excavated the site near the lagoon road, I was surprised to find the water table two meters below the surface. In fact, at this location, there is about a meter of permafrost sitting on top of saturated gravel. We had never measured ground temperatures below the water table so we put our pipe in the ground and backfilled around the pipe into the hole. The measurements we collected are quite different from the cemetery.

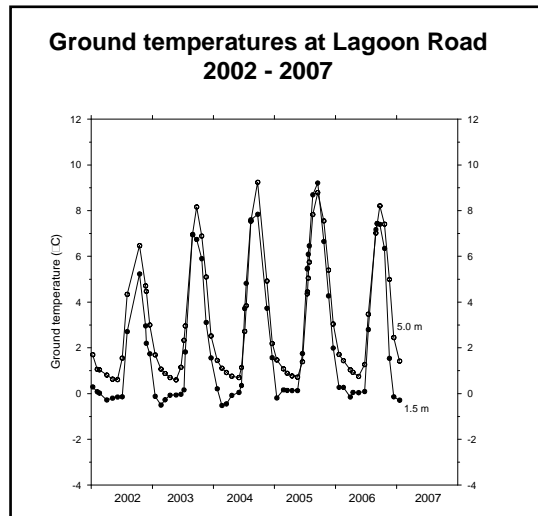
This graph shows the measurements from five meters but also measurements taken at the same time from only a meter-and-a-half below the surface. Notice how the data from



nearer the surface have much greater variation and how the peaks occur earlier than at five meters. This pattern is a well-known behaviour that we associate with conduction of heat in the ground, that is, by heat passing from one point to the next because they are touching.

The next graph shows the different pattern we measured at the lagoon road site, at one-and-a-half meters and five meters. Notice the variation at both depths is about the same, and there is no lag in the peaks between top and bottom. This pattern is associated with convection, that is, the transport of heat by water flow.

These data were used to show that there is water flow in the gravels, and that if the channels were excavated, they would fill with groundwater. As a result the Water Board gave a licence for the project. The



channels filled up and the habitat enhancement was successful. To me, this is a good example of how useful data may turn out to be and the fact that quite often, research does not contribute to the problems initially considered.

As I mentioned before, the program will only be successful in our area if it's designed carefully. The equipment needs to be robust to handle the climate and the attention of our animals. There must be a dedicated staff, people whose job it is to

conduct the data collection and who are keen to do so, even under poor weather conditions. On the North Slope, you can't always wear street shoes and expect to be comfortable. The need for repeatability means that a simple infrastructure must be developed and maintained; nothing fancy. At Gary Island, we have a cabin and a small wood stove, enough to be comfortable when the weather turns bad. But most important of all, the program must be focused on answering a series of well-defined questions.

I began this presentation by mentioning a monitoring program we have just started near Old Crow. Last summer, we installed the ground temperature cable, and since October, Robert and Sonya have been collecting data. In the long term, the purpose of the project is to measure the response of permafrost near the community to climate change. So far we've collected data to depths of nearly 17 meters. The information shows how temperature near the surface of the ground has changed over the last few months. But as we would expect there is less variation at depth. From these data, we can tell that the mean annual temperature in permafrost near Old Crow is about minus three. This is a new result, so the program has already answered one question.

I would like to conclude by reiterating several points. First, we must recognize the authority of science largely comes from its fit within a democratic society. It is an open process, which should be transparent and repeatable. Second, we notice the difference between scientific questions and the questions posed by managers. Science is needed for implementing policy but not for establishing priorities. Third, science can help us understand the behaviours of the environment and allow us to predict its response to changes. But fourth, science is limited by the knowledge it has available regarding the environment and needs reliable observations from which to recognize patterns and develop understandings about causes and effects and the behaviour of the environment.

How do we obtain reliable and useful observations? Well, I've mentioned several aspects of a successful program, but the most important is that the program should answer specific questions. We do not have the luxury of collecting data just for the sake of it. We need instead to decide in advance what the principal objectives of our program are. That is the management decision. The managers will be happy if the program provides information to address their problems. Then, you will find that to them, the value of the program will be clear, and the program will continue, as they are prepared to invest resources to achieve their goals. The most difficult, then, is to identify long-term questions to guide the overall program and short-term questions to produce results. We have to not only to collect the data, but also to analyze it so that board members can make decisions, knowing they have a sound basis for understanding the environment, or at least have some idea of the limits of our present knowledge.

### Questions, Comments & Discussion

#### **Jimmy Johnny, Mayo Renewable**

**Resource Council:** A couple a years back, before my grandmother died, she always talked to me about what we are going to see in the future, of what you're talking about, climate changes; and she mentioned to me, she said "Jimmy, as you are growing up and you are going to be out on the land all the time, you're going see these changes. You're going to see the ground melting, and you're going to see willows and lakes are drying up, and a lot of animals' food would be getting all dry." And she said, "As these things are happening and as you are growing up, your children and their children are going to see changes to where, that soon, there will be no animals left for us to hunt, fish". And she said that the last animal on this planet would be bears.



In my guiding years, I've seen a lot of changes throughout the trails as I go out by horseback. Some of our trails are melting and some of the hillsides are melting. Just last fall, I saw some changes in the white stuff the caribou eat, lichen. In some places, they're turning grey. And the willows, up at the head waters of Bonnet Plume River and on the Bonnet Plume River and Snake River, are beginning to dry up and the beavers are moving out. I don't know, the only thing that my grandma would say to me was, "You have to learn to live with it. You can't fight nature, or beat nature, just live it and take it as it comes". That's just the comment I want to make to you. So, I believe what you are saying, because I've seen it.

**Chris Burn:** There are two things I would like to say as a reflection of the comments that Jimmy has shared with us. The first is that there is sometimes a sense of helplessness about the changes in the environment that are being observed. About a year ago, I would say that many of these things were frequently discussed in conferences like this, but that was about as far as it went. But at the moment, there appears to be a national mood in Canada – and possibly even the beginning of a sense in the United States – that climate change and its effects on the environment are things that need to be considered, not as the result of some natural process, but of human activities. Our activities are contributing to those effects and they are not necessarily for the benefit of everybody involved. Just recently there seems to have been a change

in the way that our political systems are considering this topic. Today, we heard the Premier mention how much political attention this issue has received.

The second side of this is that if we are conscious that we are in what we call the "anthropocene" where people are affecting the environment, then it is possible – not necessarily easy, but possible – to try to manage that change. But that management will only happen with the participation of people who are in affected areas, and this is one of the most affected areas. You have a responsibility to the rest of us to make your stories, your views and your objectives are clear to the rest of Canada. I think that will contribute to the national discussion in a large way.

**Steve Blasko, Geological Survey of**

**Canada:** How do you personally differentiate between the changes we are seeing that are brought about by the advancement and retreat of the shoreline? In a paper several years ago, you brought our attention to the fact that the coastline used to be a hundred kilometres further out, and therefore, the climate we had in this area was subject to different conditions. Now we have the coastline at hand, and it's retreating at a pretty rapid rate. How do you differentiate between what's happening there naturally versus what we're seeing as the anthropogenic overprint? Can you differentiate?

**Chris Burn:** The important thing is to look at the summer season, rather than looking at the record of a thousand years, or 10,000 years, and to investigate, as many people in your group are doing, what is the length of the season during which there are ice-free conditions. Last night I was reading the account of Amundsen's journey through the Northwest Passage, and on the 7th of September, he was frozen in at King Point. Now, this year, you wouldn't be frozen in at King Point until sometime in October. So, the notion that the actual season of activity is changing, which is associated with a

specific change in the ice extent, and therefore, the effect of storms in the Beaufort Sea, is something recent, rather than being something associated with a long-term sea level rise and erosion of the coast from that effect.

**Lindsay Staples, Wildlife Management Advisory Council (North Slope):** I am interested in your comments with respect to the lag time in the effects from a surface disturbance. How does one determine the length of time for an appropriate follow-up program to monitor a project effect, given that one may not have a great deal of information to work from in many parts of the north? If it's a follow-up program that extends beyond the duration of the project itself, in part because an effect from that project will not be detectable beyond the life of the project, what guidance would you offer up to those who are trying to wrestle with the decision of how long a follow-up program should reasonably be extended for when one is working with all of those unknowns?

**Chris Burn:** This is a very important question, not just because of the particular issue that Lindsay has raised, but it's also a question which addresses the use of scientific knowledge and the use of scientists in decision making. The sort of question that you have raised, where we don't have a specific earlier example that we can refer to, involves asking people to use what we call their "judgment". Judgment is something which we commonly ask our elders to provide for us. We ask people who are familiar with particular types of problems to give us a sense of what the answer is to a question such as the one you've posed.

In this case, if you asked a scientist that question, a scientist would be able to produce some kind of response that had a time dimension in it, because the previous understanding that science has developed – the laws that I referred to before – the laws could be used in an understanding of the

configuration of the environment to produce a prediction of what may happen in the future. What you need to have – the science of that is the laws; the art of that is determining the configuration. Exactly what are the important variables that need to be identified and probably need to be measured at that site before the project or the disturbance takes place?

I would also say that it is relatively easy to do that in the natural environment. It is incredibly difficult to do that in the human environment. I profess absolutely no experience in dealing with that in terms of changes in society in socioeconomic systems. But in natural systems, if you can present the question in a clear fashion, if you can present what are the effects that a management committee is concerned about, you will be able to obtain a projection, giving you the answer to the question that you have, which is what is the time required. The answer for the time required will be given, not in terms of one year and three months; but rather, a range of years. Is it three years, is it 10 years, is it 30 years, or a hundred years? Many experienced scientists will be able to give you a reliable projection in what we call "order of magnitude" terms. We won't be able to give you a precise answer such as a project needs to be funded for 40 years, or 42 years, but we will be able to tell you, "It will take you a hundred years to find out," or "It will take you 30 years to find out." So somebody who is experienced, who knows the laws that apply in a particular context, and has some indication of the configuration, will be able to give you that sort of advice.

**Lindsay Staples, Wildlife Management Advisory Council (North Slope):** My second question is with respect to the variables that you would consider in making a management decision when you do have a detectable effect. When you detect an effect, at what point can you take comfort that a management action is justified, even though some people are saying that it's only modest

perturbation or disturbance in the system, and the system will self correct?

**Chris Burn:** Earlier in the presentation, I referred to what's called the Hurst phenomenon. The Hurst phenomenon is a way of describing the scales of variation that are observed in an environmental system as the length of time of the environmental system increases. As we observe more, we see more variation. The Hurst phenomenon quantifies how rapidly the increase in natural variation should take place. For example, if we have observations for 30 years, and we have a characterization of the amount of variation that takes place in those 30 years, we should expect that the scales of variation would double if the period of observation goes up to a 120 years. The length of time goes up four times; the scale of variation doubles. If we want to know if it's triple, then the scale of variation needs to be nine times, or 270 years.

The key issue in management is what is a natural effect and what is a created effect? If we have a million years, we can have every created effect equated to a natural effect. A scientist will not tell you: "After 300 years, this effect becomes created; it's no longer natural." The management board must decide what sort of impact can be tolerated. The management board may say: "We will tolerate a one in 1,000-year impact." You know, when you build dams at mine sites, the dams are meant to withstand the one in 1,000-year flood, or the one in 10,000, or the one in 100-year, depending on the rule that is set by the regulatory body. So, the management body has to decide the time scale over which it is interested.

One of the ways that this has come into effect quite recently, is in the construction of the retaining dams at the Colomac abandoned mine site, in the NWT. This is one of the first times in northern Canada where climate change has been factored into in the design of the mine site. The engineers decided that we must accommodate climate

change within the design of this structure. As a result, the retaining dam is designed to accommodate events which are much greater than the natural one in 100-year, because we expect that environment to change. But it's the manager who decides the length of time that the management is valid for.

You remember, a few years ago, Toronto was going to ship all its garbage to northern Ontario and dump it in a pit. I asked a friend in Whitehorse, whose parents live in the community where all this garbage was going to go, "What do your parents think about this terrible thing?" The response was that the parents thought it was just fine. They said there's going to be lots of economic activity, and by the time the environmental effects occur, they're going to be dead. So on their horizon, the management was really 15 years. That's their management framework. A management board has to decide what is the horizon over which we are managing. Are we managing for a hundred years, or are we managing for a thousand; or are we really only managing for 10? That's a management - not a science - decision.

**Sunny Blake, Tsiigehtchic:** Are any studies being done on erosion? We are seeing a lot of erosion in different parts of our area. I was also wondering if there are any studies to see what kind of vegetation is growing in the areas where soil is eroding away.

**Chris Burn:** About four years ago, there was some work done related to the ferry crossings at Tsiigehtchic and at the Peel River that included a fair amount of work that was done on riverbank erosion. It was done in the context of the renewal of the water licence and the research took place over a short time only. It's baseline data. There's no long-term monitoring that I'm aware of. There were people studying the amount of sediment that was coming down the Mackenzie and how much was entering the delta, but activities related to the

surveying of sediment has been reduced quite substantially.

You probably are aware of the Gwich'in ethnobotany study that was being conducted out of the Aurora Research Institute in the last few years. These are studies on vegetation. But I'm not aware of specific studies looking at erosion of the banks of the Mackenzie particularly, in your area, near Tsiigehtchic. I know there was fisheries work done on the Arctic Red River that looked at how vegetation may be used either to stop the erosion, or when the erosion begins, how it changes the vegetation. I think the best people to ask would be the people on the ethnobotany study, because they were doing wide-ranging surveys of plants.

**Don Reid, Wildlife Conservation Society:**

Many of us have some specialty and may be able to come up with sort of key questions within our individual disciplines. I think of the tundra ecosystem as a complex one, as you've also characterized it, and many complex systems, some people believe, might have central organizing processes. Fire in the boreal forest is put forward as one of those. Would you hazard any thoughts on central organizing processes or variables that we should necessarily be including in a monitoring protocol or regime for the entire North Slope ecosystem? Is there anything within your realm of expertise that you see as so pervasive through the entire ecosystem that it really is a necessary component? Some people have identified fire in the boreal as so important, but I am not sure where it lies in the tundra.

**Chris Burn:** I don't think fire is as important on the North Slope as it is, for example, in the northern Yukon and the area near Old Crow or even in the central Yukon. As I mentioned, if you had to design a monitoring program, you have to pose questions. Those questions have to be about the links in the environmental system, about causes and effects or about flows of energy within the environmental system. You need to have a model. You've got to have an idea,

a framework within which you identify relations between parts of the system, and it's those relations that really are the targets of monitoring.

What are the fundamental portions of the system? I'm very hesitant to answer that but I will give you my opinion. I am very, very hesitant to offer this as anything other than as an individual suggestion. The people who live in the area are really the ones who should be participating in that discussion, because what is important in the environmental system is actually important because a person recognized it as being important. But because I study permafrost, I will begin by saying that permafrost is one of the key variables in the ecological system, particularly the ground ice content of the permafrost. So that's one portion. The second element, which is absolutely key at the moment, is the energy that comes from the atmosphere and is used by the surface of the earth, either to grow plants or to warm the ground or to nurture animals. The climatic component is critical. Obviously, the vegetation on the surface is critical, because different vegetation influences the species that live there. Some people will attach more weight to certain animals than they will to other animals. For example, people are very interested in where moose are and not so interested in where the ground squirrels are. Moose are obviously very important for diet but ground squirrels, characteristically, are not. So, within the biological area, there are what might be described as "indicator species".

If you can somehow look at the changing ground conditions – in this case I have represented it as permafrost, but there would be other elements –changing vegetation and changing climate, then you are in a position to suggest how the living creatures may respond. Any model or framework has to have a climatic component, a vegetation component and a ground component. On top of that, there would be the animals, and then somewhere people. However, as I said, I

think people who live there are the ones who should really be defining what it is.

**Don Reid, Wildlife Conservation Society:**

There are models of tundra systems, especially those developed during the international biological program of the '70's. It would probably be a good idea to go back to those summary reports and see what those folks came up with. They paid no attention to local knowledge back then, but it would be nice to calibrate the thinking from back then with present-day thinking.

**Chris Burn:** I think that's a very important observation. Just as, in many ways, traditional knowledge builds on people's experience and stories that are handed down, in the same way, science builds on previous ideas and previous frameworks that have been developed. The reason that I didn't raise that in this discussion is that characteristically, the language that the science is presented in and the level of detail is sometimes daunting. There's a need to interpret those sorts of reports that you are referring to for the people who want to use them.



**Panel: Wildlife Population Monitoring, Reporting and Management Implications**

**Panel Facilitator:** Cameron Eckert, Government of Yukon

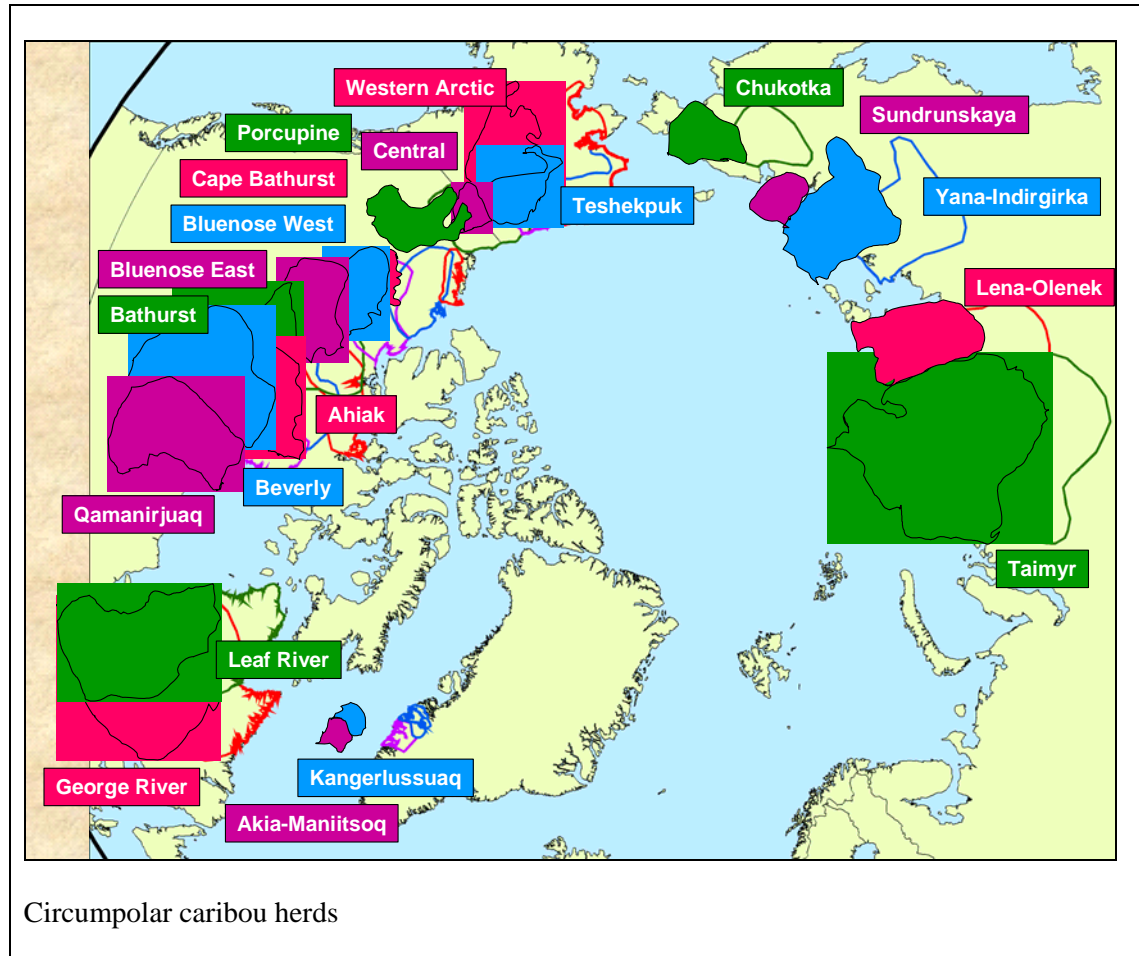
**The CircumArctic Rangifer Monitoring and Assessment Network (CARMA) - Don Russell, Canadian Wildlife Service**

Don Russell  
Canadian Wildlife Service  
P.O. Box 10038, Whitehorse YT, Y1A 7A1  
don.russell@ec.gc.ca

CARMA was formed in 2004 as a collaboration among communities, scientists, and governments to exchange information on the environment, and on the status and use of wild caribou populations across the Circumpolar North. CARMA's mission reads: Through cooperation, both geographically and across disciplines, monitor and assess the impacts of global change on human-caribou systems across the circumarctic.

The network was formed as a means to get people together to share information about the changes we're starting to see in circumpolar caribou herds and to start monitoring the herds in a coordinated manner. It is important that the herds are monitored in the same way so we can do the cross-herd comparisons. The International Polar Year has provided an opportunity for CARMA to apply for funding to develop the needed monitoring protocols and assist the managers of various herds in starting their monitoring programs. We've called the project: "Starting the Clock on the CARMA Network".

CARMA's approach to this project is to use variability across the North to see if caribou respond to habitat changes as a species, or if



response is unique to specific herds. We have selected a number of reference herds for intensive monitoring and a number of indicators to be collected on most herds. These indicators include: population census, birth rate, spring composition, calf mortality, adult mortality, harvest, community monitoring, fat assessment, morphology, disease, parasite, contaminants, genetics, hunter assessment, distribution, and NDVI monitoring (Normalized Difference Vegetation Index).

We intend to implement two years of fairly intensive coordinated, standardized monitoring of these herds and provide standardized, timely habitat monitoring (weather, snow accumulation and melt, biomass). Not every herd will be monitored for all of these indicators. The project also includes a retrospective analysis to establish

what's been done in the past, what have we learned, and what are some of the trends that exist out there.

Following the monitoring we will synthesize the information to identify the resilience of caribou as a species as well as the unique vulnerabilities of individual herds. We also want to spend a significant amount of time and effort to develop and communicate decision-support tools and encourage interchange of ideas. We are working with co-management groups across the Circumpolar North to implement this project.

The study area includes herds across the North. We have chosen to focus primarily on one ecotype of caribou - the tundra summering/taiga wintering ecotype. There are some exceptions, such as Greenland and

some of the smaller herds in Alaska that stay in the tundra year-round.

There is going to be intensive effort in the next couple of years to start learning a lot more about the Teshekpuk herd given the pressures of potential oil development on its range and the state of knowledge of that herd. The idea is to work with the agencies that are working on that herd to ensure that they are collecting data and have it analyzed in a manner consistent with what we want.

There is not a lot known about the largest caribou herd in the world- the Taimyr herd in central Siberia, which has approximately 1.1 million animals. There is some debate over that number as there are no radio collars on this herd and the biologists have a tough time keeping track of movements and distribution. We are trying to get some coordination going with the Russian scientists who are doing research on these herds.

Last week at the caribou summit in Inuvik, representatives of the co-management groups, government and a lot of delegates from most of the communities, were saying, "What we do now that all our herds are declining?" I think it's always useful to step back and say, "Well, yes, you can see that they are declining here, but they are not declining everywhere in the world." That's why there is a value in being able to see what's going on in some of these other herds. The largest herd, the Taimyr herd, is increasing. In eastern Siberian, the Chukotka herd almost emerged out of the collapse of the Soviet Union. We suspect there was a small interacting wild reindeer herd that got augmented by a huge number of domestic animals that were no longer profitable to ranch.

The largest herds in North America are over in the Ungava. There are over a million animals in the George and Leaf River herds. These herds tend to be somewhat stable, but there seems to be a shift in numbers between George and Leaf. The decline we're seeing

in the Central Barrens is not necessarily a circumpolar phenomenon. The Porcupine caribou herd was the first of all of these herds to start to decline. During the increase phase the Porcupine herd had the lowest growth rate, and when things started to change, they were the first herd to start to decline. We'd like to know if that happens on an ongoing basis.

The first thing we want to do once we have all the data collected to identify herd-specific vulnerabilities. If you look at how herds could be vulnerable to change, summer range quality is a very important factor. There are a number of indicators that would tell us something about herd-specific summer range quality. There are habitat-related indicators and there are integrators such as fall calf size. We've assembled virtually all the body condition data across North America and we are now starting to do that with Russia. There is quite a bit of variability across the North. The Porcupine herd has the largest fall calf weights, which says something about the quality of that summer range. It also has the lowest productivity of all the herds. So the fact that they have great summer range doesn't necessarily translate into being the most productive herd.

In term of winter range quality, there are certain habitat characteristics that we can very easily monitor across the Circumpolar North in a very coherent fashion. We can then look at herd specific indicators, such as fall back fat in preparation for winter. The theory is that herds won't put on a ton of back fat if they don't need to. We've found there is quite a bit of variability of fall back fat as you go across the North.

Porcupine caribou throw the biggest calves but they put on the least amount of back fat. Those two factors are probably related. In the long term, they can survive without putting a lot of back fat on. Contrast this to the caribou on Coates Island. They essentially live off their back fat reserves through the winter and can't be producing

huge calves as a consequence. We also see that contrary to back fat, which declines through the winter, femur marrow fat is essentially held and sometimes even increases over winter. It's all lost during that spring period. They hold those reserves in case they've had traumatic bad spring conditions. Some herds are losing a lot more marrow fat than others.

The degree of local control can also affect vulnerability. The hypothesis is that systems managed with strong links between the various levels of decision-making are less vulnerable. Development is the other area of vulnerability - how much development is on the range and how much could potentially occur on the range.

Porcupine herd is not a very productive herd. That's where they're vulnerable. Anything that increases mortality, be it harvest, predators, problems with pregnancy rates, problems with calf survival or the potential of 10-02 development is a potential threat. We've seen that summer range is really good, making the herd a little less vulnerable in terms of fall calf size. You can look at a number of herds to determine where some of the vulnerabilities might lie. This is a very simplistic idea of the ways to use a lot of the monitoring information to determine where these herds are vulnerable. By extension, we can also determine how to prepare for managing these herds.

The next steps for CARMA depend on the International Polar Year funding. So for now, we just have to wait and see what will happen.

### **Questions, Comments & Discussion**

**Wendy Nixon, Canadian Wildlife Service:** CARMA talks about local knowledge and how to incorporate that into the monitoring. Can you comment on doing that in Russia versus North America?

**Don Russell:** Russia is a special case. The Taimyr herd is vulnerable because it is

totally centralized and there are no environmental assessments or regulations that can readily be imposed. All decisions are made virtually without consultation. If, for example, you want to tackle a specific problem such as harvest levels you have to have buy-in from the spread out native groups that are mainly hunting this herd. There's a huge harvest, probably close to 40 or 50,000 animals harvested each year. But there's no organization. The centralized decision making is just not going to be transferred in practice to these groups because they have no buy-in. There are tremendous problems with poaching. In North America, probably 80 to 90 percent of the harvest is subsistence; in Russia, 80 to 90 percent of wild reindeer harvest is commercial. Some is some eaten, but most of it is sold. In a country that needs money, it's a bit of a problem.

### ***The Puzzle of the Porcupine Caribou Herd: Do We Have All the Pieces? - Tara Wertz, Arctic National Wildlife Service***

Tara Wertz  
Arctic National Wildlife Refuge  
U.S. Fish and Wildlife Service  
101 12th Avenue, Room 236  
Fairbanks AK, 99701 USA  
Tara\_werts@fws.gov

The Porcupine caribou have been studied fairly intensively since the early '80's, primarily due to the controversy surrounding the oil reserves located within the Arctic National Wildlife Refuge. Our monitoring protocols include many different surveys throughout the year. Many people are interested in our photo census and the location of the calving grounds each year. We have good data to indicate that the Porcupine herd went through a period of increase up until about 1988, and then, started to decline. This kind of information only provides some of the pieces of a much larger puzzle of herd characteristics. They

don't give us a complete understanding of the herd.

Studies of the Porcupine caribou, along with other barren ground herds in Alaska, show that the Porcupine have the lowest maximum rate of increase. It is only about half of what it is for the Alaskan herds. This is fairly important when you look at it in context of some of the conclusions drawn by past work done with some population modelling efforts.

There have been three population models developed for the Porcupine herd. All three concluded that even very small changes in the adult cow survival could have significant impacts on herd growth.

As a result, the Porcupine Technical Committee designed a monitoring study to look at survival rates for the past three years. The objectives of our study were to determine the seasonal mortality distribution. We also wanted to estimate annual adult female survival and we compare those estimates to past work conducted between

1982 and 1991. Our project lasted from 2003 to 2005. We haven't been able to do a photo census during that time.

The methods we used were similar to those used to obtain the earlier information. We maintained approximately a hundred radio collars per year on the adult caribou, including 12 to 15 satellite collars. Enough caribou were already collared as a part of other studies so we didn't have to collar any more. We tried to fly telemetry at least once a month throughout the year, except in July, August, December and January. We flew our telemetry flights, especially in the winter, using a 30-kilometre grid transect across the range. We calculated our survival

using the Kaplan-Meier staggered entry design and compared our survival estimates to those published by Walsh in 1995.

We tried to find each animal at least once during the four seasons of the year. We defined our season by looking at how the caribou use their range throughout the year. The summer season begins in early June and includes the calving and the post-calving periods. It is a very short season - about six weeks. Most of the caribou are on the coastal plain of Alaska and Canada. The ones in Canada at this time are usually cows that are not going to have calves or have lost their calves this year.



The fall season, which includes the rut, starts around late July and goes through to early October. There are very wide ranging movements at this time as the herd moved to the wintering grounds. You can usually find the caribou either on the south side of the Brooks Range or on the north end of the Richardson Mountains. How they get there varies.

Winter lasted from October through mid-April. Very little movement was detected during this period. It is the longest period of the year - 28 weeks. We documented two general wintering patterns for the herd. Two of the three years of our study, the herd split

almost fifty-fifty, with about half the animals wintering in the Arctic Village area on the south side of the Brooks, and other half wintering in the Upper Ogilvie River Basin and Ogilvie Mountain Ranges. In the second year of our study, as well as this winter, almost the entire herd wintered in the Upper Porcupine River Basin and around Eagle Plains.

The year ended with the spring migration, which generally started around mid-April, lasting through May. This season covers the pre-calving period. Very long movements are generally observed in short periods of time. It's very interesting to watch their movement patterns, as they approach the calving grounds. It's a very directed movement that happens over a fairly short period of time. Some of these animals are moving over 400 kilometres in that six weeks time.

We monitored 116 adult female caribou over the three years of our study. Thirty-nine animals died during that time. The mortalities were fairly evenly distributed throughout summer, fall and winter. We also had 32 males collared. Seventeen of those animals died, including 10 in the rut. This is very normal for big game herds.

The distribution of our mortalities across each of the four seasons was significantly different than what we expected to find. The summer period had more animals dying than we expected and winter had significantly less. If we look at this in term of survival rate, we see that summer has the lowest daily survival rate than any of the other three seasons. The data we obtained showed a three-year average annual survival of 0.825.

The original data set showed that average annual survival was 0.871 for the years 1982 through 1988, which was the end of the population increase phase. The 1989 through 1991 data showed the survival at 0.83. There was a pretty big drop from the increase to the decrease phase. Our average was 0.825. When we averaged those six years of data

from the decrease phase, we get an annual survival of 0.828.

These averages aren't statistically significantly different but those of us who worked on this study agree that this could be biologically significant. From a statistically significant perspective we would have to almost double our sample size – that's 200 collars - to even detect a change of 10 percent in the population to be. However, the population models that have been used in the past say that if survival changes by even six percent, that the population would still decline at a 10 percent rate. A lot of people want to know if the herd is still declining. We haven't had a census since 2001. Hopefully we will be able to do one this summer.

We are planning to extend our monitoring effort so that we can keep getting information regarding the annual survival rate. We may be able to use that information to determine if the population is increasing or continuing to decrease during those years that we can't do a photo census. This information will give us one more piece of the puzzle.

## Questions, Comments & Discussion

### Max Kotokak, Fisheries Joint

**Management Committee:** You say that the population is declining by about 5000 caribou a year. Do you ever see the dead animals? Do you take samples?

**Don Russell:** We see a lot of signs of predation. But the big issue isn't animals dying. It's the loss of productivity which is not something you would likely see. Last year was the lowest pregnancy rate and the lowest birth rate that we've ever seen. It was 60-something percent. The long term average is about 88 percent. As Tara indicated, summer seems to be the problem. At the end of the summer, if animals are not in perfect shape they extend their lactation so that they produce milk through the winter and won't be able to get pregnant.

Dorothy Cooley has been monitoring the body condition of the animals. She collects samples for contaminants work. There has also been some work looking at disease and parasites. These are all things we want to see done on a more consistent basis across the North.

**Jimmy Johnny, Mayo Renewable**

**Resource Council:** What is the cause of death of the dead caribou that you found? Do you do an autopsy when you encounter a dead animal?

**Tara Wertz:** We monitor the survival of each collared caribou using a fixed-wing airplane. We fly too high to actually see the carcass. The only animals that we can confirm the cause of death on are the ones that are turned in by hunters. The caribou are scattered throughout an almost 300,000 square-mile range. It's very hard logistically and would cost far too much to get that information.

***Harvest Data Collection and its Importance in Managing the Porcupine Caribou Herd - Joe Tetlich, Chair, Porcupine Caribou Management Board***

Joe Tetlich  
Chair  
Porcupine Caribou Management Board  
P.O. Box 31723  
Whitehorse YT, Y1A 6L3  
pcmb@taiga.net

The talks given by Chris and John earlier this morning really gave me an insight as to what monitoring means. One of the things that really stuck out is monitoring really means urging and warning, like in the example that was given of a bear monitor warning and urging people to take steps in safety. They also talked about horizons and looking to the future. That's what we're trying to do with the Porcupine Caribou Management Board.

I will give you a little history of what I know about caribou. My Dad came from Old Crow. In the '60's, he moved to Fort McPherson. He got married there and even though he was a guest to Fort McPherson, they gave him the task of being Chief. So he was Chief there for 10 years and I grew up in a sort of political environment. There were really no co-management boards at that time. Everybody was subsistence harvesting and just using their natural traditional knowledge to manage the caribou.

In the early '70's, I had the privilege of taking two years out of my schooling to go out and just be a part of living out on the land with subsistence hunters and trappers. And at that time, they were just moving with the caribou. There were no skidoos at that time and everybody was travelling with dog teams. It was really interesting to see how they managed themselves- sort of like a co-management board. There were leaders in place. There were also people behind them. And I guess this goes for all native communities where they had their own co-management boards. When people went out, they scouted for caribou. When it was hard times, they didn't see caribou. When somebody came back with the news of caribou, he would go and tell the lead person in the meat camp. Then he would yell out from his tent. All the men from the other tents would come together and discuss where the caribou were located and what they would do the next day.

Between 1970 and 1976, we started a transition between wage economy and traditional lifestyles. The fur industry was going belly-up, so more people had to go into the wage industry, working for oil companies and seismic exploration. I saw a big change from 1972 to 1976, when we started phasing out the dog team and going into skidoos. People were a lot happier going a long ways with a dog team. They enjoyed it because they went out as a group, they ate together, they laughed together,

they travelled together, and it was just one big happy family.

When people started working in the wage economy, they started getting faster skidoos. When the Dempster Highway came through in 1979 gave people easy access, without any consultation with the First Nations. From then until today, we've had problems on the Dempster.

The Porcupine caribou are harvested by about 14 user communities on the Canadian and Alaskan side. They have to go through an international boundary, a couple of special management zones, two parks, one major highway – the Dempster Highway – and numerous rivers and other obstacles on their way.

It's really important for the Porcupine Caribou Management Board to develop certain policies to sustain the herd. The Porcupine Caribou Management Agreement and the Porcupine Caribou Management Board were struck under the Inuvialuit Final Agreement. When the Porcupine Caribou Management Board was established in 1985, people realized that if it was going to be effective, then we had to have an international board. The international board was established two years after the Canadian board.

Our prime mandate is to make sure that the caribou will always be there. We really take issues of harvesting and harvesting rights seriously. We try to get the harvest data from the communities. Sometimes that's a difficult task because of how harvest numbers have been used against us in the past. We all agree that sustainability is important and that we want that caribou there for future generations. But we also all have to agree that it's our individual responsibility to make that happen. I like the phrase of "walking together". We have to walk together in order to achieve what we are going to get out of it. We need to think about the results we are actually looking for.

We just finished a summit meeting in Inuvik. It was clear that we need to keep the herd sustainable. We also need to educate people, and look at harvesting methods and priorities. The continuance of the herd is really important to us as a board because we want that caribou there for future generations. When we hear about caribou declining in the NWT and other places in North America we get really concerned. PCMB members represent users groups or communities - the Inuvialuit Game Council, the Gwich'in Tribal Council, as well as the Nacho Nyak Dun, the Tr'ondëk Hwëch'in and the Vuntut Gwitchin First Nations. The Government of the Northwest Territories and the Yukon is represented, too, as well as the federal government. Everyone has a say in decisions that we have to make. We have a really difficult task, but exciting task too, because we are part of a system that we want to sustain. All signatories of the land claims agreements have harvesting rights, so we don't have to worry about that. But we have to think about how, as individuals, we are going to educate other people. It's really important that all of us as managers and as individuals keep our individual responsibility in mind.

If we're going to do a harvest data collection, we have to get the participation of the Alaskans. In my experience as Chair of the PCMB for the past 11 years, I've found it hard to get the Gwich'in on the Alaskan side to participate in a collection of harvest data, because this kind of information has been used against them in the past. A long-time advocate for the Porcupine caribou, Jonathon Solomon, passed away this past summer. He didn't want to give information to anybody. And this is a person that meant well and wanted the caribou there for future generations. He knew how important it was to have the harvest data but he still didn't want to give that information. But we will always need that harvest information for the well-being and management of the Porcupine caribou. There are a lot of different stakeholders involved in getting this data - aboriginal

harvesters that are signatories to the agreement, non-resident, resident hunters, and outfitters.

It's getting to a time when we might have to start looking at quotas and tag systems. This came from the caribou summit. The PCMB is developing a harvest management strategy under our agreement. This strategy is going to give us direction about harvest management that will produce results but also it is going to make us all walk together

The thing that really gets me is that people are always saying that "We want that caribou for our future generations". I think we all agree on that. We don't want the young generation are coming up to us 15 years from now and saying, "Because of you, we have no more caribou." We want them to exercise the right and the privilege that we have now. Thanks a lot for listening. Mähsi' choo.

***Ringed seals as indicators of environmental change: Harvest-based sampling near Holman, NT, 1992-2006 - Lois Harwood, Fisheries and Oceans Canada and John Alikamik, Holman Hunters and Trappers Committee***

Lois Harwood  
Fisheries and Oceans Canada  
101-5204 50th Avenue  
Yellowknife NT, X1A 1E2  
harwoodl@dfo-mpo.gc.ca

John Alikamik  
Inuvialuit Game Council  
P.O. Box 2120  
Inuvik NT, X0E 0T0  
igc-js@jointsec.nt.ca

With me today is John Alikamik. During this presentation, I will be talking a lot about John's role in the study. We have an agreement: I am giving the talk and he is going to answer all the questions. John works very closely with his wife Emma on

this program at their summer home at Mahouyak, near Holman. Holman is located about 600 miles east of the Yukon North Slope.

The ringed seal is a small Arctic seal. It's very wide spread. We are using ringed seals in this study because the stock is large and there are no conservation issues. Ringed seals are a cornerstone species in the Arctic marine ecosystem. Many of the ringed seals' critical activities are tied to the sea ice - breeding, pupping, nursing, and haul out during the spring. These seals are very high on the food chain and it is relatively easy to get a fairly large sample each year. Ringed seals are also the main prey of polar bears.

In this study, we are looking at seal reproduction and condition because they directly reflect the availability, quantity and quality of the food that the seals are able to obtain. All of these factors are linked to ice conditions.

Ringed seals are small, and their condition or their fatness tends to vary. In our study we are asking: What are the environmental conditions that might affect body condition or fatness and reproduction?

The sampling and measuring of seals taken in the regular subsistence harvest is critical to this program. We picked a location and a time of year (June and July) when the amount of seals harvested will provide an adequate sample size.



We are building on a program that was started and conducted by Dr. Tom Smith in this area in the 1970's. Because of this work, we have some baseline data from as far back as 35 years or more.



*This picture shows three pups all born in the same year- 1998 - when the ice was very light and melted very early. Some of the pups – like the one on the left – was very, very fat and did very well, just like all the adult seals that year. There was lots of productivity and lots for all the seals to eat. The one on the far right here is also a pup of the same year, but it was a starveling. In this case, the ice had melted six weeks ahead of time, and the seal pup was abandoned by its mother during the nursing period because the mother no longer had a substrate on which to feed the pup. The pups can attempt to feed themselves, but they're not very proficient when they are this young.*

*This slide sums up one of the strongest signals in the data- some seals are doing well, while others are not. In 1998, many adults, the sub-adults and a good lot of the pups did really well. But a lot of the pups didn't make it. This is what we should expect to happen in terms of climate change and changes in the ice due. As the ice gets lighter and lighter, you can expect to see those trends continue.*

*John saw this variation in the samples and brought them in to show us. We were able to put the pieces together and figure out what happened. We have a publication on this particular event.*

This program was started in 1992. John has been sampling seals as part of this program for 15 years. John and I have been working together all this time. Over the years, he has been able to sample about a hundred harvested seals every summer. He had been taking the same five measurements all this time. measured, weighed, sampled, aged by the same monitor (John). We also pay for part of our program by collecting samples from the same animals for other scientists who contribute to the aging costs and some of the field costs. We collect samples for contaminants work, disease work, and genetics studies.

To study body condition, we look at the thickness of the blubber and calculate a body mass index. To get information on reproduction, we look at the ovulation rate. Female seals ovulate in the breeding season in the springtime. If they are fertilized, the blastocyst is implanted in September. The pups are born the following spring. John also keeps track of the proportion of pups that are taken in the harvest as an indication of the number of pups that are born. This provide a measure of the number of pups that are out there and available to the hunters.

Starting in June, the harvesters bring their seals to John, who samples and measures them. He keeps track of the samples, making sure they are all brought in and preserved in an appropriate way. John uses a standard data sheet. The same one has been used every year for the last 15 years, with John taking measurements in the same way, every year, for every seal. The seals are weighed whole by suspending them from a dial scale. When a seal is not getting the quantity or quality of food that it needs, they start to lose their weight first around the hip area. We have got now over 3,000 seals in this database.

The observations and recording of unusual things is also important. For example, 1998 was a very warm year that wreaked some havoc with the seals. John found a pup-of-the-year that still had his lanugo (birth fur) and brought in for us to have a look at. He knew it was unusual and he knew we would want to see it. We also collaborate with a veterinarian in BC. John once saw a seal that wouldn't go down its hole when the hunter approached. When examined by the vet, it turned out that that animal was positive for Brucella.

Our dataset shows four periods of strong signals. The first one was back in 1974-1975 when there were only 28 days of open water during the summer. That corresponded to reduced ovulation rates and reduced pup production. Between 2000 and 2005, with the exception 2001, there were very much shorter open water periods in the Holman area, again resulting in reduced reproduction and reduced condition. By contrast, in 1998 there were 185 days of open water. This illustrates the huge variability in open water seasons. That year, seal condition and pup production was high. 2001 and 2006 were had light ice years. The seals were fatter and the pup production has gone up. A pattern is really emerging in the data.

A graph of the blubber thickness of adult females, adult males, and sub-adults, that were sampled by John, since 1992, shows the ups and downs, the fluctuations, and the variability I just described. This is linked to the various heavy or light ice years and long open-water periods. But if you look at the overall trend, there has been a reduction in blubber thickness in all of the classes of ringed seals over the last 15 years. We've found a reduction of as much as a centimetre of average blubber thickness in seals from Holman over time.

The ovulation data shows the proportion of adult females that are ovulating. Back in 1974, less than half of the adult females even ovulated. They were spending the energy that they had on staying alive. They

weren't going to reproduce that year. The data that John's been working on shows a reduction in the ovulation rates in 2000, 2003, 2004, and 2005, with a recovery starting recover in 2006. The data also shows that the percent of pups taken in the harvest in these last five years this is fewer than 10 percent. The normal range of pup production is around 30 percent.

In 1974, there was a very, very short period of open water days. In 1978 and 1979 were long open water season as well as in 1993, 1994, 1998, and 1999. This is a huge variability but the seals are well adapted to function within that variability. Since 2000, with the exception of 2001, there have been periods of short open water. We are seeing that translated into seal fatness and the seal reproduction. Further testing for disease as part of this study has found some of the samples were positive for a Brucella antibody, not the Brucella bacteria itself, which means that the seal had been exposed at some point in its life.



*John Alikamik sampling ringed seals at Holman*

A summary of the study findings to date are:

- Long winters/short open water seasons such as 1974 and 2000, 2002-2005 appear linked to reduced seal condition, reduced ovulation and reduced pup production

- Short summers/long open water seasons (1998, 2001, 2006) appear linked to increased seal condition, reproduction and pup production – but have implications for survival of some pups if lactation is interrupted.
- There has been a trend toward decline in ringed seal fatness and condition at Holman over the past 15 years.
- Basic but consistent measuring and sampling of seals taken in a subsistence harvest is a reasonable means to monitor reproduction and condition of the local seal population

We'd like to first acknowledge the seal harvesters of Holman whose contributions make this program a success. We'd also like to thank the Fisheries Joint Management Committee and the Department of Fisheries and Oceans for ongoing funding of this study; Tom Smith and Humfrey Melling for their roles in the existing database and ice data collection; and other monitors past and present. I should also mention David Kuptana, Morris Nigiyok, Jimmy Memogana and Jeff Kuptana, and the students from Holman that have been assisting John Jimmy.

In closing, I'd like to note that other seal monitoring studies in the region include the one at Sachs Harbour which is a five-year program. Funding comes from the FJMC and the U.S. Minerals Management Service in Anchorage. We have also done a three-year seal study in Tuktoyaktuk. This is related to a much different, larger study, looking at the effects of industry on seals. This study is based on an actual collection of seals at that location, not on a harvested sample.

### Questions, Comments & Discussion

**Doug Larsen, Department of Environment, Government of Yukon:** One of the challenges, and purposes of this

conference, is to explore the idea of how we go from monitoring to making management decisions. Chris Burn did an excellent job this morning of linking things like monitoring to the aboriginal value system of monitoring and management and the western science approach to management.

What's happening with the Porcupine caribou herd presents an excellent example of the challenges that we have right now. How we're going to make decisions on a very important herd that we have not been able to monitor recently? Survival rates of adults give us some indirect evidence as to the trend in the population and we look around at other caribou herds that we know have declined. We're trying to incorporate aboriginal traditional knowledge and scientific knowledge into the decision making process. We're at a point now where I am quite concerned about the Porcupine herd. But we continue to grapple with when do we make the decision, and what is the best decision on behalf of the herd. And I'd be interested in any feedback from any of the panel members on that process and the challenges that we face going from collecting, to making management decisions.

**Don Russell, Canadian Wildlife Service:** That's a very valid question. At the Caribou Summit in Inuvik last week, we heard about how people cope with the caribou cycles. We also heard about the central barrens where populations were low in about 1915, low again in the '40's, in the '70's, and now they're low again. The conventional wisdom is that these populations do cycle. The challenge now is to make sure that these cycles are not aggravated by the fact that other things have changed. We're much more efficient at finding caribou or much more efficient at accessing them and hunting them. We've got unprecedented development within ranges. I think the challenge is to be able to separate the natural variation from the human impacts that now are unprecedented.

Built into the system is this history of coping with hardships and coping with times of scarcity. Huge changes took place back in the '40's, when there was a lot of scarcity. That's when people were brought off the land and placed in settlements to make it a little easier for the government to manage and help out where they could. Now we're in a different era. Each cycle presents its own unique suite of available management options.

**Joe Tetlich, Porcupine Caribou**

**Management Board:** We really need that harvest data. The Porcupine Caribou Management Board is trying a lot of different initiatives to try to explain the importance of getting that harvest count.

**Tara Wertz, Arctic National Wildlife**

**Refuge:** In Alaska, we realize that there are some things we can control, decide on and affect, and other things we can't. And both types of factors play into what we do about other game species or species that subsistence communities depend on. It really all boils down to looking at what's changed from the human element. Whether we're dealing with changes in habitat, or changes that are caused by the global warming scenario, most of that's out of our control. We can't really do anything to temper those kinds of factors. Dorothy has been working with communities in the Yukon on doing a harvest management plan. And I think that's an option and opportunity that we can control.

**Lois Harwood, Fisheries and Oceans**

**Canada:** I have a point I want to add about polar bears. I believe that Ian Sterling has noted a reduction in polar bear condition in the Mackenzie Delta and central Beaufort area. The seals we have collected and sampled from the Tuk area in the corresponding period did not show a change in blubber thickness. So, while the polar bears are having a hard time out there, the seals – offshore of the Mackenzie Delta – for that three-year period anyway were

doing well. The effect that we found in the Holman sample seems to be very localized.

In terms of the management implications of the ringed seal project, should the Fisheries Joint Management Committee and DFO ever consider a request for a commercial harvest or an increase in the harvest, they will be able to consider these results and factor them into their decisions. In terms of understanding climate change, what we're doing is one part of the documentation of the effect on one species. And in terms of John's sampling of seal tissues for mercury contaminant levels, we can gather up the numbers, and look at the condition of seals that have a burden of contaminants or disease. Their condition is lower than the healthy animals. We hope that Health Canada and other relevant agencies pick up on those data.

The work gets done on the beach at Mahouyak or at the computer in Yellowknife, but the way the whole Government picks it up and digests it and uses it is the complicated part. We do is the best we can do- collect data consistently in a long-term way, get our results out and then, pray.

**David Henry, Parks Canada:** I'd like to comment on the very good question that Doug Larsen asked and share a little bit of Parks Canada's experience. We haven't fully achieved going from monitoring to making management decisions by any means, but we think we know the direction that we're headed in. If you're going to use monitoring data, you need to have management thresholds so that you know when your data indicates a change you should be worried about. You do have to decide ahead of time on how much data you need and what your threshold is going to be. Parks Canada is finding that we are repeatedly using two useful thresholds. A "yellow threshold" tells you to get ready, because you might have a change and should start thinking about taking action. The "red threshold" is where a definite

change in your ecosystem is detected. This is when the probability that the occurrence is a natural variation is well below five percent. In the Yukon we have calculated and put a number of these thresholds in place.

The other thing that we're striving for, in a co-management environment, is to think through what you'll do when you cross one of these thresholds before it happens and come to an agreement with your partners. At least determine a set of minimum actions that you will take if a threshold is crossed. You have to define the value in your monitoring data and determine how long it can be across the yellow threshold before you take these actions. Is one year good enough, or do you want to see it across that threshold for two or three years? Coming to an agreement on what actions will be taken for each of these thresholds really helps to translate monitoring data into management decisions and some management actions.

**Lindsay Staples, Wildlife Management Advisory Council (North Slope):** Part of the challenge in agreeing on a threshold is having the confidence in the data you have so that you can believe you've reached the threshold. Joe referred to "the trauma of sharing information". Many of us are well aware that when it comes to sharing harvest information, there is a long history of concern. The term trauma speaks to the bigger issue of how information and data is used and the need for people to understand the purposes for which it's used. At this conference, we can explore ways to better share information. Over time we can build trust between different parties and organizations. It's also important to develop faith and credibility in the information in preparation for the time when you do have to make hard management decisions.

Last night some of us were talking about the survey work that was done in the NWT over the last two years and the declines in the big caribou herds. After the first year's surveys, one of the concerns of the local people was

the lack of their direct participation in the population surveys. As a result, the surveys were repeated this past year in order to involve local users. The results were largely replicated, but the big difference was the involvement of people. I think that's something we could talk more about.

There are a lot of wonderful examples that we can review and build on. Every couple of years, the Inuvialuit hold a research day. This is a forum for researchers who have done work in the Inuvialuit Settlement Region to present their work to those people in whose back yard the work is occurring. Steve Blasko holds an Open House at the Aurora Institute in Inuvik. He sets up a series of displays, and for several days, opens the door to school kids and anybody who's interested. There is a lot to be said about building those kinds of bridges between the scientific community, the communities, and the traditional users.

**Frank Pokiak, Inuvialuit Game Council:** I would like to know about the collared bulls that died. When you collared the bulls, it was at a time of year when their necks are not very big. We all know that the necks of bull caribou get really, really huge before rutting. I was wondering if they choked, if they died before the rut.



**Martin Kienzler, Department of Environment, Government of Yukon:** All the collaring of the bulls was done in March. We used the largest sized collars that are attached with long straps. We only collared mature bulls. They also have fairly large heads that would keep the large diameter collars from slipping off. We always err on the side of caution. We haven't been able to get to the dead caribou or re-collared any to see if there was an effect on the neck.

**Tara Wertz, Arctic National Wildlife Refuge:** We did have a couple of bull collars turned in by hunters. They didn't report any problems or injuries related to the collars on those bulls.

**Marlene Bailey, Fisheries and Oceans Canada (Inuvik):** I have a question for Lois and John. Do you know how the fish population affects the seal population?

**Lois Harwood, Fisheries and Oceans Canada:** We don't know the number of seals in the western Arctic. It's been estimated at over half a million. There are probably very local groups of them. In fact, the satellite tagging has shown that. It's very possible that the food they are able to obtain is changing and that could be the reason why the condition is declining. The adults feed mostly on Arctic cod. They'll also feed on zooplankton which is not as rich a food as the cod. That's what they go looking for so that may be the reason why they are getting thinner. John, can you comment on the availability of cod around Mahouyak. Has that changed at all in the last few years?

**John Alikamik:** Yes, in Mahouyak, we used to eat more cod. And there's little fish, like sardines. We don't get them now. We started getting those different ones, those long little fish – almost like a snake. They started eating those other kind of little fish. I don't see them eating cod. But maybe they eat those little shrimps. We used to eat them, but we don't see them much any more at home. Maybe it's because of global warming. We used to see lots of those little

orange ones that look like shrimps, but we don't see those much any more. And people used to eat lots of codfish, too, from the shore close to Mahouyak. But we don't get it much, either.



**Lorraine Peter, Old Crow:** I was trying to sit back and just listen to the dialogue about the Porcupine caribou herd, but I'm not able to do that. I just wanted to make a comment about some of the challenges that we face. Joe Tetlich is the Chair of the Porcupine Caribou Management Board. We have some biologists and scientists that have been working with our community and north Yukon for many years. We've known for over 10 years now that the Porcupine caribou have been in decline. That has always been a concern to the people of Old Crow. I'm sure hoping that the weather gods are on our side this summer so that we can make sure that we can do the count done to get that issue set aside once and for all. But that's not the only challenge that stands in our way.

In my community, we try to take responsibility for good hunting practices and teaching our young men and women about responsible harvesting. Just last Thursday, we had a climate change meeting in Old Crow. There were a lot of concerns about the herd again and the kind of challenges they're facing in regards to climate change with the snow depth, and the water, and especially with their food source. When I hear a person like Jimmy from Nacho Nyak Dun say that he's out in his traditional territory and seeing the food source for the

caribou drying up, you know, that really scares me. This whole issue is very scary for our people in Old Crow, and I am sure for all the user groups throughout the Yukon and NWT. So, it's my responsibility as a person who relies on the Porcupine caribou to do whatever I can. I can watch the erosion of the river and the erosion at the lakes in Crow Flats, and think about what it is doing to the animals there. But what is it that I can do as a responsible person in my community to try to help find some kind of a solution and find a balance?

that we're poised to make some decisions without that information. You know, we talk about collecting the information, but in fact, the hard part is making the decision with information. It's even harder without the information.



**Doug Larsen, Department of Environment, Government of Yukon:** I think we rely too much on scientific data and monitoring to make some hard decisions. We all know that monitoring is a difficult thing to do, but I think it's infinitely more difficult to make tough social decisions. And like Lorraine, I hope we get a count on the herd next year, but it's very possible that we're not going to - probably due to climate change and the fact that these animals aren't aggregating because the insects aren't harassing them the way they used to. If that pattern continues, it's possible we could go for another two, three, five, 10 years before we get a count. My point is that at some point, we have to make decisions, and I don't think we have to rely on scientific knowledge and data to make those decisions. And like Lorraine, I think

**Panel: Monitoring and Reporting  
in Coastal Zones**

**Panel Facilitator:** Lorraine Peter

***The Vulnerability of Ice-rich  
Permafrost Coasts - Dr. Wayne  
Pollard, McGill University***

Dr. Wayne Pollard  
Department of Geography  
McGill University  
Montreal, QC, H3A 2K6  
pollard@geog.mcgill.ca

The coastal zone includes both terrestrial and the marine elements. The focus of my talk today will be on the terrestrial side. Often the processes that occur on the terrestrial side have a strong bearing on the processes on the marine side. My presentation highlights permafrost research and monitoring activities of my students and I along the Yukon Coastal Plain. This work relies a lot on partnerships with government agencies, such as Natural Resources Canada, Indian and Northern Affairs, and Environment Canada. It also relies on partnerships in the communities. Our work couldn't succeed without the help and benefit of people from Aklavik, as well as the rangers at Ivavik and Herschel Island.

Our research program focuses mainly on landscape dynamics, and landscape processes, particularly with respect to the roles of ground ice and how ground ice ultimately contributes to landscape change. This research began in 1984. Over the past 23 years the research has contributed to numerous published papers (20+) and reports (15), graduate theses (6) and conference and community presentations.

The overarching aim of the research program is to understand and document ground ice in its role in landscape evolution. From a monitoring perspective, this means trying to characterize the distribution of ground ice as well as the relationship between processes and responses within the permafrost system. Ultimately, we want to try and make direct linkages to things like climate, because climate is the main driver in the presence, distribution and character of permafrost.

There are three basic research themes:

- What is the nature of ground ice in the Yukon coastal plain? This is a far more complex question than one would normally think.
- How does ground ice influence the way landscapes evolve? Landscape evolution and the role of landscapes are extremely important from the perspective of wildlife habitat,



vegetation, and processes that are linked to other aspects of the environment.

- How will these systems be impacted by climate change?

What is ground ice? There is a very major distinction between permafrost and ground ice. They are not the same thing. People often look at an exposure of ice and think it is permafrost. But permafrost is a thermal condition, while ground ice is, very simply, all forms of ice that exist within the ground. The majority of ground ice forms as a function of the freezing formation of permafrost. Some is formed by in situ water or the movement of water within the ground. And some is also formed by the burial of surface ice deposits. The critical thing to know about ground ice is that it comes in a huge variety of forms. It is locally very unpredictable in its distribution, and ultimately is variable in both its content and character.

Ground ice can exist in concentrations that far exceed the saturated conditions of soil. Ten metres of permafrost may be 90 percent ice by volume. That's nine metres of ice in 10 metres of permafrost. If you disturb that landscape and initiate thawing, it wouldn't stop thawing until enough of the permafrost had melted to leave a veneer of soil that takes on the role of the new active layer. The recognition that permafrost can exist in such high concentrations is an important part of understanding landscape evolution in permafrost environments.

The process of collapsing of landscapes related to the thawing of ground ice is called thermokarst. Thermokarst is divided into two dominant processes: a back-wasting thermokarst, where the ground erodes in a horizontal or planation process, or down-wasting thermokarst where the ground just literally collapses.

There are a number of other erosional processes linked to these changes in the

landscape, including various forms of mass wasting and active layer detachment. Sometimes the occurrence of an active layer detachment will strip away the veneer of protecting soil, expose the ice and ultimately generate a whole series of thaw-related features. When the ice exceeds the saturated characteristics of the soil, it can be a real mess when these ice-rich landscapes start thawing.

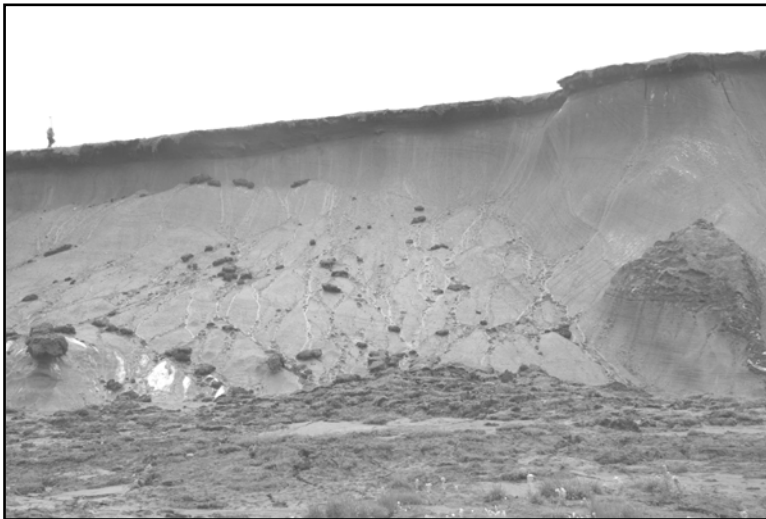
Our study sites are located all along the Yukon coastal plain. I have tried to divide our sites by the categories of the three study themes. We don't work at every one of these sites every year because of the amount of work required in this type of work. We work on only a few of these sites a year. Over a period of four or five years, we usually have the opportunity to visit and undertake very specific sets of measurements at all these sites.

The first theme is trying to understand more about the nature of ground ice. We're using a geological approach to understand the relationship between the ice and the enclosing sediments. In this context, ice is just a mineral. It is a low-temperature mineral that's highly unstable at temperatures common in our environment. Understanding the relationship of ice to both its origin and its ultimate contribution to landscape change is a very important part of understanding permafrost. We approached this stratigraphically to try to reconstruct a geologic understanding of ice within the permafrost system. This is an integrated geological approach that uses natural exposures. The ice and the sediment within a geologic column is measured and analysed. By looking at thin sections of ice, we can say a lot about the origins of the ice and its basic properties. There are a lot of natural exposures, but unfortunately, the wide variability in the pattern of ground ice means that these exposures only give us specific information for a specific site.

In mapping ground ice, we use tools that are forms of electrical sounding- either an

electrical current or an electromagnetic current. This gives us information in terms of the structure of the permafrost. These tools are very useful. So, in addition to the detailed analysis of ground ice in natural exposures, we also apply geophysical mapping to extend the knowledge into areas that don't have the presence of surface disturbance. This is an important part of understanding and predicting how large areas of land will change in response to thawing or in response to climate change.

The second theme focuses on the monitoring of landscape dynamics. These are very dynamic surfaces that are constantly changing. We began this work in the 1980's, using standard surveying equipment. We can now use differential GPSs. They are marvellous tools for analyzing the spatial patterns of some of the landforms formed in response to thawing ground ice. This picture gives you a sense of the scale of these things.



The person, standing on the top, left side, is about two metres tall. This exposure of ice is about 20 metres high and continues for almost 400 metres in length. This gives you a sense of the scale we are dealing with when we try to map these sorts of features.

We try to repeat a lot of this mapping either every few years or – if we can, in places like Herschel Island, where we based a lot of our field work from or King Point where they're very dynamic – we tend to get back every year to repeat our surveys. We combine this work with remote sensing. There is a very good record of air photos and some of them are very high resolution. We use the differential GPS to GR-reference on these air photos. We've started constructing digital elevation models. We've produced a one-metre DEM for Herschel Island that allows us now to compile fairly high-reference changes. We're starting to see rates of change, in terms of retreating surfaces, in the order of tens of metres per year. It's a very profound and significant change.

We have also been looking at coastal retreat by using the combination of remote sensing and differential GPS. We use modelling, as well. For example, we are looking at various structures of mass wasting. We model block failures by incorporating the role of ice wedges and wave erosion, and we've developed a series of numerical solutions to calculate thresholds of stability, linked to these sorts of characteristics. More information on the results of this research is presented in a poster on display at this conference.

The last theme of our research is climate change. The central focus is not just looking at the affects of warming climate or changing sea level on coastal permafrost. We are interested in feedbacks related to carbon, and as a result, carbon has become a main focus of our climate change analysis. How much more carbon is going to be released into the coastal zone and where is it going to go? Our work includes a combination of all the techniques I have already described, including shallow coring and various forms of chemical analysis in the lab. Since

permafrost is a climatic phenomenon, we also have to undertake fairly rigorous analysis of climate. We have our own meteorological stations. Currently, we've got about two-and-a-half years of data from the one that is set up at King Point. This gives us very good information in understanding the dynamics of thawing permafrost at King Point. However, those sorts of processes are very specific. We've been looking at the available data to reconstruct some of the local climate changes, in order to get a sense of the regional climate pattern to understand the overall relationships. These data, which include mean annual temperatures, mean January temperatures, and mean July temperatures all seem to indicate a gradual warming trend. But I want to point out that the statistical strength of these relationships is relatively weak. The trend lines are much more profound than the actual changes would appear to be.

We're taking all that we have learned and combining it into a series of assessment tools. We want to be able to map the Yukon coastal plain in terms of extrapolated data, based on our site-specific results. We have mapped ground ice volumes across the entire Yukon coastal plain, linking them to geological materials. We can do the same thing with rates of coastal erosion, based on a combination of long-term studies and site-specific studies that we will undertake. If we know how much erosion is taking place, how much ice is in the soil systems, and the morphology of the coast, we can start incorporating a weighted concentration of elements like carbon. We're trying to take all of these analytical tools apply them to an analysis of ground ice.

There are a couple of important messages to remember. Ice-rich coasts are dynamic by nature. Thaw-related processes are ongoing. They don't need climate change, and there is strong evidence that these processes have been going on for hundreds of years. However, the magnitude of these processes is obviously amplified during periods of

warmer conditions - warmer summers, in particular - or under conditions where we have other processes of erosion that trigger exposure of the ground ice. Undoubtedly, climate change will positively influence the parameters that control the frequency and magnitude of these processes. We expect that climate change will have a profound impact on ice-rich coasts. The question is: Is this already happening? Maybe, but we can't tell from our data. There is just not a long enough. However, from discussions with elders, hunters, and Park Rangers, we have a funny feeling that we can say, yes, it is happening.

We are supported very strongly in the field by Herschel Island Territorial Park Ivvavik National Park, the Aurora Research Institute, Polar Continental Shelf, and Natural Resources Canada. Funding comes from NSERC and ArcticNet. This is one of the main projects within ArcticNet. Even the Canadian Space Agency has helped us out.

***Long-Term Monitoring of Coastal Change in Western Arctic Canada - Steve Solomon, Bedford Institute of Oceanography Geological Survey of Canada***

Steve Solomon  
Natural Resources Canada  
Bedford Institute of Oceanography  
P.O. Box 1006  
Dartmouth NS, B2Y 4A2  
ssolomon@nrcan.gc.ca

I would like to begin by acknowledging my co-authors who represent the rest of the coastal group at the Geological Survey of Canada, Atlantic region. Most of the coastal monitoring, which is done throughout Canada, is done by these people out of the Atlantic region. I'll be directing my talk today primarily at the Western Canadian Arctic and specifically at the North Slope region.

The objective of the coastal monitoring program within Natural Resources Canada is

two-fold. One is to provide an ongoing assessment of the types and rates of change associated with various shore types and exposure situations in each region. The second is a longer-term objective to improve our understanding of coastal processes in Canada. In this area, in particular, we are trying to understand the kinds of coastal processes that are unique to the Arctic regions.

There are a variety of applications to which these data have been put, including assessments of coastal vulnerability to changing environmental forcing in response to climate variability and change, sea-level rise, or development and management activities. Another application is the assessment of hazards to coastal property, infrastructure, archaeological or cultural heritage sites, or the conservation of coastal habitats. In the case of Tuktoyaktuk to property and infrastructure; in the case of Ivvavik, we're looking at archaeological or heritage sites.

We are using two and three dimensions to look at the position of the coast and how that changes over time. We use a variety of techniques that range from the simplest techniques, such as using tapes and compasses or tapes and stakes in the ground to measure the distance to the cliff edge, to conventional survey techniques to, more recently, global positioning systems.

We try to look at the system as a whole. What is going on below the water is as important as the manifestations of change above the water. In order to get a baseline and try to understand why these changes are happening, we do a lot of work on site characterization. We collect sediment samples, photographs from the same positions, pathology and stratigraphy of cliffs, and do cryology studies.

More recently, we've been making a lot of use of remote sensing. Historically, we've used a lot of air photography and aerial videography. In recent years, as optical satellite imagery has become higher and higher resolution, we've been able to achieve a lot of our objectives using one-metre and half-metre resolution satellites. This is going to become more important in the future, especially in remote locations. It doesn't take the place of people on the ground, but it certainly expands our reach.

Other techniques that we only apply when situations or money allows, is the application of LiDAR as a means of creating digital elevation models at high resolution of the coastal areas. The U.S. has projects that allow them to map their entire coastline with LiDAR every couple of years. Using LiDAR they can look at three-dimensional changes in the volume of sediments in the coast. We haven't been very successful in getting the funds to do that. We're using sidescan sonar and sub-bottom profilers to expand our understanding of what is happening below the waterline. We're also using waves and currents meters. These are the kind of things that create the forces that cause coastal erosion.

Time-lapse photography and time-lapse videography are technologies that are becoming almost *de rigeur* for coastal studies throughout the world. We haven't been able to use them in the Canadian Arctic



yet. The remoteness and expense of the instruments makes it more difficult. That kind of technology allows us to address some of the questions Chris was alluding to in his talk in terms of the rate of changes and the intensity of measurements. If you can only visit a site once a year, once every two years or once every three years, you miss a lot of the important events that go on throughout the season. Having a remote presence at the site would alleviate a lot of those problems. We're hoping to get funding through IPY to set up some remote sites but we haven't heard anything yet.



*Databases:* We have been collecting data intermittently at a variety of sites over the past several decades. The coastal monitoring database is under construction. It's largely populated with data from the south at the moment. We're trying to gradually improve the population of that database with data in the north. Coastal Information System is another database. It contains the baseline information about the properties of the materials and morphology of the coastline. We have mapped most of the southern Beaufort Sea coast and all of Banks Island. That information is currently made available primarily through me or my colleagues at the Geological Survey. We're looking at potential ways of distributing the information over websites. It's a lot of data, and along the coastline, it's very difficult to

make paper maps. They tend to be very long and skinny if you want to try to show the detail in the coastal region. So, the information is best suited to distribution on a computer via CD or the web.

*Reporting:* We prepare annual reports for Parks Canada on our work in Ivvavik. We've been participating in Steve Blasko's community tours over the past several years and have been making some inroads by presenting information directly back to the Inuvialuit communities who are interested in this data. Over the years, we have done site-specific reporting, in particular to the Hamlet of Tuktoyaktuk, related to their ongoing erosion problems. We also present results in scientific reports and papers.

The status of the monitoring system, as a whole, has been somewhat ad hoc. In the Arctic, in particular, it's been dependent on short-term funding. A good monitoring program needs to have stable and long-term funding to ensure that you have repeat site visits with sufficient regularity that you can detect changes. In the past decade there has been a focus

on hydrocarbon development areas. We have been receiving funding that has allowed us to maintain our monitoring in those areas. Some of the other areas have perhaps been shorted a little bit.

The national Coastal Monitoring Program is currently under review. Hopefully, that will lead to a renewed commitment on the part of NRCan to a long-term monitoring strategy, not only in the Arctic, but throughout Canada. It may also require that we have a different distribution of sites. That would require some consultation, as well.

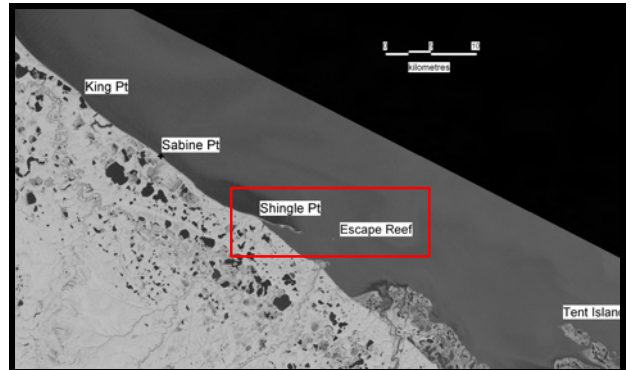
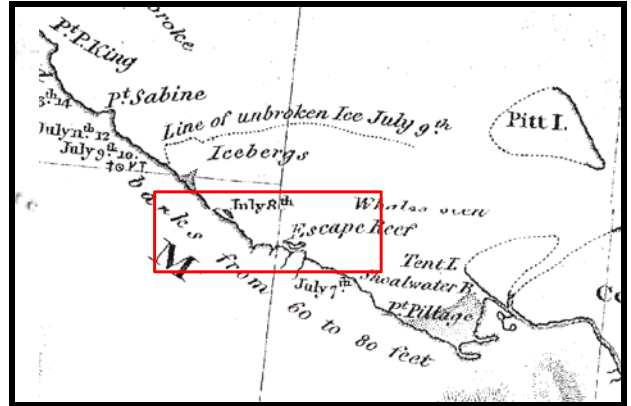
*Results to date:* It will not be a surprise to anybody who travels along the coast, the North Slope or anywhere in the Beaufort region that coastal retreat really dominates over coastal advance. Some of the highest

rates of retreat are found amongst some of the outer islands in the Delta region. Over the past 30 or 40 years, there have been some parts of the coast that have been retreating at rates of upwards of 20 meters per year on average. These are probably some of the highest erosion rates in the world, once you adjust for the fact that this only occurs over a season of two or three months. Relatively high rates, of seven meters per year are found along some low tundra cliffs. On average, retreat rates tend to be more along the lines of a half a metre-to-two meters a year.

There is significant spatial and temporal variability. Wayne Pollard's earlier presentation about ice certainly suggested that variability along the coast is quite high in terms of the geological conditions. When we combine that with variability related to exposure to storm winds, waves, and storm surges, we have a tremendous amount of spatial heterogeneity or spatial variation along the coast. This contributes to high rates of variability in the distribution of coastal retreat. Similarly, there is a very strong temporal signal with variability from one year to the next, and one time period to the next. This variability is largely related to significant storm events. People who were around in 1970 may remember a significant storm, which caused a lot of erosion along the coastline. The same thing occurred in 1993, 1999, and 2000. These high magnitude events, which occur infrequently, are the primary drivers for coastal erosion in the region.

We've been trying to detect a climate change signal in the retreat rates, but to date, we've been pretty unsuccessful. This is representative of large parts of the Arctic coastal monitoring area. I'm not really sure if this is related to the fact that we don't have a long enough period of record or the monitoring regime is not intense enough. In fact, we have only had a slight tendency to decreased erosion at protected sites and no tremendous trends or no obvious trends at some of the other sites.

I would like to show you just a couple of examples from the North Slope coastal monitoring network. In looking for baseline data, the first maps I have come across are from Franklin's expedition in 1826. Cape Point can be seen quite distinctly. Tent Island shows up as well, as does Escape Reef that is also located right near Shingle Point.



Despite the fact that we can't really use this as a baseline for quantitative measurements, it's very useful to look at some of these old maps and see which features were prominent at that period of time versus the present. One interesting thing here is you will see this big shoal right here in between Cape Point and Herschel Island. We know that there is a sill that's below the water now. Apparently during 1826, this was actually a shoal that showed up above the waterline.

Tent Island is typical of the Delta area. It has a relief of about one-to-one-and-a-half

metres above mean sea level. This is the area we're seeing erosion rates on the order of seven-to-10 meters per year on average. We haven't been monitoring at Shingle Point for very long, so most of the analysis we've done is based upon aerial photography. Photos of the shoreline taken in 1954 and 2004, shows that Shingle Point has remained extremely stable. It looks very ephemeral feature out there with only about two-to-two-and-a-half meters of relief. There is a lot of sediment being transported from the coast's up-drift that supplies this area. Shingle Point has, in fact, growing over the past 50 years.

Kay Point is an area of heavy ice wedge concentrations where there is a lot of block failure occurring. There is a spit at Kay Point which is being fed by erosion from the point. But that spit is eroding backwards at about the same rate as the point is. Erosion rates in the 2000 to 2004 timeframe were about four meters per year. In 2004 to 2006, they were about three-and-a-half meters per year. There is a lot of temporal variability in the erosion rates as a function of extreme storms. In two-year period between 1970 and 1972, there were 6.6 meters per year of erosion. That was largely due to a major storm in 1970. Similarly, the period between 1994 and 2000, the average erosion rates were 10 meters per year. There were two large storms in that period of time. In subsequent years, 2000 to 2004 there was less, and 2004 to 2006 there was much less erosion. This really emphasises how storm processes are some of the dominant features of the coastline.

Nunaluk Spit is an area that we've been monitoring with Parks Canada to try and look at the stability of coastal areas where there were archaeological or cultural heritage remains. There is a cabin there that was built in 1952. Since then, using aerial photography, we can see at least 50 meters of erosion occurred. Over the past several years the erosion has reached to within about two meters or so of the cabin. This is obviously a heritage site that has not very

long to exist and is a place that Parks may consider for some sort of a salvage operation.

We're very interested in becoming more rigorous, possibly using remote-sensing techniques, to improve our understanding and rate or intensity of observations at some of these sites on the North Slope.

### Questions, Comments & Discussion

**Wendy Nixon, Canadian Wildlife Service:** Referring back to comments from Chris Burn this morning, he talked about the boreal forest having fire as a key driver. But in the case of fire in the boreal, you get habitat recreated over and over again. In this system, I see that habitat is being altered but not recreated. I'm thinking of the implications that has for all the birds that nest along the coastal plain. I guess the sediments are shifting and spits are being recreated, but I don't see a mechanism by which that beautiful coastal plain, that is full of little potholes and little centred polygons, is or could be re-created.



**Steve Solomon:** I think you're out of luck. There are huge amounts of marine habitat being created in the near shore. But you're quite correct that we are not going to be recreating that kind of a coastal plain habitat, unless we have another glaciation,

or sea level starts to fall. Neither of these seems a likely prospect.

**Lindsay Staples, Wildlife Management Advisory Council (North Slope):** How do the monitoring requirements or needs of this coastline stack up against the west and east coast? In other words, if we were in a circumstance where more funding was to be committed to coastal monitoring in Canada, what level of relative candidacy does the north coastline represent vis-à-vis the other coasts of Canada?

**Steve Solomon:** That's a really hard question. In general, I would say that it could vary politically, depending on circumstances. From a scientific perspective, I would say the North holds the "biggest bang for the buck", in large part because we know less about these kinds of coasts and how they work than temperate coasts.

**Michael Gill, Canadian Wildlife Service:** In your presentation, you acknowledged the importance of extreme events in driving the system. If you miss a storm, you'll be missing some key information about how a coastline has changed. I think extreme events have a really large role to play in how they drive systems. An icing event or a storm that might happen for just a three-hour period can have a fundamentally large impact on a system, whether it's caribou or something else. We need to consider how well we capture extreme events in our monitoring programs. It looks like we are doing a good job of it in coastal processes, but I am less certain about whether we do a good job of monitoring and thinking about the role that extreme events, whether they are storms or other things, might have on wildlife. I think this is very important, but I'm not sure we always capture it well in some of the monitoring that we do.

**Steve Blasko, Geological Survey of Canada:** I'd like to make a further comment about the coastal zone in the western Arctic. Steve Solomon has actually been very effective at communicating to Natural

Resources Canada that the western region - the Beaufort and ISR region - is one of the most affected areas in Canada in terms of sea level rise and climate change. But when it is looked at in terms Canada at large, it is an area of low population. We, as scientists, are feeding fact into the system, but the system is not responding. I think there are great efforts made on the science side, but we're not part of the decision-making process. Political action is needed to get support for work in this region. Voices from the North need to be heard in Ottawa.

**Steve Solomon:** It might be something to consider, within this gathering, how we can better monitor extreme events, especially in a climatologically sense.

***Tarium Niryutait MPA: Developing a Research and Monitoring Plan - Burton Ayles, Fisheries Joint Management Committee***

Dr. Burton Ayles  
Fisheries Joint Management Committee  
P.O. Box 2120  
Inuvik NT, X0E 0T0  
aylesb@escape.ca

The planning process that I'm going to talk about today builds on scientific research that has gone on in the Delta for decades and traditional knowledge that has been accumulated for centuries. It also builds on two community monitoring programs. One is an oceans monitoring program and the other is the beluga harvest monitoring program.

The Tarium Niryutait Marine Protected Area has been developed cooperatively with the Fisheries Joint Management Committee. It is being led by BSIMPI - the Beaufort Sea Integrated Management Planning Initiative - and involves HTC's, Community Corps, various governments and a co-management agency, as well as industry. The plan is to

develop a marine protected area under the Federal *Oceans Act*. The FJMC - Fisheries Joint Management Committee-, of which I am the Canadian member, will be the management authority.

There are three parts to the marine protected area. The one to the far west in Mackenzie Bay extends into the Yukon North Slope. In the Atlantic, Pacific and Arctic oceans, DFO is implementing “objectives-based integrated management” that follows an ecosystem approach. This requires the establishment of objectives at several different levels of the natural environment, as well as for the social, economic and cultural environment. I am just going to be talking about the natural environment in this presentation.

The overall conservation objectives of the MPA are:

- To support the goals of the Beaufort Sea Beluga Management Plan and the Inuvialuit Final Agreement;
- To maintain a thriving population of beluga whales and beluga habitat in the Beaufort Sea; and
- To provide for optimum sustainable harvest of beluga whales by the Inuvialuit within the MPA.

Our project development group started with a community workshop that involved about 50 people. ISR co-management bodies, Elders, government and industry discussed environmental indicators. About half of them were from the ISR. We asked them what we should be looking at. That gave us a general idea of community and scientific concerns on the environment.

Our next step was a working meeting to try and refine ecosystem objectives and develop a research and monitoring plan. This meeting involved a much smaller group of about 20 participants (about half of them

from the ISR) and included representatives from the HTC, from the Fisheries Joint Management Committee, DFO and other government departments. First of all, we had to look at what the MPA objectives were. Then we looked at the specific important management objectives. Some of these were:

- Developing an annual or multi-year plan with key elements including monitoring program priorities and a research plan and protocol.
- Advising, approving and evaluating the monitoring of ecosystem based management and MEQ within the MPA
- Developing and communicating any research protocols and guidelines for research topics and methodologies
- Communicating and providing clarity for accident and spills, air and marine transport, ice roads and other activities.

The MPA also has a set of principles that tell us how we’re supposed to operate. We must:

- Ensure Inuvialuit and communities are fully engaged and support the Plan
- Ensure regulations and guidelines are enforced in a fair and equitable manner
- Use TK, local knowledge and scientific knowledge to manage the MPA
- Apply the principles of ecosystem-based management for decision making



- Maintain ongoing communication, public awareness and outreach.

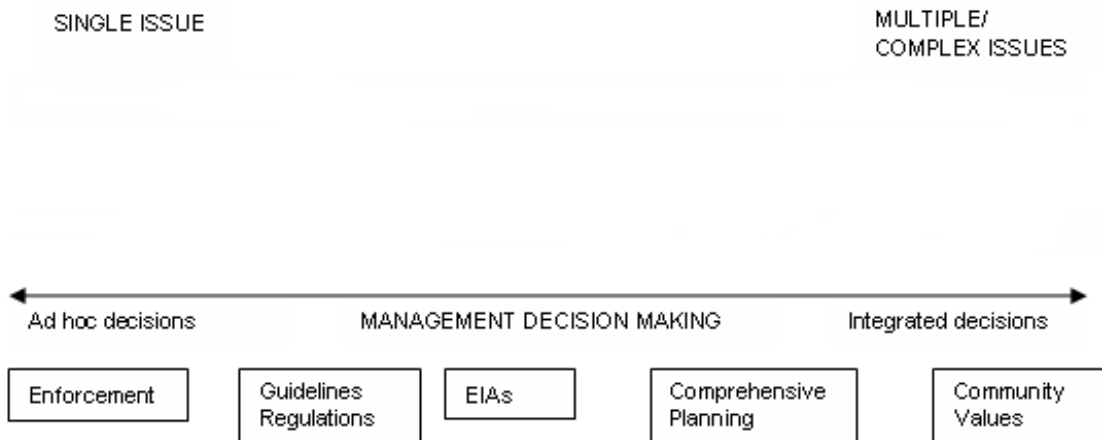
Ecosystem-based management and monitoring recognizes that activities – both within and outside the MPA – can impact on ecological integrity. So, we talked about coordinating with areas outside the MPA as well. We talked about marine environmental quality indicators and the community-based monitoring. We also talked about the importance of cumulative impacts. The earlier marine environmental quality group developed sets of indicators around the physical and chemical environment, fish and fish habitat and beluga and marine mammals and sea birds. That’s the kind of approach that we have followed to date.

We wanted to explicitly address how science and management would be linked. How was our monitoring and research going to be linked to management, and how would things be considered? We used a model that was developed by Westwater Institute in B.C. for the Fraser River Estuary, but can be applied elsewhere. It shows that management decision-making is a continuum that ranges from simple issues to complex issues, and from ad hoc decisions to integrated decisions.

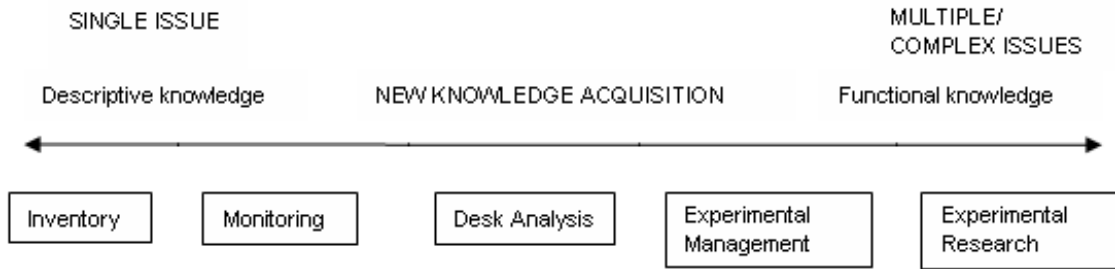
The management decision-making is a continuum that includes management enforcement such as fish wastage charges or charges related to tourism for harassing whales; guidelines and regulations, such as the HTC beluga guidelines, the Beluga Management Plan or the MPA regulations; environmental impact assessments like the Mackenzie gas pipeline review or the Environmental Impact Screening Committee reviews; comprehensive planning including community conservation plans and land use planning; and community values. At the far end of continuum are complex decisions like the signing of comprehensive land claims, the southerner’s acceptance of Inuvialuit rights to hunt whales and the acceptance by politicians that maybe climate change is a significant environmental issue. Those are the extreme end of management decisions that will affect us in the MPA.

Science can also be looked upon as a continuum from simple, descriptive knowledge that you get by doing an inventory of an environment to real functional knowledge you get once you understand what is happening in the environment.

### Management decision making continuum



## Science/new knowledge continuum



We have a range of activities that include inventory, monitoring, experimental management, and experimental research. Simple gillnet survey is an inventory. Experimental management might be the studies of the impact of vessel traffic on beluga or the effects of oil drilling on seals. We talked about this because we wanted to ensure that we were discussing the full range of management activities that would take place in an MPA, as well as the full range of management decisions, from regulations and enforcement to community values. We also wanted to make sure we had the science to support that.

If you put these two together you will see some of these things that Chris Burn talked about but in a slightly different way. We want to make sure that our monitoring program, instead of just relating to enforcement and guidelines, is as far-reaching as possible along this management decision continuum and includes community values and comprehensive planning. As we develop monitoring programs, it is necessary to make sure that we have clear questions to address. We talked about the importance of having clear objectives and a clear hypothesis.

As part of this integrated management planning process, we developed a series of conceptual ecosystem objectives. The *Oceans Act* and the habitat planning branch within DFO is intending to operate within these ecosystems objectives.

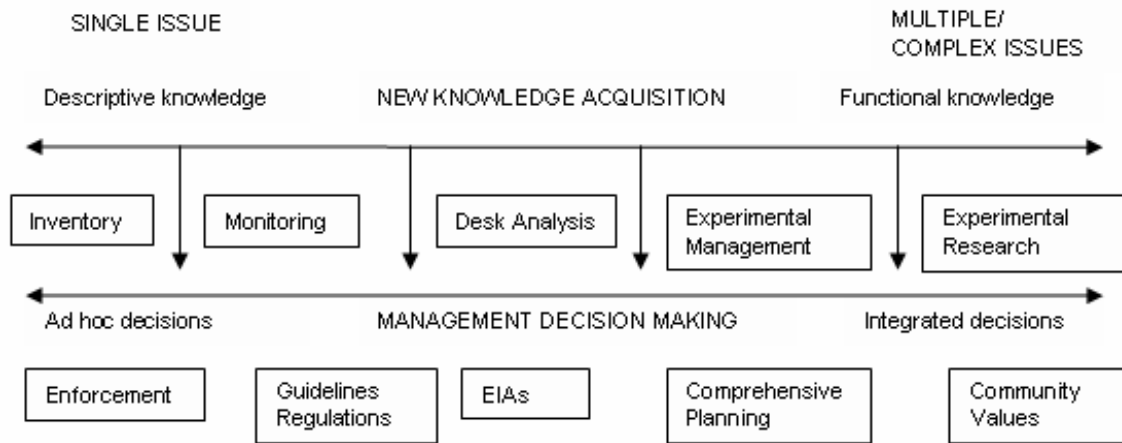
Each of the conceptual ecosystem objects includes operational objectives. I will give you one example of each.

1. To conserve the physical and chemical properties of the MPA. Operational objective: *To determine rates of change coastal processes (erosion, permafrost degradation) by monitoring in cooperation with community members.*
2. To conserve fish populations and habitat to maintain natural resilience of the ecosystem. Operational objective: *To maintain fish communities, species and populations in the MPA and surrounding EBSA within bounds of natural variability.*
3. To conserve a healthy population of belugas and ecosystem integrity. Operational objective: *To maintain the spatial and temporal variability, both within and between seasons, of the use of the Mackenzie estuary by beluga.*
4. To conserve the waterfowl, seabird, and shorebird components. Operational objective: *To maintain the historic relationship between waterfowl, seabirds, and shorebirds and the aquatic ecosystem.*

In total we developed 11 operational objectives and something like 13 projects to support those objectives.

An assessment of the proposals showed that there is a baseline in place, so there is little

## The relationship between science and management decision making in the Tarium Niryutait



need for inventories or surveys. Inventories are located on the far left of that continuum. But it was also clear that the knowledge of biological and temporal variability of populations and habitats was insufficient for us to design a proper monitoring program for just about any of the species, except possibly for beluga. It might be possible to design a proper program for some fish. Although there were 10 monitoring programs identified – half of them which would be community-driven – a lot of other work was needed to establish specific ecosystem indicators and threshold levels that I mentioned earlier.

Currently, DFO and the Fisheries Joint Management Committee are spending about \$150,000 annually on monitoring in this area. In the future, our estimate of the cost would be another \$250,000, but with upfront costs of about \$3.5 million in order to capture some of the natural variability.

What is happening next? This information is being used to complete the MPA management plan and to develop the budget proposal. The estimate is that the MPA could be approved this year. There are also plans for the pre-implementation initiation of the projects within the regular FJMC and DFO science planning process. The next

step would be the MPA approval and implementation. The work that we have done is also contributing to the development of ecosystem objectives for a broader area called the Ecological and Biological Sensitive Areas within the Beaufort Sea Large Ocean Management Area.

***Ivvavik National Park Coastal Cultural Monitoring - Lindsay Croken, Western Arctic Field Unit, Parks Canada, Inuvik***

Lindsay Croken  
Parks Canada  
P.O. Box 1840  
Inuvik NT, X0E 0T0  
lindsay.croken@pc.gc.ca

This presentation is going to be a little bit different from the other presentations that you heard today and that you will be hearing in the next couple of days, because it looks primarily at cultural monitoring along the North Slope. I'm going to give you an overview of the coastal cultural monitoring program in Ivvavik National Park and show how we use monitoring results to guide management decisions within the Western Arctic Field Unit.

Ivvavik is the first national park in Canada to be established as a result of an aboriginal land claim agreement. Created in 1984, it protects part of the calving grounds of the Porcupine caribou herd. It also represents the northern Yukon and Mackenzie Delta natural areas.

Why have cultural monitoring programs in a national park? The first reason is that, according to Parks Canada Cultural Resource Management Policies, all resources administered or managed by Parks Canada are given initial consideration as cultural resources and inventoried. Once an inventory is done all resources are evaluated to determine which one are cultural resources, what constitutes their value and what qualities and features make up their historic character. So, in other words, we are mandated to inventory and evaluate our resources and, ultimately, to care for cultural resources. We also have an obligation, under the IFA – to preserve Inuvialuit cultural identity and values.

This initial inventory and assessment took place in Ivvavik in 1987. At that time over 120 cultural sites were identified. Like any resource Parks Canada has under its care, cultural resources are subject to stresses that impact their integrity and can ultimately result in their loss. As such, the 1987 survey identified certain cultural resources vulnerable to damage or destruction by cultural or natural processes.

In 1995 and '96, we did additional detailed surveys to do condition and threat assessments at each of these sites. At that time, we commissioned assessments due to a perceived threat of coastal erosion on cultural sites. From the surveys and analysis, we determined that there were active erosion areas within the park. In places, the coast had eroded up to 200 meters since the '50's. In 1997, just a year after we did that detailed survey, we ended up doing an excavation on a house at the mouth of the Back House River. So, clearly, the perceived threat of coastal erosion on cultural sites was real. In

1997 a detailed list of priorities was identified for a number of sites. The first major monitoring report for the park was published in 1998.

In 1998, we established a monitoring strategy that was designed to track encroaching sea changes and their impact on cultural sites. Today this program includes observation and measurement of housing structures, graves, campsites and tent sites. Our objectives are to assess the impact of erosion and visitor disturbances on sites, and then, to protect and salvage cultural sites. We document cultural resources if we need to go in and do a salvage operation.

In August 2000, we did our first true monitoring on 12 sites located along the coast, using those 1997-98 protocols. We chose these sites, based on that earlier condition and threat assessment, their proximity to the coastline and the potential for change at those sites. The program includes photographic and measurement monitoring. Through a series of photo points and measurement points, we assessed changes to cultural sites and to the coastline, as well. We did additional coastline monitoring and cultural monitoring in 2002 and 2004.

As a direct result of the 2000 and 2002 monitoring, we did two salvage archeologically projects in Ivvavik, one at Niaqulik and the other at Clarence Lagoon. In both cases, the decision to excavate the site was reached in consultation with the Aklavik Community Corporation. This is an example of using the results of monitoring to make decisions within the field unit. Niaqulik was first surveyed in 1997. At that time, four houses were identified for monitoring. When we revisited the site in 2000, one house was completely gone, and a second was almost gone. Due to that loss, we made a decision to go in and salvage the remaining two houses in 2001. The objective in 2001 was to salvage the remains of that four-house camp on the edge of the Beaufort Sea and to excavate the two

remaining houses. A team of Parks Canada staff spent 18 days on the site, excavating and recording. We were really just attempting to glean as much information as possible from that site before it was washed away.

Routine and cultural monitoring in the summer of 2002 again drew our attention to a site that was in danger- two traditional Inuvialuit sod and wood houses, located on the southern edge of Clarence Lagoon. After consultation with the Aklavik HTC and the Aklavik Community Corporation, the Clarence Lagoon excavation took place in August, 2003. The excavation involved Parks Canada archaeologists, field unit staff from Inuvik and local youth hired from Aklavik and Inuvik. Inuvialuit elders, who had once lived in that area, were flown into the site during the excavation, to gather oral history about life along the North Slope coast during the turn of the century. The goals of this project – apart from salvaging the site – were to determine housing occupancy, and then, to place those occupants within the broader historical land use patterns of the Yukon North Slope.

Artifacts usually go beyond the scope of monitoring. But when we talk about monitoring leading to an excavation or salvage project, people naturally have questions about artifacts. Why do you take artifacts? Where do they go? And I think most importantly to communities: Will we ever see them again? Parks Canada has an Memorandum of Understanding with the Inuvialuit Regional Corporation that says that Parks Canada can act as an interim trustee or a temporary guardian for artifacts until such a time as facilities exist within the region to safely care for those artifacts. Artifacts from this region go to our lab in Winnipeg, where they are treated and stabilized. They are also entered into a national artifact database. Many of these artifacts require a temperature and humidity-controlled environment to stabilize them and prevent deterioration. Although we keep these artifacts in Winnipeg for now, they are

fully accessible, should people wish to see them, either in Winnipeg or by bringing them back here.

Some of our program findings tell us that severe weather and high water can have huge impacts. as seen in this photo. This is the same site before and after a storm, just within six days. Coastal erosion, overlying log debris and frost heaves continue to threaten archaeological and cultural sites. Wildlife has impacted some sites, as seen in the movement of objects around different sites on the land. A regular cultural monitoring provides us with information to make the best management decisions for these sensitive cultural sites, in cooperation with various community organizations. Although in some cases monitoring has led to excavation, it has also resulted in the collection of many artifacts. We use these objects to reveal important information about people who lived on these sites, what their families were like and their traditional activities.

All cultural monitoring is reported in the Western Arctic Field Unit's annual research and monitoring report. Monitoring Reports are presented to WMAC (NS) and the Aklavik Community Corporation. We are in the process of finalizing reports from 2002 and 2004 to present this spring. We would also like to hold a public meeting and school visit in Aklavik to talk about the results of those two excavations.

In conclusion, this program, like all monitoring programs, is not without challenges. In recent years, human resources issues and staffing turnover has impacted this program. Changes along the coastline and the fact that many of our sites are in close proximity to the coastal edge means that we need to, at times, change our monitoring protocols and adapt them to changes on the land. Logistics and access have also been an issue at times. During our 2004 monitoring, water in some areas was too shallow for us to gain access by boat.

Our next steps are to finalize those reports and present them. We are also working on ways to share the information we have gathered with the community and school groups through interpretation programs. We're planning to monitor these sites again this summer with an archaeologist, using a helicopter to ensure access to the sites.

I believe our Ivvavik Coastal Cultural Monitoring Program has been a success. Since we established the framework for monitoring in '97, we have done four years of monitoring. In cases where monitoring results have led us to excavate, we have used those opportunities to learn more about the sites, to collect archaeological facts, to gather oral history from elders, and to engage youth in those sites.

***Botanizing the Beaufort: Preliminary Results of North Coast Survey, 2005-2006 - Bruce Bennett, Department of Environment, Government of Yukon***

Bruce Bennett  
Department of Environment  
Government of Yukon  
P.O. Box 2703  
Whitehorse YT, Y1A 2C6  
bruce.bennett@gov.yk.ca

Today, I'm going to present the preliminary results of two years' work. It often takes many, many years to identify plants, especially when dealing with new species and huge range extensions of very poorly-known plants. That's why I'm just presenting preliminary results.

We're doing this work to get baseline information. I heard that baseline studies aren't required any more, but I beg to differ in this respect. We've been collecting plants on the Arctic coast of the Yukon since about the 1870's, but never as part of a proper inventory. A lot of the collections were made incidentally and many lists are based on herbarium specimens and collections. I

had this list of all these so-called rare plants that occur on the coast, but I wasn't sure if they were rare because they truly were rare or whether they had (a) not been collected because they're pretty nondescript things, or (b) not been collected because they're so obvious.

I think it's important to get baseline information for a number of reasons. We know that global climate change is happening. So, how are the effects going to be manifested on the land? Are we going to see new plants and animals arising? If we don't have a good inventory on what was there in 2005 and 2006, we haven't got a real baseline for comparison. I also wanted to look specifically for introduced plants; what was happening at all those U.S. military installations where there had been hydro-seeding? Overall, my goals were to inventory all the different plant communities, to locate the introduced plants and to relocate known populations of rare plants and see how many there are. The survey covered three completely different plant communities. There are very few plants that you find in all three areas.



I tried to get some of the very best people I could to be part of the study crews. We had two crews working in the first year. The first group consisted of Dave Nagorsen who was looking at small mammals, Terry McIntosh

from UBC who studies mosses and lichens, Jennifer Line who is a botanist and had worked on the coast before in Ivvavik, as well as Jennifer Staniforth who had also worked up on the coast for many years. Danny C. Gordon from Aklavik was our guide, translator, historian, and mentor. He was just great! We couldn't have done what we did without Danny's help. That crew started at Shingle Point and went to Kay Point.

Terry McIntosh stayed on to be part of the second crew as well. Mervin Joe with Parks Canada came and picked us up with, and brought Carolyn Parker in from the University of Alaska. Now, this is somebody who is a specialist in the Alaskan coast. So, I figured if there was anything that drifted over the border that we hadn't seen before, she would be able to pick it up. And Pippa Hett came out and helped us out from Inuvik, and we all worked all the way out to Demarcation Point. So, that was the first year.

The crew the second year consisted of Mike Oldham from Ontario, Pippa Hett from Inuvik and Danny C. Gordon from Aklavik. Mike has worked in the eastern Arctic and is one of the best botanists in Canada when it comes to sedges and grasses. Catherine Kennedy, who has been working on the vegetation of the coast for years, was also part of the crew.

Our major survey areas included Shingle Point, Kay Point, and Ptarmigan Bay. There's been a lot of erosion at Ptarmigan Bay. Danny has had to move his cabin back several times. The richest place I found on the entire coast was right behind Danny's cabin. We found new species for Yukon and we found some of the rarest of the rare, endemic Yukon/Alaskan plants. That part is eroding quickly. It was really amazing! I could have spent days and days in Danny's backyard. We also worked in the Blow River Delta, at Clarence Lagoon and we stopped off at Komakuk and Shingle Point

DEW Line Stations, looking for introduced vegetation.

Over the two years of surveys, about three weeks of field work in total, we recorded 316 species. That's about twice as many as you find in the eastern Arctic in total. We found about a quarter of all the Arctic plants in the entire world on our little piece of coast. If you add the extra 150 species that are known to grow up in the rocks along the Yukon coast, we have over a third of all the Arctic plants in the entire world. That is extremely rich. There is nothing like this in the Arctic! This is really important!

We found five new species of plants. I would only consider one of them to be rare. The other ones were probably just plants that we didn't notice before, because they're nondescript little grasses. We found 60 species that hadn't been reported from the Yukon coast before. Half of those were new to the Inuvialuit Settlement Region. They had never been recorded on the coastal side of the mountains in the Yukon. We also found 15 species in Ivvavik that hadn't been reported to grow there before. One of the biggest things is that no introduced plants found anywhere. In total, there were 837 collections made. The status changed for 52% of the species we found.

We were looking for 74 species of conservation concern. Every single plant I picked up in every single location was ranked as abundant, common, uncommon, occasional or rare. We did find a few plants that were rarer than we had expected but some plants we found were very common. For example, in *Rare Plants of the Yukon* (published in the 1981) scurvy-grass (*Honckenya pepuloides*) was reported to only occur on Herschel Island. In 1996, they found it occurred from Kay Point all the way to Demarcation Point. It was pretty common all along the beaches. We found it was the most common plant on the coast. This is probably an example of one of those plants that everybody knows so it just gets ticked off the survey form and doesn't get

collected. This was one plant that was misinterpreted as being rare, but it was actually dirt common.

Some findings were more disconcerting. We didn't find some perennial coastal species that had previously been reported as common. One plant I was specifically looking for was the Siberian *Trisetum*. It was reported to be very common between Kay Point and King Point in the 1940's. We spent days there, wandering up and down these gullies and didn't find any.

Another example is the Arctic rock cress. I went back to the exact same sites where these had been collected in the past. I was expecting it to be common. It's a pretty easy plant to identify. They're perennial, so, it isn't like it just shows up occasionally. But they were gone. We weren't able to find them. We were looking specifically for them, and we couldn't find them. Other plants reported as common in the past have disappeared from Kay Point, Nunaluk Spit and Clarence Lagoon, possibly due to increased disturbance by storms.

Oysterplants used to occupy the whole spit out at Kay Point. It's supposed to be a common plant, but now it's gone. We did find it to be very common around Shingle Point, Low River Delta. Those areas aren't being turned over every year. We also found some major range extensions. We collected a lot of material for other studies. I was making collections for genetic work that's being done all over the world.

The good news – but also cautionary good news – is that we didn't find any introduced species. There is virtually nowhere in North America you can travel for three weeks and not see a single introduced plant. We went to all these sites specifically looking for introduced plants. There were none, except for at Shingle Point. There was a place where a bunch of stuff that didn't burn was buried and covered with dirt and hydro-seeded with Violet Wheat Grass and Kentucky Blue Grass. These grasses are native to Yukon, but not native to the North

Slope. They weren't spreading. There are not a lot of weeds and other introduced plants in Inuvik and Aklavik but that doesn't mean that they're not coming. I think if introduced plants take over in Inuvik, they're going to suddenly start moving out to the other places.

My recommendations for more plant work would be to look for some of the truly rare plants we have on the coast, especially those that may be extirpated from Canada. I think that that's an important thing to know. We also need to develop a plan for the identification, control and eradication of invasive species in the local communities. I think that will keep them off the coast. You see how rich the coast is botanically. If you get sweet clover in there or something like that, it could change all sorts of things and who knows what would happen.

## Questions, Comments & Discussion

### Jimmy Johnny, Mayo Renewable

**Resources Council:** I would just like to make a comment on permafrost. As the years go by, we've been trailing horses back and forth on the same trail, going into Bonnet Plume, the Wind and the Snake. In the past five or six years I took a couple of pictures of permafrost melting. And during that time, we got a couple of horses stuck in this permafrost.

One time when we were going along the trail, there were about five or six horses in front of me. Four horses went across when all of a sudden, this big grey gelding in front of me just slowly disappeared in front of my eyes. Luckily he didn't have a pack on him. I got off my horse to check on him and saw that there was a thick layer of moss with a little bit of ground underneath and a hole from where the permafrost was melting. The horse went through it and I guess it must have loosened the top layer. It took us about between five and six hours to get that horse out. I didn't want to shoot him so we kept

working with him. I guess that horse got tired of standing up, just his nose sticking up like that.

I went to my saddle horse and I got my old 30-30. The boys looked at me, thinking I was going to shoot him. He was pawing on both sides, trying to get traction. I think he couldn't get too far because it was still frozen inside. So I went behind that horse and loaded up and I fired. And you know, horses, when they hear a rifle shot, they jump and that helped get him out of that hole in the bottom. He got out, and he stood up, and we got two horses tied to him to drag him out. So, any time you're walking around out in the bush, you've got to be very careful. You don't know if you're going to go straight down. That's kind of a scary feeling.

Up in the mountainside where our trail goes, there is a huge slide where the earth is melting and the trees are coming down. That's the kind of changes I've seen in the past few years. So, I just like to share what I see and what I know of what is happening up here in the Yukon area, especially up around the Wind, the Bonnet Plume, the Snake, and around the McQuesten area.

***Northern Bioregion Coastal  
Monitoring Pilot Project - Dr. Marlow  
Pellatt, Parks Canada***

Dr. Marlow Pellatt  
Parks Canada  
300-300 West Georgia Street  
Vancouver BC, V1M 2Y9  
marlow.pellatt@pc.gc.ca

In this presentation, I am going to talk about the coastal monitoring pilot program that we have been developing at Parks Canada. I will spend some time talking about Parks Canada's goal for ecological integrity monitoring and how that rolls into monitoring in Ivvavik National Park. Before I start, I would like to thank the folks with the Herschel Island Park for all their

assistance on this project. I would also like to thank the people who gave me a hand out in the field, Ed McLean, Jackie Bastick, Mervin Joe, from the Western Arctic Field Unit, and Gavin Manson from the Geological Survey of Canada and Jimmy Doug Meyook from Aklavik. This was a great crew and we had a very good time, despite the challenges we faced.

The rationale for this project was to develop a pilot study for coastal ecological integrity monitoring for Parks Canada's northern bioregion. This bioregion is a collection of national parks and field units in northern Canada. Hopefully, the findings will contribute to developing a broader coastal monitoring program that can answer the following questions: What is the state of park ecological integrity in the coastal ecosystem, and how is it changing? It sounds simple but it certainly wasn't.

Ecological integrity with respect to a park is defined as a condition that is determined to be characteristic of a natural region and likely to persist, including the abiotic components, or the physical components, and the composition and abundance of native species, biological communities, rates of changes and supporting processes. We are taking two approaches. One is a condition monitoring. This is monitoring over the whole park over the long term to detect major trends in the park's ecological integrity. We also use management effectiveness monitoring over small areas to assess the effectiveness of specific park management actions. This is more project-related. If something is done to improve or change something in a park system, we will monitor the impacts.

We are working in parks that have a number of different ecosystems within their boundaries. In this case we are being asked to determine measures and indicators of ecological integrity that can be used to monitor arctic and alpine, some taiga maybe, coast processes, and marine/freshwater ecosystems.

These indicators need to be able to tell us the state of the park's ecological integrity – whether it's good, or we're concerned about it, or if it's impaired. This is kind of the red, yellow, green traffic-light model. All the information that the scientists and communities are collecting are contributing to that understanding. We are collecting the data. We do the analysis, create models, both conceptual and mathematical – if that's the case – for stressors, human dimension, biodiversity processes, and so on. Then, we assign a colour to it.

Almost half of the national parks in Canada have a marine or coastal component. These are significant components of the ecosystems. In the Western Arctic the parks include Ivvavik, Aulavik and the Pingo Canadian Landmark. They all have coastal and marine components to them. It's a new venture for Parks Canada to start to look away from the land and the traditional types of organisms and ecosystems that it has historically shown an interest in. This is going to become increasingly more important as we get into the business of marine conservation areas.

Ivvavik National Park has 139 kilometres of coastline. The ratio of coastline to the boundaries is 43 percent. The marine ecosystems include estuaries, lagoons, and beaches. There is some continental shelf out there to a certain degree. The greater ecosystem is definitely influenced from the Herschel Canyon. Marine mammals are important, as are fisheries and nursery areas. The major stressors of concern for the Ivvavik are the long-range transport of atmospheric pollutants, climate change and coastal erosion. Also, there are potential risks of environmental impacts on the coastal environment, especially if development increases in the area.

The northern marine bioregion marine group held a one-day workshop in Halifax in February 2006 to brainstorm how we would pilot a marine coastal monitoring program. It brought together northern Parks Canada

scientists, some national marine conservation area scientists, and representatives from other organizations, such as DFO, Natural Resources Canada, as well as the private sector to discuss what we could do and how we could partner to do marine coastal monitoring in the North. We developed a pilot coastal marine monitoring program for 2006, which includes Torngat Mountains National Park Reserve on the east coast and Ivvavik. We are hoping to provide information to our partners about what we may be able to do as an organization. Parks Canada wants to define this ecological integrity vision, select the indicators, and develop conceptual models for what is important. We want to develop a work plan, determine the feasibility, costs, and how to work with the data, and what we can do with the field component.

We considered various criteria for selecting indicators. These included baseline information to give us information on the biology and the life history of the organism. We wanted to try to look at tolerances and whether they were correlated to ecosystem change. We considered ice, water quality, plankton, benthos, marine mammals, birds, fish, productivity, and coastal change. We also talked about what we could do with our partners and what we could do on our own. At the end of the day, we decided to tackle some sentinel fish monitoring and potentially some benthos/bivalve monitoring. We believed these are good indicators to use in a pilot project.

We selected six sites in the coastal zone of Ivvavik National Park but were not able to get to all of them to do the work we'd planned. We had some initial start-up problems with equipment, weather and ice. The weather really did not cooperate. We spent more time wanting to work than actually getting out and working.

While we certainly had our challenges we also had some successes. We collected fourhorn sculpin for contaminant analysis at three sites, and determined the feasibility of

trapping fish. We were looking for habitat types of significance in the park and located rocky habitat with kelp on it. Although the conditions prevented us from finding clams in the sediments, we confirmed they are out there because we found shells on the beach. We did some habitat mapping using video. We also determined that moving sea ice and buoys for traps don't mix very well. They tend to be problematic.

The underwater video showed a fairly uniform bottom which is typical around the park. Some ice scouring occurs in the area, but we found Colander kelp growing where substrate is available. We know there is a potential for soft coral algae and sponges to occur in deeper waters. An inventory of habitat is definitely important to do in the park. We need to get an understanding of what habitats are important and which ones aren't. It is important to understand the ecosystem in order to protect the ecological integrity.

We found that when we were working, in mid-July, the top three meters of the offshore area wasn't very salty. At most sites, salinity did not get very much more than 10 parts per 1,000. Where we were able to do some beach seining, we collected samples. Samples are being analysed for contaminants. It was a good learning experience. We never caught any fish with the traps, but we did collect a good variety of invertebrates. Now we need to think more about what indicators would be useful.

Our next step is to do some analysis, write-up what we found, and get the information out to the park and the stakeholders. The GSC will incorporate our underwater video with the side scan sonar results. We need to develop effective gear to get some of the samples we want. We'll need to get in there to work with other partners. That's the big lesson learned. For an organization our size to get into the marine monitoring business,

we need to work with partners to get it done. We're working with the Department of Fisheries and Oceans. They're planning some work with FJMC and other partners to look at the fish off Phillips Bay. We're hoping that we can contribute to that work and get some baseline information. They are repeating a large study that was done in the 1980's. Parks Canada needs to increase its capacity to undertake these coastal projects.



Almost one-half of the parks have coastal marine components. As an organization, we need to increase our capacity or learn to work better with our partners in order to get the work done and the information we need.

## Day 2: Wednesday, January 31

### **Panel – Monitoring and Reporting in Coastal Zones**

#### **Questions, Comments & Discussion**

##### **Steve Blasko, Geological Survey of**

**Canada:** Most of the effort in the North Slope area is concentrated in the terrestrial environment and in the coastal zone. Yet, the ISR extends onto the Yukon shelf. What is the level of interest in the actual shelf component? How important is the offshore relative to the coastline and to what's happening terrestrially? I am curious to know what the panel has to say about the Yukon Shelf being an important element in the puzzle of the ISR.

**Panelist:** From a physical process perspective, the relationship between what's going on, particularly in the shallower portions of the offshore, are critical for understanding what is happening in terms of the dynamics of the coastline. There are things that happen off shore that affect coastal stability such as sediment movement and ice interaction with the seabed. There is certainly a continuum of processes that are important to consider.

**Marlow Pellatt, Parks Canada:** There is no question that it is important to understand the interaction of the near-shore and off-shore marine ecosystems in order to protect the ecological integrity of these systems. Parks Canada certainly has an interest in the greater ecosystem beyond the park boundaries. The interactions between the marine, aquatic and terrestrial system are a very important topic to ecologists in Parks Canada at this time.

**Panelist:** There have been a couple of major projects in the Beaufort Sea in the last decade. The most recent one is called the “Canadian Arctic Shelf Exchange Study”.

It's primarily a ship-based program for university and government scientists from Canada and around the world. There is another large-scale project proposed under IPY. However, the state of knowledge is not far enough advanced to talk about monitoring programs. DFO is proceeding with, a Large Ocean Management Area (LOMA) program to try to identify important ecosystems.

##### **Steve Blasko, Geological Survey of**

**Canada:** In the past, the only interest in the Yukon Shelf was a result of the ‘over-the-top’ pipeline proposal. There was very little baseline information available at that time. I'm concerned that the Yukon Shelf could remain in the backwater unless we raise its profile. But I don't want to try to do that if it's not important. The main shelf, north of Richards Island, is important because that's the area where development may take place over the next 20 or 30 years. The Yukon shelf is part of that whole ecosystem and should therefore be considered important to study. I am also interested in the Inuvialuit perspective because the Yukon shelf is part of the ISR. Should we be working over there in getting some baseline information together so we know what to monitor in the future?

**Randall Pokiak, Tuktoyaktuk:** I've got a question for Bruce. Last night I was thinking about the discussions my Mom and Dad used to have when they were talking about the North Slope. My Mom saw all the unique flowers on that side and they were really attractive to her. My Dad was a harvester, and when you harvest, you look at the vegetation so that you can get an idea of what's available. Even though you might not see the animals, you know what's going to be available there. When you were talking about the discoveries you made of different plants, I was wondering if there is a possibility that there was hibernating or sleeping seed that were prompted to start growing once the temperature started changing up north here?

**Bruce Bennett, Department of Environment, Government of Yukon:**

That's a really good question. My work was a snapshot to see what's growing there now. The new plants I found were possibly overlooked or else in an area western botanists had never studied. Many of the plants I found there were abundant so it's likely they had just been missed previously. The plants I was finding were often Beringian, so they had moved over from Ivavik, along the coast. There probably is some eastern movement as well. I didn't see anything unusual that seems to be germinating out of a seed bank. The great big yellow mastodon flower you see growing on fresh slumps do appear after a slump event. The seeds wait around and then begin to grow after a slump occurs. There are certain plants that are adapted for that. I didn't see anything extremely unusual. It was a baseline study that contributes to monitor change.

**Randall Pokiak, Tuktoyaktuk:** Steve, when you are studying erosion along the coast do you compare the ice bulldozing the shoreline along the North Slope and with the storm surges? Because as a trapper and a harvester, when you're traveling along the coast, you know there are a lot of changes caused by ice movement pushing and bulldozing its way through sand spits and the banks. Do you compare that with storm surges when you are studying the shoreline erosion?

**Steve Solomon, Natural Resources Canada:** We make note on the beaches when there are signs of ice push events. But one of the problems is that these kinds of events usually occur – the ice push events in particular – when we're not in the field. They may be occurring during the early part of the break-up and during the wintertime when the ice is moving, especially west of Herschel. In parts of Alaska, where there is a lot of interaction between the coast and the sea ice, it has been postulated that sediment is being bulldozed off the inner shelf and the very near-shore areas and pushed up onto

the beach. There are actually some places where it looks as though ice processes might be building up islands from the seabed. It's a process that we know goes on along the North Slope, but we're not completely sure about the intensity of those processes and how important they are, relative to the storm surge and the erosion. The fact that the erosion seems to be dominant and that wider beaches aren't being built suggests that the erosional processes are probably more important along most of that coast than the constructive processes of ice.

There is a very significant gradient in the intensity of ice processes as you move from the delta to the west. West of Herschel Island, the ice regime is very much like it is along the Alaskan coast. East of Herschel, there are quite a few differences such as the amount of land fast ice and the amount of ice movement. I don't know if that plays any role in terms of the botany, for instance, or the benthic habitat, but there are certainly variations in terms of the importance of those kinds of activities as you move along the coast.

**Frank Pokiak, Inuvialuit Game Council:** Last year we had real extreme thing happen. We usually get these big storm surges with a lot of high water in the fall time in Tuk. But last year for about two to three weeks, we had the lowest water we have ever seen. All the elders in Tuk said they never saw that before. There were some places outside the point of Tuk where long ago there was a lake. The waters were so low that even that lake showed up. I just want to share that information because I think it's important to keep track of things like that. A lot of people are spending time out there just walking. You could walk way out on the ocean and see ocean islands that we never saw before. Why would that be? What is the cause of that? I took a whole bunch of pictures of the low water. In those pictures, you can see islands out on the ocean if you look towards the pingos.

**Steve Solomon, Natural Resources**

**Canada:** I think most people in Tuk know that what was really weird was the amount of southerly and easterly winds that blew for weeks on end. When you get the offshore winds, you get lower water. That was a really unique situation. The Tuk tide gauge was reinstalled in 2003 so we have a record to compare to the other times and can relate it to the strength of the wind. Comparing the physical measurements with the observations is really an essential part of these kinds of monitoring programs.

**Plenary Session: The Environmental Management Framework in the Northwest Territories**

**John Donihee, 2007 Yukon North Slope Conference Chair  
Introduction of the Speaker**

Our plenary speaker today is David Livingstone. David is the Director of Renewable Resources and Environment in the Yellowknife office of the Department of Indian Affairs and Northern Development. David was born in Red Lake, Ontario, grew up in mining communities in Ontario and British Columbia. He holds a Bachelor of Science in Geology, from UBC, and an MA in geography from Carleton University.

His directorate's mandate includes a variety of regulatory responsibilities for water resources, both onshore and off, in the NWT; development and implementation of environmental management programs, including the NWT Cumulative Effects Assessment Management Framework and Blueprint, the NWT Cumulative Impact Monitoring Program and Audit, the Interim Resource Management Assistance Program in the West Kitikmeot/Slave Study, Land Use Planning and the NWT Protected Area Strategy. I know David to be a man of considerable energy, and he's been working

out of the Yellowknife office for many, many years and has made an important contribution to the Northwest Territories environmental management framework.

**The Environmental Management Framework in the Northwest Territories - David Livingstone, Department of Indian and Northern Development**

David Livingstone  
Department of Indian Affairs and Northern  
Development  
P.O. Box 1500  
Yellowknife NT, X1A 2R3  
livingstoned@inac.gc.ca

I want to talk to you about what we are doing in the NWT and where monitoring fits in the broader context. I think it's really important to recognize where we've come from in the field of environmental management and, hopefully, set the path to where we want to get to. Years ago, I realised that we were dealing with conservation in a development context. Conservation follows development. It seems like we are always in the rescue mode. Development comes along and suddenly we realize we need to protect something so we scramble to do it. Or sea levels are rising so we scramble to protect the archaeological resources. We need to shift that thinking and that approach. That's what I've been trying to do over the last 10 or 15 or 20 years in the NWT - shift it so that we are putting development in an environmental management context. We need to get that environmental management context right first and then consider developments. We also need to ensure, to the extent we can, that developments provide the economic benefits and opportunities that we want for Northerners.

When Chris Burn and I first met at Carlton University. I was looking at development on the North Slope for my

Masters thesis. At that time, there was a lot of pressure from the oil and gas industry to develop offshore resources. There was also interest in building a deep water port at Stokes Point. I was working at DIAND in Ottawa at the time, and my daily job involved work in that area. I thought it would be interesting to look at how development might proceed if it really needed to – and I wasn't advocating that it should – on the North Slope. If this port was going to be built, then what were the safeguards that we could put in place to ensure that it was causing minimal harm? Among other things, I recommended that a national wildlife area be established. If there was a development, it could proceed in the context of that national wildlife area. That's certainly permitted through legislation. It's not necessarily a good idea, but it could be done to provide that extra layer – or several layers – of protection. It would ensure that if that port did proceed, there would be lots of additional scrutiny and protection.

Chris went on to be an internationally renowned scientist and I went on to become a DIAND bureaucrat. Then, about six years ago, Chris and I started to work together again. This conference has been addressing questions of how you integrate science into decision making. We've been doing that in the NWT for quite some time now. Chris provides the science, and I – and others – integrate that scientific information into our decisions. We also, among other things, try to ensure that Chris is able to provide the results of his science directly to decision-making boards, such as the Joint Review Panel.

In the end, those decisions are made by folks who are trying to do the best they can with the information they have. The information is never perfect or complete, but decisions still have to be made. What we need to do, in the context of environmental management, is carefully follow what is commonly called the "precautionary principle". There is no reason to defer a decision in the absence of perfect

information. You will never get perfect information. We need to make reasonable decisions in the context of what's the safest route to go if you're thinking about the environment, about conservation, and about protection. Don't defer them until you've got more information, because – with all due respect to scientists – they're always looking for more information, and they're always relatively uncomfortable saying, "We've got enough." It's never really works that way.

If we don't make reasonable decisions as we go forward, we are going to wind up in crisis mode that may force us to make radical decisions. Those radical decisions are not necessarily the best ones. For me, it's all about getting the context right, making reasonable decisions as we go forward and thinking about the environment first. In the NWT there is no shortage of development proposals and economic opportunities. People in the NWT are employed to the extent they want to be. Anybody who wants to work in a diamond mine can work in a diamond mine. Anybody who wants to work on the pipeline will be able to if the pipeline proceeds. I wonder, personally, whether that's truly responsible economic development. Maybe we should be a little more patient, a little more thorough and set the context properly before we launch into the development of another resource that might lie in the ground. Maybe we should take a bit more time while Northerners prepare themselves properly to really maximize the benefit from it.

I want to talk about the Cumulative Effects Assessment and Management (CEAM) Framework and how that has blended into what is now referred to as the Environmental Management Framework (EMF). Richard Binder and Norm Snowshoe were both involved in the development of this framework. They worked a lot on the project and continue to be involved.

Although there have long been concerns about cumulative effects in the NWT, the catalyst to focus on cumulative effects

management came when the diamond proposals came to the table. In addition to the three diamond mines, we've got the Mackenzie Gas Project on the table, raising concerns about the cumulative effects of the project itself as well as the opening of the basin to more development. In the past, the amount of development in the NWT has been pretty sporadic and scattered. So, cumulative effects weren't a real concern until recently.

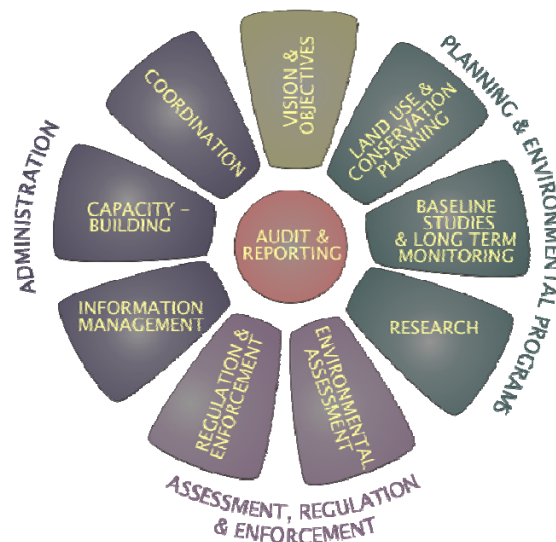
We recognized that we had some pieces of an environmental management framework but not all, and those we had weren't well linked to each other. There was a need to define, develop and better integrate various components of environmental management. No one organization has the overall mandate for cumulative effects management, but everyone has a role. In the NWT, the Mackenzie Valley Resource Management Act and the Inuvialuit Final Agreement have created co-management bodies and resource management boards that, in many ways, have more responsibility than DIAND. So, it's not about DIAND, it's not about the Mackenzie Valley Environmental Impact Review Board, or a land and water board, or a land use planning board. It's about all of us working together in a co-ordinated environmental management framework to deal with common issues.

Following the Diavik Diamonds Mine project, ministers of DIAND and Environment Canada committed to developing a CEAM framework for the NWT that would provide a context for future projects. In December 1999, we had a large workshop and established a steering committee. It was funded by Environment Canada and DIAND to ensure broad representation. Representatives of all the aboriginal governments in the NWT, the Canadian Association of Petroleum Producers, the Chamber of Mines, the NGO community, as well as federal and territorial agencies sat around the table. We agreed on a couple of pre-conditions. One pre-condition was that this framework, whatever

it looked like, was not going to be binding. We weren't going to try to impose yet another layer on governments or agencies, because we knew that if we started on that foot, it was going to be really difficult to get to where we needed to be. Instead we agreed that the group should play an advisory role.

We thought that it would be easy to pick up a model from some other jurisdiction that had developed an environmental management framework. We were surprised to find out there weren't any. We decided the first step was to define what we meant by "an ideal framework". Once we'd done that, we had the opportunity to compare it to what we already had in place in the NWT, identify the gaps that needed to be filled and the linkages that needed to be made. We also had to identify who would be responsible for what. That took a long time to work out.

The Environmental Management Framework for the NWT has nine components:



**VISION & OBJECTIVES**  
 Vision and objectives: As the saying goes, if you don't know where you're going, you'll end up somewhere else, and that somewhere else may not be

where you want to go. The difficulty is defining where we want to go on a territory-wide level. The vision doesn't provide much detail but the purpose of the exercise and the principles are clear. Fundamentally, we want to ensure that we have the best information available to make decisions. The best information requires that we draw on both traditional knowledge and scientific knowledge. We are not looking for perfect information because we'll never be able to get it.

The vision is: "Responsible economic development within a sound environmental management framework".

The purpose is to facilitate:

- mechanisms to make well-informed decisions about the environment and human activities;
- systematic and coordinated approaches to cumulative effects assessment and management;
- common principles and links between environmental management processes;
- improved certainty, clarity, efficiency, transparency and accountability of processes at all levels, and;
- development and application of traditional and scientific knowledge.



Coordination: This is a big component of this. It's also one of the biggest gaps. As I've said, the steering committee was composed of a wide representation including Indian and Northern Affairs Canada, Environment Canada, GNWT; Aboriginal governments; Canadian Association of Petroleum Producers, NWT Chamber of Mines and environmental NGOs. The implementation of this framework is guided by the blueprint. We annually update the 52 recommendations in the blueprint to track our progress. All stakeholders involved in this have a responsibility to implement recommendations for which they are

responsible and have agreed to do what they need to do in accordance with the blueprint. In some cases the implementation has been good, in others weak. This is not a perfect thing - it's evolving. I don't want anybody to leave this room, thinking that we've figured it out, because we haven't.



Land use and conservation planning is another key component. There are several land use plans in the place in the NWT such as the Gwich'in plan. There are community conservation plans in the ISR, as well as a number of existing conservation areas. The NWT Protected Area Strategy, which we modelled after the Yukon's strategy, is alive and well. We also have got a five-year action plan for the Mackenzie Valley. It's a reaction to development, but we're working hard to implement protection for the areas that have been identified. That means the pipeline would proceed in the context of that conservation area or those conservation areas. Interim land withdrawals in the Deh Cho also form part of this.



Baseline studies and long-term monitoring are a key component of any environmental management framework. There are lots of studies going on, such as compliance and effects monitoring conducted by industry and long-term and regional monitoring and observations conducted by governments, regional Aboriginal organizations and communities, but they are often disconnected.



There are lots of research programs being conducted in the NWT by governments, regional Aboriginal organizations, communities, industry, environmental NGOs, and public and private institutions. There is a lot of money available for research but it's not well integrated and it doesn't necessarily draw on the incredible capabilities in the

communities. We need to do a lot more work on thresholds, indicators and carrying capacity.

I was at the Inuvik Caribou Conference last week and we heard time and time again about the need to monitor, do research, and develop baseline information. In the NWT, we don't know how many caribou are being harvested from most herds.

We use the phrase environmental management a lot, but we're not managing the environment. We're messing with the environment. In my view, we don't manage the environment well, except in very isolated circumstances. We need to do a lot better job of managing people and the human activities that impact the environment. Last week, in Inuvik, we heard time and time again that it's not the caribou we need to manage; it's people we need to manage. The essence of environmental management is people management.



Environmental assessment is a key component when it comes to dealing with projects in the context of environmental management. There are a number of mechanisms to deal with the projects such as the screening and review boards in the ISR.



There are lots of regulations and laws in the NWT. It's not a regulatory vacuum. Last week, we heard a lot about the need to improve enforcement when it comes to caribou, the use of caribou, the reduction of waste, the over-harvesting and so on. It's a capacity issue, as much as it is a regulatory one. It's a capacity issue on the side of the enforcement officers and agencies.



We've got lots of information but it needs to be better integrated. It needs to be more available to users so

that we don't end up reinventing the wheel. We want to be able to make decisions based on the best information we have. There are lots of opportunities to do that. The irony is that we just keep building these information towers higher and higher. We don't build them laterally as much as we need to. We started with databases, and then, meta-databases, and then, warehouses. They all seem to be steps in the right direction. But we're just building these towers higher and higher and not necessarily building the linkages to the users and the people who really need that information. We need to do a lot more work in that area.



Capacity building is near and dear to my heart and I think to just about anybody who lives in a small community. We need to ensure that the folks in the communities throughout the NWT are fully involved in decision making. The best way to ensure that traditional knowledge is part of the decision making process is to make sure that the holders of that knowledge sit at the decision-making table. But most folks in communities are as busy as they can be and then we ask them to do something else, or we come and consult with them. Consultation overload is a big problem. I'm busy, but I'm not nearly as busy as I think many of the people in the communities are. The capability is there so we've got to start working to ensure that the communities have the capacity to get engaged and stay engaged to ensure that decisions reflect their interests, their visions, and their views. There are a number of ways to do that.

We can use the programs we have, like the Cumulative Impact Monitoring Program to build capacity as we go forward. We've got an opportunity to ensure that these cumulative monitoring and research programs that we are funding build capacity as we go, so that in time, the communities won't be just helping the researchers. The communities will be the researchers. We need to be drawing on the communities,

putting the communities in a leadership role, and supporting them, especially in the environmental management area. It's a bit of a challenge for many scientists and many academics. I think we've got that opportunity, and more importantly, I think we have that obligation to break the mould and move forward, to ensure that the communities are fully engaged, that they're designing the programs, conducting the programs, reporting on the programs and that they've got the support of the scientific community and academic community in that process.

I'd like to talk about briefly about the NWT Environment Sciences Centre. One of the ideas that we've had is that research capacity in the NWT needs to be enhanced. There's an economic opportunity here as well to ensure that research is done in the North, by the North and for the North. To do that, we need the capacity on the science side. We need to ensure that we have facilities that will enable us to integrate traditional knowledge and western science in a way that enables us all to move forward and links the knowledge holders. There are several ways to approach that, but in the NWT, we're thinking about a science centre that uses a hub and node model. That's in the IPY proposal.

Taiga Environmental Lab is an analytical lab that has apprenticeship and training programs for aboriginal people in particular. They're too short and too infrequent, but it's one way that we have been able to start to introduce the notion of applied science to young people in the NWT in a friendly way that's not intimidating. It has been pretty successful for us and we need to do more.



In the NWT, we have an audit requirement built into the *Mackenzie Valley Resource Management Act* (MVRMA). At least every five years, we are required by law to conduct a periodic audit of the state of the environment and the state of environmental

management. We completed the first one in 2006 and are working on responding to the 50 audit recommendations. We also have regular audits by the Auditor General. Not too long ago, we also had one that looked at the state of environmental management from the economic development perspective. There was some overlap between the two audits, but some real differences, too - a difference in tone, a difference in flavour. It was encouraging for me to see that there was some overlap. The MVRMA audit indicated that the regulatory regime is working quite well from an environmental management perspective in the NWT. In the NWT, we are very aware of development creeping north from Alberta. We don't want that in the NWT. We want development done in a way that meets the needs of residents in the NWT. This audit pointed out, that in fact, despite the criticisms you often hear, that we're not far off developing and implementing that vision. We've got a lot more work to do, but the land claims and the MVRM have enabled northerners to really take on decision making in a way that is much improved over past years.

A Regional Plan of Action (RPA) provides a cascading level of detail from the broader generic framework. These plans 'customize' the Cumulative Effects Assessment and Management (CEAM) framework for each region, and are driven by the needs of the regional Aboriginal organizations. We've completed an RPA for the area north of Yellowknife to Coronation Gulf that we call the Slave Geological Province. A Beaufort Sea Strategic Regional Plan of Action is being developed. A plan has been approved by the Deh Cho First Nations that now rests with federal and territorial governments.

The blueprint is advisory. It's been endorsed by all parties that were involved in its development. It's been approved by the federal and territorial governments, as well, and it's incorporated into DIAND's internal management system. It is the first time we have gone that far in entrenching an environmental management framework in a

government agency. Implementation is a challenge, but the fact that a department has accepted the blueprint and built it into its own accountability framework is shows significant progress.

INAC has a lead or shared lead responsibility for implementing roughly half of the Blueprint Actions. Key responsibilities include:

- providing funding and expertise for land use planning
- implementing the NWT Cumulative Impact Monitoring Program
- filling gaps in baseline biophysical information
- advancing the social, economic and cultural aspects of monitoring
- developing consistent monitoring protocols
- developing a cumulative effects research plan
- implementing Part 6 audit recommendations
- reviewing and supporting community capacity needs
- developing intervener funding programs
- clarifying transboundary review processes
- encouraging scientific/technical training and mentorship
- building capacity for social, cultural and economic cumulative effects assessment
- reviewing/refining the vision
- providing support for ongoing Blueprint implementation
- facilitating the development of Regional Plans of Action

We're making good progress on most of them, but not all of them. Funding is always a challenge. But the commitment, by and large, is growing stronger. Overall I am pretty optimistic. Hopefully, what seems to be a renewed interest by Canadians generally in environmental management will allow us really think about the environment

first, and then, place development in that context.

The Blueprint recommendations fall into four categories: baseline studies and monitoring; research coordination and capacity building. These include implementing the NWT Cumulative Impact Monitoring Program, developing a cumulative effects research plan, and annual CEAM Gathering of NWT resource management decision-makers to review progress in implementing Blueprint

We have the blueprint, the framework, and the regional plans of action. It's a comprehensive approach, but not a complete approach. It's not being implemented 100 percent in all areas. However, it is a document that gives us a road map to get from where we are to where we think we need to be. It's a living document. We review it every year. I think it's a helpful tool. I think of it as a toolkit that has a number of tools in it. It's got some instructions for some of them. For others, the tools have yet to be created, but we think we know what we need, and we think we know, generally speaking, how we need to get there. So, if we all continue to work on it in the NWT, and with our partners across the borders, I think we can get to where we want to be with a healthy economy, a healthy environment, and healthy communities.

I don't like using the phrase "sustainable development", but the intent behind that phrase is where we're trying to get to. We all want jobs for our kids, and in many cases, jobs for ourselves. But we want our kids to be able to enjoy the reasons that we came north in the first place and that keep us living in the north. I go caribou hunting. It's a really important part of my life, and I want my kids to be able to do that, too. They have been out there with me. The youngest was four months old when we flew up to the tundra and camped. I've been doing it for 20 years. My oldest boy is 19, and he's probably gone caribou hunting 15 years of

those 19 years. I want my kids to be able to continue to do that. I want them to be able to drink the water and walk the land and enjoy things the way we enjoy them; even better if that's possible. But they also need jobs. Our kids and their kids will need employment; and I think that we can do it. I think we can have both. I think we can have the best of both. But it takes will and it takes commitment, and it takes patience and persistence.

I've been doing this kind of work for a long time. I've seen what happens when government and people didn't pay enough attention to the environment. It cost hundreds of millions of dollars to clean up the mines in places like Elliot Lake or the PCB contamination on Resolution Island. Those are mistakes that we didn't need to make and sure don't need to repeat. We'll probably make new mistakes but let's not repeat the mistakes of the past. Let's work with industry and environmental organizations to come up with a better plan, a better roadmap, a better vision than the one that we've lived with in the past. The optimistic side of me thinks we can do that.

The caribou will test the NWT's commitment to sound environmental management. I was encouraged last week at the Inuvik conference when people agreed that we can't be pointing fingers at each other or blaming one party or another. It's all of us -as individuals, as representatives of agencies, as members of society. We're all responsible. We're all accountable. We all have to take on that role and work together because I sure don't want to leave a legacy of no caribou. I don't want the only caribou that we have available to us to be in domestic herds or in zoos somewhere. It's the same for the water and all the other resources - in the NWT and for the rest of Canada. I don't think any of us wants that kind of legacy. We have that opportunity, each and every one of us, to ensure that we avoid that problem- individually and collectively.

## Questions, Comments & Discussion

**Richard Binder, Joint Secretariat:** I want to add to some of the comments that David mentioned about the CEAM and CIMP Programs. I think they are really important initiatives. They are going to become especially important when we eventually decide to set the thresholds for developments in the north. Even though the CIMP Program is a product of the MVRMA and it doesn't apply to the Inuvialuit Settlement Region, I think it's really important that the Inuvialuit are involved, because we are, in fact, the end recipients of one of the largest river systems in the world. Anything that happens upstream can certainly have a negative impact in the delta or Beaufort Sea. No single agency is going to be able to address a cumulative effects assessment alone. We all have to work together and resolve this issue.

**Norman Snowshoe, Gwich'in Tribal Council:** Further to what Richard was saying, I think one of the problems with implementing these programs, the CIMP and CEAM, is lack of federal funding. The atmosphere in Ottawa right now is pro-environment, so I was just wondering are we going to be taking the initiative to go down there and try and seek some of this funding before IPY and all those guys get a hold of it?

**David Livingstone:** I'm always bugging people in Ottawa and elsewhere about the money for the monitoring program. It's incredibly frustrating to have a monitoring program that is a constitutionally-required program that we still haven't been able to implement it. I am going to be reminding them again and again and again, and I will use every opportunity I have to encourage other folks to remind those decision makers that we need to get on with this program. Ironically, it's one of those programs that provides a foundation for responsible development. It sounds like everybody wants responsible development, so why is it that we're having such a problem getting

funding for this particular monitoring program?

**Lorraine Peter, Old Crow:** My heart just races every time we talk about information like this. We've heard in the last few days about the impacts of climate change and the effects that it has on the land and animals that we depend on for our way of life. I sit and listen about the work that you've been doing in the NWT and I envy you. I wish we had a government in place in the Yukon that had that kind of political will. The environment and climate change are finally on the radar screen for the Federal Government, and I am hoping that trickles down to the Territorial Government here in the Yukon. In order for us to take responsibility to address some of the changes and the effects that we're seeing here, I would encourage all the people in this room to make sure you put pressure on our own governments to take some responsibility and to move forward to make some progress in those areas. It's very important. I have a five year old granddaughter. We've traveled to Washington D.C. on many occasions, and I know what it's like. I've experienced firsthand what it's like to sit across from someone who has no understanding whatsoever of the kind of lifestyle that I lead. We face that same challenge in our own back yards. I think, that we all need to take responsibility and talk to our leaders about how important this is for us.

**Burton Ayles, Fisheries Joint Management Committee:** My experience with audits is that they tend to focus on process and programs. One of the things that you might learn from is a conference held every two-to-three years to report on what's happening to the Great Lakes. We talk about monitoring programs and report on indicators in a consistent way. It's a public conference, so it gets a lot of attention. It means every three years, the governments of Canada and the U.S. and the state and provincial governments reports on their work and everybody has a chance to see

what the results are. Everything is kept in front of the public and they can see where the progress is being made. It keeps the scientists and the managers focused on the results, rather than on the meetings. It's something you might consider for the Mackenzie Valley, for example, is a state of the river report.

**David Livingstone:** That's a really good idea. We have an annual Science and the Changing North Conference in the NWT. The next one is in Yellowknife at the end of April. We could think about having a state of the environment report as the focus of that conference every two or three years.

**Jennifer Lyon, NatureServe Yukon:** NatureServe Yukon is the branch of the Yukon Government that is responsible for recording rare plants and animals. It's a conservation data centre. For some time, we have been trying to create this massive database - "towers of information". That's what struck me when you were talking. We are trying to make sure that the information is transferable through North America. NatureServe is a large organization, and we want to make sure that the information can be used. Can you speak further about getting the data out to the users?

**David Livingstone:** We have teamed up with NatureServe Canada in the IPY proposal which would see NatureServe Canada providing the information management component of the Science Centre in the NWT. That's one way. The hubs and nodes model of the Science Centre would act as both a feed and a dissemination tool to enable folks in the small communities. For example, land and environment committees would be nodes plugged into north and south hubs- probably one in Inuvik, and one in Yellowknife. The flow of information would be enabled that way.

We try to use the web as much as possible to ensure that people know what information there is. We're working on trying to develop

a kind of a one-window approach to research and monitoring in the NWT. Part of the problem now is that you find out where the information is through an Internet search or from somebody who tells you where it's available. There is no user-friendly system in place where someone can go to find the state of knowledge in a particular geographic area in the NWT. We're trying but it's been difficult. People who build towers are really defensive of those towers and the catwalks between them aren't terrifically well supported. We recognize the problem, and we've got enough like-minded people in the NWT who will hopefully come up with something that works better than the current model. There's no one easy solution, that's for sure.

**Jennifer Lyon, NatureServe Yukon:** The broader NatureServe database is really a model that was created in the south. So, we are struggling with how to make it work here. We do need to think North America-wide, but we need to figure out how capturing the proper information is best done in the north. That's something you may encounter.

**Evelyn Storr, Aklavik Hunters and Trappers Committee:** You have something there that seems to be good, but I don't know how many of the groups in the communities have seen this document and, in the annual review, if you will take comments from us to see if it's working at the community level. It may be working at the territorial level, but communities need to give feedback on something like this. So, my question is: What's the plan for getting feedback from communities when you are doing your annual review?

**David Livingstone:** The essence of it is that we don't do it very well. It's an annual review of the blueprint, the action plan. We meet in Inuvik or Yellowknife or Fort Simpson or wherever. We try to meet in the communities. It's a public meeting, but the people who attend are representatives of organizations. We haven't gone far enough

yet, in terms of inviting representatives of the 28 communities in the NWT. It becomes really costly to bring people to a meeting like that and finding funding is a challenge. So, we rely on the representatives of the organizations to try to get the message back and to get the message to us.

When we get the monitoring program established, it will be administered by a steering committee made up of representatives of the organizations, the aboriginal governments, and the federal and territorial government. We need to build in much stronger linkages to the communities. If we are going to enable the communities to take the lead in these things, we've got to do a much better job of getting them involved in the first place. The communities need capacity and we can't be doing these kinds of programs if the communities aren't engaged. So, the short answer is: We're not doing it very well, we need to do it better; but we recognize the problem, and we'll try to do it better.

### ***Communication Workshop 1: Understanding Your Audience***

Michelle Sicotte  
Wildlife Management Advisory Council,  
North Slope  
P.O. Box 31529  
Whitehorse, YT Y1A5T6  
wmacns@web.ca

Andrea Hoyt  
Fisheries Joint Management Committee  
P.O. Box 2120  
Inuvik, NT, X0E 0T0

**Michelle Sicotte:** Andrea and I are going to address the issue of understanding your audience. Sheila Nasogaluak from the Joint Secretariat was supposed to participate in our session, as well, but she had to return to

Inuvik. Sheila works with the Community Support unit at the Joint Secretariat and has provided a lot of information in this presentation.

The important thing to remember about the monitoring we do on the North Slope is that it should, in some way, assist us in achieving the key values entrenched in section 12 of the IFA - the conservation of wildlife, the conservation of habitat, and traditional Inuvialuit use. You shouldn't underestimate the value that good communications can have in achieving those goals. As one of the speakers mentioned yesterday, the sharing and communication of data and results builds trust between all of us, and it makes it easier to come together and make some of the hard management decisions that we're all talking about. Over and over we hear that the communications component of our activities needs improvement. That's why we put together these communication workshops.

There's no simple way to do good communications. It takes a lot of time, a lot of resources, and a lot of practice. Knowing your audience means knowing who you are talking to, what do you want them to know and what information do they need. We are going to try to focus our presentation on the community as an example of a target audience, as much as possible.

**Andrea Hoyt:** Everyone here communicates to a number of different audiences. We are all members of different audiences as well. I want people to stand up if they communicate with co-management bodies; community organizations; community members; the research community; governments; industry; youth. (Audience members participated by standing as appropriate)

**Michelle Sicotte:** All of those groups are really different. A lot of us represent different groups and we're all communicating to so many different people. But I think what everybody has in common is that in general we are overwhelmed with

information. This information overload puts all of us in a situation where often we are competing with each other to get our message out and understood. So to be effective, you need to be really clear about what the message is that you're communicating. You shouldn't expect your audience to have to work to figure out what information you're trying to share. You should be giving it to them really clearly. People have so much information coming at them. It's your job to be clear and concise.

We've established that we are communicating to lots of different groups. The next question to consider is why we are communicating. You could be looking for project support or for funding. You could be reporting your research results to the community. You could be asking for assistance or saying thank you for the community's support and assistance. In some cases, you could be hoping to persuade people to take action. You want people to do something with the information that you're giving them.

It's also important to be clear – to yourself and your audience- about your own expectations before you start your presentation. Ask yourself what are the objectives of the communications. Before you begin you have to think about what audience you're communicating to. You need to know exactly what you want to leave with, exactly what you need to know from your audience, and exactly what you want to share. Tell your audience your expectations at the start. When you have that clarity, you have more control over what's happening and in the end you more often get what you are looking for.

**Andrea Hoyt:** Sheila and I have done a lot of meetings in the Inuvialuit Settlement Region and these are some of the pointers that we thought were important. First, it's really important to plan ahead. That means doing some research into the area. How well do you know the region? For example, when you go to the public meeting in

Paulatuk, you don't refer to the RRC – the Renewable Resource Council. In the Inuvialuit Settlement Region they are HTC - Hunters and Trappers Committees. By doing a bit of research about the community ahead of time, it really helps the community to feel comfortable with what you're saying and it will be easier to connect with the audience.

It's very helpful to know what your audience already knows. For example, if you are presenting to people who have heard this presentation – or similar presentations many times, you might not need to go back and explain concepts or finding all over again. In contrast, if it is the very first time your audience has heard anything about the topic, you might have to give some really basic background.

In my personal experience, I have found that the time I spend visiting with community residents is probably the most valuable time I spend because it helps me know the local situation better. It is also a really good way to check whether I am using the right language and whether I'm able to explain things clearly. When you're sitting across from somebody and explaining it to them, and you have their body language to respond to, you can tell whether or not your message is getting across. But when you are in a big room like this, and all you see is a sea of faces, it's kind of hard to tell whether or not what you're saying is being understood. Going to a community a few days ahead of time is really useful. But even if you go only go the day of the meeting, spend some time trying to find out what's going on in the community.

If you've prepared some material, like a presentation or some speaking notes, it can be really helpful to go over those with a community member. It's nice if it's someone you know well so they can be really honest with you. Make sure that it makes sense to them, because that is who you are trying to communicate with.

It's also really important to be aware of the physical space you are meeting in. Is it a small room, or a big room? Do you need microphones? Do you want the chairs arranged in a circle, or do you want everyone stacked up like this? Spend some time there and be ready to adapt to a different space. Maybe the building you were planning to meet in is double-booked, maybe you have to change your timing, or maybe you have to go somewhere else. Maybe it's a spectacularly beautiful spring day and people are only willing to meet outside. Be ready to do that. You also have to be ready to respond to the community's needs. For example, if there is a death in the community or something else comes up at the last minutes, you have to be ready to change your plans to meet the needs of the community. They have to be ready to receive the message for your communication to be successful.

To know your audience also means making sure that you speak the same language. For example, we in the ISR talk a lot about how the HTCs and FJMC and the WMACs work together. These are acronyms that other people can't understand. In the Delta, people use terms like kickers and waveys, and terms that some scientists might not understand. And then scientists use terms like “exogenous”, and all kinds of other things that the community members might not understand. And it's not that there's a problem with any of those terms; it's just that you have to know who you are talking to, and use the right terms for the audience. Be ready to see the blank looks on people's faces and if you do try to clarify what you were trying to explain. It's the same thing when you use analogies. You really have to know your audience, because when the Mackenzie gas project comes up north and they try to describe the size of something, they often say: “It's about the size of three football fields”. No one knows how big that is. Comparing it to the size of a hockey rink is better.

Sometimes charts and graphs are very helpful in giving a visual of what you are trying to explain. If you have to use you have to simplify them so that they only show what you need for people to understand. Get rid of any extraneous information that clutters up the slide. Everyone is fond of putting photographs in their presentations because it gives people something to look at. You have to be careful with the photos you use. Photos of people in the community can be distracting. Sometimes landscape photos are best.

Taking the time to answer questions can help engage people in what you are talking about and clarify what's being said. When you're crossing audiences – say going from government to a small community – there are some things you have to take into account. For example, it's pretty acceptable in a scientific conference to say, "Please hold all your questions, and we'll answer them at the end." In a community meeting, that might not be the best way to go. If people have questions two minutes into the presentation that aren't answered, by the time you get to the end you might have lost them entirely. You have to be ready to roll with what's going on. Allow the speed of your presentation and the questioning to be appropriate for the audience. People need a few minutes to think about what their question might be. When you ask if people have any questions you have to step back and let two minutes pass while people process the information. It's difficult, but it's a really useful way to do it. The scientific community and government tend to go at a fairly quick pace, but community members often need a bit more time for things to sink in. You have to allow that to happen.

Written material can be very helpful for community members as a backup to what you're saying or as a source of more details on the topic. But if you give it out at the beginning of the presentation, it can be hard to get people's attention when they are reading as well. Some material can be sent

ahead of time to allow people to review it, or you can hand it out at the end of the meeting and tell people to contact you if they want more information.

When you get to the end of your presentation, ask for feedback so that when you return you will have a better idea of what works for that community. Some communities will want to run the meeting themselves or they will want you to work around the bingo. You can't just have one template that works for all communities, but with more experience you can do a better job each time. It's very helpful to use the resources in the community: Call the HTC, or the RRC, talk to the resource person to see what they have to say.

### Questions, Comments & Discussion

**Lindsay Staples, Wildlife Management Advisory Council, North Slope:** I have one question that I think many of us in the room can relate to. Communication implies that you've got someone to communicate with. So often, you call a meeting and nobody comes. This has been especially true over the last 10 years when people have been asked to go to so many meetings and they've had enough. Do you have any suggestions for getting people to the meeting hall?

**Andrea Hoyt:** One strategy I have used is to book my meeting on a bingo night and then ask the people running the bingo to delay the start. They will go on the radio and say, "There's a public meeting, so bingo will be at nine o'clock; but you can come down to the community hall at seven for a public meeting". That works really well. You can try putting up lots of signs all over town or you can go to the community a week ahead of time to promote the meeting. You need to let people know what you are going to be talking about and the reasons it's really important to attend. You can't just have meetings to tick off a box on your consultation record. You have to have a meeting because what you're saying is so

important that if people don't know they're going to be at a disadvantage. You have to figure out a way to communicate the relevance of the meeting and the issue to the community. The best way is to do that a week ahead of time so that people can plan their lives around coming to your meeting. It takes a lot of work to send someone in ahead of time, but that's one good way to get the response you need. I have also hired little kids to take fliers door-to-door. It works well and it's pretty cheap. You can do a mail drop but the little kids are great, because they get really enthusiastic. You can offer door prizes or free bingo cards. Food is a good attractant. You can host a community feast, rather than just soup and bannock. Make sure you advertise well.

**Darcie Matthiessen, Climate Change Coordinator, Council for Yukon First Nations:**

One way that I found works really well is to hire someone in the community to organize your meeting. Hopefully you can find someone who understands the issues. If first contact is from a community member, it does seem to be more successful. It's a more community-directed approach.

**Andrea Hoyt:** And it isn't necessarily more expensive, because flying around a week ahead of time can be costly. Hiring a community coordinator for your meeting may be a more cost-effective way of getting your message out.

**Carol Arey, Aklavik Community Corporation:**

It's important that when you are working at the community level, you go at the community's pace. We have people calling the HTC and Community Corporation offices a couple of days ahead and say that they want to hold a meeting or they want to come to your regular board meeting. That's not possible because, even though we are small communities, we have a huge agenda to cover at our meetings. We don't deal with one particular item. We deal with many areas at the community level. You can't call our corporate managers or resource person and ask them to set up a

meeting or a feast or to find out which meeting rooms are available. You have to take responsibility yourself. You have to get familiar with the community.

I have also been thinking about communication with the community. You have to realize that the people who are sitting on these boards at the community level are reviewing the research application material for the research permits. I've been fortunate enough to come to this meeting to get feedback on some of those research projects that we either commented on or supported so they could get their permits. We let our members know that this type of research is going to go on, and then, after a while we wonder where the information is. Communication is really important, either through the office or through the leaders in the community.

**Andrea Hoyt:** One other way to get people out to your community meeting is to look at the resources you have in your group. For example, if you are a researcher and you had two community members as field assistants, talk to them. They know what you did and, presumably, they're excited about sharing it. If you are on a Co-management Board think about how your members can promote a community meeting. If it's an exciting issue it will get people out. You can also get on the phone and make some calls to individuals to let them know that there's a meeting going on. Encourage them to come. It's worked before.

**Lorraine Peter, Old Crow:** I want to add that there's always the issue of our language. We always encourage the Elders to attend the meetings in the community, because they share their knowledge and their vision for our people. That's why language is so very important. I always encourage people to provide an interpreter for the Elders. I try to encourage people to come to the meeting. One good tool is using our local radio station. I know for us, CHON-FM is a very good tool to provide information to the communities, because we're lucky enough to

have one of our own people on the air that speaks our language.

**Andrea Hoyt:** Fort McPherson also has a very active local radio station. If you have the chance to go to a community ahead of your public meeting and get interviewed on the local radio station, you can very quickly make everyone in town know what's going on.

**Graham Van Tighem, Yukon Fish and Wildlife Management Board:** In my experience, having a local contact is absolutely essential. Someone local can communicate with the people to let them know what it is that you are doing, how it important it is, and what you're trying to achieve. It's important to have someone who can speak the local language or know who does. It's also important to work with a person who has a finger on the pulse of the community and knows what else is going on in the community. We're visitors but a local person knows their community.

**Audience participant:** I think people are more likely to go to your meetings if they think it's going to be a good meeting. So many people give these very dry presentations or everything is technical. I don't like going to meetings like that either, so why do you think the people in the communities would? I think you have to build your reputation as somebody who provides good information in a way that it can be understood. Then people will want to go and find out what's happening. They're coming to a meeting because they want some answers or they want the information. It has to be your job to give them that information. They shouldn't have to be working for it or trying to figure out what that graph means. I think it is a question of building up your own reputation over time so that people remember that the last time they went to your meeting, they got their money's worth by going and listening to what you had to say. That takes lots of time. But I think there are some people that give great feedback and presentations, and those

people are a little more popular when it comes to meetings.

**Steve Baryluk, Joint Secretariat:** I worked for the community support unit at the Joint Secretariat for a number of years. I am with the Game Council now. When people ask me questions about working in the communities, I tell them they need to build a relationship with the community. If you are going in there for the first time, and people don't know who you are and what you're all about, you're not likely to have many people show up. But as Andrea said, if you can even go there just a day ahead of the meeting, talk to some people on the street and just tell them what you are there for, you will have a much greater success at getting people out.

Also, you have to make sure that people feel that they can have a meaningful contribution to what's being done at that meeting. If you're going in there to just spew out a bunch of information and everything is already set in stone, it's not very interesting to the people. Sure it's great to have that information, but if they can't have a meaningful input to effect change and shape the design of what you're trying to do to make it more relevant to what they're doing in their lives, they are much less likely to be interested. People want to have some input into your project design. You might be able to add something to what you are already planning to do to meet a community need or you can go there with a bit of an open book, saying, "I want to do a project on climate change. What does the community want to know? I can get some money to do a project on this topic. What are some interesting things that the community wants to learn about or get information on?"

Some researchers have started to take that approach and they are actually having quite a lot of success in the communities. Every time you go back, people know what you're all about. They know that they can have meaningful input that's going to result in getting what they want incorporated into

what you're doing. I'm not talking about just having a field worker or two involved in the project, but having the whole community help to shape what you are doing. Then they feel like they are involved in the work that's being done and that's much more likely to get them to come out and participate at a meeting.

Building the relationship is hugely important. The more you go back and spend that little extra time, talking with people on the street, phoning them up at home, going door-to-door if you can, makes a big difference, a huge difference. And, you will have more and more success, the more often you go back.

**Norman Snowshoe, Gwich'in Tribal**

**Council:** At the community level, the members are swamped with meetings and consultations. I keep bringing up the issue of community capacity. We all want someone in the communities to coordinate the meetings and put the information out to the people, but we don't actually do it. We need someone, a technical person, in each community to coordinate these meetings, explain the issues, and let the community members know why the people are coming. If you want meaningful participation, you need capacity in the communities. So, I'll bring that issue up again at this forum; and hopefully, somebody somewhere will provide funding to do it.

**Andrea Hoyt:** With IPY and all the different projects that are going to start soon, it will be helpful for the different groups and researchers to work together and find a good way not to overwhelm the community.

Another really good topic for discussion is how do you get the rest of the community out to a meeting? You may get 10 percent always coming to meetings, but what about the other 90 percent?

**Michelle Sicotte:** I really appreciate the questions and comments. I think most, if not all, of the people who got up and offered

comments are people who work for co-management boards and community organizations. That's an important reminder that we are here to help make those links and connections, and that there are so many people who have the experience. If you don't know the answer, there are lots of people around who can help guide you there.

**Communication Workshop 2: How to Give an Effective Presentation**

Sandy Hachey  
Aasman Design Inc  
201-402 Hanson St,  
Whitehorse, YT Y1A 1Y8  
Sandy@adiyukon.com

I am here today to provide you with some ideas about how to give an effective presentation. This includes your presentation planning, flow, techniques, as well as a bit about visual aids. To start, I'd like to call on a volunteer, to come up and join me for a second. Don't be shy, great, thanks. What's your name?

*Sandy is joined at the front of the room by a volunteer.*

I don't really have a task for my volunteer, other than for her to just stand here beside me to help illustrate a point.

**A note on fear:** Everybody is afraid to give presentations. There are always those butterflies in your stomach, and you are thinking, "I hope I can come across clearly and people are going to like me and give me what I want." You have shaky sweaty hands, blushing cheeks, maybe some memory loss, and you might feel sick.

**Remember:** Your audience understands. They've all been there. They've all given some kind of presentation, so they're going to feel empathy for you. The nervousness that you are feeling is usually invisible;

people can't really tell. Remember to just be yourself, act who you are, and don't try to be something that you're not. Start your presentation in your comfort zone. Tell your friends about what you're going to be doing. Get them to give you a little boost of confidence. It is very important to get to know the audience before you begin. If you don't have the opportunity to go to a community in advance, or call on someone that you might know in the community, take a few minutes before you give your presentation. If someone else is giving a presentation before you, spend a few minutes, walk around the room, introduce yourself, learn peoples' names, and get more comfortable. And, of course, remember to practice.

The reason I asked for a volunteer to come up here and stand with me is just to make her feel a little bit uncomfortable. The point I am trying to make is that even though you might feel uncomfortable, you might be nervous or afraid, still go ahead and take a chance. It probably won't hurt you but you might get something that is unexpected and something that is really great. So thanks to my volunteer for participating.

*Sandy hands the volunteer an envelope which she opens. There is a twenty dollar bill inside as a reward for 'taking a chance'.*

**What is an effective presentation?** It's audience-centred, it accomplishes an objective, it's fun for the audience, it's fun for you, and it's conducted within a specific timeframe.

**Why do we give presentations?** In their presentations, Andrea and Michelle gave you many, many reasons why we would give a presentation, but basically it boils down to two main reasons - you are trying to inform your audience or persuade them to do something.

**Planning your presentation:** First of all, you need to determine the purpose of your presentation. Ask yourself why you are there

and what you are trying to accomplish. Know your audience. Why are they there? What are they going to get out of your presentation? Take the time to understand their protocols. Be culturally sensitive to the community and understand what will work for them. That does mean doing a little bit of legwork and getting to know them before you actually present to them. Plan your space; know the room layout and where the light switches are. Make sure you know how to work all of the equipment that you are going to be using in your presentation. Know the date, time and place. Make sure that you show up on time, and in the right place. Plan your outline of your presentation. Determine the message, what are the main points, and the results that you hope to get.

**How to organize your presentation:**

There are a few different ways you can do it. Are you going to do something in date order? Is it going to be a sequence of events? Are you going to be presenting a problem and providing a solution or demonstrating a cause and effect of a certain circumstance? Remember- do you want to inform your audience or do you want to persuade them to do something? Maybe even both.

**Presentation outline:** Try to use keyword reminders. When you are doing your PowerPoint presentation like this, you don't want to write every single word on the slide. You need to be able to speak your points and have some flow. You want to make sure you're having a conversation with your audience and that you are engaging them, that you are flexible, and that you can be responsive. If you have an audience that is looking around the room or falling asleep or not responding to what you're saying, then you're not engaging them. Be flexible and make sure that you can do something that livens things up a little bit.

**Presentation construction:** To build rapport with the audience, you need to understand them, understand where they're

coming from and what they need. Your presentation should have a solid introduction, which conveys the main message that you're trying to communicate; the body, which is smooth flowing and relays the message in a logical order, and; a conclusion that reinforces the main message you are trying to deliver.

**Building rapport with your audience:** The audience should trust you. How does this happen? Basically, you start before you begin. As I mentioned earlier, take a few minutes before your presentation, work the room, go around, introduce yourself, and learn some names. Learn about the people who are actually there. People will listen to people that they like.

**The introduction:** Always introduce yourself. Tell your audience why they should be listening to your presentation. Get their attention and build more rapport. You can do that by using humour, tell a story or provide some kind of surprising statistic. That always gets people's attention. You need to clearly state your topic, of course. If you are informing, you are you need to outline your content and identify the timeframe that you are going to be presenting in. If you are persuading, identify the problem, identify who cares about the problem and then identify the solution. You also need to provide an agenda so the audience knows the sequence of your talk, and then, get the audience's feedback. It's always a good idea to ask the audience if they are comfortable with what you have planned.

**The body of your presentation:** Your presentation should have no more than three to six main points. If it's more than that, people get confused and lost, and then, they don't really remember anything that you said. In the body, you speak to a main point, you provide supporting evidence, and then, possibly back it up with some examples. Then allow time for feedback.

**Learning styles:** When you're presenting or asking for feedback, it's always good to take into account different learning styles. Adult learners can't sit still for very long. They get a little bit agitated, and want to get up and moving around usually after about 15 minutes. It's best if you can use different functions in your presentation to adapt to their learning styles.

I am going to ask for three more volunteers to come to the front and we'll do a little bit of an exercise. Don't be shy, could be something really fun.

*Sandy is joined by three volunteers who take a seat on the stage.*

I'm going to show you examples of learning styles by teaching the volunteers how to make a marshmallow caribou. The three main learning styles are: listening which is auditory, seeing which is visual, and touching, which is tactile. I am going to explain to our volunteers how to build this marshmallow caribou. And then, I am actually going to give them written instructions on how to do it, and then, I am going to get them to actually do it.

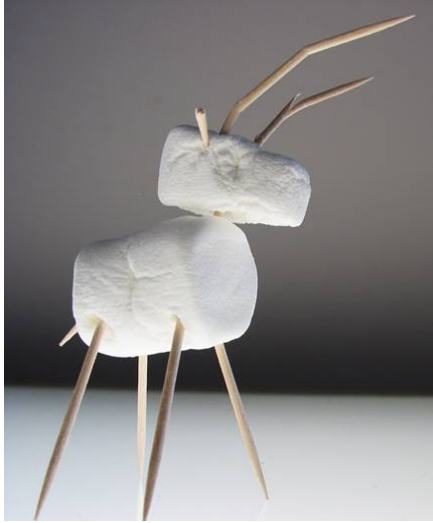
*Comments directed to the volunteers.*

Everybody should have one-and-a-half marshmallows and eight toothpicks in their bags. Before you start building it, I am going to give you verbal instruction on you how to do it. Then I am going to give you these written instructions. So, to begin, you need to take four of the toothpicks, stick them into the big marshmallow to make them into legs for the caribou. Then you take one of the other toothpicks and split it in half and attach the half marshmallow to the other marshmallow with that toothpick you already broke in half. Squish the half marshmallow to sort of shape it like a caribou head. Use the remaining toothpicks to make your antlers, your ears, and your tail.

These volunteers don't appear to be very auditory learners. Now I am going to give them written instructions to follow and they

will actually construct the caribou. They will learn how to make the caribou by actually practicing what they are doing. They have two minutes.

This is what the caribou should look like when it's finished. I think our volunteers did very well. Thanks to the volunteers for taking a chance. I really appreciate you taking the time to participate.



**Concluding your presentation:** When you conclude your presentation, you need to tell your audience that you are about to finish, summarize your main points, and give the audience something to remember. This is also a time to offer to answer any questions.

**Guidelines for answering questions:** Prepare for questions. Try to anticipate what the audience is going to ask. When they do ask a question, make sure you understand the question. That might mean repeating back the question, or paraphrasing the question so that it can be stated in a different way to promote better understanding. Plan your answer, and be honest. If you don't know the answer to a question, say so, but also say you will find out and get the information to them. Make sure you actually do it. Another thing that works well if you don't know the answer is to draw on the audience itself. Perhaps there are people in the audience who are experienced and might

be able to answer the question for you or help you in some way.

**Presentation techniques - Style:** There are four things to remember about style when you are giving your presentation.

- **Voice:** Remember your voice, its loudness and pitch. Don't stand at the podium and talk in a monotone voice and expect people to remember what you're saying, because it's really boring and they're not going to. Allow for some pauses in your presentation.
- **Body language:** Make sure you try to maintain eye contact with your audience. Use gestures in your presentations. People talk with their hands all the time. Make sure you have good posture. Remember the need to understand your audience to make sure that you are being culturally sensitive. If eye contact isn't appropriate, don't do that.
- **Appearance:** Dress appropriately. Be clean and presentable.
- **Use of space:** Make sure that you can see everyone and that everyone can see you.

**Common distracters:** Using verbal filter, such as words like "ah, um, like, hm, uh" can be real distracters. If you are swaying or rocking on your toes people can't hear what you're saying because you're moving back and forth and away from the microphone. If you pace back and forth, they will be distracted won't understand what you're doing. Don't put your hands in your pockets. No lip smacking, or chewing gum, or fidgeting, or not focusing on your audience. Sometimes it's hard to yourself and what you're doing in your presentation, but try to remember that what I have just mentioned can distract your audience.

**Presentation tips:** Smile with your audience. Make them feel comfortable. Remember to breathe. Lots of times people

get up and do their presentation and they start talking too fast because they're really nervous. Just remember to take a breath, even if you have to take 30 seconds. You can say "one moment", and have a drink of water. That gives the audience time to absorb what you are saying and gives you a second to compose yourself. Refer to notes that you made for your presentation – that always helps you – and remember to finish on time.

**Visual aids:** Why do we use these? They enhance the understanding of your presentation. They add variety and they support any concepts that you are going to be speaking about. Examples of visual aids are PowerPoint, overhead transparencies, graphs and charts, pictures, films or videos. Flip charts can be used to make notes of what you're actually speaking about, drawing sketches, and getting audience participation. It's always great to get them involved.

**Visibility tips:** Proofread your presentation. Really try to make sure that you don't have any spelling mistakes, because that is also distracting and it could make you look a little silly. In a PowerPoint, highlight key words in your presentation, and then, speak to those key points. Make sure that it's clean. Titles of presentations should be between 38 to 44 point font size, and the text should be between 20 and 28 point font size. Definitely don't use font smaller than 20 because the audience will not be able to see it. Try to make sure the slides are appealing to the eye. Use contrasting colours in the presentations and minimize distractions. Don't use more than two different styles of fonts. Graphics or flash media they tend to detract from the message that you're trying to deliver.

In conclusion, the three main dos are:

- Get to know your audience before you go to the presentation

- Spend the time to prepare - for every 30-minute presentation that you do, it takes approximately 40 hours worth of work to prepare.
- Practice, practice, practice.

The three main don'ts are:

- Don't forget your audience. Always try to engage them. It loosens up the crowd, and opens them up to be receptive to your presentation.
- Don't be late.
- Don't panic. Just remember to breathe, and it will be okay.

### ***Panel: Development and Cumulative Impacts Monitoring and Reporting***

**Panel Facilitator:** Kirstie Simpson

### ***NWT Cumulative Impact Monitor Program - David Livingstone, Department of Indian and Northern Development***

David Livingstone  
Department of Indian Affairs and Northern  
Development  
P.O. Box 1500  
Yellowknife NT, X1A 2R3  
livingstoned@inac.gc.ca

The NWT Cumulative Impact Monitor Program is a component of the broader environmental management framework. To the extent we could, we deliberately modeled this program after the program that essentially drives the monitoring for the North Slope. The website that we've developed is modeled after WMAC(NS)'s website. We've also tried to incorporate the community relations aspect of WMAC's program into our program.

The monitoring program is a requirement of the Gwich'in, Sahtu and Tlicho land claim

agreements and the Mackenzie Valley Resource Management Act. It covers the Mackenzie Valley and the Inuvialuit Settlement Region, but excludes Wood Buffalo National Park. The design of the program and its implementation has been guided throughout by a working group. The working group is composed of all the aboriginal governments in the NWT and the Federal Government. We've been together working on this for about four years now.

The problem has been the implementation. This is a work in progress, in the sense that, we have designed the program, and we've been able to implement parts of it on a year-by-year basis with funding as it becomes available. But we haven't secured the long-term and adequate funding that we need. We're talking about a program in the neighbourhood of three to three-and-a-half million a year. That's not an insignificant amount. I don't understand why it seems so difficult to implement a constitutionally-protected, legislatively-required monitoring program in the NWT.

The program is designed to monitor the cumulative impacts of land and water uses in the NWT. We are required to use traditional knowledge and western science. It's a program that's not going to do everything for everybody. With three million dollars a year, all you can do is fill in gaps. You can strengthen linkages and you can better manage the information. In reality, three million for the entire NWT won't support a comprehensive monitoring program on its own. For example, the research program that we developed and is still underway in the West Kitikmeot Region – which is perhaps 20 percent of the NWT – was budgeted at two-and-a-quarter million a year, and that was just for research. Three million for the entire NWT for long-term monitoring is a bit of a challenge.

We've used a broad definition of environment to include the social aspects of environment. It's really important to me and to everybody else on this committee, that we

use the program as a way to build community and regional capacity. It's not going to be a top-down monitoring program, driven by scientists. To a large extent, it has to be a program that starts with scientists, but it had better end up with communities, supported by scientists and not the reverse.

We have followed the standard protocol of identifying valued components, based on consultation and work with communities and experts. As a component of the Environment Management Framework, it's designed to track trends in the environment. Some of the values components we've identified are water and sediment quality; water quantity; permafrost; climate change; fish; marine mammals; key bird species; caribou, and moose. We've also identified vegetation; climate and climate change; air quality and human health. Community wellness is a key component. It's going to be a little bit more difficult to track and measure; although, through the West Kitikmeot Slave Study, we've developed community indicators that should help us to get it running.

The management regime is structure as a decision-making board. It is this committee that makes the decisions. If we want to make it a community-based program, the communities and the aboriginal governments are going to have to be directly involved in the decision making, not just advising. DIAND has a coordinating role and provides the secretariat support. They do not have a decision-making role. We want to focus on regional priorities, but we also have to recognize that the priorities in different regions are different. For example, moose in one area may be a priority, whereas caribou, woodland or barren ground caribou, may be a priority in another. Virtually all regions think moose are important, so we'll have to insure that while we're addressing the territory-wide interest, we also respect and accommodate the more regional interests.

We have been able to fund a certain number of projects every year with the limited funding we have. But once we get the long-term funding in place, there will be a formal application process. We will commit to multi-year funding as long as there is adequate progress year to year. You can't have long-term monitoring if you don't have some guarantee of long-term funding. We will also ensure that the partnerships and linkages are strong and real.

We developed a five-year work plan and a budget. Over 80 monitoring and capacity projects have been funded to date. These projects have been one-shot deals, because we can't guarantee multi-year funding at this point. We've focused on projects that have an immediate return in the current year and on projects that help to build capacity in communities. Every project we funded has a strong capacity building element to it. The idea is to prepare for the full implementation of this program while we have some money that we can direct toward capacity building. Each of these projects also has to deliver on the scientific side. There are a number of them on the website you can track.

Work plan tasks include; the operation of the working group and the development of a responsible authority. A permanent responsible authority is required in the *Mackenzie Valley Resource Management Act*. In the interim, DIAND has responsibility for this program until we deliver on our commitment to get this program up and running long term. There will be both monitoring and research aspects to the program. Emphasis will be on long-term monitoring, but you can't launch on a monitoring program without understanding some of the underlying factors and issues and concerns. Achieving that requires some research. The money set aside for workshops, training and capacity building is going to be very important. The work plan tasks also include information management, synthesis and reporting.

The audit is a requirement of the same land claims that spawned the MVRMA. It's an independent audit conducted by an independent auditor. The auditors did a very thorough job, independent of all levels of government. The same working group developed the terms of reference for the audit. We released the audit report last June ([www.nwtcimp.ca](http://www.nwtcimp.ca)). It wasn't direct at any one agency but rather contains about 50 recommendations for various organizations in the NWT. It was directed at the collective that is responsible for environmental management in the NWT. The supplementary report, which was actually thicker than the main report, is a state of environment report. It's on the website in its entirety.

The next steps for the monitoring program and the audit are to get the long-term funding. We haven't got it yet. We've got to address the audit recommendations in a formal way and we're going to continue to develop the community-based monitoring programs. In my view, if it doesn't involve the communities at all levels, start-to-finish, it isn't worth doing. It will take work to build that capacity, but I have no doubt that the capability and the interest is there in the communities. Another step is to do some context work for the monitoring program itself. The audit recommended that we need to build a better analysis framework. In addition, the traditional knowledge program needs to be strengthened.

For more information you can contact Meredith Seabrook ([seabrookm@inac.gc.ca](mailto:seabrookm@inac.gc.ca)) or Charlene Kippenhuck ([kippenhuckc@inac.gc.ca](mailto:kippenhuckc@inac.gc.ca)). They are both quite happy to help out and anxious to learn from experiences elsewhere, particularly on the North Slope.

### **Questions, Comments & Discussion**

**Ed McLean, Parks Canada, Inuvik:** In terms of the need to secure long-term funding, is this all funded by the public

purse? Is there an opportunity for industry to pay to maintain a program over the life of development?

**David Livingstone:** The program is a government responsibility. It's a regional monitoring program. I've always taken the view that regional monitoring is government's responsibility. We shouldn't be trying to offload those responsibilities to industry. Industry is very clearly responsible for project-specific monitoring, both compliance and effects monitoring. There will be some overlap, but I'm not expecting industry to fund a regional monitoring program of this kind. Nor am I expecting government to fund project-specific monitoring for industry. There will be a need to share information so that the CIMP website incorporates the results of project-specific monitoring, as well as regional monitoring. Industry will take care of its stuff, we'll do our best to take care of ours, and we'll work together in partnership as we go further.

**David Henry, Parks Canada:** Could you elaborate on what you mean by community-based monitoring? Have you developed your model for that? Many of us are aware of the Arctic Borderlands community monitoring program. What kind of community monitoring programs do you have in mind?

**David Livingstone:** Ultimately, I would like to see the communities take over responsibility for this monitoring program collectively. I'd like to see the communities determine what it is that they feel needs to be monitored. I'd like to see the



communities design the monitoring programs, implement them, and report on them, with the assistance of scientists, government scientists, academics, industry.

The situation we have now is more the reverse. Scientists, government or otherwise, will bring a program or project to the community and say, "You know, we'd kind of like you to be involved in this." The nature of the involvement ranges from just being aware of the program to providing a wildlife monitor or a field assistant, to actually being a full part of the program. The latter is pretty rare. I think there is an increasing effort being made by scientists to involve communities in a more in-depth way. But right now we have scientific-led projects with community support.

Ultimately, I'd like to see community-led projects with scientific support. No one is better positioned, better suited, or more able to conduct environment monitoring programs than the aboriginal people living in the communities. Community-led projects provide an opportunity for training and career development. I'd like to see a professional position established for long-term community-based monitoring in every community in the NWT. Just as we have an effort underway to ensure that we have nurses and teachers from communities returning to those communities, I see no reason why we can't focus on environmental professionals returning to their communities to carry out these monitoring programs. We need a lot more people who have their feet in both worlds- the scientific world and the traditional world. Richard is one of them, Norm Snowshoe is another. They are highly respected and that's what we need to build on. I think those folks are probably better than many scientists at determining what needs to be monitored and how it should be monitored. They also know better than I do how to communicate to their own community. I would like to see this program, in the medium term, if not the short term, run by communities or at least by aboriginal organizations.

**Best Management Practices Across Sectors and Across Landscapes – Kirstie Simpson, Yukon Government, Department of Energy, Mines and Resources**

Kirstie Simpson  
Department of Energy, Mines and Resources  
Government of Yukon  
P.O. Box 2703  
Whitehorse YT Y1A 2C6  
Kirstie.simpson@gov.yk.ca

In the Yukon Department of Energy, Mines and Resources, we are actually implementing a set of best management practices for oil and gas exploration and development as well as for a number of other sectors. We're doing it for a lot of reasons but I thought I would just try and focus on a couple of those today. Those reasons are to help address the need for integrated resource management across sectors and across landscapes, and to assist with long term planning for research and development initiatives and cumulative effects modeling. When I refer to sectors I mean oil and gas, guide outfitting, trapping, tourism, highways, mining, agriculture, and forestry. Those are all sectors and users of the landscape. Landscapes could be the land that caribou uses for winter range, or it could be land affected by permafrost or land within the boreal forest.

Although we started with oil and gas, we quickly realized that all of these sectors have common problems, common objectives, require common solutions, and shared information needs or shared data needs. An example might be something as simple as a camp. When you think about all the different sectors I mentioned, pretty well all of them at some point need a camp set up, either for exploration purposes or for particular kinds of development. There are many things that are common amongst camps, one of them being scavenging and attractant to bears. In this example, you might think of bear attractant being a common problem identified across these sectors and across a

variety of landscapes, as well. The objective for those camps might be to come up with ways of preventing bear and human interaction by controlling garbage. The solution might be some form of garbage management, and the shared data might be information related to bear habitat. It doesn't really make sense to come up with information around problem identification and generation of solutions for just one sector at a time when we can do it and apply it across different industries. This really applies across the Polar Regions, as well. We'd like to find solutions to common problems across the northern territories, with our neighbours in Alaska, and our neighbours in northern B.C., Alberta, and others.

We identified a number of problems when we were doing some oil and gas disposition planning in the north Yukon a number of years ago. One problem relates to managing oil and gas exploration and development, if it goes ahead, in such a way that the winter range of the Porcupine caribou herd is protected. But if you step back from that, it's not really just a question about oil and gas development. It's any kind of development activity, from guide outfitting all the way up to some of the more intense wilderness tourism activities that are planned. How would all of those affect the winter range of the Porcupine Caribou Herd? Its value doesn't stay within one particular jurisdiction. The herd crosses an international boundary, moving back and forth across the Canadian and the American landscape. As Joe Tetlichich said quite eloquently yesterday, there are objectives around herd sustainability, and ensuring that the caribou are available for future generations. That is an objective that crosses all sectors and crosses all of those administrative jurisdictions, as well.

One of the other issues raised during the disposition process was woodland caribou and their habitat. The objective we have set is somewhat similar to that for the barren land herd - to ensure its sustainability and

make sure that it's available for future generations. We can learn a lot about the effect of oil and gas exploration on woodland caribou from our neighbours in Alberta.

The wilderness tourism industry in the Yukon is a huge part of our economy. As a user of the landscape it shares and, therefore, is in conflict with other sectors like oil and gas. So, how do we plan around the issue of managing oil and gas exploration or mineral exploration with another sector that relies on a pristine environment?

Another issue raised was how are we going to manage seismic exploration in wetlands? And at no point during any of the discussions did we hear, as we are hearing on the news in the last few days, that what you really need to do to manage seismic exploration is to make sure that none of the lines are cut greater than two-and-a-half meters. We were told that we need to come up with ways of managing oil and gas exploration so that the objectives for the protection of wetland environments are maintained. I think at this point it's important to talk about some context. You can't have an objective without some sort of a context or understanding of the importance of those particular values.

In this case, wetlands are considered to be one of the most productive ecosystems on earth. They are a vital component of the natural environment and provide numerous ecological and socioeconomic benefits. We know that there is considerable potential to disturb wetlands ecosystems, and that alteration of these systems through improperly planned development activities can alter biological productivity and delay recovery time. We have a lot of good information from a lot of different case studies that tell us that when you impose industrial development upon a wetland environment there will be an effect.

One research priority we identified is quantifying the effects of low impact seismic approaches to habitat. Another is an assessment of recovery factors on different types of lines in little understood terrain and the projected cumulative effect. There wasn't a lot of available information to start with, so, last summer we initiated a project doing some fly-overs and used some GPS photo-link software and air photo interpretation to identify specific locations of the seismic lines. We will be able to add to our seismic line database.

We started to go back into some of the areas and take a look at the status of some of these seismic lines. We expected to see a linear feature that's still fairly absent of the trees that surround it, and may or may not be used as a corridor for wildlife. We saw some things that confused us such as the influence of fire on top of an anthropogenic feature and within a wetland area. The degree to which those three factors interact is something we don't know a lot about yet, so we'll probably go back next summer and take a good look at it. We also found a lot of different stages of regeneration along these lines that raised many questions. There are some things that are interesting to see. For example, we think the increased vegetation we're seeing in some places is probably a result of some low-compression vehicle travel that caused some nutrient flushing. Is that good or is that bad? We haven't really made any decisions about that, unless we think about whether or not the objectives for this area have been met or not.

One of the things that really stand out is that, in many of the areas, we're seeing the kind of regeneration pattern that matches the fire regime. Of course, a linear feature is very different from a fire footprint feature as long as it's never been used again. The big issue in Alberta has been that you can't stop people from reusing the linear features for recreational purposes. Many of the features we are looking at are not accessible to humans, especially in the summertime, so they haven't been reused. But where have

been reused, we are seeing a significant disturbance rate that's really not regenerating. Also, there is pretty significant use of those corridors by wildlife.

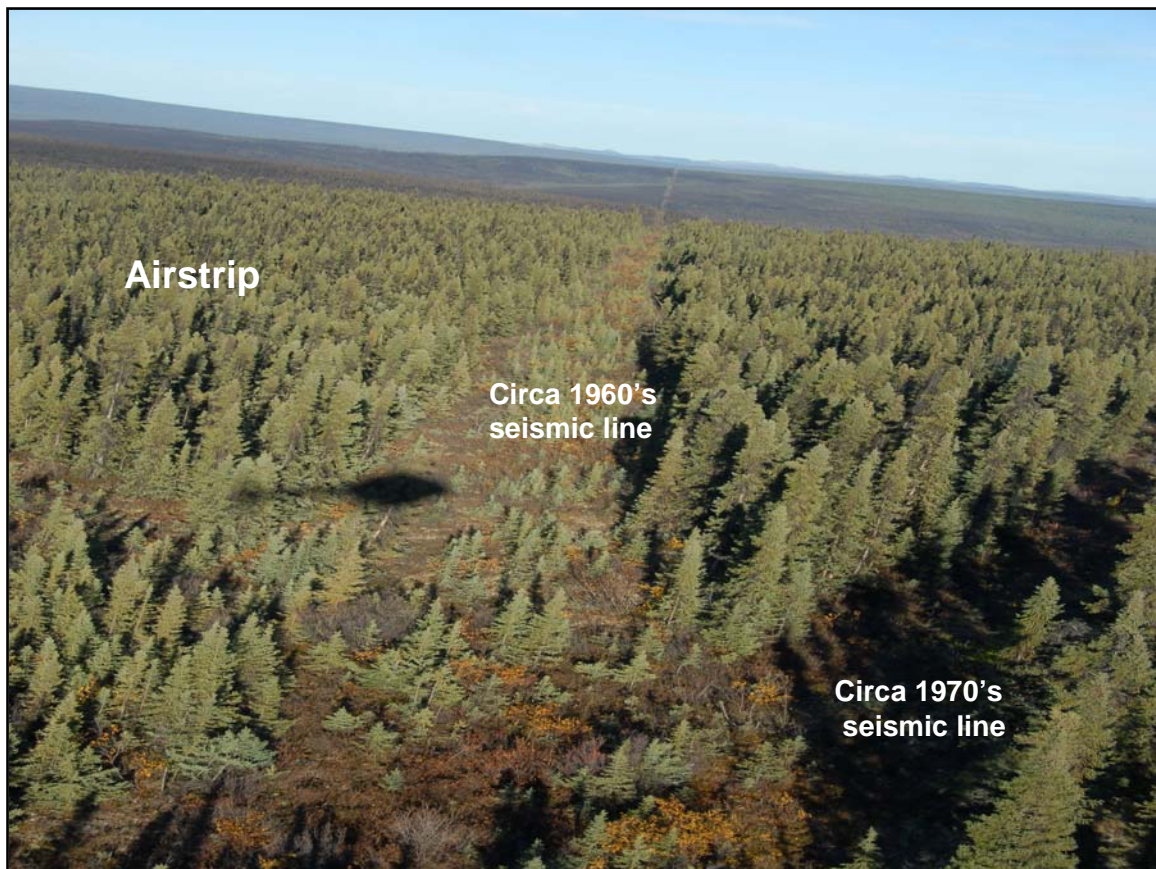
This is photo of an old airstrip that was probably built in the 1960's. It's fairly visible from the sky, but only at certain angles.

We're going to take a look at a couple of different seismic lines from the '60's and '70's. The 1960 seismic line, although it's visible from the helicopter, is coming back in quite nicely in terms of its species composition and the successional growth. It is visible from the sky, but on the ground it's beginning to come back in with trees and vegetation. The question is to what degree is there now an impact on wildlife using that area or is the effect purely a visible one.

We looked at another area in particular that was crossed by a 1960 and a 1970 seismic

line. Also, there had been some seismic exploration carried out about five years ago, using low-impact seismic exploration methods. For the most part, we were quite impressed at the degree to which the vegetation had come back. This contrasts with a well pad from around 1960 that was associated with a couple of those seismic lines. The kind of compaction and root disturbance that went on in that area has meant that we're not seeing the kind of regeneration at all on those well sites that we might on the seismic lines that are beside them. So, there is quite a stark contrast to some of the work that we're seeing with more modern-day practices.

One of the critical things, in terms of understanding whether or not we've had an effect on the environment, is to ensure that we have adequate baseline data. There are many case studies out there that illustrate the importance of having good baseline data on all the species and attributes that might be affected by activity or construction. This is



especially true for complex ecosystems, like wetlands and for pristine and near pristine environments, like sub-Arctic lakes. Commonly biologists and water quality chemists and cultural specialists will say they could have use a couple more years of data or a couple more years to collect this data, to collect the wildlife information and the habitat data, before the project begins in order to better understand the affect of the project.

Typically, a company will come to us and ask what kind of information we have available. We'll give them a map, and say, "Here you go, there's a bit of information on the map, and here's a set of guidelines on what kind of information to collect." Hopefully, as we start to collect more and more information, we'll be able to say, "Well, not only can we tell you that this is a wetland region, we can show you a picture of it, and we've done a bunch of work around identifying specific wetlands, and we can show you the area that you are gong into."

It's really critical for people to understand what a wetland is as well as the particular function and characteristic of the wetland that they're going into. Somebody who is not particularly experienced in understanding this kind of environment might not realize that it's a wetland and what is its importance.

Wetlands are unique systems that serve many functions. A wetland can be bog, a fen, or a swamp. It's important to understand that when you collect your information. If you haven't collected the baseline information in a meaningful way, you can't measure whether or not the function of that wetland has been affected or not. What is not so obvious to the eye is that there is some flood attenuation and flood control going on in here. Wetlands are really the kidneys of the earth and are an important part of ensuring that human beings have clean water. They can also serve as nesting and staging areas for birds and grazing areas for bears and caribou. Not all wetlands serve

all of those functions, so it's important for an industrial developer to understand the functioning and characteristics of the particular wetlands in the area they are working.

We may see a swan nesting in a wetland area, but do we really understand whether or not this entire environment serves another function that we need to be able to understand and protect? Really small wetlands might not even end up on a map. What is the function of such a little blip on the landscape? Something that people often forget is that wetlands form an important refugium when there are other processes going on, like fire, for example.

Although there are often substantial efforts made to compile data on habitat types and on species before project initiation, we find that design and monitoring of mitigation success suffers, often due to that lack of data. That lack of data means that in the final analysis, it's difficult to conclude whether habitat capacity across landscapes, for various species and populations that depend on that habitat, have been maintained or protected. To what degree did we understand the function of a wetland before a road was constructed? And if we didn't understand it, how are we going to measure what the effect was afterwards? How do we know whether or not the wetland was there before the seismic line was created? Was it created as a result of the seismic activity?

I want to give you an example from the Diavik Diamond Mines project. The aquatic effects monitoring program is a plan for collecting data from an aquatic environment for the purposes of monitoring project-related effects in an ecosystem. Diavik Diamond Mines defined they were going to do that by asking the question, is there an effect? They would then compare that against the baseline data that they collected. They would then ask themselves, "If there is an effect, were we the cause?" If they were the cause, the next question is do the

changes in the baseline exceed the environmental assessment predictions? And lastly, do those changes cause any significant adverse effect? In this case, we are dealing with a pristine sub-Arctic lake. About five or six years after the baseline work was originally done, the government revisited it and found that the baseline data was seriously flawed. And since the detection of change from the current aquatic effects monitoring program completely relies on the comparison to the baseline, it was concluded that the aquatic effects monitoring program cannot detect anything but the most disastrous effects on Lac de Gras. I guess that is a significant adverse effect. But the aquatic effects monitoring program was not intended to detect significant adverse effects. It was intended to detect change from the baseline, which it is not capable of doing.

Because baseline information monitoring is also often done at a very coarse level or resolution, we may only be able to look for change in one species alone. Not all effects or losses are accounted for. This means that the potential ecological impacts on biodiversity at other scales of resolution – so all the way from the gene pool to landscape level – can be quite critical, although they are often unheeded in the programs.

More and more we are seeing that ‘objective base’ management is desired by industry and is being used by regulators. They are looking for a change from prescriptive rules base management. The use of objective rather than prescriptive rules based management is valuable because it allows for identification of shared problems and creative solutions. Objective base management relies on the fact that we came up with the right objectives in the first place and on our ability to recognize if those objectives are right and if they are being met. And finally, knowing if the objectives are being met relies on good baseline data so change can be recognized and relies on good monitoring so that the change can be detected. Thank you very much.

## Questions, Comments & Discussion

**Sonny Blake, Tsiigehtchic:** You were asking whether wildlife follow Cat roads. From what I have observed, you always see trails. Even though people haven’t been there for a long time, you see a path right through where the Cat road used to be. A lot of these places have grown in already, but you see a lot of trails where moose and caribou have gone. And also, once you make a trail through there, usually wolves and wolverine will follow it. They’re just like us. If we see a path, we usually follow it, and they usually do the same.

I also had a comment for the gentleman who was talking about monitoring projects. I think it’s a good idea to get active harvesters or people who are always travelling out on the land to do these kind of projects, because they are the ones that observe all the changes, whether it's with the land or the water, the fish, the wildlife, and also, migratory species. You know, we notice every little change out there, and that's the kind of people you need for these projects.

**Graham Van Tigham, Yukon Fish and Wildlife Management Board:** Do you have any projection as to when a lot of that seismic activity up in Eagle Plains will actually regenerate or go back to its original state? There seems to be a lot of variation in the samples you observed.

**Kirstie Simpson:** The short answer is no, except that in some areas we are finding it's strongly mimicking the fire regime regeneration. It is also dependent on landscape type. How the seismic lines were built as well as soil type, moisture, and landscape type, all influence regeneration. Our best case example right now is about 50 years for regeneration if those lines were not used again. That’s the key. In fact, one of the things we’ve learned as we’ve been looking at reuse of lines as a way of reducing potential footprint effect on the landscape is that, in fact, reusing some of those existing lines is probably not the right

way to go. Reusing them will throw them right back into the beginning of their cycle and may not bring them back in at all. We're probably better off letting them continue and putting in a low impact line instead.

**Tara Wertz, Arctic National Wildlife**

**Refuge:** I'm curious as to what you think about implementing the best management practices from an industry standpoint. We can ask industry to use certain techniques to minimize their impacts and they seem to be okay with that until it gets too expensive. When we monitor, whether on a project-specific basis or a cumulative impact basis, in reality the damage has to occur before any changes can be implemented or asked to be implemented from a regulatory standpoint. Sometimes those impacts are not recoverable. I'm thinking specifically about wetlands because they are so sensitive. If you start out with a pristine environment as baseline, any impacts are going to be detrimental. If they put a road through it, it's not like you can take it back. How do you think they ought to work to prevent damage, instead of having to go back and figure out how to correct the damage once it's done?

**Kirstie Simpson:** More and more, we are getting into social decision-making, as opposed to environmental decision-making. It's not rocket science. We've got a pretty good idea of how particular development affects particular landscapes. There are some social choices to be made about whether or not we're going to allow that, knowing full well what kind of recovery times we're getting into. Certainly, there are costs to recovery; and if one of our objectives is regeneration at a particular time scale, then sometimes that regeneration will have a cost associated with it.

**Bruce Bennett, Department of Environment, Government of Yukon:** I have a comment in response to the question of how long it takes for land to regenerate. A study was done on the Canol Road that estimated it would take between 600 and 800 years, if ever, to regenerate the areas

that had been scraped right down to mineral soil. So, there are some places that won't come back in our lifetime or our kids' lifetimes or their kids' lifetimes. Luckily we've been learning from the past.

***Development Impacts and Cumulative Impact Monitoring and Reporting - Richard Binder, Inuvialuit Joint Secretariat***

Richard Binder  
Inuvialuit Joint Secretariat  
P.O. Box 2120  
Inuvik NT |XOE OT0  
lgc-tech@jointsec.nt.ca

Over the years, the Inuvialuit have been impacted by a number of events and activities. There has been commercial whaling, the fur trade, the construction of DEW-line sites, the search for oil and gas, the building of communities and villages and research activities. Inuvialuit went from being a very nomadic people that traveled in small family units to living in large centres for longer periods of time. Many took to the wage economy, while others continued on as hunters or trappers. Fur and game was plentiful in the Delta and the coastal region. In time, places like Banks Island became known as "the white fox capital of the world". Although many people have become wage earners, most of them – if not all – still depend on the natural resources available in the North and maintain a high regard for their traditional culture.

Despite the fact that the Inuvialuit were exposed to many changes over the years, for the most part, they were able to adapt. Protecting and preserving culture and traditions has always been a high priority. In the past, the system in place that regulated development in the NWT did not include a requirement to consult with the communities or the local people in the area. I remember the one-page land use permit application

form that the Government required developers to complete. That was it, a one-page document, and you got your go-ahead. Inuvialuit at their camps or on their trap lines noticed that there was a flurry of activity happening right in their back yards, but they had had no say in what was happening. They saw this as a potential threat that, if left unchecked, could have serious negative impacts to their traditional lifestyles and culture.

A number of concerned people got together and started talking. This led to the establishment of the Committee for Original Peoples Entitlement – COPE – who began the negotiations for a comprehensive land claims settlement. This agreement was eventually signed by the Inuvialuit and the Government of Canada in the spring of 1984 after 12 or 13 years of negotiations. It was a long effort. A lot of dedicated people gave up many years away from home to accomplish this agreement. The arrangement provided the Inuvialuit with some 35,000 square miles of private lands and the tools necessary to do business in the western Arctic. The three main goals of the IFA are: (1) to preserve the Inuvialuit cultural identity and values within a changing northern society; (2) to enable the Inuvialuit to be equal and meaningful participants in the northern and national economy and society; and (3) to protect and preserve the Arctic wildlife, the environment and biological productively.

A wildlife and environment management regime was set up to manage the renewable resources within the Inuvialuit Settlement Region. The Inuvialuit Game Council was set up to represent the collective Inuvialuit interests in all matters related to wildlife and its habitat. This council is 100 percent Inuvialuit, with representatives coming from the local Hunters and Trappers Committees that were established in the six communities within the ISR. Five other boards were set up to advise and make recommendations to the Game Council or appropriate ministers within the governments. The IGC appoints

50 percent of the co-management boards' memberships. The other half is appointed by the governments. A strong requirement to consult with the communities and local organizations is entrenched in the operating procedures and guidelines of all these committees.

Since the establishment of the co-management boards, regional and community organizations, a number of initiatives have been started within the region to address local interests and priorities. A regional harvest study was established to assist the managers in their day-to-day business of managing wildlife and to get baseline data of harvest levels and needs of the communities. Local fish monitoring programs were established at the request of the communities to track the local fishery. The Department of Fisheries and Oceans and the Fisheries Joint Management Committee provided the community with the support necessary to carry out the monitoring programs and, in some cases, set up local committees that would track the program. In a number of situations where it was determined that the local fishing was impacting the population of a certain river, the community self imposed local restrictions. These restrictions included quotas or a total ban on fishing.

Other species on a quota system, such as grizzly and polar bears, were closely monitored. These species not only play an important role for the subsistence harvester but they are also key targets for sport hunters, providing a source of income for many of the Inuvialuit in the business of guiding and outfitting. A special management regime was set up for polar bears, because they are a resource shared with the Inupiaq of Alaska, like beluga and other marine species. The Inuvialuit Game Council and the Inupiaq North Slope Borough Fish and Game Board signed a joint management plan to monitor polar bears in the southern Beaufort that was recognized by both the Canadian and U.S. governments. This effort to manage a shared

stock by two aboriginal groups was the first of its kind and received the 1989 Regional Director's commendation award from the U.S. Fish and Wildlife Service. A similar arrangement was developed for the management of beluga, an important resource to the Inuvialuit.

The Inuvialuit continue to monitor and sample the annual harvest of many species in the ISR, in order to track the take, and the distribution of these species, as well as to monitor contaminant levels. Agencies and community members are fully involved in the development, implementation and delivery of the monitoring programs. As mentioned earlier, John Alikamik has been monitoring ringed seals for 15 years. It is this type of continuity and meaningful involvement that has made the program a huge success story. I take off my hat to people like Lois Harwood and others, like Steve Blasko, Steve Solomon, and Chris Burn who take the time and effort to involve the community and all aspects of the monitoring programs and make sure that their findings are presented back to the community and the management organizations.

I'm going to switch gears now and talk about more recent events. In the late 1990's, the oil and gas industry returned to the Mackenzie Delta with a fairly intensive exploration program, after more than 10 years' absence from the scene. Although this was a welcome sight to many people that needed work in the region, others, like the Hunters and Trappers Committees, were not going to sit back and let this development happen at the expense of the wildlife or environment. The HTC's insisted that the industry hire local wildlife monitors to act as the eyes and the ears for the Inuvialuit. The Inuvialuit Lands Administration, the authority for all our private lands, also requested that industry hire local environmental monitors for all projects on our private lands. This arrangement was later accepted and applied to the Crown lands within the ISR. The HTC's set up a

training program for the wildlife monitors so that they had the basic qualifications to meet the industry standards in the workplace. These monitors answered directly to the HTC's and worked closely with the senior camp supervisors in the field.

There are also a number of private Inuvialuit companies that provide this monitoring service in Tuktoyaktuk, but there are no formal reporting procedures in place to advise the HTC's or the Game Council. This could be problematic and needs to be resolved. Industry covers all the costs of these services, and we make sure that the monitors are paid well for their work. In my opinion, these arrangements seem to be working fairly well. There are a number of trained people in all the communities in the ISR. Oil and gas interests, mining and even research activities make use of these services. This monitoring program was set up not only for the protection of the workers in the field, but it also provided protection for the wildlife and avoids unnecessary defence kills. This is especially important for those species that are on a quota system, such as grizzly and polar bears. Approximately 50 percent of the tags available for these species go to the local guides and outfitters to provide sports hunts in the area. This is an important source of income in the region. If there is a defence kill, a tag is taken from the community nearest the development and the community loses out on the potential source of income. If this were to happen, the Inuvialuit insist that a compensation arrangement for the loss of the use of that tag be set at the commercial value of a sports hunt. But that's another issue.

In closing, I want to mention that the wildlife and environmental monitoring programs provide an essential service. They give the Inuvialuit some level of comfort, knowing that their interests are being looked after. There is room for improvement, though, and I would like to see this program enhanced to meet the increasing demands that will be created, should the proposed

gas-gathering system and pipeline be approved for the Mackenzie Delta. We have lots of work ahead of us.

### **Questions, Comments & Discussion**

#### **Lindsay Staples, Wildlife Management**

**Advisory Council (North Slope):** You made a comment about the monitoring done by private companies and the concern about the lack of reporting or the reporting arrangements to Hunters and Trappers Committees. Do you have any thoughts about a mechanism to ensure private sector monitors report to the HTC's?

**Richard Binder:** There are ways to improve on reporting. I think it's up to the HTC's, the Game Council, and the communities to get together and meet with these private companies. They are Inuvialuit businesses and should report to the HTC's. The HTC's, in turn, could report to the Game Council. It wouldn't be very hard to make that reporting a requirement. They have got to keep daily logs anyway, so make those logs could be made available to the HTC's and to the Game Council for management purposes.

#### **Government and Industry Partnerships in Monitoring - Dr. Norm Snow, Inuvialuit Joint Secretariat**

Dr. Norm Snow  
Inuvialuit Joint Secretariat  
P.O. Box 2120  
Inuvik NT X0E 0T0  
execdir@jointsec.nt.c

I want to address some of the things this panel is dealing with. The first one is cumulative effects and cumulative impact monitoring. These are very much personal views, by the way, borne of experience. Historically, the concept of cumulative impacts – at least the first I heard of it – was introduced during the Berger Inquiry, either by Tom Berger or Carson Templeton, who was one of his primary consultants for the

Environmental Protection Board. They initially identified it as 'destruction by insignificant increments'. I guess that was considered to be somewhat negative, so it got euphemized as 'cumulative effects assessment'.

Cumulative effects assessment is very difficult to achieve in the context of the simple framework and repeatability model that Chris Burn was talking about earlier. It is sort of akin to the challenges posed by the other phrase that we hear a lot of - 'the ecosystem approach'. Years ago, during my graduate work, I decided I was going to look at energy flow through a marine ecosystem. After a year, I gave up on that idea and wondered why I ever bothered in the first place. It is far too complex, plus it's changing all the time. I think it's a forlorn hope to have the ecosystem level as the target of your monitoring. Who knows what politicians mean when they talk about 'the ecosystem approach'? I think scientists mean looking at more than the impact of stressor "A" on recipient "B"; by recognizing that "B", as part of an ecosystem, actually interacts with several other components. So, we're going to look at as many components as we can but in a practical way. I think if we don't use that sort of practical way, it's not going much good.

As Chris pointed out, we need long-term data sets. But that a lot of time and time is something we don't really have. In the case of the megaprojects in front of us here, by the time you build up a decent baseline and select the appropriate target, the project will be over. The existing long-term data sets may very well be able to achieve this objective, but you have to judiciously and select what it is that you're going to monitor.

Acknowledging these difficulties and the need to standardize the methods that we are going to be using and the approaches, the Mackenzie Valley EIRB, the Mackenzie Valley Land and Water Board and the

Inuvialuit are going to be starting an ESRF-funded project later on this year. We will be pursuing the threshold approach. Part of this project is actually going to the communities up the valley, as well as in the ISR, to get them to develop acceptable thresholds and identify valued components.

For monitoring in general, I want to use the original Mackenzie Valley pipeline project which became the subject of the Berger Inquiry as an example. As an aside, I want to point out that although the present gas project is often referred to as “the pipeline project”, the pipeline itself is confined to the valley. Field development, gathering lines and treatment facilities are not actually part of the pipeline. They are located within the ISR, and partly in the Gwich’in Settlement Region area. There was an environmental assessment as part of the first Mackenzie pipeline project inquiry. It was truly confined only to the pipeline. Berger was not required to look at gathering systems. But of course, at that time, the pipeline was bringing gas from Prudhoe Bay, and included the trans-Yukon pipeline across the North Slope. This is where the protection of the Porcupine caribou herd and its relationship to the people of Old Crow and the Inuvialuit became a pivotal issue for the project. With the creation of what is now Ivvavik National Park, the Inuvialuit had the opportunity to provide protection through their comprehensive land claims settlement. The Vuntut Gwich’in extended the maximum level of protection possible with the creation of Vuntut National Park, which is contiguous with the southern boundary of Ivvavik.

In my experience, the way in which the industrial proponents and government agencies and departments have prepared for the current gas project hearings is markedly different to the pre-Berger inquiry efforts. For a start, back then, DIAND’s Environmental Studies Program came up with very large amounts of money for government departments to acquire what was called ‘accelerated baseline data’

collection. The industry proponents hired an army of environmental consultants to do the same. This led to quite a significant duplication of effort. To alleviate this, the two pipeline consortia merged to become CAGSL or Canadian Arctic Gas Systems Limited. There was also a considerable degree of sharing between industry and government. This sharing was primarily logistical but also, in many cases, included data. Government agencies and departments also shared financial and human resources in order to optimize their budgets.

The ecological and cultural significance of the Porcupine caribou herd has long been appreciated. It received a great deal of monitoring research attention in preparation for the Berger Inquiry. In the case of the Porcupine caribou herd, Gas Arctic’s consultants worked very closely with government researchers.

On the other side of the Richardson Mountains, I was looking at benthos in Delta lakes and channels, tundra lakes to the east of the Delta and south of Tuk, and along the peninsula. This was soft bottom sampling. We were looking at the potential effects of increased siltation as a result of industry activity, mainly at the anticipated pipeline river crossings. It was the gas pipeline primarily, but there was some talk of an oil line, as well. So, we did some oil-related work, too. We did some passive and active sampling. Passive you measure because it’s actually happening. We did disturb some of the environment in one lake in the Delta and Caribou Creek, which is to the west of Old Crow and just this side of the Alaska border, by dumping oil on them.

The siltation disturbance was kindly done for us by Public Works when they put culverts in. The Dempster Highway was being constructed at this time, so we set up a monitoring program at the culverts in the Ringling River. Again the problem was the lack of long-term data sets. That’s why we were doing this accelerated baseline work, as a sort of short cut. You find out as much

as you can about the system before you disturb it or someone else does and hope that actually you've measured the right things to pass on to decision makers. In the case of the Ringling River, they put in these huge super-span culverts. They were 27-and-a-half feet wide and about 23 feet high and 300 feet long. Its shape is difficult to describe, but basically, it's an arch, and it's sort of a flattened, oval bottom. They were used at various crossings along the Dempster.

The construction of the culvert crossings gave us the opportunity to monitor the Ringling for disturbance. We had two years of baseline data, so we were able to take a look and see what was happening in the way of increased siltation in the substrate downstream. There were problems with the culvert construction. You've got to protect the arch, and they were using winter fill. If you've ever seen Ringling Crossing, it's really quite high. As long as you protect the arch, you can put thousands of tons of material on it, but not when it's winter fill, because the first rain, the ice thaws out and you get differential settling, and the thing collapses. That's exactly what happened to both of the culverts on the Ringling, and then, another one down on Rock Bottom Creek further south and on an unnamed crossing. They all failed about the same week as soon as the first rain came. We didn't actually find too much of an impact from the silt load increase in the Ringling downstream from when they put the culverts in, but when they ripped them out, and then, put in four circular culverts, there was a lot of siltation. I have gone back there a few times since. The funds dried up and the project ended, but that's another problem. But it is sort of back to what I would consider to be normal right now.

The oil spill work was active disturbance. We dumped a bunch of Norman Wells crude on a lake in the Delta near Aklavik as well as in Caribou Creek in the Yukon. The work on Caribou Creek was fine. I think we did a fair job of getting baseline data for it.

Unfortunately, we totally miscalculated the velocity of the river which was far too much. Even though we had peak booms and stuff, the oil was in the Porcupine River before we'd even turned around. So, that was a bit of a bust in terms of the effect of oil on benthos in the flowing system in the Yukon.

One of the advantages that I identified in those days was the hubs where people gathered, such as the Aurora Research Institute and the Polar Continental Shelf Project's base in Tuk. That's indeed where you could rub shoulders with the intellectual titans. I just heard recently the Tuk base of Polar Shelf is going to be demolished this year. However, as a result of Steve Blasko initiative and foresight, we're working on an initiative to try and fill the vacuum we've all felt acutely since Polar Shelf shut down. A lot of networking went on as a result of meeting up with people at these various logistics hubs. It's sort of gratifying to find out that those networks still exist for many of us. For me anyway, it was a privilege to actually have the ability to do that. I believe the sharing and the optimizing of logistics and data that took place in those days between industrial proponents and government researchers and academics was valuable. There is a true symbiosis that can happen between peer groups of researchers. We're aware that this kind of collegial cooperation is continuing into the present day, and I'm very glad to see that that is, indeed, the case.

### **Questions, Comments & Discussion**

**Kirstie Simpson:** I have a question for David Livingstone. I'm wondering why a cumulative management monitoring program wasn't fully supported for the Northwest Territories. Could you comment on the degree to which the sort of more regionalized approach to resource management through the land claim land and water management boards may have affected that?

**David Livingstone, DIAND:** I don't think there is a direct connection. I think the *Mackenzie Valley Resource Management Act*, the land claims, the Inuvialuit Final Agreement, have moved decision making closer to where it needs to be. That means in the regions, closer to the people in whose back yard these activities are taking place and involving those people directly or at least more directly in the decision-making process. The broader regional cumulative impact monitoring program is a requirement of each and every land claim, other than the Inuvialuit, and they're participants in the program. The Tlicho, Sahtu and Gwich'in claims all require the same monitoring program.

**Conference participant:** Have there been any studies done on permafrost and the effects it has had on vegetation on the seismic lines? What does clearing of the vegetation do to the permafrost?

**Kirstie Simpson:** There has been some work done in the Gwich'in region and we're looking at permafrost in our work. We started selecting sites last summer, but haven't done the field work yet. We'll be going into those sites next summer and looking at ground ice, ground moisture, soil type and some other variables. Chris Burn has done some work to look at how long it took before permafrost re-established itself. In our work, we would like to know if there is a point of no return, where if the permafrost doesn't regenerate within a certain time scale – like 30 years or 50 years, it never will.

**Chris Burn, Carlton University:** There is a very large amount of data on seismic line impacts on permafrost and vegetation in Alaska – much more than what we have available in the Yukon and NWT. It's been published since the 1970's. The biggest disturbance that has been investigated in great detail regarding seismic lines is some on the Tuk Peninsula in the late 1960's and early 1970's. Dr. McKay wrote a paper that

was published in 1970 about disturbance and permafrost. He investigated several disturbances. One is of one of Albert Oliver's dogs that was tied up at Garry Island for a summer. It went round and round and round in a circle and took all the vegetation away from where it was running around. Over the next three years, just where the dog had been tied up, the ground went down by about 30 or 40 centimetres because of warming of the ground.

The short answer to the disturbance question is that down in the southern Yukon and central Yukon, if there is a serious disturbance like a forest fire, at the moment, permafrost will not recover. It will begin to degrade and continue to degrade. The comparable information we have for the ISR comes from an analysis of the Inuvik fire in 1968. There were places near to town where the permafrost did degrade. It went down to about a metre-and-a-half below the surface but has now come back up again as the vegetation has recovered.

**Barney Smith, Department of Environment, Government of Yukon:** David, when somebody asked you about funding for the recent monitoring programs, you were pretty adamant that it was the government's responsibility. I understand it's in the agreements, but the government is still not coming up with the money. Immediately south of the NWT, in Wood Buffalo region in Alberta, there is a large cumulative environmental management agency, and another regional monitoring program, funded by industry and government. They are managed by local governments, First Nations governments and industry and they have a lot of money. I realize that there is big oil money there, but why are you so adamant that industry doesn't have responsibility for cumulative effects, especially where if industry wasn't causing some of these problems, we wouldn't have nearly as many cumulative effects to worry about?

**David Livingstone, DIAND:** To clarify your point, I said industry is responsible for its project-specific monitoring requirements, including the cumulative effects of those activities. The tar sands project is, as far as I'm concerned, an industry project and they are responsible for monitoring the effects of the tar sands development. Those are regional effects, but it is still project-specific in nature. I wouldn't expect the tar sands industry, for example, to be funding an Alberta-wide monitoring program.

I don't think that, for example, the diamond mines should necessarily be responsible for monitoring at the outfall of the Coppermine River near Kugluktuk, just because they have projects on Lac de Gras, which feeds the Coppermine River system. I think the Federal Government and the Territorial Government have responsibilities for ensuring that environmental management, as a whole, is properly implemented. Industry has responsibility for its projects within that context. In my experience, if you're going to try to require industry to fund a regional program, like the cumulative impact monitoring program, we will be debating that issue with industry for decades. But I think there is definitely overlap - shared responsibilities and shared jurisdictions. In my view, government is responsible for regional cumulative effects monitoring. Industry is responsible for project-specific cumulative effects monitoring and other project effects.

**Jimmy Johnny, Mayo Renewable Resource Council:** You were talking about private company monitoring. Is that monitoring animals around that area?

**David Livingstone:** Yes, companies are responsible for aquatic effects monitoring programs, wildlife effects monitoring programs and end-of-pipe effluent monitoring. So, they're responsible for a wide range of monitoring programs related to the effects of the specific project, and that's not just the single effect but the

cumulative, the total, effect of the interaction of individual effects.

### ***Panel: Environment and Climate Monitoring and Reporting***

**Panel Facilitator:** Dr. Chris Burn, Carleton University

### ***Ecological monitoring on Herschel Island - Dorothy Cooley, Yukon Department of Environment***

Dorothy Cooley  
Department of Environment  
Government of Yukon  
P.O. Box 2703  
Whitehorse YT, Y1A 2C6  
dorothy.cooley@gov.yk.ca

I want to begin with a little history, because I think history has a fair role in how ecological monitoring, and monitoring in general, came about in the park. Herschel Island lies off the coast of the Yukon North Slope. The park itself was established in 1987, as part of the Inuvialuit Final Agreement.

The creation of the park led to a lot of initial inventory work in the 1980's. Some of those researchers, like Catherine Kennedy and Dave Mossop, are here in this room today. Some of that initial research resulted in the establishment of monitoring programs that could be conducted by the Park Rangers, after the researchers had finished their work. These monitoring programs included black guillemot surveys, breeding bird surveys and the recording of wildlife sightings. The data actually goes back to 1988, which means we're entering the 20th year of data collection for some of these projects.

On Herschel, we are trying to bring the scientists and Rangers together to work on projects. We're especially interested in

working with the Rangers because they are on the island continuously from April until early September. That's a long field season, something that a lot of scientists don't have. The atmosphere on the island is pretty informal and relaxed. The researchers do a lot of the field training with the Rangers, who are then able to carry on with the monitoring programs on their own.

These pictures show the Rangers doing some of their monitoring work, as part of our current program. More information is provided on our poster.



*The Rangers monitor plant phenology in a number of vegetation plots.*

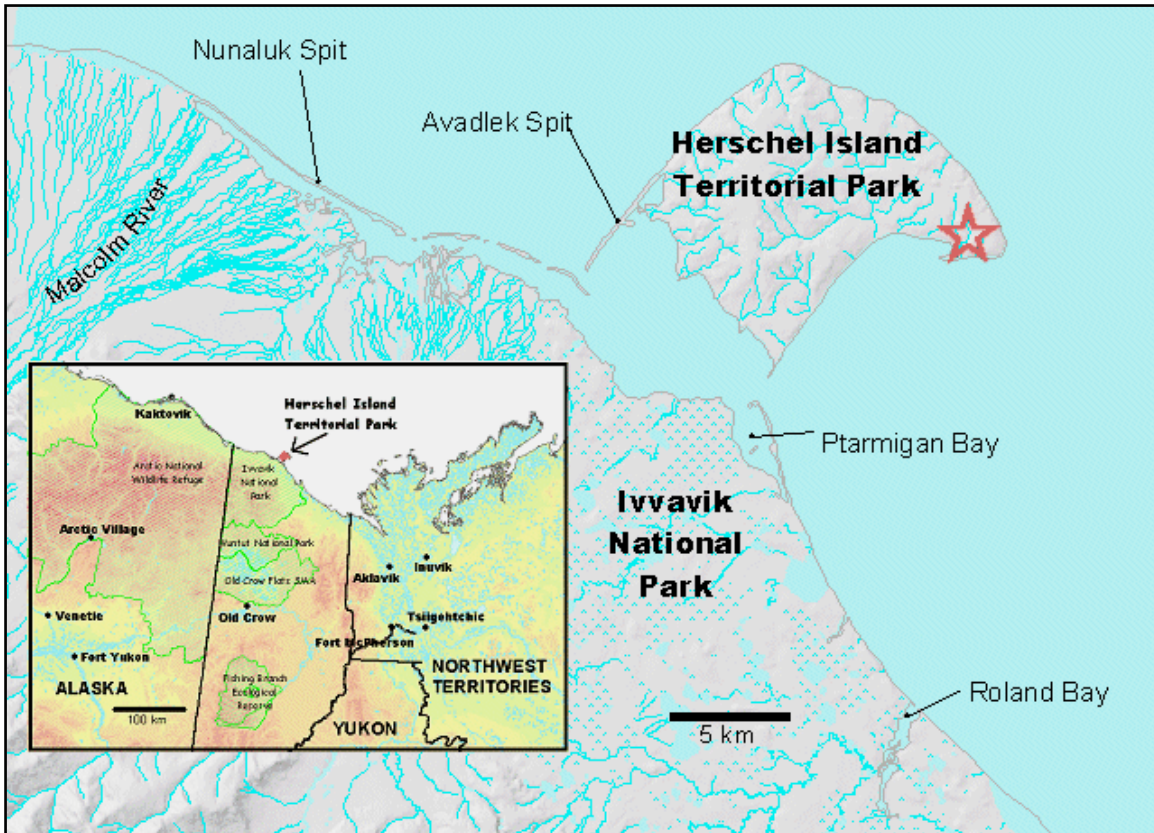


*The Rangers download a data logger, which contains soil temperatures. This is something that Scott Smith set up for us in 1999.*



*The Rangers measure a thaw slump so we can keep track of how fast these slumps grow within a year.*

The research program is fairly varied with a lot of it being related in some way to climate monitoring. The Rangers are involved in raptor and breeding bird surveys, a lot of the vegetation monitoring, small mammal surveys and they record all wildlife sightings. A lot of the weather data is also collected by the Rangers. Catherine Kennedy, with the Yukon Department of Environment, has been looking at changes in vegetation. Her data goes back to 1985. Wayne Pollard, from McGill University, is doing research on the growth of retrogressive thaw slumps. We have also started another smaller project with thaw slumps that is being conducted by the Rangers. Cameron Eckert, Yukon Department of Environment, is investigating the decline in black guillemots. Chris Burn, from Carlton University, is working with the soil temperatures, looking at the relationship of snow depths and permafrost. Annual phenology and productivity studies have been underway since 1999. This vegetation information is added to the database of the Canadian Tundra and Taiga Experiment (CANTTEX), which is part of the International Tundra Experiment (ITEX). The Rangers are involved in all of these projects.



We developed a monitoring plan and tried to make sure that all of these projects were coordinated. We started with existing programs. We didn't want to lose all that historic data. At the same time, the Herschel Island Management Plan was also being redrafted. So, those are the starting blocks. Richard and I talked with the Rangers, with the park managers in Whitehorse, and some of the scientists to see what they would like to see monitored, what could be monitored, and what should be monitored. We also determined what we can't do right now. We also talked to people at the Yukon's Heritage Branch. The settlement at Pauline Cove is a designated heritage site that requires some monitoring. Bringing all those elements together, we created the environmental and resource monitoring plan, which includes heritage resources.

We also produce two documents each year. They are mostly done for our own reference, but some people may be interested in seeing them. First, we create an instruction manual for the Rangers that gives step-by-step

instructions on how to do the various monitoring projects. We include the data forms and lists of all the equipment that's needed. It's really quite detailed. We update it every year. Each year, we also summarize the data that was collected, primarily by the Rangers. We try to ensure that we have that summary ready for the pre-season meeting of the following year. This means that the Rangers are getting feedback within a year.

**Vegetation Change on Herschel Island and the Ivvavik Coastal Plain - Catherine Kennedy, Yukon Department of Environment**

Catherine E. Kennedy  
 Department of Environment  
 Government of Yukon  
 P.O. Box 2703  
 Whitehorse YT, Y1A 2C6  
 catherine.kennedy@gov.yk.ca

The work I have been doing on the North Slope started out as a collection of baseline data. When the IFA was signed, Herschel Island became a territorial park and Ivvavik became a national park. I was working at the Department of Renewable Resources at the time. For five weeks, in 1985, a variety of people with expertise in fisheries, soils, vegetation, archaeology, and heritage, went to Herschel all at the same time, to carry out a range of studies. We had 400 plots on that little island, which is extremely high density for sampling. That work has given us an incredible data bank of information.

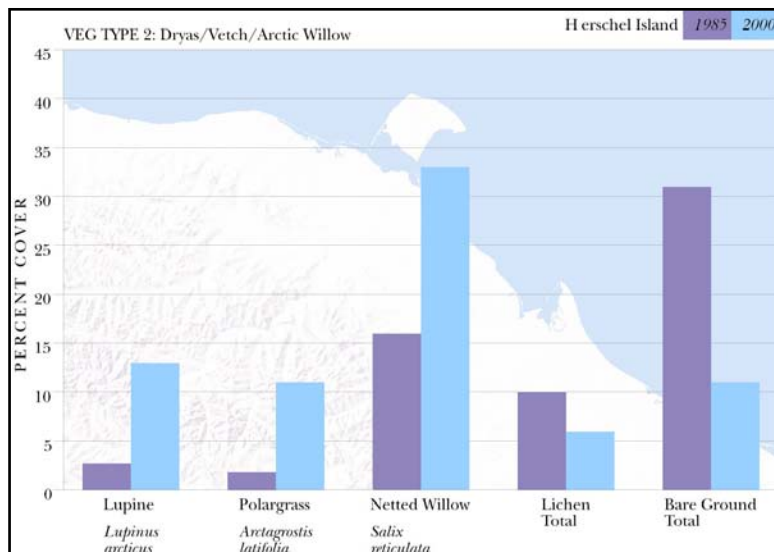
In 1999, Dorothy Cooley asked if I would go back to Herschel and help the rangers figure out the locations of the polygons from the 1985 study and to about learn the vegetation. That way when they saw an interesting nest or a muskox or a caribou, they could record the polygon as well as the time and the weather. I really was stunned to find that the vegetation classification that I had done in 1985 wasn't making sense. There was an awful lot of grass that was not what I had in the classification. This really worried me. I checked my data and found that in fact there was a big change happening to the vegetation on the island.

At some places, the changes are incredibly dramatic and seem to be increasing and increasing.

Polargrass is most noticeably increasing on upland sites, especially high points of land. It is not an introduced species. It was there in 1985 in very low amounts all over the entire island. You can expect to find it on ridge tops. It has really increased. Another change is a graminoid vegetation cover that has replaced the dryas/vetch/Arctic willow tundra, over much of Herschel.

When I was on Herschel in 1985, there were seas of cotton grass tussocks with just moss in between. Now there are a lot more lupins that weren't on the original vegetation classification. There has been a burst of lupins. We actually had a vegetation type that was called something like "many flowers on hummocks" that didn't occur on flat land. It was a very specific type of vegetation. It has invaded where previously there had just been sedge tussocks or where it was just dry grass lichen. Whole slopes were blue, and then, poking through were these rough grasses.

There is very little vegetation on the frost boils (mud boils). Woody shrubs with little woody stems are creeping in from the edges. There is also a lot less lichen. The groundcover had a lot of diversity in the lichens but it has really changed. The actual total percent cover of those frost boils was much less. All of this is extremely different than it had been about 14 years before.



That's a very short timeframe for so much change.

What I was finding on my return too valuable to not try and quantify. My problem was that I couldn't go back to the original 400 sites because the work we had done was before we had GPSs to keep us in the right place. My challenge was to find a way to compare the information. I can see it and describe it, but I really wanted to actually quantitatively assess the changes. I was able to figure out how to do it by sampling similar sites in a way that allowed me to compare the 1985 data with the more recent data.

This graph shows the changes I found in the 'dryas/vetch/Arctic willow tundra' vegetation type. That's the low tundra type with lots of bare ground. I found that the lupines and the polargrass had increased by up to 12 percent. The netted willows, those little woody willows that are creeping in on the mud boils, it had doubled from about 15 to over 30 percent. The lichen cover was reduced and the bare ground was less than half of what it had been.

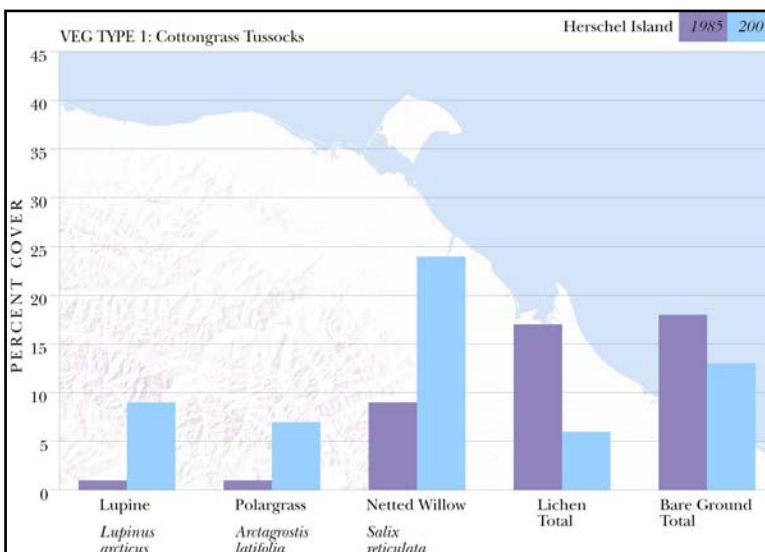
I also did the same tests on the cotton grass tussocks and found that the lupines had shot way up. The polargrass was incredibly different. It was almost no polargrass in cotton grass tussocks in 1985. The netted

willow had doubled. The lichens were less than half and the amount of bare ground was down. All together we're seeing the same trends in each category.

After I saw what was happening on Herschel I wanted to see if there had been any changes on the coastal plain as well. I was particularly interested in the cotton grass which is so dominant on the plain. In 1988 and 1989 I had worked for Parks Canada on the major biophysical inventory of Ivavik. I couldn't go back to the same sites because they were never marked and we didn't have really accurate GPS locations. In 2001, using a Landsat mapping of vegetation types, I was able to find the right vegetation types. I limited the study to just two types- the cotton grass tussocks type and the dryas/vetch/ lichen type. I wanted to look for the two most dominant vegetation types and the same two types that I was looking at on Herschel. I found a similar phenomenon, but again on predictable locations because there was subjectivity involved. This isn't stratified sampling where you do an equal number in every location. I had limited opportunity and I was looking for something very specific.

There is a point of land where Herschel almost meets out to the mainland called Catton Point. It has the dryas/ lichen vegetation type. I found it had been undergoing the same change as the same sites I had seen on Herschel. Over on the far east of the coastal plain in Ivavik, I saw that same phenomena with the lupines and the polargrass creeping in. On the Firth River I found dense polargrass growing between the cotton grass tussocks. It wasn't like that in 1988 and 1989.

When, I analyzed the data I found the changes on the coast are not as dramatic as on Herschel. I think the whole phenomenon is proceeding slower on the coastal



plain. You have to bear in mind that Herschel is a unique place on this planet; it's a study unto itself. It has attracted all kinds of wildlife and birds. People have gone to Herschel since time immemorial because it's such an abundant and rich place. I wanted to know if the phenomenon occurring on Herschel, being an island, was occurring on the mainland as well. And I did find similar results. The lupine cover had really shot way up. The polargrass had gone from almost one to seven or eight percent, netted willow were many times greater, and lichen was way down. The bare ground was somewhat reduced but not nearly as dramatic in the cotton grass as it was on the dryas/ grass/ lichen.

In 2005, I went to Kay Point. It's a predictable point of land where I would expect polargrass given all the other places we had been seeing it. We did find it coming in on every one of the promontories and down the sides. It wasn't there before, not in these numbers of percent cover. The lupines are also coming in.

One of the difficulties with my project is that there is a lot of variability from one year to the next. For years, Dorothy Cooley has tried to coordinate the vegetation study to take place about July 15th. There is a lot of value in measuring a parameter exactly on the same date. I've gone out at about the same time and found the grass wasn't as far along as it had been on other years on the same date. This really affects the data and the ability to show differences in vegetation or record percentages that are dramatically different.

I have tried to network and find other people who have noticed the same phenomenon of big grass on uphill promontories and things like that along the coast. So far, I haven't been able to connect with anyone. In the summer of 2006, I had the privilege to work with Danny Gordon on a vegetation inventory on the Blow River Delta. I was also looking in predictable places to see if I could find these grasses and I did. I don't

have previous information at all from this area but, from what I saw, I suspect that there is an increase in the polargrass.

The big difference is not just that it looks very different. When polargrass did occur on the tundra, on Herschel, and on the mainland, it was present in very low amounts on stable land, out on the tussock tundra. The most dominant place it occurred was on the thaw slumps all along the coast when they started to revegetate. That species was more like a pioneer species, an aggressive species that would be the first vegetation to appear. The big change now is that it is just coming in without any wide-spread disturbance of the tussocks and the dryas /grass/ Arctic willow vegetation type on the tundra. It could be due to a subtle change in our environment that is really suited to that species.

Over the last 14-to-22 years, there is an incredible change in the vegetation cover when you compare the work I did in the 1980s with what is happening now. There could be vegetation cycles or there could be climatic triggers. Maybe this polargrass will just subside. I can't help but wonder about the implications to the wildlife, especially the bottom of the food chain-up. It really motivates me to do this work.

### Questions, Comments & Discussion

**Conference participant:** Do you have any kind of hypothesis as to what might have caused this explosion of polargrass that you saw? Is it perhaps something to do with the soil moisture?

**Catherine Kennedy:** It could be a subtle change. Grasses are often used for reclamation because they respond very quickly and successfully. The change could be caused by as little as a few degrees warmer temperature or by drier conditions. Chris, how would you sum up the trend in terms of temperature and moisture in the last 20 years?

**Chris Burn:** Throughout the North Slope there has been an increase of about three-quarters of a degree per decade. That is an increase of about two-and-a-half degrees since about 1970; and so maybe a degree-and-a-half since 1980.

**Catherine Kennedy:** As for the moisture, I think the rangers would say it's generally drier.

**Conference participant:** Could the substantial deepening of the active layer in 1998 have had an effect on the near-surface hydrology?

**Chris Burn:** We know that in 1998, the active layer was very deep in comparison with anything that's been recorded before or since. The question of hydrology and the active layer is very interesting. It was curious to me that this year, 2006, there was hardly any water in the streams on Herschel. We had to go a long, long way to get good water. Yet in other years, when there is a deeper active layer, we see a lot more vegetation growing on the surface. Not only is there water released but also nutrients that are locked up in the top of permafrost are released into the ground. As a result, the vegetation is able to get more nutrients.

**Gord McCrae, Department of Environment, Government of Yukon:** You were saying that there is a loss of lichen in the vegetation cover. Would you expect that would have an effect on caribou at some point?

**Catherine Kennedy:** I don't know. It depends how much they depend on that lichen.

**Dorothy Cooley:** Caribou especially depend on lichen in their winter range. If they were using an area with reduced lichen, it probably would have an effect. Caribou do winter on the island. The Rangers say the caribou are there when they get there in the



spring. Travelers and other hunters are also reporting caribou.

**Bruce Bennett, Department of Environment, Government of Yukon:** When the active layer and permafrost are deeper, there is better drainage. Lupines need good drainage. That's why you see them on rock bluffs. Polargrass also like good drainage. It's usually wet on the surface because the permafrost is higher. And when the permafrost is higher, you are also getting more of that frost boiling. So, if the frost boiling isn't as active, the willows are able to creep over. As the lichens start getting shaded out, it just all seems like the permafrost has dropped and you're getting a drying trend on the top. That's why you normally just see it on the bluffs. Now it's beginning to spread.

You noticed lupines because they were flowering. You said it was "a sea of blue". Well, a lupine won't go from a seed to flowering in a year or two. It's usually about three years or a bit longer. I don't know the exact germination times up there, because they may actually go through their lifecycles much faster with the 24-hour daylight. But down here, it seems to be about three years is the quickest you could have a lupine to go from a seed to flower. How did the seeds get there? Were they in the soil before? That's always the question I'm running into: Is this part of a 30-year cycle that we are just seeing now? That's when it's helpful to ask people like Danny Gordon.

**Catherine Kennedy:** I think that's a valuable comment. There are woody shrubs, those little, low green ones you see coming into the frost boils, that don't grow to flower in one season. They're pretty slow-growing. That's a good indicator that this has been going on for a few years.

***Qikiqtaruk (it is Island) - Richard Gordon and LeeJohn Meyook, Herschel Island Territorial Park***

Richard Gordon  
Herschel Island Territorial Park  
P.O. Box 1129  
Inuvik NT, X0E 0T0  
richard.gordon@gov.yk.ca

Herschel Island has come a long ways since its creation in 1987, but it still has a lot of untold stories. We still have to communicate with our elders to hear those stories. We also have to use the scientific community to get stories for the future about the plants and animals, and how they're reacting to this climate change that may be affecting the island.

LeeJohn and I can go to our parents and our grandparents to ask what has happened in the past and to learn about our long relationship on Herschel Island. We are the next generation that is going to pass the stories on to that next generation that is coming up. We have to continue with those story lines. It's been 20 years since Herschel Island was creates as a park. We're going to see within the next 20 years if Herschel Island is going to be there as a park.

There are a lot of untold stories yet to come, and we, as park interpreters, will try and interpret those stories truthfully and honestly from our hearts, as time ticks away. Part of the Park Rangers' duties is to interpret stories of the past to our visitors. Over the last few years, researchers and visitors have come to the island, along with the Inuvialuit,

who still use the park for fishing, hunting and camping. We try to deal with any concerns that are raised. They are also discussed at the beginning and at the end of each season to see what can be done to correct them and protect the park from further damage.

Over the years, we, along with the Yukon biologists and other researchers have made research programs a priority to help protect and preserve Herschel Island Territorial Park's unique identity. Programs, such as the plant identification, the plant plots, the permafrost readings, snow density, shoreline erosion, slump erosion, bird transacts, weather observations and wildlife sightings - whether big or small - all help Park Rangers make management decisions about the park. In the beginning, we were hired as Park Rangers to be interpreters, but over the last 20 years, this has changed. Now we're more assistants in the research, and data collection. The Rangers know it's important. We have to be able to make decisions that may affect not only the Inuvialuit, but also the animals, the residents and visitors to the island.

The Park Rangers are there 24-7 starting in mid-April until the first week in September. Sometimes the Rangers do the data collecting in miserable weather that we don't want to go out in. You get people coming at three o'clock in the morning or dealing with the wildlife at six o'clock in the morning and issues like that. But the Rangers are there, collecting this data, and sharing it with the communities and other people in all walks of life. It's important to us.

A lot of things are happening. We've noticed a trend over the years. The Park Rangers that have worked in the past, they have seen these changes. We make our own observations. We have our beginning and end of season meetings to discuss what we are seeing. I take that information and relay it to the scientists who are working there. The connection with the scientific

community continues the research we need to help us make these plans.

We have two cruise ships per season. We can have up to 180 visitors in one day. They will stop for three hours at the most and want to come onto the island. During those times, the Park Rangers play an important role as interpreters and protectors of the park. This is our land. We have to protect it for future generations. Sometimes that means making hard decisions.

We all know data collection is very important. We can't make decisions unless we've have proof. That proof can come from the scientific community or the Inuvialuit or the Park Rangers. We together to create the Herschel Island Park Management Plan by meeting and working with the community of Aklavik, scientists, government agencies, Inuvialuit and other visitors. People brought up their concerns and we discussed all the issues. The plan is a working document for us as park Rangers and protectors. We use the plan because it's the people themselves who put the rules and conditions in place to protect the park. The Aklavik Community Conservation Plan is in place, too, as well as a lot of other documents, like the oral history of the Inuvialuit of the North Slope. We used all of them when we put the plan together to protect the park. We've seen a lot of changes in the last 20 years and we are going to see more in the next 20 years.

It is beautiful on the island and it's a job that everyone would love to have. It's like two weeks of vacation. You see life, and you hear life, and you protect life, because it's all there. That's the uniqueness of Herschel Island. It's got so many untold stories that are just waiting to get out there to be discovered. We are the interpreters of that, and that's what we're going to continue for the next 20 years.

## Questions, Comments & Discussion

**Conference participant:** Based on your 20 years of evidence, can you tell us when the whaling community buildings will flood?

**Richard Gordon:** There is a concern about all the heritage resources on Herschel. Two summers we moved them up 10 meters from the shoreline. If you look at old photos, you can see Simpson Point kind of goes another half a kilometre out, but all that is gone, too, now. It's all changing and, right now, the prediction for the buildings is 10 years.

**Conference participant:** There are two RCMP gravesites back from the shoreline at Pauline Cove, one of which is an RCMP officer who served his duty on Herschel Island in 1910 and died from influenza. There is a memorial to that officer in the park in the middle of Halifax. If you ever got to Nova Scotia, you can visit Central Park and see the memorial to the grave and to the service of that officer on Herschel Island in 1910.

**Richard Gordon:** The RCMP came to the island last year to recognize the two officers that are buried there. Others are buried there too - whalers and Inuvialuit. Like I said, those graves still hold a lot of stories. Relatives of the people that are buried on the island come out to Herschel and you hear their stories. People come from around the world that have relatives or kin that came to the island and disappeared. The enjoyment of being a Park Ranger on Herschel is that you meet people from all over the world who have stories. We can interpret the Inuvialuit lifestyle and they can interpret their lifestyle. Global warming is affecting everybody all over the world. Our concerns are no different from people coming from Italy or from Germany or elsewhere in the circumpolar region. Herschel Island is connected to everyone.

**Cameron Eckert, Department of Environment, Government of Yukon:** I would really like to echo Chris' earlier

comments about the really fantastic welcome that myself and many of the other researchers and visitors have received at Herschel Island over the years. I'm sure you all got the message from Richard's talk how the Rangers on Herschel Island bend over backwards and do everything for us when we're there. In addition, at the beginning of the season they collect fresh water for everybody who comes to the island throughout the summer. They also travel to the mainland and collect all the firewood that's used in the sauna and for everybody's enjoyment throughout the course of the summer. On behalf of the many researchers in this room who visit and enjoy Herschel Island, I offer our really sincere thanks for all the work you do. Thank you.

**Evelyn Storr, Aklavik Hunters and Trappers Committee:** Richard talked about the relationship that Herschel Island has with the scientific world in order to protect and manage. They also had to work really closely with the community of Aklavik in developing the plan. The Aklavik HTC has an agreement with the park on the use and care of the cabin. It's only in that kind of working relationship that things will remain on the island and people will have the respect for what is there.

**Conference participant:** Have been any observed changes in wildlife usage of the island? Sometimes changes in wildlife usage can drive vegetation changes, as well as being driven by them.

**Richard Gordon:** We had a herd of muskox that were kind of resident on Herschel for about four or five years. We would monitor and watch them because there was some concern about caribou and muskox living together. We were able to observe what the muskox were eating. We also observed that they were turning the vegetation over. That didn't scare away the caribou. The caribou are still resident on the island, but after a while the muskox, totally packed their bags and left. They were gone for about four or five years. Then, all of a sudden last spring,

we spotted 23 muskox on the island. I think this gives us an opportunity to start another monitoring program to look at how muskox and caribou can live together in a small area. We can use that information to help answer some of the questions muskox and caribou interaction on the mainland.

***Permafrost Monitoring Program on Qikiqtaruk - Herschel Island -  
Dr. Chris Burn, Carleton University***

Dr. Chris Burn  
Department of Geography  
Carleton University  
1125 Colonel By Drive  
Ottawa ON, K1S 5B6  
crburn@ccs.carleton.ca

The objectives of this long-term project are to look at the response of permafrost to climate change in a natural environment. There are four elements of the program. The first one is to monitor the temperature of permafrost at Herschel. The Rangers assist with this on a monthly basis. The second is to measure snow depth which the Rangers are also responsible for. They complete these measurements shortly after their season begins towards the end of April. The third element is to measure the thickness of the active layer which we do in August. That's the layer of ground, which thaws in the summer above permafrost. The final element is to investigate how much the ground is settling because of a deepening of the active layer and warming of the ground.

Our study transect runs from the top of Collinson Head down towards the Park buildings at Pauline Cove in a straight line. We have 10 sites where we do our measurements. At the top of the hill we measure the temperature in the ground by drilling a hole with a water jet. If we're going through ice-rich ground, we can drill about a metre a minute. But on Herschel, there is ice in the top 15 metres of the ground. Underneath that, it's thick clay. The

deepest hole we have, which is 42 meters, took us about seven hours to drill it. The only thing we introduced to the ground is water which we got from a small pond nearby.

The first hole was made in 2000. It's about 15 metres deep. From 2001 to the present day, we have been able to measure the minimum temperatures in the ground. The minimum temperatures are measured in April and the maximum temperatures in August. We were very surprised to find that the ground temperature at Herschel is about minus 8 degrees Celsius, which is similar to the temperatures measured in the Mackenzie Delta in the '70's. But Herschel is a cooler environment than the Mackenzie Delta area, because the warm water of the Mackenzie doesn't usually get to Herschel. The water in the ocean at Herschel is clear. It's not like the muddy water that's around Candle Island or Garry Island or even sometimes as far out as Shingle Point.

The first set of results established the general temperature of the permafrost on Herschel Island, but we questioned how long it had been that way. So, in 2004, we drilled a deeper hole that went down to 42 meters. We managed to get the readings from that depth last year and this year but they are very curious. Usually when you go lower and lower into the ground, the ground gets warmer and warmer. But on Herschel Island, we found that as we drilled down the ground got cooler and cooler. That's not because Herschel is unique. It's because the temperature used to be a lot cooler on Herschel. We think it used to be about minus 10. As we measure down in the ground to about 40 metres, we get a temperature of about minus eight or minus eight and a half. The fact that this temperature profile is rising, rather than cooling shows the change in climate in the last 35 years on Herschel Island. The nice thing about using Herschel as a laboratory is that at this site, there's hardly any snow. That means you can't blame snow depths for variations because there isn't any snow. The

change has occurred because of the change in air temperature, and most of that change in air temperature has been in the wintertime.

As we move down the hill, there are 10 sites where we are conducting measurements. A data logger measures the temperature in the ground just at the top of permafrost, four or five times a day throughout the year. We have the measurement location marked with a pole to make sure that when people measure the snow depth or the active layer, they always measure it at the same place. We also use the top of this marker as a reference for estimating how much the ground is being lowered because of melting of the near-surface of permafrost.

Every year, the rangers measure the snow cover. This tells us if it was a snowy year or not, and we can then look at how that affects ground temperature. We found that at one site, where the snow was about 135 centimetres, the annual temperature is about minus 5. At two other sites that didn't get even 10 centimetres of snow, the temperature, on an annual basis, is down to minus 9. This information shows us the relation between how snow affects ground temperature. When we compared our information to data collected by Dr. McKay at Garry Island from 1969 to 1971, the relationship we see suggests that we have identified something that is taking place everywhere.

We began to measure the active-layer depths in 2003. We do this work in August. The data so far shows that there hasn't been very much change in the average thaw depth from 2003 to 2006, but where we've had the most and least amount of thawing has changed over this time.

There is a lot of ice in the top of permafrost. Our drill bit can make a hole of about a metre without much difficulty. The top metre of permafrost on Herschel is about 50 percent ice. So, as the active layer gets thicker, we should expect the ground to go

down. Our measurements have shown that at all 10 of our sites over the last three years, the ground surface has actually been going down. This relates to some of the points that Catherine described. The top of permafrost is icy and contains a lot of trapped nutrients. These nutrients can't be used when the active layer is shallow. Now that the active layer is increasing, the ground is releasing these nutrients and that has resulted in a change in the vegetation. It's exactly the same reason why after a fire in a permafrost area, there is a big bloom of all sorts of vegetation. It's caused by the sudden release of nutrients.

One very surprising thing we found during our studies was a large snow bank - over five feet high - in one of the valleys that had been preserved right into the summer. It was covered with a layer of organic material which kept it from melting. We'd never seen this before. I asked Herschel Ranger LeeJohn Meyook about it and he told me that there had been very big winds over the winter. They blew all that organic material from the centre of the island and dumped it in the valleys. That's what has protected the snow. It was very nice to have that explanation. There were some foxes living close to the snow bank. It was a good place to make a den because there were no mosquitoes. Seeing them made me think about how an environment suddenly changes and how new opportunities are presented. Climate change will give us opportunities, as well as problems.

I think Herschel Island is an excellent place for working. It's a natural environment that is relatively undisturbed. There is an infrastructure in place where you can land a plane and stay comfortably. Herschel has an established history, not just the history of peoples' occupation, but also, a scientific history that forms a baseline against which changes can be measured. To me, Herschel represents a massive collaborate arrangement. Working on Herschel gives you a chance to talk to other people and discuss what you have observed. It is a very

friendly place. The Rangers more or less operate an open house. Herschel also has secure access. If we establish a long-term program that we want to have in place for years to come, we need to be sure that we'll be able to come back time and time again and not be cut off at some point. In a park management system, such as Herschel, we can be confident that a long-term project is possible.

***Parks Canada's Environmental Integrity Monitoring Program: Considerations for Kluane and Vuntut National Parks - David Henry, Parks Canada***

Dr. David Henry  
Kluane National Park and Reserve  
Parks Canada  
P.O. Box 5495  
Haines Junction YT, Y0B 1L0  
david.henry@pc.gc.ca

Parks Canada is developing an Ecological Integrity Monitoring Program in all the national parks right across the country. I'm going to use some examples from Kluane and from Vuntut, but these apply to the monitoring program in Ivvavik National Park as well.

When the *National Park Act* was revised in 2000 two new important principles were introduced. Ecological integrity (EI) was legally defined for the first time. Parks Canada is legally bound by this definition.

Ecological Integrity (EI) is "with respect to a park, a condition that is determined to be characteristic of its natural region and likely to persist, including abiotic components and the composition and abundance of native species and biological communities, rates of change and supporting processes." Canada *National Parks Act* (revised 2000)

The second principle that was included is found in this statement -

“The maintenance or restoration of ecological integrity shall be the first priority of the minister when considering all aspects of the management of parks.” Subsection 8(2) of *National Park Act* (revised 2000)

This statement, combined with the definition of EI, is driving ecological monitoring in national parks. You need to be monitoring in order to know that you’re maintaining EI.

Parks Canada started to develop EI monitoring about six or seven years ago. We are using six to eight indicators. Altogether, Parks is working in eight ecosystems, four of which are found in Vuntut - tundra, forest, wetlands and fresh water (lakes and river). These are the ecosystems for which we are reporting the ecological integrity.

We’re using the “Iceberg Model” which conglomerates measurements to provide a single measure (the top of the iceberg) to indicate what is happening to the EI in the forest environment. We are taking a bioregional approach that sees all the northern national parks are working together. There is management involvement in the program as well as stakeholder involvement. We’re focusing on two questions: “What is the state of EI in your park, and what are we doing to improve it?”

The food chain for the forest ecosystem in Kluane is very complex. You can’t monitor everything so you have to decide what to do. Wardens have been carrying on monitoring in the national parks for a hundred years, but for this program we created a more formal type of monitoring. We’re using the same methods – usually on the same sites – year after year after year as a set of benchmark measures that we hope to continue for a very long time. In the Yukon we found it helpful to create a working definition for EI monitoring. For us, EI monitoring consists of any repeated measurements, described in a written protocol. It’s planned to be carried out over the long term to serve as an early-

warning mechanism of significant change in that ecosystem, with the purpose of influencing management decisions. The method we use has to have those characteristics to be included in our EI monitoring program.

Parks Canada has made a big effort to integrate information from monitoring programs into management decision-making. One of the things that we have learned is the importance of establishing clear objectives for the monitoring program and getting support for them. Once you have those clear objectives and good buy-in to them, you determine your protocols. You carry out those protocols over a number of years, and you generate long-term databases. These long-term databases are really valuable. In Kluane, the wardens have been carrying out certain monitoring since the mid-1970s. There is also all the data that has been collected by researchers working out of the Kluane Lake research station. We recognized the value of the information that has already been collected and built the monitoring program around it.

Once you have enough data, you can set a management threshold. We have set two thresholds – yellow and red. Every five years, we prepare a State of the Park Report. We use these monitoring thresholds to evaluate the EI of the park and identify concerns. This in turn is the first phase of reviewing and revising the Park Management Plan which is the master plan for the next five or 10 years. That is an example of how monitoring is influencing management decisions in our parks.

The monitoring programs are still under development. They are currently being reviewed right across the country. We’re doing this review to better achieve the incorporation of local knowledge and traditional knowledge better. We’re also trying to garner greater support from the co-managers in the community, as well as develop a sounder statistical design and a better data management system so the data

will be around 20, 30, 70 years from now. We want to make sure that all the major park ecosystems are monitored.

I really see community-based monitoring programs as a partnership between the community, scientists and managers. Ideally, they sit down together as equal partners and develop the monitoring program together. All three have their input, offer their insights and move together. Herschel Island has done a fine job of that.

In Kluane, we have been able to go back and gather together the weather data since the 1950's and analyze it. We've found that the climate is changing in the region. One of the changes is that the periods of severe cold are much less frequent than they used to be in the '70's and '80's or earlier. Early winter, early and mid-December is definitely warmer than it used to be. We're going through a series of warm, dry summers. Since 1989, seven out of ten of the summers have been the warmest on record. Those factors are promoting the very large outbreak of spruce bark beetle that the Kluane region is experiencing.

Wardens have been monitoring mountain goats since 1976. This is a good example of the value of a long-term database. The data is showing a lot of variation. Long-term data is needed to understand what variation is natural. Mountain goats, snowshoe hare and just about any species you want to mention in northern ecosystems show a lot of variation. You have to understand how much variation is natural before you can set a management threshold to determine unnatural change. If you don't have a long-term database to set those limits on natural variation, you'll be building it on assumptions. You may be right, and you may be wrong.

In Kluane, we have long-term databases and this allows us to set these two thresholds. The yellow threshold takes in 90 percent of the historic variation. If a population crosses that yellow threshold, it's a warning to get

ready and pay attention. Start making your plans, because something is going on! If it crosses the red threshold, it's outside of 95 percent of the historic variation. It signals a definite change in this population requiring some management actions. Management actions should be thought out ahead of time and have community support so that you're in a good position to take those actions when they're called for.

Thanks to the wardens' monitoring, another example of a long-term dataset is on the Kokanee salmon in the Kathleen Lake watershed. This is a population that's clearly in trouble. The red threshold here is about 1500 fish. The wardens have been counting fish on the spawning grounds since 1976. There were many years where there didn't seem to be much point because nothing much changed. Then, suddenly in 2001, there was. We were able to determine a significant change fairly early and took some actions. We are still trying to figure out the causes of this decline. We have been looking at climate data and water temperature data from Sockeye Creek where they spawned. We have found that during the last three or four years, the water temperature during August – when the spawning takes place – has really gone up beyond the optimum level for fish reproduction. We need to do a lot more work but for now that's where we are in trying to understand the causes and what can be done for this Kokanee population.

Over the last five winters, we have been carrying out a study of the predators in the Old Crow Flats in Vuntut National Park. Local residents Dennis Frost and Isaac Thomas have been the main observers on this study. The elders have contributed a great deal with their observations. We also did an aerial survey of the wolverine to determine the winter population in the flats. We found that they are a very abundant population - 9.6 animals per 1,000 square kilometres. The population in the Old Crow Flats is over three times as dense as the wolverine populations in southern Alaska.

The wolverine is a species of special concern throughout western Canada. This population in the Old Crow Flats is going to become increasingly important in the conservation of this species in the future. We also found that muskrats, caribou carcasses and snowshoe hares are important winter food for the wolverines that either live in the flats or move into the area during the wintertime. Through this study, we have been able to set some benchmarks for all the predators in the Old Crow Flats. The plans are to repeat this study in about 10 years when we can compare these recent measures to assess what has happened to each of these predator populations. Benchmark measures will prove increasingly valuable as we move into the future.

We are communicating what we are doing in several ways. We publish annual reports for the Kluane Region ([www.taiga.net/reports](http://www.taiga.net/reports)). These are the Kluane Ecological Monitoring Program reports on EI in the park, as well as EI for areas in the greater Kluane ecosystem. If you're interested in a summary of the data, you can find that on Charlie Krebs's website ([www.zoology.ubc.ca/~krebs/](http://www.zoology.ubc.ca/~krebs/)) We have published a pamphlet "Monitoring Ecological Health of Kluane" on the same website. The Yukon News has had articles on both Kluane and Vuntut Park. We also hold open houses and community meetings.



## Day 3: Thursday, February 1

### **John Donihee, 2007 Yukon North Slope Conference Chair**

#### ***Introduction of the Speaker***

This morning the focus of the conference shifts to some topics that I've looked forward to with a great deal of interest. Our first plenary will address the role of harvesters and traditional users in environmental monitoring programs. Our speaker is Randall Pokiak. Many of you know him well. Randall has spent most of his life living off the land and its resources, and he continues to do so. He was instrumental in the negotiation and signing of the Inuvialuit Final Agreement and has been heavily involved in the co-management of the western Arctic for decades. Currently, Randall is a member of the Wildlife Management Advisory Council (NWT). He's recognized as a respected holder of traditional knowledge and believes in sharing his knowledge with others. He values teaching his children and other youth about the importance of being connected to your people, the land, and its many resources.

#### ***Plenary Session: The Role of Harvesters and Traditional Users in Environmental Monitoring Programs - Randall Pokiak, Inuvialuit Harvester, Tuktoyaktuk, NWT***

Randall Pokiak  
Inuvialuit Harvester  
General Delivery  
Tuktoyaktuk, NWT X0E 1C0

I'd like to say good morning to everybody here. I would also like to thank Lindsay Staples for phoning me and asking me to address the scientific community on environmental wildlife issues and the



research. I believe that our communities are closely knitted together. The only thing is that our types of knowledge are a little bit different: one is academic, and the other one is basically practical. I think you need both to make life a little easier for everybody.

I am going to try and do a little bit of justice here for the harvesters and for the knowledge that we can contribute to the communities. We are all trying to understand the environment, the wildlife issues and the changes that are going on within the Inuvialuit settlement region, including the Yukon North Slope. I want to give you an idea about the things a harvester goes through to get to a meeting like this. If you want a harvester to be involved, you've got to know a little bit about the kind of life that we live and the day-to-day activities. For instance, I just had an experience before I came here. That's why my voice is the way it is this morning. I'm glad I got it back before I spoke this morning. Last week I was out in the caribou conference in Inuvik. It ended Friday and I got home Friday night. Saturday morning I went out to my trapline, because I had two days, Saturday and Sunday. Before I left I told my son, "Lucky, I'm going to be gone. I should be home at seven o'clock. If I don't show up by nine o'clock, something is wrong."

I went out on the trapline and I did my thing. It's two-and-a-half-hour ride. On my way home, my crankshaft broke, at seven o'clock. I knew my boy was going to be coming out to get me, but I decided, well, I'm 57 years old, getting on in years, now so now's a chance for me to walk eight miles to see how much physical and mental change has happened from my prime years to that aging level. And that's why I lost my voice. I got dehydrated, and if I was going to have a heart attack, I would have had it then. As a harvester, you do a lot of work and you put out physically. You're putting all your energy into your muscles, your heart. Everything is working. Really, I thought. "Well, if I am going to die of a heart attack, I'm going to die of a heart attack, but the thing is, I've got commitments here and if my boy makes it, I'll be able to make it here."

I got home at 4:30 in the morning. My boy came out at 1:30 and picked me up, and we got back at 4:30. I got a plane in the morning, at ten o'clock, and I came here that same Monday afternoon. So, that gives you a little bit of an idea. If you want harvesters involved, this is what we go through trying to live up to certain commitments. It's really hard for harvesters to go through that. It's better just to stay out on the land and forget about everything else. That's why at public meetings and community gatherings, you don't see so many harvesters coming in and sitting on chairs like you are, because they prefer to be out there. They depend on their leaders that they have put into positions, under the IFA, through game councils, and through co-management boards, to represent them, and to protect their rights, and interests in the laws, regulations and legislation. I think they want to be involved, but the time commitment is something that they have to consider. That gives you an idea of the kind of impact people like myself go through, just to be involved in the things that are of interest to me as a harvester and to my family.

Before I start, I'd just like to mention that we, the academics and the harvesters, can learn from each other. Sometimes we forget that we can learn from the younger generation, too, if we listen to them and answer their question. It draws from us ways of how to explain certain things and the things that we are involved with in life.

I have a girl, Devalynn. She's 14½ years old. I did a lot of traveling last year and had an opportunity to be with her in Inuvik for five days. So, I phoned her up and said, "Devalynn, come to Inuvik. I want to visit with you. I want to spend some time with you. I'm at a meeting, but we'll have breakfast, lunch, dinner and evenings together." That first day she arrived, we were having lunch and we were sitting there, and somebody came up and shook my hand, and we talked for a few minutes about some issue, and he walked away and I looked at my girl, and I said, "That guy works for the government, and this is what he does in regards to the wildlife issues."

I just finished saying that when somebody else comes along and shakes my hand, and we talked about something else, and he walks away. And I said, "Devalynn, that guy works for the industry, and this is what his interests are." There was a conference going on in Inuvik at the time and all these people were coming into the restaurant. Then Mike Fabijan came in. He works for an environmental firm, dealing with environmental TK issues of the region. He shook my hand and talked a little bit, and I told her, "That's an environmental person, who works with oil companies and the governments at times to try and better understand about the wildlife and environmental issues." About five people came and talked to me like that.

At the end of that, Devalynn said, "Dad, you sure know lots of people and when they talk about a certain thing, you understand them and you know what they're talking about." I said to her, "My girl, look, you know me. I am a harvester and a hunter. My knowledge

is from the environment and the wildlife that's in that environment. Because of that knowledge I've gained through the years as a harvester, it has brought me to get to know these people. And in order for a harvester like myself to be involved, I had to get to know how the government works. I had to get to know how the industry works, their interests, their needs, and the same with everybody else who has interests in the Inuvialuit Settlement Region in regards to the environment and wildlife." So, it's not only my activities in earning an income and food from the land that I have to know about. You have to learn about another realm, like other agencies, so that I can say, "Okay, I know about those guys. They're influencing my life and my lifestyle. We have to be involved. We have to somehow be involved so that our interests are looked after."

And she said, "Well, how did you get to know so much?" And I said, "Devalynn, you forget I am 57 years old; you're 14. I got a real head start on you. I'll tell you what, my knowledge of my environment as a harvester has made me able to travel. I can share with you as much as I know. If you are willing to learn, if you are willing to listen, I will share with you, and this knowledge that I have about wildlife and environment, that can take you places."

I just wanted to share that, because young people are very important, because you've got to bring them up behind you. Not only should your sons be out on the land, but your daughters, because in our culture, we train our children, too. They learn to hunt. My girl is an excellent shot. She can take a rifle and load it up, and in standing position hit a target. She's been trained to do that. So, if you're going to live a life out there, you've got to be able to do these things, whether you're a boy or a girl.

One of the other things that my girl and I talked about is the caribou. When I told her about the situation, I said, "We are probably going to have to live with one caribou a

year." She looked at me right in the eye and she said, "Dad, how are we going to live?" You know, that was the question she had. With the amount of caribou meat that we normally eat, we have to reduce it quite a bit. And I said, "Devalynn, you know, living with me, you're lucky, because your diet is different. You have a wide variety of diet and wildlife. So, if you are missing out on one thing, you can get another thing, and you are accustomed to that food. A lot of children your age are unaccustomed to those kinds of foods. They can't eat seal; some of them can't eat polar bear." So, there's a change of diet. You learn, you know, from these young people. How can we reach them and introduce a certain level of understanding to them so that they can start adapting to changes that are going on?

This is a time for people to try to engage. I'm here because of my interests. I think that the scientific community should know the kind of contribution harvesters can make. The people that are out there right now, that are not here, that can't be here, they've got a lot of knowledge. They have a lot more than I have because they are out there most of the time. I spent a lot of my time negotiating and traveling. That has had a cultural and traditional impact on me, because I want to be out there, and yet I'm here. It's really important that TK is tapped into. We draw from that. The elders that negotiated or helped or started the final agreement drew from the traditional knowledge that they had. You can imagine that TK they had is a lot more than I have right now. I only draw from them and they're gone. There are few elders I can go to and say, "Look, this is the situation that I see out on the land, tell me about it." Because those elders have passed on the knowledge is gone. The only thing that we have now is remnants of what they left behind, and this is what we still draw from as a harvester.

You experience the practical side of TK knowledge when you're out there, surrounded with the atmosphere, the events, smells, sounds, sights, and all those other

things you notice. That's when the TK starts coming back to you. Sometimes something happens, and then you just remember something that was told to you. Under these kinds of situations, under these kinds of circumstances, this is how you should conduct yourself and this is what you should do. Sometimes it's life threatening. Sometimes you can either work for 10 hours or work for three. I prefer to work for three, based on the TK, rather than learning the hard way, through 10 hours of personal experiences. And as a harvester, you can combine the two. It cuts down on a lot of time and time is very precious. To be out on the land, to be with your family, to teach, to pass on certain things is very important to us. My time is very important to me.

A lot of this TK relates to the environment because that's what you live in. You've got four different seasons; you've got to understand them. The shoulder seasons, both the start and the end of them, are the ones that you've got to be a little bit more cautious about. Right in the season itself, everything is normal. You have to understand both the resources and the habits of the wildlife you're targeting. Like right now, I don't go and hunt snow geese in January. You'd be wasting the time. Knowing the resources that are there and the times and seasons is important. The timeframes we have to harvest those species is very short, so attention is really given to those times and the wildlife that you're connected with. Right now, I am not thinking about snow geese hunting. I am thinking about my trapline. I am thinking about the resources that I'm targeting right now. This is what happens with harvesters. You've got to go out and target, and you don't deviate from that. Changing takes time out of your life and your efforts are not as successful.

As harvesters, we also keep track of events, because those are changes that are going on. We are seeing a lot of that right now. Harvesting is not only hunting and trapping. When we're out there, there are a lot of

times when we've got enough of what you need, we just observe the wildlife. In our traditional culture, when that happens, your mind and everything is set on just observing. The wildlife gets very tame. They can sense they are not being harvested and you get a chance to really observe them. Because they are doing natural things, because they don't feel threatened. We get that opportunity sometimes to observe and just to see the behaviour and the habits, and say, "I've never seen that animal do that before." And when you go home, you go to an elder and talk about it. Then TK starts coming from them.

There's so much TK in the minds of harvesters. Sometimes somebody has to push the button like in a computer, and the information can come out. That's the kind of TK that I think you are trying to tap into right now. You've got to push the right buttons, so that harvesters will be able to share the knowledge that they've got for that specific time and for that specific enquiry.

I think the IFA speaks for itself. It was the elders who contributed lot of knowledge to get us where we are. Because of them, these kinds of conferences are set up. Sometimes we get so caught up in the work that we're doing, that we forget to say where we come from. To me, my history and my culture, where I come from, the kind of people that lived before me and what they contributed, what they did physically and mentally and how they adapted to the changes that were going on are important. It helps me try to adapt. All my life I have been adapting to changes and trying to direct my life to make sure that the harvesters are taking part in what's going on in regards to environment and wildlife.

One of the biggest things for the elders in negotiating the IFA was the wildlife issues. That's why you see the Joint Secretariat and the wildlife management boards set up the way they are. In the past, before the IFA, as harvesters we were impacted environmentally, economically, and socially. We were

impacted by the governments and industry. Before negotiations, the government was telling us, "Look, we can look after the land and the wildlife, that's our job." But during the negotiations, we said, "Well, that's your job, but you're not doing it very well. You are lacking and we lost a lot. There have been a lot of impacts on us and we never got compensation for it. We're the ones, as harvesters, that suffer."

Things started changing when development started impacting the environment and the wildlife. So the co-management bodies were talked about and we said, "We want to be involved in wildlife management as harvesters." And that's where the co-management bodies come in. Everybody saying, "This is what you can contribute. You can bring in the TK at board levels. We'll appoint people that can contribute and bring certain knowledge to the table." The government can bring in the technical, scientific, biological, justice side, and regulation side. We have to work together. This is what the co-management bodies are all about- trying to find ways to better manage the wildlife and the environment. And we have tried, as Inuvialuit, to take a real meaningful part in wildlife management. We still have some goals to achieve which I'm going to be speaking about a little bit here.

There have been a lot of changes going on in harvesting activity. Within the last number of years, as a harvester, we really had to adjust because of the changes. This is where our food comes from. This is my living. This is how I pay my bills- from resources are out there that I can tap into. And when conditions start changing, it starts affecting the bottom line as an income. I can get enough food. That's OK. But when you are using the land as a source of income, it starts affecting your ability to maintain the equipment you need to be out there and active on the land. The biggest struggle for harvesters is maintaining equipment. It's one of the really overriding issues that harvesters think about. "Do I have my skidoo ready?"

Do I have my boat and motor ready?" Then the next question is the gas and oil. Those are big ticket items for us. With the gas prices going up the way they are, people are saying, "I want to be out there, but I've got no gas." That's one of the things that harvesters really have to deal with.

Harvesters are also focused on the governments and the other agencies that affect their lives. I am involved with some of the wildlife management issues, because they are affecting my life. They are affecting my children. If they are going to have the lifestyle I have, they are going to have live with the laws, regulations and legislation that we're helping put together through the co-management bodies. We've got no choice but to get involved with it. Personally, I think that I'm blessed and I'm cursed. I'm blessed because I can take part in the changes going on. I'm cursed because knowing what I know, takes me away from the land and from where my heart is. The heart of a harvester is being out there. It's being free, just to be out there- no noise, no nothing. This year was the first time I really enjoyed trapping alone. My boy said he wants to come out with me, but I said, "Look, I feel like doing this alone." I just want to be out there by myself every opportunity I get. And so, this is what I've been doing since the fall.

There have been a lot of changes in the climate and changes in wildlife behaviour. I'm just going to go over some of them. Fishing is very important to us, especially during the summer to make dry fish. To me dry fish are very important because they are a source of not only food, but of income. People who are working for industry or government don't have time to go out there and fish. They are saying, "Boogie, I want 50 whitefish. I want 60 herring dried fish." And so, you get orders. Other people are doing that too. Not just me. So because of the opportunity for a harvester to generate a certain income, fish behaviour is very important. We target them in July, when drying is good for the fish and they can dry

properly. The timeframe is already getting shortened – two or three weeks – where you can do it properly. Sometimes they are late to come. When they come, you're going to have a run lasting for about three days. Then they kind of quit, and then, they run again. So, the patterns change.

The hunting of migratory birds is also changing. When we go out there for long trips, it costs us a lot in time and money. Instead of waiting out there for five days to get a load, sometimes you are waiting for weeks. You can imagine the kind of time that's taken out of a harvester's life because of the changes that are going on.

The behaviour of the beluga whaling is starting to change. I noticed it this summer. They are going out a lot quicker and taking a little longer to come back. When you are out there on the spot, it's okay. But when you are traveling from a community like Tuk, 16 miles to hunt the beluga and the behaviour is changing, sometimes you come back with nothing. Usually harvesters go out there and come back the same day. So what's happening is that you are going out there, making three or four trips, and coming back to town with nothing because the whales went out to deeper water far too quick.

The thaw in the springtime this year was a lot earlier all over the place, really early. It was a late freeze up too. I wanted to be out on the trapline in the middle of October, like normal, but I couldn't get out there till almost the 20th of November because of the ice conditions. These are the kinds of things we are noticing. When you are out hunting on the floe edge, you notice that the ice conditions are changing out there. You don't know if you should be going out. Normally, you can, depending on the thickness of the ice. You conduct yourself according to what you're seeing and what you're noticing. When you are going out further and further and further from the shoreline, there is a certain point where you are saying "Okay, that's far enough." There's a chance, while you are out there, that you might get drifted

out. There are a lot of changes that are going on that we're starting to notice.

One big issue we have as harvester is that we used to know how to predict and capitalize on those windows of opportunity for the wildlife in the different seasons. We knew about those things. We could say, "Well, I am going to be out there, and this is what I expect to get," and you do get it. When I first started trapping, I could build a snow house, an igloo. The snow was proper. The texture and everything, the snowfall, everything was proper and normal. But right now if you go out there and you try to build an igloo, even in January, you can't find the proper snow. I think that there has to be some kind of documentation to use as a benchmark.

Sometimes in our history, through our traditional knowledge, we say, "Well, summer came, but it never came, because a lot of snow never melted. It was just too cold." And sometimes it's too hot. There were the odd times you have that, but not year after year after year. Changes don't occur like that. Those kinds of events are abnormal and you notice them. Then the knowledge would be passed on in regards to how they adapted to that so that we could draw on that TK to adapt if those events happen again. If there was documentation before the 1970's about environmental conditions of each season and the behaviour of the wildlife under normal circumstances, you have a base to say, "This is how it was." A benchmark to say, "Well, since that time, there have been a lot of changes," and you can start seeing the natural state as it was. They call it the "pristine". If you are looking at wildlife and you are going to have development, you want to know the pristine conditions at the time when nothing was there. And you want to see also what happened when the development started, the impacts.

Something that should be targeted is to document the TK while people are still remembering those days. It's a challenge to

do that. Industry and governments should do their part in helping to document it so that you've got a benchmark in saying, "Okay, this is how it was". Then you have something to compare it to.

The scientific community is trying to tap into the TK, with the all the research and all the activities going on. I think that's something that we've been trying to do. You hear about "TK, TK, TK, TK"; but how much do you really learn about it from when we talk about it? The only opportunities we have are when we come to conferences like this or to co-management boards. You sit there and you share it. Sometimes it's a real challenge to a person like me. When I sit across the table with somebody and you're talking about a certain species, and they're saying, "Well, what do you guys know about it?" And you sort of repeat everything all over again.

Sometimes I sit there and I'm wondering, "What? I've been meeting with these guys, and we've talked about this issue so many times and they still ask for the same information. How much are they really receiving? How much is sinking into their heads?" And it's almost an embarrassment to somebody like me to continue to repeat TK, the same TK information. The challenge is sometimes I feel like saying, "Well, you asked me what I know about TK. We talked about it before. What do you know? What do you know from the information of the past that we've given you? What you don't mention, what you don't bring forward on the table, we'll fill it in."

It's like a teacher. When you are teaching somebody, a teacher takes a student and they say, "Well, we are going to teach you this and this and this," and you give them lessons, and then, you give them a test to see how much they actually received and sunk into their minds. That's how a teacher tests somebody that they're trying to teach. As a harvester, I think we are trying to teach students, the scientific community –

biologists, governments. I don't know how much they're actually receiving what we contribute. I don't know if they understand about the time and the effort we take to be involved so that the Inuvialuit voice is heard in relation to the wildlife, environment and harvesting issues.

This is a real challenge for the scientific community to deal with. There should be a way to get information from each harvester that's out there seeing the changes- erosion problems, climate change, and animal behaviour. There should be a way to compare it with the scientific findings. If you want to tap into those resources, I don't think that you have to buy a big ticket item like a Skidoo for somebody. The harvester will be glad if you pay some of the gas to be out there to get that information.

If a harvester is going to be out there for three months, and you're interested in knowing that area and what's out there and you want to document it, there should be some kind of contribution to help the harvester to be out there. A lot of times, it's just the lack of gas and oil alone that keeps them from being out there. Maybe you can get the information you want if there's a contribution of some kind. I think we have to work together. Industry and the government need harvesters to be out there in order to get a better picture of exactly what's going on in the ISR.

The governments and industry need the harvesters to be out there so they can get a better picture of exactly what's going on. It's hard to adjust to that as a harvester. Right now, we are really adjusting. I can't draw from that TK I know to target an animal because things change. Timeframes are narrower for us. As a harvester, you are trying to adjust to that change. The wildlife is also trying to adjust to that change. You really think that we are confused about the changes that are going on with the climate and the environment? You know, the wildlife is going through the same thing we are going through. We have to adjust to the

wild. As a harvester, I depend on certain species. If their behaviour changes, I've got to adjust to that change. But instead of using TK to draw from, you've got to start producing other knowledge. If somebody comes to me and says, "I want to go over there and do some fishing and do some hunting of a certain species", I can't say, "Well, you go at this time of the year and this is what you do through that whole process for two or three weeks." If I tell them that now, and they go out there, they come back and say, "You know, we barely made it." When industry comes to us and asks us, "When is the best time to go out there and do this thing?" Historically, before the 1970's, you could hang your hat on our TK. Now, you really don't want to share that TK, because you don't know. If something goes wrong, they're saying, "Oh, your TK was nothing. We followed your advice and this is the problem that we face."

Even as harvesters, we are going through that change. It's very important for me to try to understand the change in behaviour, the change in the patterns of wildlife and to adjust to that for a number of years and see if it's going to become stable. Once it become stable, then you can start to say, "Okay, it's been like this for so long. It's been tried, it's been proven to a certain extent, and this is the advice I will give you." I think that's the state we are in right now as harvesters. We're adjusting right now in relation to the changes in behaviour of wildlife and the environmental that are going on.

You are going to see us, as harvesters, taking a real equal and meaningful part. That is one of the goals of the IFA - to take an equal and meaningful part in what's going on in the area. I think that's something you are going to have to consider here and find a way to tap into that knowledge that TK has. You can only do that through brainstorming or in a workshop of some kind with people who say, "Okay, this is what we can contribute. If this is what you need, this is what we can contribute". I think that's

something you are going to have to try to work with.

The IFA has opened a door for us to do this. The Inuvialuit have business opportunities through the development corporations that look after training, business opportunities, and employment opportunities. The Joint Secretariat and the co-management boards are dealing with wildlife issues. Anybody that wants to can be involved. There is no shortage of positions, if you've got the training, the knowledge, and can focus yourself on being active. I'd like to see Inuvialuit biologists. I'd like to see Inuvialuit environmental training that has academic-level training and certificates, because that's what we need. This is something that is close to the hearts of harvesters and I think that Inuvialuit should really get involved in those kinds of positions.

How am I benefiting as harvester right now? I'm not benefiting from the government. I am not benefiting from industry. I'm certainly benefiting from being in the co-management boards, but a lot of harvesters are not. The only income and revenue that they are getting is from the land. I had to make a choice in my life about my time. And when I was getting involved with the co-management boards again, I said to both Game Council and to IRC, "Look, I can help you to a certain extent. I'm going to give the Inuvialuit organizations three months of time out of my life a year. Nine months is my own time. These are the decisions that I have to make as a harvester and as a person. I've got knowledge and resources that I draw from, from my involvement in the negotiations and implementation and from being a harvester. We've had the IFA for the last 25 years. I think that a lot of people are focused on getting involved. But it takes a little while for people to grow up. As a child, you can only do so much. You can push your child, when he's about five years old and he sits on his bum on the floor. You try to do that when he's 14 and you hardly move him. I think that our people, in these last 25 years, have grown up. So you can be

pushed, but you won't fall down. I think if you keep pushing them, they'll push back.

I think there's that growth there. There's that maturity and you're able to take a meaningful part in decisions and be confident about it. The IFA has opened that opportunity for us.

We've tried to protect our land and our wildlife in our negotiations. If you take a look at the IFA, the land selected was in really critical habitat areas that are connected very closely to the hearts of the people who live in this settlement area. We could only select a certain amount of land but there were still other important areas to be protected. We thought about alternate ways to protect the environment and wildlife that are close to people and harvesters. We agreed to setting up parks. Now you can see those parks we've talked about. We have marine protected areas, too. This is how we tried to protect the ISR. Any activity that goes on, whether it's in the scientific world, the industrial, or government has to go through the co-management boards. They go through environmental screening and through environmental review if they have to. This means that the Inuvialuit have a voice anything that goes on in the ISR and that's important to us.

Right now, as harvesters, we've got to continue life. Whether there are changes or not, we don't say, "Well, I am going to wait until things settle down, and then, I'm going to go back out there." There are people still out there, and they will continue to try to be out there and generate an income for themselves.

I'd like to challenge the scientific community and the people in governments to try to engage the harvesters. Find a way to get together. The attitude I've got is a harvester's because my life and the lives of other harvesters depends on it. Other harvesters could probably live with being involved with governments, industry and with co-management boards, as I have. But

there are certain times when enough is enough. How much is enough, that's a big question right now. Like I mentioned, for me, three months belongs to Inuvialuit and nine months is mine. Three months is enough to me. I can't do more than that.

It's the same with the environment right now. How much activity can take place before you are really hurting the environment, the wildlife and the lives of harvesters? That's something that has to be really talked about. The best way to do that is to engage the harvesters to be involved. Because like you were mentioning, scientists and biologists that travel to different bush camps say, "Well, we feel so welcome. When we get there, they look after us." Harvesters are like that. Because what the scientists are trying to learn is affecting their life, and their voices need to start to be heard. I came to this conference. Biologists and scientists should go to the harvesters' environment. That's where you can learn. That's where you can get a better understanding of their situation.

In closing, I would just like to mention a little event that happened in my life in regards to the wildlife and the environment. My son, Enoch, who is my helper in big game guiding, got a big kick out of it. We went on a sport hunt. We left Tuk and went to Bailey Island and we set up a camp. We set the tent up and everything and were ready to go start hunting. Dogs are there. Skidoos are there. And Enoch, my boy, is with me there. The hunter and I are standing outside and looking at the camp, and looking at the dogs, and looking at everything there, and he's taking a picture. And I looked at him and I said, "Well, welcome to my home." The hunter looked at me and he says, "Your home? I thought your home was in Tuk." I said, "As a harvester, wherever you lay your head and camp, that's your home. Welcome to my home." I pointed to the land, and I said, "This is my back yard. Look at the ocean where we are going to hunt the polar bear. This is my front yard." Harvesters are like that. Our homes,

as a harvester, may be in the community, but your real home is where you set yourself up for that season and for that time.

**Questions, Comments & Discussion**

**Doris Dreyer, Yukon Fish and Wildlife Management Board, Community Stewardship Program:**

We talked yesterday about community meetings and how the capacity of lots of communities and community members are stressed to the point where they cannot participate in meetings anymore. They basically have to choose what they're going to do. You are talking about sharing TK and how important it is, especially for the scientific community. What do you think, as a community member, would be a good way to approach harvesters and to get their knowledge and to make sure that it is effective? How can you guys really share your knowledge in a way that's respectful to your culture?

**Randall Pokiak:** A lot of the harvesters have got TK about the land. They've put years and years of effort into it. Some of them can't speak English but they've got that knowledge. One of the ways of engaging them is compensation. That's one of the big challenges. When knowledge is given, it belongs to everybody. This is what I mean about *brainstorming*. If you want to talk to the actual harvesters, there are certain harvesters that specialize in certain species. So if you are targeting polar bear, you should be talking to people who know about these things, who know about the ice conditions and the behaviour out there. It's the same with caribou and other species. Inuvialuit have specialists just like anybody else in any culture or in any society. If somebody doesn't like being out on the moving ice, they shouldn't be out there. The people that are out there are the people that know what's going on. They're confident. They're sure of themselves. You can draw from those resources. If the scientific community and the government want to get information from these guys, find a way to compensate them for their time. And the

knowledge then becomes available to the public to benefit from.

**Jimmy Johnny, Mayo Renewable**

**Resource Council:** I would like to share a little bit of what I know about my traditional knowledge, too, and how I grew up. I grew up 20 miles down river from town. That's where I learned how to hunt and set snares and trap and snowshoe and track moose in the winter and climb mountains to look for caribou, pick berries, and harvest fish. My father always had a strict rule that when salmon run, we are to only catch between 25 and 30 fish. When we get that many fish, then we pull our nets.

For you, and me, I think the land is very important to us for our traditional medicine and for our animals. I work for an outfitter. I take hunters from the States, Europe – like Germany and Austria – and they always want to go, go, go. They don't know how to sit and stay in one place and hunt. But they learn. If they want to go and go for a couple of days, it's fine with me. I can keep up with them and they don't see anything. You know, when you are traveling, just steady, you don't see anything. When you sit way up on the side of the mountain, you see a lot of country and a lot of animals. Then I say, "Look at all those moose down there. That's where you rode yesterday and you rode right by them." So, that's the kind of knowledge that we have to share with our younger people.

You said, "How can we teach them to keep asking over and over again." I know that my parents, they had a lot of patience and love from their heart to teach me what I know today. And we have to do the same thing with our younger people. We have to have patience and love and our traditional knowledge of how to speak to them. The best way we can teach our younger people is to take them out there on the land and show them and talk to them in our language, show them our traditional medicine, show them how to track, hunt, and skin, show them how to make dry meat, dry fish and stuff like

that. Berries are very important to us, too. We used to pick lots of berries: Cranberries, stone berries, blueberries, and if we were lucky, we'd run into strawberries, and we picked them, too.

It makes me feel bad because most of the mining companies and exploration camps don't clean up behind themselves. They just leave their mess. And it makes me feel good to talk about it and give out that information to environmental people. They have to learn how to clean up behind themselves. When you ride by you can smell the fuel that's been spilt there, like diesel and gas, and it doesn't seem right. I don't think it's right at all. And we have to all learn to work together to share our knowledge.

I learned from younger people, too. Little children teach us. They teach us how to be patient with them. If you turn around and say, "Okay, you, get over there in that corner and stay there," no, that's not the way to do it. They teach us patience and they teach us love. They teach us to care for them. As a native people, we have our own traditional ways of living on the land, of sharing our knowledge and hunting skill.

When I was a young boy, my father he taught us how to shoot. He'd tie our boots or our shoes at the very end of the barrel, just behind the front sight, and he'd say, "Okay, aim, keep it steady," and you know, the shoes, or whatever is tied is moving around, and you have to learn how to keep it steady, and we'd do that every day. That's how he taught us how to shoot. I am very thankful to my grandparents, my parents, my uncles and our elders for what I know today. They have taught me, and they taught me good. And for you Randy, keep up the good work, keep on teaching, and even though these young people come to see you, keep repeating yourself. It's our way of patience, love and caring.

**Doug Larsen, Department of Environment, Government of Yukon:**  
Thanks for the very insightful talk that you

gave to us on traditional knowledge. I really, really enjoyed that. I like your idea of us getting together and brainstorming to see how we can incorporate scientific and traditional knowledge better. In the Yukon we tried to do that a number of years ago at a conference, titled "Two eyes; one vision." That was the idea behind it. Perhaps now, 15 years later, we should try to do it again. I think we've all learnt a bit more since then.

I sit on two co-management boards and I don't think there is a meeting or a day that goes by when traditional knowledge isn't brought up in the discussion. I really believe in it and I think it's valuable. The challenge is how to incorporate it. Sometimes, I get the feeling that there is a real gap between how we get it and how we use it, and where it is. That's a real challenge. When someone says "Why don't you use traditional knowledge", I sit back and I think we've tried. But we don't know what it is, and we don't know how to use it. So, it's not a lack of trying. It's a lack of understanding in bringing the two together. I think that really is the challenge. You have given us some suggestions on how we might bridge that gap. We have a long way to go. And it still kind of amazes me that after 20, 25 years, we are still struggling with this really fundamental component of the land claims.



**Panel: Monitoring, Reporting and Decision Making Involving Traditional Users**

**Panel Facilitators:** Evelyn Storr, Aklavik Hunters and Trappers Committee and Barney Smith, Government of Yukon

**Sampling beluga whales at Hendrickson Island, 2000-2006 - Frank Pokiak, Inuvialuit Game Council**

Frank Pokiak  
Inuvialuit Game Council  
P.O. Box 2120  
Inuvik NT, X0E 0T0

I have been working with DFO for the past seven summers sampling beluga whales. The Inuvialuit have harvested beluga whales in the shallow, warm waters of the Mackenzie Estuary each July and part of August for a long time. The population numbers are estimated to be about 30,000. The communities harvest about 130 each year. There are currently no conservation issues with the harvest. We only take what we need. The number taken is very small compared to the size of the stock. We also take mostly male belugas to conserve the females. In our area, we have an easier time harvesting belugas because of the shallow water, so we concentrate on males. But I know in other areas, where it's more difficult, they harvest what they can.



The beluga whales that are harvested provide a very important source of food for the Inuvialuit. The harvest has high nutritional and cultural importance. The harvest takes place from six mainland areas in the Mackenzie Delta and, in recent years, by Inuvialuit from Paulatuk as well. I am based out of Hendrickson Island, which is one of the sites used by hunters from Tuktoyaktuk and from Inuvik. Occasionally, we get people from Aklavik coming down to harvest there, as well. The FJMC has a long-running monitoring program each of the six sites. The monitors take basic harvest information, measurements and samples from all the harvested whales. My job is to take extra samples, specialized samples, from the harvested whales at the site. Jerry Rogers, from Inuvik, does the same thing at one of the sites at Kendall Island.

After a beluga is shot by a hunter, everyone, including myself, helps to pull it up to the beach for butchering. I work closely with the hunters, along with the FJMC monitor, during the butchering process to get the right samples at the right time. We have to have everything timed just right so that we don't slow the butchering down.

First, the FJMC monitor measures the length of the whale and takes a few other measurements and determines if it's a male or a female. I work closely with my family members on the project. My wife Nellie helps with the labelling and writing, and other harvesters help by taking samples back to the town to the freezers when they go. I also have a freezer or two at my camp, but they're small and can only hold three-to-five samples at a time. It is really important that the samples are properly labelled and preserved frozen in this formalin chemical. Otherwise they will be of no use for DFO lab work.

One of my favourite parts of the project is being out on the land, with my family. We meet a lot of people out there from Tuk. A lot of times, they are stranded out there for two to three days, so sometimes my tent is

completely full. The project lasts for about 25 days in July and we get a lot of visitors and hunters.

The whale hunter's family cuts up the muktuk to get it ready for hanging and later for cooking. It takes a whole day to process one whale; sometimes it takes longer. The weather has to be just right. If it is too warm, then the muktuk will spoil. We learned all this from our families and pass down the traditions from generation-to-generation. After the muktuk is taken off the whale, it is hung for two to three days to let all the water drain. If you don't do that and you cook the muktuk and freeze it, there will be ice crystals. So that's really important. Also, the meat for the beluga is also laid out to cure. Pieces of beluga meat or muscle are made into dry meat. You cut them, dry them up and smoke them. That is what we eat in the wintertime. The muktuk is then cooked in a barrel over a fire on the beach. Most of the people have a barrel where they prepare their muktuk.

I take special samples that are a bit trickier to get. I have a long list that includes the reproductive tracts of females. We look at these to find out about reproductive rates. We have to know how many calves they have in their lifetime, how often and how

old they are when they stop having calves. That's quite important. The findings so far indicate that these belugas, being from such a large stock and composed of older animals, take reproduce at a slower pace than belugas from the eastern Arctic. In the east, some stocks are depleted and the females are reproducing at younger ages. The Beaufort beluga can start reproducing when they are older than nine years of age and have one calf only every third year. They are not in a rush to have their calves. Sometimes we see a huge calf that's maybe about eight feet long with its mother. Then a young calf would come beside it. So, we are observing that some of the calves do stick around with their mother even after another calf is born. We also look at the foetus if they are present in the harvested whales. This lets DFO look at the time of year that conception or mating takes place.

I take blood samples that are used to look for diseases. I also take samples of the lymph nodes. They are like tonsils under the armpits. These are the centres where bacteria accumulate, so I have to be really careful not to get myself in contact with them. DFO is testing for Brucella and some other diseases in the blood, lungs and the nasal mucous. I take that from the blowhole and the lymph nodes. I take samples of



blubber, kidney, meat, liver, which are used to look for contaminants. Some of the samples I take go as far away as Florida for lab work. The DFO scientists are mainly looking at mercury in the whale livers and organochlorines in the fat.

We also collaborate with our veterinarian, Dr. Steve Raverty. Dr. Raverty is a marine mammal specialist from B.C. He comes up each summer to check out our whales and look at what the FJMC student is learning. It's a great opportunity for the student to work alongside with both hunters and a veterinarian.

Sometimes when you are not hunting the whales, they will start follow you. It's like the example my brother mentioned earlier, how animals know when they are not being harvested. One year, my grandchild touched a whale that came right up beside the boat. They really do know when you're not harvesting. You can go right up to them.

I sample about 20 belugas each year for Brucella. Some years like in 2005, there are no positives for Brucella. Sometimes, there have been as many as four positives as there were in 2003. This data is sent to the veterinarian at the NWT Health Board so that they are aware of it. Beluga have probably had antibodies for Brucella for thousands of years. Cooking kills the bacteria that cause Brucella. So as long as people are eating cooked whale, the bacteria is killed.

Mercury in beluga liver is being studied at different locations in the Canadian Arctic. DFO looks at the livers because that is where the mercury would be the highest. We don't eat the liver. The mercury loads in our whales are higher than in the eastern Arctic. However, it seems that the mercury levels are going down slowly. We are not sure where this mercury comes from. It's probably from a combination of melting permafrost, from the atmosphere, and from down the Mackenzie River. What is known

is that the beluga are probably picking it up mostly in the fish that they eat.

I have really enjoyed working on this project. Most of all, I think this project is very important to continue. The more we understand about the beluga and their habitats, the better position we are in to determine what the effects of climate change and renewed oil and gas activity will be on them. This is long-term critical research. I recommend that it should continue for a few years yet. It is important to continue to monitor the mercury loads and we have to check for diseases.

I would like to acknowledge the FJMC and DFO for funding this study and my partners at DFO, Lois Harwood and Lisa Loseto, from Winnipeg. I would also like to thank the Hunters and Trappers Committees for their support of this project and the hunters, because without their involvement, the project would not be possible.



**Arctic Borderlands Ecological  
Knowledge Co-op - Mike Gill,  
Environment Canada**

Mike Gill  
Circumpolar Biodiversity Monitoring  
Program Secretariat  
91780 Alaska Highway  
Whitehorse YT, Y1A 5B7  
mike.gill@ec.gc.ca

I have been involved in the Arctic Borderlands Ecological Knowledge Co-op for about seven years and I am currently a Board member. I'll be talking about the Co-op in a broad sense, and then, I will be handing the floor over to Annie B. Gordon who will be talking about her specific experiences working on the community-based monitoring program.

The idea for the Co-op came out of a meeting in Dawson City in 1994. This meeting was held to figure out how scientists and community members could work together toward their common goal of understanding environmental change in the North. It was quickly acknowledged that everyone wanted to be able to make wise management decisions for conservation and adaptation.

The Co-op's first and foremost goal is to try to document information about the environment that will tell us what is changing. The focus is on three major impacts: climate change, development and contaminants. Other key goals are to use local and scientific knowledge together to understand this change, to improve communications and understanding, and to foster capacity building and training opportunities in the communities. The original participants in the Co-op were communities located within the study range of the Porcupine caribou herd and were all users of the herd. But over time, as interest in the Co-op grew, we expanded into the Mackenzie Delta and nearby coastal regions. The first Annual Gathering of the Co-op was in 1996. These gatherings, which take place

every year in a different participating community, are the place where the results of the Co-op's programs are reported and discussed.

The Co-op is a non-profit society with a Board of Directors. We have about nine members on our board. We meet by conference call once a month through the winter to deal with the business of the Co-op. Most of the important decisions are made by consensus at the Annual Gatherings. The funding comes from many sources, year-to-year. This presents a bit of a challenge as we never quite know what our budget is going to be. Our main partners are aboriginal communities, federal and territorial agencies and councils, aboriginal agencies and councils, co-management bodies and universities and researchers institutes. Environment Canada has a main coordinating role and provides a half-time position for the program director. The Co-op's website is used for reporting results. We also produce reports and posters.

The Co-op tracks change using several scientific indicators. We don't go out and collect data. We use information gathered by other agencies that are collecting it for their own purposes.

The website ([www.taiga.net/coop](http://www.taiga.net/coop)) is our main tool for reporting back. We use graphs and text to explain the information. We try to explain what the information is saying, what does it mean, why is it important, why should we worry about, and what are some of the possibilities of why we're seeing a trend or no trend for that particular scientific indicator. We have over 50 indicators that include temperature, salmon runs, caribou herd size, oil spills, aircraft flights, river break-up, PCBs, and unusual observations.

The other major component of the Co-op is a community-based monitoring program. We have a monitor in Arctic Village, Old Crow, Tuktoyaktuk, Tsiigehtchic and Fort McPherson. We also have two monitors in Aklavik and Inuvik who represent both the

Gwich'in and Inuvialuit. Every year a monitor is hired in each community to conduct interviews. The interviews are a mix of open and closed questions. Some of the topics covered are berries, fish, caribou, weather, and unusual sightings. In the coastal communities we also ask specific questions on marine fish, coastal erosion, marine mammals, weather, as well as sea ice break-up times. Typically, the monitor interviews 20 community experts a year. We are now in the 11th year. We are asking about changes so we interview the people who are spending the most time on the land - elders and youth. Some information is also mapped. The maps are digitized so that we have information that's readily available and geo-referenced. The information is also put into searchable database. The monitors report their findings at the Annual Gathering and to their community. The information is also summarized in a community-based monitoring report.

The community-based monitoring gives us long-term perspectives. The rich perspective of traditional knowledge comes out and we get a better understanding of the nature and context of what this change is. Is this normal? Has this been seen over time, or is this something new? The information is often at a local scale and very much more



detailed than you might get at scientific indicators. So, between the two sources of knowledge we can start to fill in some gaps in our understanding. We get a deeper understanding of ecosystem and human relationships while engaging local communities and indigenous people, and it can be quite cost-effective. The Arctic is a world leader on developing and using community-based monitoring techniques. At a recent workshop in Alaska, attended by people from all across the Arctic, the work that's happening in this part of the world was acknowledged as being a good example.

I'll give you one specific example of some of the information that we have. We have a number of weather indicators that show things like temperature, precipitation, and snow depth. A graph of the data collected since 1963 shows that summer temperatures along the coast have been going up over time. The scientific data tells us that summers are warmer on the coast, as well as inland at Old Crow. We're seeing more precipitation – snow and rain – in the fall and winter at Shingle Point. No significant change has been seen at Old Crow, at least from the scientific indicators, and we are getting no trend in snow depth. It's highly variable.

A summary of some of the community-based observations over the years indicates a general drying of river and lake systems, increased variability in temperature, increased frequency in summer storms, fewer very cold days in the early winter, and also, winds that are more predominant on the Yukon coast in summer. The information from the community-based monitoring also shows how weather affects people getting out on the land from all the different communities involved. Direct quotes from those interviewed really capture what's happening. We hear things like: “warm weather and lots of snow make for unsafe ice conditions; snowed two months straight; so much water, I couldn't use the usual trail; the snow is different and it's harder to pull a sled with a Skidoo; wind on coast affected boat travel; I can't predict the

weather, so I can't make plans to go out on the land; I have to check the fishnets several times a day, the water must be getting warmer. The fish soften up if they are in the water too long." With this kind of information we can start to talk about relationships and how weather actually impacts people.

Community-based observations have also guided the Co-op's research. Several years ago, people in the communities were noticing abnormal loche livers. This generated interest in doing a study to see if we could figure out what was causing this. The community people took samples that were sent to a lab for contaminant analysis. Thankfully, no abnormal levels of contaminants were found in those livers. Community observations also often identify mechanisms driving trends. A number of years ago, one community was saying "Look, spring snow conditions are really difficult. That's delaying caribou migration," This observation led to caribou researchers to focus on what was happening in that particular instance.

Looking at the scientific and community knowledge together gives a better understanding of the linkages in the system and provides a more complete understanding of our ecological relationships. This kind of understanding can be used to guide conservation, adaptation and environment assessment.

The Co-op has its challenges and opportunities. It operates on year-to-year funding, which makes it a little bit unstable. The funding we do get keeps the program going, but we need more to be able to focus on a synthesis of the information. An important challenge and opportunity is to link to other regional, national and international programs. The Yukon North Slope is probably one of the best-monitored areas in the Arctic. We have an opportunity and an obligation to bring that information forward into larger forums. This area is really well-monitored and has a lot to offer,

not just in terms of the knowledge it generates, but also, in the approaches that are being used to monitor environmental change.

**Arctic Borderlands Ecological Knowledge Co-op - Annie B. Gordon, Aklavik Community Monitor**

Annie B. Gordon  
Arctic Borderlands Ecological Knowledge  
Co-op  
91780 Alaska Highway  
Whitehorse YT, Y1A 5B7  
borderlands@taiga.net

Thank you very much for having me to speak. When I first heard about the Arctic Borderlands, we really didn't know it was all about. There were other people that went around interviewing but this was something new. So, a lot of times people would say, "I wonder what they're doing that for." And then, a few years later, I got into it. I am a full-blooded Gwich'in, but because I'm married to my husband, I am classified as Inuvialuit. So, I got into it. I was interviewing some Elders, and I said, "You know, they should have real Inuvialuit doing this, because I'm a Gwich'in." And this one elder lady, I'll never forget her for telling me that, because she said, "Well, you're doing a good job. You're telling us what you're doing this work for." And she said, "Even though you're Gwich'in, you should just keep on doing it."

You know, she's not with us any more. I always think of her when we're doing the interviews. As time went on, it got kind of easier for me, and I started understanding it more. When I first started to interview, I think we had a lot of Elders and we had a lot of good information from them. I just wish it would have started maybe 30, 25 years ago, because we would have a lot of really helpful information. A lot of our good

information is all gone. It's all buried so we lost all of that.

But the Elders we have left, they share what they have with us. Even that, it helps a lot. Now, when I go around and try to interview people, sometimes, they say, "Well, we've never been out on the land. I've got nothing much to say." Well, I say, "Just tell me whatever, and that helps, because," I say, "whatever information we get, we don't just write it down, and then, forget about it. We make use of all the information we receive. We use it later on as we put everything together. We use it in the schools. We use it for people that need to know we lived out on the land."



If it wasn't for our Elders, I don't think many of us would be able to survive. For me, I am really thankful there were a lot of Elders around in my growing-up years. Now I don't see very many Elders, and what few Elders we have left don't go out on the land like a long time ago. It's not their fault. They want to go out there, but how can they go out there when there's nobody to take them out there? I remember when we were growing up, an old lady would have one or two dogs, and that's her vehicle or her transportation there. And those two dogs, no matter even if it was one dog, they'll haul wood, they'll go fishing, they'll go trapping, they'll do anything. And they'll get everywhere with it. Now today, Elders are just in homes where they can't even go out.

I've seen Elders cry because they're missing their life out on the land, and that's part of their medicine.

In this job that we do as community monitors, it's just like going back to school every year. That's why I like doing it, because every year, when we do the interviews, we get answers back from them. They give us information, and you know, it's not the same. It's always different. There are only a handful of Elders and they try their best to be out on the land. They try their best because that's part of their life. They can't sit at home in town, because right away, you are going to hear them saying, "Oh, I feel sick. I don't know what is making me sick." But when they go out on the land, they don't feel sick at all. There's not enough time, when you are spending your time out there on the land. There's not enough time in the whole day. You know, it's a going thing.

I noticed that less time is spent out on the land, but whatever time is spent out there is very valuable to them. They notice the changes. Even for us, when we go out, we know right away that there are changes out there. There are changes in the animals, even in the fish. A few years ago, everybody was reporting that fish were soft, soggy. You can't eat fish because it's not even good enough to eat. Now, the fish are changing again, and everybody seems to be happy because, "Oh, we've got good fish!" You know, they get excited about that.

They notice that when you travel on the rivers or along the coast, you're going to see the banks falling in and just different things like this. They see it with their eyes, or they talk about it. I always wanted to go back to school. So here are 20 people I interview that are my teachers. I learn from them. I learn something different all the time. But I said, "Oh, this is my last year. I don't think I'm going to do it. I am going to get somebody else to go into doing that." And then, I changed my mind. I talked to a few Elders that say, "No, just keep on doing it.

We like to talk to you. We like it when you come,” so, that’s the reason why I keep on doing this. And I find it really interesting, because when I first started doing the interviews, we had one page there, and I always wanted to ask, I better ask that in front of everyone here: is there is a page where it asks about what we think of young people. How much our life is changing from how we grew up. You know, that’s one page I’m missing in that whole interview. And that, I guess that whoever writes them, makes up the interview, I have to look back into our first, at the start of the interviews, there, that’s what I’m missing. Because I see our young people are not living the same kind of life that we grew up in, staying out on the land, trapping, setting snares. They are living a different life, because they were not taught like we were taught. We had a lot of good teachers. Anywhere you went, if you asked, “How do you do this,” somebody will tell you.

Somebody will tell you, “Oh, we do it this way,” and then, somebody else will say, “We do it this way.” You know, if you set a lynx snare, you make it this high off the ground. Who is going to hold a measuring tape like this every time you set a snare? But they know, just by looking at your snare. They just know. We don’t carrying a measuring tape wherever we want to set a lynx snare. They tell us things like that, and I just wonder sometimes, “How do they know?” But like I say, it’s all learning. Everything.

I just want to thank Randall Pokiak who was talking before. I think he just about said everything I wanted to say. Thank you. I was just sitting there listening. That’s a very good talk he made.

I’ve been doing these interviews for Arctic Borderlands for 11 or 12 years. But from the time that they started talking with people, there has been a lot of change. Too much. For us Elders...oh, I never thought I was ever going to say that in front of this many people. I never think of myself as an Elder,

never, because long ago I asked an Elder, “How old do you have to be to be an Elder? What makes you an Elder?” And do you know what she said? She said, “You’re an Elder as soon as you start knowing how to give things that we’ve taught you, that we teach you, that we tell you. That’s when you become an Elder.” And I’m still thinking, “What does that mean?” Maybe in another 30 years time, I will really find out what she’s talking about.

I asked her, “Why do you keep telling me the same thing?” She said, “Well, I’m telling you the same thing over and over because I want you to learn, and when you get older, you’re going to pass it on. You’re going to pass it on so the next generation will hear about it.” So, whatever I hear, I try to pass it on, but gee, when do I become an Elder? But whatever, I am glad that I am able to talk.

The work that we do is really interesting. I think as time goes on, we’re going to be learning more and more, because I heard so many good speeches this morning about the changes. Everything is changing; nothing is going to be the same. We talk about all these things - weather, caribou, even animals out on the land - that they’re not the same. Sometimes we get really lots of animals out on the land, and then, sometimes, there’s hardly any. This year because of the flood, I think a lot of our animals may have drowned and died off like that. That’s why we don’t have so many animals to trap this year. But we try and set traps for whatever is out there. It’s not an easy life for our trappers to be out on the land. We don’t have dog teams like long ago. We don’t find it so easy to travel out there because we don’t know what the weather is going to be like. We don’t know how the freeze-up is going to be and how to travel out there. Sometimes the ice might be thin in some places and sometimes we may find it harder.

We are using skidoos for traveling and some of us have a hard time to get gas. The price of gas back home is so high that even

though a lot of trappers want to get out there, how are they going to get their gas to travel? You're lucky if you get enough to go caribou hunting. That's one of the things everybody tries to do is go hunting caribou. Nowadays, because you have to buy your own gas and you have to go a certain distance to get your caribou, when you come home, it's not easy to share like we used to. I remember when you traveled out with dog team and you went hunting, it didn't matter how far you went. When you came back, you just shared everything. Today it is not like that. It is all because of snow machines. You have to buy your gas to travel, and you're thinking, "You want to share, sure you'll share a bit out," but not like how we used to share with everyone, anybody.

I especially like sitting with elders. Some of them just really talk about what they miss out there and how they wish to be out on the land. But they don't have ways of getting out. So, they talk about their language. Nobody comes around and visits and talks in their own language to one another much now. It's always English. It's always English. That's one of the things that they really miss. For us, it's not our fault. When we start going to school, we didn't use our language in so you start talking in English. That's where you start losing it. I never used to even know English. My dad said, "You know, when the nurses used to say, 'How are you?'" you'd just stare up at them." I didn't know what they are telling me, so how can I answer them?

We used to always talk in our language. That was our language, so we talked it all the time. But after we went to school, we started talking in English, and I told my grandmother "Gaa-joo"?, that's saying grandmother, "Gaa-joo," I could talk English, I could write, I could read. And then, she says, "That's good. You could talk, you could write, you could read, but don't ever forget your language." She said, "If you forget your language, you're losing something valuable." And that's just how it is today.

In my language, it's really hard to translate sometimes. I was working in the hospital, and the head nurse was going to take an x-ray of an old lady. And she said, "Oh, Annie, I need an interpreter. Can you interpret to this old lady for me?" And I said, "Gee, I don't think I could." She said, "Well, I need somebody to tell her when we ask her to stand up here in front of the x-ray plate." She's a small, little woman, and they put her up and she's way up like this. The nurse said, "Well, okay, tell her to take a deep breath and to hold it." So, "Gee, how am I going to say that?" I was thinking for a while and then I said something. I thought I said for her to hold it. When I said that, I just waited for a while. She's standing there and they took her x-ray. The nurse went over and took the plate, and the lady's still standing there. And the nurse said, "Tell her we're finished." So I did. I turned around, because the nurse said, "We'll check it. it won't take very long. And if it's good, then we'll let her go." So I'm standing there waiting for the nurse to tell me that it was okay. From behind, I could hear that lady say, "How long do you think I'm going to stand here without breathing?" All this time she was holding her breath and I never even looked back. I said, "I'll never translate for anyone that's sick again. That's it!"

***The Inuvialuit Harvest Study -  
Michael Fabijan, Kavik-Axys  
Consulting***

Michael Fabijan  
Kavik Axys Inc.  
PO Box 2320  
Inuvik NT, X0E 0T0  
mfabijan@kavik-axys.com

A basic goal of the Inuvialuit Land Rights Settlement is to protect and preserve the Arctic wildlife, environment and biological productivity through the application of conservation principles and practices. The Inuvialuit Final Agreement defines a need and makes a commitment to acquire harvest

information through the Hunters and Trappers Committees and the Inuvialuit Game Council.

The Inuvialuit Harvest Study ran from 1987 to 1997. The overall objective of the study was to gather and maintain a long-term record of Inuvialuit subsistence harvest levels in the ISR. This included Aklavik, Inuvik, Tuktoyaktuk, Sachs, Holman, and Paulatuk. The information was collected and used for sound wildlife management, calculating wildlife compensation and determining wildlife usage and requirements. Funding was provided through the land claim to various implementing agencies. The study was managed by several different working groups and management committees over the course of its time. Those groups had representation from all of the user groups and interested parties.

Interviews were conducted by a local fieldworker on a regular, monthly basis. About 1000 Inuvialuit harvesters were interviewed every month. The hunters were asked when, where and what was being harvested. We created the Inuvialuit Harvest Study calendar to give people a place to record their harvest information. The calendar had photographs of about 69 species of fish, mammals and birds. The photographs had names underneath them, both in English and Inuvialuktun. The information collected always remained confidential. No one's name was ever released unless they asked for it or agreed to it.

The IHS produced annual data reports and an atlas that showed locations of harvest. All of the HTC's received monthly reports that gave a summary of what had been collected information had been collected for all of the different species. Each harvester received a copy of the data sheet after the interview so that they had their own record.

The information has been used for wildlife management and research and regional and

individual compensation. It has also been used to document long term usage needs and patterns within the region. It's currently being used for environmental assessment for both the Environmental Impact Screening Committee and the Review Board.

Harvest of some species has been monitor through other means. These include the beluga and charr monitoring programs and quotas for grizzly and polar bears. These programs are species or issue specific. The intent of the harvest study was to collect information from everybody over 16 years of age, over in the entire settlement region. Our actual coverage ranged from 80 to 100 percent. One field worker in Paulatuk was quite upset one year when he missed one hunter.

The current monitoring of harvest is limited. This raises questions about whether more is needed. The information from harvest monitoring can be used in the assessment of the impacts of oil and gas-related activities, document changes in activity levels and growth of communities and contribute to wildlife research. Information from harvest monitoring can also contribute to climate change studies and reflect broader ecosystem changes.

A renewed Inuvialuit Harvest Study would be able to use new technologies, such as GIS, for data recording. The scope of the study could change. Harvester observations could be included. Preciously observations were recorded on a fairly ad hoc basis. As Randall said earlier this morning, "The harvesters at times watch the animals and learn more about the resources that they actually rely on," There are 1,000 people out on the land all the time. There's a wealth of information that you could collect. And it would also, to some extent, cover off what Randall noted about people asking same questions all the time. Industry could first collect harvest information from a central location before going into a community to get more detail. The harvesters sit there and watch the animals. So, they know the

resources. They know the things that are changing. It takes researchers a lot of time to go out there and collect this kind of information. If you can get information from people that already know what's going on, researchers might focus their efforts a bit differently. A renewed Inuvialuit Harvest Study could include a change in the species listing as well as the frequency of the data collection. Interview methods could be updated to build in new technology.

The Inuvialuit Harvest Study has provided a valuable 10-year baseline data set, but the need to monitor harvest continues. There is a need to monitor changing patterns during and after increased industrial activity. Harvest monitoring provides a way to access and collect valuable local information that can be used in research and management. A renewed harvest study can be designed to meet current needs.

It's important to acknowledge the Inuvialuit Game Council, the Hunters and Trappers Committees, the co-management agencies, and government agencies that worked to make the Inuvialuit Harvest Study happen. Above all, the key contributors were the local fieldworkers and the 1,000 hunters that participated in the interviews. Without their cooperation and support, the study would have never happened.

***The FJMC Beluga Monitoring Program - Max Kotokak, Fisheries Joint Management Committee***

Max Kotokak  
Fisheries Joint Management Committee  
P.O. Box 2120  
Inuvik NT, X0E 0T0  
travel@jointsec.nt.ca

I have been an Inuvialuit member of the Fisheries Joint Management Committee since 1998. The beluga monitoring program is the FJMC's longest running monitoring program. The purpose of the program is to document the size and trend of harvest, and

to obtain the data necessary to assess the health of beluga and the impact of harvest on the stock. The beluga monitoring program was designed by Department of Fisheries and Oceans to see whether oil and gas activities in the Beaufort Sea were having a negative impact on beluga whales.

After the IFA was signed, the FJMC took over responsibility for the program and ran it annually, monitoring a subsistence harvest of beluga at the main whaling camps in the Delta. The program is run through the Hunters and Trappers Committee in Aklavik, Inuvik, Tuktoyaktuk, and Paulatuk. The HTC's hire the monitors to oversee the administration of the program.

The monitoring locations are run through the Aklavik HTC at Shingle Point, West White Fish, North of Aklavik; the Inuvik HTC at Kendall Island, and East White Fish; the Tuktoyaktuk HTC at Hendrickson Island and Tuktoyaktuk Harbour; and the Paulatuk HTC at Darling Bay. There is one monitor stationed in each of the whaling camps. They stay there throughout the whaling season, often with their families, and sometimes work for 24 hours straight when people are harvesting and lots of whales are landed.

The beluga monitoring program looks at whales harvested during the Inuvialuit subsistence harvest. This hunter-based monitoring program records details on the hunt, the harvest, whale gender, body colouration, presence of scarring, body measurements, including total length, fluke width, flipper width, maximum girth, blubber thickness, stomach contents and female reproductive status. Since 2000, monitors have also kept track of air traffic around the whaling camps during whaling season and filed incident reports of any instance of hunter or whale disturbed by aircraft. For many years, FJMC monitors have supported DFO, and academic research by assisting in beluga tissue, sample collection and analysis of contaminants, disease and reproductive health.

As various presenters have pointed out, it is essential to have consistent sampling and reliable, repeatable protocol. The FJMC sampling is standardized by having workshops with all monitors and HTC resource people on an annual basis. Each monitor is given a sample kit, including data forms. A head monitor is appointed by all the whale monitors and that person provides support to the monitors throughout the season. FJMC resource biologist are also available for assistance throughout the summer. In the field, all monitors use the same data sheet, do the same measurements, and use the same equipment. Monitors stand by so that whenever a whale is harvested, he or she is available to do the sampling.

Is the beluga monitoring program protocol simple? Yes. Is it repeatable? Well, 20 years of data says “yes”. Are we consistent? This is something we've been working on to ensure that all monitors are consistent, whether they've been doing it for several years, or it's their first time. Are we measuring the right variables? This is another thing we've been working on. The FJMC has been reviewing the beluga monitoring program over the last couple of years, and we've talked about making some small changes, but we are confident that overall the monitoring program is providing good data. The only thing that we are not sure about is whether the variables we are keeping track of will show change or whether we will be able to see what is causing any change. We do know that the Beaufort beluga population is healthy and that harvest levels are fairly balanced.

So, we've got this great program. Now, who do we tell about it? The FJMC has an annual community tour cycle which ensures we visit each ISR community once every 18 months and a science tour which ensures we meet with DFO scientists at least once a year. When we hold our community meetings, the beluga monitoring program is always on the agenda, and there is always interest from hunters and community

members to hear about the health of the beluga population.

In scientific meetings, many scientists are interested in the extra data that we gather, like the age, contaminants, reproduction. We do discuss with environmental managers, of course, HTCs, DFO, within the FJMC ourselves. The data from the monitoring program has contributed to our understanding, which we put into the Beaufort Sea Beluga Management Plan and has contributed to a proposed Tarium Niryutait Marine Protected Area. We also relied on the protocols of the beluga monitoring program when we sampled the whales harvested this fall at Husky Lakes in order to ensure that we could get more scientific benefit from the unfortunate circumstances of the beluga entrapment.

Some of the other data that's been gathered by monitors includes unusual observations, such as a beluga that had a narwhal tusk embedded in its jaw, and killer whales around the whaling camps. Some years monitors have collected blood and tissue samples for other scientific programs, to look at disease, contaminants and mortalities in the whales. All monitors keep a journal, noting weather observations, aircraft sightings and daily activities. On their data sheets, monitors also note any hunter comments, such as, whale struck, or lost, or anything else.

As I mentioned earlier, the FJMC has discussed ways to improve the beluga monitoring program. We have asked Steve Rafferty, a veterinarian who has been working at Kendall Island to give us advice on things we might do differently, and we will be working with him and DFO scientists to ensure that we get the most out of the program that we can.

Each year we try to do a little better, with the monitoring training workshop to ensure that the monitors are as prepared as possible when they head out to the camps. When it is possible, we work with each other to collect

samples which will help us to understand the health of the beluga population. With new concerns about human health, we try to protect our monitors by providing them with equipment and training so they can keep themselves healthy during the sampling season. And we are working at ways to communicate our results and the overall picture of Beaufort belugas to our various audiences.

We've considered some other options for the future, such as helping the HTC's to develop a hunter mentoring program. This is one thing that seems to be becoming more important, as young hunters with less experience are out on the water, and it's something the FJMC is interested in working on. Although it is the responsibility of the HTC's, we know that the whales are important, not just as part of the environment, but also, as part of the Inuvialuit diet. So, we look at how we can work with departments like Environment Canada and Health Canada to keep track of any human health concerns. We have also talked about whether it is necessary to keep doing monitoring each year, since we know the population is fairly steady and so is the harvest. At this point, the FJMC has decided that the benefit of the program is worth an annual investment. We're just looking at ways to get the most scientific benefit from our monitoring program. Finally, we've talked about ways to expand the program, possibly integrating the mentoring training elements with harvest monitoring. I am sure there are lots of other options that we are always interested in discussing with all our partners.



## **Update on the International Polar Year - Ian Church**

Ian Church  
Senior Science Advisor / Chair  
Canadian IPY National Committee  
25 Juniper Dr  
Whitehorse, YT Y1A 4W8  
ian.church@gov.yk.ca

I'm giving this presentation because, over the last couple of days, I've seen a need to clarify the activities of the International Polar Year is and Canada's role in it. I'd also like to acknowledge all of the various players and describe how the North Slope is involved in some of the IPY programs.

What is the International Polar Year? Historically, IPY's have mobilized the scientific and educational resources of many countries and have focused mainly on the physical sciences. And usually, despite being called "Polar Years", they've lasted more than a year. The initiative began in 1882-83 as the first ever internationally-coordinated science program. Eleven countries sent expeditions into the northern and southern Polar Regions. Four of those expeditions were on what is now Canadian territory. A lot of the work was focused on the weather and the atmosphere, although there was other work done.

The second IPY came in the middle of the depression (1932-1933). Airplanes were starting to fly and people have their radios going. The Aurora kicks off. Everyone's radios blank out and people can't understand why their compasses are doing weird things. So, during the second IPY there was a lot of work done on magnetism, earth magnetism, and the Aurora, as well as on atmospheric processes. Some of the efforts started then have continued into the current day. For example, there is a scientific station in Britain that continues to operate to study the upper atmosphere, the Aurora and interaction with the Earth and the magnetosphere.

The third IPY occurred in 1957-58. It eventually became known as the International Geophysical Year and involved 67 countries and a lot of big science. It was really this program that brought Canada into modern science. It was the first time satellites were used and the first time computers had ever been applied to earth sciences in a big way. There were amazing new studies. For example, a Geiger counter placed in the first American satellite proved that the magnetosphere and the Van Allen radiation belts around the earth actually exist. They had been theorized for about 10 years and finally scientists were able to prove that there was radiation in outer space.

The International Geophysical Year left a real legacy. Besides incorporating the first use of satellites, it was the first time anyone tried to map all the ocean floors. That led to what we now know of as plate tectonics. It was the first time someone tried to measure all the earth's glaciers. The first world datacenters were established. The Canadian Polar Shelf project was started. The IGY really rejuvenated Canada's earth sciences programs in our universities and trained a whole generation of new polar scientists.

This Polar Year we are thinking about how to incorporate traditional and community knowledge into programs. It's actually a requirement. How are we going that and respect the knowledge of the people that are living in the Polar Regions? IPY's have historically involved the big science stuff. What's interesting this time is that community-level science is also being involved.

There are two big lead organizations, the International Union for Science and World Meteorological Organization. There are about 30 other international organizations, such as the United Nations, that are endorsing and supporting the IPY initiative. At the national level, these programs are lead by national committees. Wayne Pollard and I sit on the national committee for Canada. The next level of organization for

IPY is the 'fully endorsed' programs and projects.

Governments play a key role but they are not part of the organization of the IPY. The international organizations set out the terms of reference for the IPY in a framework document that you can see on the website. The framework document recognizes what the large number of contributors to the program. We've got all sorts of other organizations, artists, publishers, and universities involved. Universities are major contributors.

The real foundation of IPY is the fully-endorsed programs. The process for their selection has been a long one. There were over 1200 submissions to begin with. Programs that were eventually considered for selection had to be international and involve at least six countries. They had to have data management. They had to have youth involvement. They had to have a communications strategy, including, in the North, how to get the information back into communities. If it was in the North of Canada, for instance, funding won't flow unless the communities are somehow involved. They had to have a designated lead. Being endorsed doesn't mean the project will be automatically funded.

Right now the proposals involve about 60,000 people in some 60 odd countries. Some programs have over 100 projects in them. One program that has already been funded, and is up and operating, with a research team currently in Whitehorse, is the Human Health Initiative for the Arctic. There's also a team in Nunavut, and there's a team in the NWT. There are linked together with a large number of other programs, on a circumpolar basis, lead by Arctic Council. Other programs like the beluga monitoring are contributing to the larger IPY programs. Some projects are locally driven. The Old Crow project, which is part of a large environmental change monitoring network around the area of the tree line, was developed by the First Nation with the help

of a team of researchers, some of whom are here.

Climate change has come up as being a huge integrative theme. This is leading some very large strategic initiatives, trying to pull together research in both Polar Regions. IPY events are happening over a relatively short period of time, but they are really just a part of a general flow of getting new information and providing that information to the public. Funding for IPY projects is coming from several different sources. One of the big legacies of the IYP is going to be capacity building, training the next generation of polar scientists and involving communities.

More information on the IPY is available on these websites: [www.ipy-api.ca/](http://www.ipy-api.ca/) and [www.ipy.org/](http://www.ipy.org/) Or you can contact: Bob Van Dijken in Whitehorse [bvandijken@cyfn.net](mailto:bvandijken@cyfn.net) or Pippa Seccombe-Hett in Inuvik [ipy@nwtresearch.com](mailto:ipy@nwtresearch.com)

### **Communication Workshop 3: Communicating Results**

Evelyn Storr  
Aklavik Hunter and Trappers Committee  
Box 133  
Aklavik, NT X0E 0A0  
[ahtc@permafrost.com](mailto:ahtc@permafrost.com)

Aileen Horler  
Chillybeans Consulting  
5 Harbottle Rd  
Whitehorse, YT Y1A 5T5  
[chillybeans@northwestel.net](mailto:chillybeans@northwestel.net)

**Aileen Horler:** We're here this afternoon to present the third and final workshop on communications. The first workshop yesterday was, "Understanding your audience". The second one was "How to give a great presentation". We are going to talk about communicating results.

When you are thinking about how to communicate the results of your work, remember this quote from Einstein. "Everything should be made as simple as possible, but not one bit simpler." It's real a challenge.

Yesterday, the workshop on understanding your audience noted that different audiences have different needs. For example, government agencies need different information than community members. You will be wasting everyone's time, including your own, if you supply a lot of extra and unnecessary information. Presenters too have different needs. You need to think about your objectives and why you have to or want to communicate the information. You need to be clear about what messages to use to meet your objectives. Another point that was made in Sandy's workshop yesterday is that different people learn in different ways. This is termed "learning styles".

**Evelyn Storr:** When we were working on today's presentation, we decided to focus on things to think about when reporting back to the community. I thought we should use a project that's really moving along well, and has been reported back to the community of Aklavik in ways that are working for us. So, we're going to use the Yukon North Slope grizzly bear project as an example. This project is being co-ordinated by Dr. Ramona Maraj at the Yukon Government. With Ramona's help, we're going to show you four different ways to communicate the same message. The information we are going to present is based on some of the activities of the bear project.

**Examples of four ways to communicate results**

1. **Written material:** Using a power point projection, workshop participants were shown three pages of text and given a few minutes to read them in silence. The text provided information on capturing and collaring grizzly bears as part of the Yukon North Slope Grizzly Bear Project.

2. **Narrative:** Ramona gave a three minute verbal presentation, without props, that described what happens when she and her assistants capture and collar grizzly bears as part of her project. She covered the same information as was given in the written text.

3. **Demonstration:** With the aid of two assistance (one taking the role of the technician and one the role of the grizzly, complete with bear hide), Ramona demonstrated the capture and collaring of a grizzly bear. The tart and the collar were passed through the audience so that they could get a better look at these objects.

4. **Video:** Using a power point projection, workshop participants were shown a video clip of darting and handling a tranquilized bear. Ramona explained the process as the audience watched the video.



these methods might work for the audiences that you have, as well. It was really fun to watch you respond the video, because everybody was watching it intently. Think about what that means.

There is a variety of different media that you can use to communicate. Communication can either be one-way or it can be two-way. Examples of one way communication are radio, posters, videos, newspaper ads or articles, and websites. There are several newsletters already covering the ISR that you may be able to tap into or you can create your own. Posters can use lots of text to convey a message or they can have lots of photographs that tell the same story. Different methods of two-way communication include community meetings, working in the schools, meetings with agency representatives, conferences, and workshops, like we're doing here. There is the ISR research day which has been happening for several years. It is a good forum for presenting research results and project information. As several people have mentioned over the last few days, one-on-one communication is often the best way to send your message out and to receive messages.

Following up on what we've been hearing the last few days, there are a few more points I want you to think about:

- Language is really important. Lorraine brought up the point about translation. Translation just doesn't have to be from

**Evelyn Storr:** We have just presented four ways of trying to get a message across; the same message, but using four different methods. Hopefully, by using one or a combination of those different methods, you will be able to reach the audience. Think about what would work best if you want to communicate your results in a school, to a group like this, or one-on-one. It's the same message, told in different ways.

**Aileen Horler:** Think about which of those ways worked the best for you. In thinking about that, you will be thinking about your own learning style. Think about which of

one language, you know, from Gwich'in into English or vice versa. Language 'translation' can also be about using plain language versus technical language. It's alright to use technical terms sometimes, but you really have to make the effort to explain them. Try to keep the words that you're using as simple as possible. I don't want to single out anybody here, but I did hear the word "substrate" used a couple of times". Maybe you can just say "the bottom of the ocean". It's really just that simple. Really try to explain things in non-technical terms so people will understand. This applies to presentations and written materials.

- What is the purpose of using graphs and charts? I've seen some real dillies here in the last couple of days. When you use graphs and charts, you have to think about why you're using them. If you're just using them to decorate the wall, then don't use them. You don't want people to spend all their time trying to figure out what graphs and charts are showing and they're not going to be listening to you while they do. If you do use them then make sure you explain them. I don't know how many of you have seen Al Gore's movie, *Inconvenient Truth*. I was really struck with the way he was using the graphs. He was in the graphs, walking back and forth with them and trying to explain them. I found that really effective.
- Is the text you're using appropriate to your context? Something written for one document is not always suitable for a presentation. Do we really need to hear the 'official' definitions?
- Providing information doesn't mean it's being received in a useful way. If you are explaining relationships between factors don't leave it to the audience to figure out what it all means. Your job is to show them.
- Be really careful with your reliance on technology. If you are having problems,

you have to be adaptable and figure out what you're going to do about it. You can't melt down and leave the room. You have to just keep going. This stuff happens. One of the classics, of course, is that you can't even find an extension cord or an outlet. Yesterday, Andrea addressed the value of having a look around the room before your presentation so that can be prepared before your audience arrives.

**Evelyn Storr:** I will close with a note on an experience we had in Aklavik. We had one group come to the community to talk about the pipeline. They told us they may have to use dynamite in their seismic work. They are talking about 100 pounds versus 10 pounds or whatever. I sat there and I listened to them and for the life of me, I couldn't grasp it. I didn't know what the heck they were talking about. So, I said, "I just can't seem to get what you're talking about. I don't even know the sound of that blast that you're talking about or what." I asked, "Can you go away and come back and put it on a presentation, or whatever it is you have to do to help us understand what you're talking about?" So, they went away and when they came back for another meeting they had an excellent presentation. They did what they had to do to explain that to us. It's important for you to do your research. One of our HTC members recalled some past dynamite work which really didn't go over well. If you know of something that may have a negative effect on the way people think of what you're proposing, try to come back and give them some comfort.

The other thing we want to touch on is that communications build capacity. We hear people talking about capacity building in the community, and we know that the dollars are not there. But you can rely on what's available in the community to build that capacity. If the people know what's going on, they will be willing to get involved, and they will be able to make more decisions. We want to get involved and be of assistance to the people that come in. You

can learn from what we know and we can learn from what you know. It's really important. You can only build that capacity by communicating well with the community. People who come to the community turn people off if they come in like they know everything. There have been a lot of references at this conference to traditional knowledge. We know just as much as you, probably even more when it comes to the environment and the wildlife. So, you have to come in with a different attitude.



Communication works two ways. You have to listen, and you have to allow for opportunities to learn by listening to what the others have to say. And if you don't mind, I'd like to use a little example. When I first got involved with the HTC, my intentions were to hopefully be of assistance to the board in the administration. That attitude sure changed once we started talking about different things. I was so amazed at the information that came out of the elders on the committee. Now I am there to learn

and it's really exciting. I am still learning. It's so important to listen to what others have to say. You may be the expert as a scientist or whatever your field is. But you are not the expert on what's happening on the land, because you don't live there. You don't have that day-to-day contact with the changes that are going on and how those changes are affecting the people that rely on what's out there.

The communities need to understand. They need to be involved. If the communications are not working at the community level, then it doesn't matter what you're doing or saying. If we don't have that communication, then it's not going to go anywhere. Reporting back is so important to maintain the support of the community. Communities have a right to know what's going on, and they need to know at every stage. When Ramona's project started, she ran into some problems with defective collars. She came back to the community, told us what her problem was and got the HTC's support to do what she needed to do. She kept us informed and that's good communication.

We review research applications at community level. There's one section on the application that says, "How do you plan to get communities involved? How do you plan to report?" People write things on the application but a lot of times we don't see that involvement or reporting happening. Then the next spring or the next year, applications come in again from the same

people and we haven't seen or heard from some of them yet. So, it's really important that you commit to what you put on your applications, because that will affect the decisions of the community. We hear that the research is going on but we don't get the reports. We don't like to sound negative, but the conference is about reporting and monitoring. The people who are out there doing the research work need to know our feelings in the community. If there are changes in your program or you can't do it



this year, then we need to know. For example, if you're going to be doing work down at Herschel Island, at the board level we say, "Okay, what we need is for you to let us know the days that you're going to be out there, so that we can let the harvesters know. We can let the people that are out on the land know that there may be helicopters flying or whatever." So, you just need to keep in constant contact with us.

It costs money to come back to the community all the time, but there are other ways of communicating at the different stages. Think about different ways to get that information back. If you happen to be in Inuvik, or you have some work going on in Aklavik or Tuk, maybe take a day or a couple of hours to just drop in to the HTC or call somebody up and give some updates. Take your communication activity seriously. It's really important, because the way you communicate – and I keep saying it – with the community is important. Because in the community, we are the ones who will either give you the stamp to go ahead and do what you want to do, but if there's a break in that communication, then the faith and the trust is not there anymore. Then you have to start all over to build up a relationship again with the community. "Oh, he's coming again!" You don't want people to have that kind of outlook when they see you coming. I'd like to close on that and I hope you can take those suggestions to heart.

### **Closing Session: Where do we go from here?**

**Frank Pokiak, Inuvialuit Game Council:** I would like to comment on three things. Maybe those who are listening, maybe the funding sources, government in particular, could pay a little attention to what I have to say.

The Inuvialuit Land Claim was based on land use and occupancy, which really relates to traditional knowledge. I think that knowledge is really valuable and I think those people that provide that information should be compensated properly. I'll just throw in a figure of maybe \$500 for minimum. In that sense, you would get what you pay for if you do your homework properly. In other words, review the people that you want to use, see what they're made of, and see if they know what you want. I think their time will be well worth it. Another thing is the Arctic Borderlands Co-op. I've been doing a lot of thinking about that one too. Environment Canada has been a big supporter of it, which is great, but like Mike Gill said, it's funded year-by-year. I think a two-year timeframe for funding would be better. I say that because the Co-op is collecting all that knowledge and getting people together. I think it's really important. The last thing is in regards to



funding agencies. I think the funding agencies, in particular the government, should be prepared to go all out and find funding for any research. If you do your research properly, you will get what you pay for.

**Rhonda Markell, Parks Canada:** We've got a room full of people here that have a passion for understanding the land around us. The importance of everybody working together has come up many times over the conference. The people that are out on the land, the researchers, and the students - we have to work together right from the start. Not only in carrying out the monitoring, but in determining the questions and deciding what are the things that we really need to be monitoring to let us know that the land around us is healthy. I think that, in the end, management decisions are really based on people's values. So it's really important that everybody's values are heard and brought forward into the decision making process so that we end up with something that everybody had been striving towards. There is a greater willingness for people to work together, at all levels. What has come out of this workshop is really positive.

**Ron Chambers, Alsek Renewable Resource Council:** I want to say something from the cultural side of things. A number of years ago, the circumpolar conference was going to be coming to Whitehorse. That's the conference that looks at the health of the parts of the world north of 60. I was asked to make a drum to use in the opening and closing sessions of the conference. It was left to me to decide what I would put on the drum and what the message would be. Some people in the far north may not know, as our people in this part of the country do, that the raven, or the crow, created the world. He opened his mouth and then the sun shone out. I decided to use that theme and I put it on the drum. But I didn't make the mouth of the raven wide open. I didn't feel I could do that with what was happening today. The message I had on the drum was that if we don't take care of our environment and

ourselves and where we live, he will close his mouth again, and it will all be black. That was the theme on the drum.

Later, that drum was hanging in an office in the Yukon Government building here in Whitehorse. One day I was there and saw that the skin had actually split. It's made of caribou rawhide. For me to get that skin get tight enough to drum had to dry it a lot. But still it somehow dried more and split. When I was told that people have been feeling really poorly in this building for a long time, I said, "Well, there's an indicator. It's got to be, because it takes a lot of work for me to get that drum to be tight enough to drum it." Then they looked into it and it became a pretty major thing for them to work on the air quality in that building. I thought, "There's the first step that the drum has taken care of." I took the original drum back and made a new one for them, with the same motif on it. This is the idea of using culture as the message. And it still is the same message. If we don't take care, the raven will close his mouth.

**Lindsay Staples, Wildlife Management Advisory Council (North Slope):** We've heard a lot of talk about communications at this meeting, and I appreciate the workshops that were done. I think in part it really reflects, for some of us, the need to do a better job of communicating the work that we're doing. I appreciated Randy Pokiak's reference this morning to what he considers his back yard and front yard to be. I think there is an understanding by many in the room that whether it's an airplane going overhead or a helicopter touching down on the ground, or snow machines travelling across a particular landscape, that people are interested in knowing who's out there and what they're doing. And that is, of course, what the communications work is all about. This morning, as well, Randy talked about the importance of recognizing the contribution of harvesters, when you want their knowledge and experience. Certainly there's much that we can do to improve on it

but I think we've got some good examples of how that might be done.

At the Wildlife Management Advisory Council North Slope, we've been quite conscious of trying to get materials back to the communities that are supporting our work. We supported a traditional knowledge study that Barney Smith did in Aklavik about four years ago. It was a wonderful process. He spent a lot of time there and had great support from the community. We put a great deal of value on recognizing the information and the knowledge that was gathered and actually put quite a bit of money into what I would consider to be a high quality publication. I think that was an important thing to do because the publication was not just Barney's work, it was the work of the people in the community, the elders of that community. The publication was recognizing the contributions and the special knowledge that the people have.

People talk of the urgency to collect information and knowledge, but there's also an urgency to do something with it or at least document it in a way that recognizes the tremendous contributions that people make. This morning Randall Pokiak commented how once knowledge is given, it's given to everybody to use. It is important to recognize the contribution of the giver, it is important to share it, and it is important to work with it. Sharing information and collaboration is really the critical core of good monitoring work.

How do we bring communities and researchers together? We've got some good examples in the room here of people that have done that. It would be helpful if they can share some thoughts on how we can make greater inroads or improve on these relationships with these southern-based institutions.

**Chris Burn, Carlton University:**

Working with a community is just like any friendship, when you begin, you're an acquaintance. After some time, you begin to be accepted. After a bit longer, you might be called a friend and develop a good relationship with certain people with whom you feel you have a connection.

In the university system, I would say relationships with a community are not something that anybody recognizes has any value whatsoever. In that system the indicators are publications, how much money your grant brings in, how many graduate students you have supervised, and what is your teaching score. There is nowhere in the world I live in, where somebody says, "If you've continued to be able to work with a community for 25 years, we need to recognize that in some way." It's not regarded as being something that is on their radar screen whatsoever.

What is on their radar screen are the messages of frustration coming from people who have had the beginnings of interaction with a community and feel that somehow the red carpet hasn't been laid out in front of them as it should have been. But that's a problem with the people who thought they were going to be walking on the red carpet. I don't think it's a problem related to the red



carpet. It is probably as difficult for southern university people to feel that they are coming to a community to make friends as it is for you to feel that these people can be your friend. When you meet another person, it won't help if your immediate reaction to them is reticence or cautiousness. Because the person who comes into a community has just as many views about who you are as you have about who they are. Those are usually stereotypical views.

If you extend a hand of friendship, then you may find that together you can do more than you ever could do by yourself. The difficulty with all of this is knowing how to do it. You can't read anywhere how to be a friend. It's something that we learn. We learn from our parents, we learn from people we are with. But ultimately, in my view, that's what it's all about.

**Conference participant:** I'd like to reinforce Chris's comments. From the government perspective, we are no better off. We have a community consultation tour and my management tells me the money would be better spent on research. We do not get credit for going to the community. The government might say that outreach is important, but don't put any money in it. Money is supposed to be for research. We have to argue with our management for this kind of process. Some of us are successful at it; others get frustrated at the whole thing. So, it's really difficult. We do need some feedback from the communities if this process is really considered to be valued. We're not getting that feedback.

Scientists are, by nature, introverted. They are very much caught up in what they're doing. They are often prone to being by themselves in their own world and doing what they like to do. It is difficult for them to get out and interact. Inuvialuit feel good when they are on their land. They feel at peace. That's where their heart is and where they feel they're comfortable. There are parallels with scientists. They aren't really any different. They are at peace in their

world. They're comfortable when they're either behind their computer or in their lab. As soon as you move them out of that environment and put them on the stage, it is no different than the Inuvialuit response. That's something we have to take into account. We each have our own way of being that we're trying to merge. That calls for change with time and effort on the part of the individual to get out there and make the effort.

**Steve Barlett, Joint Secretariat:** This has been a good conference. It's encouraging to see everyone pointing in the same direction and wanting to reach the same goals of shared communication and getting messages back and forth to each other. Getting buy-in from the community requires them to be involved early in the process in the development of a project or a program. It takes time to build a relationship. You can't expect a program that incorporates a lot of community input and knowledge to get off the ground and become something really strong like the Arctic Borderlands Co-op in the first year or two, or even three. Sometimes it's going to take maybe four or five or six years before that program really gets complete buy-in in a community.

A program like that is very encouraging to see. It's a good way to do things. It works and it can work very effectively. Communication is obviously the key thing. The people on the co-management boards who are attending conferences are hearing a variety of information and start to understand what's going on. When they present what they have learned in the communities, future members of the co-management boards and decision makers might hear them. Then they and other community members will learn what you're trying to do. They will understand that you're trying to do the best thing for that region and that community.

A lot of people who have brilliant minds are going into the communities and presenting a lot of really great information. The problem

is that it's hard for them to talk about what they are doing and finding out in a way that's understandable at the community level. When you're so well informed about your particular topic, it's sometimes very hard to talk about it in a way that is understandable to someone who doesn't know anything about it at all. Sometimes you have to bring down the level of detail down and leave out a lot of the extraneous information. Great communicators can take a very complex topic and explain it in a very simplified way. Build a foundation of knowledge first using simplified terms and examples and then start adding increasing levels of detail and complexity.

Compensating people who share their knowledge is addressing the intellectual property rights of the people who are holding that knowledge. In the southern world, there are lawyers working to protect the intellectual property rights of individuals, companies and researchers. The Inuvialuit are starting to recognize that their own traditional knowledge is their intellectual property. They are willing to share it but they want to make sure that they're being treated fairly and their rights are recognised.

Communication is the key. It's not something that's easily learned. It takes a lot of practice. Watch the people who are good at it and try to figure out what exactly they're doing that makes them so effective at it. Or look for the people in the communities who communicate well. There are people who have their hands sort of dipped in both worlds. To use myself as an example, or Eric Cockney from Tuktoyaktuk, we both grew up in our communities. I grew up in Inuvik, and he grew up in Tuktoyaktuk; but we both have also gone on and have a post-secondary education. I can understand the local language and how people talk in the community and I can also understand when the researchers are presenting very technical data. Some people have the ability to translate very effectively back and forth between both worlds.

You have to put in some time if you want to build a relationship. There is a bit of a shaded history with the researchers and how they conducted themselves in this area. That's starting to slowly be overcome with the new generation. The people in the communities are starting to show a willingness to participate and be involved. The earlier they can be involved in research that is relevant to their lives and their area, the more buy-in you will have.

**Evelyn Storr, Aklavik Hunters and Trappers Committee:** Conferences always seem to end on "Where do we go from here". The biggest action that we take after leaving this conference is using some of the tools that were presented in the communication workshop to improve on our communication. Maybe some of us haven't been doing a very good job and that's why we have barriers. I really think and I really feel strongly that we all have a part in this. Each and every one of us, when we leave from here, let's take a look at what we can do to improve how we are going to work with the people that come to our communities. We need to give some direction to researchers and industry so that they know what we want as communities, but we also have to respect what they want. It works both ways.

It is possible to develop some really good partnerships without outside researchers. I want to refer to the project Barney Smith did in Aklavik with the support of the Wildlife Management Advisory Council North Slope. Barney worked very closely with the community. The HTC would never have been able to do that type of work on its own. We would never be able to do the interviews and gather the stories that Barney was able to do. All the information collected as part of the project now belongs to the Aklavik HTC. In the future, if anybody wants to use it, they have to come through the HTC to get permission.

Another excellent example of how a community can take ownership of

something that's going on in their area is the North Slope grizzly bear project. The research will tell us if the population has gone up or down as well as other important information. The community will be able to make some good decisions about grizzly bear management and help us to decide about the quota. I really think we're doing what needs to be done, but we just have to better it. We have to enhance what we've been doing and it'll improve relationships.

I'm glad I'm finally getting to meet some of the researchers and put a face to the names I've known for so long. The update of the research activity that's been going on in our area and in the ISR has been really good. When I was up there talking about what we in the communities want you to do when you come, I realized that I have a part, too. I have to be able to work to help you improve

what you want to do, to advise you and identify the areas that you may be overlooking because you're so wrapped up in your work. And when you come on to the land, we have to let you know that these are things you can't do and these are the times you can't do it and this is when you can do it. We can just keep on helping each other and teaching each other about the different culture and the way that we do stuff. I'm sure that the work we would like to see done will be of benefit to future generations.

Thank you.

***Conference closed with a prayer given by Annie B. Gordon.***



## Summary of Posters

### **The Changing Flora of the Yukon North Slope Coast**

Bruce Bennett | Yukon Government  
bruce.bennett@gov.yk.ca

During the summers of 2005 and 2006 we looked at select areas within one kilometer of the North coast and recorded the abundance of all plant species. We paid special attention to areas that may have had introduced species and to known sites of rare vascular plants. We recorded 317 species of vascular plants, representing approximately one third of all plants known to occur worldwide in the arctic. Of these, 60 species had never been recorded on the Yukon coast before and 8 of those were previously unknown in the territory. The only introduced plants found were two non-native grass species planted at the Shingle Point DEW Line station. Significantly, a number of rare species known from previous surveys were not relocated, including 2 that were previously reported as locally common (but not found elsewhere in Canada) and that now seem to have disappeared.

### **Permafrost Conditions at Collinson Head, Herschel Island (Qikiqtaruk), Yukon Territory**

Dr. Chris Burn | Department of Geography and Environmental Studies, Carleton University  
crburn@ccs.carleton.ca

This poster summarizes the principal field installations and initial results of a long-term permafrost monitoring project at Herschel Island. The project is a collaborative initiative between Yukon Parks and Carleton University. The purpose is to investigate permafrost conditions on Herschel Island, and to examine how they have responded to the climate warming experienced throughout the western Arctic since 1970. Our data show that the mean annual ground temperature on Collinson Head is  $-8^{\circ}\text{C}$ , and

we have obtained the ground temperature profile to 42 m depth, which shows that the ground has warmed from its previous equilibrium temperature of  $-10^{\circ}\text{C}$ . The temperature at the top of permafrost is measured on a transect downslope from Collinson Head, at 10 sites with varying snow cover. The range in mean annual ground temperatures at these locations is from  $-5^{\circ}\text{C}$  to  $-9^{\circ}\text{C}$ . Snow depths at these sites are measured by Park Rangers. The relation between snow depth and ground temperature obtained at Herschel in 2003-04 is precisely the same as obtained at Garry Island in 1969-70, a site that is normally  $2^{\circ}\text{C}$  warmer than Herschel.

### **Species at Risk on Yukon's North Slope**

Syd Cannings and Tom Jung | Yukon Government  
syd.cannings@gov.yk.ca

This poster will review in summary form what we know of species at conservation risk on the North Slope, and discuss ways in which Inuvialuit and others on the land can help in inventory and monitoring of these species. Six species on the Yukon's North Slope have been assessed as at risk by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC): Grizzly Bear, Polar Bear, Wolverine, Tundra Peregrine Falcon, Short-eared Owl, and Bowhead Whale. However, these represent only a small fraction of the North Slope species that are of conservation concern. A number of birds and mammals, and many plants and invertebrates have not been assessed yet by COSEWIC. However, the status of all vertebrates, vascular plants, butterflies, and dragonflies have been assessed across Canada through the Wild Species 2005 project; in the Yukon, these statuses were assigned through direct translation of NatureServe Yukon's conservation status ranks. As part of Beringia, the northern Yukon is home to a number of species found nowhere else in Canada, and some of these species are apparently very rare.

### **Herschel Island Ecological Monitoring**

Dorothy Cooley and Herschel Island  
Territorial Park Rangers | Yukon  
Government  
dorothy.cooley@gov.yk.ca

Initial inventory projects started about the time the park was established in 1987 as a result of the IFA. Some of this research (the bird research in particular) developed monitoring systems for the Rangers to continue surveys. In 1999, we learned of the wonderful data that the Rangers had been collecting for 10 years or more. We started working with the Parks staff to update and standardize data collection methods and to secure data storage. We are also broadening the scope of the monitoring by inviting various experts to conduct relevant research in the Park and to develop long term monitoring protocols that build on what the Rangers have already been doing. This poster summarizes the current monitoring program and presents some example data.

### **Status of the Porcupine Caribou Herd**

Dorothy Cooley | Yukon Government  
The Porcupine Caribou Technical  
Committee  
dorothy.cooley@gov.yk.ca

The Porcupine Caribou Herd is a population of barren ground caribou that ranges across northeastern Alaska, Yukon, and northwestern Northwest Territories, providing an important source of sustenance for user communities. The size of the herd has been declining since 1989, prompting increasing concern about the status of the herd and various management actions. This poster summarizes the current management program for the herd, the major technical information (such as population estimates, calf birth rate and survival, adult survival) that has been gathered for the herd since 1985, and highlights some current data gaps.

### **Yukon North Slope Muskox Study**

Dorothy Cooley | Yukon Government  
Ian MacDonald | Parks Canada  
dorothy.cooley@gov.yk.ca

Muskoxen in Yukon are descendants of 51 animals which were re-introduced to the North Slope in Alaska in 1969 and 1970. The objective of this study was to conduct a population monitoring program in Yukon consisting of numerous jobs. The study area was from the Alaska border to the Blow River. We wanted to estimate the population size and composition, to document seasonal distribution and movements of collared muskoxen, to develop and implement a system for local travelers to report their sightings and to develop a population model to estimate future population dynamics and the effects of harvest on the population. As the study progressed, other issues came to light and were included: the presence, levels and effects of parasites and disease, and genetic differences between North Slope and NWT mainland muskoxen. This poster summarizes the findings of these studies to date.

### **Monitoring Black Guillemot Population and Nesting Success at Herschel Island, Yukon Territory**

Cameron D. Eckert, Dorothy Cooley and  
Richard R. Gordon | Yukon Government  
cameron.eckert@gov.yk.ca

The Black Guillemot (*Cephus grylle*) is a seabird with a circumpolar distribution; it breeds from the eastern Canadian Arctic south to Maine, eastward along the southern Arctic across Eurasia, reaching North America again in scattered colonies in northern Alaska and the Yukon. The Yukon's only nesting colony is on Herschel Island, a Yukon Territorial Park off the Yukon's North Coast. The Herschel Island colony has been monitored for population and nesting productivity since about 1986. Concerns about the species and ecosystem health have arisen due to population declines at the Herschel Island colony, as well as a

colony near Barrow, Alaska. Alaskan researchers have found that sea ice conditions affect nesting productivity, and have made the link between climate change and Black Guillemot population health. Black Guillemot monitoring at Herschel Island provides valuable information for understanding changes across the Beaufort Sea region.

During 2005-2006, Black Guillemot monitoring at Herschel focused on the continuation of adult counts and nest surveys, along with an investigation to determine the Black Guillemot's primary prey species. The population and nest surveys indicate a continued downward population trend for the colony: In 2005, the surveys found 60 adults and 12 nests with 22 chicks; in 2006, surveys recorded 40 adults and 9 nests with 13 chicks. The dominant prey species taken by nesting Black Guillemots were Arctic Cod (*Arctogadus glacialis*) and Short-horned Sculpin (*Myoxocephalus scorpius*), along with small numbers of Slender Eelblenny (*Lumpenus fabricii*), Arctic Lamprey (*Lethenteron japonicum*), and Capelin (*Mallotus villosus*).

**Dall's Sheep, Grizzly Bear and Wolf Interactions in the Richardson Mountains**

Jari Heikkila | Gwich'in Renewable Resource Board  
wildlife@grrb.nt.ca

The Richardson Mountains are home to a variety of wildlife species and possess a high cultural, conservation, and hunting value for northern people. Recent surveys of Dall's sheep (*Divii* in Gwich'in, *Ovis dalli dalli*) in this region have indicated a relatively low population abundance and low recruitment rates. The fluctuations of this Dall's sheep population may be shaped by a combination of factors, but the impact of predation has received limited attention so far—our study aims to fill this gap. Grizzly bears (*Shih*, *Ursus arctos*) and wolves (*Zhoh*, *Canis lupus*) are common in the Richardson Mountains, however their

demographic parameters, habitat use, nutritional ecology, and impact on this sheep population remain poorly known. Moreover, activities related to oil and gas industry as well as climate change may create disturbances to habitat and species dynamics in the future. To get a broad understanding of this ecosystem and to assess the factors driving Dall's sheep, grizzly bear and wolf populations, we will (1) investigate the population and spatial dynamics of those three species; (2) quantify the interactions between them, emphasizing on Dall's sheep predation; (3) assess the impact of habitat features, snow and climate on the species' dynamics and interactions; (4) document the traditional knowledge of the Gwich'in about *Divii*, *Shih* and *Zhoh*; and (5) evaluate the impact of the abundance and distribution of other species such as caribou (*Rangifer tarandus*), moose (*Alces alces*), muskox (*Ovibos moschatus*), and golden eagle (*Aquila chrysaetos*) on Dall's sheep, grizzly bear and wolf dynamics and interactions.

Methods used include GPS tracking; fatty acid signatures and stable isotopes analyses; field observations of sheep behavior and predation events; habitat, snow, and climate monitoring; interviews with Gwich'in elders and active land users; and integrated research with collaborative agencies. In 2006, we fitted 6 Dall ewes, 7 grizzly bears, and 8 wolves with GPS collars. We have so far received over 2,500 locations (partial data) through Argos satellite system, and we present herein home ranges estimates and details of other fieldwork conducted during the last year. In 2007, we plan to equip more wolves and grizzly bears with collars, continue habitat monitoring and body tissue sampling, observe Dall's sheep behaviour and investigate predation in the field, and start the Traditional Knowledge interviews in the Gwich'in communities. Moreover, we recently created a poster for the 17th international bear conference (Karuzawa, Japan), about grizzly bear management in the Gwich'in Settlement Area.

**Community-based Management and Research of Grizzly Bears in the Canadian Arctic: Insights from the Gwich'in Settlement Area**

Catherine Lambert Koizumi | Gwich'in Renewable Resource Board

Marsha Branigan | Environment and Natural Resources, Government of the Northwest Territories

John Nagy | Environment and Natural Resources, Government of the Northwest Territories

Jari Heikkila | Gwich'in Renewable Resource Board

Andrew E. Derocher | University of Alberta  
wildlife@grrb.nt.ca

Grizzly bear (*Ursus arctos*) management often implies a top-down approach, where governing authorities establish harvest rules after only limited consultations with local communities. However, in the Gwich'in Settlement Area (GSA), a 57 000 km<sup>2</sup> territory located in Canada's Western Arctic, grizzly bear management is based on a co-management framework that includes the communities, Gwich'in organizations, and the Government of the Northwest Territories. Our poster describes this unique community-based process that has led to the elaboration of a management agreement for grizzly bears in the GSA, and the communities' voluntary compliance to it. Grizzly bears are intrinsically linked with the Gwich'in culture and way of life. After signing a land claim agreement with the Canadian government in 1992, the Gwich'in people regained responsibility for managing wildlife on their land. In the late 90's, communities expressed concerns about the potential overharvest of bears. In response, Gwich'in elders and hunters, local renewable resource councils, the Gwich'in Renewable Resource Board, and the territorial government collaborated towards the design and implementation of a grizzly bear management agreement. The agreement was adopted in 2000, and the communities still abide by it today. By involving community members throughout the process, we believe that this collaborative

bottom-up approach translates into a more sustainable harvest of grizzly bears in the area and into a greater appreciation of the species. We conclude by highlighting a grizzly bear research recently launched in the GSA, also community-based, which will fill important knowledge gaps and provide recommendations relevant to the continuing management and conservation of the species.

**Porcupine Caribou Management Board**

Deana Lemke | Porcupine Caribou Management Board  
beyondwords@northwestel.net

The Porcupine Caribou Management Board's poster presentation focuses on describing the co-management of the Porcupine Caribou Herd. Because the herd's population has been steadily declining, the co-management process is more important now than it ever has been. The poster will outline the composition of the Porcupine Caribou Management Board: its members and the organizations who appointed them. By bringing together representatives of all governments and user communities in the Canadian portion of the herd's range, expertise and resources are pooled to help manage the herd and its habitat. In this way, informed compromises are achieved, the Porcupine Caribou Management Board engages in public consultation, and then makes recommendations to governments and agencies. The Harvest Management Strategy is an example of co-management at its best. All user groups are working together to form a consensus on the best ways to manage the use of the herd in the future.

**Snow-pack Development and Ground Freezing, Blackstone Uplands, Yukon**

Pascale Roy-Léveillé and Dr. Chris Burn |  
Department of Geography and  
Environmental Studies  
prleveil@connect.carleton.ca

The Blackstone Uplands constitute important winter habitat for the Porcupine Caribou herd, and is a popular area for hunting in the fall and early winter. Use of snowmobiles on unprotected tundra may damage the vegetation cover, thus reducing the quality of caribou habitat. Six inches (15 cm) of snow and frozen ground below are the current minimum criteria to open the Blackstone Uplands to snowmobile access. Our objective is to examine how accessible reference sites can be used to assess snow-pack development and ground frost penetration over the Blackstone Uplands. We sampled vegetation structure, topography, rate of snow accumulation, and rate of frost penetration in the ground at 220 sampling stations over the summer, fall, and winter of 2006. We are now examining the relations between these variables. The results of this analysis will yield an increased understanding of snow cover and ground frost penetration in the area, thus facilitating effective management of the Blackstone Uplands.

**CircumArctic Rangifer Monitoring and Assessment (CARMA) Network: Monitoring Caribou Body Condition - Protocols for Field Workers**

W. Nixon, D. Cooley, S. Kutz, K. Parker, P. Barboza, P. McNeil, R. White, R. Otto, A. Gunn, G. Kofinas, D. Russell and A. Neimanis | CARMA  
wendy.nixon@ec.gc.ca

The CARMA (CircumArctic Rangifer Monitoring and Assessment) Network is an international group of scientists, managers, co-management board representatives and non-government organizations whose mission is to “through cooperation, both geographically and across disciplines,

monitor and assess the impacts of global change on the human/Rangifer system across the circumarctic”. In achieving this mission, CARMA’s approach is to conduct a comparative analysis among Rangifer herds across the Arctic. It is important therefore that we develop a set of practical, cost-effective protocols to monitor body condition, including fatness, protein reserves, reproductive state, parasites, disease, and morphology, using a hierarchy of monitoring levels. The intensity of monitoring can range from “visual appraisal” (eg. hunter assessment of fatness) to detailed information, depending on the specific program that is implemented. The protocols manual will be field tested over the coming year, and made available on the CARMA Network website for partners and others. Consistent use of common protocols will help us to determine impacts of change both between herds and within herds over time.

**Hunting Caribou, Managing Caribou**

David Neufeld | Parks Canada  
dave.neufeld@pc.gc.ca

This poster will promote a deeper understanding of culturally entrenched understandings about relations between human and non-human people of the North Slope. Presentation: Royal Navy explorers meeting Inupiaq and Inuvialuit on the North Slope in the early 19th century traded for ivory drill bows decorated with ingenious images showing caribou and hunting scenes. These ivories, now in the British Museum, offer a fresh view of the traditional relationship between indigenous people of the North Slope and caribou. In combination with current anthropological discourse, the interpretation of these drill bow images suggests ways to re-balance contemporary co-management regimes. The images facilitate fuller cross-cultural communication and understanding of Indigenous values in the stewardship of animals, thus promoting more carefully targeted research and management actions. The poster will

include interpreted examples of caribou hunting imagery from the drill bows.

**Wildlife at the Edge: Species Diversity, Abundance and Assemblage at the Forest to Tundra Transition**

Troy Pretzlaw and Murray M. Humphries |  
Department of Natural Resource Sciences,  
McGill University  
troy.pretzlaw@mail.mcgill.ca

The southern edge of the Arctic is defined by the forest to tundra transition, which marks the range limit of several mammals and birds. The objective of our study was to determine the current species assemblages of terrestrial vertebrates and model the pattern of diversity, habitat use, and species associations across this gradient. We determined the relative abundance of 22 species along the Dempster Highway from contiguous boreal forest near Dawson City to contiguous arctic tundra in the Richardson Mountains. We found that, despite the patchiness and complexity of vegetation, species are clustered into ecologically linked groups corresponding strongly to boreal forest, taiga or tundra habitat. This distinctive pattern underscores the overriding importance of habitat relative to climate in determining species occurrence. This project showcases logistically feasible field techniques to sample the relative abundance and habitat use of many species simultaneously, which could be used for monitoring species along the North Slope.

**PRISM Shorebird Surveys on the Yukon North Slope**

Pam Sinclair, Ian MacDonald, Wendy Nixon, Mike Gill and Sarah Davidson  
pam.sinclair@ec.gc.ca

We conducted surveys of breeding shorebirds on the Yukon North Slope in June 2005 and 2006, as part of the Arctic component of PRISM (Program for Regional and International Shorebird Monitoring). The goals of Arctic PRISM are to estimate the numbers of shorebirds

nesting in the North American Arctic, and to monitor changes in their numbers and distribution. Surveys were conducted in the Yukon North Slope/Mackenzie Delta/Tuktoyaktuk Peninsula region in 2005 and 2006; we are reporting on the Yukon North Slope portion of the survey. We surveyed a total of 60 12ha ground plots on foot, during June 7-13. Plots were accessed by helicopter, and surveyors were based at Herschel Island. We also conducted some aerial surveys while traveling between plots. Within the survey plots we recorded 11 shorebird species, and 19 other bird species; these plot surveys are also suitable for monitoring songbirds, ptarmigan, and jaegers; in addition, the aerial surveys may be suitable for monitoring owls and loons.

**Multi-scale Perspective**

Luc Sirois | Département de Biologie,  
UQAR  
luc\_sirois@uqar.quebec.ca

Variations in seed maturation is one of the most important mechanisms by which northern forests will respond to the anticipated climate change. In this study, the relationship between growing degree days > 5 °C (DD) and seed maturity was evaluated at three spatial scales. At the continental scale, the development of female gametophytes and embryos were evaluated as a function of the heat sum at 11 sites across black spruce's Canadian range. At the regional scale, cone size and percentage of germinated seeds formed in 1998, 1999, and 2000, were analyzed at 7 sites distributed along a latitudinal gradient in northern Quebec. At the local scale, cones were collected along perilacustral and insular transects according to their exposure to large water bodies and from 10 islands located within a 2835 km<sup>2</sup> hydroelectric reservoir. Our results confirm the 800-940 DD thermal sum threshold necessary for the complete maturation of black spruce embryos at several populations distributed across the total range of the species (753 DD for maturity). Along the regional south to north

climatic gradient, the percentage of germination can be predicted by a sigmoid function of a thermal sum ( $y = 2.8 + 25.1 / [1 + e^{(x-896.6)/84.6}]$   $r^2 = 0.85$   $p < 0.0001$ ) that attains a plateau at around 800-940 DD. At the local scale, once the 800-940 DD threshold is attained, variations in the percentage of seed germination are associated with inter-tree differences and local site factors (thickness of organic matter, density, tree height, tree age, fetch). In the springtime, cold enclaves are created by the presence of the hydroelectric reservoir. The seed germination percentage in these enclaves vary from  $0.6 \pm 0.7$  to  $14.9 \pm 19.1$  according to the site (compared to  $22.7 \pm 15.1$  for a site not exposed to the reservoir), which is the equivalent to the germination percentages for sites at latitude 1-30 further north. This data suggest that the potential for black spruce regeneration increases strongly beyond the 800 DD isotherm, which evokes the possibility that arctic forests may become more dense under the current anticipated climate changes.

#### **Long-Term Monitoring of Coastal Change in Western Arctic Canada**

S. M. Solomon, R.B. Taylor, D.L. Forbes, D. Frobel, G.K. Manson and D. Whalen | Natural Resources Canada, Geological Survey of Canada (Atlantic)  
ssolomon@nrcan.gc.ca

The Geological Survey of Canada (GSC) maintains a network of coastal monitoring sites across Canada including the Arctic. Repetitive cross-shore and longshore surveys, sediment samples, and photographs are collected at each site, with additional observations such as cliff lithology and stratigraphy, thaw depths, etc. Objectives of the monitoring program vary depending on the region and our partners. In general, the GSC monitors shore-zone changes (1) to provide an ongoing assessment of the types and rates of change associated with various shore types and exposure situations in each region, and (2) to improve our understanding of coastal processes.

Information from the monitoring program provides a basis for assessing coastal vulnerability to changing environmental forces in response to climate variability and change, sea-level rise, or development and management activities. It is also used for assessing hazards to coastal property, infrastructure, archaeological or cultural heritage sites, or the conservation of coastal habitats.

#### **Arctic Borderlands Ecological Knowledge Co-op: Summary of Findings of Caribou Monitoring**

Michael Svoboda | Arctic Borderlands Ecological Knowledge Co-op  
Michael.Svoboda@ec.gc.ca

This poster presents a summary of findings and a sample of illustrative quotes with respect to caribou. Caribou from this herd are the main large ungulate ranging across the Northern Yukon. The Arctic Borderlands Ecological Knowledge Co-op has coordinated a community ecological monitoring program with Aklavik Gwich'in (AG) and Inuvialuit (AI), Fort McPherson Tetlit Gwich'in (FM), and Old Crow Vuntut Gwitchin (OC). Community monitors interview ~19 local experts in each community annually to ask what is changing in the environment and why. Hunters, fishers, and berry pickers share their observations and explanations of ecological change, focusing on weather, caribou, fish, berries, other animals, and community socio-cultural conditions. Local experts are selected by community renewable resource councils (e.g., Aklavik Hunters and Trappers Committee). 298 interviews have been completed. Interviews are coded, noting long-term trends, four-year observations, unusual findings, and interpretations of change and rules of thumb. People in communities in the Yukon, Alaska and the Northwest Territories depend on the Porcupine Caribou Herd for food, and spiritual and cultural well-being. The community monitoring program is a component of the Arctic Borderlands

Ecological Knowledge Co-op's program, which draws on local knowledge and science to document and synthesize findings, and communicate about the effects of climate change, regional industrial development, and contaminants.

**Managing Regional Change to Ecological Resources Under the North Yukon Regional Land Use Plan.**

S.R. Francis, J.L. Ryder, J. Hamm, P. McNeil and R.J. Vladars  
North Yukon Planning Commission  
Canadian Wildlife Service  
john@planyukon.ca

To fulfill its planning mandate under the terms of the Vuntut Gwitchin First Nation Final Agreement, the North Yukon Planning Commission will recommend a draft land use plan for the North Yukon region in the coming year. The principles of sustainable development, integrated decision making, and cumulative effects management have guided plan production. The plan recommends the adoption of thirteen distinct landscape management units (LMU's) that reflect ecological/socio-economic considerations and existing land designations. LMU's reflect three categories of management: protected area, interim protected area, and integrated management areas (IMA's). In the IMA's, thresholds are proposed for each unit. Thresholds apply to two indicators: 1) surface disturbance, and 2) linear density (km/km<sup>2</sup>). The thresholds within units were based primarily on an assessment of Porcupine caribou herd distribution. Future development impacts within IMA's would be tracked. Current status of the two indicators will be evaluated against the threshold on an annual basis. All development activities would be considered valid provided the threshold was not exceeded. The relevance of the indicators and thresholds would be reviewed periodically in the spirit of adaptive management.

**Monitoring Bison Health Using Community Hunter Information and Samples**

Michelle Oakley, Thomas Jung, Linaya Workman, Lorne Larocque, Michael Jim, Boyd Campbell | Yukon Government  
Michelle.Oakley@gov.yk.ca

The Aishihik wood bison herd has been thriving since reintroduction to SW Yukon in the late 1980's. The herd is part of a national wood bison recovery effort and is internationally important because it is one of only two herds in the world of significant size that are free of important disease threats. The herd numbers approximately 700 animals, and hunting (~15% of herd harvested annually) is the main tool being used to limit herd size, as predation is not yet a significant factor. The Yukon Wood Bison Management Plan recommends a cap to herd size (at 500 animals) until community concerns around the impact of bison on other species, the landscape, and people can be addressed. The herd shares its range with other ungulate species, including caribou, moose, Dall sheep, elk, and mule deer, and there are concerns bison may negatively impact other species through competition for resources, changes to the landscape, or transmission of disease.

Disease issues have been paramount in national wood bison recovery efforts since the early 1900's, when bison contracted tuberculosis (TB) and brucellosis from infected cattle. The Aishihik wood bison herd is free of TB and brucellosis, and is growing at a rate that makes reproduction-limiting diseases unlikely. However, disease issues remain at the forefront nationally and locally, and background health/disease information is needed to address these concerns. A healthy bison herd is very important to Yukon people and to the species with which bison share the ecosystem. Monitoring bison health/disease is difficult, requiring a large number of various samples annually. Harvested bison provide excellent opportunities to collect samples and background health information.

Despite a large annual bison harvest and a well-publicized request for hunter samples (and provided sample containers), useable samples are rarely obtained. This is partly due to the remoteness of the hunt from wildlife offices and the fact that the hunt takes place in winter, temperatures commonly between -20 C and -40 C. This makes proper sampling (such as preventing frozen samples) difficult without additional training and equipment, and without people dedicated to this effort. Our program is designed to target certain local hunters, conservation officers and first nations game guardians that are present at many of the bison harvests each year, to give these people additional training in sampling and data recording, and to compensate them for their efforts in difficult field conditions. If just 25% of harvested bison yielded useable samples, significant and valuable health/disease information could be obtained, that would address many community and national health/disease issues. This program will also serve as a pilot project to continue health monitoring work with local hunters, to gather samples to address specific disease concerns or as part of regular background health monitoring.

**Calving in Captivity: Protocol and Efficacy of a Field Application to Raise Recruitment of a Threatened Woodland Caribou Population**

Michelle Oakley, Richard Farnell, Layne G. Adams, Don E. Russell, Gretchen Roeffler, Jamie McClelland, Lorne L. LaRocque, Mason Reid and Robert G. White |  
Department of Environment, Yukon Government  
Michelle.Oakley@gov.yk.ca

The Chisana herd of western Yukon Territory and Wrangle-St. Elias area of Alaska is the latest threatened woodland caribou (*Rangifer tarandus caribou*) population (Farnell & Gardner 2003). This genetically distinct population (Zittlau et al. 2000) has declined from an estimated 2,000 animals in the late 1980's to approximately

600 animals (80% annual decline). Its annual recruitment during this time has been 0-14 calves per 100 adult cows. Thus, the population is ageing, has a highly skewed sex-ratio (17-23 m: 100 f), suffers high neonatal predation, and is subject to extirpation. Managers and stakeholders agreed the population should be protected. Management approaches included: encourage predator control by local people through trapping and hunting, a complete hunting closure on this herd in the Yukon and Alaska (since 1993), and use of a predator enclosure for captive calving to increase neonatal calf survival. Starting in March 2003 we enclosed 8 ha of white spruce woodland and open upland tussock tundra using a 1.5 m fence of geocloth as a visible barrier. The enclosure was adjacent to preferred post-calving habitats, close to a lake for air transport and water, and situated on a side hill for visibility inside the pen. Each year pregnant cows were net-gunned and individually transported inside a helicopter to the enclosure. Then pen location was moved in the second year and enlarged. During the first week of April 2004, 2005, 2006, pregnant caribou (40, 48 and 50 respectively), were captured and held in the pen until 3 weeks after calving. Each year captured caribou were weighed, ultra-sounded for pregnancy and to measure rump-fat, and examined for overall body condition. Blood was collected to confirm pregnancy status and for health/disease analyses, and a radio-collar with visual band was fitted. Natural forage in the enclosure was supplemented with moistened lichens (*Cladina* sp.) picked primarily by Yukon school groups and a commercial pelleted reindeer ration (15% CP: Unifeed, Okotoks, Alberta).

Pregnant cows gave birth between 9 May and 6 June. Each year, cows and calves were released in mid-June, when the median calf age was 3 wk, for a total pen time for cow caribou of approximately 10 weeks. The majority of cows and calves generally moved 20 – 30 km from the pen into their typical range in Alaska, and were joined by

other caribou. In the fall 2003, there were 12/17 (71%) calves still alive in the fall compared to 12% survival of calves born in the wild. In 2004, 2005, 2006, calves born in the pen also had significantly higher survival to recruitment than calves born outside the pen. This technique has proved to be a useful recovery technique for small caribou populations declining due to low neonatal calf survival. Modeling of herd size and number of pregnant caribou/calves needed to sustain or increase the population should be done to determine if the technique would be useful in other herd situations. Variations of capture method and duration of holding time could change the outcomes, as well as the costs of the project.

#### **Sensitivity of Canada's Yukon Coastal Plain to a Warming Climate**

Nicole Couture and Wayne Pollard |  
Department of Geography, McGill  
University  
nicole.couture@mail.mcgill.ca

Climate changes in the Arctic will have profound impacts on the permafrost coastline of Canada's Beaufort Sea. In addition to warmer air and sea temperatures contributing to erosion, coasts will experience higher sea levels and increased storminess, and they will be exposed to these conditions for longer periods due to an increase in the length of the open water season. This study examines what makes one region of this coastline, the Yukon Coastal Plain, especially susceptible to change, how that change may occur, and the impacts this can have.

The response of coastal bluffs to changing conditions depends on their physical properties and constituents, so the first phase of this study outlines the properties of terrain units in the Yukon Coastal Plain with different surficial geologies. The amount of ground ice is one of the most important determinants of susceptibility to erosion; it also determines the thermal properties of the coastal sediments and is important in regulating their ground thermal regime. This

region is shown to be especially vulnerable to a changing climate because of its extremely ice-rich nature. Many of the terrain units along the Yukon Coastal Plain are also shown to have high organic carbon contents. It is important to assess the flux of that carbon to the Arctic Ocean as erosion proceeds because of the role it may play in climate feedbacks. The second phase of the study involves modelling coastal erosion by combining terrestrial environmental data (such as micro-climate and soil physical and thermal properties) with marine environmental data (such as sea-ice cover, wave fetch and energy, and wind velocity, direction and duration).

Environmental conditions will govern the physical sensitivity of the Yukon Coastal Plain, which can in turn result in considerable impacts on human activities. This region is important to aboriginal communities for historical, cultural, and economic reasons and the significance of the area is underlined by the fact that most of the coastal plain has been designated as either a national park or a territorial one. The oil and gas industry are active in the region and will also be impacted by changing conditions. In light of the effects of climate change on both physical environments and on humans, the suitability of Canada's Yukon Coastal Plain as a potential site for long term coastal monitoring is discussed.

#### **Block Failure Occurrence Along Arctic Coasts**

Wayne Pollard and MD. Hoque | McGill  
University  
pollard@geog.mcgill.ca

Climate change is expected to have a direct bearing on the pattern of arctic coastal erosion. Rising sea levels, longer periods of open water and increased storm activity will increase the frequency and magnitude of wave-induced erosion. Rates of coastal retreat will be amplified by warming and thawing permafrost. It is not surprising that arctic coastal retreat has recently gained

considerable attention from both the science and engineering communities. For this reason coastal erosion and its impact on northern communities and northern peoples is a central focus of our research program at McGill and within ArcticNet. Permafrost coasts are subject to complex erosional processes, however one of the least understood processes and possibly one of the most important is block failure. Block failures provide a spectacular form of coastal recession in permafrost areas. The occurrence of wave induced horizontal thermo-erosional niche structures together with the presence of ice wedges within the permafrost are two key variables driving the block failure processes along arctic coasts. The main purpose of this presentation is to describe block failure mechanisms associated with frozen vertical cliffs on arctic coasts. This study provides computational models for block failure mechanisms and investigates the relative

contribution of horizontal niche and ice wedge in block failure of permafrost cliffs fronted by a beach. Block failures occur on coastal bluffs throughout the Arctic, however our study has focused mainly on the southern Beaufort Sea coast. The Beaufort Sea coastal region is important for a number of reasons, including: its unique human history, current land use, land claims, potential oil and gas development, permafrost and ground ice characteristics, and higher than average rates of climate change. Extensive sections of Beaufort Sea coast are characterized by bluffs ranging from 3-30 m in height. Much of the Canadian Beaufort Sea coast is also undergoing high rates of annual retreat and erosional landforms commonly include a variety of thermokarst and mass wasting features (e.g. retrogressive thaw slumps, active layer detachments and block falls).

## Appendix I:

### Plenary Speakers

**Effective Wildlife Monitoring and Reporting on the Yukon North Slope**  
**John Donihee** | 2007 Yukon North Slope Conference Chair

Environmental monitoring and reporting activities continue to be an essential part of the management of the wildlife resources of the North Slope. Equally important to ensure successful wildlife management is the direct involvement of harvesters and the institutions established by the Inuvialuit Final Agreement (IFA) in these activities. Inuvialuit harvesters play a role in these efforts as of right through the Wildlife Management Advisory Council (North Slope) but it should also go without saying that they can bring unique knowledge and perspectives to bear on wildlife management problems on the North Slope. John's plenary will take an historical perspective in arguing that the community based or indigenous wildlife management system based in its modern form on the IFA and Inuvialuit beneficiaries must play a central role if an effective wildlife monitoring and reporting system is to be developed for the North Slope.

**Environmental Science, Monitoring and Management**  
**Dr. Chris Burn** | Carleton University

Environmental management is essential for sustainable development. As a result, environmental management is a political activity that makes decisions, or choices, about human use of the environment. In order to remove these decisions from party politics, quasi-judicial advisory boards have been established. These boards may claim that their decisions are "science-based", particularly when justification is needed for controversial decisions. Science is then used

as a powerful and reliable authority. The purpose of science is to understand and explain environmental systems, and progress in science is achieved by testing ideas against observations. These ideas are rarely static, because a large part of science concerns recognizing patterns in the observations that accumulate over time. One of the most important ideas in environmental science, that the environment itself changes over time, was introduced only 150 years ago by Charles Darwin. We are more conscious now than ever before, especially in the North, that our environment is changing. We need to recognize new patterns in the landscape, test our new ideas, and state clearly when environmental processes have changed. As our observations accumulate, we must expect our understanding of the environment to change, and our management strategies to respond. Observations are the building blocks of environmental science, but to be useful they must be consistent and continuing. Long-term monitoring requires simple, repeatable measurements that are sensitive to and informative of environmental change. Successful monitoring involves careful attention to measurements, has dedicated staff, seeks to use its database for solution of short-term problems, and has secure funding. The latter is only possible when the relevance of the monitoring to management decisions is clear.

**The Environmental Management Framework in the NWT**  
**David Livingstone** | Department of Indian Affairs and Northern Development

The need for a common framework to help developers, regulatory agencies and others to understand and manage the effects of development projects on the environment and communities of the NWT has been recognized for many years. Increasingly, the potential cumulative effects of development have become a central issue in environmental management; this has

catalyzed the development and implementation of a broad environmental management framework that establishes a context for responsible economic development in the NWT.

The NWT environmental management framework is a product of legislation, policy and programs. The framework has five broad components: an overarching vision; planning and environmental programs; assessment, regulation and enforcement; administration; and, audit and reporting. Most but not all components and sub-component programs are entrenched in legislation, notably the Mackenzie Valley Resource Management Act and the Inuvialuit Final Agreement. The remaining programs and activities are largely policy and mandate-based.

Central to the effective implementation of the framework is the realization that no one agency in the NWT with an environmental mandate is solely responsible for sound environmental management (particularly with respect to cumulative effects); similarly, no agency is without responsibility. Coordination among the respective agencies is essential to ensure that collectively we have a common vision and road map.

### **The Role of Traditional Users in Environmental Monitoring Programs** **Randall Pokiak | Inuvialuit Harvester**

The role of harvesters and traditional users in environmental monitoring programs is an important one. Local harvesters contribute a unique perspective, as well as traditional knowledge and experience to help us understand changes to wildlife and the environment. Local harvesters see a range of environmental changes that science may not be aware of. The knowledge and observations of a harvester provide a different perspective than that of scientists; in fact, local and traditional knowledge can assist scientists in monitoring environmental change. Scientific knowledge in monitoring can also help harvesters gain a broader understanding of resource management. Harvesters can play an important role in monitoring the impacts of development on the land and on harvesting activities. It is also important that harvesters have a role in supervising and reviewing environmental monitoring programs as these programs have a direct impact on the traditional lifestyle that harvesters maintain and work hard to preserve.

## Appendix II:

### Agenda

#### Monday, January 29

3:00                    **Registration** (open until 7 pm)

#### Tuesday, January 30

8:00                    **Registration**

9:00                    **Welcome and Opening**

Lindsay Staples | Wildlife Management Advisory Council (North Slope)

Dennis Fentie | Yukon Government

John Donihee | 2007 Yukon North Slope Conference Chair

10:00                  Break

10:30                  **Plenary | Environmental Science, Monitoring & Management**

Chris Burns | Carleton University

12:00                  Lunch (on own)

1:00                    **Panel | Wildlife Population Monitoring, Reporting and Management Implications**

Don Russell | Canadian Wildlife Service

Tara Wertz | Arctic National Wildlife Service

Joe Tetlich | Porcupine Caribou Management Board

Lois Harwood | Fisheries and Oceans Canada

John Alikamik | Inuvialuit Game Council

3:00                    Break

3:30                    **Panel | Monitoring and Reporting in Coastal Zones**

Dr. Wayne Pollard | McGill University

Dr. Steve Solomon | Bedford Institute of Oceanography

Burton Ayles | Fisheries Joint Management Committee

Lindsay Croken | Parks Canada

Bruce Bennett | Yukon Government

Dr. Marlow Pellatt | Parks Canada

5:30                    **Poster Session**

#### Wednesday, January 31

8:00                    **Registration**

9:00                    **Welcome and Announcements**

9:15                    **Plenary | The Environmental Management Framework in the Northwest Territories**

David Livingstone | Department of Indian and Northern Development

10:15                  Break

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- 10:45      **Workshop | Understanding Your Audience**  
Sheila Nasogaluak | Inuvialuit Joint Secretariat  
Michelle Sicotte | Wildlife Management Advisory Council (North Slope)
- 11:15      **Poster Session**
- 12:00      Lunch (on own)
- 1:00      **Panel | Development and Cumulative Impacts Monitoring and Reporting**  
Kristie Simpson | Yukon Government  
David Livingstone | Department of Indian and Northern Development  
Richard Binder | Inuvialuit Joint Secretariat  
Dr. Norm Snow | Inuvialuit Joint Secretariat
- 3:00      Break
- 3:30      **Panel | Environment and Climate Monitoring and Reporting**  
Dr. Chris Burn | Carleton University  
Catherine Kennedy | Yukon Government  
Dorothy Cooley | Yukon Government  
Richard Gordon and LeeJohn Meyook | Herschel Island Territorial Park  
David Henry | Parks Canada
- 5:30      **Workshop | Giving a Great Presentation**  
Sandy Hachey and Al Aasman | Aasman Design Inc.

**Thursday, February 1**

- 8:00      **Registration**
- 9:00      **Welcome and Announcements**
- 9:15      **Plenary | The Role of Harvesters and Traditional Users in Environmental Monitoring Programs**  
Randall Pokiak | Inuvialuit Harvester
- 10:00      **Panel | Monitoring, Reporting and Decision Making Involving Traditional Users**  
Frank Pokiak | Inuvialuit Game Council  
Mike Gill | Environment Canada  
Annie B. Gordon | Arctic Borderlands Ecological Knowledge Co-op  
Michael Fabian | Kavik Axys Inc.  
Max Kotokak | Fisheries Joint Management Committee
- 12:00      Lunch (on own)
- 1:00      **Workshop | Communicating Results**  
Evelyn Storr | Aklavik Hunter and Trappers Committee  
Aileen Horler
- 1:30      **Breakout Sessions | Lessons learned in monitoring, reporting and management**
- 2:30      **Conference Summary | Where do we go from here?**
- 3:00      **Poster Session**
- 6:00      **Closing Banquet**

## Appendix III:

### Delegate List

**Name**

**Organization**

Jack Akhiatak  
Environmental Impact Review Board

Scott Alexander  
Government of NWT

John Alikamik  
Inuvialuit Game Council

Dorian Amos  
Environment Yukon

Lawrence Amos  
Joint Secretariat

Dennis Arey  
Aklavik Hunters & Trappers Committee

Carol Arey  
Aklavik Community Corp.

Foster Arey  
Aklavik Community Corp.

Dr. Burton Ayles  
Fisheries Joint Management Committee

Adriana Bacheschi  
Parks Canada

Alan Baer  
Environment Yukon

Marlene Bailey  
Fisheries and Oceans Canada

Chandeep Bajaj  
Indian and Northern Affairs Canada

Steven Baryluk  
Inuvialuit Game Council

Jim Bell  
Yukon Government

Bruce Bennett  
Environment Yukon

Kevin Bill  
Joint Secretariat

Gilles Binda  
Indian and Northern Affairs Canada

Richard Binder  
Joint Secretariat

Paul Birckel  
Alsek Renewable Resources Council

Sonny Blake  
Porcupine Caribou Management Board

Steve Blasco  
Geological Survey of Canada

Peter Borotsik  
Ta'an Kwach'an Council

Marsha Branigan  
Government of NWT

Stewart Breithaupt  
Yukon Fish and Game Association

Dr. Chris Burn  
Carleton University

Syd Cannings  
Environment Yukon

Jean Carey  
Environment Yukon

Ron Chambers  
Alsek Renewable Resources Council

Stephen Charlie  
WMAC (NWT)

Teri Cherkewich  
Yukon Government

Ian Church  
Yukon Government / IPY Canada

Eric Cockney  
Environmental Impact Screening Committee

Mike Connor  
Environment Yukon

Dorothy Cooley  
Environment Yukon

Lindsay Croken  
Parks Canada

Sarah Davidson  
Canadian Wildlife Service

Susan Davis  
Yukon Conservation Society

Tracy Davison  
Government of NWT

Suzan Davy  
Environment Yukon

Carol Domes  
Environment Yukon

John Donihee  
Yukon North Slope Conference, Chair

Bruce Downie  
Environment Yukon

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Doris Dreyer  
Yukon Fish and Wildlife Management Board

Cameron Eckert  
Environment Yukon

Darius Elias  
MLA - Vuntut Gwitchin Yukon Legislative Assembly

Ian Ellsworth  
Government of NWT

Michael Fabijan  
Kavik AXYS

Emmie Fairclough  
Ta'an Kwach'an Council

Herbert Felix  
Environmental Impact Review Board

Rob Florkiewicz  
Environment Yukon

Foisy, Pierre Mr.  
Environment Yukon

Morris George  
Environmental Impact Screening Committee

Mike Gill  
Environment Canada

Richard Gordon  
Environment Yukon

Danny C. Gordon  
WMAC (NS)

Annie B. Gordon  
Arctic Borderlands Ecological Co-op

Danny A. Gordon  
Aklavik Hunters & Trappers Committee

Shel Graupe  
Vuntut Gwitchin First Nation

Ronnie Gruben  
Environmental Impact Screening Committee

Diane Gunter  
Environment Yukon

Robert Hager  
Nacho Nyak Dun

Terry Hall  
Government of NWT

Roger Howse  
Indian and Northern Affairs Canada

Andrea Hoyt  
Joint Secretariat

Dr. Murray Humphries  
McGill University

Torrie Hunter  
Environment Yukon

Lynda Hutcheson  
Parks Canada

Jimmy Johnny  
Mayo RRC

Sebastian Jones  
Yukon Fish and Wildlife Management Board

Stacey Jones  
Yukon Government

Tom Jung  
Environment Yukon

Pat Kasook  
Inuvialuit Game Council

Sharon Keaton  
Environment Yukon

Martin Kienzler  
Environment Yukon

Bill Klassen  
Environmental Impact Screening Committee

Elsabe Kloppers  
Yukon Fish and Wildlife Management Board

Michael Kohler  
Joint Secretariat

Allan Koprowsky  
Environment Yukon

Mr. Kotokak Sr.  
Joint Secretariat

Fred Kuptana  
Joint Secretariat

Dave Ladret  
Environment Yukon

Nora Ladue  
Ross River Dena Council

Randy Lamb  
Environment Yukon

Catherine Lambert Koizumi  
Gwich'in Renewable Resources Board

Doug Larsen  
Environment Yukon

Ron Larsen  
Parks Canada / WMAC (NS)

Ella LeGresley  
Yukon Government

Deana Lemke  
Porcupine Caribou Management Board

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Jennifer Line  
Environment Yukon

Joe Linklater  
Vuntut Gwitchin First Nation

David Livingstone  
Indian Affairs and Northern Development

David Loeks  
Environmental Impact Review Board

Valerie Loewen  
Environment Yukon

MacDonald, James Mr.  
Tr'ondek Hwech'in

Gord MacRae  
Environment Yukon

Ramona Maraj  
Environment Yukon

Rhonda Markel  
Parks Canada

Darcie Matthiessen  
Council of Yukon First Nations

Alice McCulley  
Environment Yukon

Fred McFarland  
Joint Secretariat

Edward McLean  
Parks Canada

LeeJohn Meyook  
Environment Yukon

Ron Morrison  
Government of NWT

Dave Mossop  
Yukon College

Stephanie Muckenheim  
Environment Yukon

Sheila Nasogaluak  
Joint Secretariat Community Support Unit

David Neufeld  
Parks Canada

Wendy Nixon  
Canadian Wildlife Service

Agnes Noksana  
Environmental Impact Screening Committee

Paula Pacholek  
Joint Review Panel

Larry Peckford  
Environmental Impact Review Board

Marlow Pellat  
Parks Canada

Lorraine Peter  
Destiny Management Consulting

Ryan Peterson  
Tr'ondek Hwech'in

Catherine Pinard  
Environment Yukon

Don Pittman  
Fisheries and Oceans Canada

Dr. Jim Pojar  
CPAWS Yukon

Frank Pokiak  
Inuvialuit Game Council

Ernest Pokiak  
WMAC (NS)

Randal Pokiak  
WMAC (NWT)

Dr. Wayne Pollard  
McGill University

Geraldine Pope  
Kluane First Nation

Troy Pretzlaw  
McGill University

Boyd Pyper  
Environment Yukon

Dr. Kathleen Racher  
Indian and Northern Affairs Canada

John Reid  
Beaufort Sea Strategic Regional Plan of Action

Dr. Donald Reid  
Wildlife Conservation Society of Canada

Mary Anne Ross  
Gwich'in Tribal Council

Pascale Roy-Léveillé  
Carleton University

Albert Ruben  
Inuvialuit Game Council

Ruben Ruben  
Environmental Impact Screening Committee

Don Russell  
Canadian Wildlife Service

Kyle Russell  
Environment Yukon

Pippa Seccombe-Hett  
Aurora Research Institute

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Rose Sellars  
Environment Yukon

Tim Sellars  
Yukon Government

Darryl Sheepway  
Yukon Fish and Wildlife Management Board

Michelle Sicotte  
WMAC (NS)

Kirstie Simpson  
Yukon Government

Pam Sinclair  
Canadian Wildlife Service

Barney Smith  
Environment Yukon

Dr. Norm Snow  
Joint Secretariat

Norman Snowshoe  
Gwich'in Tribal Council

Steven Solomon  
Geological Survey of Canada

Lindsay Staples  
WMAC (NS)

Evelyn Storr  
WMAC (NS)

Georgina Sydney  
Yukon Fish and Wildlife Management Board

Lisa Taylor  
Arctic Borderlands Ecological Co-op

Steve Taylor  
Tr'ondek Hwech'in

Joe Tetlichi  
Porcupine Caribou Management Board

Beth Theriault  
Environment Yukon

Katherine Thiesenhausen  
WMAC (NWT)

Beth Thomson  
Fisheries and Oceans Canada

Melissa Valja  
No affiliation

Graham VanTighem  
Yukon Fish and Wildlife Management Board

Tara Wertz  
USFWS Arctic National Wildlife Refuge

Marisa Whyte  
WMAC (NS)

## Appendix IV:

### Excerpt from the Western Arctic Claim

### The Inuvialuit Final Agreement

### Section 12, Yukon North Slope

**12.(1)** For the purposes of this section, "Yukon North Slope" means all those lands between the jurisdictional boundaries of Alaska and the Yukon Territory and the Northwest Territories, north of the height of land dividing the watersheds of the Porcupine River and the Beaufort Sea, and including adjacent nearshore and offshore waters and islands.

#### Principles

**12.(2)** The Yukon North Slope shall fall under a special conservation regime whose dominant purpose is the conservation of wildlife, habitat and traditional native use.

**12.(3)** Subject to subsections (5) to (15):

(a) all development proposals relating to the Yukon North Slope shall be screened to determine whether they could have a significant negative impact on the wildlife, habitat or ability of the natives to harvest wildlife;

(b) other uses within the Yukon North Slope shall be considered and may be permitted if it is shown that there would be no significant negative impact on wildlife, habitat or native harvesting;

(c) other uses within the Yukon North Slope that may have a significant negative impact on wildlife, habitat or native harvesting shall be permitted if it is decided that public convenience and necessity outweigh conservation or native harvesting interests in the area; and

*As amended January 15, 1987*

(d) development proposals relating to the Yukon North Slope that may have a significant negative impact shall be subject to a public environmental impact assessment and review process.

### Disposal of Land

**12.(4)** Subject to this section, the withdrawal from disposal under the Territorial Lands Act of certain lands described in the Prohibition and Withdrawal of Certain Lands from Disposal Order (SOR/80-198, 27 March, 1980, as set out in Annex E-1), within the Yukon North Slope shall be maintained.

*As amended January 15, 1987*

### National Park

**12.(5)** Canada agrees to establish, under the National Parks Act, the Settlement Legislation or such other legislation as may be appropriate or necessary, a National Park comprising the western portion of the Yukon North Slope shown in Annex E and more particularly described as the area bounded to the south by the height of land being the watershed and to the east by the eastern shoreline of the Babbage River.

**12.(6)** The planning for the National Park and the management thereof shall have as their objects to protect the wilderness characteristics of the area, maintaining its present undeveloped state to the greatest extent possible, and to protect and manage the wildlife populations and the wildlife habitat within the area.

**12.(7)** Except as provided in subsection (14), the National Park shall be zoned and managed as a wilderness oriented park.

**12.(8)** Development activities inconsistent with the purposes of the National Park shall be prohibited, and any change in the character of the National Park shall require the consent of the Inuvialuit.

**12.(9)** The Wildlife Management Advisory Council established by subsection (46) shall advise the appropriate minister on park planning and management. The Council shall recommend a management plan for the National Park.

*As amended January 15, 1987*

**12.(10)** No lands forming part of the National Park shall be removed from National Park status without the consent of the Inuvialuit.

**12.(11)** Canada agrees that prior to the establishment of the National Park, the lands comprising it shall be maintained in a manner that recognizes their future use and protects the land and its habitat for this purpose.

**12.(12)** Nothing inconsistent with the provisions of this Agreement shall be permitted between the date of the execution of this Agreement and the coming into force of appropriate legislation creating the Park.

**12.(13)** The rights provided to the Inuvialuit under this Agreement in respect of the National Park shall take effect as of the date of the coming into force of the Settlement Legislation. For greater certainty, the Government of the Yukon Territory shall retain its present jurisdiction until the creation of the National Park.

**12.(14)** If it is determined pursuant to section 11 that an area identified in Annex E as Stokes Point is required for limited scale use and temporary use purposes in support of hydrocarbon development, the use shall be permitted on the following conditions:

(a) the land to be used does not exceed forty (40) acres and any additional land that is required to satisfy the licencing requirements of the Yukon Territorial Water Board;

*As amended January 15, 1987*

(b) the use of the land is such as not to prevent its restoration to the state it was in prior to such use; and

(c) the activity must not be on a scale and of a nature as to significantly derogate from the quality and character of the adjacent Park lands.

**12.(15)** In subsection (14),

(a) "limited scale use" includes the storage of fuel and supplies, emergency repairs and maintenance facilities, transshipment depots, caches and similar uses; and

(b) "temporary use" means a period of active occupation that, in the aggregate, does not exceed six (6) years.

*As amended January 15, 1987*

### **Territorial Park**

**12.(16)** The parties agree that Herschel Island is to be established as the Herschel Island Territorial park and, in establishing that Park, the Government of the Yukon Territory will consult the Inuvialuit.

**12.(17)** Except for the lands adjacent to Pauline Cove, the park regime on Herschel Island shall be no less stringent than that of the National Park pursuant to subsections (5) to (13).

*As amended January 15, 1987*

**12.(18)** Within the lands adjacent to Pauline Cove, the historic resources shall be protected in a manner no less stringent than that of the regime of a National Historic Park as set out in the National Parks Act.

**12.(19)** Any development activity proposed within the lands adjacent to Pauline Cove shall be subject to:

(a) the screening and review process set out in section 11; and

(b) the criteria set out in subsection (23) shall apply; and

(c) the terms and conditions governing such development shall be no less stringent than those under the Territorial Land Use Regulations in force at the time.

*Subsection as amended January 15, 1987*

### **Area East of the Babbage River**

**12.(20)** The parties agree that the area east of the Babbage River extending to the jurisdictional boundary between the Yukon Territory and the Northwest Territories, but not including the adjacent nearshore and offshore waters, shall be designated as an area in which controlled development may take place, subject to the provisions of this Agreement and to laws of general application.

**12.(21)** Any development activity proposed for the area referred to in subsection (20) shall be subject to the screening and review process set out in section 11.

**12.(22)** Any development activity proposed for the adjacent nearshore and offshore waters shall be subject to the normal government process and the wildlife compensation provisions of section 13.

**12.(23)** The appropriate review board shall take into account the following criteria in its consideration of any development proposal:

(a) analysis of the significance of the part or parts of the Yukon North Slope proposed for development use from the standpoint of conservation and harvesting interests;

- (b) evaluation of practical alternative locations and of the relative commercial and economic merits of and environmental impact on such locations compared to the part or parts of the area proposed for utilisation in the application;
- (c) evaluation of the environmental and social impacts of the proposed development;
- (d) weighing of the interests of users, conservationists and harvesters in the Yukon North Slope against public convenience and necessity for development;
- (e) evaluation of the ability of the applicant to demonstrate that he has, or will acquire, the proven capability to carry out the project in accordance with established standards of performance, safeguards and other requirements and to carry out the necessary environmental mitigation and restoration; and
- (f) requirements for effective machinery to ensure that the development proceeds in accordance with any established terms and conditions.

### **Inuvialuit Harvesting Rights**

**12.(24)** Subject to the laws of general application respecting public safety and conservation, the Inuvialuit right to harvest on the Yukon North Slope includes:

- (a) subject to the collective harvesting rights in favour of all native peoples under the Porcupine Caribou Management Agreement referred to in Annex L, the preferential right to harvest all species of wildlife, except migratory non-game birds and migratory insectivorous birds, for subsistence usage throughout the Yukon North Slope;
- (b) the exclusive right to harvest furbearers and polar bear; and
- (c) the exclusive right to harvest game within the National Park, the Territorial Park and adjacent islands.

**12.(25)** Where harvesting rights are extended to other native peoples pursuant to subsection (33) and subsections 14(17) and (18), their requirements as to subsistence usage shall be taken into account in setting subsistence quotas and the subsistence requirements of all native peoples shall be accommodated within conservation limits.

**12.(26)** Sport fishing shall be permitted throughout the Yukon North Slope including the National Park and the Territorial Park.

**12.(27)** Where, in the exercise of their exclusive right to harvest game within the National Park and the Territorial Park, the Inuvialuit wish to permit:

- (a) persons who are not beneficiaries of the Settlement or adjacent land claims settlements to harvest any such game, prior approval of the appropriate minister is required and that minister may grant the privilege on any terms and conditions he stipulates; and

*As amended January 15, 1987*

- (b) persons who are beneficiaries of adjacent land claims settlements to harvest any such game, those persons, if so permitted, may harvest game on the same basis as the Inuvialuit.

**12.(28)** Where, in the exercise of their exclusive right to harvest polar bear in the Yukon North Slope outside the National Park, the Inuvialuit permit persons who are not beneficiaries of the Inuvialuit Settlement or adjacent land claims settlements to harvest any such polar bear, the harvesting shall be regulated by the competent authority under the laws of general application.

**12.(29)** Where, in the exercise of their exclusive right to harvest furbearers in the Yukon North Slope outside the National Park, the Inuvialuit permit non-Inuvialuit to harvest any such furbearers, the harvesting shall be subject to any approval or notification required by the appropriate government and shall be regulated by the competent authority under the laws of general application.

**12.(30)** For greater certainty, the Inuvialuit shall make no gain or profit from the granting of permission to non-Inuvialuit to harvest furbearers except where it is part of a reciprocal arrangement with beneficiaries from an adjacent land claims settlement.

**12.(31)** The Inuvialuit may trade and barter game products with other Inuvialuit beneficiaries in the Yukon North Slope.

**12.(32)** Subject to the provisions of the Migratory Birds Convention Act and any regulations thereunder, the Inuvialuit may for subsistence usage sell game products to other Inuvialuit beneficiaries in the National Park.

**12.(33)** Where native beneficiaries in adjacent land claims settlements acquire rights to game resources within the Yukon North Slope on the basis of traditional use and occupancy, those beneficiaries shall be entitled to exchange game products with the Inuvialuit on the same basis as that provided for the Inuvialuit under this Agreement.

**12.(34)** Where, in the final settlement of the land claims of adjacent native groups, provision is made for the exchange of game products with the Inuvialuit, the right of the Inuvialuit to exchange amongst themselves shall be extended to those other native beneficiaries.

**12.(35)** Subject to the provisions of the Migratory Birds Convention Act, any regulations thereunder and other similar laws of general application, the right to harvest includes the right to sell the non-edible products of legally harvested game.

**12.(36)** The right to harvest game includes the right to use present and traditional methods of harvesting and the right to possess and use all equipment reasonably needed to exercise that right, subject to international agreements to which Canada is a party and to laws of general application respecting public safety and conservation. The right to harvest game includes the right to possess and transport legally harvested game within and between the Yukon Territory and the Northwest Territories.

**12.(37)** Subject to subsection (38), the right to harvest game includes the right to travel and establish camps as necessary to exercise that right.

**12.(38)** In the National Park referred to in subsection (5) and the Territorial Park referred to in subsection (16) the Inuvialuit have the right to use existing hunting, fishing and trapping facilities associated with their game harvesting activities and to establish new facilities after consultation with the management authority. The location of new facilities shall be determined on the basis of the management objectives for these parks.

*As amended January 15, 1987*

**12.(39)** The Inuvialuit need not obtain permits, licences or other authorization to harvest wildlife but may be required to show proof of status as Inuvialuit beneficiaries. Where, for the purpose of conservation, permits, licences

or other authorizations are required by the appropriate minister or on the recommendation of the Wildlife Management Advisory Council, Fisheries Joint Management Committee, or the Porcupine Caribou Management Board, the Inuvialuit shall have the right to receive such permits, licences or other authorizations from the local authority at no cost.

*As amended January 15, 1987*

**12.(40)** Nothing in this Agreement or the Settlement Legislation shall prevent any person from taking game for survival in an emergency.

**12.(41)** Within their respective jurisdictions, governments shall determine the harvestable quotas for wildlife species based on the principles of conservation and the following procedures:

(a) the Wildlife Management Advisory Council (North Slope) established by subsection (46) shall determine the total allowable harvest for game according to conservation criteria and such other factors as it considers appropriate. The Council shall make its recommendations to the appropriate minister, who shall, if he differs in opinion with the Council, set forth to the Council his reasons and afford the Council a further consideration of the matter;

(b) in determining the total allowable harvest, conservation shall be the only consideration. For greater certainty, where the Inuvialuit have the exclusive right to harvest, they shall be entitled to harvest the total allowable harvest;

(c) for the purposes of management and in order to protect the interest of the Inuvialuit harvesters, subsistence quotas for the wildlife referred to in paragraph (24)(a) shall be jointly established by the Inuvialuit and the governments having jurisdiction over species or species groups of subsistence value, as follows:

(i) within the total allowable harvest for game, the Wildlife Management Advisory Council (North Slope) shall determine the subsistence quotas according to the criteria and factors it considers appropriate in addition to those referred to in subparagraph (ii). The Council shall make its recommendations to the appropriate minister, who shall, if he differs in opinion from the Council, set forth to the Council his reasons and afford the Council further consideration of the matter, and

(ii) in determining the subsistence quota, the following criteria shall be taken into account by the Council or, where appropriate, by the Porcupine Caribou Management Board, and the appropriate minister:

- (A) the food and clothing requirements of the Inuvialuit,
- (B) the usage patterns and levels of harvest of the Inuvialuit,
- (C) the requirements for particular wildlife species for subsistence usage,
- (D) the availability of wildlife populations to meet subsistence usage requirements including the availability of species from time to time,
- (E) the projections for changes in wildlife populations, and
- (F) the national and international obligations of Canada with respect to migratory game birds;

*(F) as amended January 15, 1987*

(d) the allocation of the Inuvialuit quotas amongst themselves shall be the responsibility of the Inuvialuit.

### **Economic Benefits**

**12.(42)** The parties agree that the predominant number of persons employed in the operation and management of the parks referred to in subsections (5) and (16) should be Inuvialuit. The appropriate government shall provide training to assist the Inuvialuit in qualifying for such employment.

**12.(43)** To the extent that the management regime of the said parks provides for economic activities, the parties agree that opportunities should be provided to the Inuvialuit on a preferred basis.

*As amended January 15, 1987*

**12.(44)** The Inuvialuit shall be invited to participate in the planning process for any development on the lands available for development adjacent to Pauline Cove on Herschel Island, and in the economic opportunities arising out of such development. Subject to all applicable laws, the Inuvialuit shall have the right of first refusal with respect to any activities in the nature of guiding related to wildlife within the Yukon North Slope.

**12.(45)** The Inuvialuit and the Council for Yukon Indians may enter into bilateral agreements such as the agreement dated March 15, 1984 between the Council for Yukon Indians and the Inuvialuit, whereby the native groups may share in the rights, privileges and benefits afforded Inuvialuit beneficiaries in the Yukon North Slope.

### **Wildlife Management Advisory Council (North Slope)**

**12.(46)** In order to provide for joint planning by the native people and the governments in the Yukon North Slope with respect to the principles set out in subsections (2) and (3), a Wildlife Management Advisory Council shall be established as soon after the execution of this Agreement as is practicable.

**12.(47)** The Council shall have as permanent members a Chairman and an equal number of native and government members.

**12.(48)** The permanent members of the Council shall include at least one person designated by the Government of the Yukon Territory and one person designated by the Minister of the Environment of Canada.

**12.(49)** In addition to permanent members of the Council representing government, temporary members may be co-opted from government departments as they may be required from time to time.

**12.(50)** The permanent members of the Council appointed to represent the native interests shall include persons designated by the Inuvialuit, and, subject to agreements, by other native groups that have acquired harvesting rights in the Yukon North Slope under their land claims settlements.

**12.(51)** The Chairman of the Council shall be appointed by the Government of the Yukon Territory, with the consent of the native members and Canada.

**12.(52)** The permanent members of the Council shall each have one (1) vote. The Chairman shall have a vote only in case of a deadlock. Temporary members shall not have a vote.

**12.(53)** The Council may establish rules and adopt by-laws regulating its procedures.

**12.(54)** The Government of the Yukon Territory agrees to provide a secretariat to

assist in meeting the administrative needs of the Council.

**12.(55)** Each party shall pay the remuneration and expenses of the members of the Council that it appoints or designates.

**12.(56)** The Council shall provide advice to the appropriate minister on all matters relating to wildlife policy and the management, regulation and administration of wildlife, habitat and harvesting for the Yukon North Slope and, without restricting the generality of the foregoing, the Council shall:

(a) provide advice on issues pertaining to the Yukon North Slope to the Porcupine Caribou Management Board, the Yukon Land Use Planning Commission, the Review Board and other appropriate groups;

(b) prepare a wildlife conservation and management plan for the Yukon North Slope for recommendation to the appropriate authorities as a means for achieving and maintaining the principles of conservation set out in subsections (2) and (3);

(c) determine and recommend appropriate quotas for Inuvialuit harvesting of game in the Yukon North Slope; and

(d) advise on measures required to protect habitat that is critical for wildlife or harvesting including those referred to in subsection 14(3).

*As amended January 15, 1987*

### **Yukon North Slope Annual Conference**

**12.(57)** There shall be a Yukon North Slope Annual Conference, to be held once a year in

the Yukon Territory, to promote public discussion among natives, governments, and the private sector with respect to management co-ordination for the Yukon North Slope.

**12.(58)** Each Yukon North Slope Annual Conference shall be attended by representatives of native groups with an interest in the Yukon North Slope, at least one senior official from each appropriate government department and representatives of other interested parties, as selected by the Chairman, including industry and special interest groups.

**12.(59)** A Chairman shall be named at each Yukon North Slope Annual Conference to hold office until the next Annual Conference. The first Chairman shall be appointed by the Government of the Yukon Territory, the second Chairman shall be appointed by the native groups that have an interest in the Yukon North Slope and, thereafter, the Chairman shall be appointed by those parties on an alternative basis.

**12.(60)** The Government of the Yukon Territory agrees to provide administrative support services for the Yukon North Slope Annual Conference.

**12.(61)** During the third Yukon North Slope Annual Conference, Canada, the Government of the Yukon Territory and the Inuvialuit shall collectively review the proceedings and results of past Conferences and determine whether the objective in having such Conferences warrants their continuation and, where the Conferences are continued, such a review shall be carried out every three years thereafter.

## Appendix V:

### List of Acronyms

ANWR	Arctic National Wildlife Refuge
ABEKC	Arctic Borderlands Ecological Knowledge Co-operative
CARC	Canadian Arctic Resources Committee
CEAA	Canadian Environmental Assessment Act
CWS	Canadian Wildlife Service
CYFN	Council of Yukon First Nations
DAP	Development Assessment Process
DFO	Department of Fisheries and Oceans
DIAND	Department of Indian and Northern Development
DND	Department of National Defense
EIRB	Environmental Impact Review Board
EISC	Environmental Impact Screening Committee
FJMC	Fisheries Joint Management Committee
YFWMB	Yukon Fish and Wildlife Management Board
GNWT	Government of the Northwest Territories
HTC	Hunters and Trappers Committee
IFA	Inuvialuit Final Agreement
IGC	Inuvialuit Game Council
IRC	Inuvialuit Regional Corporation
ISR	Inuvialuit Settlement Region
PCMB	Porcupine Caribou Management Board
RRC	Renewable Resources Council
WMAC (NS)	Wildlife Management Advisory Council (North Slope)
WMAC (NWT)	Wildlife Management Advisory Council (Northwest Territories)
YTG	Yukon Territorial Government

## Appendix VI:

### North Slope Resources On-line

#### Wildlife Management Advisory Council (North Slope)

[www.wmacns.ca/](http://www.wmacns.ca/)

#### Yukon North Slope Wildlife Conservation and Management Plan

[www.wmacns.ca/conservation/wcmp/](http://www.wmacns.ca/conservation/wcmp/)

- **Volume 1: Environmental Overview**  
[www.wmacns.ca/pdfs/153\\_wcmp%20volume1.pdf](http://www.wmacns.ca/pdfs/153_wcmp%20volume1.pdf)
- **Volume 2: Goals and Actions**  
[www.wmacns.ca/pdfs/160\\_landl\\_volume2%20reduced.pdf](http://www.wmacns.ca/pdfs/160_landl_volume2%20reduced.pdf)
- **Volume 3: Yukon North Slope Wildlife Population Status Reports**  
[www.wmacns.ca/pdfs/178\\_Species%20Status%20Reports%20January%202008-MC-FINAL.pdf](http://www.wmacns.ca/pdfs/178_Species%20Status%20Reports%20January%202008-MC-FINAL.pdf)
- **Volume 4: Implementation Plan (pending completion)**

#### Yukon North Slope Long-term Research Plan

[www.wmacns.ca/conservation/ltrmp/research](http://www.wmacns.ca/conservation/ltrmp/research)

##### Issues and Actions

[www.wmacns.ca/conservation/ltrmp/issues/](http://www.wmacns.ca/conservation/ltrmp/issues/)

##### Guide for Researchers

[www.wmacns.ca/conservation/ltrmp/researchguide/](http://www.wmacns.ca/conservation/ltrmp/researchguide/)

#### WMAC(NS) Publications (newsletters, fact sheets, term reports)

[www.wmacns.ca/resources/newsletters/](http://www.wmacns.ca/resources/newsletters/)

[www.wmacns.ca/resources/factsheets/](http://www.wmacns.ca/resources/factsheets/)

[www.wmacns.ca/resources/publications/](http://www.wmacns.ca/resources/publications/)

#### Arctic Borderlands Ecological Knowledge Co-op

[www.taiga.net/coop](http://www.taiga.net/coop)

- **Community-based Monitoring Program**  
[www.taiga.net/coop/community/index.html](http://www.taiga.net/coop/community/index.html)
- **Indicators**  
[www.taiga.net/coop/indics/index.html](http://www.taiga.net/coop/indics/index.html)

#### Database of Documented Traditional Knowledge

[www.wmacns.ca/resources/databases/](http://www.wmacns.ca/resources/databases/)

#### Herschel Island Territorial Park

[www.environmentyukon.gov.yk.ca/parksconservation/HerschelIslandQikiqtaruk.php](http://www.environmentyukon.gov.yk.ca/parksconservation/HerschelIslandQikiqtaruk.php)

**Ivvavik National Park of Canada**

[www.pc.gc.ca/pn-np/yt/ivvavik/index\\_E.asp](http://www.pc.gc.ca/pn-np/yt/ivvavik/index_E.asp)

**Inuvialuit Final Agreement**

[www.wmacns.ca/pdfs/1\\_IFA.pdf](http://www.wmacns.ca/pdfs/1_IFA.pdf)

**Aklavik Community Conservation Plan**

[www.bmmda.nt.ca/outgoing/Aklavik%20CCP%20-%20Final.pdf](http://www.bmmda.nt.ca/outgoing/Aklavik%20CCP%20-%20Final.pdf)

**Sustainability of Arctic Communities**

[www.taiga.net/sustain/index.html](http://www.taiga.net/sustain/index.html)

**Fisheries Joint Management Committee**

[www.fjmc.ca](http://www.fjmc.ca)

**Porcupine Caribou Management Board**

[www.taiga.net/pcmb/](http://www.taiga.net/pcmb/)

**Porcupine Caribou Herd Satellite Collar Project**

[www.taiga.net/satellite/index.html](http://www.taiga.net/satellite/index.html)

**Northern Climate Exchange**

[www.taiga.net/nce/index.html](http://www.taiga.net/nce/index.html)

**Beaufort Region Bibliography- A Yukon Perspective**

[www.tc.gov.yk.ca/archives/findingaids/beaufort\\_v4.pdf](http://www.tc.gov.yk.ca/archives/findingaids/beaufort_v4.pdf)