Traditional Knowledge
A discussion paper to consider capacity building

Purpose of this document

The purpose of this document is to stimulate discussion associated with the building of capacity of a variety of groups who are engaged in the management of northern resources and their development using both traditional knowledge and western science. While this paper focuses primarily on traditional knowledge capacity needs because there are no systematic programs in place to meet these needs, it is also intended to strengthen the appreciation of western science by non-scientists. It is hoped further that one result of this paper will be the development of education and training programs that will generate opportunities for northerners to use the best knowledge available in making decisions that will affect the quality of life for generations to come. These capacity building programs will enhance appreciation of both western science and traditional knowledge, the similarities and differences of each and the skills required to access and effectively communicate each.

Background

Traditional knowledge (TK) and traditional methods of making decisions are vitally important aspects of everyday life in northern communities. Until recently, TK has been difficult to include in modern development projects because it is held in oral traditions and is in a different format to western science and technology. The challenge for aboriginal people is to be able to use TK in development (both social and economic development) projects where western science and technology have previously been the dominant information for decision-making. Aboriginal peoples want to have an integral and meaningful role in making decisions about their own future. Development projects are beginning to include traditional knowledge in planning and implementation when aboriginal peoples are directly or indirectly affected. Many governments, non-governmental organizations, development agencies, and corporations are interested in the principles that underpin aboriginal peoples' traditional knowledge systems. Some are entering into partnerships with aboriginal communities to research and document components of traditional ecological knowledge that can be used to make resource management decisions in a manner that respects the role of the community in controlling the research methods and the release of information. Others are finding ways to support the inclusion of traditional knowledge in management decisions by inviting representations to be made in planning and management deliberations. Many in the north, are actively attempting to incorporate traditional knowledge through direct aboriginal representation on co-management bodies.

The challenge that northerners concerned with effective management face now is to ensure that the best possible knowledge is available for use. This requires skills and understandings not currently supported through training and education. It requires aboriginal representatives to have a basic understanding of western science, the management framework used by government and the ability to communicate on a "cross knowledge system" basis. Similarly it requires managers working within a scientific framework to have a basic understanding of TK concepts, ways in which knowledge is traditionally communicated and the ability to include TK in their analysis and decisions.

What is Traditional Knowledge?

Traditional knowledge is more than a simple compilation of facts drawn from local, and often remote, environments. It is a complex and sophisticated system of knowledge drawing on centuries of wisdom and experience. It also constantly grows and changes with new information. To use this sophistication one must include the aboriginal peoples themselves as practitioners. Traditional knowledge systems assume that people are part of the land, not that they own the land, so they consider themselves as true guardians. The wisdom derived from this philosophy can be used to advantage when planning for the future.

The Importance of TK to Biodiversity

Biodiversity, as defined for the purposes of the United Nations Convention on Biological Diversity[1], is:

> The variability among living organisms from all sources including, *interalia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems. (United Nations, 1992: 1)

Put in simpler terms, it is commonly used to refer to the number and variety of living organisms on the planet, which are generally defined in terms of genes, species, and ecosystems. Biodiversity has recently become a serious concern amongst those involved in issues and activities related to the environment due to the increasing worldwide losses of species and ecosystems resulting from unsustainable development of all types, and the threat this poses to the environment in various parts of the world. Although species extinction is a natural part of the evolutionary process, species and ecosystems are now disappearing at alarming rates, previously unrecorded in human history. Although the bulk of the losses are occurring in tropical forests, which contain the greatest amount and variety of identified species, there are continuing threats to the northern ecosystem resulting from oil and gas, minerals and ore mining development (Rayrock, 1997; Sallenave, 2000: 1), the presence of persistent organic pollutants and hydro-electric power developments.

[1] The Convention was an outcome of the Earth Summit held in Rio de Janeiro, Brazil in 1992 and was intended to focus on: 1) the conservation of biological diversity, 2) the sustainable use of the components of biodiversity and 3) the fair and equitable sharing of the benefits arising out of the utilization of genetic resources.

The loss of species and ecosystems has major economic, social and environmental, implications for the north primarily, and to all Canadians in general. Biological resources are needed for at least 40 per cent of the world's economic needs. Biological diversity is the planet's life insurance policy.

> "The richer the diversity of life, the greater the opportunity for medical discoveries, economic development, and adaptive responses to such new challenges as climate change" (United Nations, 1992: 1).

Traditional Knowledge[2] and the Biodiversity Convention

The United Nations Convention on Biological Diversity recognized the importance of traditional knowledge including traditional environmental knowledge, in conserving and protecting biological diversity worldwide. Article 8(j), in particular, refers to indigenous knowledge and requires that:

> The traditional knowledge of indigenous and local communities be respected, preserved and maintained; that the use of such knowledge should be promoted for wider application with the approval and involvement of the holders of such knowledge; and that they should equitably share in the benefits which arise from the use of their knowledge. (United Nations, 1997: 2)

The Convention, hosted by the United Nations Environmental Program, held a workshop on traditional knowledge and biological diversity to bring together practitioners in the field to discuss the role of indigenous knowledge in biological diversity. It recognized the importance of indigenous and local communities to the conservation and sustainable use of biological diversity.

As others have pointed out, science cannot fill the gaps in ecological information needed to conduct proper environmental assessment and monitoring. As Sallenave (2000: 5) comments:

> Traditional environmental knowledge, which encompasses the biophysical, economic, social, cultural and spiritual aspects of the environment, is in many instances better suited to answer scientists' many questions.

Traditional ecological knowledge emphasizes the inter-relationships between components of the environment and avoids scientific reductionism. Moreover, traditional ecological

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2 The terms traditional knowledge as well as indigenous knowledge are used in this report. Indigenous knowledge refers to knowledge that is specific to a particular locality. Whereas traditional knowledge, as defined in the Workshop on Traditional Knowledge and Biological Diversity, is a term used to describe a body of knowledge built by a group of people through generations living in close contact with nature. It includes a system of classification, a set of empirical observations about the local environment, and a system of self-management that governs resources use (Workshop, 1997: 17). United Nations. Convention on Biological Diversity, Convention Text (1992) Article 2, Use of Terms. Internet: www.biodiv.org/chm/conv/art2/htm., 00/06/27, 2p.

knowledge views humans as part of the natural environment, not simply as observers or controllers. This view is compatible with concepts of many Canadian First Nations and of the general Dene concept of "dè", which is similar to the scientific concept 'ecosystem'. However, where ecosystems concepts are based on the idea that living things exist in association with non-living elements, "dè" is based on the idea that everything has life and spirit. Dè includes the spiritual and physical aspects of the land, people, wildlife and their habitats.

Scientific classification systems of the world's genetic traits, species and ecosystems are incomplete due to the scarcity of scientifically trained taxonomists. Therefore, the documentation and use of local classification systems will add new dimensions of information and understanding to the current knowledge of biodiversity and the many factors that affect it (United Nations, 1997: 15).

Past successes have shown that,

> (T)here is a large body of evidence to show that in most cultures and societies indigenous peoples have successfully cultivated and inhabited areas with a high degree of diversity. This was possible in part because they were practitioners of environmental processes designed to transform, manage, and use nature, in order to conserve it. They knew that in many cases their survival--especially in tropical forest, desert and savannah and short-grass areas--depended on the diversity of the ecosystems. The indigenous knowledge accumulated by these peoples and communities constitutes a reservoir of adaptations which are of great importance for long-term sustainability. (Consuelo Quiroz, 2000: 1).

In addition to the scientific uses of indigenous knowledge for particular studies, there are also cultural reasons for preserving traditional environmental knowledge. Two of the main reasons are:

1. That it is particularly important to research traditional knowledge given that the rate of erosion of the traditional knowledge of biodiversity held by indigenous and local communities has never been so high as it is in the current generation. If young people are to learn the traditional knowledge and maintain its survival into continuing generations, they will need appropriate incentives to make it worth their while to carry this knowledge and the related skills. Creating careers based on their forebears traditional knowledge is one way to achieve this (United Nations, 1997: 13), and,
2. Traditional Resource Rights are another imperative "given that knowledge and traditional resources are central to the maintenance of identity for indigenous and local communities" (United Nations, 1997: 9).

Some of the most beneficial outcomes of using traditional knowledge is that it can be used specifically for the following purposes:

- to provide information about the various physical, biological and social components of a particular landscape
- to assist in establishing rules for using these landscapes without damaging them irreparably
- to clarify and enhance relationships among their users
- to assist in the development of technologies for using them to meet the subsistence, health, trade and ritual needs of local people
- to help create a view of the world that incorporates and makes sense of all the above in the context of a long-term and holistic perspective in decision-making (United Nations, 1997: 17)
- to provide an effective social development framework that produces healthy communities
- to provide youth with a clear sense of identity and belonging
- to re-establish a respectful place for elders in community life

How can TK assist communities, industry, and governments in environmental management?

Governments are increasingly recognizing the value of TK in Canada and globally. This is evidenced by greater and greater inclusion of TK in research requirements, in licensing land and water use, in co-management regimes, and in assessing potential impacts of development. The numerous United Nations and international initiatives to provide meaningful recognition for TK into a multitude of development initiatives suggests that Canada's own steps will likely increase. The following outlines ways in which TK can assist industry and government in environmental management. Indeed, blending industrial and traditional economies demands the ability to "know two ways", an instruction given by many elders and formally adopted by the Dogrib Community Services Board concerned with formal education in their region. While the value of "two ways" may be acknowledged, the achievement of a true blended economy, in which traditional life prospers, requires a dramatic effort, if it is to be successful.

Little or no baseline information about pre-development conditions is available through western science in this region. The "old" knowledge available through TK is crucial to acquiring a clear understanding of pre-development conditions. Without an understanding of pre-development conditions, managers cannot effectively carry out assessments, conduct impact monitoring, or carry out reclamation programs. Attempts to manage cumulative effects without baseline information would be futile.

Being able to distinguish natural ebbs and flows in wildlife and fish populations from development impacts, for example, is important to establishing reclamation objectives. TK can provide the historic trends through baseline research of "old" knowledge, needed to effectively inform further development or reclamation plans.

TK can be an effective vehicle for identifying western scientific research needs and priorities. The very differences in the knowledge systems can serve the interests of all concerned and become a new source of strength rather than conflict. If for example, TK holders witness a change in the environment that they do not understand, (and there is sufficient trust by managers that they will identify real change), TK holders may well recommend and actively support scientific research. The very fact that elders witness something new in the environment suggests a very real problem that should receive urgent and immediate attention. The longevity of TK would dismiss a rare but not unusual change.

"New" biological and environmental insights are available through TK. The classification system of Aboriginal peoples sometimes differs from western science because they are based in observable sets of differences (not genetics) and can be more illuminating for management purposes.

TK can inform land use or development planning processes effectively to ensure that sensitive areas are protected and that impacts of development activity are limited or mitigated. For example, TK has provided information about fish spawning areas and groundwater flow that was contrary to information available to environmental managers. Follow-up scientific research has verified TK predictions and solved problems science would not otherwise have recognized. With experience and trust built over time, the strengths of each knowledge base adds to the power of the information available to make accurate predictions about environmental effects.

TK can provide an economical means of acquiring environmental information. When TK informs the western science research agenda, the expense of carrying out very time consuming and expensive (and sometimes redundant or inconclusive) research can be reduced.

Incorporating TK and TK holders (especially active and knowledgeable harvesters in conjunction with knowledgeable elders in documenting and sharing their observations) in monitoring initiatives can be both economical and practical. It is cheaper to build on the "field trips" already underway (harvesting activities) than to sponsor trips fully to collect information and samples for impact monitoring purposes.

It can also be economical to involve Aboriginal peoples in all phases of development or reclamation planning and management as it may well result in avoiding costly delays or legal proceedings.

Many Aboriginal peoples believe that they have an inherent responsibility for stewardship over their traditional territory. This sense of responsibility has existed for thousands of

years. About twenty-five years ago, this lead to the pursuit of recognition of "Aboriginal Rights" as a means of exercising these responsibilities in the north. More recently it has also lead to participation in the regulatory process as a means of affecting decisions made about traditional lands. The TK work will enhance their participation in the regulatory process and increase the quality of environmental management decisions made by all governments.

TK and culture can provide a stabilizing force in rapidly changing social and economic environments where lifestyles of younger generations can differ significantly from those of their parents and even greater, with their grandparents. When young people do not see that their own culture has value in their daily lives, experience has shown that social breakdown is inevitable. When value of their own culture is demonstrated, even in rapidly changing circumstances, young people can thrive in the knowledge of who they are with a sense of belonging and purpose.

How can TK and western science be "integrated" for environmental management?

Aboriginal peoples, scientists and managers are recognizing the unique strengths of each others knowledge and are beginning to use TK to inform management decisions. Recognizing the capacity of TK to create predictive models is leading to acceptance that it is not only the "data" that is of value, but that it is both necessary and desirable for aboriginal peoples to participate in the decisions that facilitates the use of their own ability to predict outcomes. Resistance to reliance on the oral tradition as a means of transmitting information is diminishing over time as the experience of acquiring and using TK grows. The cultural values and spiritual beliefs that underlie much of the knowledge are beginning to be accepted for what they are, an effective means of influencing human behavior that usually works in favor of making sustainable choices. Aboriginal peoples are becoming more comfortable with sharing TK with scientists and managers as they gain experience with research processes that enable them to organize TK in a manner that can be understood by non-aboriginal people and their own people alike.

All too often however, initiatives that have attempted to "integrate" TK and western science have in fact undermined the development of mutually respectful understandings of the differences in these knowledge systems and the distinct value of each. In some cases, for example, the research agenda is established by scientists (or managers who trust the western scientific process) and they decide what information they want from TK. When this happens, TK holders tend to feel used, distrusted and disrespected. The setting of research agendas is a reflection of the knowledge system itself and of biases and assumptions inherent to any knowledge system. It is therefore critical, that the "experts" in each knowledge system, have the opportunity to establish their own research agenda, and to use their own prediction models. Effective skills for exchanging information between these "experts" will enhance the mutual understandings of each other without one subsuming the other.

To ensure that both TK and western science are integrated into management decisions, it is critical that they are directly represented in the decision making process and that steps are

taken to ensure mutual understandings develop. This is where "integration" can be effective, and indeed must be, is in the application of the information in the decision making process. Management bodies are encouraged to explain their decisions, and to identify how and where they have used TK and western science in their decisions.

Over time (as trust develops), ideas for collaborative work between scientists, TK researchers and elders are brought forward. When this happens, significant learning occurs on all sides and there is a notable increase in respect demonstrated about the strengths of the distinct knowledge systems.

Many aboriginal peoples find themselves in a transitional stage, facing the demands of a changing and demanding world, but still rooted in traditional life styles. This may place them in difficult living conditions. Projects that are planned and implemented using traditional knowledge help reduce the difficulties of this transitional condition for indigenous peoples. Young people, for example, can through training, become valuable conduits between their elders and the current management process, enhancing their status as well as that of their elders.

There are two streams of training that must be developed to ensure that the best possible knowledge is available to northern governments. One is to develop our capacity within each region to research and document TK so that it is accessible in writing and in electronic form. The second is to develop the capacity of co-management regimes to ensure the best possible knowledge is used in their deliberations and decisions through acquiring cross knowledge interpretation and communications skills.

Different Stages of Assembly of Traditional Knowledge

Within the north each community has achieved a different level of development of their TK research and development capacity or their ability to transfer the information out of the community. While this is quite normal and what would be expected, nonetheless, to provide effective capacity building support to everyone, it represents a challenge. There are several aspects to this challenge. First, no one community will want to bear the main burden of developing the transferable database of knowledge. Second, each will want to see some benefit from the effort that has been put into the project. Third, each community will want to be able to participate in a reasonable fashion in the decision-making process that comes out of the assembly and transfer of the traditional knowledge. Furthermore, communities are interested in the development of regional initiatives such as establishing computer based communication links, regional databases and regional web sites. Care will be taken to work from the current level of capacity of each of our communities and regions.

The Barriers

Probably the most significant barrier to collaboration between western scientists and that approach to management and traditional knowledge holders is their ability to understand

each other. It is not only a language problem, there is also fundamental differences in world view, and different methods of acquiring, communicating, transferring and verifying knowledge Some examples are:

World view: Aboriginal cultures believed that spirit or "de"' exists in all of creation, including in water, the air, ground, rocks, birds, animals, insects, fish etc. Humans are the most dependent of all spirits on earth and therefore have greater responsibility for respecting other spirits for whom they are dependent on. This responsibility includes asking other spirits to give themselves to humans so that we may survive through our harvesting activities, giving thanks and appreciating the magnitudes of the 'gifts' we receive through these activities, and a stringent conservation practices that ensure resources or 'gifts' are not wasted. People are capable of communicating with other spirits and can share their 'power' or 'energy' with each other. Long before there was contact with non-aboriginal peoples, it was known that the world was round and that there were four peoples of four basic races or colours, including the yellow people (Asian), the black people (African, Australian and East Indian), white people (European) and red people (the aboriginal peoples of North America). Aboriginal history teaches that up to the 1700's and in the north (Denendeh), the Dene population was guestimated at approximately 750,000 to 1,000,000 people and that the land was able to sustain this many people provided that 'we take care of it'.

Knowledge systems: Traditionally the most common methods of acquiring knowledge were from elders within the community and through personal and collective experience. However, also quite common was the acquisition of knowledge through dreams and vision quests where knowledge was received from other spirits or the creator. Story telling is a common communication form used to relay information and spiritual understandings.

Should we do a comparison here to science in world view and knowledge systems????

Some examples of how these differences can negatively impact communication and understandings between traditional knowledge holders and scientists and managers are: Allice do you have any examples to insert here like a situation where a manager gets frustrated in a meeting where an elder is telling a story that relates to stewardship responsibilities and the manager is only interested in "data"

Capacity Building

To meet the goal of full integration of science and TK in northern resource management it is necessary to develop the skills of co-management representatives and the organizational

capacity of management bodies. The challenge will be not just to research, document and assemble the knowledge, but to develop the capacity of the representatives to communicate effectively with each other and for managers to utilize TK in their processes. It is also important to develop the means within the community to carry on long after any specific development project has ended to access and utilize their distinct knowledge to meet ongoing monitoring and management needs.

TK research and documentation capacity

There is relevant northern experience and research methodology to draw from to design a TK Researcher training program.

1.1 Community TK Research Teams

We recognize that to be able to collect and utilize Traditional Knowledge in modern day management initiatives we will need the full cooperation and trust from the communities and the various boards and committees established under the land claim and self-government agreements. There are a great many individuals and groups that must be engaged in cooperative working relationships in order to ensure that research meets the needs of the communities and their representative committees. In addition, there are many safeguards that are necessary before full disclosure of TK can take place. These include such things as understandings on intellectual property issues, operational local and regional Elders Committees Agreements with Aboriginal Governments regarding recognition of the role of elders committees and the use of traditional knowledge, and an undertaking to ensure that the acquired TK can be segmented into public and proprietary information at different levels as required. Finally, it is imperative that the communities and particularly the Elders and harvesters who are going to be informants have a clear understanding of the objectives of the various projects, and that they can help shape those objectives to better meet their own expectations.

We are cognizant that there is insufficient numbers of post secondary students or graduates who would have the necessary skills to fill these research positions. This paper contemplates a training plan therefore that assumes that we will not find people with post-secondary education and that we may well need to plan for training people with grade 10 or lower education levels. This can be workable if the weakness of an individual can be offset by the strengths of another and if ongoing mentoring and on the job training is provided. For example, one person may have very strong aboriginal language skills but not be literate in English. Another may know how to speak at a conversational level but may not be strong in writing in English and yet another person may know the traditional lifestyle or land and can read maps but not have strong communication skills. In this case, the strengths of each can

be built on to create an effective TK Team. The key will be to get them working as a team, recognizing the value of each of their distinct strengths. By carrying out much of the training at a regional level, we will facilitate the development of further support systems between the teams from each community.

Major Skills to be developed

Many of skills outlined below will be relevant to those who wish to specialize in the development of research skills, while also relevant to those who wish to focus on the utilization of traditional knowledge in decisions and management.

To do this effectively a detailed training program (course curriculum and on the job training strategies) will need to be designed. An outline of the major skills to be detailed is set out below.

1. **Aboriginal language skills**

    - It will be necessary to develop intricate understandings of the aboriginal language and concepts. Researchers will need to understand root words that form the basis of distinct concepts and understandings. While Aboriginal language is still the first language of some, significant changes in lifestyle have affected the level of sophistication in communicating understandings that are very much rooted in the land and the relationship to the natural environment. Rapid change and exterior influences have resulted in slang and an abandonment of "old language" that was critical to survival on the land.
    - Basic and advanced literacy will be required to ensure that high research standards can be achieved and clearly communicated
    - Methodologies for verifying translations are critical to ensuring that distinct traditional knowledge and understandings are accurately communicated (moving from literal to culture based interpretations)
    - Methods for encouraging the use of "old language" in the interview process and getting at underlying concepts and values
    - Methods for checking assumptions in interpretations and translations and how to identify root words.
    - Recognizing and practicing the traditional communications protocols between younger people and elders and between male and females
    - The development of a continual learning ethic

2. Preparing for interviews

- Establishing clear interview objectives with the participation of elders committees and other members of the research team that relate to research goals
- Identifying the range of interview techniques to be used (ie one on one, field trips on the land, group discussions)
- Operating audio and video recording equipment including the use of counters, recorders, mikes etc
- Ensuring supplies are on hand including audio or video tapes, maps and note books; developing codes for labeling recorded tapes
- Developing clear understandings of the purpose of specific interviews and identifying specific topics to be addressed
- Working with and without interview guides
- Identifying how stories and legends are used to transfer knowledge
- Methods for extracting knowledge and understandings from stories or legends
- Clarifying and establishing roles for each team member participating in the interview
- Reading and utilizing maps as a research tool (including the use of a range of map scales)
- Identifying data recording needs conducive to use in GIS
- Testing data input to GIS together with technicians as a means of understanding how to organize information

3. Pre-interview, interview

- Communicating the interview context clearly with informants including the specifics of the research project; describing the mandate of the sponsoring organization (ie land use planning board etc) and the roles and responsibilities of Chief and Council and the Elders Committee (or others) in relation to the project
- Ensuring informants are willing to participate in the research with a clear understanding of the purpose
- Establishing a rapport with informants including providing personal history and family ties to larger community and identifying personal reasons for joining the team
- Explaining the training component and identifying any current limitations
- Reviewing and completing the informant interview agreement

- Scheduling interview, time and location

4. **Conducting Interviews**

   - Using interview guide when appropriate and dealing with variations from the research guide effectively and with respect
   - Recording with audio or video equipment as non-intrusively as possible
   - Utilizing codified labels on recorded tapes and keeping notes with reference to counters as required
   - Asking questions of clarification as required without being disruptive; addressing questions from the informant about the program including making note of such questions; encouraging the use of "old language"

5. **Interview follow-up**

   Transcribing and summarizing recordings; establishing filing systems for notes, recorded tapes and maps; inputting GIS data; identifying and noting questions requiring clarification; identifying and noting new issues or research questions arising from interview; developing a Verification Workbook for future use, translating and transcribing interviews; producing summaries for each interview

6. **Preparing for verification workshop with Elders Committee**

   Organizing with all team members the questions/issues to be addressed in the workshop; preliminary identification of information gaps; drafting a workshop agenda; identification of aboriginal terminology requiring discussion; establishing a workshop schedule with Elders Committee and location

7. **Leading Verification Workshops with Elders Committee**

   Reviewing draft agenda; adding workshop issues identified by members of the Elders Committee; reviewing interview progress to date (including who has been interviewed to date); reviewing and discussing each issue identified (including gaps); reaching consensus on further interview needs and on interpreting terminology;

8. **Follow-up interviews**

   Based on workshop results modify interview guides as required; explain purpose of further interview (expansion or reduction of focus); conduct follow-up interview and repeat 4,5,6, & 7 above.

9. **Literature searches and literature reviews**

   How to find relevant literature, where to look, how to determine relevancy; how to include references to existing literature

10. **Writing research reports and analysis skills**

    Organizing data for inclusion in reports; writing research reports (methods and major components); defining "analysis"; linking data to analysis; supporting analysis with other literature; identifying major conceptual understandings; comparing these understandings to current concepts

11. **Preparing analysis**

    Community Research Team members do preliminary analysis and write reports for review by consultants; identify gaps and or questions; draft preliminary analysis (including "raw data" or quotes from interviews); translate preliminary analysis into Aboriginal language; prepare for Elders Committee analysis review workshop; conduct workshop and identify and further publication limitations; identify gaps; repeat steps 4, 5, 6, 7, 8, & 9 as required until findings and analysis are satisfactory to the Elders Committee and Consultants;

12. **Data, Models, and Management Strategies**

    Community Research Team members will encounter a range of traditional knowledge. Just as in science, the information will include data, models of relationships, predictive models based on indicator species or events, and traditional strategies used to manage the environment over long periods of time. Team members will incorporate all levels of knowledge and its application into the database of information collected and input to the GIS.

13. **Formatting to match GIS Input Requirements**

    GIS suitable to TK input requires special handling of data and other information. Researchers will relate all information to geographic coordinates and other variables. In part this will be a hybrid of the format derived from scientific analysis and that derived from traditional analysis. Different levels of public and proprietary accessibility will be assigned to the information collected for entry into the GIS database.

14. **Releasing Research Reports**

    Incorporating further interview and verification steps, research reports are finalized and a final review and verification workshop is conducted with the Elders Committee; copywriting reports as appropriate; results are released and distributed to all members of Sponsoring agencies and Committee members.

15. **Developing strategies** for the use of TK in management decisions will be incorporated into the training offered to researchers, liaisons, elders committees, and Committees established under the land claims and self-government agreements.

Database Skills Required:

- Creating tables
- Creating new relationships between tables
- Adding and editing new administration pages for new data input
- Entering Data in both aboriginal language and in English
- Dealing with multiple names for one place (indicating more detailed info of an area)
- Managing the data relationship between specific topics, specific interviews and specific elders
- Cataloguing photos, audio and video clips
- Ensuring database tables include topics covered in research
- Troubleshooting

Geographic Information System

Various regional Aboriginal governments have established GIS's, TK researchers will need to both access and input data into their GIS. Basic skills should be acquired from those most familiar with these specific systems.

Some of the training outlined above should be carried out during field trips on the land with elders as an effective and traditional training method. These trips also remind elders of information not often discussed within the confines of a community (some of the best interviews have been recorded on the land or shortly after such a trip). These trips contribute significantly to the education of the researchers and other team members, who may have not had the benefit of the experience of living the very traditional ways.

Applying Traditional Knowledge in the management process

Traditional methods of making decisions are vitally important aspects of everyday life in Aboriginal communities. It is difficult however, to utilize TK in planning and managing development projects because it is held in oral traditions and is in a different format to western science and technology. The challenge for aboriginal people is to be able to use TK in development projects where western science and technology have previously been the dominant information for decision-making while ensuring that the management system is workable and one that builds on the strengths of both science and TK. The following skills will equip aboriginal representatives to interpret TK within a modern management framework.

To effectively use traditional knowledge in land and water management, key understandings and skills are required to "interpret" the knowledge and communicate it effectively to managers who are trained to work within a western model that may rely on western science to provide information. The following understandings and skills are required

Cultural knowledge

Extensive cultural training to understand and articulate the Aboriginal world view is critical to ensuring the contextual use of data derived from traditional knowledge is appropriate. This is especially critical to Aboriginal representatives who are expected to bring forward the distinct needs and concerns of their constituents. Learning Aboriginal history, cosmology, spiritual teachings and distinct concepts related to the natural world and the Aboriginal place in it will provide background knowledge critical to representing the Aboriginal people and our vision.

Aboriginal Communication styles

In order to communicate Aboriginal understandings and knowledge effectively it is necessary to understand the distinct Aboriginal communication styles and protocols. The use of stories, legends and myths are common in the Aboriginal culture. It is important to understand how information is transmitted in each of these styles. Distinct teaching methods also reflect communication styles and understandings of the learning capacity of the people involved. It is therefore important to have a basic understanding of these methods to understand the choices made by elders in what they communicate and how they choose to communicate to specific audiences. Learning the traditional communication protocols will help ensure that efforts made to access traditional knowledge are not offensive.

Understanding and communicating traditional predictive models, management and monitoring systems

While little documentation has been done on the traditional aboriginal management systems it will be important for those involved in the management of northern lands

and resources to understand and communicate these systems so that they can be considered when making decisions and to create conceptual frameworks and solutions. The distinct Dene predictive model for example, is expressed as fear of what "might" happen in given situations. This reflects the spiritual belief that few people are prophets and not everyone can see the future with any kind of certainty. It implies too that we can only build on past relevant experience in assessing future outcomes, and that we cannot know for certain what the outcomes might be for decisions that we have no experience with. Knowing how to "listen" to these fears and relate them to the impact assessment process will help ensure that Aboriginal concerns are given full consideration.

Aboriginal management practices and decision making processes if understood may well be relevant to management challenges today. In cases where action or observations are required on the land, harvesters working together with elders may provide a viable alternative to sending out technicians or scientists for certain kinds of field studies. There are currently proposals to establish monitoring programs which builds on our traditional monitoring model. This model involves a system of active harvesters making observations while they are on the land, reporting these observations to elders on their return, and discussing what these observations indicate (analysis). Future decisions then take into account this analysis. Our harvesters are open to learning new skills too that they can employ while they are on the land including; learning how to take and preserve samples; recording their observations; utilizing a GPS to pinpoint geographic locations of interest.

Basic understanding of western scientific concepts and methods:

It is important for Aboriginal people who are interacting with non-Aboriginal people and organizations involved in land and resource management to understand the basic scientific concepts that these people operate within. *Alan, can you list concepts and or skills for this section.*

Management Boards

A preliminary list of Boards and Agencies would benefit from these training and development opportunities:

Mackenzie Valley Land and Water Board
Mackenzie Valley Environmental Impact Review Board
Land and Water Boards and committees established through aboriginal rights agreements
Land Use Planning Boards and Committees
Wildlife Management Boards
Protected Areas Management bodies

Joint Caribou Management Boards
A variety of Advisory Committees that may be established (ie. National Parks, Great Slave Lake)