Research Gap Analysis

Prepared for
Gwich'in Renewable Resources Board

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List of Acronyms

ARI	Aurora Research Institute
DFO	Department of Fisheries and Oceans, Government of Canada
ENR	Department of Environment and Natural Resources, Government of Northwest Territories
GFMP	Gwich'in Forestry Management Plan
GRRB	Gwich'in Renewable Resources Board
GSA	Gwich'in Settlement Area
INAC	Indian and Northern Affairs Canada
NWT	Northwest Territories
RRC	Renewable resource council
RWED	Now ENR above
VEC	Valued Ecosystem Component

Introduction

The mandate of the Gwich'in Renewable Resources Board (GRRB) is defined in the **GWICH'IN COMPREHENSIVE LAND CLAIM AGREEMENT (1992)** as follows:

Powers of the Renewable Resources Board

12.8.23 In furtherance of its purpose as the main instrument of wildlife management in the settlement area, the Board shall have the power to:

- *(a) establish policies and propose regulations in respect of:*
  - *(i) the harvesting of wildlife by any person, including any class of persons;*
  - *(ii) the commercial harvesting of wildlife; and*
  - *(iii) commercial activities relating to wildlife including:*
    - *(A) commercial establishments and facilities for commercial harvesting; propagation, cultivation and husbandry of fur bearers and other species; and commercial processing, marketing and sale of wildlife and wildlife products, which may include trade with persons not included in 12.4.16;*
    - *(B) guiding and outfitting services; and*
    - *(C) hunting, fishing and naturalist camps and lodges;*
- *(b) exercise the powers and duties given to it elsewhere in the agreement;*
- *(c) approve plans for the management and protection of particular wildlife populations, including transplanted wildlife populations and endangered species, and particular wildlife habitats including conservation areas, territorial parks and national parks in the settlement area;*
- *(d) approve the designation of conservation areas and endangered species;*
- *(e) approve provisions of interim management guidelines, park management plans and policies that impact on wildlife and harvesting by the Gwich'in in a national park;*
- *(f) approve regulations which may be proposed by government pursuant to 12.8.29, except for those in respect of which the Board has already made a final decision under 12.8.27;*
- *(g) establish rules and procedures for the carrying out of any consultation required by these provisions; and*
- *(h) review any matter in respect of wildlife management referred to it by government.*

Research and Harvesting Studies

12.8.37 It is intended that the Board and government departments and agencies work in close collaboration, and exchange full information on their policies, programs and research.

12.8.38 The Board may participate in harvesting studies, in data collection and in the evaluation of wildlife research. It is intended that the Board have an independent research capability, to the extent agreed by government and which does not duplicate research which is otherwise available to it.

12.8.39 The Board shall establish and maintain a public file for reports, research papers and data received by the Board. Any material furnished on a confidential basis shall not be made public without the consent of the originator.

It should be noted that while the powers of the GRRB (Section 12.8.23) provide the direction to be involved in the management of renewable resources in the GSA, Sections 12.8.37 and 12.8.38 provide the direction for the GRRB to be directly involved in Research and to have a research staff. Section 12.8.39 directs the board to have and maintain a library of research reports, papers etc.

The objectives of this report are as follows:

1. Compile a database of renewable resource research in the GSA;
2. Compile a Reference Database for the GRRB;
3. Collect as many of the reports material as possible or provide electronic (web) references for the material;
4. Conduct a Gap Analysis of the research based on the mandate of the GRRB; and
5. Identify areas for community involvement in research and monitoring in the GSA.

The information collected in objectives 1 and 2 were used to conduct the Gap Analysis identified in objective 4. The research gaps were then used to develop recommendations for future research, methods for prioritizing future research and developing a strategy for community review and involvement in GRRB research.

Although some of the research data is from earlier periods, the Research Database developed for this report can be considered complete for the period 1999 to 2009.

It must be noted that **this is not a definitive** database of research reports on the GSA for the same period. An attempt has been made to accumulate all information for the period 1999 to 2009. In some cases the information is for periods earlier than this.

The databases for this project were developed in FileMaker Pro Version 10.

The databases and Gap Analysis contain references to species of fish, birds, mammals and plants. Table 1 provides the Gwich'in names, common names and scientific names for the species referenced in the report.

Table 1: Cross reference for the Gwich'in names, common names and scientific names for the species referenced in the report.

Subject	Tetlit Gwich'in	Common English	Scientific
Fish	Łuk zheii (Łuk dagaii)	Broad Whitefish	*Coregonus nasus*
	Dalts'an	Lake Whitefish	*Coregonus clupeaformis*
	Sruh	Inconnu	*Stenodus leucichthyes*
	Treeluk	Arctic Cisco	*Coregonus autumnalis*
	Sriijaa	Arctic Grayling	*Thymallus arcticus*
	Dhik'ii	Dolly Varden	*Salvelinus malma*
	Vit	Lake Trout	*Salvelinus namaycush*
	Chehluk	Burbot	*Lota lota*
	Eltin	Northern Pike	*Escox lucius*
	Daats'at	Longnose Sucker	*Catastomus catastomus*
	Shii	Dog Salmon	*Oncorhynchus keta*
Trees	Eneedridh	Black Spruce	*Picea mariana*
	Ts'iivii	White Spruce	*Picea glauca*
	Aat'oo	Paper Birch	*Betula papyrifera*
	K'aii'	Shrubs (Willow)	*Salix spp.*
Birds	(see Deetree'aa)	Black Ducks	
	Neet'aii	Mallard	*Anas platyrhynchos*
	Gugeh	Snow Geese	*Chen caerulescens*
	Deech'yu	White-fronted Goose	*Anser albifrons*
	Daazraii	Tundra Swans	*Cygnus columbianus*
	Deetree'aa	Scoters (known as Black Ducks locally)	*Melanitta perspicillata,*
	Njaa	White-winged Scoter	*Melanitta fusca*
	Daagoo	Willow Ptarmigan	*Lagopus lagopus*
	Daih	Spruce Grouse	*Dendragapus canadensis*
	Deetrin'	Raven	*Corvus corax*
	Jah	Sandhill Crane	*Grus canadensis*
	Ezhin	Golden Eagle	*Aquila chrysaetos*
	Thak	Bald Eagle	*Haliaeetus leucocephalus*
	Vihsaiivee	Snowy Owl	*Nyctea scandiaca*
	Nehdoh	Great Gray Owl	*Strix nebulosa*
	Echìidruu	Boreal Owl	*Aegolius funereus*
Mammals	Ts'it	Porcupine	*Erethizon dorsatum*
	Vadzaih	Caribou	*Rangifer tarandus*
	Dinjik	Moose	*Alces alces*
	Divii	Dall Sheep	*Ovis dalli*
	Shih	Grizzly Bear	*Ursus arctos*
	Shoh	Black Bear	*Ursus americanus*
	Dzan	Muskrat	*Ondatra zibethicus*
	Tsee'	Beaver	*Castor canadensis*
	Tsuk	Marten	*Martes americana*
	Geh	Snowshoe Hare	*Lepus americanus*
	Tthaa	Arctic Ground Squirrel	*Spermophilus parryii*

	Negoo tsoo	Fox	*Vulpes vulpes*
	Niinjii	Lynx	*Lynx lynx*
	Nehtr'uh	Wolverine	*Gulo gulo*
	Dhivii	Weasel	*Mustela*
	Chihthee	Mink	*Mustela vison*
	Tryuh	River Otter	*Lutra canadensis*
	Zhoh	Wolf	*Canis lupes*
Other	Tshuu	Water	
	Gwijat	Soils (Dirt)	
	Jak	Berries	

Information gathered from: Teetl'it Gwich'in Language Dictionary (2005); Gwich'in Words about the Land (1997); and More Gwich'in Words about the Land (2001).

Renewable Resource Research in the GSA

The intent of this database is two fold: First, to have as a source of research licences and permits information including contact information for the primary researcher; and second, to provide the basis for the Research Gap Analysis.

Under territorial legislation, all research in the NWT requires a licence/permit from at least one of four agencies, depending on the type of research being conducted:

1. Prince of Wales Northern Heritage Centre - Archaeology
2. Department of Environment and Natural Resources, Government of the Northwest Territories – Wildlife
3. Department of Fisheries and Oceans - Fisheries
4. Aurora Research Institute

Through the licencing process, researchers are informed of appropriate organizations, communities and other licencing/permitting agencies that should be contacted prior to conducting studies. In addition, the application for licences and permits are circulated to the GRRB for comment in the review process. Licencing ensures research activities are communicated to interested parties and provides opportunities for the exchange of information, which appears to be unique to northern Canada.

For the purposes of this project, only the research associated with renewable resources in the GSA were included in the database.

In addition to the above permits, the GRRB manages a research fund called the Wildlife Studies Fund. Most of the research funded by the GRRB is captured by the licencing/permitting system outlined above but there are some exceptions.

The Research Database for this project contains all renewable resource research licenced/permitted by the following organisations:

1. Aurora Research Institute (ARI) 1996 to 2009
2. Department of Fisheries and Oceans 1996 to2008
3. Environment and Natural Resources, GNWT (formerly RWED) 1999 to 2009
4. GRRB 1992 to 2009

In the case of the ARI, the database includes licences that cover projects relating to climate change and geological processes relating to river bank stability.

The Research Database contains a total 578 entries.

The fields in the database are as follows:

Field Name	Description
Info-Source	This is a description of who issues the research licence/permit and/or one of ARI, DFO, ENR or GRRB
YEAR	The year the licence/permit was issued
SPECIES	The species the licence was issued for (if applicable to the research).
Theme	The discipline the research was issued for
LICENCE_Permit	The license/permit number.
LOCATION	General description of where the research area is located.
NAME	Licence/Permit holders name
AFFIL	Who the licence/permit holder works for.
ADD2	Licence/Permit holders address
ADD3	Licence/Permit holders address
ADD4	Licence/Permit holders address
PHONE	Licence/Permit holders phone number
EMAIL	Licence/Permit holders email address
TITLE:	Title of the research project
DESCRIPTIO	Brief description of the research project.

The Research database can be searched using any of the fields above.

Because of differences in the reporting of data by different agencies, records in the database vary slightly in the information they contain. In addition, some of the final reports on the projects may not be available from the licencing/permitting agency.

ARI indicated that their collection of research reports was incomplete but they were in the process of contacting all the research licence holders to obtain a copy of the final reports. The reports that are held at ARI may or may not be in digital form but can be viewed or obtained by contacting ARI and requesting information using the licence or file number contained in the database.

In the case of Environment and Natural Resources (ENR) and DFO the reports were not readily available.

GRRB has copies of most reports from the research they funded on file in their library and many of them are also available as a download from their web site.

Recommendations on Research Database

In completing this database it was noted that the various licencing/permitting agencies maintain different levels of information in their individual databases. It would be convenient if all agencies maintained and reported similar information, in particular in the area of research summaries. This would facilitate better search ability of the combined database.

It was noted that the GRRB does not have a numbering system for their research projects. It is recommended that GRRB initiate a system for numbering research projects so that the resulting information can be better tracked. This numbering system could then be cross referenced with the licences/permits from the other agencies.

The availability of information on the specific research projects regardless of the agency is inconsistent. It is noted, however, that in recent years this has improved with information being more available electronically either from the agency or on the Web. It is recommended that all agencies that licence/permit research maintain a web accessible list of reports linked to downloadable research reports/summaries for each specific licence/permit.

Reference Database

As outlined in the introduction, the Gwich'in Comprehensive Land Claim Agreement states that the GRRB "*shall establish and maintain a public file for reports, research papers and data received".* The Reference database will complete most of this function. The Reference database is also critical in the research Gap Analysis as it provides a summary of the research material that has been published for the GSA. The Reference database will also be a valuable resource to GRRB staff and having as many of the reports as possible in electronic format will make their work more efficient.

Material for the Reference database came from the following sources:

1. GRRB Library Database
2. GRRB One Note Fisheries Database
3. DFO database for fisheries information for the Mackenzie Valley
4. ENR reports and papers (published scientific papers, manuscript reports, file reports)
5. ARI library

All references were converted to a format that was importable to FileMaker Pro and combined into one database. This database contains 4,795 references.

The data in the original database covered a more extensive area than the GSA. References were examined for their general applicability to the GSA and were included if applicable.

The reference material may not be complete in the area of water quality as none of the sources were specific to this subject. The subject is covered, however, in a general manner with considerable information available through the DFO and GRRB fisheries database reports.

The fields in the database are:

Field	Description
Authors	The authors of the document
Editors	The editor if the document is from an edited report or book
In	The title of the book above
Year	The year published
Journal	The title of the Journal
Volume/Number	The Volume and Number of the Journal
Pages	Number of pages in the document
Publishing Company	Publishing company if the document is a book or report
Publishing Location	Location (city) of the publisher
Report Number	Report number if it is a numbered series
Title	Title of the document
Summary	Summary or Abstract of the document
Keywords	Key search words for the document
Location of File	Where the actual document may be found (may be a URL address)
Catalogue No.	The library catalogue number where the document is housed

The database is searchable by any field for any word or combination of words.

Report Sources/Locations

One of the objectives of the project was to accumulate all reference material into the GRRB library. It soon became apparent that this would not be a practical objective for this project. It was noted in the searches, however, that much of the information was available in electronic format or on internet websites in downloadable files. This was the case for most of the ENR publications and reports. Unfortunately importing the links for these reports to the database has to be done on a report by report basis and therefore was outside the terms of reference of this project.

Links to the electronically available information are summarized below.

GRRB

The reports in the Reference Database identified as GRRB Library are all available at that location. This library formed the foundation for this database. All reports noted as GRRB Library are available in the GRRB office in Inuvik, NT.

GRRB Fisheries Library

As well as the GRRB physical library, there is a significant collection of literature on GSA fisheries studies that is contained in a One Note database. In addition to the

references for the reports etc., the database has hyperlinks to 398 reports in .pdf format. Although these references have been imported into the 2009 Reference Database, the hyperlink importing was not within the scope of this contract. These reports have been identified in the 2009 Reference Database as GRRB Fisheries and the reports can be accessed through the OneNote GRRB Fisheries Database.

ENR

ENR publications relating to the GSA were obtained from the ENR Web site (http://www.nwtwildlife.com/). These include 70 Manuscript Reports, 30 file Reports and 14 scientific publications. Either abstracts or full reports are available for these ENR documents as follows: Manuscript reports include 31 reports and 39 abstracts; File Reports include 22 reports and 8 abstracts; and scientific publications include 14 Abstracts. These hyperlinks are available in the tables that are contained in Appendix 1.

DFO Database

The DFO has prepared a database containing all references to the fisheries resources in the NWT that is geo-referenced. This made it possible to extract reference material that provided information on the fisheries resources of the GSA. This database contained 592 references. This data was included in the Reference Database but on closer examination it was discovered that much of the data was already contained in the Gwich'in Fisheries database so it had already been included in the Reference database.

ARI Library

The ARI Library is searchable from the internet web page:

http://nwtlibraries.ece.gov.nt.ca/web2/tramp2.exe/log_in?setting_key=english

Searches were conducted for references of all the research subjects covered by the GRRB. When these references were combined into the Reference database it was found that many duplicates existed. It was felt that the original Gwich'in Library was probably based on the ARI Library and little new material is contained there.

One observation on the Reference Library is that there can be no direct relationship made between the Research database and the Reference database. This is because many of the research reports for licences or permits have never been submitted to the licencing bodies. ARI and the GRRB are becoming stricter on this requirement of licencing or support but some voids in reporting still exist.

Recommendation for Reference Database

Under Section 12.8.39 of the Gwich'in Comprehensive Land Claim Agreement, the GRRB is directed to keep a public file (library) of reports on information pertaining to its mandate. At present the GRRB does not have the capability to fulfill this function because of staffing pressures. It is therefore recommended that the GRRB investigate the possibility of partnering with the Aurora Research Institute so that the professional library staff of the ARI could maintain the library for the GRRB. This would allow the GRRB to fulfill its mandate for a library without the staff pressure of having to maintain it with their own permanent staff.

Gap Analysis

To conduct the Gap Analysis, a matrix was developed with the species or disciplines of interest along the horizontal axis and actions or locations along the horizontal axis. Four matrices were developed to do the actual analysis, one for each of Aquatics, Birds, Mammals and Forestry. The content of the axis of each of these matrices were reviewed by the GRRB staff before the analysis was conducted to ensure they captured the research relevant to the GSA. The main sources for the species on the axis of the matrices were the two Gwich'in Traditional Knowledge studies entitled Nành' Kak Geenjit Gwich'in Ginjik – Gwich'in Words About the Land (Gwich'in Elders, 1997) and Gwìndòo Nành' Kak Geenjit Gwich'in Ginjik – More Gwich'in Words About the Land (Gwich'in Elders, 2001) and the Gwich'in Forestry Management Plan (GFMP).

To populate the matrices, i.e. to show where research had been conducted, searches were done of both the Research Database and the Reference Database for the key species or groups on the horizontal axis of the matrices. The research projects and reports found were then assigned to an action on the vertical axis of the matrix.

Each reference (4,694) or research project (578) was assigned equal weight and no attempt was made to determine the quality of the information contained in the reports or produced by the research project. The results are a measure of the research and reporting effort in each of the categories in the matrices. To judge the quality of the research was beyond the scope of this project.

Once populated, each matrix was analyzed for Gaps in research and reporting effort. The Gaps noted are discussed below.

Decision Process for Recommendations

A type of decision tree was used to develop the recommendations from the Gap Analysis. It was felt that this would provide more consistent recommendations and a logical

process for the development of future recommendations. The process used is outlined as follows:

1. Is topic on which research is proposed important to the Gwich'in Culturally or Economically, would it involve a country food species, or is the proposed research related to general environmental Quality? If the answer is YES go to 2 and if the answer is NO the research project will have a low priority.
2. Is there is a Management Plan implemented (for Cultural, Economic and Food items) or baseline data available (environmental quality)? If YES go to 3 and if NO go to 5.
3. Research on Cultural, Economic or Food items relating to a Management Plan (including Monitoring Plans) should have a high priority. For research on Environmental Quality go to 4.
4. Research on Environmental Quality (including monitoring the environmental quality using the concept of indicator species or Valued Environmental Components (VEC)) and track trends compared to the baseline that has been developed should have a high priority.
5. For Cultural, Economic or Food items complete, review or develop and implement a Management Plan including monitoring. For Environmental Quality go to 6.
6. For Environmental Quality complete the baseline, select the VECs to be monitored and implement the monitoring plan.

Research by the GRRB, apart from the above, should be limited to examining the following:

1. Measured changes in cultural, economical or food related items (e.g. Dolly Varden Char, Caribou, berries, etc) which are not being studied by co-management partners.
2. Measuring changes in environmental quality (VECs) that are not being studied by co-management partners (e.g. water quality, possibly contaminants, etc.).

The above is not to suggest that the GRRB should not participate in an active way in other research, but rather that they should ensure that if other co-management partners have a mandate for research in a particular area they should play a supporting and review role rather than take the complete initiative on themselves.

In many areas the GRRB is successfully developing and implementing management plans and implementing monitoring plans. The above is only suggested as a guide for the future selection and prioritizing of research so that decisions on research will be consistent and more easily presented to the communities.

Aquatic Resources

The Gap Analysis for the Aquatic Resources can be found in Table 2.

Research Gaps for aquatic resources will be discussed by fish species, group of fish species and others. Recommendations will be made within the discussion groups. As an overall observation, considerable amounts of research effort have been placed on the fish species that are traditionally important to the Gwich'in people. This includes broad whitefish, lake whitefish, inconnu and dolly varden char. These species will therefore be examined as a group. The second group of fish will be burbot, dog salmon, lake trout, grayling and northern pike. These species generally had much less research effort even though they have either a domestic fishery or recreational value. The third group to be discussed will be cisco and long nose suckers. At present this group has the least interest as a food source or sport fish but in the past they were extremely important as dog food for the Gwich'in people.

Broad Whitefish, Lake Whitefish, Inconnu and Dolly Varden Char

These are the main fish species of domestic value to the Gwich'in people. From the types and amount of research found on these species it is thought that there is a good understanding of the species biology, distribution, population dynamics, movement and harvest. It is also noted that only one of these species, dolly varden char, is currently threatened from the harvesting pressure.

Because of the importance of these species, it is critical that they are monitored and managed for the benefit of the Gwich'in people. To accomplish this it will be necessary to have a solid understanding of the status of their populations, which can be obtained through monitoring, and to have a method to respond to changes in the population which can be obtained through a management plan. It is felt that the co-management partners can be utilized to fill in any information Gaps in the general biology of these species with their annual research efforts.

No research permits were found for work on contaminants in any of these species.

The research Gaps for these species are:

1. The management plan for Inconnu is relatively old and may need to be updated.

2. There is no integrated management plan for Dolly Varden Char even though there are several components of a plan developed.

3. There is no management plan for lake whitefish.

4. Individual monitoring Plans should be developed for Inconnu, Dolly Varden Char and Whitefish. These plans can be modeled after the Dolly Varden Char Monitoring Plan in place for the Rat River (Aklavik) and can be implemented

on a yearly basis by the appropriate Renewable Resource Councils using paid staff to ensure accurate results. Scientific and Technical support for these studies can be provided by the GRRB.

5. A monitoring program for contaminant levels in Inconnu, Dolly Varden Char and Whitefish should be developed and implemented. Sampling could be conducted on domestically harvested fish. The resulting data should be maintained in a database at the GRRB. The study should be conducted on a regular cycle (5 year) and be designed so statistical trends in contaminant levels can be tracked, if encountered. This monitoring would concentrate on the contaminant levels in the fish species sampled. If levels of concern (CCME Criteria) were found programs could be developed to provide a more in depth examination of the contaminant sources and their effect on human health in the area.

Burbot, Lake Trout, Grayling, Northern Pike and Dog Salmon

In this group of species Burbot has a domestic fishery value for the Gwich'in people. Lake Trout, Grayling and Northern Pike have a sport fishing value and Dog Salmon (Chum Salmon) is only recently noted in the GSA. The level of knowledge and research on these species in the GSA vary but are generally more limited than the first group of species.

Burbot is the most important species to the Gwich'in in this group and it has had the most attention from a research perspective. Some information is available about the biology and habitat of this species but other information is limited, including harvest data. Recent research has been initiated on contaminants associated with the species. Distribution data is mainly associated with other more general studies on fish populations.

Limited information has been collected on Lake Trout, Grayling and Northern Pike in the GSA. Biological information is available from other jurisdictions. These three species are most commonly associated with a sport fishery, and sport fisheries are limited in the GSA. No data was found relating to contaminants in these species.

Dog Salmon appear to be a recent arrival to the area. Little information is available on the distribution of the species but considerable information is available from other jurisdictions.

The research Gap recommendations for this group of species are as follows:

1. The GRRB should consider obtaining more information on the biology, habitat and movement of Burbot in the GSA.
2. A Burbot management plan should be developed.
3. A Creel census system should be developed with the co-management partners of the GRRB to monitor the harvest of Lake Trout, Grayling and Northern

Pike in the GSA. Particular attention should be placed on the lakes in the eastern GSA (e.g. Sandy and Travaillant Lake area), which has a high sport fishing potential.

4. The contaminant research on Burbot should be continued and programs should be initiated on Lake Trout, Grayling and Northern Pike.
5. Research on Dog Salmon should be placed in the hands of co-management partners because the research consumes scarce resources and contributes little to the knowledge base of fish important to the Gwich'in people.

Cisco and Long Nose Suckers

There was limited research or reference material on these species in the GSA. The species have limited direct importance to the Gwich'in people and therefore research efforts by the GRRB on these species should be limited.

General Fisheries Research Gaps

General fisheries data for the GSA is available from a series of Environmental Impact Statements that have generally been conducted on the various iterations of the Mackenzie Gas Pipeline project. These data do not provide a comprehensive picture of the aquatic habitat in the GSA. In general, these data are concentrated on the east side of the Mackenzie River because the pipeline proposals followed a route in that area. It would benefit the management of the fisheries in the GSA to have a more comprehensive inventory for the aquatic habitat in the GSA.

Recommendation:

1. In cooperation with the co-management partners, design and implement a program to document the aquatic habitats in the GSA. This program should also be coordinated with the Renewable Resource Councils and be used as a training and employment program for Gwich'in youth interested in Renewable Resource Management.

Other Aquatic Resources

The research and reference reports found on aquatic resources other than fish were limited. In the case of water quality it should be pointed out that most of this type of data is presently accumulated in environmental impact studies and very limited monitoring of water quality is conducted by regulators. It is felt that this is a major research and monitoring Gap. There should, at a minimum, be consistent water quality monitoring where major rivers (Mackenzie and Peel rivers) enter the GSA. The protocols for monitoring these stations should provide for data sets that over time can be readily and accurately monitored for trends in water quality. This could be done in a similar manner

to the system used by the Prairie Provinces Water Board (http://www.mb.ec.gc.ca/water/fa01/index.en.html). The present system for hydrometric monitoring in the NWT was considered sufficient upon review (http://www.wsc.ec.gc.ca/index_e.cfm?cname=main_e.cfm). It should be noted that these data are presently available on the WEB and references to them are not included in the Reference Database.

The present information on other components of the aquatic environment is limited for the GSA. It probably is not necessary to have a detailed inventory of aquatic invertebrates, plankton, or periphyton for the GSA. It would however be valuable to have a general stream classification for the GSA. This would allow for the evaluation of specific areas for fish habitat and be a tool in the evaluation of the numerous development permits that are submitted to the regulatory system. Many systems of this type are in existence (http://ilmbwww.gov.bc.ca/risc/pubs/aquatic/overview/index.htm).

The recommendations for non-fish aquatic resources are:

1. The GRRB should approach their co-management partners and INAC to design and implement a transboundary water quality monitoring network for the Mackenzie and Peel Rivers.

2. The GRRB, with the co-operation of their co-management partners, should initiate an aquatic habitat classification. The system could be phased over several years.

Table 2: Information and research matrix for aquatic resources.

	Fish											Aquatic Environment			
	Broad Whitefish	Lake Whitefish	Inconnu	Dolly Varden	Burbot	Lake Trout	Dog Salmon	Arctic Grayling	Northern Pike	Long Nose Sucker	Cisco	Water	Invertebrates	Sediment	Plankton
Biology	16	6	6	8	2	2		3	6		4		1		
Habitat	7	1	1	1	2	1					1				
Distribution	11	6	8	2	2	1	4	2	3	3	7		1	3	
Population Dynamics	4	2	1	3		1									
Harvest	14	6	1	5		2			2						
Predators													1		
TK	8	2	1			1			1						
Invasive Species															
Development Impacts	1		2		1				1				1	5	
Disease, Parasites					1	2									
Quality, Contamination			1		1								1		
Quantity												1			
Management Plans	1		1	1											
Climate Change	2	2		1	1	1	1	1	1	1	1			2	
MACKENZIE R															
PEEL R	4	2	3	2		3	1	3	3			1	2		
ARCTIC RED R	2	1	1		3	1		2	1	1	2				
RAT R			1	14	1			1			1	1			
TRAVAILLANT R	2	2	2		2	3		2	2	2	3				
RENGLENG R															
CAMPBELL CK	3	1	1		1	1		1	1		1				
FROG CK	1								1						

Table 2: Information and research matrix for aquatic resources (continued).

	Fish											Aquatic Environment			
	Broad Whitefish	Lake Whitefish	Inconnu	Dolly Varden	Burbot	Lake Trout	Dog Salmon	Arctic Grayling	Northern Pike	Long Nose Sucker	Cisco	Water	Invertebrates	Sediment	Plankton
VITTREKWA R				3									1		
WILLOW R													1		
VITTREKWA R-L															
TRAVAILLANT L	2	2	2		2	4		2	2	1	3				
SANDY L						1									
CAMPBELL L	1	1	1					1	2		1				
SHELL L									1						
BONNETPLUME L									1						

Forestry

The Gap Analysis matrix for Forestry can be found in Table 3.

Looking at the research and references on tree species, spruce are well researched, with limited research on poplar and birch and virtually no research on larch. Research on shrubs and under story is also very limited.

A reasonable level of research is available on soils, particularly on permafrost and soils.

There is a Draft Gwich'in Forestry Management Plan (GFMP) for the GSA.
Looking at species other than harvestable timber there is limited research or reference material.

No reference was found to the Ecosystem classification conducted by the GNWT in the late 1990s and early 2000s. This is considered to be a very important piece of information in the management of forestry resources of the GSA (forestry resources in this context includes non-forestry plants and activities shown in the Gap Matrix).

The recommendations developed from the Gap Analysis are:

1. GRRB should work through the ENR (Forestry) to determine the status of the ecosystem classification for the GSA. If it is complete the GRRB must obtain a copy of the information for their use. If it is not complete they should initiate an agreement with the ENR to complete the work for the GSA.

2. The GRRB should complete and implement the GFMP as soon as possible.

3. The GRRB, with the assistance of their co-management partners, should develop and implement a system to quantify the timber harvest for all purposes in the GSA. The implementation of this system should involve the Renewable Resource Councils.

4. The GRRB should develop and implement a plan to inventory and monitor the locations for berry picking and medicinal plant collection in the GSA. This should be done in cooperation with the Gwich'in Social and Cultural Institute.

Table 3: Information and research matrix for forestry resources.

	Forestry					Non-Timber Forestry					
	Spruce	Larch	Poplar	Paper Birch	Shrubs	Under Story	Soils	Berries	Medicinal Plants	Traditional Food	Mushrooms
General Biology	14		1	1	1	2	4				1
Inventory	1										
Commercial Harvest											1
Domestic Harvest								1			
Sustainable Harvest	1		1								
Development Activities	1						3				
Conservation Zones											
Forest Protection	4						1				
Forest Health											
Forest Renewal	12						1				
Harvest of NTFP											
Wildlife	1		1	2			3				
Heritage Resources											
Traditional Knowledge	1			1				2	1	9	
Land slides, Slumping							1				
Permafrost	9	1					11				
Invasive Species											
Management Plans	1							1			
Climate Change	2						1				

Birds

The Gap Analysis matrix for bird species in the GSA is contained in Table 4. The research on bird species in the GSA is limited compared to fish and wildlife. It appears that in recent years activities have increased with the influence of Ducks Unlimited. Of all the species examined, geese seem to have received the most attention and no information was found on ravens.

The species that appear to be most important to the Gwich'in people are ducks, geese and grouse (including ptarmigan). The populations of these species appear to be healthy but monitoring and Management Plans would be advisable to try to detect and avoid population declines.

Song birds and shore bird populations are being used in other jurisdictions as a barometer of environmental health. The general inventories of these two groups of birds in the GSA are limited.

Very limited information could be found on contaminant levels in waterfowl or grouse species important to the Gwich'in people as food sources.

Recommendations resulting from the above are:

1. The GRRB should continue to support their co-management partners and Ducks Unlimited in the development and implementation of monitoring programs for waterfowl.

2. The GRRB should examine with their co-management partners, the possibility of establishing a monitoring program for songbirds and shorebirds. This might be designed around a similar concept to the 'Christmas Bird Counts' in southern Canada but be associated with a date in the summer months.

Consideration should be given to conducting a survey of contaminant levels in waterfowl and grouse from the GSA.

Table 4: Information and research matrix for birds.

	Black ducks	Mallard	Geese	Swans	Scoters Scaup Others	Willow Ptarmigan	Sharp-Tail Grouse	Spruce Grouse	Raven	Small Birds	Sandhill Crane	Shore Birds	Eagles	Owl	Raptors
Biology	1		2		1										
Habitat	2		2									1			
Food			3											1	1
Distribution	1	3	5	1	1		1			4		2	3	2	2
Population Dynamics	2	1	4	3			1					1			
Harvest	7	7	9	1	5										
Predators						1									
Disease															
Contaminants						1	1	1				1			
Development						1						1			
Climate Change	1	1	1	1	1					1	1	1			
Invasive Species															
Management Plan			1												
Traditional Knowledge								1			1		1		

Mammals

The information and research matrix for mammals can be found in Table 5.

The Gap Analysis considers two groups of mammals. The first group includes Caribou (Porcupine, Barren Ground caribou other than Porcupine, and Woodland), moose, Dall's Sheep, Grizzly bears and Black bears). Looking at the matrix, it is apparent that this group represents the 'charismatic mega fauna' of the GSA and has received a considerable amount of research attention. The only species in the group that might be considered for additional effort is the Black Bear. It is also interesting to note that most of these species have management plans in place or in development.

One area of limited research or reference material on these mammals, as is the case for most wildlife in the GSA, is contaminant levels. Because most of these species are used as food by the Gwich'in people this should receive immediate and dedicated attention.

The second group of mammals includes the small furbearers: Muskrat, Beaver, Marten, Snowshoe Hare, Arctic Ground Squirrel, Fox, Lynx, Wolverine, Weasel, Mink, River Otter and Wolf. The level of information and research on this group varies. During the 1960s and 1970s the work on Beaver, Muskrat, Marten and Wolverine was high. This seems to have now been reduced as has the demand for these species in the fur market. The effort on wolf has varied as well but the wolf is a popular species for study because of the ecological niche it occupies.

It is difficult to justify additional research for this second group of mammals except where the species is used as a consistent food item by the Gwich'in people or the species could provide information as a general indicator of environmental quality for the area. It is felt that muskrat might fill both of the above requirements and might be considered in future research needs by the GRRB. Muskrat should be monitored for contaminant levels because it is a food item for the Gwich'in. In addition, as an aquatic herbivore, it would make an excellent candidate as an environmental indicator for the general health of the delta as a whole.

Recommendations on Mammals

1. The present research level on all groups of caribou appears sufficient to fulfill the GRRB mandate and the GRRB should maintain their present level of effort in participation on all groups involved with caribou management in the GSA.

2. The GRRB should work cooperatively with the co-management partners to implement a Woodland and Barren Ground Caribou Management Plan for the

GSA.

3. The GRRB should ensure that Management Plans are in place and implemented for Moose, Dall's Sheep and Grizzly and Black Bear in the GSA.

4. The GRRB should, in co-operation with its co-management partners, develop a contaminant monitoring program for the mammal species most commonly used as food items by the Gwich'in people.

5. The GRRB should develop an environmental health monitoring plan for the Mackenzie Delta based on a species such as the muskrat.

Table 5: Information and Research matrix for mammals.

	Caribou																		
	Porcupine	Other Barren Ground	Mountain Including Woodland	Moose	Dall's Sheep	Grizzly Bear	Black Bear	Muskrat	Beaver	Marten	Snowshoe Hare	Arctic Ground Squirrel	Fox	Lynx	Wolverine	Weasel	Mink	River Otter	Wolf
Biology	7	5	3	5	9	5	2	3	4	9			2	3	5		3	1	8
Habitat	3	1		3	3	3		3	2	2		1		1					2
Food	3	1		1		3								1			2		2
Distribution	9	5	5	18	11	5	2	5	9	2	3	2	4	4	6	2	3	3	7
Population Dynamics	5	8		7		1					1								3
Harvest	7	1	1	8	10	4	4	4	7	8	2	1	4	6	9		4	1	7
Predators	3	3			1						2	1							1
Contaminants	8	6	4					4	3								9	1	1
Disease				2		1				1				1	3				
Invasive Species																			
Management Plans	1	3	1	4	2	5	1		1										
Traditional Knowledge	1	1	1	1	1	1	1	1	1	1	1	1			1	1	1	1	

Climate Change and Permafrost

The Research Database contained 44 studies on 'climate change'. This makes it one of the most studied topics examined in this report. These studies have covered many disciplines and it is doubtful if more research done by the GRRB could contribute to an understanding of this phenomenon.

It is therefore recommended that the GRRB support studies on this topic by other organizations but not contribute their research effort to the subject.

Similarly there were 50 research projects dedicated to the study of permafrost. Although permafrost impacts the renewable resources that the GRRB has a mandate to study, it is outside their direct mandate.

It is recommended that, as with climate change, the GRRB support future research on permafrost but not support it with research funds.

RRC, Community Input Recommendation

One of the objectives of the present study was to develop a system to involve the communities in decision making of research by the GRRB and develop research projects that have more community involvement. For the former objective the following procedure is suggested:

1. The GRRB develop a system for prioritizing research similar to the one presented above.
2. GRRB research priorities are reviewed every two years (this will provide time to complete pieces of work and not overload the RRCs).
3. Every two years, summaries of research results are presented to the RRCs (in the communities). At these meetings the progress on past research priorities should be presented as well as the priorities for the next two years.
4. The research priorities should then be finalized taking the RRC (community) input into consideration.

In relation to the involvement of the communities in research, the recommendations from the Gap Analysis have identified several areas where direct community (RRC) involvement is necessary. All Management Plans must have a monitoring component. This component is perfectly suited for community (RRC) involvement. The GRRB should develop the detailed monitoring plans to include community involvement similar to the Dolly Varden Char monitoring on the Rat and Peel Rivers. This can easily be expanded to any of the species where a Management Plan is implemented.

The same concept can also be used where environmental quality monitoring is involved. The monitoring activities can be primarily done by the communities.

In both cases it is cautioned that the GRRB would have to take a very active role in ensuring that the RRC personnel involved in the research are properly trained and supervised. This is particularly true in any work done on contaminants where very strict quality control protocols are used.

Recommendations Summary

The following is a summary of the recommendations from the report. They refer to data organization as well as research Gaps.

1. All agencies who issue research licences/permits should maintain and report similar information to ARI.
2. The GRRB should initiate a system for numbering research projects so that the resulting information can be better tracked.
3. It is recommended that all agencies that licence/permit research maintain a web accessible list of reports linked to downloadable research reports/summaries for each specific licence/permit.
4. It is recommended that the GRRB investigate the possibility of partnering with ARI so that the professional library on staff with ARI could maintain the library for the GRRB. This would allow the GRRB to fulfill its mandate for a library without the staff pressure of having to maintain it with their own permanent staff.
5. Monitoring Plans should be developed or finalized and implemented for Inconnu, Dolly Varden Char, Whitefish and Burbot. These plans can be modeled after the Dolly Varden Char Monitoring Plan in place for the Rat River (Aklavik) and can be implemented on a yearly basis by the appropriate Renewable Resource Councils using paid staff to ensure accurate results. Scientific and Technical support for these studies can be provided by the GRRB.
6. The GRRB should consider obtaining more information on the biology, habitat and movement of Burbot in the GSA.
7. A Creel census system should be developed with the co-management partners of the GRRB to monitor the harvest of Lake Trout, Grayling and Northern Pike in the GSA. Particular attention should be placed on the lakes in the eastern area of the GSA (Sandy and Travaillant Lake area) which has a high sport fishing potential.
8. In cooperation with the co-management partners, design and implement a program to document the aquatic habitats in the GSA. This program should also be coordinated with the Renewable Resource Councils and be used as a

training and employment program for Gwich'in youth interested in Renewable Resource Management.

9. The GRRB should approach their co-management partners and INAC to design and implement a transboundary water quality monitoring network for the Mackenzie and Peel Rivers.
10. The GRRB with the co-operation of their co-management partners should initiate an aquatic habitat classification. The system could be phased over several years.
11. GRRB should work through the ENR (Forestry) to determine the status of the ecosystem classification for the GSA. If it is complete the GRRB must obtain a copy of the information for their use. If it is not complete they should initiate an agreement with the ENR to complete the work for the GSA.
12. The GRRB should complete and implement the GFMP as soon as possible.
13. The GRRB, with the assistance of their co-management partners, should develop and implement a system to quantify the timber harvest for all purposes in the GSA. The implementation of this system should involve the Renewable Resource Councils.
14. The GRRB should develop and implement a plan to inventory and monitor the locations for berry picking and medicinal plant collection in the GSA. This should be done in cooperation with the Gwich'in Social and Cultural Institute.
15. The GRRB should continue to support their co-management partners and Ducks Unlimited in the development and implementation of monitoring programs for waterfowl.
16. The GRRB should examine with their co-management partners the possibility of establishing a monitoring program for songbirds and shorebirds.
17. The GRRB should maintain their present level of effort in participation on all groups involved with caribou management in the GSA.
18. The GRRB should work cooperatively with the co-management partners to implement a Woodland and Barren Ground Caribou Management Plan for the GSA.
19. The GRRB should ensure that Management Plans are in place and implemented for Moose, Dall's Sheep and Grizzly and Black Bear in the GSA.
20. The GRRB should, in co-operation with its co-management partners, develop a contaminant monitoring program for contaminants in the species most commonly used as food items by the Gwich'in people. These would include whitefish, inconnu, dolly varden char, burbot, caribou, moose, ducks, geese, grouse and muskrat.
21. The GRRB should develop an environmental health monitoring plan for the Mackenzie Delta based on a species such as the muskrat.
22. It is recommended that the GRRB support the studies on climate change and permafrost by other organizations but not contribute funding to these research efforts.

Appendix 1
Hyperlinks to ENR Publications and Reports

ENR Scientific Publications

Author Hyperlink to Abstract	Year	Title	Journal	Vol.	Pages
Carmichael L. E., J. Krizan, J.A. Nagy, E. Fuglei, M. Dumond, D. Johnson, A. Veitch, D. Berteaux and C. Strobeck.	2007	Historical and Ecological Determinants of Genetic Structure In Arctic Canids.	Molecular Ecology	16 (16)	3466-3483.
Carmichael L.E., J.A. Nagy, N.C. Larter, and C. Strobeck.	2001	Prey specialization may influence patterns of gene flow in wolves of the Canadian Northwest.	Molecular Ecology	10:00	2787-2798
Dragon D.C., and B.T. Elkin.	2001	An Overview of Early Anthrax Outbreaks in Northern Canada: Field Reports of the Health of Animals Branch, Agriculture Canada, 1962–71.	Arctic	54:	32-40
Frame P.F, D.S. Hik, H.D. Cluff and P.C. Paquet.	2004	Long Foraging Movement of a Denning Tundra Wolf.	Arctic	57:	196-203
Frame P.F, H.D. Cluff and D.S. Hik.	2007	Response of Wolves to Experimental Disturbance at Homesites.	The Journal of Wildlife Management	71(2):	316-320.
Gamberg, M., B. Braune, E. Davey, B. Elkin, P. F. Hoekstra, D. Kennedy, C. Macdonald, D. Muir, A. Nirwal, M. Wayland, and B. Zeeb.	2005	Spatial and temporal trends of contaminants in terrestrial biota from the Canadian Arctic.	Science of the Total Environment	351-352:	148-164
Gau, R.J., S. Kutz., and B.T. Elkin.	1999	Parasites in grizzly bears (*Ursus arctos*) from the central Canadian Arctic.	Journal of Wildlife Diseases	35:00:00	618-621.

Hoberg E.P., S.J. Kutz, J. Nagy, E. Jenkins, B. Elkin, M. Branigan, and D. Cooley.	2002	*Protostrongylus stilesi* (Nematoda: Protostrongylidae): Ecological Isolation and Putative Host-Switching Between Dall's Sheep and Muskoxen in a Contact Zone	Comparative Parasitology	69(1):	9-Jan
Jenkins. E. J., A. M. Veitch, S.J. Kutz, E.P. Hoberg, and L. Polley.	2006	Climate change and the epidemiology of protostrongylid nematodes in northern ecosystems: *Parelaphostrongylus odocoilei* and *Protostrongylus stilesi* in Dall's sheep (*Ovis d. dalli*).	Parasitology (2006),	132,	387–401.
Johnson, C.J., M.S. Boyce, R.L. Case, H.D. Cluff, R.J. Gau, A. Gunn, and R. Mulders.	2005	Cumulative effects on human developments on Arctic wildlife.	Wildlife Monograph	160	36 pages.
Kutz S.J., B. T. Elkin, D. Panayi and J. P. Dubey.	2001	Prevalence of *Toxoplasma gondii* Antibodies in Barren-Ground Caribou (R*angifer tarandus groenlandicus*) From the Canadian Arctic.	The Journal of Parasitology.	Vol. 87, No. 2.	pp 439-4561
Lyver P.O'B. and A. Gunn.	2004	Calibration of Hunters' Impressions with Female Caribou Body Condition Indices to Predict Probability of Pregnancy	Arctic	57:00:00	233-241
McLoughlin P.D., L. R. Walton, H.D. Cluff, P.C. Paquet and M.A. Ramsay.	2004	Hierarchical Habitat Selection by Tundra Wolves.	Journal of Mammalogy,	85(3):	576-580
McLoughlin P.D., M. K. Taylor, H.D. Cluff , R.J. Gau, R. Mulders, R.L. Case, S. Boutin, and F. Messier	2003	Demography of barren-ground grizzly bears.	Can. J. Zool.	81:00:00	294-301

ENR Manuscript Reports

#	Author	Year	Title	Pages	Hyperlink to Abstract	Hyperlink to PDF Report
102	Shank, C. C.	1997	The Northwest Territories' System of Raptor Data Collection and Storage.	a13 pp.		(PDF = 102 KB)
103	Veitch, A. M.	1997	An Aerial Survey For Muskoxen In The Northern Sahtu Settlement Area, March 1997.	42pp.	Veitch, A. M. ;1997.; An Aerial Survey For Muskoxen In The Northern Sahtu Settlement Area, March 1997.; 42pp.	
106	Veitch, A. and E. Simmons.	1998	Mackenzie Mountain Non-Resident and Non-Resident Alien Hunter Harvest Summary 1997.	28 pp.	106;. ;Veitch, A. and E. Simmons. ;1998;. Mackenzie Mountain Non-Resident and Non-Resident Alien Hunter Harvest Summary 1997. ;28 pp.	
108	Popko, R. A. and A. M. Veitch.	1998	An Aerial Survey for Beavers in the Sahtu Settlement Area October 1997.	17 pp.	108. ;Popko, R. A. and A. M. Veitch. ;1998;. An Aerial Survey for Beavers in the Sahtu Settlement Area October 1997. ;17 pp.	
112	Thiesenhausen, K. and A. Veitch.	1999	Vegetation Classification Project Sahtu Settlement Area, Summary of the 1998 Field Season.		112. ;Thiesenhausen, K. and A. Veitch. ;1999;. Vegetation Classification Project Sahtu Settlement Area, Summary of the 1998 Field Season.	
115	Carrière, S.	1999	Small Mammal Survey in the Northwest Territories. Report 1998.	22 pp		(PDF = 936 KB)

120	Veitch, A., E. Simmons and N. Whiteman.	2000	Mackenzie Mountain Non-Resident And Non-Resident Alien Hunter Harvest Summary 1998.	38 pp.	120. ;Veitch, A., E. Simmons and N. Whiteman.; 2000;. Mackenzie Mountain Non-Resident And Non-Resident Alien Hunter Harvest Summary 1998.; 38 pp.;	
121	Veitch, A., and E. Simmons.	2000	Mackenzie Mountain Non-Resident and Non-resident Alien Hunter Harvest Summary 1999	. 29 pp	121. ;Veitch, A., and E. Simmons. ;2000;. Mackenzie Mountain Non-Resident and Non-resident Alien Hunter Harvest Summary 1999;. 29 pp	
122	Veitch, A., R. Popko, and N. Whiteman.	2000	Classification of Woodland Caribou In the Central Mackenzie Mountains, Northwest Territories, August 1999.	24 pp		(PDF = 818 KB)
124	Zimmer, A., L. Robinson, A. Veitch, R. Trembath, and N. Whiteman.	2000	Sahtu Settlement Area Vegetation Classification Project Progress Report – 1999.	32 pp	124. ;Zimmer, A., L. Robinson, A. Veitch, R. Trembath, and N. Whiteman. ;2000;. Sahtu Settlement Area Vegetation Classification Project Progress Report – 1999. ;32 pp;.	.
128	D'Hont, A. M.	2000	NWT Resident Hunter Harvest Survey Results for Licence Year 1990/91.	12 pp + appendices.	D'Hont, A. M. ;2000;. NWT Resident Hunter Harvest Survey Results for Licence Year 1990/91.	
129	D'Hont, A. M.	2000	NWT Resident Hunter Harvest Survey Results for Licence Year 1991/92.	12 pp + appendices.	D'Hont, A. M. ;2000;. NWT Resident Hunter Harvest Survey Results for Licence	

					Year 1991/92. ;	
13	Treseder, L. and R. Graf.	1985	Moose in the Northwest Territories.	41 pp.	13. ;Treseder, L. and R. Graf. ;1985;. Moose in the Northwest Territories. ;41 pp.	
130	D'Hont, A. M.	2000	NWT Resident Hunter Harvest Survey Results for Licence Year 1992/93.	13 pp + appendices	130. ;D'Hont, A. M. ;2000;. NWT Resident Hunter Harvest Survey Results for Licence Year 1992/93. ;13 pp + appendices	
131	D'Hont, A. M.	2000	NWT Resident Hunter Harvest Survey Results for Licence Year 1993/94.	13 pp + appendices		(PDF = 1825 KB)
132	D'Hont, A. M.	2000	NWT Resident Hunter Harvest Survey Results for Licence Year 1994/95.	13 pp + appendices.	132. ;D'Hont, A. M. ;2000;. NWT Resident Hunter Harvest Survey Results for Licence Year 1994/95. ;13 pp + appendices.	
133	D'Hont, A. M.	2000	NWT Resident Hunter Harvest Survey Results for Licence Year 1995/96.	13 pp + appendices.	133. ;D'Hont, A. M. ;2000;. NWT Resident Hunter Harvest Survey Results for Licence Year 1995/96. ;13 pp + appendices.	
134	D'Hont, A.M.	2000	NWT Resident Hunter Harvest Survey Results for Licence Year 1996/97.	13 pp + appendices.	134. ;D'Hont, A.M. ;2000;. NWT Resident Hunter Harvest Survey Results for Licence Year 1996/97. ;13 pp + appendices.	
137	Veitch, A., and E. Simmins.	2001	Mackenzie Mountain Non-resident and Non-resident Alien Hunter Harvest Summary 2000.	40 pp.		(PDF = 671 KB)
138	Ashley B.	2001	Edible Weights of Wildlife Species Used for Country Food in the	83 pp		(PDF =852

			Northwest Territories and Nunavut.			KB)
142	Larter N., and J. Nagy.	2001	The Distribution of Forage Types Among four Terrestrial Habitats on Southern Banks Island.	20 pp.	142. ;Larter N., and J. Nagy. ;2001;. The Distribution of Forage Types Among four Terrestrial Habitats on Southern Banks Island. ;20 pp.	
143	Carriere S., and J. Lange.	2002	Detailed Procedures Manual: General Status Ranks of Wild Species in the Northwest Territories.	61 pp		(PDF = 606 KB)
144.	Popko R., A. Veitch, and M. Promislow.	2002	An Aerial Survey for Beaver Lodges in the Sahtu Settlement Area.	29 pp.		(PDF = 301 KB)
146	Larter N.C.	2002	Caribou Tracking Survey in the Paulatuk Area Associated with the Darnley Bay Resources Aeromagnetic Survey, September 1997.	19 pp		(PDF = 87 KB)
152	Larter N. and D.G. Allaire.	2002	Mackenzie Mountain Non-Resident and Non-Resident Alien Hunter Harvest Summary	46 pp		(PDF = 442KB)
154	Larter N.C. and D. Allaire.	2003	Mackenzie Mountain Non-Resident and Non-Resident Alien Hunter Harvest Summary 2003.	51pp		(PDF = 497 KB)
160	Gunn, A., J. Lee and B. Elkin.	2005	Catalog of Data Files for Caribou Collections (Morphologic Measurements, Parasitology, Contaminants)	84pp		(PDF = 1108 KB)
165	Larter N.C. and D. Allaire.	2005	Mackenzie Mountain Non-resident and Non-resident Alien Hunter Harvest Summary 2004.	51 pp		(PDF = 1521 KB)
167	Nagy J. A., W.H. Wright, T.M. Slack and A.M. Veitch	2005	Seasonal ranges of the Cape Bathurst, Bluenose-West, and Bluenose-East barren-ground caribou herds.	9 pp.		; (PDF = 3265 KB)
168	Larter N.C., and D. Allaire.	2006	Mackenzie Mountain Non-resident and Non-resident Alien Hunter Harvest Summary 2005.	62 pp		(PDF = 1372 KB)
171	Nagy J.A. and D. Johnson.	2006	Estimates of the Number of Barren-ground Caribou in the Cape Bathurst and Bluenose-West Herds and Reindeer/Caribou on the Upper Tuktoyaktuk Peninsula Derived	66 pp		(PDF = 2806 KB)

			Using Post Calving Photography, July 2006.			
174.	Larter C. L., D.G. Allaire.	2007	Mackenzie Mountain Non-resident and Non-resident Alien Hunter Harvest Summary 2006.			(PDF = 1524 KB)
177	Nagy J.A., B. Tracz and A. Gunn.	2008	Estimates of the Number of Barren-ground Caribou in the Bluenose-East Herd Derived Using Post Calving Photography, July 2005.	In press		.
180	Larter N.C. and D.G. Allaire.	2008	Mackenzie Mountain Non-resident and Non-resident Alien Hunter Harvest Summary 2007.	77 pp		(PDF = 1518 KB)
23	. Poole, K.G.	1989	Lynx management and research in the NWT, 1988-89.	46 pp.	23;. Poole, K.G. ;1989;. Lynx management and research in the NWT, 1988-89. ;46 pp.	
24	Poole, K.G.	1989	Marten management and research in the NWT, 1988-89.	39 pp.	24. ;Poole, K.G. ;1989;. Marten management and research in the NWT, 1988-89. ; 39 pp.	
26	Shank, C. and R. Glaholt.	1987	Gyrfalcon survey : Richardson Mountains, NWT - field report 1987.	13 pp		(PDF = 309 KB)
30	McLean, B.D. and F. Jackson.	1992	Spring classification counts of the Bluenose herd, March 1988.	19 pp.	30. ;McLean, B.D. and F. Jackson. ;1992;. Spring classification counts of the Bluenose herd, March 1988. ;19 pp.	
31	Fraser, P. and M. Williams.	1992	Spring classifications counts of the Bluenose caribou herd, March 1989.	20 pp		(PDF = 491 KB)
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