February 2010

REPORT

FINAL REPORT ON

Renewable Resource Assessment of the Ka'a'gee Tu Candidate Protected Area

Submitted to:
Indian and Northern Affairs Canada
Yellowknife, NWT

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PLAIN LANGUAGE SUMMARY

This report summarizes available information on renewable resources in the Ka'a'gee Tu Candidate Protected Area (Study Area), their current and potential future uses, and their economic value. The purpose of the study was to assess the use of wildlife, fish, trees, plants, art and craft materials, wilderness and renewable energy. The results were based on reported accounts of renewable resource uses, estimates, and best professional judgement. The economic value of resource uses was calculated through replacement values (the money saved by harvesting resources instead of buying them) or estimates of direct income for the people in the community of Kakisa.

Trees, fish and wildlife were found to be the resources with the highest importance for the Study Area. Commercial logging of trees, fuel wood consumption, recreational fishing, commercial fishing, and subsistence harvesting of wildlife were found to be highly valuable for the Study Area residents in terms of economic values. Tourism and trapping have a comparatively lower economic value, however, trapping is acknowledged to have a high traditional and cultural value for the people in the nearby communities.

Subsistence wildlife harvesting and trapping are both important resource uses with high future potential in the Study Area. Recreational hunting is also assumed to occur but is less important in the area. There is no big game outfitting or commercial wildlife harvesting in the Study Area and the future potential for these resource uses is assumed to be limited.

Fishing, both subsistence and recreational, have been found to be of cultural and economic importance in the Ka'a'gee Tu area. While it is difficult to assess the economic value of subsistence fishing due to lack of data, cultural tradition certainly adds value. Kakisa, Tathlina and beaver lakes are considered the most important lakes in the Study Area. There is currently a viable commercial fishery utilizing Kakisa Lake. Past license holders also used Tathlina and Dogface lakes but recent stock declines probably resulted in the current lack of this resource use.

Two local fishing lodges (Deeghani Lake Lodge and Brabant Lodge) contribute annual revenue to the local economy. The value of recreational fishing is assumed to be high with a high future potential.

Trees and plants have been used throughout the centuries in the Ka'a'gee Tu area for traditional and personal use. Trees are currently used for both commercial logging and as fuel wood to heat homes and cabins. There are several areas within the Study Area that have been identified as potential logging areas, with good sawlog potential. It is assumed that this resource use has a high future potential.

Traditionally, plants and berries have been harvested by the Ka'a'gee Tu First Nations for food and treating illness. Rat root is a very important plant used for healing by the Ka'a'gee Tu people. The areas around Kakisa, Tathlina and Beaver lakes have been identified as important harvest areas.

Birchbark, plants, porcupine quills, tree branches, roots and sap, animal antlers, bone, fur, hide and feathers found within the Ka'a'gee Tu area are all used by the people of Kakisa to produce arts and crafts. There are currently no artists registered with the NWT Arts Database that live in Kakisa and arts and crafts are not reported to bring an important income to the local residents.

Wilderness resources in this report have been assessed in their relation to tourism activities, and include non-consumptive activities such as wildlife viewing, bird watching, aurora watching, scenery watching / sight-seeing,

photography, boating, hiking, backpacking, cross-country skiing, snowshoeing, snowmobiling, horse-back riding, picnicking, swimming and interpretive activities.

Within the Ka'a'gee Tu area, Dogface Lake is considered to have a "high" tourism potential. Deeghani Lake Lodge, a sport fishing destination, is located on an island within this lake. The highest ranking for tourism potential in the Study Area was in the Beaver Lake area (including the Brabant Lodge). It is likely that many of the visitors to the area are people driving the highways of the Dehcho Connection, a route connecting the NWT, Alberta and British Columbia.

The community of Kakisa depends currently on diesel fuel for its electrical power. There is interest in supplementing this fossil fuel consumption with alternative energy sources but there are no known uses of wind energy, hydroelectric energy or solar energy within the Ka'a'gee Tu area. Currently, provisions in the draft Dehcho Land Use Plan prevent the development of hydroelectric projects within the Study Area.

EXECUTIVE SUMMARY

Introduction

In accordance with the objectives outlined in the Northwest Territories Protected Areas Strategy's Renewable Resource Assessment Guidelines (NWT-PAS 2005), the purpose of this study is to conduct an assessment of the status of renewable resources within the Ka'a'gee Tu Candidate Protected Area, located within the Dehcho Land Claim Area (Dehcho) of the Northwest Territories (NWT). The Ka'a'gee Tu First Nations (KTFN) began the initiative of land protection in this area beginning in the 1970s, with official support for the protection of the current Candidate Protected Area being confirmed in 2006 (Ka'a'gee Tu First Nation 2006). This description incorporates an assessment of each resource's distribution, abundance, present use by residents of the area, future potential use and economic value. The analysis aims to assist in the determination of the social and economic implications of the renewable resources and their uses within the Ka'a'gee Tu Candidate Protected Area (Study Area).

This Renewable Resource Assessment (RRA) analyzes seven different categories of renewable resources including their present and future uses and potential commercial values. The resources assessed in this study are:

- Wildlife (subsistence harvest, recreational harvest, outfitting, trapping, commercial harvesting);
- Fish (subsistence fishing, recreational fishing, commercial fishing, hatcheries);
- Trees (commercial timber harvest, fuel wood harvest);
- Plants (berry picking, medicinal and food plant harvesting, agriculture);
- Art and Craft Materials (clothing, birchbark baskets, beadwork, carving, quillwork, tufting)
- Wilderness (eco-tourism, tourism businesses, lodges); and
- Renewable Energy (wind power, hydro-electric power, solar power, geothermal power).

Wildlife

Wildlife is assessed as being a key renewable resource in Ka'a'gee Tu Candidate Protected Area. The area sustains a wide variety of boreal ungulates, carnivores, mustelids, aquatic mammals, and avifauna. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the Species at Risk Act (SARA) listed species potentially occurring in the study area include wood bison, woodland caribou, wolverine, peregrine falcon, whooping crane, yellow rail, rusty blackbird, and northern leopard frog. The use of wildlife resources including subsistence hunting, recreational hunting, and trapping occurs in the study area. Both big game outfitting and commercial harvest of wildlife are not practiced in the Study Area.

Subsistence harvesting is an important resource use among Dehcho residents and provides a fairly large amount of meat to the families. Subsistence hunting reduces the high cost of imported commercial food and equates to approximately $70 million annually for Dehcho residents. Subsistence harvesting is strongly connected with Traditional Knowledge and possesses a high cultural value in this respect. There is a recognized economic value for wildlife subsistence harvesting because of the savings realized by local residents who do not have to purchase meat at high costs. Moose remain the most important wildlife species for subsistence harvest of Dehcho residents. It is not known what percentage of the reported community harvest does occur regularly within the Ka'a'gee Tu Candidate Protected Area.

Today, trapping still holds important cultural and traditional value to NWT residents. It is believed that trapping provides moderate value (i.e. active trappers are likely to be using the Study Area, and a stable healthy furbearing population exists) to the Study Area residents through direct income; and many more residents likely trap for food (rabbits and hares), other domestic use (parka trims) and local sales. Data on trapping success and income were not yet available for the Ka'a'gee Tu Candidate Protected Area, and no estimates of domestic use or local sales of trapped furbearers exist or were available for this report. It is not known how much revenue is generated by the harvest of furs from the Study Area. More information is needed regarding species specific harvest, harvest volumes and locations and economic benefits. It is believed that, similar to other Dehcho Regions, trapping plays a role in the Study Area economy.

Fish

Historically, three methods of fishing have occurred in the Ka'a'gee Tu Candidate Protected Area. These methods include subsistence, commercial, and recreational fish harvesting. In the community of Kakisa, many people depend on fish resources for a source of meat to feed themselves and their families. There are several different species of fish that are commonly utilized. The main species used for a food source include whitefish, arctic grayling (blue fish), lake trout, walleye and inconnu. Recreational fishing typically focuses on the larger and more unique game species such as lake trout, pike and walleye. Currently, two commercial licenses are in use in the Study Area, and the business is primarily conducted locally. The only lake that was commercially used for fisheries during the last years is Kakisa Lake. Tathlina Lake has been previously utilized by commercial fishermen employing float planes as a means of transporting catches. After fish stocks started to decline the annual quota was not reached anymore. The Great Slave Lake commercial fishery for whitefish extends into the Study Area and uses Beaver Lake.

The most common areas of fish harvest are Kakisa Lake, Tathlina Lake, Beaver Lake and their tributaries. Other popular areas include Dogface Lake and the Cameron River. These areas are most easily accessed by snowmobile in the winter and by boat in the summer.

Trees

Trees have been used throughout the NWT for centuries, for transportation, cooking, heating and shelter. Today, the people of Kakisa still use wood for the same purposes. The Ka'a'gee Tu Dene use trees and shrubs to make dog sleds, canoes, toboggans, snowshoes and axe handles. They also subsidize their heating costs with wood collected from the Study Area.

There is currently one commercial harvesting permit operating within the borders of the Study Area. This permit allows for the harvest of 2000 m^3 (552 cords) of wood in 2009. There are several small saw mills in the southern part of the NWT, but not in the community of Kakisa. There are several areas within the Ka'a'gee Tu Candidate Protected Area that have been identified as potential logging areas, with good sawlog potential. These are found in northern and south-eastern portions of the Study Area.

At present, most of the wood cut for personal use in the Study Area is cut without any permit and is used for wood heating and smoke house purposes both within the community and at cabins throughout the Study Area. No specific numbers are available on how much wood is taken each year for this purpose, but it is estimated that 300 cords of wood are used annually.

Plants

Plants have been, and continue to be used for a variety of purposes within the Study Area. They are used for food, medicine, ritual and spiritual purposes. Berries are abundant within the Study Area and are harvested, as well as onions and wild herbs, for consumption. Rat root is a particularly important plant used for healing by the Ka'a'gee Tu people. The areas around Kakisa, Tathlina and Beaver lakes have been identified as important harvest areas. The Study Area has been identified as having some land appropriate to certain types of farming. Currently farming is not allowed within the Ka'a'gee Tu Candidate Protected Area, but there has been a community gardening project established in Kakisa to encourage healthy eating. There is currently no available information on the economic value attached to food plants within the Study Area.

Art & Craft Materials

Everyday items necessary for the survival of the people of Ka'a'gee Tu have traditionally be made directly from renewable resources. Over time, the design of many of these items became more decorative. Renewable resources still play an important role as materials used to make arts and crafts in the Ka'a'gee Tu Candidate Protected Area.

At this time there are no artists registered with the NWT Arts Database that live in Kakisa. Most artists make their crafts as needed for personal use, or when ordered by a customer. Arts and crafts, while culturally important within the Ka'a'gee Tu Area, do not contribute significantly to the local economy.

Birchbark, plants, porcupine quills, tree branches, roots and sap, animal antlers, bone, fur, hide and feathers found within the Ka'a'gee Tu area are all used by the people of Kakisa to produce arts and crafts. Typically, any animals harvested for art and craft materials are also used for subsistence purposes as well.

Wilderness

Renewable wilderness resources relate to tourism activities in the Study Area. These include non-consumptive activities such as wildlife viewing, bird watching, aurora watching, scenery watching / sight-seeing, photography, boating, hiking, backpacking, cross-country skiing, snowshoeing, snowmobiling, horse-back riding, picnicking, swimming and interpretive activities. Consumptive activities such as fishing and hunting are considered in other sections of this report.

Within Ka'a'gee Tu, Kakisa Lake and the Kakisa River are considered to have "low" tourism potential based on low marketability and potential economic benefit (Deh Cho Environmental 2003). Dogface Lake is considered to have a "high" tourism potential. Deeghani Lake Lodge, a sport fishing destination, is located on an island within this lake. The highest ranking for tourism potential in the Study Area was in the Beaver Lake area at the headwaters of the Mackenzie River. This area, and specifically Brabant Lodge located on Beaver Lake, is considered to have "very high" tourism potential. The remainder of the Study Area is either not assessed or is not considered to have any tourism potential.

Most tourists visiting Ka'a'gee Tu spend time at the Kakisa River Bridge Territorial Park day-use area, located on the Mackenzie Highway, or at the Lady Evelyn Falls Territorial Park campground, located along the road between Kakisa and the highway. Visitors also drive down to the community of Kakisa and occasionally spend the night in the motel there. Boating activities are popular along the Kakisa River. Tourists may also hike through the Cameron Hills area in the South-west of the Study Area. It is likely that many of the visitors to the

area are people driving the scenic Dehcho Connection (also known as the Waterfalls Route), a circular route extending through parts of the NWT, Alberta and British Columbia.

The estimated economic value of tourist activities taking place within Ka'a'gee Tu is estimated to be $10,000 annually. This revenue is from two main sources: camping fees at the Territorial Park and tourist purchases and accommodation fees at the River Front Convenience Store & Motel.

Renewable Energy

The community of Kakisa is reliant on fossil fuels (diesel fuel) for its electrical power. The Lady Evelyn Falls Territorial Park, located within Ka'a'gee Tu, also relies on diesel fuel for its seasonally operated facilities. The power for both is generated at a plant located north of the Study Area, providing energy that is often considered expensive for community residents. There is interest in supplementing this fossil fuel consumption with alternative energy sources. In this report, renewable resources in the forms of wind energy, hydroelectric energy and solar energy are assessed.

Currently, there are no known uses of wind energy within Ka'a'gee Tu, although small-scale turbines could potentially provide energy to isolated cabins in the Study Area.

Studies have been conducted to investigate the potential for harnessing hydroelectric energy along the Mackenzie River. The rivers within Ka'a'gee Tu were not considered in these studies. However, in the past there was interest in harnessing the flow of the Kakisa River to the east of the community of Kakisa. Currently, provisions in the draft Dehcho Land Use Plan prevent the development of hydroelectric projects within the Study Area.

There are no known situations where solar energy is harnessed within Ka'a'gee Tu, though potentially suitable applications could include providing supplementary power at the Territorial Park, in the community of Kakisa, and at isolated cabins in the Study Area.

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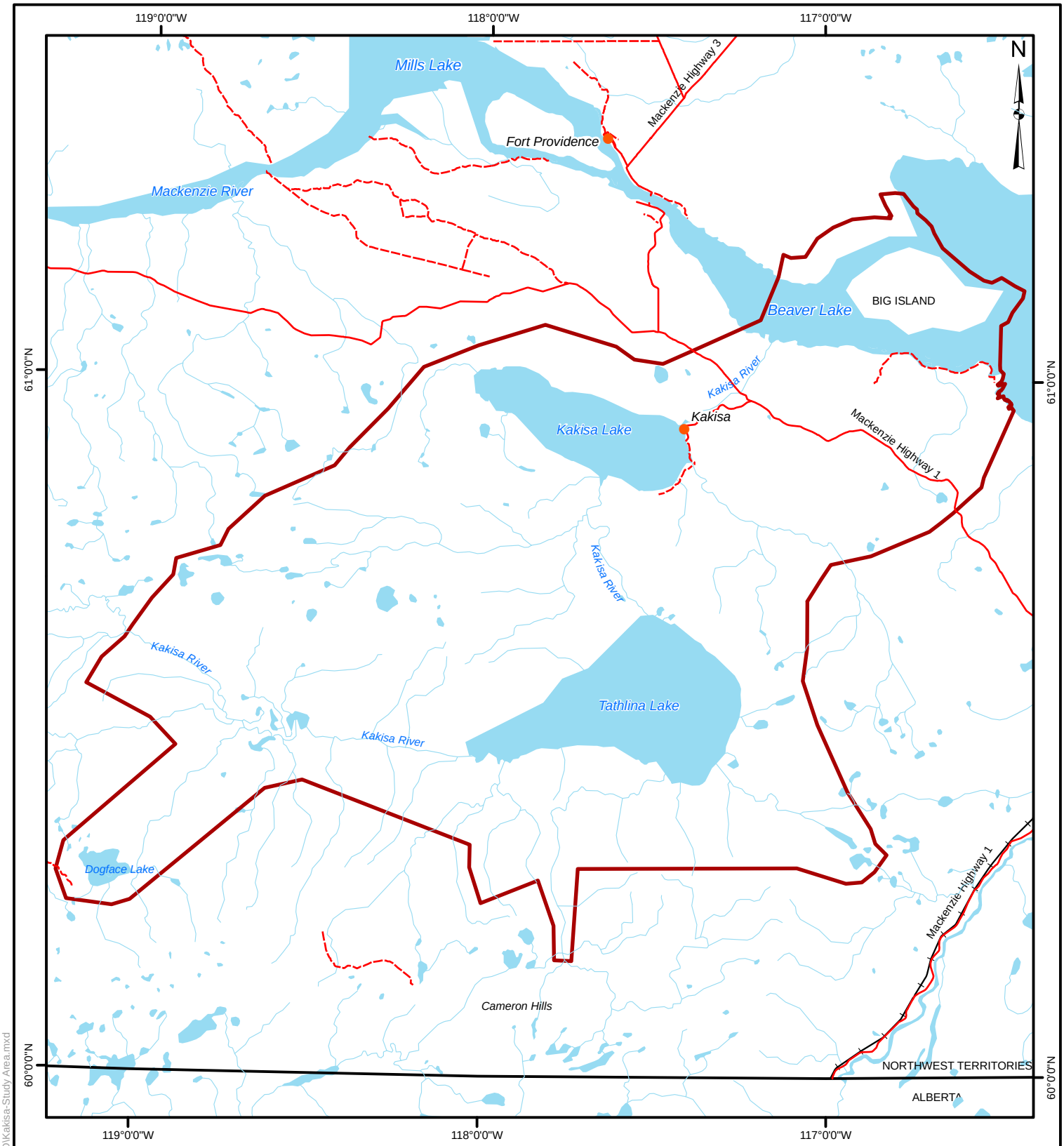
1.0 INTRODUCTION

The Northwest Territories (NWT) is often regarded as one of the world's greatest remaining wilderness areas, encompassing such variable landscapes as taiga, tundra and boreal ecosystems. The Northwest Territories Protected Areas Strategy (NWT-PAS) is a community-based tool that helps guide the protection of areas that are considered to be of cultural or ecological significance (NWT-PAS 1999). Using the best available knowledge, it aims to help achieve long-term protection to a network of these areas across the NWT and works with two goals to represent areas of concern: to protect special natural and cultural areas; and to protect core areas to represent the NWT's 42 ecoregions.

In January 2006, the community of Kakisa (which may also be referred to as Ka'a'gee or translated as *Between the Willows*) identified the Ka'a'gee Tu Area of Interest (Ka'a'gee Tu or Study Area) as a NWT-PAS Area of Interest (EBA Engineering Consultants Ltd. [EBA] 2007). The Area of Interest was incorporated into the Final Draft Dehcho Land Use Plan as a Conservation Zone with only tourism and traditional harvesting as permitted activities (Dehcho Land Use Planning Committee [(DLUPC] 2006). In June 2008, after further input from surrounding communities and with unanimous support from the Dehcho First Nations, the boundary was modified to included additional significant cultural and ecological components. In December 2008, the K′a′gee Tu First Nation (KTFN) submitted a formal proposal to the Canadian Wildlife Service (CWS) requesting that the CWS sponsor the Ka'a'gee Tu Area of Interest as a Candidate Protected Area. In August 2009, the CWS agreed to formally sponsor the Ka'a'gee Tu Candidate Protected Area. With this protection, the people of the KTFN are seeking to preserve their traditional harvesting areas known to be rich in wildlife, plants, and fish resources. The KTFN is seeking permanent protection of the Study Area through the NWT-PAS.

The Ka'a'gee Tu Candidate Protected Area measures approximately 9,600 square kilometers (km^2) in size and is located in the south-eastern corner of the Dehcho region (Figure 1). It includes a large portion of the Kakisa River watershed, including the Upper, Middle and Lower Kakisa rivers, Tathlina Lake, and Kakisa Lake. The people of Ka'a'gee Tu want to maintain their cultural and natural heritage by ensuring their traditional harvest areas are maintained. The area is rich in wildlife and provides habitat for diverse species such as boreal woodland caribou, moose, beaver, fish and many species of waterfowl. Along the shores of Beaver Lake at the area's northern boundary, the shores of Heart Lake along the eastern boundary, and along the Upper Kakisa River in the area's south-west corner, there are wetlands known as Etaáhdlîî that are recognized nationally and internationally as important habitat for waterfowl (NWT-PAS 2008).

Most of the Ka'a'gee Tu Candidate Protected Area is currently protected through the Dehcho Interim Measures Agreement (IMA) through existing surface and subsurface land withdrawals (DLUPC 2006). Additionally, the Candidate Protected Area includes portions or all of the following Conservation Zones in the Final Draft Dehcho Land Use Plan: Upper Mackenzie Conservation Zone 10; Great Slave Lake Shoreline Conservation Zone 11; Heart Lake, McNally Creek, Muskeg River Conservation Zone 13; and Kakisa Watershed Conservation Zone 14 (DLUPC 2006). This area was selected for protection to balance the preservation of the Ka'a'gee Tu Dene cultural and natural heritage resources with known socio-economic resources. Therefore, areas of known high non-renewable resource potential were excluded from the Candidate Protected Area (NWT-PAS 2008). Areas included in the Ka'a'gee Tu Candidate Protected Area consist of important travel routes, harvest sites for plants and wildlife (including waterfowl and fish), camp sites, and other environmentally and culturally significant areas (EBA 2007). This document was prepared to compile all available documented information on the Ka'a'gee Tu Candidate Protected Area's renewable resources, their current and potential uses and



LEGEND

- COMMUNITY
- ROAD
- SEASONAL ROAD
- RAILWAY
- STUDY AREA

0 10 20 40

SCALE 1:850,000 KILOMETRES

PROJECT

RENEWABLE RESOURCE ASSESSMENT OF THE KA'A'GEE TU CANDIDATE PROTECTED AREA

TITLE

STUDY AREA

REFERENCE

Data was collected from Natural Resources Canada, January 2009
Projection: UTM Zone 11 Datum: NAD 83

Golder Associates
Hay River, Northwest Territories

PROJECT No.08-1328-0034			SCALE AS SHOWN	REV. 0
DESIGN	JK	21 Jan. 2009		
GIS	RJ	08 Apr. 2009		
CHECK	GC	19 Oct. 2009		
REVIEW	GC	19 Oct. 2009		

FIGURE: 1

N:\Active\2008\MG-08-026 PAS Trout lake kakisa\GIS\MXD\Kakisa-Study Area.mxd

significances, and their economic values as outlined in the Renewable Resource Assessment Guidelines (NWT-PAS 2005).

1.1 Objectives

The objectives of an RRA are described in four phases:

- Phase 1: Collect and review existing information on renewable resource components and their use.
- Phase 2: Data assessment, evaluation and identification of gaps.
- Phase 3: Fill in the gaps in renewable resource information for the area.
- Phase 4: Reporting.

The objectives of this study encompass RRA Phases 1, 2 and 4. Phase 3 will not be addressed in this report.

The RRA uses existing available knowledge to address the following questions for the Study Area and the surrounding area:

1. What are the important renewable resources and how abundant are they?
2. How and to what extent do people currently use the renewable resources?
3. What is the economic value of this resource use?
4. How are the resources and resource uses distributed throughout the area?
5. What is the potential for increasing renewable resource use in the future?

This RRA includes the following renewable resources that have potential and / or existing commercial value, or are used locally:

Resource	Resource Use
Wildlife	Subsistence hunting, recreational hunting (resident hunting), outfitting (non-resident hunting), trapping, commercial harvesting
Fish	Subsistence fishing, sport fishing, commercial fishing, hatcheries
Trees	Commercial harvesting, fuel wood
Plants	Berry picking, medicinal plant harvest, food plant harvest, agriculture
Art & Craft Materials	Clothing, birchbark baskets, bead work, tufting, quill work, carving
Wilderness	Eco-tourism, tourism businesses, lodges
Renewable Energy	Wind power, hydroelectric power

The authors of this report recognize that the Ka'a'gee Tu Candidate Protected Area may be valued in a way that does not necessarily entail the use of the area, or consumption of its resources. Ka'a'gee Tu may be appreciated for its significant aesthetic values as well. Local residents and visitors to the area

take pleasure in the beauty of the environment, both in person and through media. There are also the important, but not measurable cultural values, associated with Ka'a'gee Tu. These functions and values are acknowledged and appreciated, but not examined in this assessment.

The scope of this study is limited to gathering information from existing studies or through interviewing persons knowledgeable about the area, its renewable resources and their uses and values. This methodology restricts this report to an analysis of knowledge and data sets that presently exist and are accessible. The values taken into consideration are user oriented; indirect use benefits are acknowledged to have assessable market values, but these values are not assessed in this report.

2.0 BACKGROUND AND DESCRIPTION OF THE STUDY AREA

2.1 Background of the Ka'a'gee Tu Candidate Protected Area

The Ka'a'gee Tu Candidate Protected Area delineates an area around Kakisa and Tathlina lakes, and covers approximately 9,600 km^2 between Great Slave lake in the north-east and the Cameron Hills in the south (Figure 1). It is located between approximately 60° 45' and 61° 30' North latitude and between approximately 116° 45' and 118° 30' West longitude. The Candidate Protected Area covers and protects almost half of the Kakisa watershed and at the same time excludes some areas in order to permit regulated non-renewable resource development (EBA 2007).

The Candidate Protected Area lies predominantly within the Kakisa watershed with small areas of the Upper Mackenzie (in the west), West Great Slave Lake (in the north), and the Hay (in the south-east) watersheds contributing to the Study Area's hydrological regime (SENES Consultants Ltd. 2005). The Kakisa watershed is drained by the Kakisa River and its tributaries, which drain the area north through wetland complexes and lakes.

The Study Area encompasses two large and shallow lakes (Tathlina and Kakisa lakes) as well as Beaver Lake in the northern section of the Study Area, Heart Lake along the eastern boundary, and numerous other smaller lakes, ponds, and wetlands (Figure 1). Both Kakisa and Tathlina lakes are drained by the Kakisa River system. The Upper Kakisa River, draining into the south-western portion of the Study Area, empties into the west end of Tathlina Lake, the Middle Kakisa River leaves the north end of Tathlina Lake and empties into the south end of Kakisa Lake. From there, the Lower Kakisa River connects the north-east end of Kakisa Lake with the south end of Beaver Lake (Figure 1). At the outlet of Kakisa Lake, the river becomes shallow and widens, and often contains extensive aquatic vegetation (EBA 2007). The Lower Kakisa River flows over Lady Evelyn Falls (at Lady Evelyn Falls Territorial Park), scenic rapids of 15 metres (m) height (Figure 1; Section 9, Wilderness).

The Ka'a'gee Tu Candidate Protected Area is in Step 5 of the eight-step process of the NWT-PAS (1999). Although the Area of Interest proposal was not formally issued until February 2006, the Ka'a'gee Tu Dene that have occupied this south-western area of the Dehcho since time immemorial and have been practicing and promoting initiatives to protect their traditional harvest areas for many decades (KTFN 2006). A Traditional Knowledge study funded and carried out by the KTFN in 2003 identified some of these traditional practices.

Historically, the KTFN has been known to apply and support land protection through traditional land use practices and through negotiations with government agencies and representatives (KTFN 2006). Selected examples of these active involvements are listed below:

- In March of 2000, the World Wildlife Fund (WWF) prepared a concept plan for the KTFN to propose protection for the Heart Lake area (Concept Plan for the Ka'a'gee Tu First Nation's Proposed Heart Lake Protected Area) east of the current Candidate Protected Area. This proposal was not executed, however a large portion of this area is now included in the proposed Candidate Protected Area.
- In 2004, the Dehcho First Nations (DFN) prepared a report outlining the process of land use mapping and its use in establishing a protected areas network in the Dehcho (DFN 2004).
- In 2005, the KTFN conducted a Traditional Knowledge assessment of the proposed Mackenzie Gas Project. A report was produced that focused on the potential impacts of the proposed pipeline and associated activities on the Ka'a'gee Tu watershed.
- In November 2005, the first formal KTFN / NWT-PAS meeting was held and initial discussions identified the need to determine the spatial outline of an Area of Interest.
- In January 2006, a preliminary mapping workshop was held in Kakisa, where the community reviewed existing environmental and traditional knowledge data, and identified the preliminary boundaries of an 'Area of Interest' based on recommendations from community representatives. The criteria for the boundaries included:
- the need to permanently protect major components of the Kakisa watershed;
- the need to protect critical fish, migratory bird and wildlife habitat;
  - the need to protect the core traditional land use area and the cultural history and traditions of the Ka'a'gee Tu Dene;
  - the need to preserve a representative portion of the Hay River Lowlands ecoregion; and
  - the motivation to accommodate non-renewable resource development for economic purposes, and therefore defining the Candidate Protected Area to exclude areas with significant potential for non-renewable resource development.
- In February 2006, a KTFN band council passed a resolution (BCR #06-02-2006) to confirm support for the Area of Interest delineated in the KTFN's submission to the NWT-PAS Secretariat.
- In May 2006, the KTFN completed the NWT-PAS Step 1 and 2 Report for the Ka'a'gee Tu Area of Interest. This document provides an overview of the rationale for the boundaries of the Area of Interest and summarizes the abiotic, biotic, cultural, and economic values of the area, based on existing information (KTFN 2006).
- In May 2006, the DLUPC released the Final Draft Dehcho Land Use Plan, which designates the area of the Ka'a'gee Area of Interest as the Kakisa and Tathlina Watershed Conservation Zone with traditional harvesting and tourism as the only permitted activities (DLUPC 2006).
- In March 2007, the Geological Survey of Canada completed a Hydrocarbon Assessment of the Ka'a'gee Tu Area of Interest (Morrow 2007).
- In March 2007, EBA finalized the Ka'a'gee Tu Phase I Ecological Assessment. This report describes the ecological significance of the proposed Area of Interest and provides a rationale for its classification as a National Wildlife Area (EBA 2007).

- In November 2007, EBA prepared a report titled: Ecological Assessment of the Ka'a'gee Tu Protected Areas Strategy Vegetation Assessment. This Assessment describes vegetation community types and the flora and fauna present in the area (EBA 2007).
- In June 2008, a Non-Renewable Resource Assessment (Minerals) of the Ka'a'gee Tu Area of Interest was compiled (Gebert 2008).
- In August 2009, the CWS formally agreed to accept a proposal by the KTFN and to sponsor the Ka'a'gee Tu Candidate Protected Area.
- In this report, Golder Associates Ltd. is producing a Renewable Resource Assessment of the Ka'a'gee Tu Candidate Protected Area, which will outline:
  - the abundance and distribution of renewable resources;
  - their past, current and future use;
  - the estimated economic value of the resource uses; and
  - the future potential of identified resource uses.

2.2 Description of Study Area Components

The Ka'a'gee Tu Candidate Protected Area is located within the Taiga Plains Ecozone (Environment Canada [EC] 2007). In 2007 the Taiga Plains Ecozone was reclassified by the Ecosystem Classification Group (2007) and the Study Area lies within the Great Slave Lowlands Mid-Boreal (MB) and Tathlina Plain MB Ecoregions of the greater Mackenzie and Slave Lowlands MB Ecoregion. The Mackenzie and Slave Lowlands MB Ecoregion is characterized by short, warm summers and long, cold winters. The mean annual temperature ranges from approximately -2.0 to -5.5 degrees Celsius (°C). The mean summer temperature is from 15.5 to 16.5°C in July and the mean winter temperature is -25.5 to -28°C in January. The mean annual precipitation varies between 310 and 410 millimetres (Ecosystem Classification Group 2007). The most species-rich habitats within the Taiga Plains ecozone are the mixed woods and shrublands associated with fens, bogs, ponds, streams, and lakes that are found within the Candidate Protected Area (EC 2007).

There is one community located within the Study Area. Home of the Ka'a'gee Tu Dene, Kakisa is located 240 air km southwest of Yellowknife, NWT, on the east side of Kakisa Lake at the mouth of the Lower Kakisa River (The Legislative Assembly of the Northwest Territories 2004). Originally located at Tathlina Lake, the community moved to the south shore of Kakisa Lake after a forest fire in 1943 caused a massive fish die-off in Tathlina Lake (KTFN 2006). In 1962, the community was moved to its present location at the north-east corner of Kakisa Lake in order to be closer to the Mackenzie Highway (running across the northern portion of the Study Area; Figure 1). Kakisa and the Mackenzie Highway are currently linked by a 13 km all-weather road. Float plane access is also available during the summer months. Most of the 55 residents are involved in hunting, trapping and fishing, with tourism and sport-fishing activities playing a secondary role (Statistics Canada 2006).

The community of Fort Providence (727 residents; Statistics Canada 2006) is located north of the Study Area (Figure 1) and it is known that in the past, residents from this community traveled into the Study Area to hunt and trap (KTFN 2006). They traveled on overland trails and by canoe. Today, Fort Providence is connected to the Mackenzie Highway and therefore, people can easily travel to Kakisa and access the Ka'a'gee Tu Candidate Protected Area. The community of Hay River (3,628 residents;

Statistics Canada 2006) and neighbouring Hay River Reserve (309 residents; Statistics Canada 2006), is located 137 km southeast of Kakisa and plays a role in the sustainability of Kakisa as a community. Many health services for Kakisa residents are provided in Hay River. As well, clean water is imported from Hay River to Kakisa two times per week due to the lack of a certified water treatment facility in the community (KTFN 2006).

Clean drinking water is important to the community and the Dehcho in general. Water is stated as being the most important resource to the Dene in the Dehcho Land Use Plan, Final Draft (DLUPC 2006: page 30). Keeping the air quality, water quality, quantity and flow substantially unchanged or improved is one of the goals of the Land Use Plan and many of the zoning principles identified are based on the protection of the Mackenzie and Liard Rivers as well as other smaller lakes and watercourses that are important to individual communities (DLUPC 2006).

2.2.1 Conservation Zones

The Ka'a'gee Tu Candidate Protected Area is located mainly within the Kakisa and Tathlina Watershed Conservation Zone (Conservation Zone 14) of the Draft Dehcho Land Use Plan (DLUPC 2006). The north-eastern portion of the Candidate Protected Area falls within the Heart Lake, McNally Creek, Muskeg River Conservation Zone (Conservation Zone 13), with portions of land also located in the Upper Mackenzie (Conservation Zone 10) and the Great Slave Lake Shoreline (Conservation Zone 11) conservation zones, respectively (Figure 2).

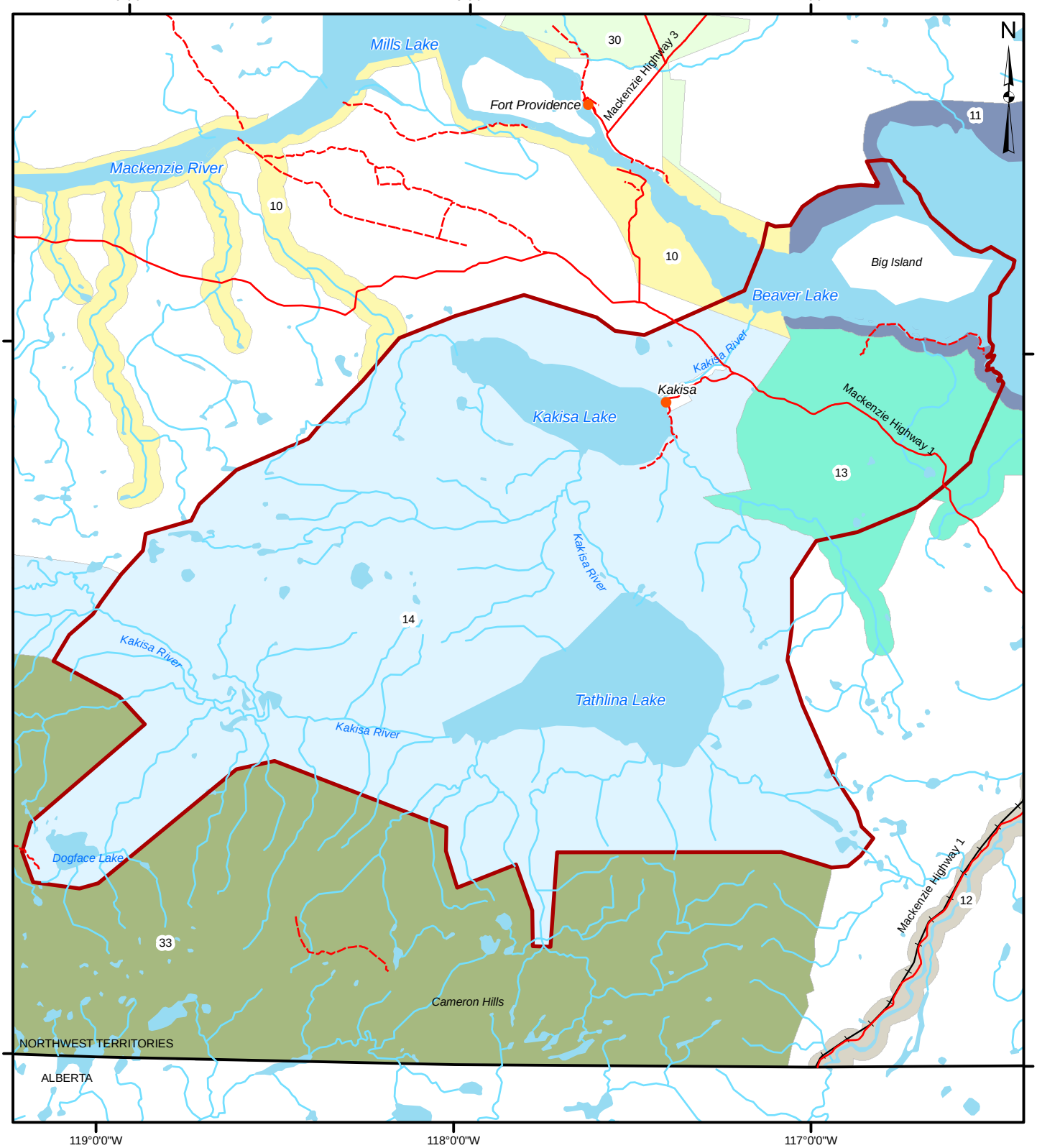
Most of the Study Area currently has both surface and subsurface lands withdrawn from development (DLUPC 2006). The only exceptions are an area west of Tathlina Lake and one to the north of the lake. Even though these two areas are not included in the Dehcho Interim Land Withdrawal, they are included in the Kakisa and Tathlina Watershed Conservation Zone. Conservation Zones are areas recognized for their significant ecological and cultural values and the Land Use Plan is providing flexible protection to these lands. Along with traditional and subsistence hunting, tourism is the only development activity permitted in these Conservation Zones (DLUPC 2006).

2.2.2 International Biological Programme [IBP] Sites

The IBP was a cooperative effort between different agencies and nations to study the land for a better understanding of the life-supporting systems across the world (Beckel 1975). In 1969, the Canadian Committee for IBP established two Northern Panels. Panel 9 was responsible for all arctic areas and Panel 10 was responsible for the subarctic region. The goals of these two Northern Panels were to:

- Locate and describe representative examples of arctic and subarctic ecosystems;
- Demonstrate how the biological value of each potential site may equal or outweigh all other values of that site; and
- To aid the territorial and federal governments in developing guidelines for the management and recognition of these areas as Ecological Sites (Beckel 1975).

IBP Ecological Sites are special areas, which represent a variety of vegetation and wildlife communities. Many of the identified sites form habitats for endangered populations, unique plant associations, or areas for breeding and other life cycle stages of wildlife populations (Nettleship and Smith 1975). Northern Ecological Sites often encompass large surface areas because productivity in



LEGEND

- COMMUNITY
- ROAD
- SEASONAL ROAD
- RAILWAY
- STUDY AREA
- BLUEFISH CREEK SPECIAL MANAGEMENT ZONE
- BUFFALO LAKE, RIVER AND TRAILS CONSERVATION ZONE
- CAMERON HILLS SPECIAL MANAGEMENT ZONE
- GREAT SLAVE LAKE SHORELINE CONSERVATION ZONE
- HAY RIVER CORRIDOR CONSERVATION ZONE
- HEART LAKE, MCNALLY CREEK, MUSKEG RIVER CONSERVATION ZONE
- JEAN MARIE RIVER - NORTH SPECIAL MANAGEMENT ZONE
- KAKISA AND TATHLINA WATERSHED CONSERVATION ZONE
- LOWER BIG BUFFALO SPECIAL MANAGEMENT ZONE
- SAMBAA K'E/ REDKNIFE RIVER CONSERVATION ZONE
- UPPER MACKENZIE CONSERVATION ZONE

0 10 20 40

SCALE 1:850,000 KILOMETRES

REFERENCE

Data was collected from Dehcho Land Use Planning Board, and Natural Resources Canada, January 2009.
Projection: UTM Zone 11 Datum: NAD 83

PROJECT

RENEWABLE RESOURCE ASSESSMENT OF THE KA'A'GEE TU CANDIDATE PROTECTED AREA

TITLE

LAND USE ZONES

Golder Associates
Hay River, Northwest Territories

PROJECT No.08-1328-0034			SCALE AS SHOWN	REV. 0
DESIGN	JK	21 Jan. 2009		
GIS	RJ	08 Apr. 2009		
CHECK	GC	19 Oct. 2009		
REVIEW	GC	19 Oct. 2009		

FIGURE: 2

N:\Active\2008\MG-08-026 PAS Trout lake kakisa\GIS\MXD\Kakisa- Land use zones.mxd

the north is low and more space is needed to support viable populations. Many of these sites contain features such as relict or endangered populations, unique plant associations, breeding areas, critical range for animals, pristine lakes, and mineral springs. Although IBP sites do not have any form of legislative protection, their designation serves to emphasize the ecological importance of the identified areas. Within the Northwest Territories there are 120 identified IBP sites, 14 of which fall within the Dehcho Region (EBA 2003). There are three IBP sites within the Ka'a'gee Tu Study Area.

2.2.2.1 Kakisa River IBP Site (IBP Site 25)

This IBP site measures approximately 365 km^2 and is located west of Tathlina Lake along the Upper Kakisa River (Beckel 1975). It includes a section of the river, its tributaries and associated floodplains. This area was also recognized by the Ka'a'gee Tu Dene as an important wildlife area, and the KTFN named it Etaáhdlı̨. This IBP site is comprised of broad active floodplains that are dominated by sedge-dwarf birch-larch plant communities (Beckel 1975; EBA 2003). The active floodplains are considered important habitat for waterfowl, beavers, muskrat, and moose due to their floating bogs and numerous shallow lakes and ponds, (EBA 2003). This IBP site provides abundant wildlife habitat for species such as waterfowl, beaver, muskrat and moose. The reason for its IBP nomination was good habitat quality for nesting waterfowl and abundant wildlife (Beckel 1975).

2.2.2.2 Deep Bay Wood Bison Sanctuary IBP Site (IBP Site 22)

The Deep Bay Wood Bison Sanctuary IBP Site is located north-east of the Study Area. This IBP site measures approximately 4,168 km^2 and is located between the western shore of Great Slave Lake and Highway 3 (EBA 2003). The area was nominated because of its diverse wildlife (mainly wood bison [*Bison bison athabascae*] and waterfowl) and its limnological characteristics (Beckel 1975). The area is relatively flat with many ephemeral lakes and peat plateaus. This area is also known as an important waterfowl staging area, and habitat for woodland caribou, wolves, and lynx. The IBP site covers the south-eastern portion of the Mackenzie Bison Sanctuary (Section 4).

2.2.2.3 Heart Lake IBP Site (IBP Site 79)

The Heart Lake IBP site measures approximately 130 km^2 and is located partially inside the Candidate Protected Area but mostly outside the eastern boundary of the Study Area, directly south of Great Slave Lake. This area was nominated as an IBP site and subsequently proposed as a NWT-PAS Protected Area (World Wildlife Fund [WWF] 2000) due to unique plant associations and landscapes, rare plant species, rich and diverse habitats for flora and fauna, and a valuable traditional knowledge and scientific learning area (Beckel 1975; Eng and Green 1989; WWF 2000).

The IBP Site encompasses various landscape features, including different wetland types, uplands (including ancient beach ridges, limestone escarpments and canyons), talus slopes, ancient coral reef outcrops, and alvars ("naturally open areas of thin soil on top of flat limestone or marble rocks with sparse vegetation cover of shrubs and herbs with trees absent or not forming a continuous canopy"; WWF 2000). These alvars are known to support rare plant species (EBA 2003).

2.2.3 Other Conservation Sites

Beaver Lake, located in the northern portion of the Study Area (Figure 1), has been identified as an Important Bird Area (Important Bird Areas Canada 2004) and a Key Migratory Bird Terrestrial Habitat Site (Latour *et al.* 2008). Beaver Lake and its islands provide habitat for a variety of species, including moose, boreal woodland caribou, whooping crane, American white pelican, waterfowl and fish species. Beaver Lake has been identified as an important traditional harvesting area for fish, moose, woodland caribou, and waterfowl (EBA 2007).

2.2.3.1 Important Bird Area

Important Birds Areas (IBAs) is a program which is not supported by legislation, but whose mandate exists to indentify, conserve and monitor a network of sites, both nationally and globally, which provided essential habitats for bird populations. A site may be classified as an IBA if one or all of the following criteria apply:

- One or more globally threatened species occur in the site;
- The site, on its own or as one of a set of sites, hold a suite of restricted-range species or biome-restricted species; or
- An exceptionally large population of migratory or congregatory species exist on the site (Bird Life International 2009).

Beaver Lake, within the Study Area has been identified as an IBA due largely to its abundant population of tundra swans and various duck species. It is estimated that 2% of the North American tundra swan population, and 1% of the world duck population congregate in and around Beaver Lake (Important Bird Areas Canada 2004).

2.2.3.2 Key Migratory Bird Terrestrial Habitat Site

Key Migratory Bird Terrestrial Habitat Sites are protected and managed by Environment Canada's CWS. The area surrounding Beaver Lake (encompassing 445 km^2) is believed to support at least 1% of a Canadian waterfowl population, which meets the requirements to be considered a key terrestrial habitat site – NT Site #19 (Latour *et al.* 2008). Waterfowl is known to pass through the Beaver Lake area in May, and again in September and October; species including tundra swans, ducks (mostly American wigeon, scaup, mallards and canvasbacks). In addition, the wood bison, which has been identified as a threatened species by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), is known to frequent the northern shore of Beaver Lake (Latour *et al.* 2008). Identification of a site as a key migratory bird terrestrial habitat site allows for protection of habitats from such disturbances as pollution of lake water and alteration of water levels, potentially resulting in the degradation of aquatic and shoreline habitats.

3.0 METHODS

3.1 Collection and Review of Existing Documented Information

The Golder team has reviewed and summarized the existing documented literature on renewable resources and their uses in the Ka'a'gee Tu Study Area and conducted numerous interviews with persons knowledgeable of the area to obtain additional undocumented information. Information sources included literature reviews and on-line searches for scientific publications, relevant draft and final reports, relevant draft land use plans, traditional knowledge studies, other ecological and resource assessments and surveys, maps and databases, and interviews with outfitters operating in the area, Kakisa residents, GNWT, Department of Environment and Natural Resources (ENR; Dehcho region) representatives, NWT-PAS representatives, and other knowledgeable persons.

It should be noted that although every reasonable attempt was made to compile all information available for the renewable resources and their uses in Ka'a'gee Tu, only limited information was available that was specific to the Candidate Protected Area. Traditional documentation for resource use in the area was often very general and precise locations or details were not provided to our team. Throughout this study, conclusions are often based on the best available information for the resources' uses or potential future uses and their economic values. All information sources are referenced in the text and are listed in alphabetical order for each separate section of this report in Section 13 (References).

3.2 Mapping

The basemap data (Figure 1) were supplied by the NWT-PAS as a series of Environmental Systems Research Institute, Inc. (ESRI) shapefiles for hydrography, terrain elevation, communities and roads. All of this information is also displayed on the maps for each of the resources. Additional data sources are referenced on each map.

Mapping of the renewable resources was completed using ArcMap Geographic Information Systems (GIS) software tools. The IMG-Golder Information Management team assembled mapped information from a variety of sources, scales and formats to produce a series of maps that convey the spatial distribution of renewable resources.

3.3 Assessment and Evaluation of Data

All current and potential resource uses within the seven resource categories were described according to the following criteria (where data were available):

- distribution of resource in the Study Area;
- extent of present resource use and importance for people in the Study Area;
- the potential for resource use in the Study Area in the future; and
- estimated economic value of the resource in the Study Area.

The method of calculation of economic values differed depending on the particular resource use. Wildlife and fish economic values were derived from meat and fish edible weights and meat replacement values. Income through trapping was estimated via fur auction sales. Fuel wood value was calculated on the basis of estimated consumption and costs for fuel wood in the Study Area. Tourism values were derived from known visitor numbers and their estimated spending habits. Due to a lack of available documented information, little or no economic value was given to commercial timber harvest, plants, art and craft materials, or renewable energy resources. Information on these renewable resources and their uses in Ka'a'gee Tu could be effectively gathered through conducting surveys with resident harvesters to record resource harvest locations, harvest volumes, harvest species, and estimate the economic values of those harvests.

4.0 WILDLIFE RESOURCES, THEIR USES AND THEIR ECONOMIC VALUE

4.1 Introduction to Wildlife

This section describes potentially occurring wildlife resources in the Ka'a'gee Tu Candidate Protected Area, their distribution and abundance (where available). Subsistence harvest, recreational harvest, trapping, big game outfitting and commercial harvest are examined for current and potential future use, use of the Study Area and the economic value of these activities.

Numerous species of both large and small game and furbearers reside in the area. They constitute a principal resource for local residents. Table 1 summarizes the major wildlife species that may be harvested in the Study Area. Not all of the species listed may be harvested within Ka'a'gee Tu, but are reported to potentially occur in the Study Area.

4.1.1 Wood Bison

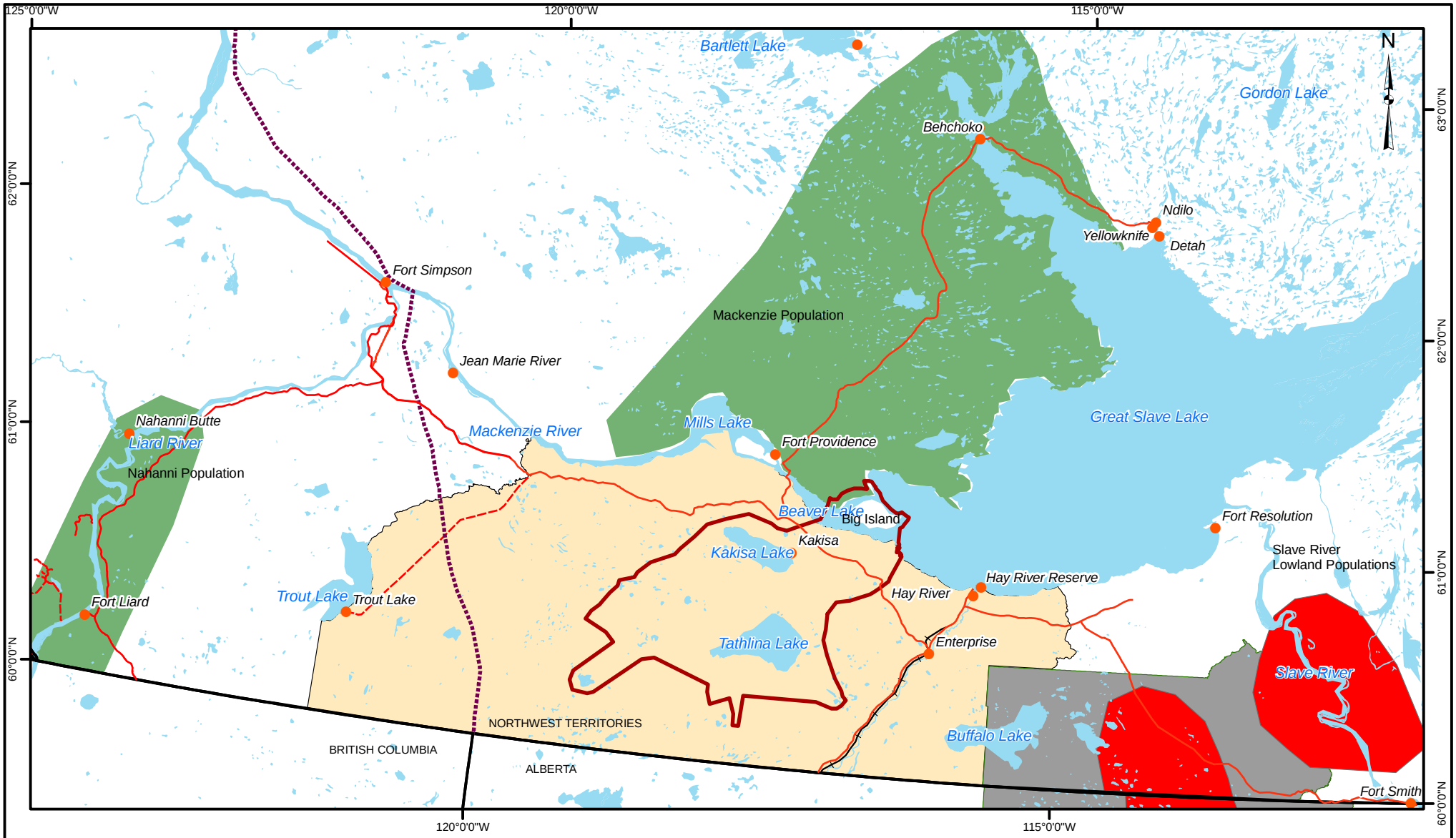
Wood bison are listed as Threatened under both the Species at Risk Act (SARA; 2009) and COSEWIC (2007), and are considered At Risk in the NWT (GNWT, ENR 2009a). Wood bison use different habitats depending on the season. In summer, they can be found in small willow pastures and uplands where they feed on sedges, forbs and willows. In the fall, they can be found in the forest where they feed on lichens. In winter, they move to frozen, wet sedge meadows and lakeshores where they feed on sedges (GNWT, ENR 2009a).

Most of the Ka'a'gee Tu Candidate Protected Area falls within the Bison Control Area (Figure 3). Bison in both the Wood Buffalo National Park population and Slave River Lowlands population are infected with bovine tuberculosis and brucellosis (GNWT, ENR 2009d). Attempts to keep infected animals from mixing with unaffected herds have included the establishment of the Bison Control Area between populations to prevent spread of these diseases. The section of Ka'a'gee Tu north of the Mackenzie River falls within the the range of the Mackenzie bison population (Figure 3). This population declined to about 1,600 bison in March 2008, down approximately 20 percent (%) from estimates obtained in 1998 and 2000, but regardless, is considered to be healthy and supports a small harvest (GNWT, ENR 2009d).

Table 1: Commonly Harvested Wildlife Species Potentially Present in the Study Area and Their Reported Occurrence in the Study Area

Family	*Local or Common Name*	*Scientific Name*	*Occurrence and Reported Critical Habitat*
Cervidae	Moose	*Alces alces*	Throughout the region (Deh Cho Land Use Planning Committee 2003).
	Boreal woodland caribou	*Rangifer tarandus caribou*	Throughout the boreal region, present in Ka'a'gee Tu (GNWT, ENR 2007).
	Wood Bison	*Bison bison*	Found in the region, but not throughout Ka'a'gee Tu (GNWT, ENR 2009a)
Ursidae	Black bear	*Ursus americanus*	Throughout the boreal region (Clarkson 1985; GNWT, Department of Renewable Resources 1990; Bromley and Buckland 1995).
Canidae	Wolf	*Canis lupus*	Throughout the boreal region (KFTN 2006)
	Red Fox	*Vulpes vulpes*	Throughout the boreal region (Whitaker Jr. 1996).
Felidae	Lynx	*Lynx canadensis*	Present throughout the boreal region including Ka'a'gee Tu (WWF 2000; EBA 2007).
Mustelidae	Marten	*Martes americana*	Throughout the boreal region (EBA 2007))
	Fisher	*Martes pennanti*	Uncommon throughout the southern boreal region (Crosscurrent 2004).
	Wolverine	*Gulo gulo*	Uncommon throughout boreal systems including Ka'a'gee Tu (WWF 2000; ENR 2006; Banci 1994).
	Mink	*Mustela vison*	Throughout the boreal region (Whitaker Jr. 1996).
	Least weasel	*Mustela nivalis*	Throughout the boreal region (Whitaker Jr. 1996).
	Ermine	*Mustela erminia*	Throughout the boreal region, present in Ka'a'gee Tu (Whitaker Jr. 1996; WWF 2000).
	Otter	*Lontra canadensis*	Mackenzie Valley, aquatic systems (WWF 2000; EBA 2007).
Leporidae	Snowshoe hare	*Lepus americanus*	Throughout the northern boreal region including Ka'a'gee Tu (Whitaker Jr. 1996; WWF 2000).
Castoridae	Beaver	*Castor canadensis*	Aquatic systems in the study area (Poole and Croft 1990; KFTN 2006)
Erethizontidae	Porcupine	*Erethizon dorsatum*	Throughout the boreal region (Whitaker Jr. 1996).
Muridae	Muskrat	*Ondatra zibethica*	Aquatic systems in the Study Area (WWF 2002; KFTN 2006).
Phasianidae	Grouse/ptarmigan e.g.willow ptarmigan	Various spp. e.g., *Lagopus lagopus*	Throughout the boreal region (Bayha and Snortland 2004).
Anatidae	Goose	*Chen caerulescens*, *Anser* spp.,	Mackenzie Valley (CWS 2007; United States Fish and Wildlife Service [USFWS] 2004; Bayha and Snortland 2004).
	Tundra swan	*Cygnus columbianus*	Mackenzie Valley (CWS 2007; USFWS 2004; Bayha and Snortland 2004).
	Trumpeter swan	*Cygnus buccinator*	Mackenzie Valley (CWS 2007; USFWS 2004; Bayha and Snortland 2004).
	Duck	*Anas* spp., *Aythya* spp. *Melanitta* spp., *Mergus* spp., *Bucephala* spp. *Oxyura jamaicensis*	Mackenzie Valley (CWS 2007; USFWS 2004).

N:\Active\2008\MG-08-026 Dehcho RRA\MXD\Bison



LEGEND

- COMMUNITY
- PIPEPLINE
- PROPOSED PIPELINE
- SEASONAL ROAD
- STUDY AREA
- BISON HERD RANGE
- DISEASED HERDS RANGE
- WOOD BUFFALO NATIONAL PARK
- BISON CONTROL AREA

0 25 50 100

SCALE1:2,602,252 KILOMETRES

REFERENCE

Data was collected from Natural Resources Canada, and Environment and Natural Resources NWT, April 2009.
Projection: UTM Zone 11 Datum: NAD 83

PROJECT

RENEWABLE RESOURCE ASSESSMENT OF THE KA'A'GEE TU CANDIDATE PROTECTED AREA

TITLE

BISON CONTROL AREA

Golder Associates
Hay River, Northwest Territories

PROJECT No.08-1328-0034			SCALE AS SHOWN	REV. 0
DESIGN	BA	17 Apr. 2009	FIGURE: 3	
GIS	RJ	17 Apr. 2009		
CHECK	GC	20 Oct. 2009		
REVIEW	GC	20 Oct. 2009		

4.1.2 Moose

Moose maintain no status under SARA (2009) or COSEWIC (2007), and are considered Secure throughout the NWT and populations in the Dehcho region are stable (GNWT, ENR 2008a). Moose are found throughout the boreal and tundra regions of the NWT, though occurring in low densities relative to southern portions of the species range (Department of Indian and Northern Affairs [DIAND] 2005; GNWT, ENR 2007). The territorial moose population is estimated to be between 30,000 and 40,000 animals (GNWT, ENR 2008a). Within the Dehcho region, moose numbers have not been consistently documented, but local knowledge and sporadic surveys have indicated that moose populations in the area are considered to be stable (GNWT, ENR 2008a). For the western Dehcho, systematic moose surveys have been conducted in the past. Large-scale moose surveys of the Mackenzie River Valley (from Jean Marie River to north of Wrigley) in November 2003 and of the Liard River Valley (from the British Columbia border to Poplar River) in February 2004 estimated densities of 4.4 and 4.9 moose per 100 km^2 (Larter 2009). Also associated with these moose surveys was a contaminant assessment of moose organs (Larter 2009; Larter and Kandola 2009).

Average moose densities throughout the NWT are estimated at three to four animals / 100 km^2 (GNWT, Resources, Wildlife and Economic Development [RWED] 2004; EBA 2007). A variety of studies proximate to the Candidate Protected Area have offered a range of moose density estimates. In 1997, Bradley and Johnston completed surveys in the Dehcho region, centred around the Mills Lake and Mink Lake areas, found densities of three moose / 100km^2 (Bradley and Johnston 2000; EBA 2007). Decker and Mackenzie (1980) found moose densities in the Liard Valley ranged from 1 to 24 animals per 100 km^2. Bradley *et al.* (1998) found moose densities at Mills Lake and Mink Lake had declined from 17 animals per 100 km^2 in 1991, to 7 animals per 100 km^2 in 1994, and then to 3 animals per 100 km^2 in 1997, paralleled by decreasing calf to cow ratios within the study site over the same period. These densities roughly correspond to moose densities found elsewhere in the Mackenzie Valley (i.e., MacLean 1994; Veitch *et al.* 1996; Swallow *et al.* 2003).

In the Dehcho, moose occupy a variety of habitat that provide good browse including, aquatic environments, coniferous and mixed-wood forest, lowland willow/birch complexes, post-burn communities, and upland areas of river drainages (Ruttan 1972; DLUPC 2003). These environments provide a variety of forage, including willow, birch, and aquatic vegetation (Renecker and Schwartz 1998). Mapping of moose distributions within the Dehcho were completed by the DLUPC (2003). Results indicate that much the Ka'a'gee Tu Study Area offers good moose habitat. The KFTN have identified several area of key moose habitat within the Ka'a'gee Tu including Tathlina Lake to Etaáhdlıį, Kakisa River, Cameron Hills and Beaver Lake (Falk and Gillman 1980; KFTN 2006). In 2002, Gunn *et al.* (2004) further recorded moose observations within the Ka'a'gee Tu Candidate Protected Area. Results revealed 30% of all moose observations occurred in early successional habitats, 25% in willow / alder systems, 23% in spruce forests, 7% in riparian areas, and 6% in cutlines. This same study further highlighted a disproportionate occurrence (39%) of moose in habitats burned in the last 20 years despite these same habitats comprising only 7% of the entire study area.

Bradley and Johnson (1998) reported moose to be the most significant large mammal south of the tree line in the NWT for meat harvesting and consumption. Resident and non-resident hunters harvest an estimated 1000 to 2000 moose per year in the NWT (NWT Cumulative Impact Monitoring Program (CIMP) 2009; DIAND 2005).

4.1.3 Boreal Woodland Caribou

The boreal woodland caribou is listed as Threatened under both SARA (2009) and COSEWIC (2007), and are considered Sensitive in the NWT (GNWT, ENR 2008b). The preferred habitat of boreal woodland caribou is old growth (over 100 years old) coniferous forests that tend to foster extensive lichen growth on trees and the forest floor (Olsen *et al.* 2001). Therefore, the animals mostly prefer areas that have not been burned in the recent past. Woodland caribou have been surveyed within the Candidate Protected Area and beyond. It is known that these caribou calve in the Study Area (EBA 2007). ENR has collared 40 female woodland caribou within the North Cameron Hills Area, including the Study Area from 2003 to 2006 and were relocated by fixed wing aircraft on a regular basis throughout the year (reported in EBA 2007). Traditional Knowledge surveys showed that the main population of caribou occur between Kakisa Lake and Etaáhdlįį, and further south (KTFN 2006). Caribou were generally hunted opportunistically and not as actively as moose (KTFN 2006).

Although there are currently a series of woodland caribou studies underway in the NWT, the most relevant woodland caribou information available for the Ka'a'gee Tu Candidate Protected Area is that provided by the Dehcho Boreal Caribou Study. Two components of this study are of particular relevance:

1) The studies specific to Ka'a'gee Tu, already documented in the Ka'a'gee Tu Phase 1 Ecological Assessment (EBA 2007). These studies showed that caribou are using the Study Area during all times of the year and that this area is also used for calving; and

2) Collaring studies in an area to the west, centred around Trout Lake in the Sambaa K'e Candidate Protected Area. This study has deployed collars on 69 caribou between 2004 and 2009 (over a larger area, extending to north to Wrigley), and several project updates have been released (most recently, Larter and Allaire 2009).

Two findings from these studies are of relevance to this assessment report: First, there is some indication that population characteristics may be different for caribou that were collared north of the Mackenzie River from those collared south of the Mackenzie River. Secondly, there are indications that the caribou south of the Mackenzie River are currently experiencing a slight decline.

The rate of population increase was calculated using the adult female survival rate and cow to calf ratios. Although the data is limited and other factors may influence the population, these measures have indicated that the population rate of increase, ranging from a rate of 0.71 to 1.07 from 2004 to 2009 within the Trout Lake area (Larter and Allaire 2009), and from 0.84 to 0.99 from 2003 to 2006 within the Ka'a'gee Tu area (EBA 2007). In other words, the observed rate of calf recruitment has not replaced adult mortality. Further, the KTFN also report that caribou populations in the Study Area have been recently declining; however, this trend is not predicted to continue (KFTN 2006). A possible explanation of this finding is the diversity of caribou predators in the Dehcho region (including humans, wolves and black bears), and the presence of seismic lines, which facilitate movements of all predators (Larter and Allaire 2009). These concerns are addressed by the Draft Action Plan for Boreal Woodland Conservation in the NWT.

4.1.4 Black Bears

The Ka'a'gee Tu Candidate Protected Area falls within black bear range in the NWT (Whitaker Jr. 1996). Black bears are not listed federally (SARA 2009; COSEWIC 2007), and are considered Secure in the NWT (GNWT, ENR 2008a). The black bear population in the NWT and potential trends are unknown, but conservatively estimated at 10,000 (GNWT, ENR 2009b). There have been no surveys or formal attempts to estimate black bear densities within the Dehcho or the Study Area (EBA 2007). Background information on their ecology is provided in the Phase 1 Ecological Assessment (EBA 2007). Harvest records indicate that black bears are currently not an economically important furbearing species in this region (Section 4.7)

The bears are classified as both a big game species and furbearer in the NWT. They are managed mostly by controlling the hunting season for resident and non-resident hunters. All sport hunters are limited to one adult bear per year that is not accompanied by a cub. All General Hunting License holders may hunt during any season. Non-resident hunters must hunt with a licensed outfitter (GNWT, ENR 2008c).

Fewer than 200 black bears are estimated to be harvested in the NWT annually, with fewer than 100 bears thought to be taken by subsistence harvesters. An additional estimated 30 problem bears are destroyed annually throughout the western portion of the NWT (GNWT, ENR 2009b).

4.1.5 Furbearers

Within the Study Area, furbearers include several carnivores, mustelids and aquatic mammals. Currently, density estimates for furbearers within Ka'a'gee Tu are unavailable. Densities for many furbearers are known to vary significantly between the years, mainly due to population cycles that affect furbearers and their prey (Poole 1994).

4.1.5.1 Carnivores

Wolves are not listed under SARA (2009) and are classified as Not at Risk by COSEWIC (2007). They are distributed over most of the NWT, and populations are considered to be Secure (GNWT, ENR 2008a). However, potential risks for the local population may arise from habitat removal and human disturbance (Clarke *et al.* 1996).

Wolves occupy a variety of habitat types determined primarily by den site locations, presence of prey, and prey habitat requirements. At the regional scale, home ranges are established based on food availability (McLoughlin *et al.* 2004). Though subject to impacts including overhunting and declines in prey sources, wolves are relatively resilient to human impacts, are adaptable to prey fluctuations and habitat selection, and maintain a high reproductive potential (Weaver 2001; EBA 2007). A wolf's diet is seasonally dependent on prey availability and may include snowshoe hare, red fox, lemmings and voles, ptarmigan, and water birds and their eggs (GNWT, ENR 2008d).

No abundance or density studies have been conducted specifically on wolf populations in the Dehcho. Van Zyell de Jong and Carbyn (1998) have estimated wolf densities to be between one animal per 101 km^2 to one animal per 944 km^2. The NWT populations of grey wolves are mostly stable, with some localized increases (GNWT, ENR 2008d). The KTFN (2006) report that wolf densities have increased

in recent years within the Candidate Protected Area. EBA (2007) suggest that the Study Area contains suitable denning habitat for these carnivores. Wolves are thought to occur throughout the entire Candidate Protected Area as they are generalists and follow their prey (EBA 2007). It has also become apparent, that in absence (or limited abundance) of ungulates, wolves may prey on beavers and it is thought that in areas, where beavers are not trapped, they could potentially sustain the local wolf population (N. Larter, GNWT ENR, pers. comm., 2009).

The Ka'a'gee Tu Candidate Protected Area lies within established red fox range, where the animals occupy specific boreal habitat within the region (EBA 2007). Local abundance and densities of the red fox are not known. Like other furbearers, their populations fluctuate. Red fox occur in a variety of habitats and the number of natal dens per unit area is believed to be an appropriate and direct index of habitat productivity (Smits and Slough 1993). Fox dens are most often found in well-drained upland terrain, which are typically associated with eskers, hummocks, or moraines (Jones and Theberge 1982; Garrott *et al.* 1983; Smits *et al.* 1988; Smits and Slough 1993; Anthony 1996). Red fox often select historically favoured den locations and den site fidelity is high (Garrott *et al.* 1983; Smits and Slough 1993; Anthony 1996; Landa *et al.* 1998).

Home ranges of breeding individuals appear to be centred on the den site or a series of dens, and are smaller during the denning season compared to the rest of the year (Landa *et al.* 1998). The home range size of a fox will vary, and is usually smaller when prey densities are high because of reduced foraging effort (Anthony 1997). Red fox are non-specific predators and efficient scavengers (Hiruki and Stirling 1989; Jepsen *et al.* 2002). This strategy results in a wide seasonal and regional variation in diet. Through much of the year microtine species constitute as much as 50% of the diet (Smits *et al.* 1989; Elmhagen *et al.* 2002). Fox are highly dependent on microtine species in both summer and winter, to the extent that fox populations cycle in synchrony with this prey (Smits and Slough 1993; Carriere 1999; Jepsen *et al.* 2002). In areas of human development, fox may use food wastes as an additional food resource (Eberhardt *et al.* 1982; BHP Billiton (BHPB) 2007; Diavik Diamond Mines Inc. (DDMI); De Beers 2007). Carrion is also important, especially during the winter (Kennedy 1980; Smits *et al.* 1989; Anthony *et al.* 2000). During the summer, the fox diet is often more varied. In addition to carrion, the fox may consume invertebrates, small mammals, birds, eggs, and fruits (Smits *et al.* 1989; Anthony *et al.* 2000; Elmhagen *et al.* 2002).

Lynx are not listed by SARA (2009), are classified as Not at Risk under COSEWIC (2007) and have Secure status in the NWT (GNWT, ENR 2008a). Lynx are solitary hunters that select dense climax coniferous forests, softwoods, and mature mixed-woods. These carnivores have been known to venture to the tundra when food is scarce (Banfield 1974). Lynx populations are known to fluctuate in density following prey population cycles, such as small mammals and snowshoe hare (Poole 1994). They also prey on ptarmigan and other birds, voles, fox and carrion. Lynx harvest levels are monitored through pelts turned into the GNWT for fur auctions (Indian and Northern Affairs [INAC] 2007).

4.1.5.2 Mustelids

Mustelids inhabiting the Dehcho and potentially the Study Area include wolverine, marten, and mink. Wolverine, the largest member of the weasel family, has a circumpolar distribution in the tundra, taiga, plains, and boreal forests of North America including the Study Area (Weir 2004; EBA 2007). The NWT wolverine population is recognized as Special Concern under both SARA (2009) and COSEWIC (2007). They are considered Sensitive in the NWT (GNWT, ENR 2008a). Primarily solitary,

wolverines are highly adaptable animals that can alter their location and distribution over time, but often occur with large ungulate populations. Source of food include caribou, moose, small mammals, hare, fox, ermine, ptarmigan, and fish (Mulders 2000).

Marten occupy old growth forest habitats, and are common throughout the forested areas of the NWT (Banfield 1974). Although wide-ranging, marten select features that are associated with mature forests (such as wide-diameter snags; Porter *et al.* 2005) and display a degree of selection against burn areas (Latour et al. 1994). They are present throughout the northern boreal forests of Canada (Banfield 1974). EBA (2007) suggest that, based on vegetation composition within the Study Area, marten may occur along the north and east slopes of Cameron Hills and north of Kakisa Lake.

Marten prey on a range of animals, including red squirrel, snowshoe hair, voles, birds, insects, and berries, but are not dependent upon a particular species. Their diet can fluctuate widely with changes in prey densities (Banfield 1974). American marten harvest totals in Canada are synchronized with those of snowshoe hare (Fryxall *et al.* 1999), although one study in the NWT found American marten to prefer voles (Douglass *et al.* 1983).For trappers in the boreal Taiga Shield ecozone, marten are economically the most important fur-bearing species in the NWT (Latour *et al.* 1994).

4.1.6 Aquatic Mammals

Beaver and muskrats occur throughout the Study Area, wherever riparian habitat exists, including wetlands, rivers, lakes and slow-moving streams (EBA 2007). Popko *et al.* (2002) reported between 43 to 58 active beaver lodges per 100 km^2 during surveys between 1989 and 2001 along the Mackenzie Valley. These numbers supported the assessment that this population could well support increased harvest levels (Popko *et al.* 2002). In 2007/2008 NWT trappers harvested 1,399 beavers and 10,736 muskrats (GNWT, ITI 2008b).

In 1989, aerial surveys of active and abandoned beaver lodges were conducted in the western NWT including plots near Kakisa and Liard River, and two in the Trout Lake area. Active lodge densities for the surveyed plots were estimated at 1.00 lodge per km^2 for Kakisa, 0.12 lodges per km^2 for Liard North, 0.17 lodges per km^2 for Trout Lake East and 0.25 lodges per km^2 for Trout Lake West (Poole and Croft 1990). Surveys of lodges along rivers proximate to the study area were also conducted. Results indicated the density of active lodges was 0.45 lodges per km^2 along the Kakisa River and 0.27 lodges per km^2 along the Liard North / Muskeg rivers (Poole and Croft 1990). The study showed that the Kakisa area had the highest density of active beaver lodges, indicating that this species may play an important role in the fur harvest of this area (Section 4.5).

4.1.7 Waterfowl

The abundance of small lakes, streams and wetlands in the area provide feed and rest for many species of ducks, and comprise part of a common waterfowl migratory route (USFWS 2004, 2008). Several wetland areas in the Dehcho have been specifically identified as having importance to waterfowl. These areas include the upper Mackenzie Valley, Beaver Lake, Kakisa River (Etaáhdlîî), Falaise Lake, Tathlina Lake, and Heart Lake (Canadian Wildlife Service [CWS 2007]; EBA 2007). The Arctic Ecology Map Series (CWS 1965) identified the nearby Great Slave Lake shoreline as a fall staging area for migratory waterfowl.

Waterfowl densities in the Study Area are being studied in the spring and fall of 2009. The western segment of USFWS Waterfowl Survey Strata 17 (NWT Closed Forest and Forest Tundra) includes the Ka'a'gee Tu Candidate Protected Area. The area defining Strata 17 comprises the Taiga plains habitat of the Mackenzie Valley Lowlands. The 2008 dabbling duck breeding population for Strata 17 was an estimated 570,300 birds and comprises an average of 204,700 American green-winged teal (*Anas crecca*), 139,000 mallards (*Anas platyrhynchos*), and 95,500 American widgeon (*Anas Americana)*. The 2008 diving duck breeding population for Strata 17 was an estimated 393,000 birds dominated by 237,000 scaup (*Aythya* spp.). Among sea ducks, the 2008 breeding population of scoters (*Melanitta* spp.) for Strata 17 is estimated to be 13,700 birds. Due to declines in scoter populations in western Canada, all three species of scoter are considered to be a sensitive in the Northwest Territories (NWT Species Monitoring Infobase 2005).

Breeding surveys of waterfowl population conducted by Ducks Unlimited in 2003 found Tathlina Lake (in the Study Area) and Falaise Lake (immediately north of the Study Area) to maintain the highest densities of all waters surveyed. Surveys revealed a total of 17 species with an average density of 14 ducks / km ^{2} for Tathlina Lake and 19 ducks / km^2 for Falaise Lake.

Collectively, the 2008 breeding waterfowl population in Strata 17 totaled 988,600 ducks and 23,900 Canada geese (*Branta canadensis*) (USFWS 2008). Similar to the Mackenzie Valley lowlands, it is believed that the valley portions of the Study Area offer favourable waterfowl habitat.

4.2 Subsistence Hunting

Subsistence hunting comprises an important part of life for many northern people. A high proportion of Dehcho residents are reported to hunt. The NWT's Bureau of Statistics (2008) found that 69% of the population of Kakisa hunted, 71% of households, country meat constituted most or all of the meat consumed in 2003, versus an NWT average of 37% and 17% respectively. The cost of living in Kakisa (Table 2) was listed as 132.5% based on that of Edmonton (NWT Bureau of Statistics 2008). This reported value is based solely on food items purchased in stores. Calculated food price indices do not take into account any harvested or farmed food items consumed in the communities.

Table 2: Community Cost of Living and Food Price Index *

Communities	*Cost of Living (2005)*	*Food Price Index (2004)*
Yellowknife	-	100
Edmonton	100	-
Fort Simpson	137.5	142.1
Fort Providence	132.5	125.5
Jean Marie	142.5	-
Nahanni Butte	145.0	169.1
Trout Lake	157.5	165.8
Kakisa	132.5	-

* Source: NWT Bureau of Statistics 2008.

Moose generally dominates the region-wide subsistence harvest for all communities in the Dehcho region (GNWT, ENR 2008f). It is not known which percentage of this harvest took place specifically within the Study Area.

4.3 Recreational Hunting

Non-Aboriginal residents in the Dehcho region harvest wildlife for 'recreational' purposes. This harvest is regulated by the Northwest Territories Hunting Regulations (Table 4.8; GNWT, ENR 2008c). These regulations are summarized in the following paragraphs.

The Study Area lies within Hunting Management Unit D of the GNWT's hunting regulations. Recreational harvest bag limits and seasons for Hunting Management Unit S are found in Table 3.

Table 3: Current Hunting Bag Limits and Seasons for Resident Non-Aboriginal Hunters Management Unit D *

Species	*Bag Limit*	*Season*
Woodland (Boreal) Caribou	1/year	15 July – 31 Jan
Wood Bison	1/draw	1 Dec – 15 Mar
Moose	1/year	1 Sept – 31 Jan
Black Bear	1/year	15 Aug - 30 June
Wolf	1+/year	25 July – 31 May
Wolverine	1+/year	25 July - 30 Apr, 1 July – 30 June
Ptarmigan and Grouse	10/day, possession limit of 40	1 Sept - 30 Apr
Squirrel, Porcupines, Hares	No limit	1 July - 30 June

* Source: GNWT, ENR 2008d.

The amount of game taken in the area by resident recreational hunters is estimated to be relatively small. As of 2007, only 522 people of non-Aboriginal decent resided in the entire Dehcho region (NWT Bureau of Statistics 2008). No information regarding the sale of recreational licenses from Ft. Providence or Hay River (which ENR offices administer the community of Kakisa) was available for this study (J. Chamber, GNWT ENR, pers. comm. 2009).

4.4 Big Game Outfitting

Both historically and currently, there are no licensed big game outfitters operating in the Ka'a'gee Tu Candidate Protected Area (J. Chamber, GNWT ENR, pers. comm. 2009). Within the Dehcho four hunting outfitters are in operation, South Nahanni Outfitters based in Whitehorse and Nahanni Butte Outfitters based in Hudson's Hope, British Columbia (BC). Additionally, Ram Head Outfitters and Redstone Outfitters operate in the Sahtu Settlement Area, but portions of their zones fall within the Dehcho. Four classes of big game hunters exist in the Dehcho region (Larter and Allaire 2008):

1. *General Hunters* – subsistence harvesters, primarily Aboriginal people.
2. *Resident Hunters* - Canadian citizens or landed immigrants who have been living in the NWT for at least two consecutive years prior to application for the license.
3. *Non-resident Hunters* - Canadian citizens or landed immigrants who live outside the NWT, or have not resided in the NWT for a full two years prior to application for the license.
4. *Non-resident Alien Hunters* - hunters who are neither NWT residents nor non-residents.

Non-resident and non-resident alien hunters must use outfitter services and have to be accompanied by a guide.

4.5 Trapping

Trapping holds a central place in NWT's history (Berton 1988). It is still of paramount importance to many people in the NWT, which are interested in being able to follow a traditional lifestyle. However, the number of people reported to actively trap seems to be decreasing despite government incentives and comparatively high fur prices (GNWT, Industry, Tourism, and Investment (ITI) 2008a). The NWT's annual fur sale value decreased 80% from $6.1 million in 1987/88 to $1 million in 1993. High wages in the non-traditional sectors are blamed for taking workers away from trapping activities (Genuine Mackenzie Valley Furs (GMVF) 2005).

The GNWT ITI manages the Genuine Mackenzie Valley Furs Program, through which the GNWT provides trappers with access to the international fur auction market. In addition, the program actively markets and promotes fur at international venues through partnerships with other harvesting jurisdictions and the private sector. Most pelts harvested in Kakisa are submitted to Fort Providence, with lesser numbers submitted to Hay River.

The proportion of Kakisa residents that engaged in trapping in 2003 was 41.7%, much higher than the NWT average of 6% (GNWT Bureau of Statistics 2008). The GNWT ITI does not maintain records of fur harvest from the community of Kakisa; trappers must travel to surrounding communities to submit pelts to the GNWT under the GMVF. Table 4 presents an estimate of furbearer harvest submitted to ITI through the Genuine Mackenzie Valley Furs Program from the communities of Fort Providence and Hay River. This harvest includes submissions from Kakisa trappers. It is however not clear, how much of total contribution stems from Kakisa and how much of that was harvested within the Study Area.

Table 4: Average Annual Furbearer Harvest for Fort Providence and Hay River (Including Kakisa) Between 2004-05 and 2008-09 through the Genuine Mackenzie Valley Furs Program*

Species	*Fort Providence*	*Hay River*	*Total*
Black bear	0.0	0.2	0.2
Beaver	92.8	94.2	187
Coyote	0.0	2.6	2.6
Fisher	2.0	4.8	6.8
Cross fox	2.6	2.0	4.6
Red fox	6.6	7.6	14.2
Silver fox	0.6	0.2	0.8
Lynx	82.4	142.0	224.4
Marten	664.8	240.6	905.4
Mink	24.2	21.0	45.2
Muskrat	175.8	123.6	299.4
Otter	0.4	0.4	0.8
Squirrel	11.6	20.4	32
Weasel	31.2	82.6	113.8
Wolf	6.8	1.2	8
Wolverine	10.4	10.6	21
Total	**1,112.2**	**754**	**1,866.2**

*Source: Rossouw 2009.

Of the approximately 1,900 pelts harvested annually, marten are most commonly harvested by trappers from Fort Providence and Hay River (Table 4). On average 905 marten pelts per year were submitted between the seasons of 2004-05 and 2008-09. Muskrat, lynx, and beaver are also commonly harvested, with lesser numbers of squirrel, weasel, wolf, wolverine, fox and fisher (Table 4). These data do not include harvest for domestic use by either aboriginal or non-aboriginal hunters, such as rabbit for food and traditional sewing or wolverine, wolf and fox for parka trims.

4.6 Commercial Harvesting

Currently, there is no commercial wildlife harvest in the Dehcho region. Given the lack of sufficient large mammal populations in the Study Area, the potential for commercial harvest of any big game species in the Ka'a'gee Tu Candidate Protected Area does not seem likely. It may not be sustainable to add a commercial harvest operation to the existing Aboriginal, resident and non-resident harvest.

4.7 Economic Value of Wildlife

4.7.1 Subsistence and Recreational Harvest

Subsistence hunting is defined as harvesting by Aboriginal residents for food and personal use, while recreational harvest describes harvesting by resident non-Aboriginal hunters (GNWT, ENR 2008d). Since it is believed that the recreational harvest in the Study Area is minimal and no data exist on this resource use, the following estimated are based on subsistence harvest information only.

The NWT's prohibitive cost of imported commercial food products makes subsistence hunting one of the most common wildlife uses. The NWT spends annually approximately $130 million on food imports (NWT Bureau of Statistics 2008). Harvesting of local country food saves Dehcho residents the cost of buying imported food and in this way adds to the overall savings of each harvester. In 1988, the GNWT estimated that the value of foods being harvested annually in the NWT equal about $70 million (Deloitte Haskins and Sells 1988).

Usher (1976) outlined different methods that could be employed to measure the economic value of country food consumption, concluding that substitution is the most suitable method (using the cost of purchase of the same amount of meat or fish). Little such information has been recently published. Additional values are derived from the use of skins, bones and antlers for clothing, art, crafts, and other uses. Further, there are a number of intangible values to country food for which an economic value cannot be estimated (Usher 1976).

To estimate subsistence harvest based savings, this report assumes a replacement value of $20 per kg edible weight (Larter and Allaire 2004; Larter and Allaire 2005). With approximately 15 family households in Kakisa (NWT Bureau of Statistics 2008) and an estimated 1.0 to 1.5 moose harvested per household (N. Larter, GNWT ENR, pers. comm., 2009), approximately 19 moose per year are harvested by Kakisa residents. Ashley (2002) lists the range of edible meat per moose as ranging between 159-204 kg. Combining the edible weight calculation and the per kg replacement value yields an average saving of $3,630.00 per moose (Ashley 2002; Larter and Allaire 2004; Larter and Allaire 2005). Based on the harvest of approximately 3,448.5 kg of moose meat, the annual meat replacement value for the subsistence harvest of Kakisa is at least **$68,970**. It is not known which percentage of this value is harvested within the Study Area.

4.7.2 Big Game Outfitting

With no hunting outfitters operating in the Ka'a'gee Tu Candidate Protected Area, there is no direct or indirect economic investment to the region from big game outfitting.

4.7.3 Trapping

Trapping provides a considerable, but highly variable, benefit to the area. Considering the communities of Fort Providence and Hay River (where most pelts from Kakisa are submitted), the overall value of pelts sold has ranged from a low of $17,999 to a high of $69,836 in Hay River between the winters of 2004-04 and 2008-09, and from a low of $46,073 to a high of $101,620 in Fort Providence over the same period (Rossouw 2009). The average values are provided in Table 5.

Table 5: Average Annual Furbearer Sold Price (in $) for Fort Providence and Hay River (Including Kakisa) Between 2004-05 and 2008-09 through the Genuine Mackenzie Valley Furs Program*

Species	*Fort Providence*	*Hay River*	*Total*
Black bear	0.0	0.0	0
Beaver	927.4	1,360.61	2,288.01
Coyote	0.0	96.48	96.48
Fisher	100.43	145.06	245.49
Cross fox	58.09	135.40	193.49
Red fox	95.52	246.97	342.49
Silver fox	42.5	34.72	77.22
Lynx	8,834.04	20,862.59	29,696.63
Marten	38,247.05	13,545.43	51,792.48
Mink	392.31	233.14	625.45
Muskrat	253.11	331.21	584.32
Otter	95.83	55.80	151.63
Squirrel	19.08	24.46	43.54
Weasel	74.13	246.07	320.2
Wolf	775.76	87.73	863.49
Wolverine	2,209.42	3,792.90	6,002.32
Total	**52,124.67**	**41,198.57**	**93,323.24**

* Source: Rossouw 2009

The average annual sold price for all harvested furbearers in Fort Providence and Hay River (including the Kakisa harvest) is approximately $93,000. Marten contributes on average over 50% to this harvest income at an average price of $64 per pelt in 2004 (Rossouw 2009). Lynx contributes approximately

30% ($107 per pelt in 2004), wolverine, beaver and wolf account for another 10%. Muskrat, weasel and mink are also harvested, however, their pelt prices are lower and thus, they contribute less to the economic value.

As described above, Kakisa trappers are submitting their fur to Fort Providence and Hay River. Values provided in tables 4 and 5 do not detail the Kakisa portion of the harvest. Based on population numbers and percent of resident reporting to actively trap, it can be assumed that approximately 10% of the reported harvest stems from Kakisa residents. Based on this assumption, Kakisa trappers would receive an annual trapping related gross income of approximately **$9,000**.

Based on the current annual income from trapping in the area, it can be assumed that there is future potential for trapping in and around the Ka'a'gee Tu Candidate Protected Area. The composition of the harvest might change due to the cyclic nature of most furbearer populations and changes in market values.

4.7.4 Commercial Harvest

Commercial harvesting includes the large-scale harvesting of wild game for the export of meat products, such as occurs with muskox on Banks Island and arctic char in Cambridge Bay. There is currently no commercial harvest taking place in the Study Area, and it does not seem feasible to assume future potential of this resource use due to lack of infrastructure and relatively small land area of the Ka'a'gee Tu Candidate Protected Area.

4.8 Wildlife Conclusion

Data to derive the current and potential future resource use and economic value of resources in the Study Area is limited. Table 6 summarizes the main findings of the renewable resource values of wildlife for the Study Area. Values and descriptions are based on available information and estimates provided in the above sections. Table 6 compares the economic values and potential of different uses of the wildlife resource in the Study Area through indirect and direct income, resource use and future potential of the resource use. Examples for estimated indirect income are meat replacement values of harvested and distributed meat and domestic use of fur. Direct income is money received, for example from fur sales to auctions. Future potential is based on current use and available information on status of wildlife populations.

Table 6: Estimated Economic Value and Estimated Future Potential of Wildlife Resource Uses in the Dehcho and Study Area

Wildlife Resource Use	*Current Estimated Annual Indirect Income*	*Current Estimated Annual Direct Income*	*Current Estimated Use Within Study Area*	*Future Potential*
Subsistence Harvest	$68,970	None	Portions of Study Area likely used for harvest.	Believed to be moderate to high.
Recreational Harvest	Believed to be limited due to low number of non-Aboriginal residents.	Minimal	Unknown	Believed to be limited based on low resident non-Aboriginal population.
Outfitting	None	None	None	Believed to be limited due to lack of limited wildlife resources.
Trapping	Believed to be high due to high number of population reported to trap.	$9,000 (pooled with Hay River and Fort Providence fur return)	Active trappers likely using the Study Area.	Believed to be moderate to high. Stable, healthy furbearer populations.
Commercial Harvest	None	None	None	Believed to be low, based on access to area and limited wildlife resources.

The economic value of wildlife is difficult to calculate due to a lack of specific information for the Study Area. Based on the limited information available, it seems that the harvest of wildlife resources is of moderate importance to economy of the Study Area. Though only supported by approximate estimates and the high proportion of households consuming country foods, subsistence harvest of wildlife is of moderate to high importance in the Study Area and likely in the Dehcho. Due to the low non-Aboriginal population in the Study Area (NWT Bureau of Statistics 2008), recreational harvest in the Study Area is likely low. Indirect income (through cost savings) from subsistence harvest is estimated to be high for the Study Area. Direct income from trapping currently benefits close to half of the Kakisa residents. It is also believed that many residents trap for either domestic use or local sales and are not assessed through the ITI data base (GNWT, ITI 2008a and b). While the value of trapping income can only be assumed, it is believed to be an important contribution to the local economy. Additionally, both trapping and subsistence harvest possess an undeniably high cultural value and are strongly connected to the lives of people in and around the Study Area.

In summary, wildlife resources in the Study Area are currently reported to be mainly used for subsistence harvest and trapping. These two resource uses are believed to have a moderate to high future potential. In comparison, recreational harvest, outfitting, and commercial harvest are believed to have limited or low future potential in the Study Area.

5.0 FISH RESOURCES, THEIR USES AND THEIR ECONOMIC VALUE

5.1 Introduction to Fish

Historically, three methods of fishing have occurred in the Ka'a'gee Tu Candidate Protected Area. These methods include subsistence, commercial, and recreational fish harvesting. In the community of Kakisa, many people depend on fish harvests for a source of meat to feed themselves and their families. There are several different species of fish that are utilized. The main species used for a food source include whitefish (*Coregonus* spp.), arctic grayling (blue fish; *Thymallus arcticus*), lake trout (*Salvelinus namaycush)*, walleye (*Sander vitreus*), and inconnu (coney; *Stenodus leucichthys*). Recreational fishing typically focuses on the larger and more unique game species such as lake trout, grayling, pike and walleye. Tathlina Lake has been previously utilized by commercial fishermen employing float planes as a means of transportation. Currently, two commercial licenses are in use in the Study Area, and the business is primarily conducted locally. In the past as many as 8 to 10 commercial fishing licenses per year were issued for the Ka'a'gee Tu Candidate Protected Area (F. Taptuna, Department of Fisheries and Oceans [DFO], pers. comm. 2009).

The most common areas of fish harvest are Kakisa Lake, Tathlina Lake and their tributaries (Figure 4). Other popular areas include Dogface Lake and the Cameron River (F. Taptuna, DFO, pers. comm., 2009). These areas are most easily accessed by snowmobile in the winter and by boat and canoe in the summer.

5.2 Subsistence Fishing

Many people in the community of Kakisa rely on locally harvested meat and fish. Table 7 indicates the percentage of households in the area that rely on harvested meat and fish as a food source. In order for a household to be added to the numbers in the table, more than 75% of the household's meat must come from harvested animals and fish (NWT Bureau of Statistics 2004).

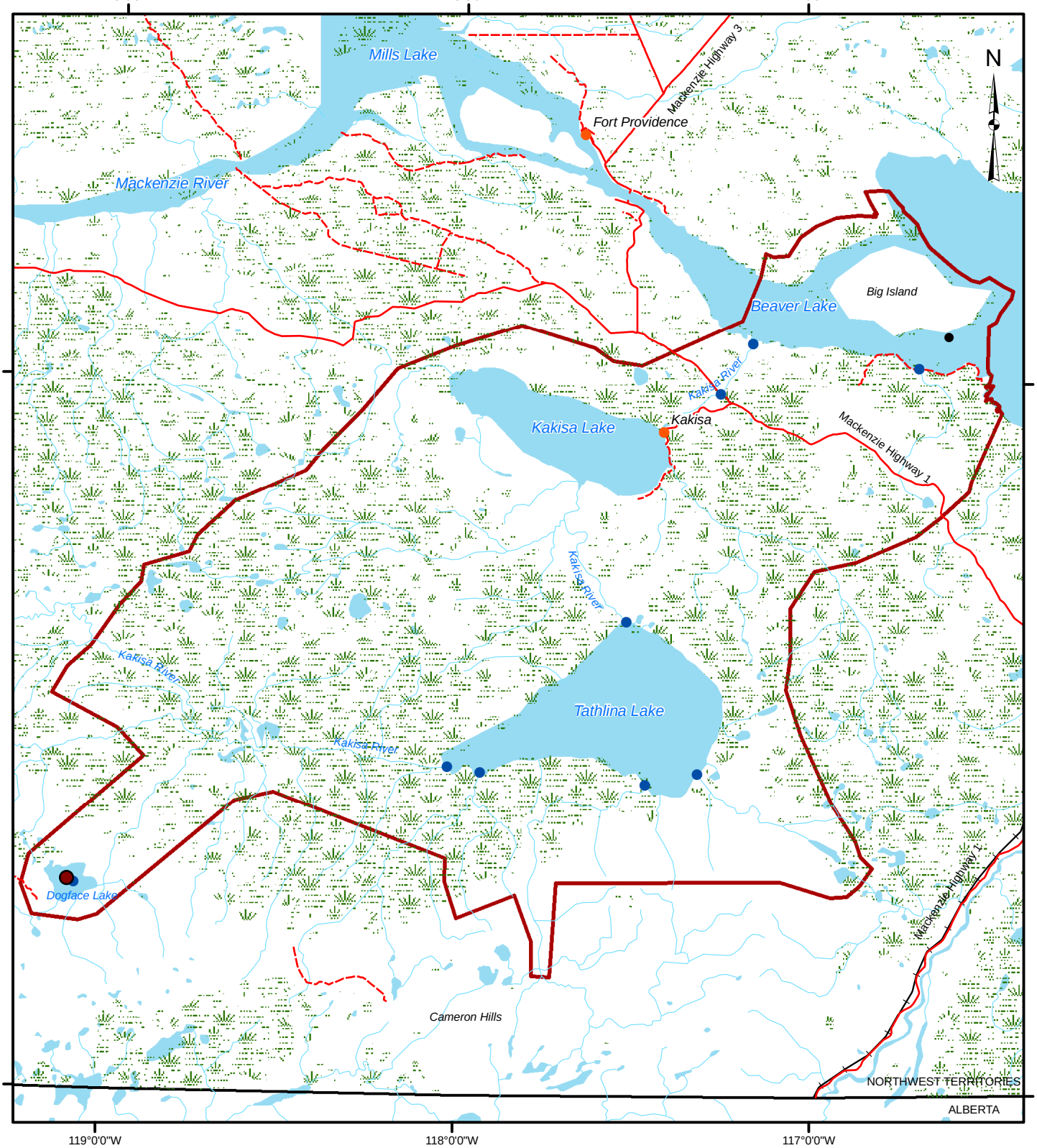
Table 7: Percentage of Residents Consuming More than 75% Wild Meat and Fish *

Community	*1994*	*1999*	*2004*
Kakisa	20.0	80.0	76.9
Average Small NWT Communities	36.4	48.7	45.5
NWT Total	**15.5**	**21.3**	**17.5**

* Source: NWT Bureau of Statistics 2004.

Kakisa is well above the territorial average for percentage of people consuming wild meat and fish. The high cost of shipping farmed fresh meat from southern communities likely plays a large role in this statistic (Larter and Allaire 2005, 2004). It is not known what proportion of that wild harvest consumption is meat from fish versus meat from other wildlife sources.

The meat obtained from the fish harvest greatly decreases the cost of food for local families. Fresh meat is often very expensive in remote communities because of the difficulties of shipping and



LEGEND

- BRABANT LODGE
- DEEGHANI LAKE LODGE
- COMMUNITY
- KNOWN FISHING POINTS
- ROAD
- SEASONAL ROAD
- RAILWAY
- STUDY AREA

REFERENCE

Data was obtained from Department of Fisheries (F. Taptuna, DFO, pers. comm. 2009.), Dehcho Land Use Plan, and Natural Rsources Canada, January 2009.
Projection: UTM Zone 10 Datum: NAD 83

0 10 20 40
SCALE 1:850,000 KILOMETRES

PROJECT
RENEWABLE RESOURCE ASSESSMENT OF THE KA'A'GEE TU CANDIDATE PROTECTED AREA

TITLE
KNOWN FISHING LOCATIONS

Golder Associates
Hay River, Northwest Territories

PROJECT No.08-1328-0034			SCALE AS SHOWN	REV. 0
DESIGN	JK	21 JAN. 2009	FIGURE: 4	
GIS	RJ	08 Apr. 2009		
CHECK	GC	19 Oct. 2009		
REVIEW	GC	19 Oct. 2009		

N:\Active\2008\MG-08-026 PAS Trout lake kakisa\GIS\MXD\Kakisa-Fish.mxd

refrigeration. The estimated financial cost of replacing the fish harvested with fresh farmed meat can be calculated by using $20 per kg as a base price (Bayha and Snortland 2004; 2003; 2002). This value has been used in various other reports to help determine the value of the fish resource but it is a rough estimate used in previous fish harvest studies conducted in the NWT.

Most of the harvested fish are taken as a meat source for human consumption; however, another very common use of fish is feeding the by-catch or excess fish to animals. Many people in the area own dogs for pets or as part of a dog-sled team. The fish is used as an inexpensive and healthy food for the dogs (F. Taptuna, DFO, pers. comm. 2009). The amount of this occurrence is unknown and will not be considered further in this report.

There are currently no Domestic Fishing Licenses awarded specifically for the Study Area. Domestic licenses are awarded to long term residents of the NWT that are not of Aboriginal or Inuit descent. Most of the fish harvested are done so by Aboriginal people who are allowed to harvest fish without domestic licenses. Domestic licenses entitle the holder to fish for subsistence using gill nets in designated areas and seasons (K. Hickling, GNWT ENR, pers. comm. 2008).

5.3 Recreational Fishing

Fishing licenses used in the Ka'a'gee Tu Study Area can originate from many different communities including Hay River, High Level, Fort Liard, and many others. This makes it very difficult to actually determine how many fishing licenses were sold for the purpose of fishing within the Study Area. The total numbers of these licenses were not obtainable for the purposes of this report.

Popular fishing locations are shown on Figure 4 along various water bodies of the Study Area. The Kakisa River, Tathlina Lake and Dogface Lake have been identified as frequent fishing locations F. Taptuna, DFO, pers. comm. 2009). One of the most prominent and popular arctic grayling spawning and fishing spots in the area is also located near the road crossing of the Kakisa River (GNWT, ITI 2008). The majority of the population and transportation routes are located near the Kakisa Lake and river, contributing to their accessibility and popularity. However, there are other smaller lakes and rivers / creeks that are less accessible but used occasionally for angling (Figure 4). In the winter months, Tathlina Lake is a popular destination. This is primarily because Tathlina Lake is an easier body of water to navigate in terms locating pockets of fish when compared to Kakisa Lake. Tathlina Lake is also readily accessible by snowmobile in the winter months which aids in its popularity as an ice fishing location (F. Taptuna, DFO, pers. comm. 2009).

There are two fishing lodges that are located within the Study Area. The Deegahni Lake Lodge and the Brabant Lodge operate seasonally during the summer months. The Deegahni Lake Lodge is located on an island in Dogface Lake in the south-western corner of the Study Area (Figure 4). The lodge offers 3-day trips for $1200 per fishermen. The Deegahni Lake Lodge has a capacity of 10 fishermen. In a typical summer the lodge typically caters to 40 to 50 fishermen. These numbers are a historical average. However, the lodge is reporting slower business in recent years due to a decrease in popular sport fishing species being caught. This may be because the lake is experiencing larger than normal algal blooms which may be having detrimental effects on the fish populations. The lodge owner has reported spotting several fish kills on the shores (D. Fergusson, Deegahni Lake Lodge Owner, pers. comm. 2009). It is not known if this issue is being caused by regular cycles or increased summer temperatures. The lodge can be accessed via chartered flights from either Fort Providence or

Hay River. The cost of these flights is not included in the cost of the lodge's fishing trips. Popular fish species include walleye, northern pike, and whitefish (Deh Cho Environmental 2003).

The Brabant Lodge is located on Brabant Island, 51 km west of Hay River by air in the headwaters of the Mackenzie River (Brabant Lodge 2007). The lodge offers 5-day and 7-day packages for fishermen beginning in Edmonton and flying to Hay River and then by float plane to Brabant Island. The cost of this trip varies from $4,499 for a five day stay to $5,599 for a seven day stay (AnglerWeb.com 2009). The lodge has a capacity of 40 guests (Deh Cho Environmental 2003). The number of guests hosted in a season is currently unavailable. Fish species caught include pike, arctic grayling, walleye and whitefish. Participants have an area of 200 square miles to fish encompassing both the Mackenzie River and Great Slave Lake (Brabant Lodge 2007). The lodge also offers conference facilities in addition to its fishing packages (Brabant Lodge 2007).

5.4 Commercial Fishing

Commercial Fishing Licenses allow the holders the right to commercially fish and sell their catch according to territorial guidelines (K. Hickling, GNWT ENR, pers. comm. 2008). DFO will not authorize commercial fishing on lakes (other than Great Slave Lake) without the support of the affected First Nation(s) (DLUPC 2006). Beaver Lake and in particular the area around Big Island is used as part of the Great Slave Lake commercial fishery.

There are currently two commercial licenses issued for the Study Area. Kakisa Lake is the only Lake that reported commercial fisheries for the past years (D. Clayton, Manager, Freshwater Fish Marketing Corporation, pers. comm. 2009). Historically there have been up to ten licenses per year issued for Kakisa and Tathlina lakes. Due to past stock problems, the current operations are operated on a small scale basis and most of products are sold locally (F. Taptuna, DFO, pers. comm. 2009).

A commercial fishery once operated at Dogface Lake in the 1960's and early 1970's and the quota was open for fishing in the late 1970s and early 1980s but there is no report of harvest (Stewart and Low 2000). A small commercial by-catch of Northern pike was taken in 1972 (Yaremchuk *et al.* 1989).

5.5 Fish Hatcheries

There are no reports on historic or currently operating fish hatcheries in the Ka'a'gee Tu Study Area. With no apparent concerns for fish populations in the area, there is not likely to be any fish hatcheries constructed in the near future (F. Taptuna, DFO, pers. comm. 2009).

5.6 Economic Value of Fish

5.6.1 Subsistence Fishing

The community of Kakisa and the surrounding area gain financial benefits as a result of harvesting fish. Many residents of Kakisa rely on fish stocks as a source of fresh meat. The estimated financial cost of replacing the fish harvested with fresh farmed meat can be calculated by using $20 per kg as a base price (Bayha and Snortland 2004; 2003; 2002). This value has been used in various other reports to

help determine the value of the fish resource. People in the Kakisa area most commonly harvest lake trout, inconnu, whitefish, walleye, arctic grayling, and northern pike for their subsistence needs.

Without an extensive study / survey into the amount of fish caught for food in the Study Area it is very difficult to accurately understand how much replacing harvested fish with store-bought meat would affect each household. In other locations, these types of studies have been executed to understand such effects. A study conducted by the Sahtu Renewable Resource Board took place over a 5 year span starting in 1998. This study canvassed the communities in the region asking all anglers to report their catches for a running tally. The study was found to be highly successful as it maintained a very high participation level. Over the entire 5 year span participation involvement was over 90% for the three communities in their area of concern (Bayha and Snortland 2004; 2003; 2002). A similar study would be the most effective means of placing a dollar value on the replacement value of fish caught for subsistence.

5.6.2 Recreational Fishing

The Study Area has many water bodies that contain a variety of species of sport fish. Kakisa Lake and the Kakisa River are the most common areas for recreational fishing due to its ease of access and plentiful fish stock, but there are also many smaller water bodies that have popular fishing spots (Figure 4; F. Taptuna, DFO, pers. comm. March 2009; GNWT, ITI 2008). Arctic grayling are the target sport fish along the Kakisa River downstream of Lady Evelyn Falls to the Kakisa River Bridge (EBA 2007). The smaller water bodies typically require additional aircraft or small vessels to access during the summer months and snowmobiles in the winter months. This limits their appeal to recreational fishing.

It is difficult to place an economic value on recreational fishing licenses because they can be used anywhere in the area for which they are issued. Recreational fishermen can come from several locations and is not possible to track their activities. The wide range of companies that sell recreational licenses makes placing an economic value on the licenses used in the Study Area impractical.

Other indirect economic benefits of sport fishing include the purchase of tackle, equipment, boats, augers, gasoline and other goods necessary for the sport of fishing. These benefits are very difficult to track effectively as some items are likely brought in from other regions.

Deegahni Lake Lodge averages from 40-50 visitors per year. The average cost of such a trip is $1200 per person for a three day weekend trip. Flights to and from Dogface Lake are not included in the price. This means that the yearly income from the lodge is estimated to be between $48,000 and $60,000 annually. The patrons of the lodge are required to supply their own food and fishing gear. The lodge contains accommodations for up to ten people. The lodge supplies fully outfitted fishing boats, stoves, refrigeration units, satellite televisions, generators, and other minor goods. This lodge is reporting slow business in recent times due potentially to warmer temperatures that may be causing large algal blooms in the relatively shallow waters of Dogface Lake (D. Fergusson, Deegahni Lake Lodge, pers. comm. 2009). Algal blooms can lead to many problems including decreased oxygenation of the waters and reduced visibility for the fish.

The Brabant lodge offers 5-day and 7-day packages for fishermen beginning in Edmonton and flying to Hay River and then by float plane to Brabant Island. The cost of this trip varies from $4,499 for a five day stay to $5,599 for a seven day stay (AnglerWeb.com 2009). The lodge has a capacity of 40

guests (Deh Cho Environmental 2003). The number of guests hosted in a season is currently unavailable.

The Study Area may have potential for the expansion of fishing lodge businesses. Many other successful lodges operate in the NWT, indicating a demand for such business endeavors. Further investigations would be required in order to assess whether there was local support for such additional business, and fish assessments conducted to ascertain whether local fish stocks could handle increased fishing pressure.

5.6.3 Commercial Fishing

There are currently two commercial fishing licenses issued in the Study Area (F. Taptuna, DFO, pers. comm. 2009). Kakisa Lake supports a commercial fishery which targets walleye but also includes Northern pike. This is a gillnet fishery and has a harvest a quota of 20,000 kg of walleye annually (Stewart and Low 2000). In recent years, this quota has not been reached due to transient stock problems since the 1990's but it appears to be sustainable (INAC 2003; Great Slave Lake Advisory Committee [GSLAC] 2005). Table 8 provides the annual amount of fish that was harvested during the summer months (May to October) in Kakisa Lake since 2006. The main targeted fish species is walleye with an occasional small by catch of Northern pike.

Table 8: Annual Landings of the Kakisa Lake Commercial Fishery for Walleye and Northern Pike*

Year	*Weight (kg)*	*Value ($)*
2006	18,344	75,451
2007	10,633	43,761
2008	7,481	32,634
2009	8,386	31,601

* Source: E. Smith, Freshwater Fish Marketing Corporations, pers. comm. 2009)

Tathlina Lake also had a commercial fishery with an annual quota of 20,000 kg of walleye. This quota has not been reached due to stock depletion and environmental factors since 2001 (GSLAC 2005). There may be some additional economic opportunities with commercial fishing in the Study Area. Tathlina Lake has historically supported small scale commercial operations that utilized float planes to carry up to nine tubs of fish from the lake per flight (F. Taptuna, DFO, pers. comm. 2009). Flying the fish from the lake is an expensive venture and for larger scale operations, more efficient means of transportation would likely have to be established. However, it is unknown how fish stocks in the lake would respond to the subsequent increased fishing pressure. There is ongoing monitoring of these two walleye stocks and age structure of the population will be determined using fish from the commercial harvest (INAC 2003; D. Leonard, DFO, pers. comm. 2009).

The area of Great Slave Lake included in the Study Area (Beaver Lake), falls into Zone IW Fish Area classified by DFO, is a major fishing ground for the commercial fishery (DFO 2006). This area has a catch quota of 227 tonnes, and is managed primarily for whitefish species (GSLAC 2005). However, in recent years no commercial harvest was reported for that area (D. Clayton, Manager, Freshwater Fish Marketing Corporation, pers. comm. 2009).

5.6.4 Fish Hatcheries

There are currently no fish hatcheries in the study area and there are no plans to establish any hatchery in this area. The stocks of fish in this area appear to be strong and there is little need for support by a hatchery (F. Taptuna, DFO, pers. comm. 2009).

5.7 Fish Conclusion

Subsistence fishing remains an important part of the lives of people in northern communities. The economic value of this resource use would be difficult to replace if subsistence fishing activities were limited. The cultural tradition of fishing in these communities adds to the value of fishing in and around the Study Area. Kakisa Lake and Tathlina Lake have traditionally been the most productive and relied upon lakes in the Study Area. The value of subsistence fish resource use lies in the indirect benefit of meats that do not need to be purchased and cannot currently be measured in a dollar figure without further surveying of the local yearly catches. Commercial fisheries provide income and employment for the surrounding communities.

While recreational fishing does derive small economic benefits for the Study Area, there may be the potential for expansion in the area through the establishment of additional fishing lodges. There are approximately 40 to 50 annual visitors flown in to the Deegahni Lake Lodge. Their contribution to the local economy is estimated to be in the $48,000 to $60,000 range. This value does not take into effect any of the local goods they might purchase or use during their adventure. As the guest capacity of Brabant Lodge is roughly four times that Deeghani Lake Lodge the contribution to the local economy is much higher. Without rough numbers of guests per year however, we do not have the ability to calculate these estimations at this time.

Economic value from commercial fisheries in the Study Area was reported for Kakisa Lake only. Stock depletions and logistics may be the reason for the ceasing of this activity in other lakes in the area and the decline in the annual landings of fish reported for Kakisa Lake (from $75,451 in 2006 to $31,601 in 2009). For the purpose of this report, the economic value of commercial fishing is based on the average value of the past four years, for which data were reported. The estimated value of commercial fishing in the Study Area is estimated at approximately **$45,862**. This small scale commercial fishery is believed to be sustainable (F. Taptuna, DFO, pers. comm. 2009) and is likely to be continued.

Large scale commercial fisheries and fish hatcheries will likely not be a viable option of fish resource use in the foreseeable future for the Ka'a'gee Tu area, because they may be considered economically risky to pursue in this remote area and because the fish stocks did show signs of depletion in the past. Smaller operations have found some measure of success in recent times but much of their benefits are seen on a local scale.

Table 9 summarizes the known economic value and future potential for fish resources uses within the Study Area.

Table 9: Estimated Economic Value and Future Potential of Fish Resource Uses in the Study Area

Wildlife Resource Use	*Current Estimated Annual Indirect Income*	*Current Estimated Annual Direct Income*	*Current Estimated Use Within Study Area*	*Future Potential*
Subsistence Fishing	Unknown	Unknown	Portions of Study Area likely used for harvest.	Believed to be high.
Recreational Fishing	Unknown	$48,000 - $60,000 through Deegahni Lake Lodge	Groups of fly-in fishermen use the Study Area.	Believed to be high.
Commercial Fishing	Unknown	$45,862	Kakisa Lake	Believed to be moderate, based on limited access to area and recovering fish stocks.
Fish Hatcheries	None	None	None	Believed to be low, based strong, healthy fish stocks.

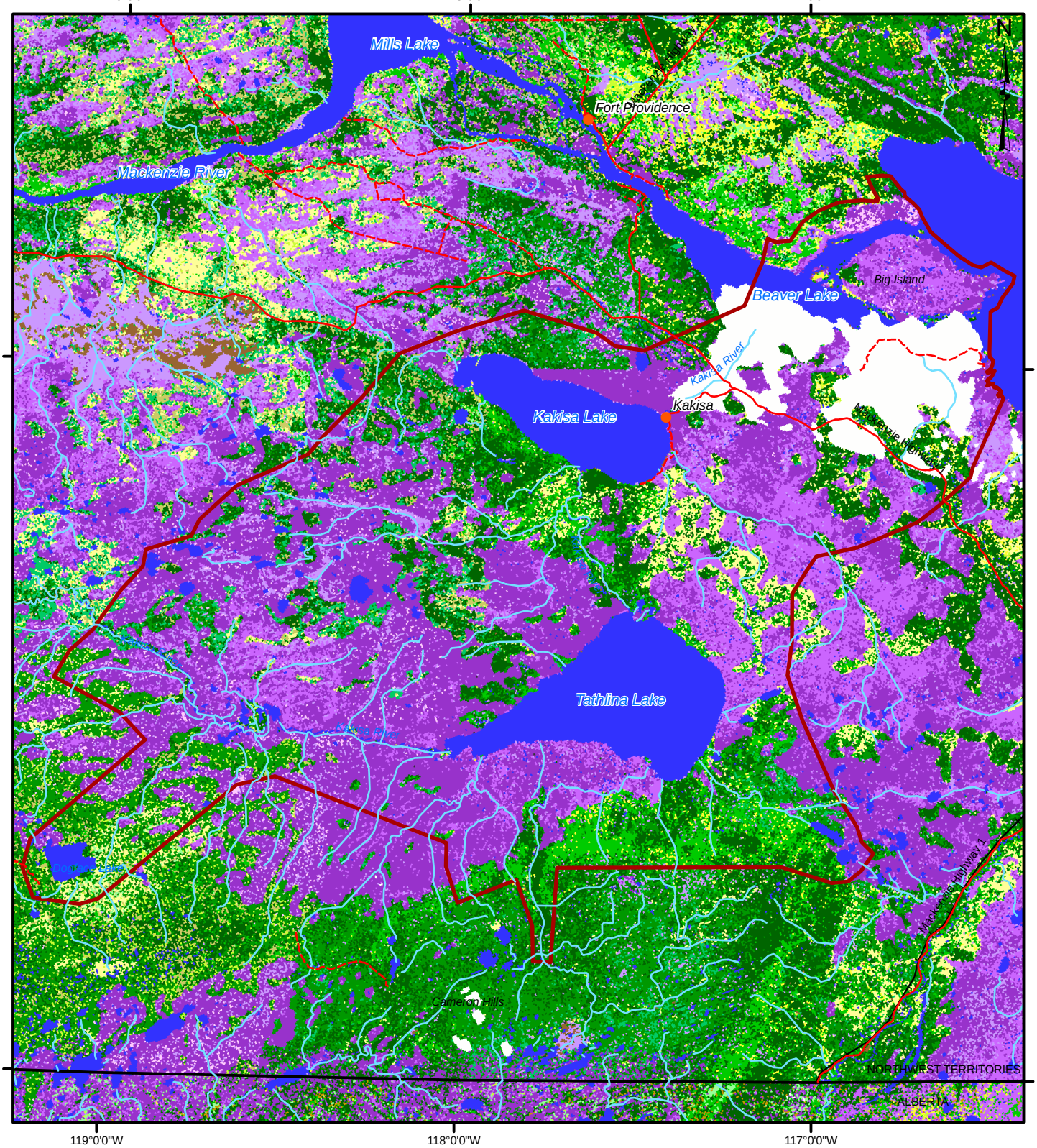
6.0 TREE RESOURCES, THEIR USES AND THEIR ECONOMIC VALUE

6.1 Introduction to Trees

Located within the Taiga Plains Ecozone, the Ka'a'gee Tu Candidate Protected Area is predominantly situated within the Great Slave Lowlands MB and Tathlina Plain MB Ecoregions of the greater Mackenzie and Slave Lowlands MB Ecoregion (Ecosystem Classification Group 2007).

The Ka'a'gee Tu area is dominated by spruce forests (EBA 2007a; Figure 5). Depending on topography and soil conditions, other species that potentially occur are paper birch (*Betula papyrifera*) and shrubs, white spruce (*Picea glauca*), balsam fir (*Abies balsamea*), trembling aspen (*Populus tremuloides*), balsam poplar (*Populus balsamifera*), green alder (*Alnus crispa*), white spruce, balsam fir, jack pine (*Pinus banksiana*) and tamarack (*Larix laricina*) (EC 2007). Shrubs are present in two layers; taller shrubs, such as willow (*Salix* ssp.) and birch and lower shrubs such as Labrador tea (*Ledum palustre*), cranberry (*Vaccinium vitis-idaea*) and bearberry (*Arctostaphylos uva-ursi*). Wetlands occur throughout the area and they typically support a variety of sedges, cotton grass (*Eriophorum* spp.) and willows (EBA 2007a).

Currently, the demand for wood products in the NWT comes from the mining industry, housing industry and for use as fuel wood. Most of the wood sold to industry and housing is imported from the south due to lower prices. Some of the smaller communities are using whole logs from the NWT to construct log homes (Forintek Canada Corp. [Forintek] 2007).



LEGEND

- COMMUNITY
- ROAD
- SEASONAL ROAD
- RAILWAY
- STUDY AREA

For vegetation classification legend see appendix 1

0 10 20 40

SCALE 1:850,000 KILOMETRES

REFERENCE

Data was collected from National Resources Canada, and Government of Northwest Territories (Environment and Forestry). January 2009.
Projection: UTM Zone 11 Datum: NAD 83

PROJECT

RENEWABLE RESOURCE ASSESSMENT OF THE KA'A'GEE TU CANDIDATE PROTECTED AREA

TITLE

VEGETATION COVER

Golder Associates
Hay River, Northwest Territories

PROJECT No.08-1328-0034			SCALE AS SHOWN	REV. 0
DESIGN	JK	21 JAN. 2009	FIGURE: 5	
GIS	RJ	08 Apr. 2009		
CHECK	GC	19 Oct. 2009		
REVIEW	GC	19 Oct. 2009		

N:\Active\2008\MG-08-026 PAS Trout lake kakisa\GIS\MXD\Kakisa-Vegetation Cover.mxd

Figure 5 Continued

VEGETATION COVER LEGEND

Trees have been used by people throughout the NWT for centuries. In the past, trees were of primary importance for transportation, cooking and heating purposes, and shelter. Today, wood is harvested for similar purposes, including as construction material for houses, mine timbers, pipeline pads, for transportation equipment such as boats, snowshoes and dogsleds, for furniture and as heating fuel (GNWT, ENR 2006).

Traditionally, the Ka'a'gee Tu Dene used trees and shrubs to make dog sleds, spruce bark canoes, toboggans, snowshoes, axe handles, fish traps, fish nets, bows deadfall for bears, roofs, paddles houses, carpeting in tents and lean-to's, ice scoops and firewood (KTFN 2006). Some tree and shrub species were also used in traditional medicines. Tree and shrub species are still harvested today for traditional purposes (KTFN 2006; L. Chicot, K'a'gee Tu Dene Chief, pers. comm. January 2009).

The following sections examine the resource use of trees in the Study Area for both commercial logging and as a fuel source in the Study Area.

Information regarding the harvesting of trees by Kakisa residents for personal construction materials (e.g., for houses, sheds, docks, drying racks, doghouses, etc.) was not available for the purposes of this report.

6.2 Commercial Logging

Commercial logging is of minor economic importance in the NWT. In 2007, the NWT exported $109,108 worth of forest products (Natural Resources Canada 2008). Lack of infrastructure, expensive transportation costs, coupled with unfavourable lease conditions (maximum of 5 year tenure) result in a small forestry industry (Invest NWT 2005). When the yield is high enough the industry is sustainable and covers the costs. Annual harvest levels vary accordingly and are anywhere between 46,000 cubic metres (m^3) and 200,000 m^3 (PACTeam 2003). The value for exported domestic softwood lumber for the NWT peaked in 1999 at $6.7 million (National Forestry Database Program 2004), and in 2006 only amounted to an estimated $43,000 (Canadian Council of Forest Ministers 2008).

Currently, the demand for wood products in the NWT comes from the mining industry, housing industry and for use as fuel wood. Most of the wood sold to industry and housing is imported from the south due to lower prices. Some of the smaller communities are using whole logs from the NWT to construct log homes (Forintek 2007).

There are a few small saw mills in the southern part of the NWT. The closest one to the Study Area is located in Fort Providence, with a second one in Jean Marie River. The Fort Providence sawmill is a portable sawmill that was purchased by the community to process rough lumber and firewood (Northern News Service Ltd. 2008). Fort Providence does not have any commercial harvesting permits at the moment, but have expressed interest in sawlog and fuel wood logging (A. Cassidy, Resource Analyst Forester, GNWT, ENR, pers. comm. January 2009). There is currently no sawmill within the Ka'a'gee Tu Candidate Protected Area, but Kakisa has expressed an interest in acquiring a wood chipper. This, however, is only in the planning stages (A. Cassidy, Resource Analyst Forester, GNWT, ENR, pers. comm. January 2009).

There is one commercial permit for harvesting trees in the Ka'a'gee Tu area. It has been issued to an operator based out of Hay River, and allows for the harvest of 2,000 m^3 of white spruce sawlogs which

are 23 centimetres (cm) in diameter or greater at the stump. This is a one year permit and the operator is expected to harvest all 2,000 m^3 of the permitted sawlogs (A. Cassidy, Resource Analyst Forester, GNWT, ENR, pers. comm. January 2009).

Presently, local sawmills produce only rough, green lumber. Most of this lumber is sent to Alberta where it is processed before being resold to the public. The rest of the wood harvested is used as fuel wood to supplement or replace fossil fuels (Forintek 2007).

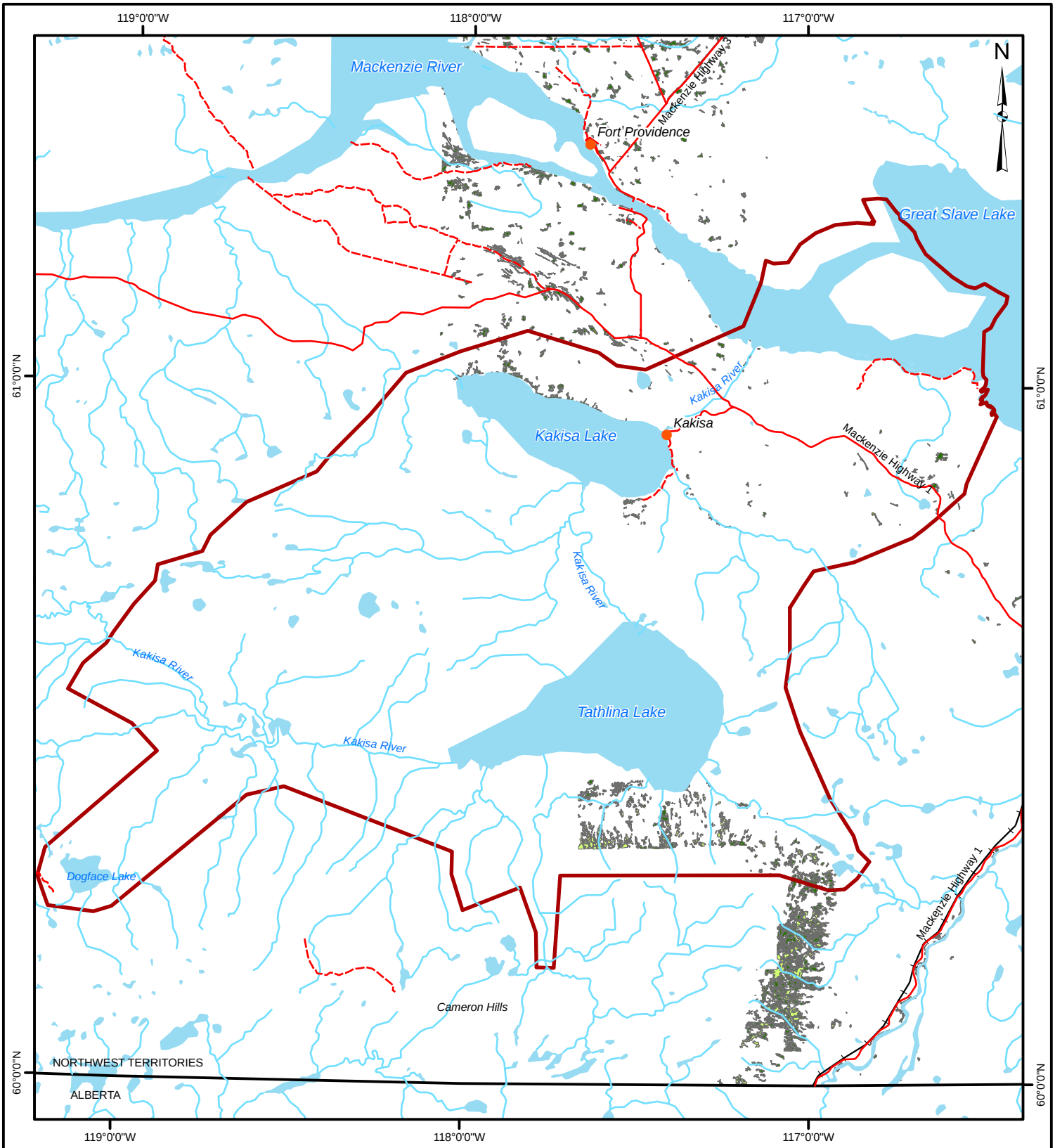
Most of the forest in the Dehcho area is commercially unproductive forest land due to amongst other factors (such as soils, moisture, elevation and aspect) significant spruce budworm infestations, as well as the occurrence of wild fires (J.C. Bartlett & Associates Ltd. [J.C. Bartlett] 2004). However, the Cameron Hills, which are located within the southern portion of the Study Area, are classified as having very high volumes / hectares of sawlog stands at approximately 350 m^3 / hectare (Figure 6; J.C. Bartlett 2004). This is one of the few areas within the Dehcho region with very productive forest land and merchantable tree stands (J.C. Bartlett 2004). The lands to the north of Kakisa Lake and along the south-eastern portion of the Candidate Protected Area (which are near highways) present a high potential to supply sawlogs (Figure 6; J.C. Bartlett 2004). The roads running through or near some of these tree stands would make these areas more accessible to logging and facilitate log transport.

The GNWT ENR Forestry Division is in the process of completing a detailed forest resource assessment from Fort Providence to Wrigley, including the Ka'a'gee Tu area. At present, they do not have any detailed figures regarding logging potential in the area; however, it is felt that there is potential for sawlog harvesting (A. Cassidy, Resource Analyst Forester, GNWT, ENR, pers. comm. January 2009).

6.3 Fuel wood

There has always been a significant harvest of trees for fuel wood to be used in home heating as part of northern culture in the NWT (Invest NWT 2005). An estimated 19% of all homes in the NWT use firewood, but only 25% of these are reported to use firewood as a primary heating source. Usually, standing dead wood is harvested because of its better burning quality in wood stoves (Industry Profile 2005). All residents of the NWT may harvest wood for fuel with a free Timber Cutting Permit issued by NWT ENR offices. The Dehcho has the highest fuel wood consumption rate in the NWT. More than 25% of Dehcho households use fuel wood as their primary source of heating fuel (Invest NWT 2005). Fuel wood can be profitable, with prices fetching $270-$300 per cord in Yellowknife (Forintek 2007) and $240 per cord in Hay River (Arctic Energy Alliance 2008).

Wood pellet heating is becoming more popular in the NWT. In 2006, approximately 625 tonnes of wood pellets were imported from other provinces and sold in the NWT for an approximate value of $190,000.00. There is currently no facility in the NWT harvesting trees solely for pellet production (Forintek 2007). As interest in wood pellet heating rises, manufacturing and selling wood pellets within the NWT may become more economical.



LEGEND

- COMMUNITY
- ROAD
- WINTER ROAD
- RAILWAY
- STUDY AREA
- ASPEN
- PINE
- SPRUCE

0 10 20 40

SCALE 1:850,000 KILOMETRES

REFERENCE

Data was obtained from Dehcho Land Use Planning Board, January 2009.
Projection: UTM Zone 11 Datum: NAD 83

PROJECT

RENEWABLE RESOURCE ASSESSMENT OF THE KA'A'GEE TU CANDIDATE PROTECTED AREA

TITLE

TIMBER POTENTIAL

Golder Associates
Hay River, Northwest Territories

PROJECT No.08-1328-0034			SCALE AS SHOWN	REV. 0
DESIGN	JK	21 JAN. 2009	FIGURE:6	
GIS	RJ	08 Apr. 2009		
CHECK	LC	08 Apr. 2009		
REVIEW	GC	XX XXX. XXXX		

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Fuel wood is important to the residents of Kakisa as they use it to supplement the heating costs of their homes, to smoke fish in their smoke houses and for heating and cooking purposes in their camps and cabins on the land (L. Chicot, Ka'a'gee Tu Dene Chief, pers. comm. January 2009).

There are currently no personal permits issued in the Ka'a'gee Tu area for the harvest of wood, so there is no record of how much wood is harvested for fuel wood purposes (A. Cassidy, Resource Analyst Forester, GNWT ENR, pers. comm. January 2009). However, it is estimated that the community uses approximately 300 cords of wood each year to heat homes, operate smoke houses, for camp fires at the Lady Evelyn Falls Territorial Park and the annual Dehcho First Nations Assembly. This does not include wood usage in camps and cabins (L. Chicot, Ka'a'gee Tu Dene Chief, pers. comm. January 2009).

6.4 Economic Value of Trees

The commercial value of trees harvested within the Study Area is based on one sawlog permit issued for the harvest of 2,000 m^3 in 2009. The estimated value of this one-time wood harvested in the Study Area under this commercial license is approximately **$90,000**. This estimate is based on the delivered wood price of white spruce sawlogs (approximately 45.00/m^3) delivered in High Level, Alberta and Ft Nelson, BC (J.C. Bartlett 2004).

The residents of Kakisa use approximately 300 cords of wood harvested annually in the Study Area. Of those, approximately 40 cords are used for purposes other than as fuel wood in dwellings. At a value of $240 / cord, the estimated value of wood harvested by individuals and used for purposes other than as heating fuel in homes (e.g., for smoke houses, park campground fires) is **$9,600**.

Heating fuel is supplied to the community of Kakisa by Bassett Petroleum Distributors out of Hay River. Consumption rates for the community were unavailable (Bassett Petroleum Representative, Bassett Petroleum Distributors, pers. comm. February 2009). Kakisa is estimated to use 260 cords of the 300 cords of fuel wood used annually to supplement heating costs in the community residences (L. Chicot, Ka'a'gee Tu Dene Chief, pers. comm. January 2009). Some residents pay over $1000 every two weeks for heating oil while those who supplement with wood heat pay approximately $300 every two weeks (L. Chicot, Ka'a'gee Tu Dene Chief, pers. comm. January 2009). According to Chicot's communications, this means an estimated 526 litres (L) to 1754 L of heating fuel is consumed every month throughout the winter months. Assuming those residents who pay $2000 a month in heating do not use wood to supplement their heating costs (based on pers. comm. with L. Chicot) it is estimated that fuel wood could produce a monthly savings of $1,400 for oil consumption during the winter months.

Table 10 outlines the estimated value of trees harvested annually for personal use within the Study Area. This includes trees harvested for fuel wood as well as other purposes such as for smoke houses and campfires at the Lady Evelyn Falls Territorial Park. Table 11 presents fuel prices for the community of Kakisa.

Table 10: Economic Value of Wood Harvested for Personal Use in the Study Area *

Estimated Cords of Annual Wood Harvested	*Costs of Wood / Cord *****	*Total Value of Harvested Trees*
300	$240	$72,000

* Sources: L. Chicot, Ka'a'gee Tu Dene Chief, pers. comm. January 2009; Arctic Energy Alliance 2008; and A. Cassidy, Resource Analyst Forester, GNWT, ENR, pers. comm. January 2009.

** Based on Hay River prices (Arctic Energy Alliance 2008).

Table 11: Fuel Prices for the Community of Kakisa*

Community	*Wood Prices*	*Heating Oil Price*	*Total Heating Oil Consumption **
Kakisa	$240 per cord **	$1.14 per L ***	526 to 1754 L per month***

* Sources: J. Vandenburg, Director Petroleum Products, GNWT, Public Works and Services (PWS), Petroleum Product Division (PPD), pers. comm. November 2008.
** Arctic Energy Alliance 2008.
*** L. Chicot, Ka'a'gee Tu Dene Chief, pers. comm. January 2009.

Table 12 outlines the savings incurred by using wood heat for homes in the community of Kakisa. This estimate does not include the wood required to heat the cabins located throughout the Study Area. This additional fuel wood is likely harvested in close proximity to the cabins inside the Candidate Protected Area but is not quantifiable for the purpose of this report. The savings outlined in Table 12 are the maximum potential savings that residents of Kakisa could incur monthly if all homes used supplementary wood heating.

Table 12: Estimated Maximum Potential Savings through Supplementing Heating Requirements with Fuel Wood in Kakisa during the Winter Months

*Approximate Cost of Heating Oil Without Fuel Wood Supplement per Household **	*Approximate Cost of Heating Oil With Fuel Wood Supplement per Household **	*Monthly Savings per Household*	*Number of Private Dwellings in Kakisa **	*Total Maximum Estimated Monthly Savings to the Community*
$2,000	$600	$1,400	19	$26,600

* Sources: L. Chicot, K'a'gee Tu Dene Chief, pers. comm., 2009.

** Statistics Canada 2006.

The potential maximum savings that the residents of Kakisa could realize through supplementing their household heating with wood fuel may be valued as high as $25,500 during the winter months, but this would require that all of the 19 dwellings in the community were able to save $1400 on their heating costs monthly by supplementing their oil heat with wood heat.

More realistically, it is estimated that 260 cords of wood are used in Kakisa for fuel wood heating annually. Since fuel wood is priced at approximately $240 per cord in Hay River (Arctic Energy Alliance 2008), the estimated annual fuel wood replacement value for supplementing home heating in Kakisa is approximately **$62,400**.

The economic value of trees used for personal construction materials by the residents of Kakisa was not quantifiable, and therefore no economic value has been determined for this use of wood in the Study Area. Construction material is acknowledged, however, as a potential additional source of economic value for the use of trees in Ka'a'gee Tu.

Table 13 summarizes the estimated economic value of trees harvested within the Study Area annually for both commercial and residential fuel wood purposes.

Table 13: Estimated Economic Value of Trees in the Study Area

Tree Use	*Current Estimated Annual Value*
Commercial logging	$90,000
Resident wood harvest for non-dwelling fuel purposes (e.g., smoke houses, cabins)	$9,600
Residential fuel wood harvest for dwellings	$62,400
Residential wood harvest for personal construction materials	unknown
TOTAL	**$162,000**

6.5 Trees Conclusion

Trees are important to the Ka'a'gee Tu Dene. They are used for a variety of purposes including for constructing boats and sleds while engaging in traditional activities on the land, for commercial harvest, and for fuel wood used to heat homes, camps, cabins, and smoke houses.

Table 14 summarizes the estimated economic value, current use and future potential use of trees in the Ka'a'gee Tu Study Area.

7.0 PLANT RESOURCES, THEIR USES AND THEIR ECONOMIC VALUE

7.1 Plants

Located within the Taiga Plains Ecozone, the Ka'a'gee Tu Candidate Protected Area is predominantly situated within the Great Slave Lowlands MB and Tathlina Plain MB Ecoregions of the greater (Level III) Mackenzie and Slave Lowlands MB Ecoregion (Ecosystem Classification Group 2007). The most species-rich habitats within the Taiga Plains Ecozone are the mixed woods and shrublands associated with fens, bogs, ponds, streams, and lakes that are found within the Candidate Protected Area (EC 2007).

The Great Slave Lowlands MB Ecoregion is a nearly flat wetland dominated area with scattered patches of mixed-wood and jackpine (*Pinus banksiana*) forests. The Tathlina Plain MB Ecoregion consists of extensive peat plateaus with net and northern ribbed fens. Limited upland forests occur on drier terrain along rivers and streams. Open and closed black spruce (*Picea mariana*) stands with scattered tamarack (*Larix laricina*) on extensive areas of poorly drained organic and mineral soils and

some paper birch (*Betula papyrifera*) and shrubs. Upland slopes and the banks of watercourses are covered by white spruce (*Picea glauca*), balsam fir (*Populus balsamifera*), and aspen (*P. tremuloides*) mixed wood forests (EC 2007).

Table 14: Estimated Economic Value and Future Potential of Tree Resource Uses in the Study Area

Tree Resource Use	*Current Estimated Annual Value*	*Current Estimated Use Inside Study Area*	*Future Potential*
Commercial logging	$90,000	2,000 m^3	Unknown but assumed to be potential for increased commercial harvest.
Resident wood harvest for non-dwelling fuel purposes (e.g., smoke houses)	$9,600	40 cords from stands of wood surrounding the community, along the roadside and by trails and cabins located in the Ka'a'gee Tu Study Area.	Likely stable.
Residential dwelling fuel wood harvest	$62,400	260 cords from stands of wood surrounding the community, along the roadside and by trails and cabins located in the Ka'a'gee Tu Study Area.	Likely stable.
Residential wood harvest for personal construction materials	unknown	unknown	Unknown but assumed to be stable

The understory to these tree communities is comprised of willow and alder shrubs, low growing shrubs including Labrador Tea (*Ledum palustre*) and Leatherleaf (*Chamaedaphne calyculata*), and berry shrubs such as cranberry (*Vaccinium vitis-idaea*), current (*Ribes glandulosum*) and blueberry (*Vaccinium* spp.). The ground cover is dominated by lichen and mosses, which form a thick, continuous carpet (EC 2007).

The Ka'a'gee Tu area is dominated by black spruce and tamarack wetland forests (EBA 2007a; EBA 2007b; Figure 5). Shrubs are present in two layers; taller shrubs such as willow and birch and lower shrubs such as Labrador tea, cranberry and bearberry (*Arctostaphylos uva-ursi*; EBA 2007a). Shrub and herb habitats are limited and are found mainly around the Muskeg River and north of Beaver Lake. Broadleaf forests can be found south of Tathlina Lake, along the north and east slopes of the Cameron Hills, along the south shore of Kakisa Lake and the north shore of Beaver Lake. The area north of Kakisa Lake is reported to support a dense population of black spruce, upland Jack pine, Labrador tea and cranberry. The Kakisa headwaters are reported to support black spruce, birch, leatherleaf, lichen peat moss and shrubs (EBA 2007b; Figure 3). Fens found within the Study Area support sedges, cottongrass and willow species (EBA 2007a).

7.2 Berry Picking

Berries are abundant throughout the Candidate Protected Area (KTFN 2006). Traditionally, berries are mainly eaten fresh, with some frozen for use throughout the winter. Berries are still harvested today (KTFN 2006). Table 15 provides a list of berry species harvested in the Study Area.

Table 15: List of Berry Species Harvested in the Study Area *

Scientific Name (genus and species)	*Common Name(s)*	*Area Found*
Amelanchier alnifolia	Saskatoon berry	Throughout the Study Area.
Cornus sericea	Red willow berries	Throughout the Study Area.
Ribes hudsonianum	Northern black currant	Throughout the Study Area.
Rubus spp	Wild red raspberry, Dewberry, Dwarf raspberry	Throughout the Study Area, especially around Tatl'ailii Dadelii.
Rubus chamaemorus	Cloudberry, Baked apple berry, Yellowberry	Throughout the Study Area, especially around Tatl'ailie Tu.
Shepherdia canadensis	Buffaloberry, Soopolallie, Soapberry	Throughout the Study Area.
Vaccinium spp	Common blueberry	Throughout the Study Area, especially around Tatl'ailie Tu.
Vaccinium vitis-idaea	Lingonberry, Bog cranberry, Cowberry, Mountain cranberry	Throughout the Study Area, especially along the shores of Tatl'aill.
Viburnum edule	Low bush cranberry	Throughout the Study Area.
Viburnum opulus	High bush cranberry	Throughout the Study Area.

* Source: KTFN 2006.

7.3 Medicinal Uses

Many plant species have long served medicinal, ritual and spiritual purposes for the Dene. Different plant species serve different functions, such as the relief of coughs and colds through herbal teas. The K'a'a'gee Tu Dene depended on the land to cure ailments and sustain good health. Some plants are still harvested today for medicinal use (KTFN 2006). Etaahdlii is one area within the Ka'a'gee Tu Candidate Protected Area that has been deemed excellent for harvesting rat root (KTFN 2006). Table 16 shows those species occurring within the Study Area that are used by the K'a'a'gee Tu people for medicinal purposes.

Table 16: List of Medicinal Plants Traditionally and Presently Used within the Study Area *

Scientific Name	Common Name	Medicinal Uses
Mentha arvensis	Wild Mint	Colds and fever.
Cornus sericea	Red willow	Treatment for aching bones dues to cold, chest pain, washing wounds and stomach ulcers.
Picea mariana *Picea glauca*	Spruce needles	Treatment for colds.
Solidago canadensis	Goldenrod	Chest colds.
Ledum groenlandicum	Labrador tea	Colds.
Salix spp.	Willow	Used with other plants to treat various ailments.
Picea mariana *Picea glauca*	Spruce gum	Treatment for colds and open wounds.
Acorus americanus	Rat root	Treatment for sore throat, stomach aches and toothaches.
Evernia mesomorpha	Spruce fungus	Boiled with spruce gum when people are sick.
Populus balsamifera	Small poplar buds	Ointments.
Haploporous odoratus	Willow fungus	Burned to keep mosquitoes away and smoked to treat headaches.
Larix laricina	Tamarack	Treatment for infected sores.

* Source: KTFN 2006.

7.4 Food Plant Harvest / Agriculture

The areas around the Kakisa, Tathlina and Beaver lakes are important areas for plant harvesting (EBA 2007b). The following section describes what wild foods may be harvested in the Study Area.

7.4.1 Edible Plants

Traditionally, during the summer months the roots of plants, wild vegetables and berries such as wild carrots (*Sium suave*), onions (*Allium* spp.) and mint (*Mentha arvensis*) were harvested for consumption (KTFN 2006). The people of the Ka'a'gee Tu area still rely on traditional plants for food, medicine and cultural activities (DLUPC 2006). Table 17 lists the potentially harvested food plants found within the Study Area.

7.4.2 Mushrooms

Although no documented information was found of mushroom harvests in Ka'a'gee Tu, native morel mushrooms (*Morchella esculenta* and *Morchella angusticeps*) are picked throughout the NWT. These mushrooms, triggered into fruiting by forest fire activity, are typically found in the year following a forest fire and are harvested on open ground during the early summer months (Underhill 1979; Territorial Farmers Association *et al.* 2000).

Table 17: List of Potentially Harvested Food Plants in the Study Area and Their Traditional Known Uses *

Scientific Name	Common Name(s)	Traditional Uses **
Allium testile	Wild onions and chives	Flavouring soups and stews; bulbs eaten raw or boiled.
Angelica lucida	Wild celery	Stems without flowers can be eaten.
Aralia nudicalis	Wild sarsaparilla	Rhizomes can be cooked. Whole plant can be eaten.
Calamagrostis canadensis	Marsh reedgrass	Used for drinking straw *.
Cicuta maculate	Water hemlock	Smoked to relieve headaches.
Claytonia tuberose	Tuberous spring beauty	Corms sliced and fried like potatoes.
Heracleum lanatrum	Cow parsnip	Young stems roasted and eaten, or eaten raw. Leaf stalk eaten raw, rhizomes eaten like a potato. Seeds used for flavouring.
Hordeum jubatum	Foxtail barley	Young shoots eaten early summer.
Maianthemum canadense	Wild lily-of-the-valley	Fruit can be eaten.
Oxyria digyna	Mountain sorrel	Fresh leaves and fruit can be eaten.
Phramites australis	Reed	Young shoots eaten.
Sium suave	Water parsnip	Roots eaten cooked or raw.
Typha latifolia	Cattail	Young rhizomes and shoots eaten fresh, inner stem eaten, mature rhizomes peeled and cooked or dried and ground to make flour.

***** DLUPC 2006.

** Marles *et al.* 2000.

7.4.3 Agriculture

Agricultural activities have been undertaken in NWT throughout the last century. There have been successful endeavours to produce vegetable and even grain crops in the area's challenging climates, with efforts beginning in the mid-1900s as far north as the communities of Aklavik and Inuvik in the Mackenzie Delta (RMC Resource Management Consultants 1985).

Successful agricultural activities require several environmental factors to be within a tolerable range. Thresholds exist that must be considered when determining if a crop will mature. Factors that may influence the success of an agricultural attempt include the nature of the soil (its composition, temperature and the presence of permafrost), the land's topography and different climatic factors, such as number of growing degree days, frost-free days, sunlight hours and precipitation (Resource Management Consultants 1985; GNWT, Economic Development and Tourism 1990). Other human-controlled factors such as crop rotation, tillage, fertilizers, windbreaks, irrigation and pesticides must also be considered for different agricultural endeavours (Territorial Farmers Association *et al.* 2000).

An important limiting growing factor for crops in the north is the number of growing degree-days they are exposed to. This measurement incorporates the number of days where the mean temperature exceeds a certain minimal level and by how many degrees it exceeds that minimal level. For cold season crops, the mean temperature must be a minimum of 5^{o}C, and for warm season crops, 10^{o}C. Additionally, the number of frost-free days is also important when considering if an area is suitable for crop development (Territorial Farmers Association *et al.* 2000; GNWT, Economic Development and Tourism 1990).

Four areas in the NWT have been identified as most suitable for agricultural uses. These are the Slave River Lowlands, Upper Mackenzie River Area, Hay River Valley and the Liard River Valley (Territorial Farmer's Association *et al*. 2000). The northern portion of the Ka'a'gee Tu has been assessed for agricultural potential. Only 0.5% of that land has been deemed to have the most arable soil (KTFN 2006). This area is concentrated near the community of Kakisa and is considered to have severe limitations requiring careful selection of crop types, conservation practices and a high risk of failure. 5.5% of the assessed Study Area is considered to have very severe limitations and is deemed suitable for forage crops only (Figure 7; KTFN 2006).

There is currently no agriculture permitted within the Kakisa and Tahtlina Watershed Conservation Zone (DLUPC 2006). However, within the community, Kakisa residents have recently participated for two years in a community garden project sponsored by Agriculture and Agri-food Canada and NWT Industry, Tourism and Investment (ITI) aimed at promoting the growth and consumption of fresh vegetables in the NWT (Agriculture and Agri-food Canada and GNWT, ITI 2008). Through this program, residents of Kakisa are able to grow and take home fresh produce for personal consumption.

7.5 Economic Value of Plants

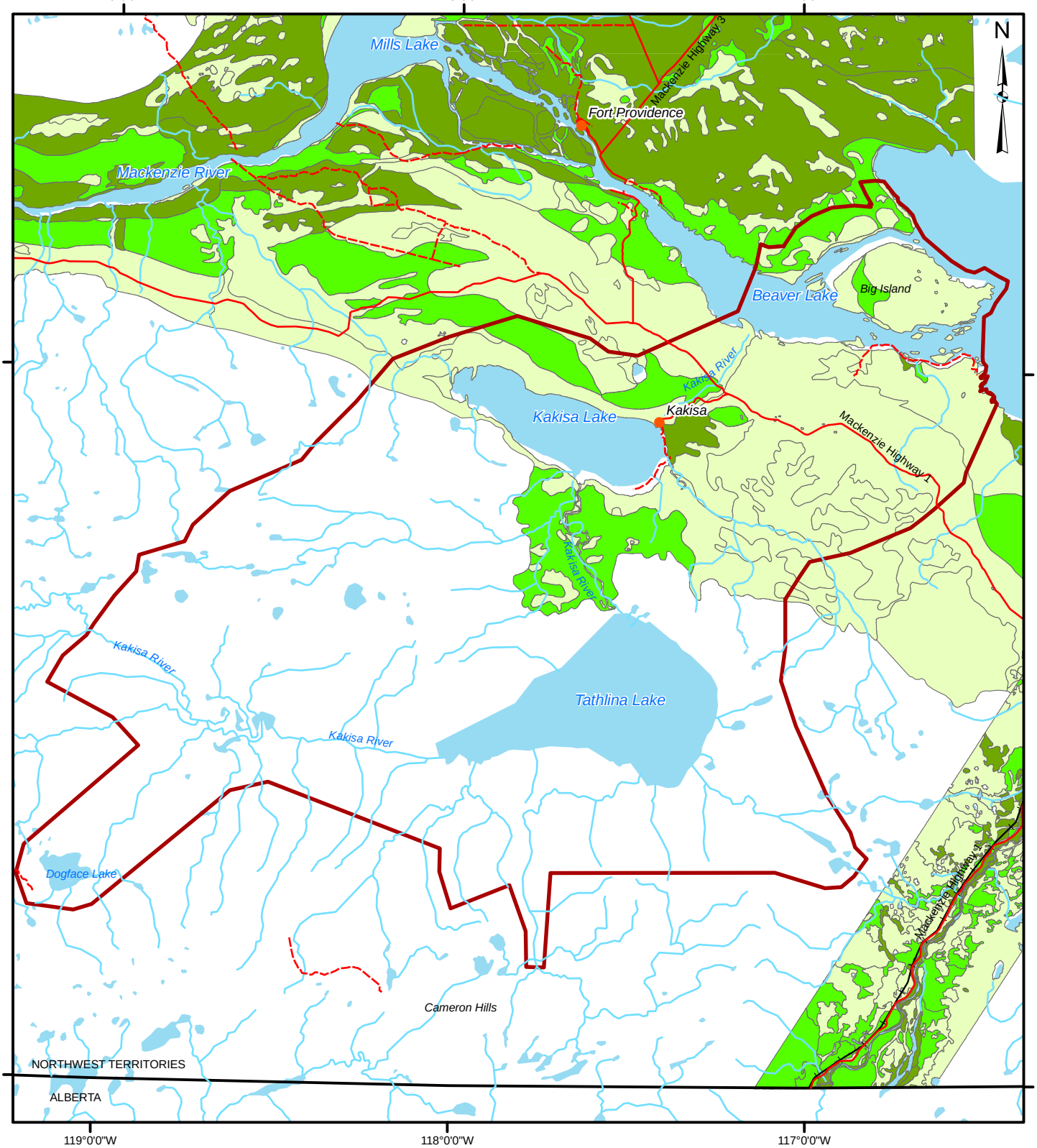
The NWT generates roughly $6-7 million annually in agriculture. Crops brought to market include garden fruits, berries and vegetables, wild berries and herbs and forage (GNWT, ITI 2008).

It is possible that the harvesting of native morel mushrooms could generate a profit if burn sites were easily accessible and the market existed for their sale (Territorial Farmers Association *et al.* 2000), but these mushrooms do not have any present economic harvest value in the Study Area.

Berry picking is an activity which could help to supplement food costs for Study Area residents. Freshly picked or frozen berries may replace fruits and vegetables that need to be purchased in local grocery stores. Unlike meat replacement values, food replacement values of berries are unknown. Besides the food replacement values, berries may have an economical value through their sale. There is no information available to suggest that berries are harvested in the Study Area for sale.

Medicinal plants may be considered to have an economic replacement value. However, it is difficult to quantify the values of medicinal plant use because methods of harvest, doses, frequencies of use, and present market values of supplementary non-traditional medicines are not known.

Agricultural activity within the community of Kakisa currently generates an unknown quantity of fresh produce for consumption by community residents. The produce species, volumes and economic replacement values of these food sources are unknown. If the community garden project continue, the



LEGEND

- COMMUNITY
- ROAD
- WINTER ROAD
- RAILWAY
- STUDY AREA
- VERY LOW
- LOW
- MEDIUM
- HIGH

0 10 20 40

SCALE 1:850,000 KILOMETRES

REFERENCE

Data was obtained from Dehcho Land Use Planning Board, January 2009.
Projection: UTM Zone 11 Datum: NAD 83

PROJECT

RENEWABLE RESOURCE ASSESSMENT OF THE KA'A'GEE TU CANDIDATE PROTECTED AREA

TITLE

AGRICULTURAL POTENTIAL

Golder Associates
Hay River, Northwest Territories

PROJECT No.08-1328-0034			SCALE AS SHOWN	REV. 0
DESIGN	JK	21 JAN. 2009	FIGURE:7	
GIS	RJ	08 Apr. 2009		
CHECK	GC	19 Oct. 2009		
REVIEW	GC	19 Oct. 2009		

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savings gained by the community through growing some of its own food could be significant, given the high cost of purchasing fresh produce within the remote communities of the NWT.

7.5.1 Plants Conclusion

Historically, plants have been utilized for many different purposes in and around the Study Area. They are an important renewable resource, harvested for food and medicine. The relative importance of the different plant uses in the Study Area is difficult to quantify because it is unclear which particular species or what quantities of those species are harvested. It is generally acknowledged that fresh plant products, harvested from the land, are beneficial for residents who consume them and encourage healthier eating (DLUPC 2006).

8.0 ART AND CRAFT MATERIALS RESOURCES, THEIR USES AND THEIR ECONOMIC VALUE

8.1 Introduction to Arts and Crafts Materials

Historically, clothing and household items were made directly from renewable resources such as hide, fur, sinew and bone. Over time, the people responsible for creating these items began to incorporate a less utilitarian methodology in their design, and arts and crafts items became popular (GNWT, Economic Development and Tourism 1997). Many arts and crafts items are still entirely functional, such as knives with bone handles, or bowls made from wood, but many items are also decorative in nature, such as porcupine quill pictures or miniature souvenirs of drums or canoes. Renewable resources today play an important role as raw materials for modern arts and crafts pieces, and many of these materials may be found within the Ka'a'gee Tu Candidate Protected Area.

8.2 Use of Renewable Resources for Arts and Crafts Materials

There are currently no artists registered in the NWT Arts Database who reside in Kakisa (GNWT, ITI 2008). Information on the distribution, use and harvesting trends of the art and craft materials that may be harvested and used in the Kakisa area is not readily available. It is assumed that harvesting activities would likely be concentrated around easily accessible areas such as trails, navigable waterways, cabins and lodge locations.

Renewable resources existing in the Ka'a'gee Tu Study Area that may be harvested, collected, and utilized for arts and crafts purposes are summarized in Table 18. Also shown are the resource's potential uses as art and craft materials and locations where the harvestings of these materials are thought to take place.

Concerns have been raised in the Dehcho region regarding the harvesting of renewable resources by non-residents. Traditional materials such as birch bark, fur and hides are valued by residents of the area, and they want assurance that these resources will be properly used and not wasted in order to maintain sustainable harvest levels. It is recommended that individuals wishing to harvest such resources contact the First Nations for approval and guidance on how best to utilize these materials (DLUPC 2006).

Table 18: Renewable Resources Used for Arts and Crafts and Potentially Located in Ka'a'gee Tu *

Renewable Resource	*Use in Arts and Crafts*	*Probable and Possible Sources*
Birchbark	Birchbark baskets	Throughout Ka'a'gee Tu.
Lichen, berries, flowers, plants, bark	Dyes for porcupine quills Tanning agents	Throughout Ka'a'gee Tu, possibly around Tsa Tu (Beaver Lake).
Spruce roots / gum	Birch bark baskets	Throughout Ka'a'gee Tu.
Wood of various trees and shrubs	Carving Tanning agents miniature snowshoes bows and arrows Birch bark baskets (reinforcement) Beadwork Canes Drums	Anywhere in Ka'a'gee Tu where trees and shrubs exist.
Antler / bone	Carvings Knife handles	Parts from animals harvested in Ka'a'gee Tu are used in arts and crafts.
Feathers	Stuffing pillows Dusting tool Arrows	Within Ka'a'gee Tu.
Fur (beaver, fox, wolverine, marten, wolf, mink, lynx, rabbit / hare)	Clothing (mitts, mukluks, parkas) Souvenirs Decoration	Parts from animals harvested in Ka'a'gee Tu are used in arts and crafts. Animals can be found through the Candidate Protected Area but some abundant areas include Tatl'ailie Tu, Etaahdlii, Redknife Hills, Lughenia Mie east of Tatl'ailie Tu, Etaahdlii and Nagah Zhihe.
Hair (caribou, moose)	Hair tufting (on pictures, clothing, etc.)	Parts from animals harvested in Ka'a'gee Tu are used in arts and crafts. Caribou can be found throughout the Candidate Protected Area. Especially abundant at south-west edge of Ka'a'gee Tu and Etaahdlii basin, south and north of Etaahdlii and in the Tsa Tu (Beaver Lake) area. Moose is found throughout the Candidate Protected Area but is abundant at Ka'a'gee Tu, Tatl'ailic Tu , upper Ka'a'gee Deh and Tsa Tu (Beaver Lake).
Hide (caribou, and more commonly moose)	Clothing (mitts, mukluks, parkas) Canvas (for beadwork) Souvenirs miniature snowshoes miniature canoes Drums	Parts from animals harvested in Ka'a'gee Tu are used in arts and crafts. Caribou can be found throughout the Candidate Protected Area. Especially abundant at south-west edge of Ka'a'gee Tu and Etaahdlii basin, south and north of Etaahdlii and in the Tsa Tu (Beaver Lake) area. Moose are found throughout the Candidate Protected Area but is abundant at Ka'a'gee Tu, Tatl'ailic Tu , upper Ka'a'gee Deh and Tsa Tu.
Quills (porcupine)	Quillwork Beadwork Birch bark baskets Decorative trim on clothing	Porcupine can be found throughout the Candidate Protected Area but is abundant in the Redknife Hills.
Sinew	snowshoes Beadwork Clothing (mitts, mukluks, parkas)	Harvested within Ka'a'gee Tu.

* Sources: KTFN 2006; L. Chicot, Ka'a'gee Tu Dene Chief, pers. comm. January 2009.

8.2.1 Vegetation Matter

Birchbark is used to create traditional lightweight, waterproof and rot-resistant birch bark baskets. The bark of the paper birch is harvested preferably in late spring or early summer (GNWT, ITI 2005). Birchbark is harvested within the Ka'a'gee Tu (L. Chicot, Ka'a'gee Tu Dene Chief, pers. comm. January 2009), although specific harvest locations are unknown.

Traditionally, different lichen, berries, flowers, plants and bark materials were valued for their abilities to dye arts and crafts materials, in particular porcupine quills. Today these resources have become less important in the industry as commercial dyes and other modern dying agents are readily accessible to artists. Some of these natural renewable resources are still harvested within the Ka'a'gee Tu, but it is unknown which areas may be used for such purposes (GNWT, ITI 2005; L. Chicot, Ka'a'gee Tu Dene Chief, pers. comm. January 2009).

Spruce roots and spruce gum are important in the creation of birch bark baskets. The roots are used to sew the pieces of bark together, and the gum is used as a sealant in the basket's seams, aiding in its waterproofing (GNWT, ITI 2005).

The wood of various trees and shrubs is often used in arts and crafts, or during the traditional tanning process for hides. The wood may be used solely for or incorporated into carvings, souvenirs (such as miniature snowshoes, bows and arrows, miniature canoes), birch bark baskets (red willow strips are commonly used for reinforcing the basket and its lid), beadwork, and canes (GNWT, ITI 2005).

8.2.2 Animal Components

Antler and bone materials are often used for or incorporated into carvings, used in beadwork, or used as decoration for other arts and crafts (GNWT, ITI 2005). These materials may be gathered within Ka'a'gee Tu, and are likely most often taken from animals that were harvested for subsistence purposes (Section 4).

Traditionally, feathers were taken from ducks and Canada geese harvested for subsistence purposes to be used for stuffing pillows and blankets. Feathers can be incorporated into arts and crafts items for their decorative value. However, there is no evidence that feathers are currently used for utilitarian or artistic purposes in present day.

The hide from animals, in particular moose and caribou, is a very important renewable resource used in Dene culture and in the arts and crafts industry (KTFN 2006). Tanned hide is used to make clothing items such as pants, mitts, mukluks and parkas, and is also used in various arts and crafts projects such as for canvas material for beadwork, for pieces of souvenir items such as miniature snowshoes and canoes and as handles on birch bark baskets (GNWT, ITI 2008).

Pelts from harvested furbearers, such as fox, beaver, wolverine, marten, wolf, mink, rabbit and others (Section 4) are often used in the arts and crafts industry in the creation of clothing and souvenirs and as decoration on different items (GNWT, ITI 2005). The pelts of animals harvested in Ka'a'gee Tu may be used by artists for arts and crafts purposes.

The hair of the moose and caribou are particularly prized for their value in the art of tufting. The modern art of tufting, involving the collecting, dyeing and sewing of bunches of hairs into designs on

hide or other canvas material, originated in the Fort Simpson area. The preferred hairs to use are the white ones on the shoulder and rump of the animal.

Porcupine quills have been used for hundreds of years by artists in the communities of the Dehcho region, and the use of them precedes the use of beadwork as a form of artistic enhancement for clothing and other works of art. Quillwork is typically incorporated into sewing, weaving and birch bark basket designs. The quills can be obtained from either live or dead porcupines (GNWT, ITI 2005).

Sinew is important in the arts and crafts industry as a quality stitching material. It was traditionally used for sewing projects, in beadwork and incorporated into other items such as snowshoes. Sinew is still used within the Ka'a'gee Tu Study Area (L. Chicot, Ka'a'gee Tu Dene Chief, pers. comm. January 2009).

Animals from Ka'a'gee Tu are important in the production of arts and crafts in Kakisa, although no animal is harvested solely for this purpose. It is unknown how many animals are harvested each year, but it is roughly estimated that approximately 160 animals are harvested per year (typically some moose and caribou, with beaver, fox, wolverine, and an assortment of other mostly fur-bearing animals) for arts and crafts purposes (L. Chicot, Ka'a'gee Tu Dene Chief, pers. comm. January 2009; Section 4). Animals are taken from throughout the Ka'a'gee Tu area.

8.3 Current Economic Value of Art and Craft Materials

In the Dehcho region in 1989 it was estimated that 181 artists worked to produce arts and crafts items. The most popular items sold were baskets, apparel, tuftings and jewellery, generating an estimated $0.5 million in the Dehcho (GNWT Economic Development and Tourism 1993). During the 1990's it was determined that throughout the NWT (prior to splitting with Nunavut) 46% of art items went to tourists, 30% to collectors, and 23% to non-tourists (GNWT, Economic Development and Tourism 1993).

More recently, tourists have been found to spend an estimated $2 million per year on arts and crafts in the NWT. It was found that handmade goods such as pottery, baskets and textiles were the most sought-after arts and crafts items, while clothing and footwear were less popular. A survey conducted of American visitors to the NWT established that unique and original art items were most highly valued, and that an average of 40% of those people interviewed had planned to spend between $100 and $300 on arts and crafts items while visiting (Zieba 2005).

Producing and selling arts and crafts may provide needed income to families with limited opportunities for economic development. The economy in Kakisa is based on traditional activities, one of which is traditional crafts (KTFN 2006). While renewable resource from the Ka'a'gee Tu Study Area are utilized by Kakisa artists for art and craft purposes, the resources are not significant contributors to the local economy when used as arts and crafts materials (L. Chicot, Ka'a'gee Tu Dene Chief, pers. comm. January 2009).

The Great Northern Arts Festival is annually located in Inuvik but brings artists from across the NWT and sells to visitors from around the world (Great Northern Arts Society 2008). It is would be possible for some of the arts and crafts made in Kakisa with materials gathered in the Ka'a'gee Tu Study Area, to be sold in Inuvik. Other festivals such as the Open Sky festival, across the NWT and Canada may

also sell arts and crafts items that were made from Ka'a'gee Tu materials. However, there is little evidence that this has occurred to date.

8.4 Art and Craft Materials Conclusion

The economic importance of the arts and crafts industry in the community of Kakisa is unknown. According to Kakisa's Chief Lloyd Chicot (pers. comm. January 2009) there are practicing artists in the community who do harvest renewable resources from the Ka'a'gee Tu Study Area for arts and crafts materials. While the number of animals harvested from the area for such purposes may be tentatively quantified, the distribution of such resource use is unknown. The amounts and locations of vegetative matter harvested for arts and crafts purposes in the Ka'a'gee Tu Candidate Protected Area are almost entirely unknown.

Most artists within the community of Kakisa only produce arts and crafts for sale on a by-order basis (L. Chicot, Ka'a'gee Tu Dene Chief, pers. comm. January 2009). It may be concluded that, while important locally as a source of arts and crafts materials, not enough information is known about the distribution, use or harvesting trends of Ka'a'gee Tu Candidate Protected Area renewable resources for arts and crafts purposes to determine how valuable the area is for such an industry comparative to other potential areas.

9.0 WILDERNESS RESOURCES, THEIR USES AND THEIR ECONOMIC VALUE

9.1 Introduction to Wilderness

For the purposes of this report, the description of wilderness as a renewable resource refers to its use for tourism, including eco-tourism activities and business generated for regional accommodations such as lodges. Tourism activities that are described in this section are not related to hunting, fishing, outfitting, trapping or other consumptive activities (i.e., involving taking materials from the land). Sections 4 (Wildlife) and 5 (Fish) describe these consumptive renewable resource uses within Ka'a'gee Tu.

Wilderness and tourism-related activities may include wildlife viewing, bird watching, aurora watching (i.e., looking at the aurora borealis in the night sky), scenery watching or sight-seeing, photography, boating (canoeing, rafting, kayaking, motor-boating), hiking and backpacking, cross-country skiing, snowshoeing, snowmobiling, horse-back riding, picnicking, swimming, or interpretive activities (particularly concerning cultural or traditional sites). Most of the guided and outfitted tourist activities taking place in the Dehcho Region are conducted between the months of June and October (GNWT, RWED 2005).

'Hard' tourism activities require a good level of fitness and skill and require participants to be prepared for adverse conditions over a number of days in remote or difficult terrain. 'Soft' tourism activities require only a low to moderate level of fitness and skill, are usually considered safe and typically last one day (Terriplan Consultants 2008). These activities may be undertaken by the independent visitor to the area or be conducted through a local lodge, guide, outfitter, or charter company. Additionally,

the use of wilderness for educational, research or nature interpretation activities may also be considered.

Commercial tourism activities in the NWT must be carried out by a tourism operator under the *Tourism Act* (1988) and requires a Tourism Operator License. Potential or current operators may obtain a Tourism Operator License at the GNWT, ITI office in Fort Simpson (GNWT, ITI 2008a).

9.2 Ka'a'gee Tu Tourism

The greater part of the Ka'a'gee Tu Candidate Protected Area lies within the Kakisa and Tathlina Watershed Conservation Zone (DLUPC 2006a). The zone is estimated to be 8,384 km^2 and, significantly, the only permitted use for the area under the Land Use Plan is "tourism" (DLUPC 2006a). Other smaller areas of Ka'a'gee Tu encompass portions of the Upper Mackenzie Conservation Zone, Great Slave Lake Shoreline Conservation Zone and Heart Lake, McNally Creek, Muskeg River Conservation Zone, all of which also only have "tourism" as a permitted land use activity (DLUPC 2006a).

Specifically, the Land Use Plan identified two areas within the Study Area that could be considered to have tourism potential. The Kakisa Lake and Kakisa River areas are considered to have "low" tourism potential. The other area, located in the south-western corner of the Study Area, is identified as having a "high" tourism potential. This area encompasses Dogface Lake and, on a small island in the lake, the Deegahni Lake Lodge (Section 5; DLUPC 2006b). The highest ranking for tourism potential in the Study Area was in the Beaver Lake area at the headwaters of the Mackenzie River. This area, including Brabant Lodge located on Beaver Lake, is considered to have “very high” tourism potential. The remainder of the Study Area is either not assessed or is not considered to have any tourism potential (DLUPC 2006b).

It appears that visitors to the Ka'a'gee Tu area typically participate in 'soft' tourism activities such as picnicking, single-day hiking, backpacking and river paddling, and camping in a designated territorial park with ample facilities (KTFN 2006). 'Hard' tourism activities, if undertaken, could include multiple-day back-packing treks through the Cameron Hills area, which may or may not include sections of the Ka'a'gee Tu Candidate Protected Area.

9.3 Access to the Ka'a'gee Tu Candidate Protected Area

9.3.1 Access by Road

The Ka'a'gee Tu Candidate Protected Area is located along the Dehcho Connection, a popular tourist destination for drivers wishing to enjoy the NWT's scenery with the convenience of vehicle accessibility. This route links the Mackenzie, Liard and Alaska highways in a looped path. The southern-most point of the route goes through Grande Prairie, Alberta. It extends north-west from there through British Columbia and enters the NWT as the Liard Highway near Fort Liard. From Grande Prairie, the route also extends north-east, entering the NWT from Alberta on the way to Enterprise (Deh Cho Travel Connection 2003).

The Dehcho Connection spans the southern NWT between Fort Liard and Enterprise, with the Ka'a'gee Tu Candidate Protected Area encompassing a portion of the route between Enterprise and Fort Providence. Visitors traveling along this route can access the Ka'a'gee Tu area from the Dehcho

Connection along the Mackenzie Highway (also referred to as Highway 1 or the Waterfalls Route). A 13-km all-weather road connects the highway to the village of Kakisa, located south of the highway, within the heart of Ka'a'gee Tu (Figure 8; The Legislative Assembly of the NWT 2004).

Tourists can rent cars from Hay River, Fort Simpson or Yellowknife and drive to the Ka'a'gee Tu area (Northwest Territories Tourism [NWT Tourism] 2008).

9.3.2 Access by Air

The community of Hay River, located east of Ka'a'gee Tu, is serviced by daily flights from both Edmonton and Yellowknife. Additionally, Fort Simpson, located north-west of Ka'a'gee Tu is accessible by air from Yellowknife and Whitehorse (Yukon; NWT Tourism 2008).

Air access directly into the Ka'a'gee Tu area is possible by chartering a float plane to the Kakisa, Tathlina or Dogface lakes. Additionally, there may be several airstrips located throughout the Study Area that may be serviceable (e.g., to the west of Dogface Lake and to the west of Kakisa River; to the west of Kakisa Lake; Figure 8; Toporama 2008). The condition of these airstrips is not known, but they could potentially be used to bring tourists directly into the Ka'a'gee Tu area (i.e. for hiking, camping, etc).

9.3.3 Access by Water

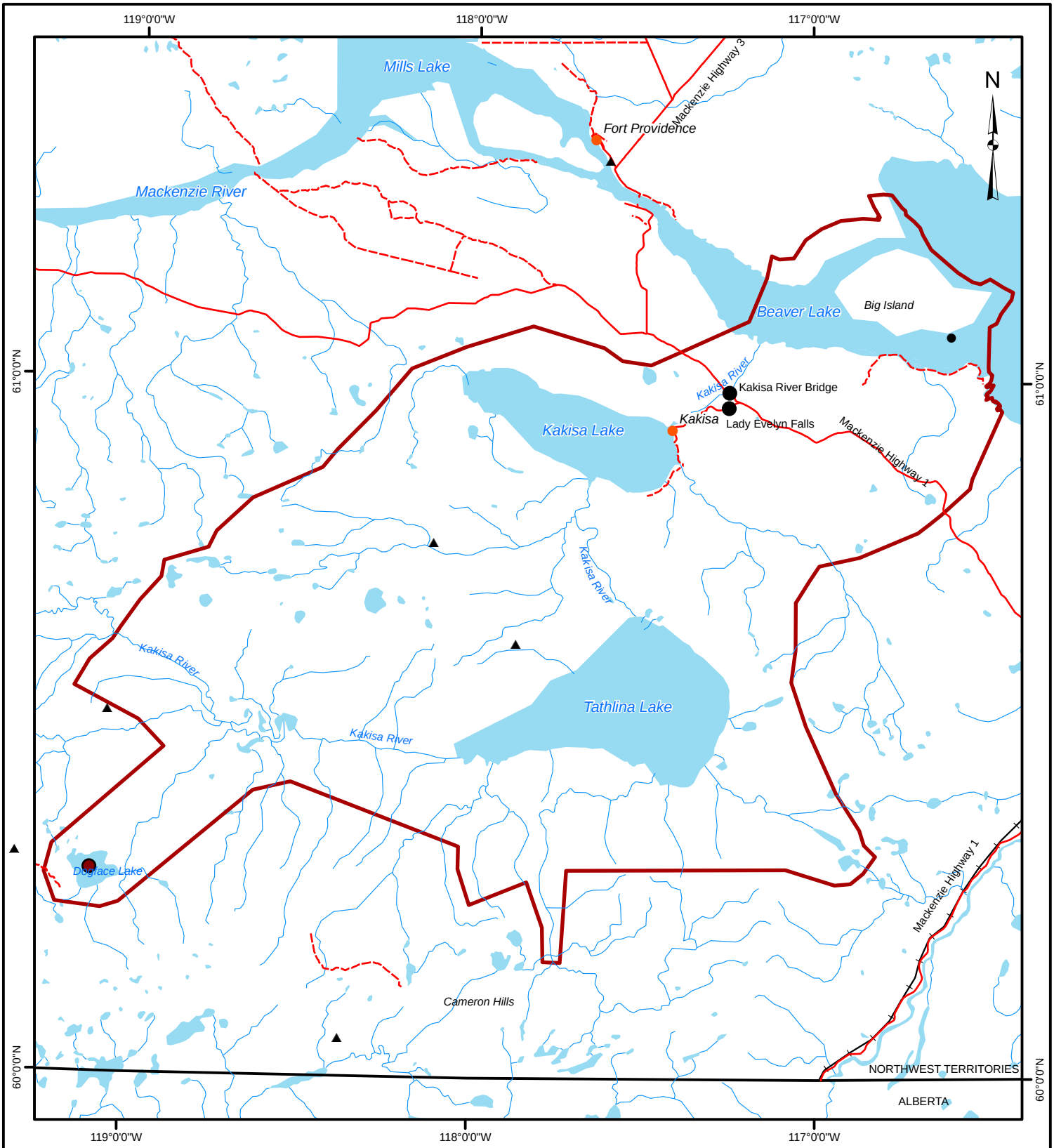
Tourists can access the Ka'a'gee Tu area by boat from along the Mackenzie River. The main access from the Mackenzie River to the interior of the Study Area is via the Kakisa River which drains Tathlina and Kakisa Lakes. There are several possible routes from Kakisa Lake to other interior regions of the study area (Figure 8).

9.4 Attractions within the Ka'a'gee Tu Candidate Protected Area

9.4.1 Kakisa River Bridge Territorial Park

The Mackenzie Highway leads west from Enterprise and passes through the McNallie Creek Falls Territorial Park (outside of the Study Area) and on to the Kakisa River Bridge Territorial Park. The park is located approximately 68 km south-east of Fort Providence and is within Ka'a'gee Tu. This day-use park area is used by visitors for picnicking, fishing or scenery watching (GNWT, ITI 2008b). The park offers amenities such as:

- a boat launch;
- day use / picnic facilities;
- drinking water;
- fire pits / firewood;
- fishing along the Kakisa River;
- toilets / outhouses; and
- a pet-friendly (on-leash) policy.



LEGEND

- BRABANT LODGE
- RUNWAY
- COMMUNITY
- DEEGHANI LAKE LODGE
- Territorial Park
- ROAD
- SEASONAL ROAD
- RAILWAY
- STUDY AREA

REFERENCE

Data was obtained from Natural Resources Canada, January 2009.
Projection: UTM Zone 11 Datum: NAD 83

0 10 20 40
SCALE 1:850,000 KILOMETRES

PROJECT
RENEWABLE RESOURCE ASSESSMENT OF THE KA'A'GEE TU CANDIDATE PROTECTED AREA

TITLE
TOURISM

Golder Associates
Hay River, Northwest Territories

PROJECT No.08-1328-0034			SCALE AS SHOWN	REV. 0
DESIGN	JK	21 JAN. 2009		
GIS	RJ	08 Apr. 2009		
CHECK	GC	19 Oct. 2009		
REVIEW	GC	19 Oct. 2009		

FIGURE: 8

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9.4.2 Lady Evelyn Falls Territorial Park

Camping facilities are not available at either McNallie Creek Falls Territorial Park or the Kakisa River Bridge Territorial Park. However, tourists traveling along the Waterfalls Route of the Mackenzie Highway may choose to stay and camp at the Lady Evelyn Falls Territorial Park, a designated "Natural Environment Park" (GNWT, ITI 2008c). Travelers can head 6.5 km south from the Mackenzie Highway down the road to Kakisa and end up at the park which includes a scenic campground where many amenities are available.

The park's primary attraction is the Lady Evelyn Falls, a curtain-like waterfall that drops 15 m over a limestone sill of the Kakisa River, located a short walk along a trail from the campsite. A staircase leads into the river gorge where visitors can view the waterfall and fish for pickerel (walleye), arctic grayling and northern pike in the fast-moving river there (Section 5; GNWT, ITI 2008c; GNWT, ITI 2008d).

Visitor services that are available in Lady Evelyn Falls Territorial Park include (GNWT, ITI 2008c):

- 3 boat launches
- 13 camp sites;
- day use / picnic facilities;
- drinking water;
- fire pits / firewood;
- fishing along the Kakisa River;
- interpretive displays;
- kitchen / picnic shelter;
- a lookout;
- showers / toilets / outhouses;
- a staffed information center;
- trails from the campsite to the waterfall;
- wheelchair access around the campsite; and
- a pet-friendly (on-leash) policy.

9.4.3 Community of Kakisa

The village of Kakisa is located on the eastern shore of Kakisa Lake near the start of the Kakisa River (Figure 8), and is home to approximately 55 Dene (Statistics Canada 2006). The community is linked to the Mackenzie Highway by an all-weather road. It is also accessible by float plane during the summer months (The Legislative Assembly of the NWT 2004).

Kakisa offers a limited selection of amenities for visitors to the community. The River Front Convenience Store & Motel (owned by the KTFN) provides some groceries as well as gasoline to residents and tourists, and has several rooms available for visitors (KFTN 2006). This business also

serves tourists visiting nearby Lady Evelyn Falls and the associated territorial park (The Legislative Assembly of the NWT 2004).

9.4.4 Deegahni Lake Lodge

Deeghani Lake Camp, or Deeghani Lake Lodge, is one of few lodges in the Study Area. It began operations in the early 1970s (KTFN 2006) and is located on Dogface Lake in the Study Area's south-west corner (Figure 8). The operation's focus is on sport fishing and it does not cater to non-fishing related tourist activities (D. Fergusson, Deeghani Lake Lodge, pers. comm. April 2009; Deh Cho Environmental 2003). The lodge is described in detail in Section 5 (Fish).

9.4.5 Brabant Lodge

Brabant Lodge predominantly offers recreational fishing services and is located 51 km (32 miles) west of Hay River in the headwaters of the Mackenzie River (Brabant Lodge 2007). While the lodge does offer conference facilities to guests, there are no other tourism activities beyond sport fishing. Brabant Lodge is described in detail in Section 5 (Fish).

9.4.6 Mystery Tours

Mystery Tours is a tourism operator based out of Hay River offering boat cruises, birding tours, wildlife viewing and one-day fishing trips. The operator possesses a license that extends down the Mackenzie River as far as Mills Lake and as such tours may include Beaver Lake in the Study Area (Operator, Mystery Tours, pers. comm. June 2009). Guests of Mystery Tours predominantly take part in short (two hours of less) boat tours in and around the Hay River Harbour area, with a small number entering into the Study Area (Operator, Mystery Tours, pers. comm. June 2009). The area surrounding Beaver Lake is ranked as having very high tourism potential and providing very high potential economic benefit (Deh Cho Environmental 2003).

9.4.7 Lakes and Rivers

In an assessment of tourism potential within the Dehcho, Kakisa Lake was rated as having a "good" location and accessibility for reasons such as multiple options for access (e.g., boat, float plane, vehicle) and being near a major corridor (i.e., the Mackenzie Highway; Deh Cho Environmental 2003). However, due to low marketability and potential economic benefit, the overall ranking for Kakisa Lake is considered low and it is noted that more adequate infrastructure would be needed to support multi-day tourist activities (Deh Cho Environmental 2003).

Recreational opportunities in the Ka'a'gee Tu area include fishing on Kakisa and Tathlina lakes for pickerel and pike, as well fishing as along the Kakisa River. Fishing guides may be available through the Kakisa Band Office (Section 5; NWT Tourism 2008; GNWT, ITI 2008c).

Visitors can also participate in boating adventures in the Study Area by paddling in the current of the Kakisa River either above or below the Lady Evelyn Falls (NWT Tourism 2008). Boaters may conduct these activities independently, without the aid of a guide or outfitter.

9.4.8 Trail Systems

There are opportunities for visitors to travel on foot through portions of the Ka'a'gee Tu Candidate Protected Area. The proximity of trail systems in Ka'a'gee Tu to the Mackenzie Highway is considered an asset, even drawing in tourists that primarily conduct their tourist activities around the comforts of their vehicles.

Lady Evelyn Falls Territorial Park: There are trails leading from the park's campground to picnic spots located above the falls, including interpretive displays for tourist education. The park is accessible by vehicle from the Mackenzie Highway, so these trails can be easily walked by anyone traveling along the Deh Cho Connection route (GNWT, ITI 2008c). A traditional trail also leads from the park and falls along the Kakisa River and into the village of Kakisa (Deh Cho Environmental 2003) which may be used by tourists.

Kakisa Trail System: There is a mapped trail that leads from Kakisa along the south-east shore of Kakisa Lake to the Kakisa River, connecting Kakisa Lake with Tathlina Lake to the south (DLUPC 2006a). This recently upgraded trail could be used by tourists wanting to explore the area on foot (or bicycle, etc.; KTFN 2006). Additionally, other trails in the Kakisa area can be used by hikers and backpackers for unguided day hikes; however, there seems to be minimal interest in these trail systems from more adventurous multi-day hikers (Deh Cho Environmental 2003).

Dogface Lake: There appears to be a trail leading from an airstrip located to the west of Dogface Lake to the southern shore of the lake (Toporama 2008). No reference to this airstrip has been noted elsewhere.

Cameron Hills: Located in the south-east corner of the Ka'a'gee Tu area, the Cameron Hills and associated Cameron River may be of interest to hikers and backpackers for unguided, single-day trips. The proximity of these hills to the Mackenzie Highway is an asset; the area can be accessed from the section of the Mackenzie Highway that follows Hay River to the east of the Study Area (e.g., from near the 60th Parallel Territorial Park; Figure 8). There are many trails in this area, particularly in the higher plains of the hills (Deh Cho Environmental 2003). Tourists may potentially come across oil and gas and / or forestry developments in the Cameron Hills areas outside of the Ka'agee Tu Study Area (Deh Cho Environmental 2003).

9.5 Nearby Tourist Attractions

Visitor Information Centers are located in Hay River to the east and Fort Simpson to the west. Nearby territorial parks with camping facilities are located near Fort Providence (on the Mackenzie River) and in Hay River. Other attractions for visitors in nearby communities include a golf course in Hay River, and gasoline and grocery providers in Fort Providence (GNWT, ITI 2008c).

The Cameron Hills, located south of the Study Area, are identified as Special Management Zone number 33 in the Dehcho Land Use Plan (DLUPC 2006a). Although there are numerous other permitted land uses within this area (including oil and gas, mining, and forestry) tourist activity is also permitted, including the use of the trail systems throughout the hills (Deh Cho Environmental 2003).

9.6 Economic Value of Wilderness

The economic value of visitors participating in wilderness-related activities in the Ka'a'gee Tu Candidate Protected Area may be attributed to two primary sources of tourist income to the area:

1) Lady Evelyn Falls Territorial Park (campsite revenues); and

2) Lady Evelyn Falls visitors going into Kakisa (spending at the River Front Convenience Store & Motel for supplies, groceries, gasoline, accommodations etc.).

No other hotel, motel or bed and breakfast accommodations are considered outside of Ka'a'gee Tu for the purpose of this report (e.g., those in Enterprise, Hay River or Fort Providence). The three official places to stay in Ka'a'gee Tu (i.e., the Lady Evelyn Falls Territorial Park, the River Front Convenience Store & Motel and the Deegahni Lake Lodge) are the accommodations assessed for this RRA, although the Deegahni Lake Lodge is assessed in the Fish Section (Section 5).

Lady Evelyn Falls Territorial Park:

Overnight visitors to the Lady Evelyn Falls Territorial Park camping site currently pay $15.00 per night for a site with no electrical hook-ups, and $20.00 per night for a site with power (T. Colosimo, ITI, pers. comm. December 2008). For the purpose of this report, it will be assumed that visitors use the sites without power in equal proportion to the sites with power, therefore averaging $17.50 per night for a campsite.

The number of visitors to the Lady Evelyn Falls Territorial Park is summarized for the years 2000 to 2008 in Table 19.

Table 19: Economic Value of Visitors to Lady Evelyn Falls Territorial Park *

Year	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*Average*
Total Visitors	624	566	511	435	434	424	376	328	443	**460**
$ Value **	10,920	9,905	8,943	7,613	7,595	7,420	6,580	5,740	7,753	**$8,052**

* Source: S. Marsh, GNWT, ITI, pers. comm. February 2009.

** Value estimated at visitors spending on average $17.50 per night on camping fees in the park.

River Front Convenience Store & Motel:

There are very few tourist purchases made each year at the River Front Convenience Store & Motel. According to a representative of the establishment, tourists stay at the motel only occasionally, and do not spend much money at the store (which has minimal supplies) or gas station. It is estimated that, in total, tourists would spend an average of **$2000 per year** at the River Front Convenience Store & Motel (Representative, River Front Convenience Store & Motel, pers. comm. April 2009).

Summary of Economic Value of Wilderness

Table 20 provides a summary of the economic contributions that tourists provide to the Ka'a'gee Tu Candidate Protected Area. Revenues are primarily from camping fees and spending at the community store / gas station / motel complex.

Table 20: Summary of Estimated Economic Value of Tourism in Ka'a'gee Tu

Location	*Activity Generating Income*	*Annual Value*
Lady Evelyn Falls Territorial Park	Camping fees	$8,052 (averaged for 2000-2008) *
River Front Convenience Store & Motel	Groceries, supplies, gasoline, accommodation fees	$2,000 **
TOTAL		**$10,052**

* Source: S. Marsh, GNWT, ITI, pers. comm. February 2009.

** Representative, River Front Convenience Store & Motel, pers. comm. April 2009.

9.7 Wilderness Summary

The natural wilderness within the Ka'a'gee Tu area attracts tourists to participate in various activities including scenery watching, picnicking, camping, hiking and backpacking, boating and fishing (Section 5).

The most popular destinations within the Study Area are:

- the Kakisa River Bridge Territorial Park (for day-use picnicking, hiking and fishing);
- the Lady Evelyn Falls Territorial Park (for picnicking, hiking, fishing, absorption of interpretive displays, and camping);
- the Kakisa River (for boating and fishing);
- the village of Kakisa (for day trips, re-supply of groceries and / or gasoline, or overnight visits);
- Cameron Hills (for hiking and backpacking); and
- the Deegahni Lake Lodge (for sport fishing, Section 5).

The estimated economic value of tourist activities taking place within the Ka'a'gee Tu Study Area is estimated to be $10,000 annually. This revenue is from two main sources: camping fees at the Territorial Park and tourist purchases and accommodation fees at the River Front Convenience Store & Motel.

There is considered to be a moderate potential to increase tourism-related activities in the Ka'a'gee Tu Candidate Protected Area (KTFN 2006). The potential increased development of tourism within the

Ka'a'gee Tu area would need to take into consideration the cultural traditions and respect for the land that the residents of Kakisa and other Dene using the area have. Education and enforcement measures may be implemented to ensure that tourist activities do not disturb the land and that visitors comply with all regulations put in place to protect the area. Additionally, the need for tourism-related activities to provide a net benefit to affected communities needs to be considered (DLUPC 2006a).

10.0 RENEWABLE ENERGY RESOURCES, THEIR USES AND THEIR ECONOMIC VALUE

10.1 Introduction to Renewable Energy

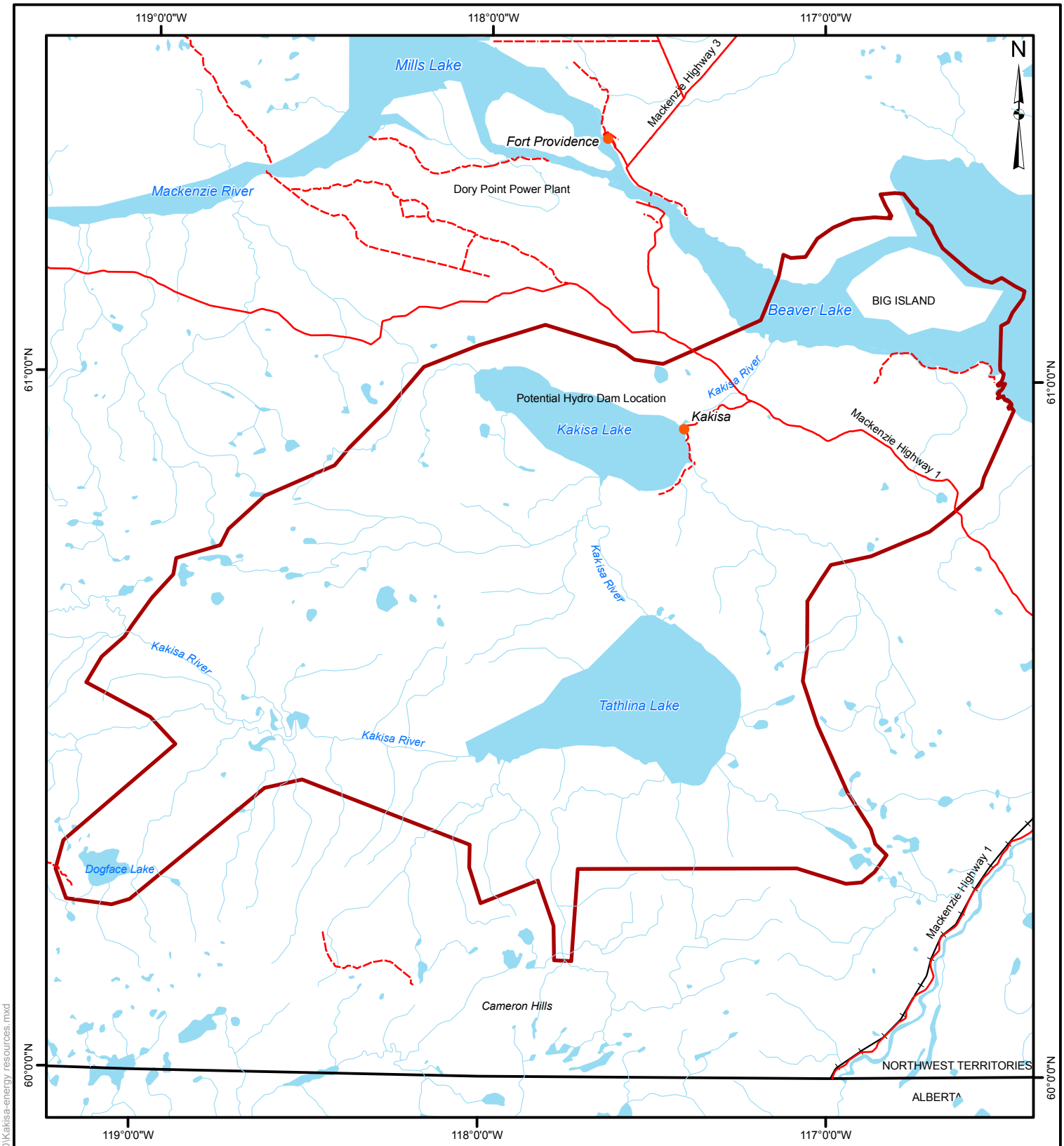
Many remote communities across the NWT and northern Canada are largely dependent on fossil fuels for their energy sources, and residents must deal with the associated high energy costs (Infrastructure Canada 2006). In 2004 / 2005, NWT consumers used nearly 416 million litres of non-renewable (i.e., fossil) fuels. 55% of the fuel was used for transportation, 22% for space heating, and 23% for electricity generation (GNWT 2007a). Types of fuel used in the NWT included diesel, aviation, gasoline, natural gas and propane fuels. The repercussions of the territory's dependence on fossil fuels resulted in increased greenhouse gas emissions rates of more than 60% between 1996 and 2001 alone (GNWT 2007a). Correspondingly, awareness and concerns about 'global warming' and observable climate change in the north have been growing in recent years.

Increasingly, NWT communities are investigating alternative energy sources. Studies examining strategies for harnessing renewable energy are being conducted across the north (GNWT 2007b). The renewable energy sources of wind energy, hydro-electric energy, and solar energy are considered in this report.

Many communities in northern Canada have actually implemented the use of these energy sources. Wind energy is successfully harnessed in Whitehorse, and the use of wind-diesel hybrid generators may soon become established in NWT communities (GNWT, ITI 2007c). Hydro-electric power production supports many communities in the NWT including Hay River, Enterprise, and Yellowknife (GNWT, ITI 2007d).

Currently, the community of Kakisa is dependent on diesel fuel to produce its electricity. Northland Utilities Limited (NUL) is the service provider for the community, with its plant's capacity at 302 kilowatts (kW) of electricity (GNWT, ITI 2007d). The plant, located at Dory Point near the ferry crossing of the Mackenzie River (north of the Study Area; Figure 9), also powers The Lady Evelyn Falls Territorial Park's facilities. The Kakisa River Bridge Territorial Park, as a day-use area only, is not supplied with any power source (M. Schmitz, GNWT, ITI, pers. comm. January 2009)

There is a potential economic value for renewable energy in the NWT, as the value of electricity consumption is considered very high. The GNWT subsidizes the cost of power for most residential consumers with subsidies varying between communities to a specified maximum consumption of power per month (i.e., 700 kW hours; NTPC 2008). The use of renewable energy could off-set the high costs of electricity for communities, potentially decreasing or ceasing the need for government subsidization.



LEGEND

- COMMUNITY
- ROAD
- SEASONAL ROAD
- RAILWAY
- STUDY AREA

0 10 20 40

SCALE 1:850,000 KILOMETRES

REFERENCE

Data was collected from Natural Resources Canada, January 2009
Projection: UTM Zone 11 Datum: NAD 83

PROJECT

RENEWABLE RESOURCE ASSESSMENT OF THE KA'A'GEE TU CANDIDATE PROTECTED AREA

TITLE

ENERGY RESOURCES

Golder Associates
Hay River, Northwest Territories

PROJECT No.08-1328-0034			SCALE AS SHOWN	REV. 0
DESIGN	JK	21 Jan. 2009		
GIS	RJ	08 Apr. 2009		
CHECK	GC	19 Oct. 2009		
REVIEW	GC	19 Oct. 2009		

FIGURE: 9

N:\Active\2008\MG-08-026 PAS Trout lake kakisa\GIS\MXD\Kakisa-energy resources.mxd

The feasibility of using renewable energy that could be harnessed in the Ka'a'gee Tu Study Area and used in Kakisa and / or Lady Evelyn Falls Territorial Park is considered to be low. The uses of renewable energy within Ka'a'gee Tu would likely be limited to uses in the area's isolated off-grid cabins and lodges. Renewable energy could be considered a substitute or supplement to non-renewable resource uses at these sites, for example by replacing energy required from diesel generators for electricity. The use of fuel wood for energy in Ka'a'gee Tu (i.e., typically used for space heating) is considered in Section 6.

10.2 Wind Energy

10.2.1 Wind Energy Introduction

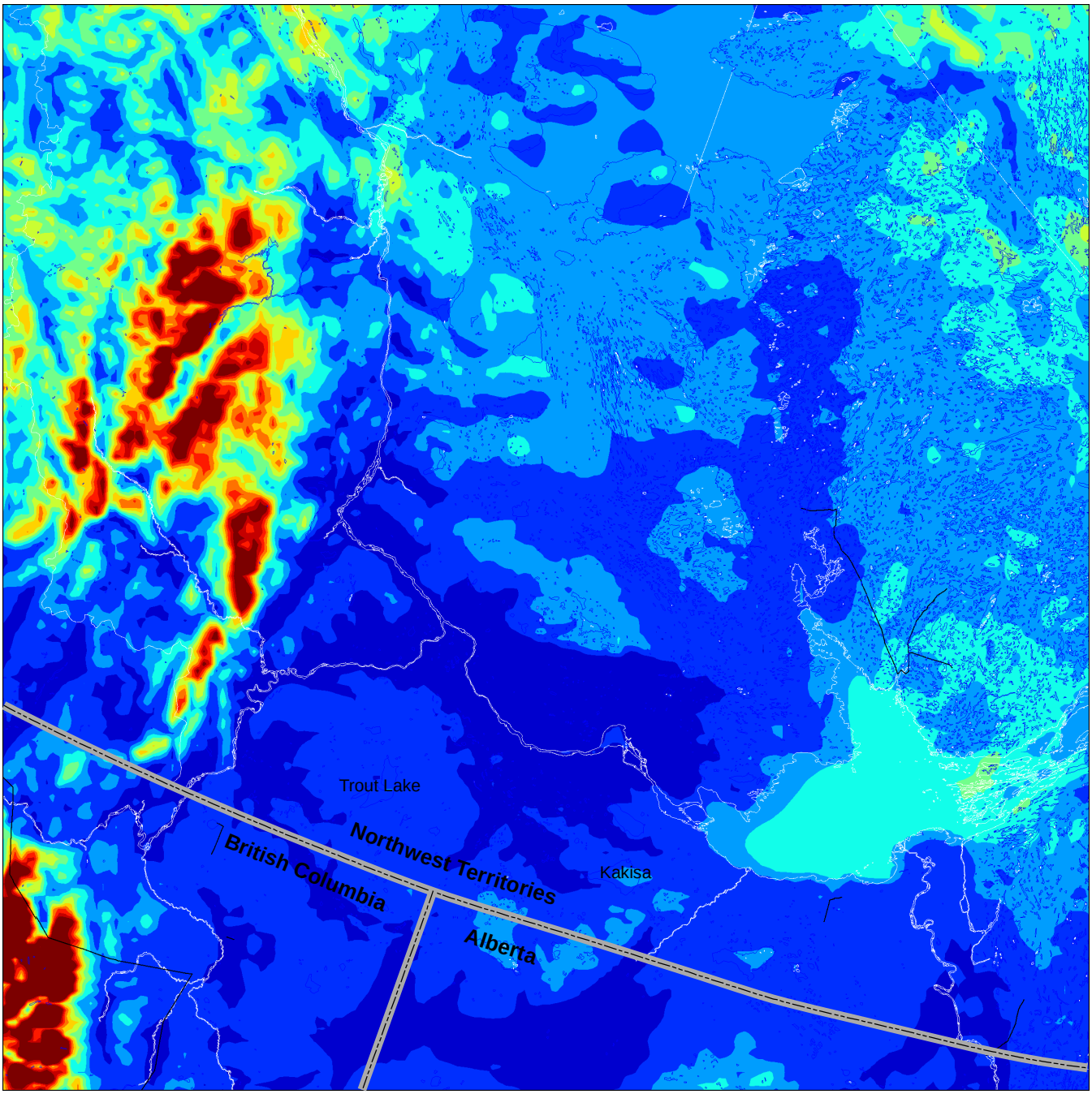
Wind energy is considered a form of solar energy where the earth's air, heated by sunlight, causes surface air movements. It is possible to harness wind energy commercially through the use of turbines and generators, and this energy source is typically regarded as an efficient, reliable and environmentally responsible method of generating electricity (The Pembina Institute 2005). The GNWT has explored the possibility of harnessing wind across the territory. Although the best locations for wind turbines appear to be offshore in the Beaufort Sea and on the north side of Great Slave Lake (Figure 10; GNWT, ITI 2007c), there are also other turbine location possibilities, including near Norman Wells (Pinard *et al.* 2008).

10.2.2 Wind Energy in the NWT and the Ka'a'gee Tu Candidate Protected Area

Wind energy is harnessed in many of Canada's provinces and also in the Yukon Territory. Over the past 20 years, wind turbines were installed in the Yukon (two at the Haeckell Hill wind farm outside of Whitehorse; one in 1993 and one in 2000) and in several locations across the NWT and Nunavut, including Sachs Harbour and Rankin Inlet. The only large-scale turbines that are still functional are the two in Whitehorse where there is the combined capacity for 1 megawatt (mW) of power to be generated (M. Phelan, Arctic Energy Alliance, pers. comm. February 2006). However, in the community of Ulukhaktok, NWT, two small-scale wind turbines with a combined capacity of 600 watts (W) have been installed and functioning for several years for private use at a resident's cabin (Rankin 2009). The success of these turbines has been associated with plans that Aurora College has to offer at least one course on building and maintaining small-scale wind turbines for private use in the NWT (Rankin 2009).

The large-scale turbines that were installed in the NWT failed, due in part to high costs, the lack of technology for successful operations in remote northern locations, the lack of skilled maintenance personnel, and lack of government financing commitment. However, the attraction of harnessing wind energy in the territory is becoming more recognized, along with increased support for wind-energy research and plans to have an operational turbine installed in an NWT community by 2009 (Pinard *et al.* 2008; GNWT 2007b).

Higher wind speeds (without exceeding a threshold level of maximum speed) are better suited to the generation of electricity using wind energy, and higher elevations are generally sites of higher wind speeds than lower elevations (The Pembina Institute 2005; M. Phelan, Arctic Energy Alliance, pers.



LEGEND

3 4 5 6 7 8 9 10 (m/s)

REFERENCE

Data was obtained from Canada Wind Energy Atlas, June 2009

PROJECT

RENEWABLE RESOURCE ASSESSMENT OF THE KA'A'GEE TU CANDIDATE PROTECTED AREA

TITLE

WIND (80M)

Golder Associates
Yellowknife, Northwest Territories

PROJECT No. 08-1328-0034			SCALE AS SHOWN	REV. 0
DESIGN	JK	21 Jan. 2009	FIGURE: 10	
GIS	KM	17 Feb. 2010		
CHECK	GC	17 Feb. 2010		
REVIEW	GC	17 Feb. 2010		

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comm. February 2006). To be economically viable, a large-scale wind turbine generally requires an average wind speed of over 6.5 metres/second (m/s; Pinard *et al.* 2008).

Ka'a'gee Tu does not appear to encompass a landmass with wind conditions that are typically favourable for wind power generation. A review of a series of maps generated by the Canada Wind Energy Atlas (CWEA) shows the mean wind speeds throughout the area in m/s. The wind speeds are assessed for heights of 30, 50 and 80m, and can be viewed as either mean annual wind speeds or mean seasonal wind speeds (CWEA 2008). For Ka'a'gee Tu, even at 80m height, the mean annual wind speeds are relatively low - at less than 6.5 m/s. At several localized areas, including around Kakisa and around Tathlina Lake, during the winter season the mean wind speeds are between 6.0 and 6.5 m/s (Figure 11; CWEA 2008). However, because this speed is not high enough to be considered economically viable, and because this highest speed is only experienced for a few months per year in these particular areas (Pinard *et al.* 2008; CWEA 2008), they are not considered appropriate for establishing large-scale wind turbines.

At various points throughout Ka'a'gee Tu (e.g., at cabin and lodge locations) where localized mean wind speeds are significantly higher than the overall speeds in the Study Area, there may be the potential to install small wind turbines (i.e., turbines with capacities between 300 W and 300 kilowatts [kW]). Small turbines typically require wind speeds of between 3 and 20 m/s (Canadian Wind Energy Association [CanWEA] 2008). Even at 30 m height, this speed is achieved across much of Ka'a'gee Tu throughout most of the year (Figure 11; CWEA 2008). Further studies would be required to assess any such possibilities.

Several concerns exist that should be examined when considering installing any wind turbines in Ka'a'gee Tu. Wildlife concerns include the noise generated by wind turbines, wildlife collisions with turbine blades (e.g., birds and bats) and habitat alteration. However, in recent years, turbine blades have been designed to minimize noise and deter wildlife contact (American Wind Energy Association 2005). If considering small wind turbines, the footprint of ecological alteration would be minimal and could be considered off-set by the reduced dependence on any non-renewable energy source.

10.2.3 Wind Energy Conclusion

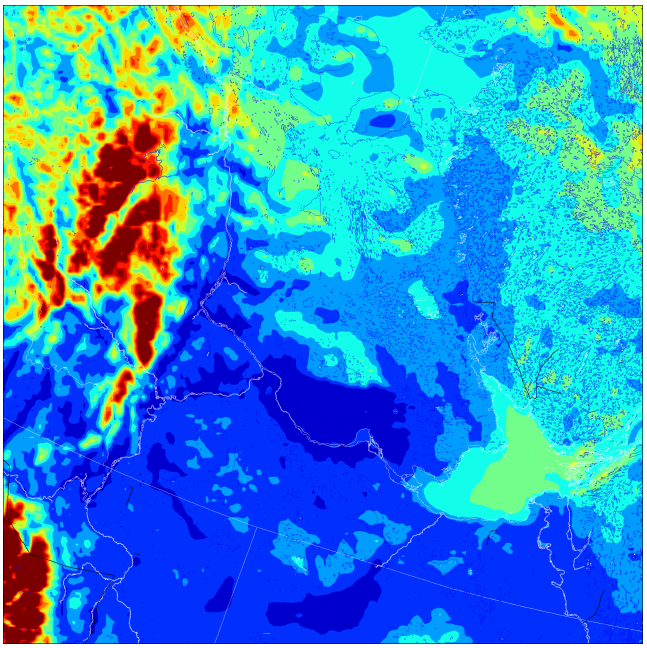
Using wind energy generated in the Ka'a'gee Tu Candidate Protected Area for community use is not considered feasible. However, there is some potential for the generation of electricity using wind energy in the Study Area; the most practical potentially use of wind energy appears to be from small turbines for small-scale use in cabins or lodges in localized areas with sufficient mean wind speeds.

10.3 Hydroelectric Energy

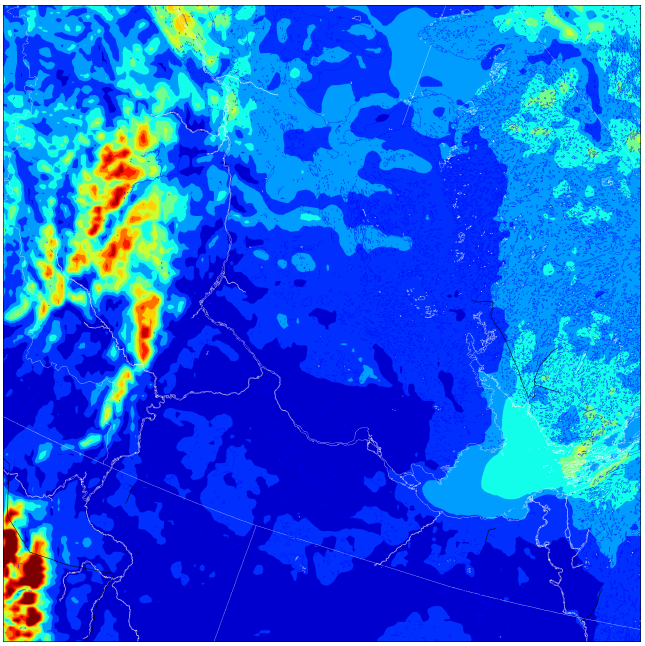
10.3.1 Hydroelectricity Introduction

A sustainable, clean source of energy such as hydroelectricity (i.e., power generated by the energy of moving water) is appealing for environmental as well as economic reasons. Hydroelectricity could provide renewable energy across the territory and is considered essentially isolated from continually rising fossil fuel prices (GNWT, ITI 2008a; GNWT, ITI 2008b). Its use would also help reduce the emissions of greenhouse gasses in the NWT. A new draft plan was developed by GNWT, ITI on the

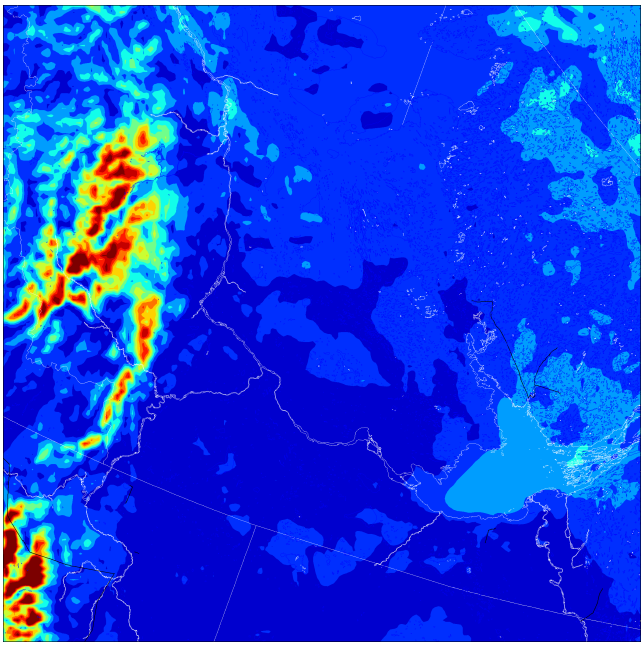
Winter (December, January, February)



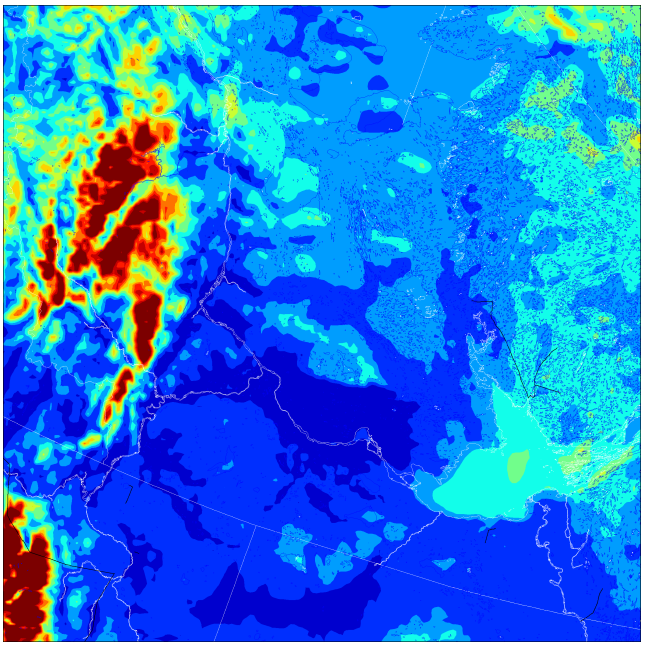
Spring (March, April, May)



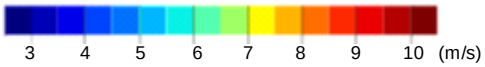
Summer (June, July, August)



Fall (September, October, November)



LEGEND



REFERENCE

Data was obtained from Canada Wind Energy Atlas, June 2009

PROJECT

RENEWABLE RESOURCE ASSESSMENT OF THE KA'A'GEE TU CANDIDATE PROTECTED AREA

TITLE

SEASONAL MEAN WIND SPEEDS AT 80 M HEIGHT

Golder Associates
Yellowknife, Northwest Territories

PROJECT No. 08-1328-0034			SCALE AS SHOWN	REV. 0
DESIGN	JK	21 Jan. 2009	FIGURE: 11	
GIS	KM	17 Feb. 2010		
CHECK	GC	17 Feb. 2010		
REVIEW	GC	17 Feb. 2010		

Project: ?J:\2005\GIS\ArcMapTemplates\templates\v91\MyProject.mxd? - Plot: ?J:\2005\GIS\ArcMapTemplates\templates\v91\MyProject.pdf?

NWT Hydro Strategy (2008a) and examined the feasibility of increasing hydroelectric resources across the territory.

10.3.2 Hydroelectricity in the NWT and the Ka'a'gee Tu Candidate Protected Area

Currently, the only renewable energy used to generate large-scale electricity for industrial and residential consumption in the NWT is hydroelectric energy, which contributes approximately 41% of the territory's current electricity production (versus fossil-fuel derived electricity; GNWT 2007b). There is the potential to increase the amount of power harnessed to approximately 11,500 megawatts, the total capacity of which only a small portion is currently utilized. The NWT could potentially become self-sufficient for its power needs, and even supply energy to southern markets (GNWT 2007b).

Hydroelectricity is used by eight communities in the NWT. The power is generated at six locations, with each location producing between 4,300 kW (Snare Cascades) to 18,000 kW (Taltson; GNWT, ITI 2007d). These hydro power plants are located to the north and south of Great Slave Lake, and service communities in those regions. There are no power plants or communities using hydroelectricity in the Ka'a'gee Tu Candidate Protected Area, though the communities of Enterprise and Hay River to the east of the Study Area are located along hydroelectric power systems which they utilize (GNWT, ITI 2007c).

The GNWT has examined the resources available in the territory for the potential future development of hydroelectric power. A map of potential hydro power plants shows seven considerations around the Great Slave Lake area, as well as three along the Mackenzie and Great Bear rivers. The map does not give any indication that hydroelectric resources within Ka'a'gee Tu have been considered by the GNWT. Its legend mentions that potential mini-hydro sites exist in the NWT (e.g., near communities around the northern regions of Great Slave Lake) but it does not appear that any examination of potential hydro power generated within Ka'a'gee Tu has been undertaken (GNWT, ITI 2007c).

In the Draft Hydro Strategy report (2008a), the possibility of connecting Kakisa (and Fort Providence) to an existing hydroelectric system is mentioned. A newly extended power transmission connection could help Kakisa residents by enabling them to access a lower-cost hydroelectric system that is already in place (i.e., the Taltson system; GNWT, ITI 2008a).

It is important to note that any potential development of an extended hydro system connection into Kakisa, even though envisioned by the GNWT, has not yet been addressed but would need to consider the support of the local Ka'a'gee Tu First Nations in order to proceed with any development activities (GNWT, ITI 2008a).

There is one additional reference in the Draft Hydro Strategy report to a potential hydro power project on the Kakisa Lake watershed system at approximately 60º57'04"N and 117º22'41"W (Figure 9). This development would be located on the Kakisa River, approximately 2.5 km northeast of Kakisa. This project could have a stated capacity to produce between 13 and 18 megaWatts (MW) of electricity for the community of Kakisa (GNWT, ITI 2008a), significantly more power than the 302 kW (or 0.302 MW) that is currently available (GNWT, ITI 2007d).

There has been interest in developing the Kakisa River for its hydroelectric potential since at least the 1970s. In 1973 a study was conducted to assess the environmental impact that a dam on the Kakisa

River would have on Kakisa Lake (a thesis study conducted by R. J. Lamoureux). This report was unavailable during the development of this report.

At a Dene Nation Leadership Meeting in Yellowknife in 1984, Motion 8 stated that the Denendeh First Nations acknowledged that studies had been done to assess the potential of the Kakisa River for hydro dam development, but that the Chiefs of the Denendeh were opposed to any development that would adversely affect the environment, and therefore were opposed to this specific project (Deneron and Charlie 1984).

Today, any plans to assess the potential for hydro development projects in the Ka'a'gee Tu Candidate Protected Area are generally not supported. The Ka'a'gee Tu First Nation have expressed concerns that any hydro-electric development would affect fish health in the area (KFTN 2006). In support of these and other associated concerns, Conformity Requirement (CR) #16 in the Final Draft Dehcho Land Use Plan (2006) states the following:

"CR #16: (1) Responsible Authorities will not authorize any hydroelectric development on the Mackenzie (Dehcho) and Liard Rivers (Acho Tine Deh) or within any Conservation Zones in the Dehcho territory" (page 30, DLUPC 2006).

Since the rivers of Ka'a'gee Tu fall within Conservation Zone 14 (Section 1, Introduction; Figure 2), hydroelectric dams are not considered an option for renewable resource development within the Study Area.

10.3.3 Alternatives to Large-Scale Hydroelectric Development

Run-of-River Hydroelectric Projects

An alternative to hydroelectric dams are 'run of the river' hydroelectric projects. These are systems where little or no impoundment of the river water takes place, and the natural flow of the river is used and not regulated throughout the seasons (DLUPC 2006). These types of hydroelectric projects could be considered outside of Ka'a'gee Tu's boundaries, and the electricity potentially transmitted to cabins or lodges in the area, but construction would not be permitted within the Study Area, as stated in the Final Draft Dehcho Land Use Plan (2006):

"CR #16: (2) Run of the river hydroelectric development as defined in the Plan is permitted outside the areas described in (1) within the Dehcho territory" (page 30, DLUPC 2006).

In-Stream Hydrokinetic Generators

An example of another possible alternative to large-scale hydroelectric development is the use of an in-stream hydrokinetic generator (or in-stream hydro). This is a submersible turbine that is considered to be a low-impact way to harness renewable energy. In the summer of 2008 the village of Ruby in western Alaska became the first community in America to install a 5 kW in-stream hydro turbine. Another larger turbine (100 kW) is planned to be installed in-stream in Eagle, Alaska in 2009, as well as a 25 kW one at Nenana, Alaska (Bryson 2009).

The benefits of the in-stream hydro technology is its relatively simple design, ease of transportation and quick installation (i.e., within weeks). The potential draw-backs of in-stream hydro may include

their inability to withstand bombardment by logs and debris floating down-stream, susceptibility to mechanical damage from river silt, and threats to fish migration and river vessel navigation. Additionally, the turbines are intended to be removed from the rivers each fall, limiting their usefulness to the rivers' ice-free months. The Energy Centre at the University of Alaska Fairbanks is planning to study these issues at the turbine to be installed in the Tanana River (Bryson 2009).

It is possible that as the technology for in-stream hydro advances, there may be an appeal to study its potential application for harnessing renewable energy within the Ka'a'gee Tu Study Area.

10.3.4 Hydroelectric Energy Conclusion

The development of hydroelectric energy projects within the Ka'a'gee Tu Candidate Protected Area does not appear to be desirable. However, it is possible that a transmission line extension could be built to connect Kakisa to the existing Taltson hydro system. More in-depth studies would be required to determine the support for and practicality of this possibility.

10.4 Solar Energy

10.4.1 Solar Energy Introduction

Solar energy is the energy produced by sunlight. It may be captured and utilized in different ways, including through solar hot water systems, solar air systems and solar photovoltaic (PV) systems (M. Phelan, Arctic Energy Alliance, pers. comm. 2006).

10.4.2 Solar Energy in the NWT and the Study Area

Solar hot water systems are diverse but include:

- cheap and simple "unglazed" systems utilizing sunlight heat on black pipes containing a glycol solution;
- "glazed" systems, which are more expensive, with absorber plates encasing the pipes and increasing efficiency; and
- "evacuated tube" systems in which hollow glass tubes are heated and are very efficient and possibly the most suitable systems for cold climates, but are very expensive (M. Phelan, Arctic Energy Alliance, pers. comm. 2006).

Any of these systems could be used at houses and cabins within the Study Area.

Another form of capturing solar energy is through the use of solar walls which trap solar heat. Solar walls are perforated dark-coloured walls which are mounted on the exterior of a building's south-facing wall. Sunlight hits the wall and heats it, and the warm air from the surface of the wall is brought through the perforation holes in the wall via negative pressure from fans located at the top of the wall. The heated air rises behind the wall and is brought through the fan into the building where it ventilates the building with warm fresh air (Solarwall 2008). The first solar wall installed in the NWT in the 1990s

was on a recreation centre in Fort Smith. The wall reduced the building's energy costs and greenhouse gas emissions. It helped both heat the building and keep it cool in the warmer season by shading the building. Several other such projects have reportedly been installed since in the NWT (Infrastructure Canada 2006); however, none are known to exist in the Study Area. It would be possible to use solar walls to heat houses and cabins in the area, although the initial cost of purchasing the walls and logistics of installing them may deter potential users.

Solar PV panels are another option for utilizing the sun's energy. These work with a photoelectric effect where photons of the sunlight's energy strike electrons on the panels. With enough energy, the electrons produce a current which supplies electricity. These silicone panels are considered semiconductors, producing electricity only some of the time as a function of the nature of the sunlight's energy. They are very expensive systems that typically operate at a low efficiency; they are best suited to uses where an economic gain is expected only over a long time period or where alternative sources of energy are not available, such as at remote weather monitoring stations, microwave transmitters or telephone relay stations (Yukon Government 2005; M. Phelan, Arctic Energy Alliance, pers. comm. 2006). They could, however, supplement other energy sources (e.g., fuel wood) for houses and cabins, Territorial Parks or fishing lodges throughout the Study Area. At this time, there is no indication to believe solar energy is being used within the Study Area, although the potential to use this alternative source exists.

Canada is considered to have very large potential for solar energy use and excellent solar resources (Natural Resources Canada [NRCAN] 2009). Studies have been, and are currently being conducted to determine the potential for solar energy use in Canada's north. New technologies are being developed to effectively store solar energy for use during the winter months, during which the presence of direct sunlight is considerably reduced. There are no data relating to the number of bright sunlight hours are available for the community of Kakisa. Environment Canada collects data on the amount of bright sunshine at several weather stations. Hay River and Fort Smith (the closest communities to the Study Area) are not among these stations. The closest community that measures bright sunshine days is Fort Simpson, north-west of the Study Area. The total hours of bright sunshine per month and the number of days each month with measurable sunshine are provided in Table 21. The data were collected between 1975 and 2000 and reflect average monthly values (EC 2009).

Table 21: Hours of Bright Sunshine and Total Number of Days with Measurable Sunshine in Fort Simpson, NWT*

Month	*Total Number of Hours*	*Total Days*	*Average Hours / Sunshine Day*	*Average Hours / Day*
January	51.3	17.4	2.95	1.78
February	96.1	20.9	4.6	3.43
March	174.6	27.5	6.35	5.63
April	243.7	27.4	8.89	8.12
May	284	29.3	9.69	9.16
June	297.6	28.6	10.41	9.92
July	301.7	29.6	10.19	9.73
August	261.7	28.3	9.25	8.44
September	159	25.6	6.21	5.3
October	79.2	19.3	4.1	2.55
November	48.2	15.6	3.09	1.61
December	29.3	13.7	2.14	0.95
Total per year	**2,026.4**	**283.2**	**7.16**	**5.55**

*Source: EC 2009.

Studies in the United Kingdom have shown that an average daily bright sunshine rate of 4 hours is sufficient to charge batteries through solar panels (Sunshine Solar 2009). Table 21 demonstrates that the sunshine hours per day during the winter season (October, November, December, January, and February) are below the required daily rate, but that the remaining seven months show the potential to be sufficient to be used for the generation of solar energy. It is assumed that the sunshine in the Study Area is at least similar to the Fort Simpson area, if not even higher.

Solar insolation refers to the amount of electromagnetic energy incident on the surface of the earth (Apricus Solar Co. 2008). The rating of solar insolation is generally expressed in kWh/m^2/day and represents the amount of solar energy striking a square meter of the earth's surface in one day (Apricus Solar Co. 2008). The annual insolation rating and subsequent PV potential for Hay River is 3.4 – 4.2 and would be considered a low to moderate rating (NRCAN 2007). While there is potential for solar energy use in the Study Area, to be an efficient source of energy, a solar collector (such as an evacuated tube) would likely need to be used for energy production during the winter months.

10.4.3 Solar Energy Conclusion

At least, during the summer months, there is the potential for solar energy use in the Ka'a'gee Tu area. People using houses or cabins in the area could take advantage of the sun's energy to heat water for bathing or washing. They could install solar walls against the sunny sides of buildings to help generate heat during colder months, and provide shade and cooling effects during warmer months. Additionally, solar PV panels could be installed on or near houses and cabins to provide supplementary power, or be used for remote weather monitoring or other stations located throughout the Study Area.

10.5 Economic Value of Renewable Energy

10.5.1 Economic Value of Wind Energy

There is currently no known economic value for wind energy use in Ka'a'gee Tu.

Costs associated with installing small wind turbines for cabins or lodges in Ka'a'gee Tu need to be investigated in order to determine if such a venture is economically feasible. Cost concerns could include environmental and feasibility assessments, permitting, construction, installation and maintenance of the wind turbine and any other associated infrastructure.

10.5.2 Economic Value of Hydroelectric Energy

There is currently no known economic value for hydroelectric energy use in Ka'a'gee Tu.

The GNWT suggests that even if mini-hydro facilities were developed for community use (e.g., from a river within the Study Area for use in Kakisa and / or the Lady Evelyn Falls Territorial Park), subsidies would still be required to keep the cost of energy affordable (GNWT 2007b). The high capital costs and small electrical loads of most NWT communities do not generally justify the economic investment of such projects. Environmentally, however, the sustainability of such power generation is appealing, even though existing diesel generators or other energy sources might still have to be maintained as back-up measures for communities (GNWT 2007b).

10.5.3 Economic Value of Solar Energy

There is currently no known economic value for solar energy use in the Ka'a'gee Tu area. The town of Jean Marie River, north-west of the Study Area, installed 8 solar panels designed to generate 1.8kW of power, which were worth $15,000.00 (Northern News Service Online 2005). The installation of these panels produced a savings of $2,260.00 and reduced greenhouse gas emissions by 1400kg over an 11 month period (Wohlegmuth 2007). The installation of solar panels in the Study Area may show similar economic benefits as seen in Jean Marie River.

The different systems for capturing solar energy are associated with different installation and maintenance costs. While "unglazed" solar hot water systems cost between $50 and $90 per square meter (M. Phelan pers. comm. 2006), solar wall prices are dependent upon the nature of their installation (Solarwall 2008), and PV panels may cost thousands of dollars per square meter (M. Phelan pers. comm. 2006). The different systems also operate at different efficiencies, where PV panels may be as low as 5% efficient (Yukon Government 2005) while solar hot water panels may be as high as 90% efficient (Phelan 2006). The feasibility of establishing solar energy technologies in SGN could be determined by the balances between system costs, system efficiencies and current energy displacement values.

10.6 Renewable Energy Conclusion

There is the potential for the utilization of wind and water as renewable energy sources within the Ka'a'gee Tu Candidate Protected Area. Detailed investigations would need to be carried out in order to understand the feasibility of installing wind turbines in Ka'a'gee Tu. It is probable that commercial wind turbines would not be practical for use in the Study Area (CWEA 2008), but small-scale turbine use might be possible for cabins and lodges throughout the area. The development of hydroelectric power plant locations have been considered along the Kakisa River for generating hydroelectric energy, but this option has proven unfavourable and is now prohibited in the Final Draft Land Use Plan (DLUPC 2006). The use of small-scale or run of the river types of hydroelectric projects could potentially be accomplished on streams or rivers outside of the Study Area and through the transmission of that power to cabins or lodges within Ka'a'gee Tu.

There are no known economic values for any renewable resources used for energy in the Ka'a'gee Tu Study Area. The potential exists that renewable energy could be economically feasible if the displacement value of the new energy source is more economic than what it is replacing. For example, instead of heating and lighting cabins with a diesel fuel generator and kerosene lanterns, users could switch to small-scale wind turbines to generate power for electric space heaters and light-bulbs. This situation could be considered economically worthwhile when the price of the small-scale turbine was exceeded by the dollar value of the original energy source (e.g., fossil fuels) saved.

11.0 KNOWLEDGE GAPS, POTENTIAL FUTURE STUDIES AND FINAL CONCLUSION

11.1 Knowledge Gaps and Potential Future Studies

The following section identifies knowledge gaps determined through the Study and recommendations for potential future studies to fill these gaps. Table 22 provides a brief outline of the knowledge gaps that are present in the assessment of the Study Area as well as some suggested studies that could be undertaken to fill in these knowledge gaps.

11.1.1 Wildlife

Current data on distribution and abundance of wildlife species for the Ka'a'gee Tu Candidate Protected Area are scarce. Some habitat use information exists, but population estimates and distributions for the Study Area are limited. Through past and ongoing studies, there is growing information on boreal woodland caribou distribution and abundance in the area.

Neither harvest numbers nor locations are reported for both subsistence and recreational harvests. No direct data on trapping success and income were available for the Study Area. No estimates of domestic use or local sales of trapped furbearers exist or were available for this report.

Table 22: Knowledge Gaps and Potential Future Studies for the Study Area

Resource	Knowledge Gaps	Suggested Studies
Wildlife	Population estimates and distributions for wildlife species within Study Area.	Conduct surveys to record numbers and locations of wildlife species harvested for subsistence or recreation purposes.
	Harvest numbers and locations for subsistence and recreational harvest.	
	Data on trapping success and income for Study Area.	Conduct surveys to record numbers and locations of wildlife species trapped for domestic and commercial purposes.
	Domestic use and local sales of fur.	
Fish	Species and volume of fish meat harvested for subsistence purposes by Kakisa residents.	Conduct surveys to Kakisa residents to assess their annual consumptions of harvested fish meat.
	Volume and economic replacement value of fish meat used as dog food.	Conduct survey among dog owners to determine economic value.
	Number or recreational and commercial fishing licences in the Study Area.	Conduct surveys and/or interviews with visiting fishermen and fishing guides to determine where fishing licences were purchased and economic contribution of fishermen to the local economy.
	Reasons for decreasing fish stocks.	Conduct field surveys of fish species.
	Potential for the expansion of recreational fishing within the Study Area.	Conduct interview with Kakisa residents to assess any interest in expanding recreational fishing business.
Trees	Quantities and economic value of wood harvested for various construction purposes.	Conduct surveys to determine the importance of local trees as a source of construction materials; could determine an economic value.
	Fuel wood harvest statistics.	Use the GNWT's forest resource assessment to guide harvesting decisions such as harvest areas and quantities.
Plants	Economic value of plant use.	Review and/or conduct Traditional Knowledge studies to assess plant use for different purposes, volumes harvested, and harvest locations.
Art and Craft Materials	Number of artists living in Kakisa.	Conduct surveys or telephone interviews to identify artists living in Kakisa.
	Harvest locations and volume of plant and animal parts used in locally produced arts and crafts.	Conduct surveys of local artists to identify harvest areas and numbers/volumes of plant and animal species harvested.
	Economic value of locally produced arts and crafts.	Conduct surveys to determine importance of arts and crafts to the local economy.
Wilderness	Independent tourist activities (outside of the Kakisa River Bridge Territorial Park, the Lady Evelyn Falls Territorial Park, and the community of Kakisa).	Conduct tourist surveys to determine tourist use of, or interest in Ka'a'gee Tu resources (e.g., hiking, camping, boating etc.), as well as community interest in defining detail tourist travel patterns.
Renewable Energy	Potential utilization of wind, small-scale hydroelectric or solar energy in Study Area.	Conduct a survey to determine interest in alternative energy sources.
	Interest in or economic value for use of renewable energy in community of Kakisa, Kakisa Rive Bridge Territorial Park, Lady Evelyn Falls Territorial Park, or cabins in Study Area.	Conduct feasibility studies to determine alternative energy use potential.

Surveys could be conducted that would record the numbers and locations of wildlife species being harvested by subsistence and recreational hunters. Trapping success and economic value of this resource use are closely monitored in the NWT and in the Dehcho. These databases do not take into account where the animals were harvested. Without unveiling trapline locations, these surveys could have a general area description of the origin the trapped fur. This would enable an assessment of current wildlife harvests, key harvest areas, their economic values, and their future potential use as a renewable resource (Table 22).

11.1.2 Fish

There is general information available about the harvest of fish within the Ka'a'gee Tu Candidate Protected Area, but details are scarce. The species and actual volumes of fish meat harvested for subsistence purposes and consumed by Kakisa residents is unknown. Surveys would need to be carried out among Kakisa residents in order to assess their annual consumption of harvested fish meat. With this information available, the economic value of the meat could be figured, according to current meat replacement values in the community.

The volume and economic replacement value of fish meat being used as dog food is unknown. A simple survey conducted through dog owners in the community could ascertain the importance of locally harvested fish meat in the diets of their dogs, and an economic value could be attributed to this use of fish resources in the area.

The number of recreational fish licences that are used within the Study Area is unknown. It is difficult to collect such information because of the broad geographical area where licenses could be purchased and then used within the Ka'a'gee Tu Study Area. One possible strategy for gathering this data could be through initiating voluntary surveys that visiting fishermen in the area could complete, indicating where they had purchased their licenses. The survey could also gather key information such as species caught, number of fish, and even supplementary information on fish sex, weight and health, potentially contributing to important baseline data on fish resources in the area. The role that local fishing guides play in the economy of the area could also be assessed through interviews with knowledgeable persons when they're available in the community of Kakisa. During such interviews, any economic contributions that fishermen make to the local economy through the purchase of tackle, bait and other fishing-related items could also be addressed.

There is some information available on commercial fishing licences issued in the Study Area. An interview with the licensees could reveal important information on species and numbers of fish caught and the economic values of these business enterprises.

It has been noted that current fish stocks in Dogface Lake may have been decreasing in size. It is unknown whether the cause of this potential decrease may be due to algae blooms, either naturally induced or otherwise. Field surveys of fish species, densities and health, supplemented with additional surveys of water parameters in Dogface Lake, could help contribute to an understanding of the existence, extent and potential causes of any fish stock declines in the lake. While such studies may be useful for gathering current baseline data for future studies, complimentary Traditional Knowledge studies could be used to collect information on past fish stock trends, health and lake health, in order to assess trends in fish resources and environmental conditions within Ka'a'gee Tu.

The potential for the expansion of recreational fishing with the Study Area is not well understood. Interviews with the residents of Kakisa could initially assess whether there was any interest in expanding this business in the area. Then field surveys, coupled with Traditional Knowledge studies, could assess whether fish stocks in the area's rivers and lakes would be likely to support an increase in fishing pressure. Increasing the number of fishing lodges in the area would also have to be financially justified, indicating the probability of economic gain through such an endeavour (Table 22).

11.1.3 Trees

The use and economic value of trees as described in this report are based on estimations only. The species, locations and patterns of wood harvest in the Study Area are largely unknown. The quantities and economic value of wood harvested for various construction purposes is entirely unknown. The final volume and economic value of commercial harvesting in Ka'a'gee Tu will not be known until the end of the 2009 cutting season. The use and economic value of fuel wood has been approximated for fuel wood used in Kakisa dwellings and campfires at the Lady Evelyn Falls Territorial Park and at the annual Dehcho First Nations Assembly. However, the use of fuel wood at camps and lodges within the Study Area is not quantified.

There are many assessments that could be used to determine the future potential of wood use within the Study Area. The GNWT is currently conducting a forest resource assessment of the area, which will contribute to understanding the real potential for commercial and other wood uses in the area. The residents of Kakisa have interest in obtaining a wood chipper, indicating a future economic value for such a product. They could use the GNWT's assessment to guide harvesting decisions such as harvest areas and quantities. A supplementary study may be able to assess whether a portable sawmill could also be of use within the community. It may also be worth investigating whether producing wood pellets could be economically viable in the future, as this form of heating increases in popularity. Depending on these results, considerations could be given to increasing the number of commercial harvest permits issued annually in the area.

Additional surveys could be conducted within the community of Kakisa to determine the importance of local trees as a source of construction materials for houses, sheds and other purposes. Once the volume of such uses was known, an economic value could be placed on the use of trees for construction purposes (Table 22).

11.1.4 Plants

Information is available regarding the use of plant resources within the Study Area. The types of berries harvested and even harvest locations have been documented. Various medicinal plants species that are harvested are known, although harvest locations are not well documented. There is some information about the harvest of wild plant species for food purposes, but details on species and harvest locations are unavailable. Based on the lack of harvest information, the economic value of plants in Ka'a'gee Tu is unknown.

It is uncertain what plant use information has already been documented in past studies. Traditional Knowledge studies could be reviewed to determine any gaps in knowledge regarding preferred plant harvest locations within the Study Area, species and purpose of harvest (i.e., food or medicine) and volumes of plants harvested. If information is incomplete or missing, further Traditional Knowledge studies and surveys on current use could be conducted to clarify plant use in the Study Area. To

protect culturally sensitive areas (such as sacred or spiritual sites), generalized information could be recorded, indicating areas instead of specific locations for harvests, or even simply recording whether harvests occurred within or outside of the Study Area boundaries (Table 22).

11.1.5 Art and Craft Materials

Little is known about specific collecting areas for art and craft materials within the Study Area. Areas with abundant animal and vegetation resources as well as popular resource harvest areas are fairly well understood, and it is acknowledged that animals harvested for subsistence may have specific parts set aside for art and craft purposes, but details of these harvests were unavailable for this report. Specific numbers and species of animals used for their fur, sinew, bones and other materials, as well as species and volumes of vegetation matter used for arts and crafts purposes are not known. Additionally, the number of artists living in the area using these renewable resource materials, the amount of arts and crafts they produces, and the economic value of those arts and crafts is unknown.

Studies could be conducted that would help clarify the importance of renewable resources as art and craft materials in the Study Area. Surveys or simple telephone interviews could easily identify “artists” living in Kakisa. These artists could be interviewed to reveal important collecting areas for their art and craft materials (Table 22).

11.1.6 Wilderness

The areas most frequented by visitors include the Kakisa River Bridge Territorial Park day-use area, for which specific annual tourist numbers are not known; the Lady Evelyn Falls Territorial Park, including its campground, day-use area, and trails to the Lady Evelyn Falls, for which the annual frequency of visitors and estimated economic values are known; and the community of Kakisa. The annual dollar value of tourist spending in Kakisa has been estimated, but details of expenditures on gas, supplies, accommodation fees or other costs were not readily available. Tourist spending within the community is known to be done primarily at the River Front Convenience Store & Motel.

It is not understood how well utilized other features of the Study Area are utilized by tourists, including trails, rivers, lakes and the Cameron Hills area. It is presumed that most activity done by visitors in these areas is sport-fishing oriented, but it is possible that hikers, back-packers, wildlife and bird watchers, boaters, photographers, and others also may use these areas as well.

In order to assess whether residents of the area are interested in learning more about tourist activities and trends in the Study Area, a survey could be issued to those living in Kakisa. The survey could ascertain if residents were supportive of defining detailed tourist travel patterns and economic contributions within the Candidate Protected Area, and whether there was a desire to increase tourist activity in the Study Area. If the Ka’a’gee Tu are supportive of increasing tourist activities within the area, it may be useful initially to consider boosting attractions within areas already described as having “high to very high” tourism potential, including Dogface Lake and its small island on which Deeghani Lake Lodge is located and Brabant Island on which Brabant Lodge is located. The compatibility and feasibility of increasing non-fishing tourist activities such as boating, hiking and wildlife photography would need to be assessed alongside the current use as a sport-fishing destinations. The potential for encouraging tourism activities around Tathlina Lake could also be assessed in future studies (Table 22).

11.1.7 Renewable Energy

There is virtually no information available on the current or future potential use of renewable energy within the Study Area.

While general wind speeds are available for the area, no detailed local studies have been conducted to determine the possibility of harvesting wind energy for small-scale use in homes, cabins or lodges throughout the area. Studies could assess whether these are even desirable for users of the Study Area. If harnessing wind energy proved desirable, then wind feasibility studies could assess local wind conditions to determine appropriate locations for the erections of wind turbines. Additional studies could be required to ascertain the effects such structures could have on wildlife, and identify mitigation measures for any potential negative effects. Complimentary assessments could determine the economic feasibility of providing or supplementing energy costs with alternative wind energy sources.

Although the use of hydroelectric energy has been considered in the past along the Kakisa River, the Dehcho are currently not in favour of developing hydroelectric projects within the Study Area. It is possible however, that in the future there may be support for small-scale hydroelectric projects such as run-of-river hydroelectric systems or in-stream hydrokinetic generators. Surveys would need to be conducted in order to assess the support for such projects. Then field and desk-top studies could identify environmental concerns and appropriate mitigation measures for developing hydroelectric resources at suitable locations. Additional studies could determine the economic feasibility of providing or supplementing energy costs with alternative hydroelectric energy sources (Table 22).

11.2 Final Conclusion

There is limited information available on the distribution, abundance, current and potential future use and economic value of the different renewable resources examined in the Study Area. There are variable sources of information for each resource examined, including reports, datasets, maps, Traditional Knowledge studies, surveys and the knowledge of various persons that were interviewed. The presence, accuracy and availability of information sources for the different resources varied significantly.

To allow for the comparison of the renewable resources, their uses and the information available for each one, Table 23 was created. It presents all of the resources and their identified uses and assigns them to one of several categories. They are ranked according to their known importance to the Ka'a'gee Tu Study Area and the residents of Kakisa, based on their current and future potential uses and economic value. The resources are also ranked according to the amount and quality of information available for their assessment.

Table 23: Relative Importance of Renewable Resource Uses in the Study Area to the KFTN and Relative Amount and Quality of Available Information

Importance of Resource (based on current and future potential use in Study Area and economic value)	*Amount and Quality of Information*			
	Abundant information; specific to Study Area	**Moderate amount of information; some specific to Study Area**	**Limited information; partially specific to Study Area**	**Very little or no information; not specific to Study Area**
High Importance		Fish (recreational) Trees (commercial) Trees (fuel wood)	Wildlife (subsistence)	Fish (subsistence)
Moderate Importance		Wildlife (trapping) Fish (commercial) Wilderness (tourism)	Plants (berries)	
Low Importance			Plants (medicinal, food	Art and craft materials (animal and vegetable components)
Very Low Importance			Wildlife (outfitting, commercial) Fish (hatcheries)	Renewable Energy
Unknown				Trees (construction)

Fish (recreational), trees (commercial and fuel wood), and wildlife (subsistence harvest) resource uses are acknowledged as having a high importance and constitute an important resource use in the Study Area. It is reported that this harvest does occur regularly within the Study Area. The fish and wildlife species composition and the harvest volumes are not known but it is believed that subsistence harvest plays an important role for Study Area residents. Plants (berry picking), wilderness (tourism), wildlife (trapping) and fish (commercial) constitute resource uses of moderate importance and are practiced regularly. Trapping is believed to provide some value to Study Area residents through direct income through the selling of pelts although it is acknowledged that many more residents likely trap for food (rabbits and hares), other domestic use (parka trims) and local sales. Additionally to their economic value, wildlife and fish subsistence harvest and trapping resource uses are known to be of high cultural importance to the residents. The harvest of wildlife for recreational purposes is assumed to be minimal and no commercial harvest or big game outfitting operations exist within the Study Area. It is believed that the future potential for these three resource uses is limited and low, respectively.

Fish are known to be an important subsistence and recreational food source for Study Area residents and are harvested on a regular basis. General harvest locations are known but data on species and volumes of fish that are harvested are not available. The Deeghani Lake Lodge reported to provide service to several fishermen that use the Study Area for their fishing trips. The commercial use of fish does occur but is reported to not currently have any value. Hatcheries do not exist in or close to the

Study Area and, therefore, do not contribute to the economic value of fish resource use. The economic value of fish resource use in the Study Area is not well understood. Fish taken through subsistence harvest have a meat replacement value for the residents of the area but because the amount of subsistence harvest is not known, their overall economic value cannot be determined. Fish harvested through recreational harvest activities does benefit residents and non-residents, who may not consume the fish in the area. Therefore, some of the meat replacement value may not contribute to the local economy through its indirect meat replacement value. Fish taken through recreational fishing generate some income for the lodge operators who take tourists sport fishing. Commercial fish harvest, especially in Kakisa and Tathlina lakes provide income for local residents.

Trees are considered an important renewable resource for their use as fuel wood for the lodge, camps and cabins throughout the Study Area. The locations and volumes of such harvests are not known. Resource use of trees as timber for commercial logging in the Study Area is also practiced and contributes considerably to the study Area's economic value.

The extent of plant use in the Study Area is largely unknown. However, berry picking is known to take place, and it is generally understood which species are harvested and where the harvest occurs. It is unknown how much is harvested. Information regarding the harvest of plants for medicinal or wild food reasons was not available. No economic value could be estimated for plant resource use due to the complete lack of information.

The use of renewable resources from the Study Area as art and craft materials is believed to occur. Animal parts are collected and harvested throughout the area for use in the arts and crafts industry, primarily hides and fur, but specific harvest locations are unknown and it is not known how much of this harvest stems from the Study Area. The extent of plant matter harvest for art and craft materials in the area is unknown, and is assumed to be of low importance. The art and craft materials collected and gathered from the Study Area are acknowledged to have an economic value, but their significance within the overall economy of the Study Area and the nearby communities is not known. Its future potential may be directly linked to the local tourism industry.

Wilderness as a resource in the tourism industry is assessed as being of importance to the Study Area and having a high future potential. Information on the use of this plentiful resource is partially available but limited information could be found describing the economic importance of the tourism industry using resources within the Study Area for the community of Kakisa. It is known that tourists do visit the area on regular basis, including the Kakisa River Bridge Territorial Park day-use area,; the Lady Evelyn Falls Territorial Park, including its campground, day-use area, and trails to the Lady Evelyn Falls, and the community of Kakisa. The annual dollar value of tourist spending in Kakisa has been estimated, but details of expenditures on gas, supplies, accommodation fees or other costs were not readily available. Tourist spending within the community is known to be done primarily at the River Front Convenience Store & Motel. It is presumed that most activity done by visitors in these areas is sport-fishing oriented, but it is possible that hikers, back-packers, wildlife and bird watchers, boaters, photographers, and others also may use these areas as well.

There is little current information available that describes the possibilities and interest for the use of renewable energy sources in the Study Area. This resource use has been assigned a status of very low importance because it is currently not utilized in the area, and the Dehcho Land Use Plan does currently not support hydroelectric power generation inside the Study Area. However, the potential for

future exploitation of renewable energy resources does exist, given that the interest exists and potential environmental impacts are addressed.

In conclusion, there is a wealth of renewable resources within the Study Area. Many of these, such trees, fish, wildlife and wilderness resources, are presently well used but not commercially exploited (with the exception of commercial logging of trees). Other resources, such as plants, and art and craft materials have distribution and utilization patterns that are not well understood and / or documented or not used to their potential capacity. Renewable energy resources experience presently only limited utilization in the Study Area, but the potential for their exploitation may exist if further studies proved their developments to be economically, environmentally and socially acceptable.

As a final step, estimated economic values of all renewable resource uses in the Study Area assessed in this report are presented in Table 24. The uses are restricted to those where economic values could be estimated. It has to be stressed that values were calculated primarily on the basis of assumptions and estimations and should be interpreted with extreme caution because detailed information was not available.

Table 24: Estimated Resource Harvest and Replacement Value / Income by Residents of Kakisa Based on Resource Use within the Study Area

Resource / Resource Use	*Estimated Annual Indirect and Direct Economic Value*
Wildlife	
Subsistence Harvest	$68,970
Trapping	$9,000
Fish	
Recreational	$48,000 - $60,000
Commercial	$45,862
Trees	
Commercial Logging	$90,000
Fuel Wood	$72,000
Wilderness	
Tourism (camping fees and motel)	$10,052

The resource use with the highest economic value is commercial logging of trees through the commercial harvest of one license holder. This resource use is believed to have the potential to increase available tree resources in the Study Area. The use of trees as fuel wood generates indirect (through replacement value) and direct income to residents of the Study Area.

Subsistence Wildlife Harvest is providing indirect income to the Study Area residents through cost savings. It is assumed that this resource use will play an important role in the future as well due to a healthy and stable moose population and the high percentage of residents consuming country foods. Recreational fishing through tourists visiting the Deeghani Lake Lodge is contributing to the area's economy. This resource use is believed to have a high future potential with plentiful fish resources in the Study Area. Similarly, tourism (as a wilderness resource use) generates direct income, of which only a small proportion could be assessed for this RRA report. It is believed to have a high future potential because tourism is likely not using the existing potential of wilderness resources in the Study Area.

The economic value of trapping is addressed in terms of direct gross income. The reports values are estimates only, because the economic value does not take into account the expenses (such as traps, equipment and transportation) experienced by the hunters and trappers. On the other hand, it is assumed that a large portion of the actual harvest remains unreported due to domestic use of pelts (as parka trims or for arts and crafts) and snared hares and rabbits may be used as food.

No data were available to assess the economic value of subsistence and recreational harvest of wildlife and subsistence fishing. Renewable resources used as art and crafts materials could bring income to the communities. It is unknown how much of the material is harvested (or collected) inside the study Area.

12.0 CLOSURE

We trust the information presented in this report meets your current requirements. Should you have any questions or concerns, please do not hesitate to contact Golder Associates Ltd.

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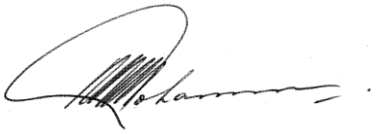

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