

PROPOSED FOREST ECOSYSTEM NETWORK
FOR THE
LA BICHE RIVER WATERSHED

August 30, 1999

RECOMMENDED BY:

THE LA BICHE / BEAVER ECOSYSTEM TECHNICAL GROUP

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CONTENTS

I. EXECUTIVE SUMMARY AND RECOMMENDATIONS	1
II. INTRODUCTION.....	2
HOW HAS THE SIZE OF THE FOREST ECOSYSTEM NETWORK CHANGED?.....	5
III. FOREST ECOSYSTEMS OF THE LA BICHE RIVER WATERSHED.....	7
IV. OBJECTIVES AND DESIGN OF THE FOREST ECOSYSTEM NETWORK.....	13
V. FOREST ECOSYSTEM NETWORK STRATIFICATION	17
VI. RECOMMENDATIONS.....	20
VII. ACKNOWLEDGEMENTS	21
VIII. LA BICHE / BEAVER ECOSYSTEM TECHNICAL GROUP	21
IX. REFERENCES.....	22
APPENDIX A: FOREST BIRD HABITAT POTENTIAL MAP METHODOLOGY	24
APPENDIX B: BRITISH COLUMBIA'S RED (ENDANGERED OR THREATENED) AND BLUE (VULNERABLE) LISTED FOREST BIRD SPECIES.....	25
APPENDIX C: COMMON AND SCIENTIFIC NAMES OF 114 BIRD SPECIES OBSERVED (1995- 99) AT THE LA BICHE RIVER, YUKON.....	26
APPENDIX D: COMMON AND SCIENTIFIC NAMES OF 390 PLANT SPECIES OBSERVED (1995-98) AT THE LA BICHE RIVER, YUKON.	27

TABLES AND MAPS:

- Table 1:** Total area (km²) of the lower and middle La Biche River sections for the 1996, 1997, and 1999 configurations.
- Table 2:** Total number of birds per km² (100 hectares) supported by the forests of the lower La Biche River valley, Yukon. Based on 1995 surveys across a variety of forest types.
- Table 3:** Total area (km²) and percent of Leading Tree Species and Forest Age-class for the La Biche River Survey area, Forest Ecosystem Network (FEN), and the five areas that comprise the network.
- Table 4:** Total area (km²) and percent of Forest Bird Habitat Potential Map Assemblages for the La Biche River Survey area, Forest Ecosystem Network (FEN), and the five areas that comprise the network.
- Table 5:** Total area (km²) and percent of Cutblocks and Fragmentation Effect within the Forest Ecosystem Network (FEN), and the five areas that comprise the network.
- Map 1:** Forest Ecosystem Network Recommendation.
- Map 2:** 1996 and 1997 areas, and the final (1999) Forest Ecosystem Network Recommendation.
- Map 3:** Forest Cover (leading tree species).
- Map 4:** Forest Age-classes.
- Map 5:** Forest Bird Habitat Potential Map.
- Map 6:** Forest Fragmentation Map.

I. EXECUTIVE SUMMARY AND RECOMMENDATIONS

With its diverse ecosystems, habitats and associated biological communities the Labiche River valley is one of the most ecologically significant areas of the Yukon. The physiographic and climatic conditions of the area, together with the geographical position, combine to produce a unique mosaic of ecosystems. The exceptionally productive forests support bird, plant, mammal, fish and amphibian communities unlike those found anywhere else in the Yukon. Further, as research continues, it is becoming apparent that this area is biologically significant in the boreal northwest.

In December 1996, the La Biche / Beaver Ecosystem Technical Group was formed to design a Forest Ecosystem Network for the La Biche River valley. This was in response to a Canadian Environmental Assessment Act screening report which requires Forest Resources, DIAND to establish "*a protected area within the La Biche valley that is representative of all landscapes present.*" This report presents the Technical Group's final boundary and recommendations for the La Biche River Forest Ecosystem Network. The implementation of the boundary and recommendations will satisfy the requirement of the CEAA screening for a protected area. As well, the final designation of the Forest Ecosystem Network as a permanent protected area will contribute to the Yukon Government's commitment under the Yukon Protected Areas Strategy for a protected area in the Muskwa Plateau Ecoregion.

The following recommendations by the La Biche / Beaver Ecosystem Technical Group are based on comprehensive field studies (1995-99) and analyses of the La Biche River valley and its associated ecosystems.

These recommendations are made: 1) in recognition of the unique natural disturbance patterns of this landscape, 2) to ensure connectivity of ecosystems within the Forest Ecosystem Network, 3) to ensure the connectivity of the Forest Ecosystem Network with adjacent areas so that it does not become an isolated remnant of a larger system, and 4) to conserve the exceptional biological diversity of birds, plants, amphibians, and mammals of this watershed. The La Biche / Beaver Ecosystem Technical Group recommends that:

1. Department of Indian Affairs and Northern Development Canada immediately implement the La Biche River Forest Ecosystem Network (Map 1) as an area permanently removed from harvesting to satisfy this requirement under the 1996 CEAA screening.
2. During the period between now and the completion of this designation, no further logging should be planned or conducted in the proposed La Biche River Forest Ecosystem Network. To this end, Forest Resources' should include this area in its Resource Report and pursue its designation as a Forest Reserve.
3. A spatially based, comprehensive forest management plan be completed for Forest Management Unit Y01 by March 2000. Key to this recommendation is that the development of this plan must include direct input from the La Biche / Beaver Ecosystem Technical Group, as well as First Nations, and conservation organizations.
4. Planning, development and implementation of similar Forest Ecosystem Networks, as part of a Forest Management Plan, be initiated immediately in other watersheds within Forest Management Unit Y01 and southeast Yukon.

II. INTRODUCTION

Survey area

The middle and lower La Biche River occupies the northern portion of the Muskwa Plateau Ecoregion in the extreme southeast corner of the Yukon Territory. It flows south into northern British Columbia before turning east and entering the Liard River upstream of the community of Fort Liard, Northwest Territories. From there, the Liard River flows northwest into the Mackenzie River system. The survey area specifically assessed for the Forest Ecosystem Network includes the middle and lower La Biche River, south to the Yukon/B.C. border, and east to the Yukon/N.W.T. border (Map 1).

This area lies in the transition between two Ecozones – the Boreal Cordillera and the Taiga Plains. Forested plateaus and highland areas characterize the Boreal Cordillera Ecozone with average elevations over 760 metres above sea level. The Boreal Cordillera Ecozone is topographically complex with numerous high peaks and plateaus separating wide valleys and lowlands. In contrast, the topography of the Taiga Plains Ecozone is subdued; mixedwood forests and wetland complexes are common.

Ecological Significance of the La Biche River Valley

The forests of the lower La Biche River valley, lower Beaver River, and parts of the middle La Biche River valley are exceptionally productive and unique in the Yukon. The physiographic and climatic conditions of the area, together with the geographical position, combine to produce a unique mosaic of ecosystems in this extreme southeast portion of the Territory. When compared with the surrounding boreal forests, the La Biche River drainage supports a productive, structurally diverse, and species rich forest ecosystem. The bird, plant, mammal, fish and amphibian communities found here are remarkably different from those found elsewhere in the Yukon.

Unlike the majority of the forests in the Yukon, the conditions found in the survey area are generally not characteristic of fire-dependent forest ecosystems (Applied Ecosystem Management 1998). Compared to adjacent regions, this area appears to have a naturally suppressed fire regime. Consequently, small scale, low intensity disturbances such as forest insects and disease have had a strong influence on the creation and maintenance of the forest mosaic over at least the last 250 years (Applied Ecosystem Management 1998). The resulting forests are extremely heterogeneous. They have highly variable internal stand and age structure with trees up to 250 years in age.

These restricted ecosystems support forest bird communities not found elsewhere in the Yukon. Many of the bird species found in this area are at the northwestern limit of their range. As well, this area supports very high densities of many of the more common forest bird species. This makes the La Biche River a critical area for forest bird populations.

Breeding populations of Wood Frogs, and the Yukon's only known population of Chorus Frog inhabit the La Biche River valley. Both species are dependent on wetland ecosystems and the adjacent diverse mixedwood forests.

Bull Trout is endangered or extirpated throughout much of its range. While this species is known to occur in the Liard Drainage, it was recently found in moderately high numbers in the La Biche River. The La Biche River and the Liard Drainage are among the few remaining North American river systems which support healthy Bull Trout populations.

The La Biche River valley is also within the home range of a herd of Wood Bison, a “threatened” species in Canada. This herd has increased from three animals (in 1993) to over 20 animals (including young) in 1999.

The plant communities in the lower La Biche River valley include species rare to the Yukon such as Devil’s Club (*Oplopanax horridus*) and Ostrich Fern (*Matteuccia struthiopteris*). The forest ecosystems in this area are old and extremely heterogeneous in stand composition and structure. Their uniqueness is derived in part by the overlap of species from the prairies, eastern and northern boreal forests, and Beringia.

The La Biche River valley probably supports the highest density of Black Bears found in the Yukon. This area has exceptional Black Bear habitat, characterized by a diverse shrub understory within moist and productive forests. In spring, the bears forage on the newly green vascular plants, while a rich variety of berry and root plants provide important late summer and fall bear foods.

Background of the La Biche River Forest Ecosystem Network

By way of the Canadian Biodiversity Strategy and the Yukon Protected Areas Strategy, Canada and the Yukon are committed to conservation of ecosystems through the representative protection of ecoregions and the protection of areas of ecological significance. To date, the only conservation initiative in the Yukon portion of the La Biche River valley has been the establishment of an interim forest harvesting deferral area, as required by the Canadian Environmental Assessment Act (CEAA) Level 1 Screening of the Liard First Nation Forestry Training Society Timber Harvest Agreement (LFN-THA).

Two of the “Environmental Concerns” listed in Section 7 of the CEAA Level 1 Screening of the LFN-THA refer to landscape level protection within the La Biche River watershed. The first environmental concern is for “Protection of the flora and fauna that are not common to the Yukon Territory”. The mitigation to satisfy this environmental concern is:

... “a protected area within the La Biche valley that is representative of all landscapes present must be in place prior to any further harvesting outside what is planned for the 1996-1997 season. The formation of a key stakeholders working group to designate the protected area and the percentage of land base to be protected is an immediate priority”.

The formation of a key stakeholders working group is also the mitigation required to satisfy the environmental concern that “There is a requirement for a “forest ecosystem network” which excludes lands permanently from harvest in the La Biche River valley for the protection of rare, threatened and vulnerable species as a living laboratory.”

The mitigation reads:

... “A working group of key stakeholders is to be struck immediately to advise Forest Resources on areas to be protected from harvesting and on the representative percentage of land base required for protection.”

To this end, DIAND-Forest Resources convened a stakeholder meeting (December 3, 1996) with representatives from the federal government (Environment Canada-Canadian Wildlife Service,

DIAND-Forest Resources), the Yukon Government (Yukon Parks and Habitat sections), the timber industry working in the La Biche River valley (Trans North Timber), and conservation groups (Yukon Conservation Society and Canadian Parks and Wilderness Society). The goal of this meeting was to identify an area in which timber harvesting would not take place within the La Biche watershed.

The area delineated at the December 1996 meeting (Map 2) had not yet been surveyed for ecological values. As a result, the biologists and ecologists attending the meeting were directed by DIAND-Forest Resources to evaluate the proposed area and other potential areas for their suitability to satisfy the required environmental mitigation. The La Biche/Beaver Ecosystem Technical Group (Technical Group) was formed in response to this direction.

A time frame was established whereby the area delineated in December 1996 would receive interim protection for three years (to December 1999) at which point the Technical Group would make its final recommendation and an area would be designated for permanent protection from timber harvesting. The task of the Technical Group during the three-year period was to survey the diversity of habitats within the La Biche River valley and, based upon this work, delineate a Forest Ecosystem Network that would satisfy the required environmental mitigation.

The ongoing objective of the Technical Group is to provide ecological information and recommendations in support of ecosystem-based management in the Beaver and La Biche River watersheds. At an April 1997 meeting, the Technical Group used Forest Resources' forest cover data to assess the area established at the 1996 meeting, and confirmed that it was not "representative of all landscapes present." The area was primarily aspen dominated stands. It did not adequately represent spruce dominated and mixed forest types in the La Biche River valley. The Technical Group then began to design a Forest Ecosystem Network that would satisfy the CEAA mitigation. Field surveys to assess the network were planned.

On May 22 1997, the Technical Group gave a full briefing to the Yukon Government, Department of Renewable Resources' Deputy Minister, Assistant Deputy Minister, and Directors of Fish & Wildlife, and Parks and Outdoor Recreation branches. The Technical Group was given very clear direction to continue their work in the La Biche River valley and develop a Forest Ecosystem Network to meet the CEAA mitigation.

In June 1997, the Technical Group initiated field surveys to ground-truth the area delineated in 1996 and other areas of potential importance for a Forest Ecosystem Network. The field surveys confirmed that the area delineated in 1996 represented very little of the variable and unique habitats that occur throughout the lower La Biche River valley, and that the continued development of a more complete Forest Ecosystem Network was required.

In fall 1997, the Technical Group formally recommended that the boundaries of the December 1996 area be adjusted to include additional areas to form a Forest Ecosystem Network which more accurately reflects the diversity of ecosystems in the La Biche River valley.

On December 3, 1997, Forest Resources convened a second meeting of the stakeholders group. At this meeting, a revised area was presented by DIAND in response to the Technical Group's recommendation (Map 2). There was agreement that: 1) the newly delineated area would replace the original area, and 2) the Technical Group would continue work to assess and refine the Forest Ecosystem Network. The process was on-track and December 1999 continued to serve as the date by which the Technical Group would recommend a Forest Ecosystem Network that would satisfy the CEAA mitigation.

In June 1998, the Technical Group conducted further field surveys focusing on the middle La Biche, the Mount Martin sub-watershed, and adjacent subalpine habitats in the Kotaneelee Range. These surveys determined the extent of the unique ecosystems of the lower La Biche River valley in the watershed and adjacent areas.

In June 1999, the Technical Group coordinated field surveys in the lower La Biche River which included preliminary Black Bear habitat assessment, and amphibian and bat surveys.

In May to August 1999, the Technical Group generated a Forest Bird Habitat Potential Map (Map 5) for eight key forest bird species using Forest Resources' forest inventory data. The eight forest bird species were chosen based on their dependence on the La Biche River valley. These species are also considered relevant indicators of both landscape level and stand level forest habitat integrity in the La Biche River watershed. Key habitat areas have been identified based on: 1) the forest cover preferences of these eight forest bird species, 2) landscape features such as watershed boundaries, and 3) biological features such as rare plant distributions, wetlands, and bear habitat.

For the past year, the Technical Group has compiled and assessed the information gathered from 1995 to 1999 in the La Biche River area. This body of information has resulted in the final proposal for a Forest Ecosystem Network (Map 1) which is being put forward through this report.

How has the size of the Forest Ecosystem Network changed?

As discussed, the area drafted in 1996 fell well short of the CEEA requirement to establish a “a protected area within the La Biche valley that is representative of all landscapes”. In designing a Forest Ecosystem Network to meet this requirement the size increased between 1996 and 1997 with a slight increase in 1999 (Table 1). However, in the design process the Technical Group sought, wherever possible and without compromising its conservation objectives, to avoid areas of importance to forestry and oil & gas. It should be noted then that there has been a significant reduction in the size of the Forest Ecosystem Network between 1996 and 1999 in the lower La Biche River area where these industrial interests area highest (Table 1).

TABLE 1: Total area (km²) of the lower and middle La Biche River sections for the 1996, 1997, and 1999 configurations.			
	Lower La Biche	Middle La Biche	Total Area
1996	90	0	90
1997	128	50	178
1999	75	108	183

Present Status of the La Biche River Valley

Forest companies have logged approximately 300,000 m³ in the lower La Biche River valley. South of the border in British Columbia, over 1.8 million m³ have been logged within the La Biche River valley. Although the Director, Renewable Resources, DIAND committed to implementing a forest management plan for the area by 1997, there is still no forest management plan in place to guide timber harvesting in Yukon’s Forest Management Unit Y01, which includes the La Biche watershed. There is no regional land use plan for this area and there is no timeline to identify when these plans will be in place. Current plans based upon DIAND’s Preliminary Timber Supply Analysis indicate a potential increase in the annual rate of logging in

this watershed. The Forest Ecosystem Network recommended by this report will provide a timely backbone of landscape-level ecological protection in the La Biche River watershed.

The region has high potential for natural gas development. It currently supports the Yukon's only natural gas operation, the Anderson Gas lease, which has been in operation for approximately 15 years. The Yukon Oil and Gas Act has recently been passed by the Yukon legislature and the natural gas tendering process in the southeast Yukon is underway.

Ninety-five percent of the Muskwa Plateau Ecoregion lies in northeastern British Columbia. Currently, there is only one provincial park comprising less than two percent of the ecoregion. The Yukon Protected Areas Strategy (YPAS) has not yet developed a protected area proposal for this ecoregion. While resource allocations are being made, YPAS processes are not anticipated in this area until after the Liard First Nation land claim has been settled. However, YPAS commits the Yukon Government to establishing protected areas in all of Yukon's 23 ecoregions. The Forest Ecosystem Network recommended by this report would contribute to the Yukon Government's protected area commitments in the Muskwa Plateau Ecoregion.

Summary of Progress on the Forest Ecosystem Network

- Extensive and regular field studies have occurred in the La Biche River watershed over the last five years (1995 to 1999). Surveys of forest birds, forest habitats, forest insects and diseases, forest plants, forest dynamics, fish, amphibians, bats and Black Bear habitat have occurred in various parts of the La Biche River and Beaver River watersheds.
- A Forest Bird Habitat Potential Map (Map 5) and a Forest Fragmentation Map (Map 6) have been generated to help guide the design of a Forest Ecosystem Network.
- The Technical Group has designed a final Forest Ecosystem Network (Map 1), which meets the requirements of the CEAA mitigation.
- The adoption of the Forest Ecosystem Network would also contribute to the Yukon Government's commitment under the Protected Areas Strategy for a protected area in the Muskwa Plateau Ecoregion.

III. FOREST ECOSYSTEMS OF THE LA BICHE RIVER WATERSHED

The information contained in this section varies in scale depending on the amount and type of field work that has been completed. Much of the general information is adapted from the draft Ecoregions of the Yukon book.

Physiography

The La Biche River flows south through the Muskwa Plateau Ecoregion, which lies west of the Liard River in the extreme southeast corner of the Territory. This area is part of a larger ecoregion extending south into British Columbia. This ecoregion is part of the Alberta/Great Slave Plain Physiographic Region (Mathews 1986) or Interior Plains (Bostock 1948) which lie east of the Canadian Cordilleran.

The subdued topography slopes south and east toward the Liard River. The elevation ranges from over 1,066 metres on the ridge south of Mount Martin, a southern extension of the Kotaneelee Range south of the La Biche River, to the plain of the Liard River below 300 metres. Local relief is about 450 metres.

The La Biche and Beaver Rivers and their tributaries follow the northeast-southwest trend of the bedrock before cutting through the ridges in a more easterly direction. There are no lakes in the Yukon part of the ecoregion.

Climate

The La Biche River valley is climatically different from the rest of southeast Yukon including the Watson Lake area. The southwest-northeast trending Beaver Crow Ridge-Mount Merrill alpine massif provides an effective climatic divide between the Cordilleran and Taiga Plains Ecozones (Applied Ecosystem Management 1998). Due to its physiographic location, the climate of the La Biche River valley is more similar to that of the Taiga Plains than the Boreal Cordilleran climatic region in which much of the rest of the Yukon lies.

The closest climate station to the La Biche River survey area is approximately 30 km to the northeast in Ft. Liard, NWT. It receives slightly more annual precipitation than Watson Lake. A greater proportion of this annual precipitation occurs during the summer months of July and August which coincides with the peak growing season. On average, this area is two degrees Celsius warmer than Watson Lake during the summer months. Due to topographical position, lightning activity may be lower in this region than in other parts of the southeast Yukon (Applied Ecosystem Management 1998). The combination of greater summer precipitation, possibly fewer lightning strikes, and poorly drained, wet soils may explain the absence of fire as a dominant disturbance in this area. The result is the lush and structurally diverse forests of the La Biche River valley.

Natural Disturbances

As discussed above, fire has been naturally suppressed in this area and has had little direct influence on the composition and structure of the forests in the La Biche River valley (Applied Ecosystem Management 1998).

Forest renewal and composition in low elevation forests (below 800 metres) in the La Biche River valley appear to be controlled by the interactions between edaphic characteristics, insects

and diseases. In particular, the dynamics of Eastern Spruce Budworm have contributed to the maintenance of the structurally complex, heterogeneous mixed-wood forests found in the area.

There are two geographically distinct zones of fire activity in the La Biche River valley. Fire patterns change at around 800 metres elevation: lower elevation forests are characterized by infrequent fire events, and high elevation forests experience relatively frequent fire events. As a result, in the last 200 years, 82 percent of the high elevation forests have burned, while only 25 percent of the low elevation forests have been affected by fire (Applied Ecosystem Management 1998).

The combined effect of these natural disturbance patterns has allowed a very productive, structurally diverse, and rich forest ecosystem to develop in the La Biche River valley.

Hydrology and Riverine Characteristics

The physical characteristics of the lower La Biche River valley are generally described as laterally unstable, typically having side channels dominated by pioneering species of shrubs (*Salix sp.*) and plants most tolerant to periodic dewatering and ice-scour.

Large aggregations of unstable organic debris, primarily trees and root bases, are common. The wide active channel to streambed width ratio reflects a highly variable discharge and associated bedload. The lower La Biche River receives inflows from a number of small drainages originating from higher elevations. These streams typically become low in gradient upon entering the La Biche River. The La Biche River's surface water conditions are typical of many other streams within the Liard River basin.

Soils

Soils in this ecoregion have formed under a relatively moist continental climate, somewhat milder and wetter than the adjacent Hyland Highland Ecoregion.

Soil development reflects the mineralogy of the underlying Cretaceous calcareous shales and sandstones. Where soil parent materials are fine-textured clay loam morainal deposits and glacio-lacustrine materials, Brunisolic Gray Luvisol soils dominate the landscape. These are highly productive forest soils commonly found throughout the boreal forest regions of Canada. Eutric Brunisols are the most common soils on coarse-textured well drained portions of the landscape (Zoladeski and Cowell 1996).

Wetlands are extensive (greater than 25 percent of the area) in the B.C. portion of this ecoregion, but are less so in the Yukon portion of the ecoregion. Organic Cryosolic soils are common on peat plateau bogs, palsa bogs and some veneer bogs. Northern ribbed fens are common and are without permafrost. Fen soils are most commonly classified as Fibrisols or Mesosols.

Vegetation

The mixed boreal forest vegetation of the Muskwa Plateau area of the Yukon is distinctly different from that of the adjacent Hyland Highland Ecoregion. The more continental climate with warmer, moister summers and relatively lower fire frequency is reflected in the lush vegetation and high species diversity of this ecoregion. Fluvial sites in this area are the most productive in the Yukon. Trees on upland sites can reach 30 metres or more (Applied Ecosystem Management 1998).

Though the region is dominated by White and Black Spruce (*Picea glauca* and *P. mariana*) forests, plant communities typical of more southern forests with tall fern meadows and Devil's Club (*Oplopanax horridus*) differentiate the Yukon part of this ecoregion from other parts of the Yukon and possibly from other parts of the Muskwa Plateau Ecoregion. This area may represent a glacial refugium containing some plant species not documented immediately to the south of the region.

White Spruce/feathermoss forests form the dominant climax community found on moderately to rapidly drained fluvial and morainal deposits. Shrubs such as Highbush Cranberry (*Viburnum edule*), Prickly Rose (*Rosa acicularis*), Dwarf Raspberry (*Rubus pubescens*), Red-osier Dogwood (*Cornus stolonifera*) and, Green and Mountain Alder (*Alnus crispa* and *A. incana*) are common. Herbs include horsetail (*Equisetum spp.*), Bunchberry (*Cornus canadensis*), Common Mitrewort (*Mitella nuda*), Tall Bluebell (*Mertensia paniculata*) and Twinflower (*Linnaea borealis*). As indicated above, several fern species and Devil's Club are also present.

Black Spruce is more common on poorly drained sites usually with a Labrador Tea (*Ledum decumbens*) / feathermoss understory. On moist and wet nutrient rich sites, Tamarack (*Larix laricina*) is occasionally found with Black Spruce. Subalpine Fir (*Abies lasiocarpa*) is common at elevations over 750 metres. Lodgepole Pine (*Pinus contorta*) does occur in one large burn in the southern part of the Yukon portion of the ecoregion but does not appear to be common elsewhere. Trembling Aspen (*Populus tremuloides*) also forms pure stands in this old burn. Balsam Poplar (*Populus balsamifera*), White Birch (*Betula occidentalis*) and Trembling Aspen are found in mixed forest stands together with White Spruce.

Species Distributions and Populations

Fish

Six species of fish are known residents of the La Biche River. The dominant species appear to be Arctic Grayling (*Thymallus arcticus*), Bull Trout (*Salvelinus confluentus*), and Longnose Sucker (*Catostomus catostomus*). With the exception of the Bull Trout, a species common only to the Liard Drainage, all other species have been widely documented throughout many sub-drainages of the Yukon and Mackenzie drainage basins (Lindsey et al. 1981). Of special note: in Alberta, the Bull Trout is considered "vulnerable" and a species of "special concern" (Alberta Fish and Wildlife Branch 1999). The British Columbia Ministry of Environment Lands and Parks and the British Columbia Conservation Data Centre currently list the Bull Trout as a "vulnerable" species. In the United States, Bull Trout stocks specific to the Columbia and Snake River basins have been listed as either "threatened" or "endangered" under the Endangered Species Act by the U.S. Fish and Wildlife Service.

The habitat requirements for three dominant species are similar in the La Biche River. They prefer cold, clear streams and rivers whose substrate is composed of gravel and cobble (Scott and Crossman 1973). Deep pools and extensive cover in the form of fallen trees, cutbanks, side channels and instream vegetation provide rearing habitat. Spawning habitat is generally over clean gravel substrates of larger rivers or tributary streams (Knowles and Gumtow 1996; McPhail and Lindsey 1970; Scott and Crossman 1973).

Bull Trout are negatively impacted by logging practices that remove riparian vegetation (Knowles and Gumtow 1996). Harvesting within the riparian zone reduces the amount of instream woody debris, a critical component of Bull Trout habitat. Logging and the associated road network also

tend to increase overland runoff to streams, adding to sediment loads and degradation of spawning habitat. Elsewhere, degraded conditions have severely reduced or eliminated migratory Bull Trout as water temperature, stream flow and other water quality parameters fall below the range of conditions which these fish can tolerate. Dams and other in-stream structures have blocked migration routes, altered water temperatures and caused the loss of fish as they pass through and over dams or are trapped in irrigation and other diversion structures.

Amphibians

Breeding populations of Wood Frog and Boreal Chorus Frog occur in the lower La Biche River valley. Wood Frogs occur throughout the Yukon, however, the La Biche River supports the only known Yukon population of Boreal Chorus Frog. As well, the Yukon population represents a significant range extension (Slough 1999). Both species of frogs are dependent on undisturbed wetlands and adjacent forest for all parts of their life cycle.

Birds

The rich and productive forests of the La Biche River area support an assemblage of forest birds that is unique in the Yukon (Table 2; Appendix C; Eckert et al. in prep.). The absolute density of birds is extraordinary (Table 2). Many of these species are at the northwest extent of their range and are therefore considered important to protect. Individuals found at the limit of a species' range have been found to provide important genetic diversity to the population as a whole. Further, a number of the species found in the La Biche River valley are declining elsewhere in their range, and four are classified as "threatened" or "vulnerable" in British Columbia (Appendix B). Philadelphia Vireo (classified as "vulnerable" in B.C.), and Black-and-white and Canada Warblers (classified as "vulnerable" in B.C.) are found only in this ecoregion in the Yukon, while Ovenbird, Mourning Warbler, and Rose-breasted Grosbeak which occur in low numbers in adjacent parts of the Hyland Highland Ecoregion are most common in the Muskwa Plateau. Cape May and Bay-breasted Warblers (both classified as "threatened" in B.C.) occur here and as far west as the edge of the Liard Basin Ecoregion (Sinclair 1998), and these, as well as a number of species which occur slightly further west, reach peak densities in the Muskwa Plateau Ecoregion, including Tennessee and Magnolia Warblers, Western Tanager, and White-throated Sparrow. This is one of few Yukon ecoregions where Pileated Woodpecker is known to occur, and the only ecoregion where it has been found breeding (Birds of the Yukon Database, CWS).

Although wetlands are not numerous in the La Biche River valley they support such rare Yukon species as Pied-billed Grebe, Marsh Wren, and Le Conte's Sparrow, along with more widespread species such as Sora, Solitary Sandpiper, Common Snipe, Alder Flycatcher, Common Yellowthroat, Lincoln's and Swamp Sparrows.

Forest bird species, which are abundant in mixed forests, include Yellow-bellied Sapsucker, Hammond's Flycatcher, Gray Jay, Swainson's Thrush, American Robin, Magnolia and Yellow-rumped Warblers, American Redstart, Chipping Sparrow, and Dark-eyed Junco. White Spruce forests support an abundance of species such as Three-toed and Black-backed Woodpeckers, Boreal Chickadee, Bay-breasted Warbler (classified as "threatened" in B.C.), Tennessee Warbler, Western Tanager, White-winged Crossbill, and Evening Grosbeak. Red-eyed Vireos reach their peak densities in Balsam Poplar forests, while Trembling Aspen forests support high densities of Ruffed Grouse, Least Flycatcher, Warbling Vireo, and Ovenbird. Species occurring in riparian tall shrubs and young deciduous forests include Philadelphia Vireo (classified as "vulnerable" in B.C.), Alder Flycatcher, and Yellow Warbler. Eastern Phoebe is a La Biche River specialty, which has nested each year (1995-99) along the river.

The Yukon's only documented record for Broad-winged Hawk is from the lower La Biche River and while its status is unclear this species may occur as a rare breeder. Bald Eagles are seen along the La Biche River, and may nest there, along with Spotted Sandpipers and Bank Swallows. Numerous owls inhabit the forests including Great Horned Owl, Northern Hawk Owl, and Great Gray and Boreal Owls. Species known to occur in winter are Three-toed and Black-backed Woodpeckers, Gray Jay, Common Raven, Boreal Chickadee, Red-breasted Nuthatch, and Common Redpoll (Birds of the Yukon Database, CWS).

TABLE 2: Total number of birds per km² (100 hectares) supported by the forests of the lower La Biche River valley, Yukon. Based on 1995 surveys across a variety of forest types (Eckert et. al in prep).

SPECIES	Birds/km ²	SPECIES	Birds/km ²
Swainson's Thrush	126	Hairy Woodpecker	9
Tennessee Warbler	106	Solitary Vireo	9
Magnolia Warbler	71	Woodpecker sp.	8
White-throated Sparrow	66	Evening Grosbeak	7
Yellow-rumped Warbler	57	Canada Warbler	6
Bay-breasted Warbler	52	Dark-eyed Junco	6
Chipping Sparrow	45	Philadelphia Vireo	6
American Redstart	41	Black and White Warbler	5
Northern Waterthrush	41	Cedar Waxwing	3
Hammond's Flycatcher	34	Mourning Warbler	3
Yellow-bellied Sapsucker	34	Red-breasted Nuthatch	3
Warbling Vireo	33	Ruffed Grouse	3
Western Tanager	32	Swamp Sparrow	3
Least Flycatcher	29	Lincoln's Sparrow	2
Yellow Warbler	27	Pine Siskin	2
American Robin	25	American Kestrel	1
Gray Jay	22	American Wigeon	1
White-winged Crossbill	22	Black-backed Woodpecker	1
Boreal Chickadee	19	Common Yellowthroat	1
Ovenbird	18	Northern Flicker	1
Rose-breasted Grosbeak	18	Ruby-crowned Kinglet	1
Red-eyed Vireo	16	Red-winged Blackbird	1
Varied Thrush	16	Sharp-shinned Hawk	1
Purple Finch	11	Tree Swallow	1
Alder Flycatcher	10	Three-toed Woodpecker	1
Fox Sparrow	10	Winter Wren	1
		TOTAL	1068

NOTE: Many more forest bird species depend on the forests of the La Biche River valley (Appendix C). These data area for species detected during standardized counts. Not all species are detected during these counts.

Plants

Almost 400 species of vascular plants (Appendix D) have been identified in the La Biche River valley, which is more than one third of all the vascular plants in the Yukon. Few areas in the Yukon can boast more rare species than the 41 that are found in this southeast corner of the Territory. Of these, eight were identified that were new to the Yukon and only occur in the southeast corner of the Territory. The rare species are comprised of 23 forbs, six shrubs, two ferns and eight graminoids, including among them, Wild Sarsaparilla (*Aralia nudicaulis*), Cattail (*Typha latifolia*), Devil's Club (*Oplopanax horridus*), Ostrich Fern (*Matteuccia struthiopteris*),

Lady Fern (*Athyrium filix-femina*), Monkey Flower (*Mimulus guttatus*), and several orchid species. As well, there is one grass species that is rare and endemic to the Yukon. Four species that are non-native to Canada were also discovered for the first time in the Yukon. These plants likely were introduced during the recent forestry and oil and gas activity.

Moose

Moose occur throughout the Yukon in densities that vary with region, habitat and season. In late March 1993, a helicopter-based survey of moose occurred in the lower La Biche and Beaver river watersheds, following Gasaway et al. (1986). In all, 89 of 172 blocks, each averaging about 21 km² were counted. Over half of the moose survey area was dominated by spruce forests. Corrected moose densities averaged 156 moose/1000 km². The highest densities occurred in deciduous forests (242) and floodplain areas (194), intermediate densities occurred in spruce forests (144) and “not-sufficiently restocked” areas (129), and the lowest densities occurred in pine forests (92) and “non-productive” areas (80). “Not Sufficiently Restocked” sites are areas with good productivity but little forest cover, as might happen after a fire or clear-cut. A total of 271 moose were seen during the survey, including six cows with twins and 37 cow-calf pairs.

These moose densities are average by Yukon standards (Yukon Moose Management Guidelines 1996). The proportion of calves and the presence of six pairs of twins in late winter are consistent with a healthy, productive population that should be stable or increasing. Calf densities (22.2 calves/100 adults) are among some of the highest late winter calf proportions for Yukon moose populations surveyed to date (Yukon Renewable Resources, unpublished data).

The importance of the deciduous forests and floodplain areas is apparent from their higher moose densities. Willow, aspen and birch are the preferred browse species for moose in the Yukon (Florkiewicz and Henry 1993). Areas dominated by these species offer favourable snow conditions and cover. Floodplain and deciduous forests made up a relatively small proportion of the total area, underlining their high relative importance to moose in winter.

Bison

Wood Bison were historically present in the Muskwa Plateau Ecoregion until the last one was shot in 1879 in British Columbia (Cowan and Guiget 1973). Wanderers from the Nahanni Herd, re-established in British Columbia in the 1950's, and they regularly range into the lower La Biche River valley. Anecdotal reports suggests that in the lower La Biche, bison numbers have increased from three animals (in 1993) to over 20 animals (with young for the first time) in 1999.

Bats

Surveys in the lower La Biche River, Yukon in 1999 documented one species of Myotis (likely Little Brown Myotis) and a suspected Long-eared Myotis. The Little Brown Myotis (*Myotis lucifugus*) occurs further north than any other bat species, and is the most common bat in the region (Slough 1999). Several bat species, including the Western and Northern Long-eared Myotis (*M. evotis* and *M. sptentrionalis*), Long-legged Myotis (*M. volans*), Big Brown Bat (*Eptesicus fuscus*), and Silver-haired Bat (*Lasionycteris noctivagans*) have recently been found in this ecoregion in British Columbia (Wilkinson et al. 1995). Surveys just south of the Technical Group's survey area in British Columbia have found Little Brown Myotis, Long-legged Myotis and Northern Long-eared Myotis. The latter two species are also expected to occur in the lower La Biche River valley.

IV. OBJECTIVES AND DESIGN OF THE FOREST ECOSYSTEM NETWORK

Conservation Objectives

The primary objective of the La Biche River Forest Ecosystem Network is to protect the range of landscapes and associated ecosystems and habitats found in the La Biche River valley. Further, the Technical Group sought to achieve a design that would ensure ecological integrity within the Yukon portion of the lower La Biche River valley.

In order to maintain fully functioning and diverse forest ecosystems, natural landscape patterns and stand level forest dynamics must be protected and maintained - both during and following human activities. Natural ecosystem diversity maintains ecosystem health and resiliency in the midst of disturbance. The forests in the lower La Biche River valley are inherently structurally diverse and thus, are naturally resilient. The conservation objective of the Forest Ecosystem Network has been met by ensuring that the design adequately protects this diversity of ecosystem form and function

Forest Ecosystem Network Design

Incorporating these conservation objectives in the design of the La Biche River Forest Ecosystem Network helps ensure ecological integrity within the Yukon portion of the lower La Biche River valley. Wherever possible and without compromising its conservation objectives, the Technical Group sought to avoid areas of importance to other users (forestry and oil & gas). The areas comprising the Forest Ecosystem Network were selected so as to:

1. Provide a contiguous forested area representing the full range of habitats found in the La Biche River valley, and one that is large enough to provide adequate forest interior conditions and connections between riparian and upland ecosystems.
2. Provide a variety of patch sizes, shapes and types that include elements of the pattern (proportion, frequency and arrangement) which would have resulted from natural disturbances.
3. Include a complete, significant sub-watershed of the La Biche River.
4. Maximize the inclusion of unique, rare or special features and habitats (e.g. riparian areas, wetlands, old-growth forest) that are known to contain rare or sensitive species (i.e. those most dependent on the La Biche River valley).
5. Provide natural breaks to reduce the chance of landscape level disturbances such as fire impacting the entire Forest Ecosystem Network, using the La Biche River, Mount Martin and the southern extent of the Kotaneelee Range.
6. Provide a connection between all areas of the Forest Ecosystem Network using a significant riparian corridor (500 metres) along the La Biche River.

It is critical to recognize that it is both the individual areas within the Forest Ecosystem Network, as well as the overall design and function, that help achieve adequate protection of the unique biological communities found in the La Biche River valley.

Design Tools

While the design of the Forest Ecosystem Network was primarily based on five years (1995-99) of field surveys by the Technical Group, three additional tools were used to determine appropriate boundaries for the Forest Ecosystem Network. These were: 1) Digital forest cover data, 2) the Forest Bird Habitat Potential Map, and 3) the Forest Fragmentation Map.

Digital Forest Cover Data

Forest Resources' digital forest cover data was used to assess leading tree species (Table 3; Map 3) and age-class (Table 3; Map 4) composition within the survey area and Forest Ecosystem Network. While the forest cover inventory data are at a relatively coarse scale, they are the only continuous digital coverage of vegetation cover and/or habitat types readily available. As such, these data were useful to help ensure that general forest types were represented in the Forest Ecosystem Network. It is important to note that digital forest cover data, and thus the values presented in Table 3 are not adjusted for cutblocks in the lower La Biche River valley. In reality, the area of older (150-250 year old) White Spruce forests is significantly lower in both the survey area and the Forest Ecosystem Network. This adjustment could not be made as the digital coverage for forest cover is slightly distorted and does not correctly align with the digital coverage for cutblocks and other base data. To provide a visual indication of this reduction, the cutblocks are shown on maps of leading tree species (Map 3), and forest age-class (Map 4).

TABLE 3: Total area (km²) and percent of Leading Tree Species and Forest Age-class for the La Biche River Survey Area, Forest Ecosystem Network (FEN), and the five areas which comprise the network.														
Leading Species	Survey Area		FEN		Area 1		Area 2		Area 3		Area 4		Area 5	
	km ²	%	km ²	%	km ²	%	km ²	%	km ²	%	km ²	%	km ²	%
T. Aspen	158.8	26.5	53.2	29.0	10.0	22.0	8.0	25.7	3.4	15.8	17.4	29.7	14.5	53.5
B. Poplar	6.4	1.1	4.9	2.7	4.7	10.3	0.1	0.3	0.0	0.0	0.0	0.0	0.1	0.5
L. Pine	22.2	3.7	3.0	1.6	0.3	0.7	0.0	0.0	0.4	1.7	2.3	3.9	0.0	0.0
B. Spruce	37.1	6.2	7.5	4.1	0.6	1.4	2.7	8.8	0.3	1.4	3.5	5.9	0.4	1.4
W. Spruce	241.5	40.4	98.1	53.5	23.5	51.5	18.8	60.5	13.1	61.5	32.2	55.1	10.6	39.3
None	132.1	22.1	16.5	9.0	6.4	14.0	1.5	4.8	4.2	19.5	3.1	5.3	1.4	5.3
Age Class	Survey area		FEN		Area 1		Area 2		Area 3		Area 4		Area 5	
	km ²	%	km ²	%	km ²	%	km ²	%	km ²	%	km ²	%	km ²	%
0-50	138.9	23.2	18.1	9.9	6.9	15.1	1.5	4.8	5.2	24.4	3.1	5.3	1.4	5.3
50-100	157.2	26.3	34.7	18.9	4.9	10.8	1.2	3.8	1.7	8.0	12.6	21.5	14.3	52.8
100-150	251.3	42.0	109.2	59.6	23.2	51.0	25.6	82.5	12.4	58.5	36.8	63.0	11.2	41.3
150-200	48.6	8.1	19.0	10.4	9.2	20.2	2.8	8.9	1.9	9.0	5.0	8.5	0.1	0.5
200-250	2.3	0.4	2.3	1.2	1.3	2.9	0.0	0.0	0.0	0.0	0.9	1.6	0.0	0.0
	Survey area		FEN		Area 1		Area 2		Area 3		Area 4		Area 5	
Total Area	598.2		45.5		31.0		21.3		58.4		27.1		183.3	
Percent of Survey area			30.6		7.6		5.2		3.6		9.8		4.5	
Percent of FEN					24.8		16.9		11.6		31.9		14.8	
Note: The digital forest cover data, and thus the values presented above are not adjusted for cutblocks in the lower La Biche River valley. In reality, the area of older (150-250 year old) White Spruce forests is significantly lower in both the survey area and the Forest Ecosystem Network.														

Forest Bird Habitat Potential Map (Map 5)

As a group, forest birds are diverse, and include numerous habitat specialists which are sensitive to habitat changes. As well, they are easy to survey making them excellent environmental indicators. A Forest Bird Habitat Potential Map (Table 4; Map 5; Appendix A) developed by the Technical Group helped translate some of the design goals into appropriate boundaries for the Forest Ecosystem Network. The potential habitat use by eight forest bird species (whose Yukon ranges are primarily restricted to the middle and lower La Biche River) was mapped by applying habitat use models for each species to Forest Resources' forest cover polygons. These forest bird species are considered indicators of critical habitat in the La Biche River watershed. The specific combination of species supported by each forest polygon is an "assemblage", and in total the map identifies nine unique assemblages within the survey area. In reality, the forests of the La Biche River valley support a great diversity of forest bird assemblages, however the nine assemblages identified by this desk-top exercise provide a generalized but useful tool.

The resulting Habitat Potential Map generally identifies areas of importance to these forest bird species and assemblages. It is important to note that it does not indicate *all* stands used by these species and assemblages, nor does it map stands *known* to be used by these species and assemblages. While the Habitat Potential Map alone can not be used to delineate a Forest Ecosystem Network, it does identify areas which may be important to this select group of forest bird species.

TABLE 4: Total area (km ²) and percent of Forest Bird Habitat Potential Map Assemblages for the La Biche River Survey area, Forest Ecosystem Network (FEN), and the five areas which comprise the network.														
Assemblage Number	Survey area		FEN		Area 1		Area 2		Area 3		Area 4		Area 5	
	km ²	%	km ²	%	km ²	%	km ²	%	km ²	%	km ²	%	km ²	%
1	48.2	8.1	26.0	14.2	7.6	16.8	9.4	30.4	4.5	21.3	4.4	7.6	0.0	0.0
2	59.7	10.0	22.1	12.1	8.8	19.4	8.9	28.8	3.4	16.1	0.9	1.6	0.0	0.0
3	10.3	1.7	6.9	3.8	0.5	1.1	0.0	0.0	0.0	0.1	6.4	10.9	0.0	0.0
4	14.4	2.4	7.6	4.1	4.9	10.8	0.1	0.3	1.2	5.5	1.2	2.1	0.1	0.6
5	37.1	6.2	11.5	6.3	3.3	7.3	3.5	11.2	0.0	0.0	1.9	3.3	2.8	10.4
6	18.3	3.1	9.7	5.3	1.9	4.2	0.0	0.0	0.2	1.0	5.6	9.6	2.0	7.5
7	27.1	4.5	16.5	9.0	3.5	7.8	3.5	11.1	0.0	0.0	4.4	7.5	5.1	18.8
8	6.6	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	33.6	5.6	12.5	6.8	0.5	1.2	1.0	3.3	0.0	0.0	6.4	11.0	4.5	16.6
none	343.0	57.3	70.5	38.5	14.3	31.5	4.6	14.9	11.9	56.0	27.1	46.4	12.5	46.2
	Survey area		FEN		Area 1		Area 2		Area 3		Area 4		Area 5	
Total Area	598.2		45.5		31.0		21.3		58.4		27.1		183.3	
Percent of Survey area			30.6		7.6		5.2		3.6		9.8		4.5	
Percent of FEN					24.8		16.9		11.6		31.9		14.8	
Assemblages:									Proportion of high potential habitat for each species within the FEN:					
1) Solitary Vireo, Western Tanager, Bay-breasted Warbler, Rose-breasted Grosbeak, Magnolia Warbler 2) Rose-breasted Grosbeak, Magnolia Warbler, Canada Warbler 3) Solitary Vireo, Western Tanager, Bay-breasted Warbler 4) Rose-breasted Grosbeak, Red-eyed Vireo, Canada Warbler 5) Rose-breasted Grosbeak, Red-eyed Vireo, Ovenbird 6) Rose-breasted Grosbeak, Magnolia Warbler 7) Rose-breasted Grosbeak, Red-eyed Vireo 8) Canada Warbler 9) Rose-breasted Grosbeak									Solitary Vireo: 18% Western Tanager: 18% Bay-breasted Warbler: 18% Rose-breasted Grosbeak: 57% Ovenbird: 6% Magnolia Warbler: 31% Canada Warbler: 16% Red-eyed Vireo: 19%					

Forest Fragmentation Map (Map 6)

A Forest Fragmentation Map (Map 6) developed by the Technical Group helped identify areas with reduced impacts from industrial forest fragmentation. Forest fragmentation from industrial activity (cutblocks, roads, landings, seismic lines etc.) has significantly altered the landscape in the lower La Biche River valley. Fragmentation reduces both the extent and quality of the interior forest habitats which are critical to breeding populations of numerous forest bird species. The negative impacts of forest fragmentation (e.g. nest predation, parasitism) on interior forest birds have been well established. The Brown-headed Cowbird, North America's foremost brood parasite, is relatively common in the lower La Biche River valley. Nest predators and brood parasites gain access to forested habitats via edge habitats, and their success increases as edge habitat is created. In the lower La Biche River, cutblocks alone have created approximately 209 km of edge habitat (68 km within the Forest Ecosystem Network). Forest fragmentation has also been found to negatively impact a number of mammal species (e.g. movement barriers, increased predation risk) and can dramatically change the microclimate of fragmented stands.

The degree of forest fragmentation throughout the La Biche River valley was an important consideration in selecting areas to include in the Forest Ecosystem Network. While studies have documented effects of fragmentation penetrating up to 300 metres into a stand, a conservative value of 100 metres was used for determining the extent of the effect of fragmentation in the La Biche River valley. To calculate Fragmentation Effect, this buffer (100 metres) was applied to cutblocks, roads, and seismic lines.

	FEN	Area 1	Area 2	Area 3	Area 4	Area 5
Total Area	183.3	45.5	31.0	21.3	58.4	27.1
Cutblock Area	4.5	1.4	3.1	0.0	0.0	0.0
percent	2.5	3.2	10.0	0.0	0.0	0.0
Fragmentation Effect Area	23.6	6.6	13.4	1.5	2.2	0.0
percent	12.9	14.4	43.2	6.9	3.8	0.0
Note: The area of Fragmentation Effect was calculated using a 100 metre buffer on cutblocks, roads and seismic lines.						

V. FOREST ECOSYSTEM NETWORK STRATIFICATION

As stated previously, it is both the individual areas included in the Forest Ecosystem Network, as well as the overall design and function that together will help achieve adequate protection of the unique biological communities found in the La Biche River valley. The following stratification provides an understanding of how areas within the Forest Ecosystem Network contribute to the value of the network as a whole.

AREA 1 - Riparian Corridor: This area (45 km²) consists of a 500 metre buffer on each side of the La Biche River from the Yukon/B.C. border north to the northern extent of the Forest Ecosystem Network on the mid-section of the La Biche River. The corridor is approximately 37 km in length. Significant areas of the lower portion of this corridor have already been clear-cut logged (Table 5; Map 6)

Protecting a significant riparian corridor on the La Biche River recognizes the high biological productivity and diversity of riparian areas. Riparian habitats are also a critical source of biological and genetic diversity following landscape level disturbances such as fire. The linear nature of riparian areas make them ideal as travel corridors for many wildlife species, serving as the primary connection and corridor through the Forest Ecosystem Network. A fully intact riparian zone will also ensure the protection of aquatic habitats along the mainstem of the La Biche River. These habitats are critical to the fish populations found in the La Biche River. The continued existence of the Bull Trout, a declining and endangered species in much of its range, in the La Biche River is dependent on the protection of these freshwater habitats. Using a buffer of 500 metres on either side of the La Biche River will allow for reasonable protection of habitats limited to the riparian zone. The riparian corridor is a focal point in the delineation of the Forest Ecosystem Network.

Bird species most commonly found in the riparian zone include Least and Hammond's Flycatchers, Warbling Vireo, Philadelphia Vireo (classified as "vulnerable" in B.C.), and Red-eyed Vireo, Yellow Warbler, Black-and-White Warbler, and Swamp Sparrow. Most significant is Philadelphia Vireo (classified as "vulnerable" in B.C.) which is only found in habitats immediately adjacent to the La Biche River. Further, the La Biche River is the only watershed in the Yukon where this species is known to occur.

AREA 2 - Lower La Biche River: This area (31 km²) is bounded by the La Biche River to the west, the approximate height of land to the east, the Yukon/B.C. border to the south, and Area 3 to the north. Significant portions of this area have been clear-cut logged (Table 5; Map 6).

One of the key features of the lower La Biche River valley is the occurrence of extensive old-growth White Spruce and mixed forests (White Spruce, Trembling Aspen, Balsam Poplar, and White Birch) away from the riparian zone. Despite extensive forest fragmentation (Table 5; Map 6) due to logging, road construction and seismic lines in the north half of this area, there are important stands of dense, old-growth White Spruce as well as open mixed forests (White Spruce, Trembling Aspen, Balsam Poplar).

Numerous bird species found in the La Biche River including Western Tanager, Solitary Vireo, Bay-breasted Warbler (classified as "threatened" in B.C.), Magnolia Warbler, American Redstart, Rose-breasted Grosbeak, and White-throated Sparrow are at their highest densities in this area. The denser stands of old-growth White Spruce are preferred by Western Tanager and Solitary Vireo while the open mixed forests support relatively high densities of Canada Warbler (classified as "vulnerable" in B.C.), American Redstart, and Rose-breasted Grosbeak. This area

supports high densities of White-throated Sparrow and Magnolia Warbler across forest types as long as sufficient deciduous understory is present. The Forest Bird Habitat Potential Map (Map 5) indicates that the southern portion of this area contains forests that are important to Ovenbird, a species which is susceptible to forest fragmentation.

AREA 3 - La Biche River East & Hanging Valley: This area (21 km²) is bounded by the La Biche River to the west, and the Yukon/NWT border to the east, Area 2 to the south, and the watershed border of the lower La Biche River to the north.

This area has no cutblocks and little in the way of seismic lines and is therefore relatively free of forest fragmentation from industrial activity (Table 5; Map 6). As such, this area provides forest interior habitat for communities and species which are negatively affected by forest fragmentation. While this area has not been specifically surveyed for habitat, wildlife or birds, its lack of fragmentation makes it an important part of the Forest Ecosystem Network.

The Forest Bird Habitat Potential Map (Map 5) indicates that this area is characterized by important stands of relatively dense White Spruce. This habitat type potentially supports Solitary Vireo, Western Tanager, Bay-breasted Warbler (classified as “threatened” in B.C.), Rose-breasted Grosbeak and Magnolia Warbler. As well, the Forest Bird Habitat Potential Map (Map 5) indicates some stands of relatively open old-growth forests which potentially support Canada Warbler (classified as “vulnerable” in B.C.).

AREA 4 - Mount Martin West sub-watershed: This area (58 km²) includes a complete sub-watershed of the La Biche River, located to the west of Mount Martin.

The Mount Martin West sub-watershed is characterized by a variety of forested habitats including Black and White Spruce, Subalpine Fir, Lodgepole Pine and extensive Trembling Aspen. This area is a very important component of the Forest Ecosystem Network as it is a significant sub-watershed of the La Biche River, which has not been fragmented by logging and has relatively few seismic lines (Table 5; Map 6). As such, this area will serve as an ongoing reference for our baseline understanding of forest ecosystems.

This area supports relatively high densities of Solitary Vireo, American Redstart, and Magnolia Warbler. In addition, Cape May Warbler (classified as “threatened” in B.C.) is relatively common in this area and rare on the lower La Biche River. The Forest Bird Habitat Potential Map (Map 5) indicates that this area contains forests that are important to Ovenbird. As well, Le Conte’s Sparrow, an extremely rare and localized species in the Yukon, inhabits the sedge wetlands at the south end of the sub-watershed. A recent (June 1999) discovery in this area was the Yukon’s first documented nest of Pileated Woodpecker, a very rare species in southeast Yukon.

AREA 5 - Middle La Biche River: This area (27 km²) is bounded by the headwaters of two creeks to the west, the La Biche River to the east, the Mount Martin sub-watershed to the south, and an un-named creek (60°14’20”N/ 124°14’21”W) to the north. The northern border includes a 250 metre buffer along each side of the creek.

This area includes relatively large stands of mature Trembling Aspen, smaller stands of young to mature White Spruce, as well as riparian habitats associated with two small creeks. Its position to the west of the La Biche River, and north of Mount Martin, which may afford some protection if a landscape level event (e.g., fire) impacts the lower La Biche River, makes it a critical component of the Forest Ecosystem Network. Protecting the headwaters of these creeks will

contribute to the maintenance of healthy downstream aquatic habitat that is critical to the continued existence of the Bull Trout in the La Biche River.

This area has no cutblocks and no apparent seismic lines and is therefore free of forest fragmentation from industrial activity (Table 5; Map 6). As such, this area provides forest interior habitat for communities and species which are negatively affected by forest fragmentation.

Forests along the middle La Biche River support relatively high densities of Western Tanagers, Bay-breasted Warblers (classified as “threatened” in B.C.), Ovenbirds, Canada Warblers (classified as “vulnerable” in B.C.), and Magnolia Warblers. The Forest Bird Habitat Potential Map (Map 5) indicates that this area contains forests that are important to Ovenbird. Philadelphia Vireo (classified as “vulnerable” in B.C.) was also found at one location in this area. A species found in this area and not elsewhere in the La Biche River valley was Golden-crowned Kinglet.

VI. RECOMMENDATIONS

The following recommendations by the La Biche / Beaver Ecosystem Technical Group are based on comprehensive field studies (1995-99) and analyses of the La Biche River valley and its associated ecosystems.

These recommendations are made: 1) in recognition of the unique natural disturbance patterns of this landscape, 2) to ensure connectivity of ecosystems within the Forest Ecosystem Network, 3) to ensure the connectivity of the Forest Ecosystem Network with adjacent areas so that it does not become an isolated remnant of a larger system, and 4) to conserve the exceptional biological diversity of birds, plants, amphibians, and mammals of this watershed. The La Biche / Beaver Ecosystem Technical Group recommends that:

1. Department of Indian Affairs and Northern Development Canada immediately implement the La Biche River Forest Ecosystem Network (Map 1) as an area permanently removed from harvesting to satisfy this requirement under the 1996 CEAA screening.
2. During the period between now and the completion of this designation, no further logging should be planned or conducted in the proposed La Biche River Forest Ecosystem Network. To this end, Forest Resources' should include this area in its Resource Report and pursue its designation as a Forest Reserve.
3. A spatially based, comprehensive forest management plan be completed for Forest Management Unit Y01 by March 2000. Key to this recommendation is that the development of this plan must include direct input from the La Biche / Beaver Ecosystem Technical Group, as well as First Nations, and conservation organizations.
4. Planning, development and implementation of similar Forest Ecosystem Networks, as part of a Forest Management Plan, be initiated immediately in other watersheds within Forest Management Unit Y01 and southeast Yukon.

VII. ACKNOWLEDGEMENTS

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APPENDIX A: FOREST BIRD HABITAT POTENTIAL MAP METHODOLOGY

A Habitat Potential Map (Map 5) was themed for eight key forest bird species (listed below) using Forest Resources' digital forest cover data. These species are considered "key" because their Yukon ranges are primarily restricted to the middle and lower La Biche River. As well, these eight species require a forested, breeding habitat that is most likely to be affected by disturbance to forest cover. Generally, these species are indicative of the most sensitive avian communities that are recorded to occur in the La Biche Forest Management Unit (Y01). It is important to note that the La Biche River valley provides critical habitat for many other species and that the eight "key" forest bird species were selected to help guide the design of the Forest Ecosystem Network. The rationale was that identifying areas of importance for the most sensitive species would highlight appropriate areas for an ecosystem network.

General habitat preferences were described for each of the eight species (see below) using forest cover parameters of leading species, percent cover of leading species, secondary species, and average stand height. The habitat descriptions were based on a combination of published studies, five years of unpublished survey data in the region, and the experience and combined expertise of personnel from the Canadian Wildlife Service, Yukon Renewable Resources, and DIAND Forest Resources. The forest cover inventory data were used as a modeling base for two reasons: 1) It is the only continuous digital coverage of vegetation cover and/or habitat types readily available, and 2) The resulting products are at a scale, resolution and arrangement directly applicable to forest management planning in the region. This initiative builds on similar existing strategies for development/conservation efforts in boreal mixed-wood forests. The themed polygons identify areas of high quality habitat or importance to the individual species and the resulting assemblages. This model identifies stands potentially utilized by these species and assemblages at a fairly coarse scale. As such, it does not indicate *all* stands used by these species and assemblages, nor does it map stands *known* to be used by these species and assemblages.

General Habitat Descriptions for the Eight Forest Bird Species:

Bay-Breasted Warbler: leading species White Spruce, leading species canopy cover $\geq 70\%$; average stand height > 20 metres.

Solitary Vireo: leading species White Spruce, leading species canopy cover $\geq 70\%$; average stand height > 20 metres.

Western Tanager: leading species White Spruce, leading species canopy cover $\geq 70\%$; average stand height > 20 metres.

Magnolia Warbler: leading species White Spruce, and secondary species Trembling Aspen or Balsam Poplar; average stand height > 15 metres.

Canada Warbler: leading species White Spruce, or Trembling Aspen, or Balsam Poplar, leading species canopy cover $< 70\%$ and $> 30\%$; average stand height > 20 metres.

Red-eyed Vireo: leading species Trembling Aspen or Balsam Poplar; average stand height > 18 metres.

Ovenbird: leading species Trembling Aspen or Balsam Poplar $> 70\%$; average stand height > 20 metres.

Rose-Breasted Grosbeak: leading species Trembling Aspen or Balsam Poplar; OR leading species White Spruce with secondary species Trembling Aspen or Balsam Poplar; average stand height > 15 metres.

APPENDIX A continued:

Species Assemblages:

Each forest cover polygon was found to potentially support up to five of the eight species. The specific combination of species supported by each polygon is an “assemblage”, and in total there are nine unique assemblages (listed below). In reality, the forests of the La Biche River valley support a great diversity of assemblages, however the nine assemblages identified by this desk-top exercise provide a generalized but useful tool. The resulting Habitat Potential Map (Map 5) shows the pattern of these nine assemblages in the La Biche River valley.

Assemblage	Species Composition
1	Solitary Vireo, Western Tanager, Bay-breasted Warbler, Rose-breasted Grosbeak, Magnolia Warbler
2	Rose-breasted Grosbeak, Magnolia Warbler, Canada Warbler
3	Solitary Vireo, Western Tanager, Bay-breasted Warbler
4	Rose-breasted Grosbeak, Red-eyed Vireo, Canada Warbler
5	Rose-breasted Grosbeak, Red-eyed Vireo, Ovenbird
6	Rose-breasted Grosbeak, Magnolia Warbler
7	Rose-breasted Grosbeak, Red-eyed Vireo
8	Canada Warbler
9	Rose-breasted Grosbeak

APPENDIX B: BRITISH COLUMBIA’S RED (ENDANGERED OR THREATENED) AND BLUE (VULNERABLE) LISTED FOREST BIRD SPECIES**RED (endangered or threatened):**

Cape May Warbler (*Dendroica tigrina*) - threatened
Bay-breasted Warbler (*Dendroica castanea*) - threatened

BLUE (vulnerable):

Philadelphia Vireo (*Vireo philadelphicus*)
Canada Warbler (*Wilsonia canadensis*)

Source:

B.C. Conservation Data Centre
Wildlife Inventory Section, Resources Inventory Branch,
Ministry of Environment, Lands and Parks
P.O. Box 9344 Station Provincial Government
Victoria, BC V8W 9M1

**APPENDIX C: COMMON AND SCIENTIFIC NAMES OF 114 BIRD SPECIES OBSERVED (1995-99)
AT THE LA BICHE RIVER, YUKON.**

Common name	Scientific name	Common name	Scientific name
Pied-billed Grebe	<i>Podilymbus podiceps</i>	Gray Jay	<i>Perisoreus canadensis</i>
Horned Grebe	<i>Podilymbus auritus</i>	Common Raven	<i>Corvus corax</i>
Trumpeter Swan	<i>Cygnus buccinator</i>	Black-capped Chickadee	<i>Parus atricapillus</i>
Canada Goose	<i>Branta canadensis</i>	Boreal Chickadee	<i>Parus hudsonicus</i>
Green-winged Teal	<i>Anas crecca</i>	Red-breasted Nuthatch	<i>Sitta canadensis</i>
Mallard	<i>Anas platyrhynchos</i>	Winter Wren	<i>Troglodytes troglodytes</i>
Cinnamon Teal	<i>Anas cyanoptera</i>	Marsh Wren	<i>Cistothorus palustris</i>
Blue-winged Teal	<i>Anas discors</i>	Golden-crowned Kinglet	<i>Regulus satrapa</i>
American Wigeon	<i>Anas americana</i>	Ruby-crowned Kinglet	<i>Regulus calendula</i>
Ring-necked Duck	<i>Aythya collaris</i>	Mountain Bluebird	<i>Sialia currucoides</i>
Lesser Scaup	<i>Aythya affinis</i>	Townsend's Solitaire	<i>Myadestes townsendi</i>
Common Goldeneye	<i>Bucephala clangula</i>	Swainson's Thrush	<i>Catharus ustulatus</i>
Bufflehead	<i>Bucephala albeola</i>	American Robin	<i>Turdus migratorius</i>
Common Merganser	<i>Mergus merganser</i>	Varied Thrush	<i>Ixoreus naevius</i>
Bald Eagle	<i>Haliaeetus leucocephalus</i>	Bohemian Waxwing	<i>Bombycilla garrulus</i>
Sharp-shinned Hawk	<i>Accipiter striatus</i>	Cedar Waxwing	<i>Bombycilla cedrorum</i>
Northern Goshawk	<i>Accipiter gentilis</i>	Philadelphia Vireo	<i>Vireo philadelphicus</i>
Broad-winged Hawk	<i>Buteo platypterus</i>	Solitary Vireo	<i>Vireo solitarius</i>
Red-tailed Hawk	<i>Buteo jamaicensis</i>	Warbling Vireo	<i>Vireo gilvus</i>
Golden Eagle	<i>Aquila chrysaetos</i>	Red-eyed Vireo	<i>Vireo olivaceus</i>
American Kestrel	<i>Falco sparverius</i>	Tennessee Warbler	<i>Vermivora peregrina</i>
Merlin	<i>Falco columbarius</i>	Orange-crowned Warbler	<i>Vermivora celata</i>
Spruce Grouse	<i>Dendragapus canadensis</i>	Yellow Warbler	<i>Dendroica petechia</i>
Blue Grouse	<i>Dendragapus obscurus</i>	Magnolia Warbler	<i>Dendroica magnolia</i>
Ruffed Grouse	<i>Bonasa umbellus</i>	Cape May Warbler	<i>Dendroica tigrina</i>
Sora	<i>Charadrius semipalmatus</i>	Yellow-rumped Warbler	<i>Dendroica coronata</i>
Killdeer	<i>Charadrius vociferus</i>	Bay-breasted Warbler	<i>Dendroica castanea</i>
Lesser Yellowlegs	<i>Tringa flavipes</i>	Black-and-white Warbler	<i>Mniotilta varia</i>
Solitary Sandpiper	<i>Tringa solitaria</i>	American Redstart	<i>Setophaga ruticilla</i>
Spotted Sandpiper	<i>Actitis macularia</i>	Ovenbird	<i>Seiurus aurocapillus</i>
Least Sandpiper	<i>Calidris minutilla</i>	Northern Waterthrush	<i>Seiurus noveboracensis</i>
Common Snipe	<i>Gallinago gallinago</i>	Mourning Warbler	<i>Oporornis philadelphia</i>
Northern Hawk Owl	<i>Surnia ulula</i>	Common Yellowthroat	<i>Geothlypis trichas</i>
Great Gray Owl	<i>Strix nebulosa</i>	Wilson's Warbler	<i>Wilsonia pusilla</i>
Boreal Owl	<i>Aegolius funereus</i>	Canada Warbler	<i>Wilsonia canadensis</i>
Mourning Dove	<i>Zenaida macroura</i>	Western Tanager	<i>Piranga ludoviciana</i>
Common Nighthawk	<i>Chordeiles minor</i>	Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>
Belted Kingfisher	<i>Ceryle alcyon</i>	Chipping Sparrow	<i>Spizella passerina</i>
Pileated Woodpecker	<i>Dryocopus pileatus</i>	Clay-colored Sparrow	<i>Spizella pallida</i>
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	Le Conte's Sparrow	<i>Ammodramus leconteii</i>
Hairy Woodpecker	<i>Picoides villosus</i>	Fox Sparrow	<i>Passerella iliaca</i>
Three-toed Woodpecker	<i>Picoides tridactylus</i>	Song Sparrow	<i>Melospiza melodia</i>
Black-backed Woodpecker	<i>Picoides arcticus</i>	Lincoln's Sparrow	<i>Melospiza lincolni</i>
Northern Flicker	<i>Colaptes auratus</i>	Swamp Sparrow	<i>Melospiza georgiana</i>
Olive-sided Flycatcher	<i>Contopus borealis</i>	White-throated Sparrow	<i>Zonotrichia albicollis</i>
Western Wood-Pewee	<i>Contopus sordidulus</i>	White-crowned Sparrow	<i>Zonotrichia leucophrys</i>
Alder Flycatcher	<i>Empidonax alnorum</i>	Golden-crowned Sparrow	<i>Zonotrichia atricapilla</i>
Least Flycatcher	<i>Empidonax minimus</i>	Dark-eyed Junco	<i>Junco hyemalis</i>
Hammond's Flycatcher	<i>Empidonax hammondii</i>	Red-winged Blackbird	<i>Agelaius phoeniceus</i>
Dusky Flycatcher	<i>Empidonax oberholseri</i>	Brown-headed Cowbird	<i>Molothrus ater</i>
Eastern Phoebe	<i>Sayornis phoebe</i>	Pine Grosbeak	<i>Pinicola enucleator</i>
Eastern Kingbird	<i>Tyrannus tyrannus</i>	Purple Finch	<i>Carpodacus purpureus</i>
Violet-green Swallow	<i>Tachycineta thalassina</i>	Red Crossbill	<i>Loxia curvirostra</i>
Tree Swallow	<i>Tachycineta bicolor</i>	White-winged Crossbill	<i>Loxia leucoptera</i>
Bank Swallow	<i>Riparia riparia</i>	Pine Siskin	<i>Carduelis pinus</i>
Cliff Swallow	<i>Hirundo pyrrhonota</i>	Common Redpoll	<i>Carduelis flammea</i>
Barn Swallow	<i>Hirundo rustica</i>	Evening Grosbeak	<i>Coccothraustes verspertina</i>

**APPENDIX D: COMMON AND SCIENTIFIC NAMES OF 390 PLANT SPECIES OBSERVED (1995-98)
AT THE LA BICHE RIVER, YUKON.**

Common name	Scientific name	Common name	Scientific name
Brandeg's Bedstraw	<i>Galium brandegi</i>	Slender Wheatgrass	<i>Elymus trachycaulus</i>
Yellow Rattle	<i>Rhianthus minor</i> ssp. <i>borealis</i>	Crowberry	<i>Empetrum nigrum</i>
False Medic	<i>Schizachne purpurascens</i>	Fireweed	<i>Epilobium angustifolium</i>
Lesser Bladderwort	<i>Utricularia minor</i>	Horneman's Willowherb	<i>Epilobium hornemannii</i>
Small-flowered Bulrush	<i>Scirpus microcarpus</i>	White-flowered Willowherb	<i>Epilobium lactifolium</i>
Clasping Twistedstalk	<i>Streptopus amplexifolius</i>	Broad-leaved Willowherb	<i>Epilobium latifolium</i>
Canada Violet	<i>Viola canadensis</i>	Common Horsetail	<i>Equisetum arvense</i>
Meadow Arnica	<i>Arnica chamissonis</i>	Swamp Horsetail	<i>Equisetum fluviatile</i>
Toothed Wood Fern	<i>Dryopteris carthusiana</i>	Scouring-rush	<i>Equisetum hyemale</i>
Northern Starwort	<i>Stellaria calycantha</i>	Marsh Horsetail	<i>Equisetum palustre</i>
Northern Wood Fern	<i>Dryopteris expansa</i>	Meadow Horsetail	<i>Equisetum pratense</i>
Creamy Peavine	<i>Lathyrus ochroleucus</i>	Dwarf Scouring-rush	<i>Equisetum scirpoides</i>
Red Honeysuckle	<i>Lonicera dioica</i>	Wood Horsetail	<i>Equisetum sylvaticum</i>
Wild Lily-of-the-valley	<i>Maianthemum canadense</i>	Northern Scouring-rush	<i>Equisetum variegatum</i>
Water Plantain	<i>Alisma plantago-aquatica</i>	Bitter Fleabane	<i>Erigeron acris</i>
Impatiens	<i>Impatiens</i> sp.	Daisy Fleabane	<i>Erigeron elatus</i>
Round-leaved Rein-orchid	<i>Platanthera orbiculata</i>	Arctic Fleabane	<i>Erigeron humilis</i>
Fringed Brome	<i>Bromus ciliatus</i>	Narrow-leaved Cottongrass	<i>Eriophorum angustifolium</i>
Common Mitrewort	<i>Mitella nuda</i>	Short-anthered Cotton-grass	<i>Eriophorum brachyantherum</i>
Trailing Raspberry	<i>Rubus pubescens</i>	Sheathed Cottongrass	<i>Eriophorum vaginatum</i>
Porsild's Bluegrass	<i>Poa porsildii</i>	Wormseed Mustard	<i>Erysimum cheiranthoides</i>
Crested Wheatgrass	<i>Agropyrum pectiforme</i>	Edward's Wallflower	<i>Eutrema edwardsii</i>
Biennial Wormwort	<i>Artemisia biennis</i>	Northern Rough Fescue	<i>Festuca altaica</i>
Smooth Brome	<i>Bromus inermis</i>	Wild Strawberry	<i>Fragaria virginiana</i>
Shepherd's Purse	<i>Capsella bursa-pastoralis</i>	Northern Bedstraw	<i>Galium boreale</i>
Lamb's-Quarters	<i>Chenopodium album</i>	Small Bedstraw	<i>Galium trifidum</i>
Annual Hawksbeard	<i>Crepis tectorum</i>	Moss Gentian	<i>Gentiana prostrata</i>
Flixweed	<i>Descurainia sophia</i>	Felwort	<i>Gentianella amarella</i>
Foxtail	<i>Hordeum jubatum</i>	Bastard Toad-flax	<i>Geocaulon lividum</i>
Pineapple Weed	<i>Matricaria discoidea</i>	Bicknell's Geranium	<i>Geranium bicknellii</i>
Alfalfa	<i>Medicago sativa</i>	Large-leaved Avens	<i>Geum macrophyllum</i>
White-sweet Clover	<i>Melilotus alba</i>	Tall Mannagrass	<i>Glyceria grandis</i>
Yellow-sweet Clover	<i>Melilotus officinalis</i>	Dwarf Rattlesnake Orchid	<i>Goodyera repens</i>
Timothy	<i>Phleum pratense</i>	Oak Fern	<i>Gymnocarpium dryopteris</i>
Common Plantain	<i>Plantago major</i>	Alpine Hedysarum	<i>Hedysarum alpinum</i>
Kentucky Bluegrass	<i>Poa pratensis</i>	Cow-parsnip	<i>Heracleum lanatum</i>
Common Dandelion	<i>Taraxacum officinale</i>	Woolly Hawkweed	<i>Hieracium triste</i>
Alsike Clover	<i>Trifolium hybridum</i>	Alpine Sweetgrass	<i>Hierochloa alpina</i>
Red Clover	<i>Trifolium pratense</i>	Common Sweetgrass	<i>Hierochloa hirta</i>
White Clover	<i>Trifolium repens</i>	Mare's-tail	<i>Hippuris vulgaris</i>
Red Fescue	<i>Festuca rubra</i>	Arctic Rush	<i>Juncus balticus</i>
Toad Rush	<i>Juncus bufonius</i>	Chestnut Rush	<i>Juncus castaneus</i>
Neckweed	<i>Veronica peregrina</i>	Drummond's Rush	<i>Juncus drummondii</i>
Siberian Wild Rye	<i>Elymus sibiricus</i>	Thread Rush	<i>Juncus filiformis</i>
Black Huckleberry	<i>Vaccinium membranaceum</i>	Common Juniper	<i>Juniperus communis</i>
Canadian Milk-vetch	<i>Astragalus canadensis</i>	Pacific Bog Sedge	<i>Kobresia myosuroides</i>
Intermediate Wheatgrass	<i>Elymus hispidus</i>	Siberian Kobresia	<i>Kobresia sibirica</i>
Canada Thistle	<i>Cirsium arvense</i>	Simple Bog Sedge	<i>Kobresia simpliciuscula</i>
Chick-pea Milk-vetch	<i>Astragalus cicer</i>	Tamarack	<i>Larix laricina</i>
Mountain Alder	<i>Alnus incana</i>	Northern Labrador Tea	<i>Ledum decumbens</i>
Balsam Poplar	<i>Populus balsamifera</i>	Labrador Tea	<i>Ledum groenlandicum</i>
Trembling Aspen	<i>Populus tremuloides</i>	Common Duckweed	<i>Lemna minor</i>
Field Sow-thistle	<i>Sonchus arvensis</i>	Ivy-leaved Duckweed	<i>Lemna trisulca</i>
Narrow-leaved Bur-reed	<i>Sparganium angustifolium</i>	Branched Pepper-grass	<i>Lepidium bourgeauanum</i>
Fowl Mannagrass	<i>Glyceria striata</i>	Fuzzy-spiked Wildrye	<i>Leymus innovatus</i>
Lady Fern	<i>Athyrium filix-femina</i>	Twinflower	<i>Linnaea borealis</i>
Nodding Beggarticks	<i>Bidens cernua</i>	Arctic Lupine	<i>Lupinus arcticus</i>
Pennsylvania Bitter-cress	<i>Cardamine pensylvanica</i>	Arctic Wood-rush	<i>Luzula arctica</i>
Grey Sedge	<i>Carex canescens</i>	Confused Wood-rush	<i>Luzula confusa</i>

Appendix D continued: Common and Scientific names of 390 species of plants recorded at the La Biche River, Yukon.			
Common name	Scientific name	Common name	Scientific name
Rare-flower Sedge	<i>Carex rariflora</i>	Small-flowered Wood-rush	<i>Luzula parviflora</i>
Water Hemlock	<i>Cicuta maculata</i>	Alpine Clubmoss	<i>Lycopodium alpinum</i>
Nodding Wood Reed	<i>Cinnia latifolia</i>	Stiff Clubmoss	<i>Lycopodium annotinum</i>
Richardson's Geranium	<i>Geranium richardsonii</i>	Ground-cedar	<i>Lycopodium complanatum</i>
Narrow-leaved Hawkweed	<i>Hieracium umbellatum</i>	Mountain Clubmoss	<i>Lycopodium selago</i>
Heart-leaved Twayblade	<i>Listera cordata</i>	Star-flowered False Solomon's-seal	<i>Maianthemum stellatum</i>
Three-leaved Solomon's-seal	<i>Maianthemum trifolium</i>	Tall Bluebells	<i>Mertensia paniculata</i>
Tall Monkey Flower	<i>Mimulus guttatus</i>	Elegant Stitchwort	<i>Minuartia elegans</i>
Rough-leaved Ricegrass	<i>Oryzopsis asperifolia</i>	Red Sandwort	<i>Minuartia rubella</i>
Alaska Knotweed	<i>Polygonum caurianum</i>	Bog Stitchwort	<i>Minuartia stricta</i>
Marsh Skullcap	<i>Scutellaria galericulata</i>	Blunt-leaved Sandwort	<i>Moehringia lateriflora</i>
Bur-reed	<i>Sparganium minimum</i>	Single Delight	<i>Moneses uniflora</i>
Large-flowered Fleabane	<i>Erigeron grandiflorus</i>	Mountain Forget-me-not	<i>Myostris alpestris</i>
Seacoast Angelica	<i>Angelica lucida</i>	Sweet Gale	<i>Myrica gale</i>
Wild Sarsaparilla	<i>Aralia nudicaulis</i>	Water-milfoil	<i>Myriophyllum sibiricum</i>
Purple-leaved Willowherb	<i>Epilobium ciliatum</i>	One-sided Wintergreen	<i>Orthilia secunda</i>
Sweet-scented Bedstraw	<i>Galium triflorum</i>	Bog Cranberry	<i>Oxycoccus microcarpus</i>
Devil's Club	<i>Oplopanax horridus</i>	Field Locoweed	<i>Oxytropis campestris</i>
Blunt-fruited Sweet-cicely	<i>Osmorhiza depauperata</i>	Pendant-podded Locoweed	<i>Oxytropis deflexa</i>
Drummond's Willow	<i>Salix drummondiana</i>	Blackish Locoweed	<i>Oxytropis nigrescens</i>
Canada Goldenrod	<i>Solidago canadensis</i>	Showy Locoweed	<i>Oxytropis splendens</i>
American Vetch	<i>Vicia americana</i>	Fringed Grass-of-Parnassus	<i>Parnassia fimbriata</i>
Floating Marsh-marigold	<i>Caltha natans</i>	Kotzebue's Grass-of- Parnassus	<i>Parnassia kotzebuei</i>
Dewey's Sedge	<i>Carex deweyana</i>	Northern Grass-of-Parnassus	<i>Parnassia palustris</i>
Awl-leaved Mudwort	<i>Limosella aquatica</i>	Few-flowered Lousewort	<i>Pedicularis capitata</i>
Balsam Willow	<i>Salix pyrifolia</i>	Labrador Lousewort	<i>Pedicularis labradorica</i>
Fringed Aster	<i>Aster ciliolatus</i>	Langdorf's Lousewort	<i>Pedicularis langsdorfii</i>
Enchanter's Nightshade	<i>Circaea alpina</i>	Sweet Coltsfoot	<i>Petasites frigidus</i>
Ostrich Fern	<i>Matteuccia struthiopteris</i>	Arctic Coltsfoot	<i>Petasites frigidus</i>
Cattail	<i>Typha latifolia</i>	Palmate Coltsfoot	<i>Petasites frigidus</i>
Subalpine Fir	<i>Abies lasiocarpa</i>	Alpine Timothy	<i>Phleum alpinum</i>
Northern Yarrow	<i>Achillea millefolium</i>	White Spruce	<i>Picea glauca</i>
Siberian Yarrow	<i>Achillea sibirica</i>	Black Spruce	<i>Picea mariana</i>
Mountain Monkshood	<i>Aconitum delphinifolium</i>	Lodgepole Pine	<i>Pinus contorta</i>
Baneberry	<i>Actaea rubra</i>	Green-flowered Rein-orchid	<i>Platanthera hyperborea</i>
Moschatellina, Ntn.Muskflower	<i>Adoxa moschatellina</i>	One-leaved Rein-orchid	<i>Platanthera obtusata</i>
Mountain Dandelion	<i>Agoseris aurantaica</i>	Alpine Bluegrass	<i>Poa alpina</i>
Rough Hair Grass	<i>Agrostis scabra</i>	Arctic Bluegrass	<i>Poa arctica</i>
Green Alder	<i>Alnus crispa</i>	Glaucous Bluegrass	<i>Poa glauca</i>
Little Meadow-foxtail	<i>Alopecurus aequalis</i>	Fowl Bluegrass	<i>Poa palustris</i>
Saskatoon	<i>Amelanchier alnifolia</i>	Tall Jacob's-ladder	<i>Polemonium acutiflorum</i>
Northern Fairy-candelabra	<i>Androsace septentrionalis</i>	Boreal Jacob's-ladder	<i>Polemonium boreale</i>
Cut-leaved Fleabane	<i>Anemone multifida</i>	Showy Jacob's-ladder	<i>Polemonium pulcherrimum</i>
Narcissus Anemone	<i>Anemone narcissiflora</i>	Alpine Bistort	<i>Polygonum viviparum</i>
Windflower	<i>Anemone parviflora</i>	Northern Pondweed	<i>Potamogeton alpinus</i>
Richardson's Anemone	<i>Anemone richardsonii</i>	Slender-leaved Pondweed	<i>Potamogeton filiformis</i>
Rosy Pussytoes	<i>Antennaria rosea</i>	Grass-leaved Pondweed	<i>Potamogeton gramineus</i>
Blue Columbine	<i>Aquilegia brevistyla</i>	Diverse-leaved Cinquefoil	<i>Potentilla diversifolia</i>
Spreading-pod Rockcress	<i>Arabis divaricarpa</i>	Shrubby Cinquefoil	<i>Potentilla fruticosa</i>
Spreading-pod Rockcress	<i>Arabis divaricarpa</i>	Norwegian Cinquefoil	<i>Potentilla norvegica</i>
Drummond's Rockcress	<i>Arabis drummondii</i>	Marsh Cinquefoil	<i>Potentilla palustris</i>
Hairy Rockcress	<i>Arabis hirsuta</i>	Pink Wintergreen	<i>Pyrola asarifolia</i>
Holboell's Rockcress	<i>Arabis holboellii</i>	Green Wintergreen	<i>Pyrola chlorantha</i>
Lyre-leaved Rockcress	<i>Arabis kamchatica</i>	Arctic Wintergreen	<i>Pyrola grandiflora</i>
Polargrass	<i>Arctagrostis latifolia</i>	Lesser Wintergreen	<i>Pyrola minor</i>
Pendant Grass	<i>Arctophila fulva</i>	Kidney-leaved Buttercup	<i>Ranunculus abortivus</i>
Red Bearberry	<i>Arctostaphylos rubra</i>	Subalpine Buttercup	<i>Ranunculus eschscholtzii</i>
Kinnikinnick	<i>Arctostaphylos uva-ursi</i>	Creeping Spearwort	<i>Ranunculus flammula</i>
Alpine Arnica	<i>Arnica angustifolia</i>	Small Yellow Water-buttercup	<i>Ranunculus gmelinii</i>
Alpine Arnica	<i>Arnica angustifolia</i>	Far-northern Buttercup	<i>Ranunculus hyperboreus</i>

Appendix D continued: Common and Scientific names of 390 species of plants recorded at the La Biche River, Yukon.			
Common name	Scientific name	Common name	Scientific name
Heart-leaved Arnica	<i>Arnica cordifolia</i>	Lapland Buttercup	<i>Ranunculus lapponicus</i>
Purple Arnica	<i>Arnica lessingii</i>	Macoun's Buttercup	<i>Ranunculus macounii</i>
Mountain Sagewort	<i>Artemisia norvegica</i>	Celery-leaved Buttercup	<i>Ranunculus sceleratus</i>
Aleutian Mugwort	<i>Artemisia tilesii</i>	Lapland Rhododendron	<i>Rhododendron lapponicum</i>
Arctic Aster	<i>Aster sibiricus</i>	Skunk Currant	<i>Ribes glandulosum</i>
Alpine Milk-vetch	<i>Astragalus alpinus</i>	Northern Black Currant	<i>Ribes hudsonianum</i>
American Milk-vetch	<i>Astragalus americanus</i>	Black Gooseberry	<i>Ribes lacustre</i>
Elegant Milk-vetch	<i>Astragalus eucosmus</i>	Northern Gooseberry	<i>Ribes oxycanthoides</i>
Hairy Arctic Milk-vetch	<i>Astragalus umbellatus</i>	Red Swamp Currant	<i>Ribes triste</i>
American Winter Cress	<i>Barbarea orthoceras</i>	Marsh Yellow Cress	<i>Rorippa palustris</i>
Slough Grass	<i>Beckmannia syzigachne</i>	Prickly Rose	<i>Rosa acicularis</i>
Scrub Birch	<i>Betula glandulosa</i>	Dwarf Nagoonberry	<i>Rubus arcticus</i>
Alaska Paper Birch	<i>Betula neoalaskana</i>	Cloudberry	<i>Rubus chamaemorus</i>
Water Birch	<i>Betula occidentalis</i>	Red Raspberry	<i>Rubus idaeus</i>
Moonwort	<i>Botrychium lunaria</i>	Western Dock	<i>Rumex occidentalis</i>
Pumpelly Brome	<i>Bromus pumpellianus</i>	Willow-leaved Dock	<i>Rumex salicifolius</i>
Bluejoint	<i>Calamagrostis canadensis</i>	Alaska Willow	<i>Salix alaxensis</i>
Purple Reedgrass	<i>Calamagrostis purpurascens</i>	Northern Bush Willow	<i>Salix arbusculoides</i>
Wild Calla	<i>Calla palustris</i>	Athabasca Willow	<i>Salix athabascensis</i>
Spring Water-starwort	<i>Callitriche verna</i>	Barclay's Willow	<i>Salix barclayi</i>
Fairyflipper	<i>Calypto bulbosa</i>	Bebb's Willow	<i>Salix bebbiana</i>
Common Harebell	<i>Campanula lasiocarpa</i>	Coyote Willow	<i>Salix exigua</i>
One-flowered Harebell	<i>Campanula uniflora</i>	Grey-leaved Willow	<i>Salix glauca</i>
Alpine Bittercress	<i>Cardamine bellidifolia</i>	Pacific Willow	<i>Salix lucida</i>
Cuckoo Bitter-cress	<i>Cardamine pratensis</i>	Park Willow	<i>Salix monticola</i>
Water Sedge	<i>Carex aquatilis</i>	Bilberry Willow	<i>Salix myrtilifolia</i>
Raymond's Sedge	<i>Carex atratiformis</i>	Tea-leaved Willow	<i>Salix planifolia</i>
Golden Sedge	<i>Carex aurea</i>	Netted Willow	<i>Salix reticulata</i>
Brownish Sedge	<i>Carex brunnescens</i>	Scouler's Willow	<i>Salix scouleriana</i>
Low Northern Sedge	<i>Carex concinna</i>	Yellow Spot Saxifrage	<i>Saxifraga bronchialis</i>
Bent Sedge	<i>Carex deflexa</i>	Tufted Saxifrage	<i>Saxifraga caespitosa</i>
Lesser-panicled Sedge	<i>Carex diandra</i>	Nodding Saxifrage	<i>Saxifraga cernua</i>
Yellow Bog Sedge	<i>Carex disperma</i>	Stoloniferous Saxifrage	<i>Saxifraga flagellaris</i>
Yellow Bog Sedge	<i>Carex gynocrates</i>	Hawkweed-leaved Saxifrage	<i>Saxifraga hieracifolia</i>
Brittle-stalked Sedge	<i>Carex leptalea</i>	Yellow Marsh Saxifrage	<i>Saxifraga hirculus</i>
Ryegrass Sedge	<i>Carex loliacea</i>	Red-stemmed Saxifrage	<i>Saxifraga lyallii</i>
Thick-headed Sedge	<i>Carex macloviana</i>	Brook Saxifrage	<i>Saxifraga nelsoniana</i>
Scandinavian Sedge	<i>Carex media</i>	Prickly Saxifrage	<i>Saxifraga tricuspidata</i>
Meadow Sedge	<i>Carex petasala</i>	Rayless Mountain Butterweed	<i>Senecio indecorus</i>
Alpine Sedge	<i>Carex podocarpa</i>	Black-tipped Groundsel	<i>Senecio lugens</i>
Meadow Sedge	<i>Carex praticola</i>	Rayless Alpine Butterweed	<i>Senecio pauciflorus</i>
Russet Sedge	<i>Carex saxatilis</i>	Arrow-leaved Groundsel	<i>Senecio triangularis</i>
Single-spiked Sedge	<i>Carex scirpoidea</i>	Soopolallie	<i>Shepherdia canadensis</i>
Beaked Sedge	<i>Carex utriculata</i>	Sibbaldia	<i>Sibbaldia procumbens</i>
Sheathed Sedge	<i>Carex vaginata</i>	Moss Campion	<i>Silene acaulis</i>
White Arctic Heather	<i>Cassiope tetragona</i>	Arctic Catchfly	<i>Silene involucreta</i>
Raup's Paintbrush	<i>Castilleja raupii</i>	Northern Goldenrod	<i>Solidago multiradiata</i>
Field Chickweed	<i>Cerastium arvense</i>	Western Mountain-ash	<i>Sorbus scopulina</i>
Bering Chickweed	<i>Cerastium beeringianum</i>	Boreal Starwort	<i>Stellaria borealis</i>
Mouse-ear Chickweed	<i>Cerastium fontanum</i>	Thick-leaved Starwort	<i>Stellaria crassifolia</i>
Leatherleaf	<i>Chamaedaphne calyculata</i>	Long-leaved Starwort	<i>Stellaria longifolia</i>
Strawberry-blite	<i>Chenopodium capitatum</i>	Long-stalked Starwort	<i>Stellaria longipes</i>
Northern Golden-saxifrage	<i>Chrysosplenium tetrandrum</i>	Horned Dandelion	<i>Taraxacum ceratophorum</i>
Tuberous Springbeauty	<i>Claytonia tuberosa</i>	Few-flowered Meadowrue	<i>Thalictrum sparsiflorum</i>
Narrow-leaved Collomia	<i>Collomia linearis</i>	Northern Starwort	<i>Trientalis arctica</i>
Yellow Coralroot	<i>Corallorhiza trifida</i>	Spike Trisetum	<i>Trisetum spicatum</i>
Bunchberry	<i>Cornus canadensis</i>	Stinging Nettle	<i>Urtica dioica</i>
Red-osier Dogwood	<i>Cornus stolonifera</i>	Dwarf Bilberry	<i>Vaccinium caespitosum</i>
Golden Corydalis	<i>Corydalis aurea</i>	Bog Blueberry	<i>Vaccinium uliginosum</i>
Pink Corydalis	<i>Corydalis sempervirens</i>	Lowbush-cranberry	<i>Vaccinium vitis-idaea</i>
Elegant Hawksbeard	<i>Crepis elegans</i>	Sitka Valerian	<i>Valeriana sitchensis</i>
Fragile Fern	<i>Cystopteris fragilis</i>	Indian Hellebore	<i>Veratrum viride</i>

Appendix D continued: Common and Scientific names of 390 species of plants recorded at the La Biche River, Yukon.			
Common name	Scientific name	Common name	Scientific name
Mountain Bladder Fern	<i>Cystopteris montana</i>	American Brooklime	<i>Veronica americana</i>
Tall Larkspur	<i>Delphinium glaucum</i>	Alpine Speedwell	<i>Veronica wormsjoldii</i>
Gray Tansy Mustard	<i>Descurainia incana</i>	American Highbush-cranberry	<i>Viburnum edule</i>
Hoary Draba	<i>Draba cana</i>	Early Blue Violet	<i>Viola adunca</i>
Austrian Whitlow-grass	<i>Draba fladnizensis</i>	Dwarf Marsh Violet	<i>Viola episila</i>
Long-stalked Whitlow-grass	<i>Draba longipes</i>	Kidney-leaved Violet	<i>Viola renifolia</i>
American dragonhead	<i>Dracocephalum parviflorum</i>	Death Camas	<i>Zygadenus elegans</i>
White Mountain-avens	<i>Dryas crenulata</i>	Alaskan Wild Rye	<i>Elymus alakanus</i>
Yellow Mountain-avens	<i>Dryas drummondii</i>	Dwarf Mountain Fescue	<i>Festuca brachyphylla</i>
Entire-leaved Mountain-avens	<i>Dryas integrifolia</i>	Arctic Cinquefoil	<i>Potentilla hypartica</i>
Fragrant Fern	<i>Dryopteris fragrans</i>	Snow Cinquefoil	<i>Potentilla nivea</i>
Wolf-willow	<i>Elaeagnus commutata</i>	Yellow Avens	<i>Geum aleppicum</i>
Creeping Spike-rush	<i>Eleocharis palustris</i>	Slimstem Reedgrass	<i>Calamagrostis stricta</i>
Calder's Wild Rye	<i>Elymus calderi</i>	False Asphodel	<i>Tofieldia coccinea</i>

La Biche River Forest Ecosystem Network
MAP 1
 Final (1999) Recommendation



FOREST ECOSYSTEM NETWORK DESIGN

The habitats comprising the Forest Ecosystem Network were selected so as to:

- 1) Provide a contiguous forested area representing the full range of habitats found in the La Biche River Valley, and one that is large enough to provide adequate forest interior conditions and connections between riparian and upland ecosystems.
- 2) Provide a variety of patch sizes, shapes and types that include elements of the pattern (proportion, frequency and arrangement) which would have resulted from natural disturbances.
- 3) Include a complete, significant sub-watershed of the La Biche River.
- 4) Maximize the inclusion of unique, rare or special features and habitats (e.g. riparian areas, wetlands, old-growth forest) that are known to contain rare or sensitive species (i.e. those most dependent on the La Biche River Valley).
- 5) Provide natural breaks to reduce the chance of landscape level disturbances such as fire impacting the entire Forest Ecosystem Network, using the La Biche River, Mount Martin and the southern extent of the Kotaneelee Range.
- 6) Provide a connection between all areas of the Forest Ecosystem Network using a significant riparian corridor (500 metres) along the La Biche River.

FOREST ECOSYSTEM NETWORK:

AREA 1 - Riparian Corridor (45 km²): 500 metre buffer on each side of the La Biche from the Yukon/BC border north to the northern extent of the FEN.

- Recognizes the importance of riparian areas to biodiversity.
- A primary connection and movement corridor.
- A critical area for fish such as Bull Trout, and birds such as Philadelphia Vireo.

AREA 2 - Lower La Biche River (31 km²): Bounded by the La Biche on the west, the height of land on the east, the Yukon/BC border on the south, and Area 3 on the north.

- Extensive old-growth White Spruce and mixed forests.
- Numerous bird species found at their highest densities.

AREA 3 - La Biche River East & Hanging Valley (21 km²): Bounded by the La Biche to the west, and the Yukon/NWT border to the east, Area 2 to the south, and the watershed border of the lower La Biche to the north.

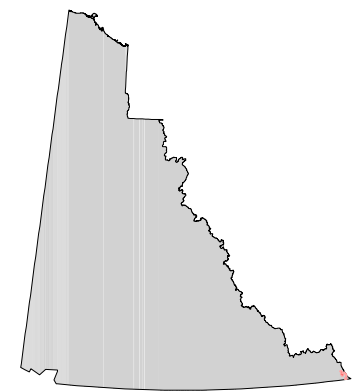
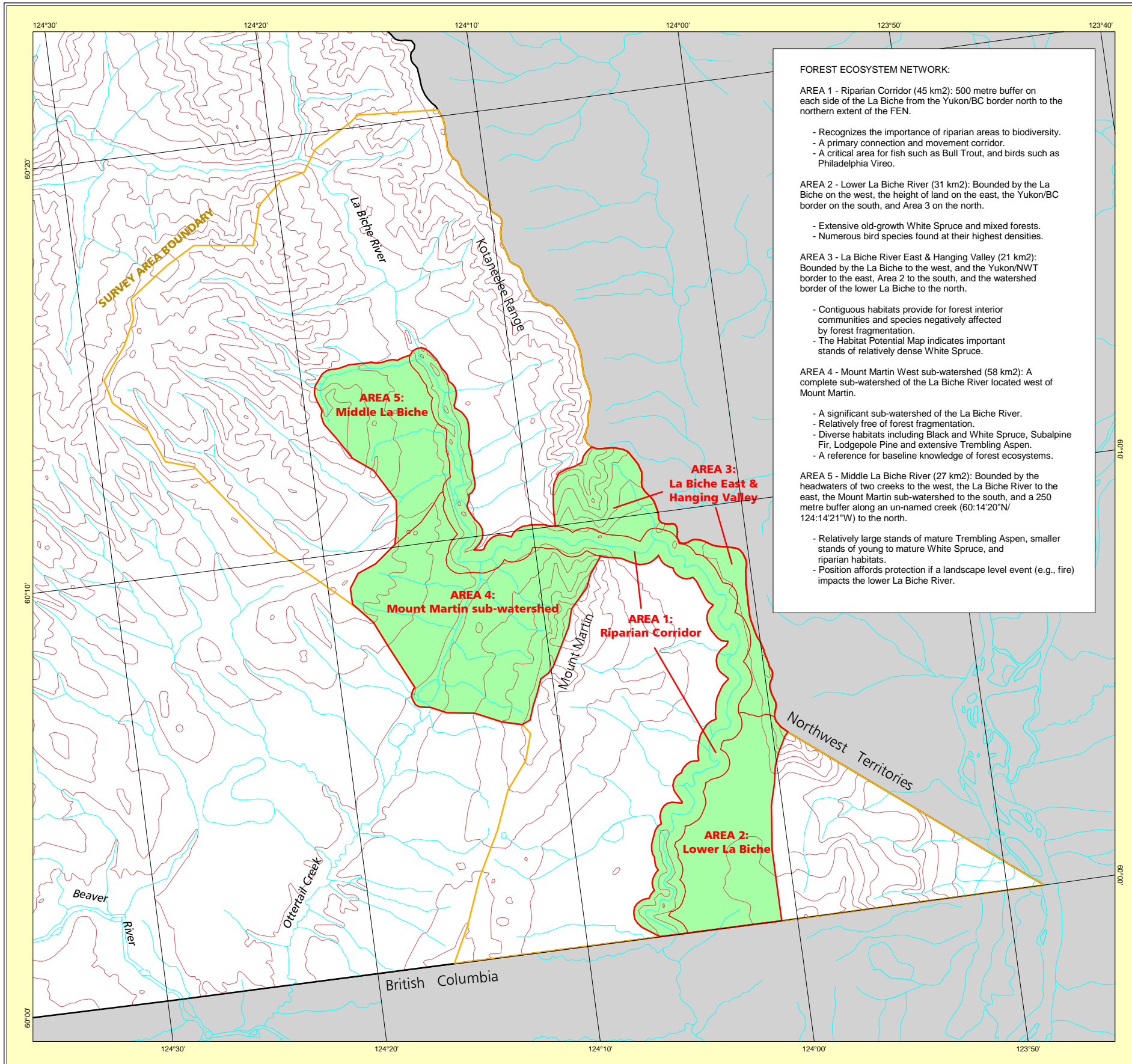
- Contiguous habitats provide for forest interior communities and species negatively affected by forest fragmentation.
- The Habitat Potential Map indicates important stands of relatively dense White Spruce.

AREA 4 - Mount Martin West sub-watershed (58 km²): A complete sub-watershed of the La Biche River located west of Mount Martin.

- A significant sub-watershed of the La Biche River.
- Relatively free of forest fragmentation.
- Diverse habitats including Black and White Spruce, Subalpine Fir, Lodgepole Pine and extensive Trembling Aspen.
- A reference for baseline knowledge of forest ecosystems.

AREA 5 - Middle La Biche River (27 km²): Bounded by the headwaters of two creeks to the west, the La Biche River to the east, the Mount Martin sub-watershed to the south, and a 250 metre buffer along an un-named creek (60:14'20"N/124:14'21"W) to the north.

- Relatively large stands of mature Trembling Aspen, smaller stands of young to mature White Spruce, and riparian habitats.
- Position affords protection if a landscape level event (e.g., fire) impacts the lower La Biche River.



Map Compiled By:
 La Biche / Beaver Ecosystem Technical Group
 Habitat and Endangered Species Branch, Yukon Renewable Resources
 Protected Areas Secretariat, Yukon Renewable Resources
 Regional Management, Yukon Renewable Resources
 Canadian Wildlife Service, Environment Canada
 Forest Resources, Department of Indian Affairs and Northern Development

30 August 1999

La Biche River Forest Ecosystem Network
MAP 2
1996, 1997, and final (1999) Areas






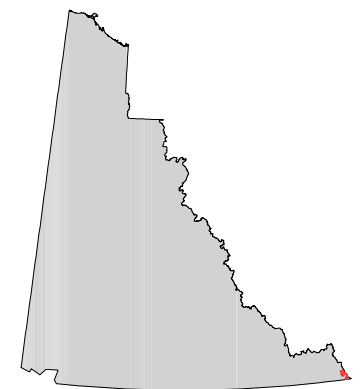
FOREST ECOSYSTEM NETWORK

The primary objective of the La Biche River Forest Ecosystem Network is to protect the range of landscapes and associated ecosystems and habitats found in the La Biche River Valley. Further, the Technical Group sought to achieve a design that would ensure ecological integrity within the Yukon portion of the lower La Biche River Valley. The design final (1999) Forest Ecosystem Network meets the primary objective.

HOW HAS THE SIZE CHANGED?

The area drafted in 1996 fell well short of the CEAA requirement to establish a "a protected area within the La Biche valley that is representative of all land-scapes". In designing a Forest Ecosystem Network to meet this requirement the size increased between 1996 and 1997 with a slight increase in 1999. However, in the design process the Technical Group sought, wherever possible and without compromising its conservation objectives, to avoid areas of importance to forestry and oil & gas. It should be noted then that there has been a significant reduction in the size of the Forest Ecosystem Network between 1996 and 1999 in the lower La Biche River area where these industrial interests are highest.

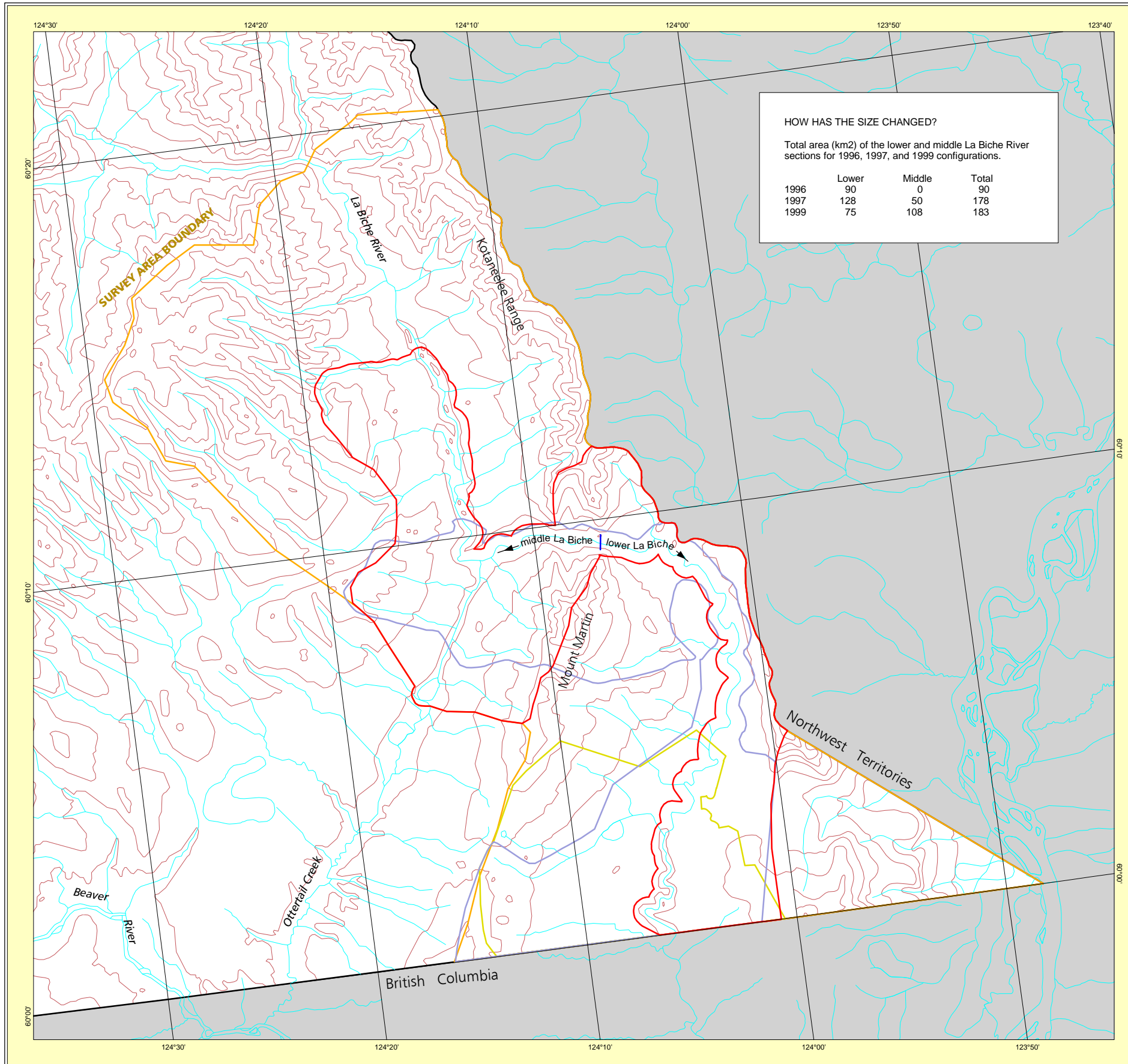
-  Final (1999) Forest Ecosystem Network
-  1997 Area
-  1996 Area



HOW HAS THE SIZE CHANGED?

Total area (km²) of the lower and middle La Biche River sections for 1996, 1997, and 1999 configurations.

	Lower	Middle	Total
1996	90	0	90
1997	128	50	178
1999	75	108	183



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La Biche / Beaver Ecosystem Technical Group
Habitat and Endangered Species Branch, Yukon Renewable Resources
Protected Areas Secretariat, Yukon Renewable Resources
Regional Management, Yukon Renewable Resources
Canadian Wildlife Service, Environment Canada
Forest Resources, Department of Indian Affairs and Northern Development

30 August 1999



La Biche River Forest Ecosystem Network
 MAP 3
 FOREST COVER



FOREST COVER DATA

Forest Resources' digital forest cover data was used to assess leading tree species and age-class composition within the survey area and Forest Ecosystem Network. While the forest cover inventory data are at a relatively coarse scale, they are the only continuous digital coverage of vegetation cover and/or habitat types readily available. As such, these data were useful to help ensure that general forest types were represented in the Forest Ecosystem Network.

LEADING TREE SPECIES

-  White Spruce
-  Black Spruce
-  Deciduous (Aspen)
-  Deciduous (Poplar)
-  Deciduous (White Birch)
-  Pine
-  Fir
-  Cutblocks

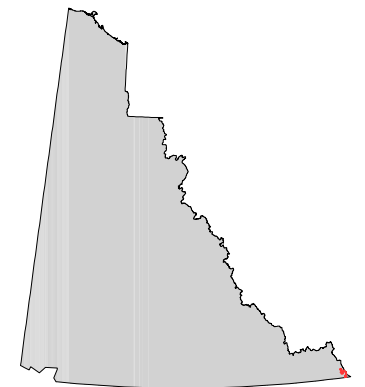
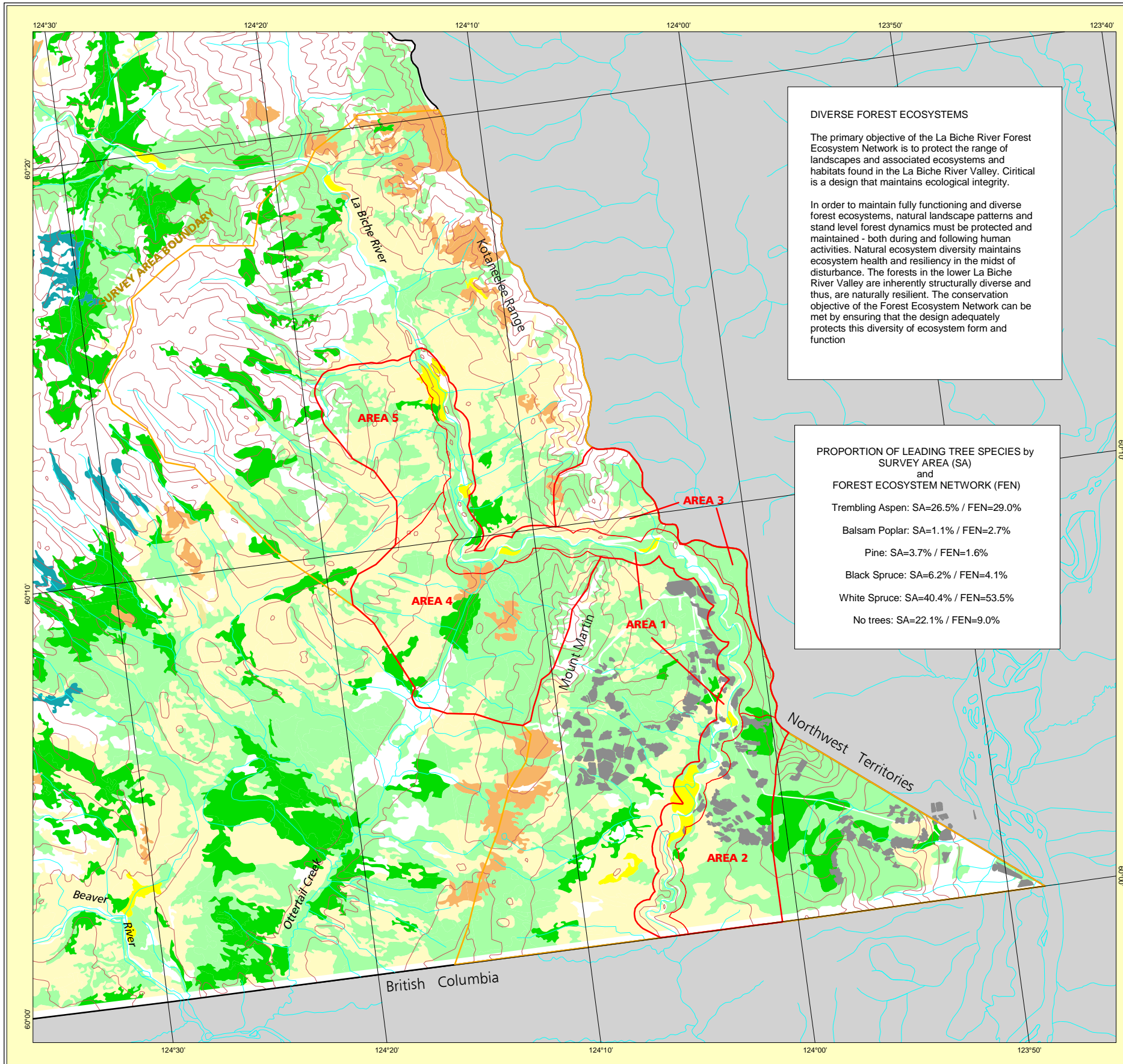
DIVERSE FOREST ECOSYSTEMS

The primary objective of the La Biche River Forest Ecosystem Network is to protect the range of landscapes and associated ecosystems and habitats found in the La Biche River Valley. Critical is a design that maintains ecological integrity.

In order to maintain fully functioning and diverse forest ecosystems, natural landscape patterns and stand level forest dynamics must be protected and maintained - both during and following human activities. Natural ecosystem diversity maintains ecosystem health and resiliency in the midst of disturbance. The forests in the lower La Biche River Valley are inherently structurally diverse and thus, are naturally resilient. The conservation objective of the Forest Ecosystem Network can be met by ensuring that the design adequately protects this diversity of ecosystem form and function

PROPORTION OF LEADING TREE SPECIES by SURVEY AREA (SA) and FOREST ECOSYSTEM NETWORK (FEN)

- Trembling Aspen: SA=26.5% / FEN=29.0%
- Balsam Poplar: SA=1.1% / FEN=2.7%
- Pine: SA=3.7% / FEN=1.6%
- Black Spruce: SA=6.2% / FEN=4.1%
- White Spruce: SA=40.4% / FEN=53.5%
- No trees: SA=22.1% / FEN=9.0%



Map Compiled By:
 La Biche / Beaver Ecosystem Technical Group
 Habitat and Endangered Species Branch, Yukon Renewable Resources
 Protected Areas Secretariat, Yukon Renewable Resources
 Regional Management, Yukon Renewable Resources
 Canadian Wildlife Service, Environment Canada
 Forest Resources, Department of Indian Affairs and Northern Development

30 August 1999







La Biche River Forest Ecosystem Network
MAP 4
FOREST AGE CLASSES



FOREST AGE CLASS DATA

Forest Resources' digital forest cover data was used to assess leading tree species and age-class composition within the survey area and Forest Ecosystem Network. While the forest cover inventory data are at a relatively coarse scale, they are the only continuous digital coverage of vegetation cover and/or habitat types readily available. As such, these data were useful to help ensure that general forest age classes were represented in the Forest Ecosystem Network.

FOREST AGE CLASSES

-  200-250 years
-  150-200 years
-  100-150 years
-  50-100 years
-  0-50 years
-  Cutblocks

FOREST AGE and STRUCTURAL COMPLEXITY

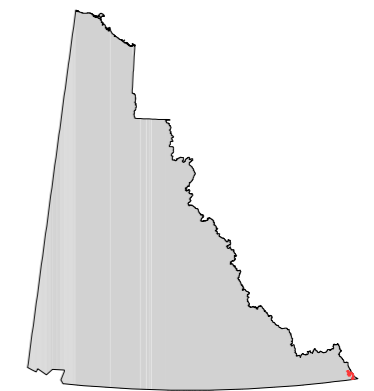
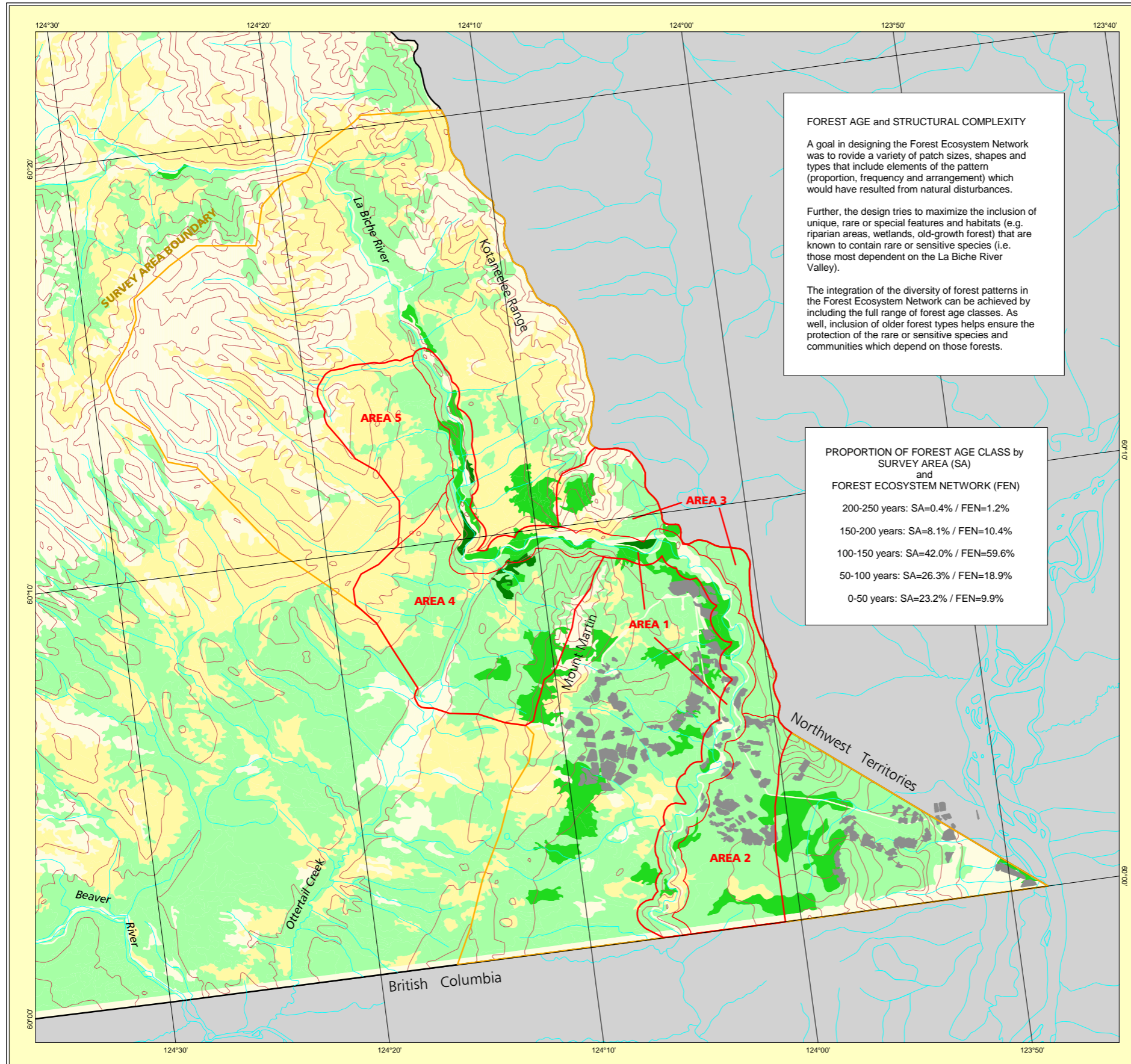
A goal in designing the Forest Ecosystem Network was to provide a variety of patch sizes, shapes and types that include elements of the pattern (proportion, frequency and arrangement) which would have resulted from natural disturbances.

Further, the design tries to maximize the inclusion of unique, rare or special features and habitats (e.g. riparian areas, wetlands, old-growth forest) that are known to contain rare or sensitive species (i.e. those most dependent on the La Biche River Valley).

The integration of the diversity of forest patterns in the Forest Ecosystem Network can be achieved by including the full range of forest age classes. As well, inclusion of older forest types helps ensure the protection of the rare or sensitive species and communities which depend on those forests.

PROPORTION OF FOREST AGE CLASS by SURVEY AREA (SA) and FOREST ECOSYSTEM NETWORK (FEN)

200-250 years:	SA=0.4%	FEN=1.2%
150-200 years:	SA=8.1%	FEN=10.4%
100-150 years:	SA=42.0%	FEN=59.6%
50-100 years:	SA=26.3%	FEN=18.9%
0-50 years:	SA=23.2%	FEN=9.9%



Map Compiled By:
La Biche / Beaver Ecosystem Technical Group
Habitat and Endangered Species Branch, Yukon Renewable Resources
Protected Areas Secretariat, Yukon Renewable Resources
Regional Management, Yukon Renewable Resources
Canadian Wildlife Service, Environment Canada
Forest Resources, Department of Indian Affairs and Northern Development

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La Biche River Forest Ecosystem Network
MAP 5
FOREST BIRD HABITAT POTENTIAL MAP

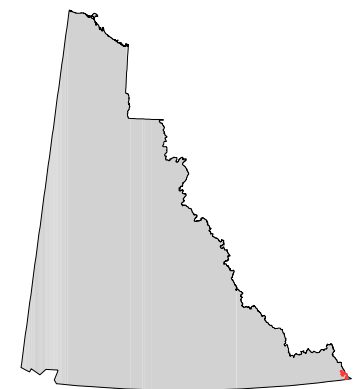


FOREST BIRDS AS ENVIRONMENTAL INDICATORS

As a group, forest birds are diverse, and include numerous habitat specialists which are sensitive to habitat changes. As well, they are easy to survey making them excellent environmental indicators.

FOREST BIRD ASSEMBLAGES

-  Rose-breasted Grosbeak, Magnolia Warbler, Solitary Vireo, Western Tanager, Bay-breasted Warbler
-  Rose-breasted Grosbeak, Magnolia Warbler, Canada Warbler
-  Solitary Vireo, Western Tanager, Bay-breasted Warbler
-  Rose-breasted Grosbeak, Canada Warbler, Red-eyed Vireo
-  Rose-breasted Grosbeak, Ovenbird, Red-eyed Vireo
-  Rose-breasted Grosbeak, Magnolia Warbler
-  Rose-breasted Grosbeak, Red-eyed Vireo
-  Canada Warbler
-  Rose-breasted Grosbeak



Map Compiled By:
 La Biche / Beaver Ecosystem Technical Group
 Habitat and Endangered Species Branch, Yukon Renewable Resources
 Protected Areas Secretariat, Yukon Renewable Resources
 Regional Management, Yukon Renewable Resources
 Canadian Wildlife Service, Environment Canada
 Forest Resources, Department of Indian Affairs and Northern Development

30 August 1999

FOREST BIRD HABITAT POTENTIAL MAP

This themed map shows habitat potential for eight key forest bird species using Forest Resource's digital forest cover data. These species are considered "key" because their Yukon ranges are primarily restricted to the middle and lower La Biche River. As well, these eight species are neo-tropical migrants that require a forested summer/breeding habitat most likely to be affected by disturbance (developmental or natural) to forest cover. Generally, these species are indicative of the most sensitive avian communities that occur in the La Biche Forest Management Unit (Y01).

This model identifies stands potentially utilized by these species and assemblages at a fairly coarse scale. As such, it does not indicate all stands used by these species and assemblages, nor does it map stands known to be used by these species and assemblages.

HABITAT DESCRIPTIONS:

BAY-BREASTED WARBLER: leading species White Spruce, leading species canopy cover $\geq 70\%$; average stand height > 20 metres.

SOLITARY VIREO: leading species White Spruce, leading species canopy cover $\geq 70\%$; average stand height > 20 metres.

WESTERN Tanager: leading species White Spruce, leading species canopy cover $\geq 70\%$; average stand height > 20 metres.

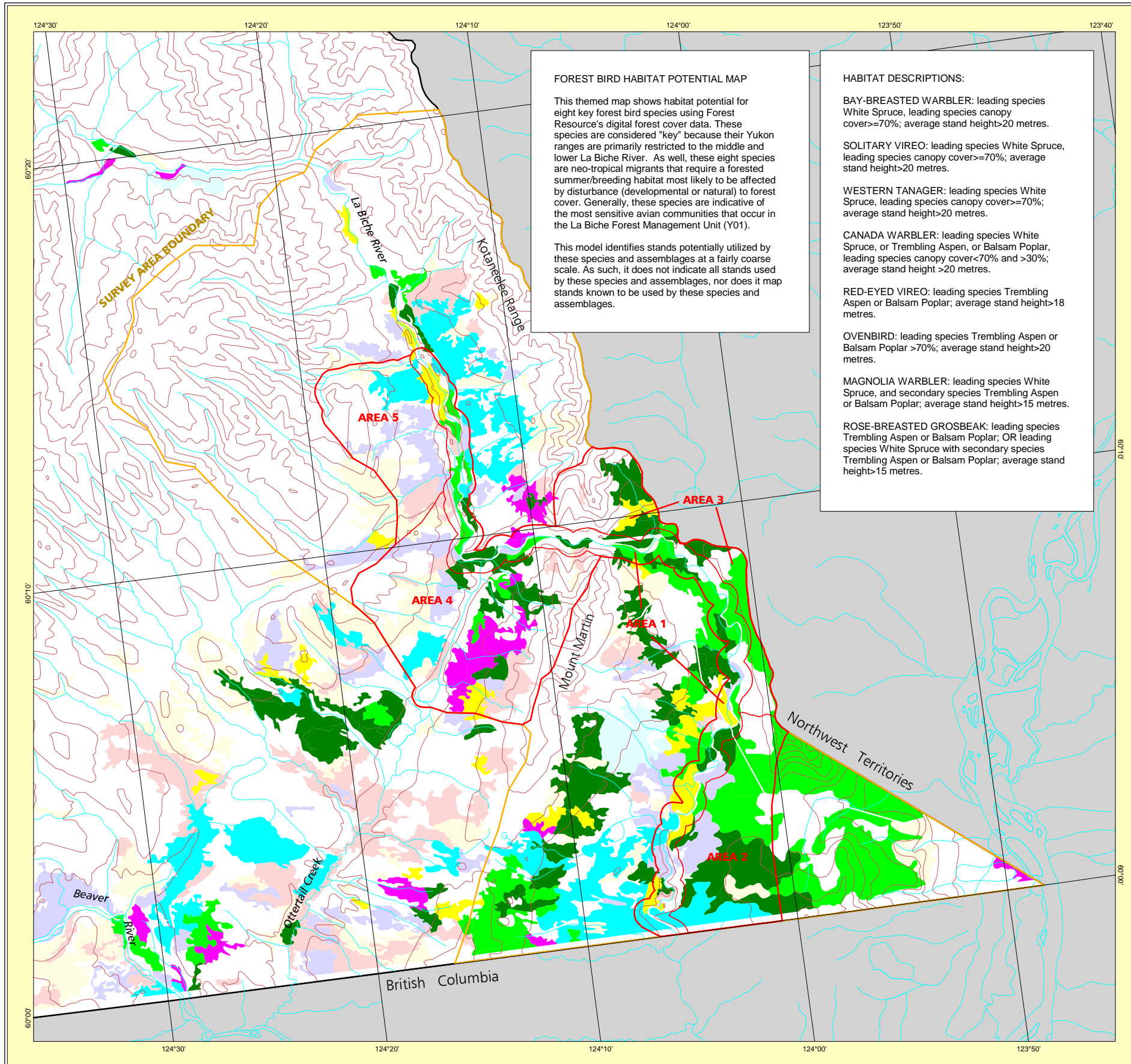
CANADA WARBLER: leading species White Spruce, or Trembling Aspen, or Balsam Poplar, leading species canopy cover $< 70\%$ and $> 30\%$; average stand height > 20 metres.

RED-EYED VIREO: leading species Trembling Aspen or Balsam Poplar; average stand height > 18 metres.

OVENBIRD: leading species Trembling Aspen or Balsam Poplar $> 70\%$; average stand height > 20 metres.

MAGNOLIA WARBLER: leading species White Spruce, and secondary species Trembling Aspen or Balsam Poplar; average stand height > 15 metres.

ROSE-BREASTED GROSBEAK: leading species Trembling Aspen or Balsam Poplar; OR leading species White Spruce with secondary species Trembling Aspen or Balsam Poplar; average stand height > 15 metres.



La Biche River Forest Ecosystem Network
MAP 6
FOREST FRAGMENTATION





FOREST FRAGMENTATION

This map shows cutblocks (grey polygons) as well as the fragmentation influence (yellow polygons) resulting from cutblocks, seismic lines, and roads.

The degree of forest fragmentation throughout the La Biche River Valley was an important consideration when selecting areas to include in the Forest Ecosystem Network. This map helps highlight areas with reduced impacts from industrial forest fragmentation.

FRAGMENTATION TYPE

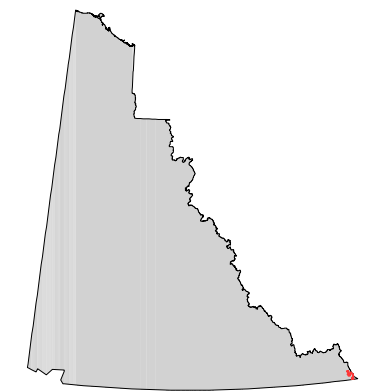
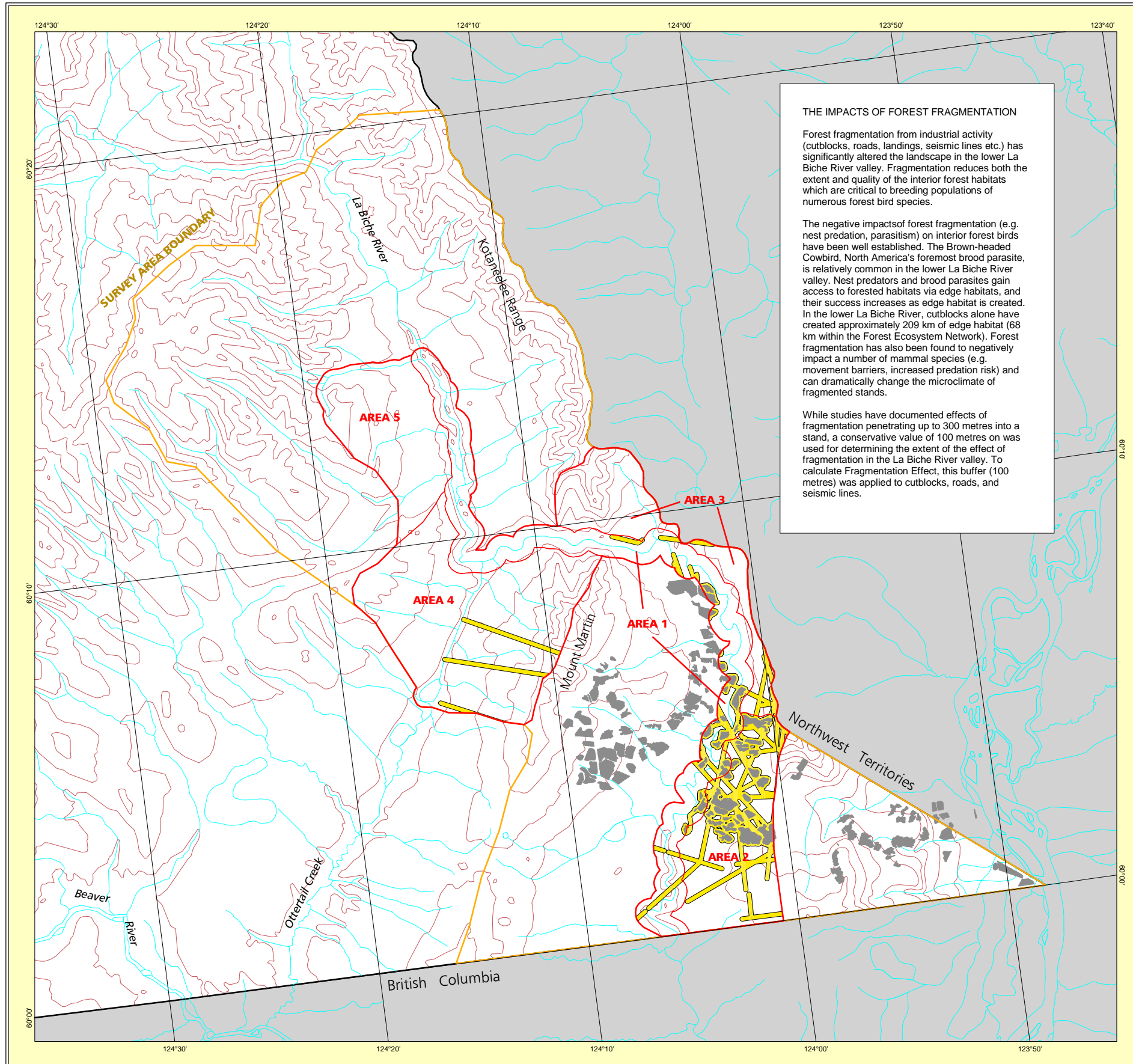
-  Cutblocks
-  Fragmentation Effect (100 metre buffer)

THE IMPACTS OF FOREST FRAGMENTATION

Forest fragmentation from industrial activity (cutblocks, roads, landings, seismic lines etc.) has significantly altered the landscape in the lower La Biche River valley. Fragmentation reduces both the extent and quality of the interior forest habitats which are critical to breeding populations of numerous forest bird species.

The negative impacts of forest fragmentation (e.g. nest predation, parasitism) on interior forest birds have been well established. The Brown-headed Cowbird, North America's foremost brood parasite, is relatively common in the lower La Biche River valley. Nest predators and brood parasites gain access to forested habitats via edge habitats, and their success increases as edge habitat is created. In the lower La Biche River, cutblocks alone have created approximately 209 km of edge habitat (68 km within the Forest Ecosystem Network). Forest fragmentation has also been found to negatively impact a number of mammal species (e.g. movement barriers, increased predation risk) and can dramatically change the microclimate of fragmented stands.

While studies have documented effects of fragmentation penetrating up to 300 metres into a stand, a conservative value of 100 metres was used for determining the extent of the effect of fragmentation in the La Biche River valley. To calculate Fragmentation Effect, this buffer (100 metres) was applied to cutblocks, roads, and seismic lines.



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