Muskwa-Kechika Management Area Biodiversity Conservation & Climate Change Assessment

Summary Report

Prepared by the Yellowstone to Yukon Conservation Initiative
for the
Muskwa-Kechika Management Area Advisory Board
February, 2012

Yellowstone to Yukon Conservation Initiative
Muskwa-Kechika Management Area
CPAWS Canadian Parks and Wilderness Society British Columbia Chapter
Wilburforce foundation

FOR MORE INFORMATION CONTACT:

Yellowstone to Yukon Conservation Initiative
1240 Railway Avenue, Unit 200
Canmore, AB T1W 1P4 Canada
Telephone: (403)609-2666
Fax: (403)609-2667
Available for download from: http://www.y2y.net

SUGGESTED CITATION:

Yellowstone to Yukon Conservation Initiative. 2012. Muskwa-Kechika Management Area Biodiversity Conservation and Climate Change Assessment, Summary Report. Yellowstone to Yukon Conservation Initiative. Canmore, AB. Canada

COPYRIGHT:

The contents of this report are solely the property of the Yellowstone to Yukon Conservation Initiative and cannot be reproduced without permission.

DISCLAIMER:

This report is disseminated under the sponsorship of the Yellowstone to Yukon Conservation Initiative in the interests of information exchange. Yellowstone to Yukon Conservation Initiative assumes no responsibility for its contents or the use thereof.

YELLOWSTONE TO YUKON CONSERVATION INITIATIVE:

The Yellowstone to Yukon Conservation Initiative (Y2Y) works to create and maintain an interconnected series of parks and wildlife corridors that allow both people and animals to thrive across an international landscape.

MUSKWA-KECHIKA ADVISORY BOARD:

Appointed by the Premier of British Columbia, the Muskwa-Kechika Advisory Board (M-KAB) is mandated with advising government on natural resource management in the Muskwa-Kechika Management Area (M-KMA) to ensure that activities within the area are consistent with the objectives of the Muskwa-Kechika Management Plan.

Table of Contents

Introduction

This is a summary of a Biodiversity Conservation and Climate Change Assessment of the greater Muskwa-Kechika Management Area prepared by the Yellowstone to Yukon Conservation Initiative. The full report is available at www. y2y.net. The conservation assessment aims to identify opportunities and help solve challenges in the management of the Muskwa-Kechika Management Area (M-KMA) and northern Rocky Mountain region. The report provides information and a variety of resource maps to help strengthen conservation now and into the future, especially since projected climate change will affect wildlife, plants and the ecosystem.

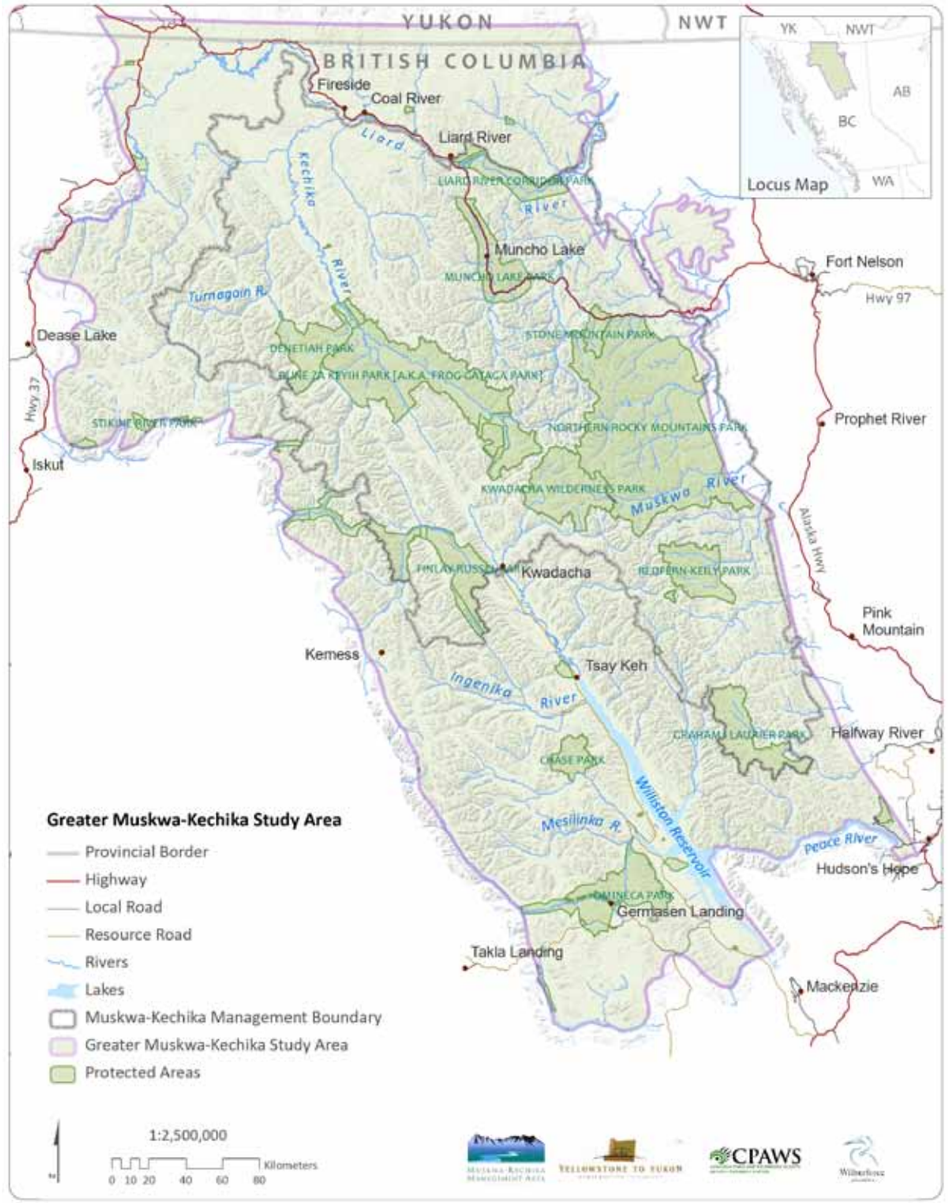
The Yellowstone to Yukon Conservation Initiative (Y2Y) proposed this project because of the important role that the M-KMA plays within the Yellowstone to Yukon region. The wild and natural landscapes that once covered most of the North American continent have disappeared, but the-M-KMA is still mostly intact. This report recommends ways to protect the variety of life in the M-KMA region using protected areas and other conservation management tools as building blocks.

Pristine waters and intact boreal ecosystems characterize the mountain landscapes of the Muskwa-Kechika region.

Wayne Sawchuk

MK

MAP 1
Study Area



The study area on Map 1 includes the M-KMA and the greater ecosystem, shown by the purple boundary. M-KMA information is posted at www.muskwa-kechhika.com.

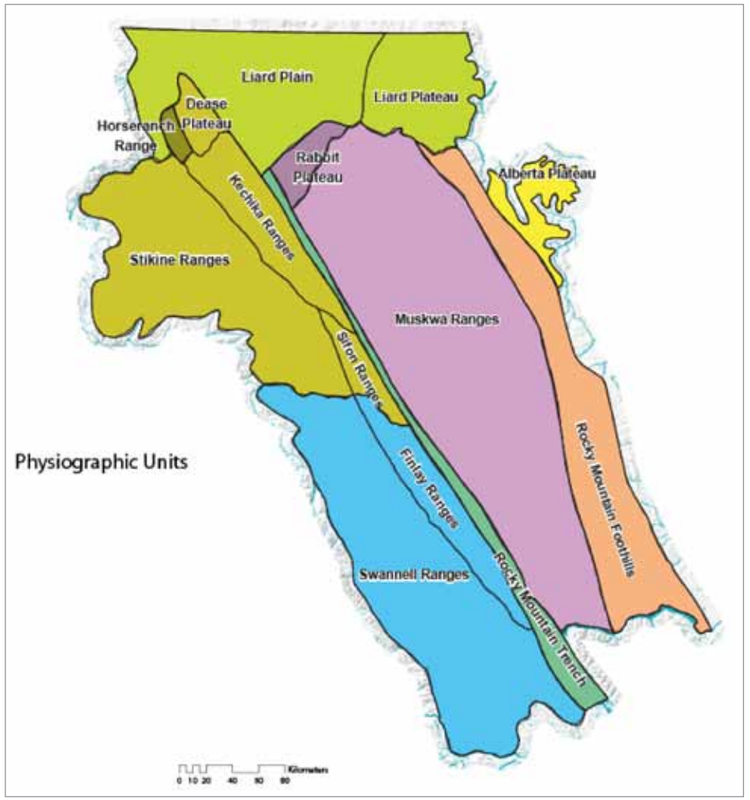
To view larger scale maps, or download the full report, go to: http://www.y2y.net.

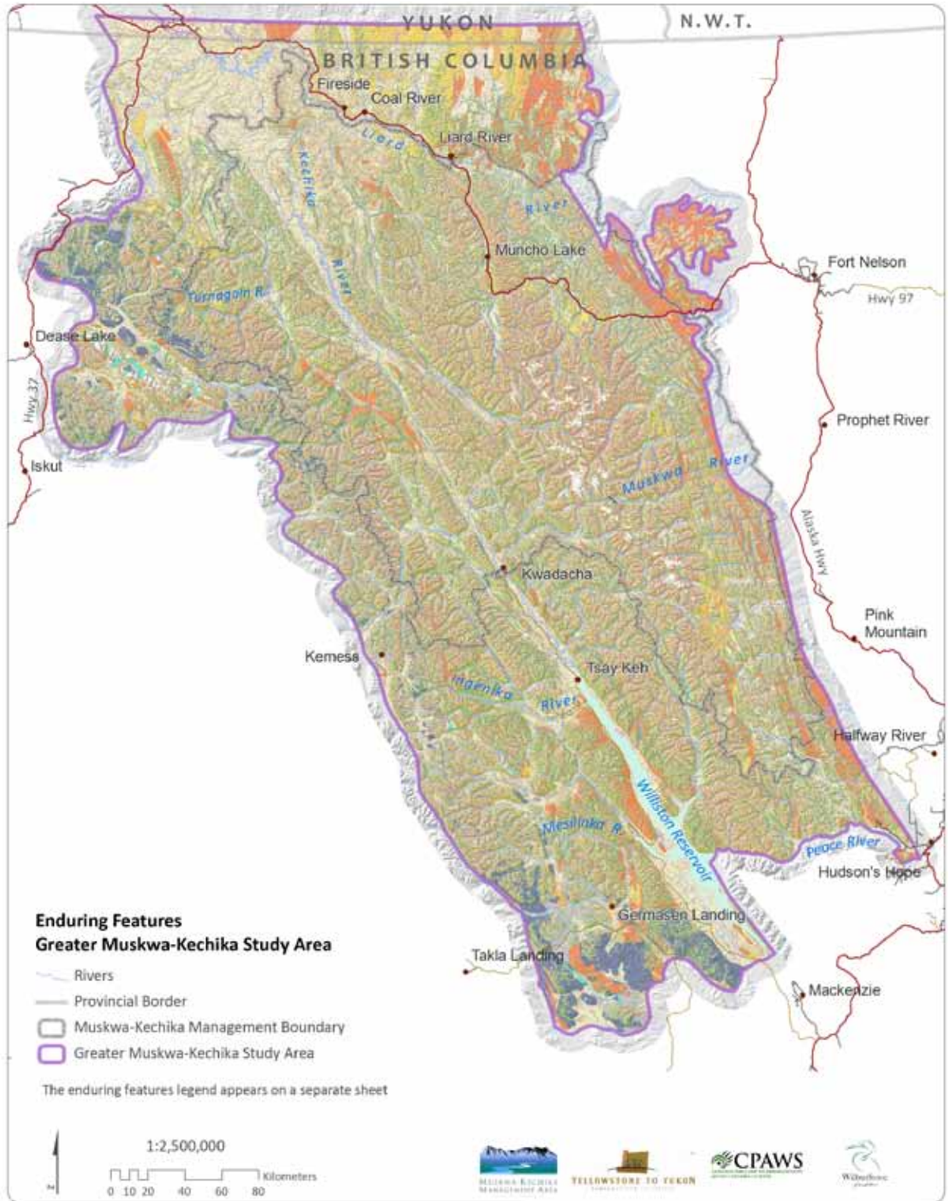
Enduring Features Assessment

The rich variety of life in the greater M-KMA ecosystem is shaped in large part by the variety of the land. This includes landforms, bedrock and surface geology, and water bodies—together called "enduring features". These features are the base upon which Earth's living skin develops, and where plants and animals grow and evolve. Map 2 shows the large landforms called Physiographic Units that shape the study area and determine its diverse life forms.

Many species and ecosystems will change as a result of climate disruption, but all species and all future ecosystems will continue to need the land on which to live. The more variety a landscape has today, the more variety of life is likely to be found there in the future. If we protect the variety of the land features today, there is a good chance the land will support biodiversity and wildlife species in the future.

MAP 2
Physiographic Units of the Study Area

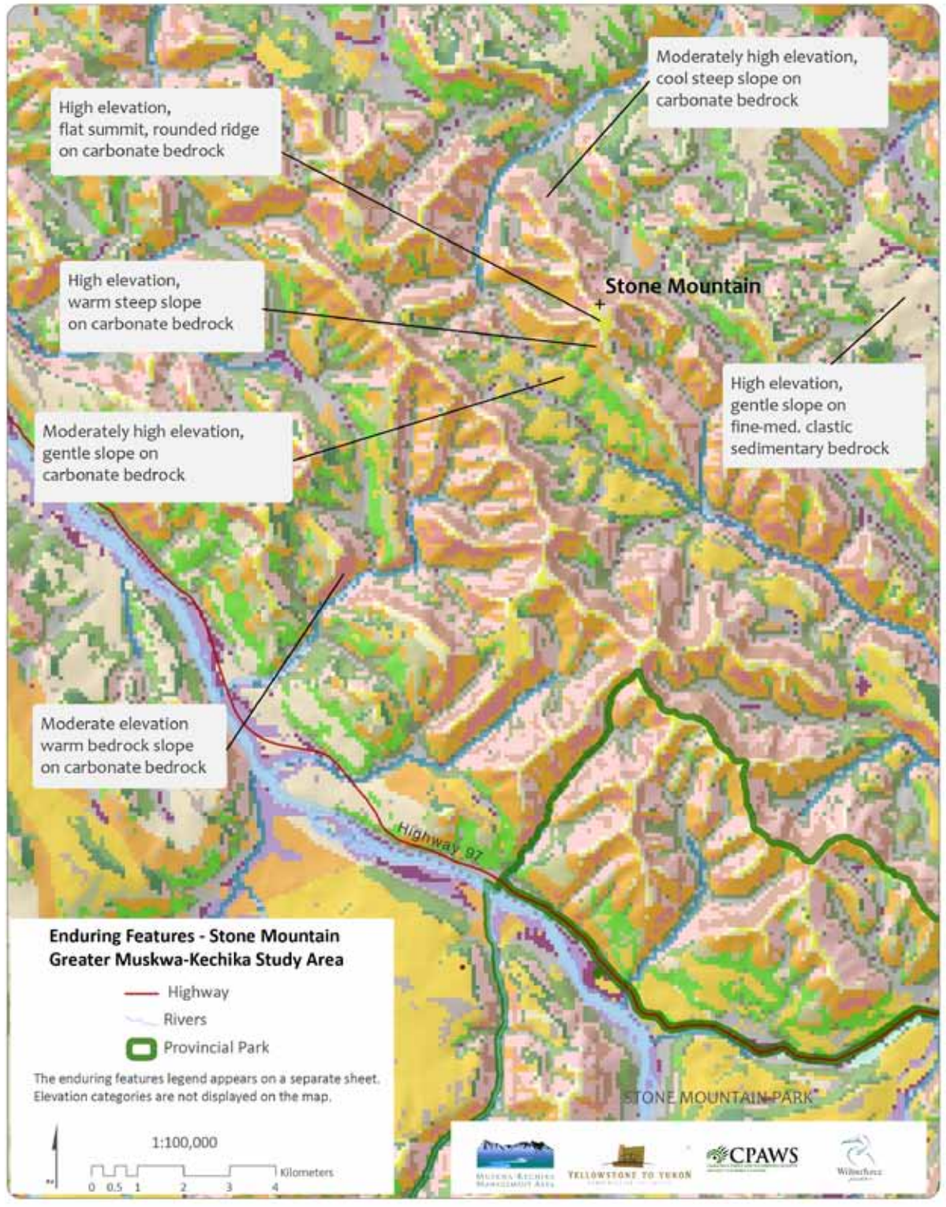




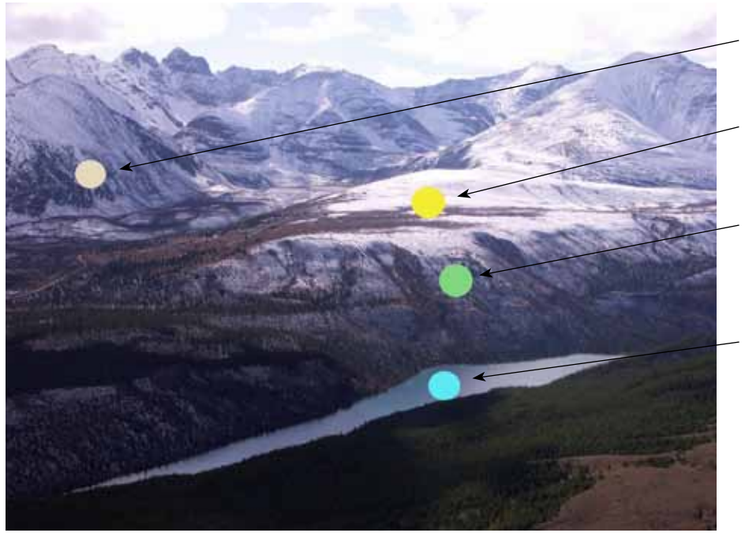
MAP 3
Enduring Features of the Greater M-K Ecosystem

Map 3 shows a model of the variety of enduring features in the M-KMA region—more than 1600 distinct and, in some cases, rare combinations of land and water features, each supporting the variety of life.

MAP 4
Enduring Features of the Stone Mountain Area



Map 4 shows a close up of the enduring features model in the Stone Mountain Area. Each colour-coded feature has distinct characteristics of slope, geology, orientation, soil and elevation, as shown in the legend on the following page.



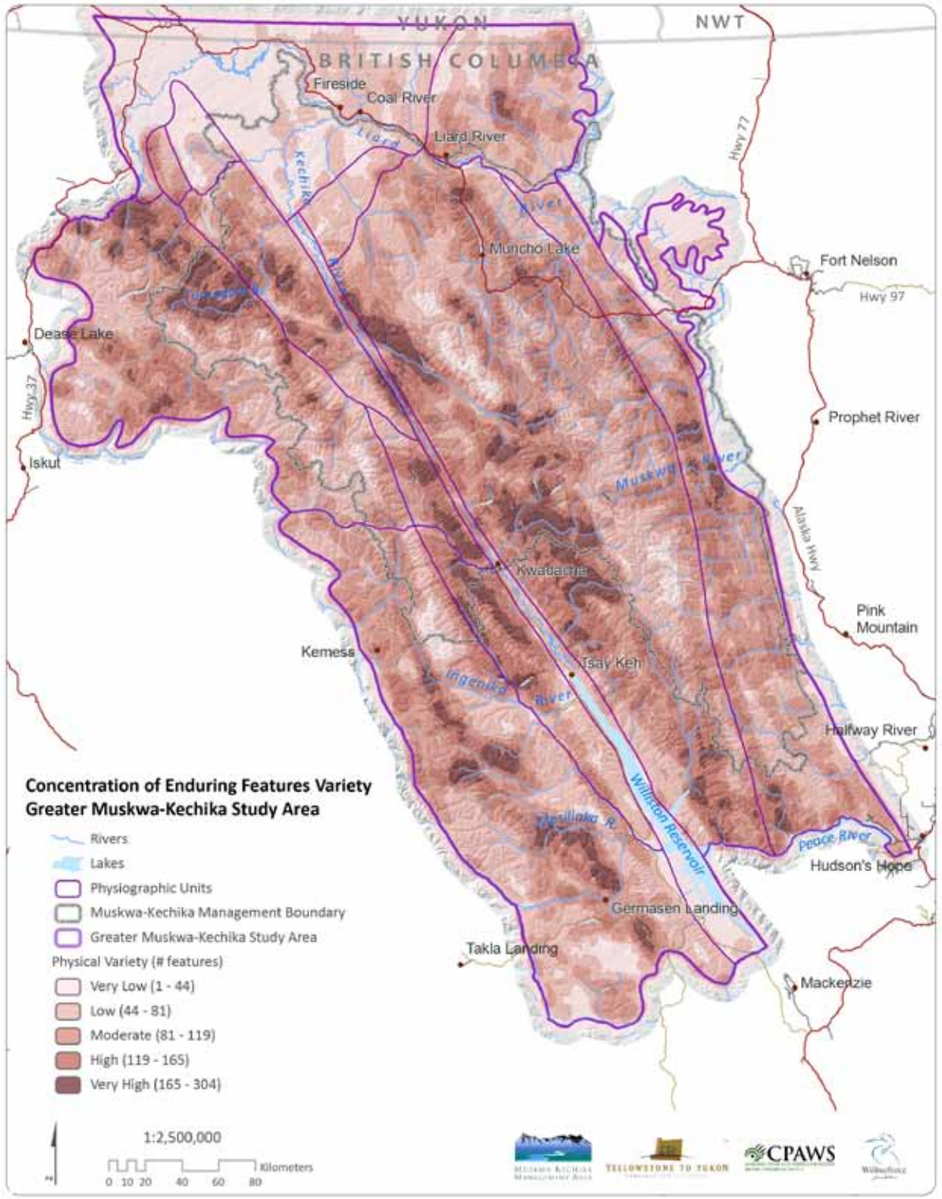
This photo in the Summit Lake area illustrates the variety of enduring features in this typical landscape in the Muskwa Ranges. The coloured dots correspond to the legend below to show how the different types of enduring features are based on the slope and landforms.

Enduring Features
SIMPLIFIED DISPLAY LEGEND to MAP 1648 UNIQUE SIGNATURES

Primary Landform Influenced Combinations	Hydrography	Flats on Bedrock Influenced Combinations
4 - steep slope (cool)	50 - lake	122 - gntl slope, coarse clastic sedimentary rock
5 - steep slope (warm)	51 - river	131 - dry flat, coarse clastic sedimentary rock
6 - bedrock slope (cool)	52 - stream	222 - gntl slope, calcareous sedimentary (and metasedimentary)
7 - bedrock slope (warm)	53 - wetland	231 - dry flat, calcareous sedimentary (and metasedimentary)
8 - cliff (cool)	54 - glacier	322 - gntl slope, carbonate bedrock
9 - cliff (warm)		331 - dry flat, carbonate bedrock
11 - flat summit		422 - gntl slope, siliceous bedrock
12 - rounded ridge		431 - dry flat, siliceous bedrock
13 - crest		522 - gntl slope, fine-medium clastic sedimentary & metamorphic
21 - low hill top flat		531 - dry flat, fine-medium clastic sedimentary & metamorphic
22 - gentle slope on quaternary sediments		622 - gntl slope, soft volcanics
23 - upper sideslope (cool)		631 - dry flat, soft volcanics
24 - upper sideslope (warm)		722 - gntl slope, hard volcanics
31 - dry flat on quaternary sediment		731 - dry flat, hard volcanics
33 - mid sideslope (cool)		822 - gntl slope, granitics and similar crystalline bedrock
34 - mid sideslope (warm)		831 - dry flat, granitics and similar crystalline bedrock
41 - valley bottom flat		922 - gntl slope, ultramafic bedrock
42 - cove/toe slope		931 - dry flat, ultramafic bedrock
43 - lower sideslope		

Note: Elevation is not displayed due to cartographic constraints

MAP 5
Concentration of Enduring Features Variety



Areas with a high variety of enduring features (Map 5)

Each enduring feature has a unique combination of characteristics such as geology, elevation or land form—kind of like a bar code. Each combination of land features produces different growing conditions that create different habitats and support species suited to those local conditions. Places with a high variety of enduring features offer more habitat options and thus should also support the greatest variety of plants and animals.

Map 5 shows the physical variety in the study area, from very low to very high. The areas with the darker red tones have the highest physical variety and should support higher biodiversity. These areas deserve special conservation attention. Some areas with a high variety of physical features are within existing protected areas, while others are located outside (see Map 7).

Areas with many rare enduring features (Map 6)

Also important is the location of rare enduring features—those unique combinations of elevation, geology and landforms not common in the area. These uncommon physical features can produce rare ecosystems or habitat for uncommon species, which in both cases could deserve special management. For example, rare enduring features include certain types of uncommon bedrock formations (like types of volcanic rock known as serpentine rock), which can provide unique habitat for rare plant species.

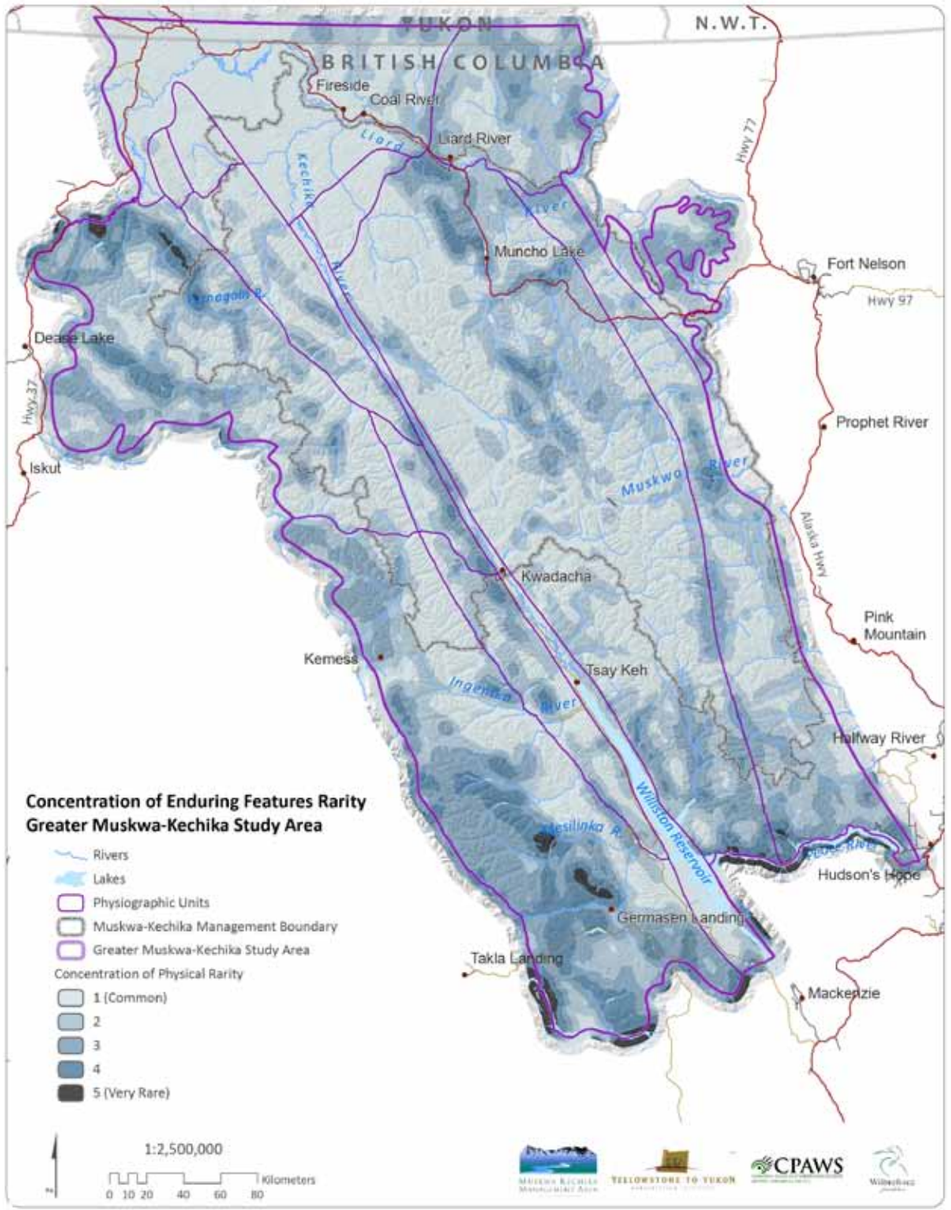
The darker grey colours on Map 6 show areas with high concentrations of rare features within the M-KMA. Some of the uncommon physical features are captured in the existing protected areas network, while other concentrations of high rarity lie outside protected areas. Note the areas with very high rarity values in the southwest and northwest parts of the ecosystem, some of them within Omineca Park and others outside existing protected areas. Areas of high physical rarity outside existing protected areas may warrant special management attention.

Areas with concentrations of high variety and rare features (Map 7)

Map 7 combines areas of high enduring feature variety and rarity, with the yellow and red colours highlighting where the land has the most physical variety and more uncommon features. Note that several of these "hotspot" areas are located outside the existing protected areas network—these areas are worthy of special management attention for conservation.

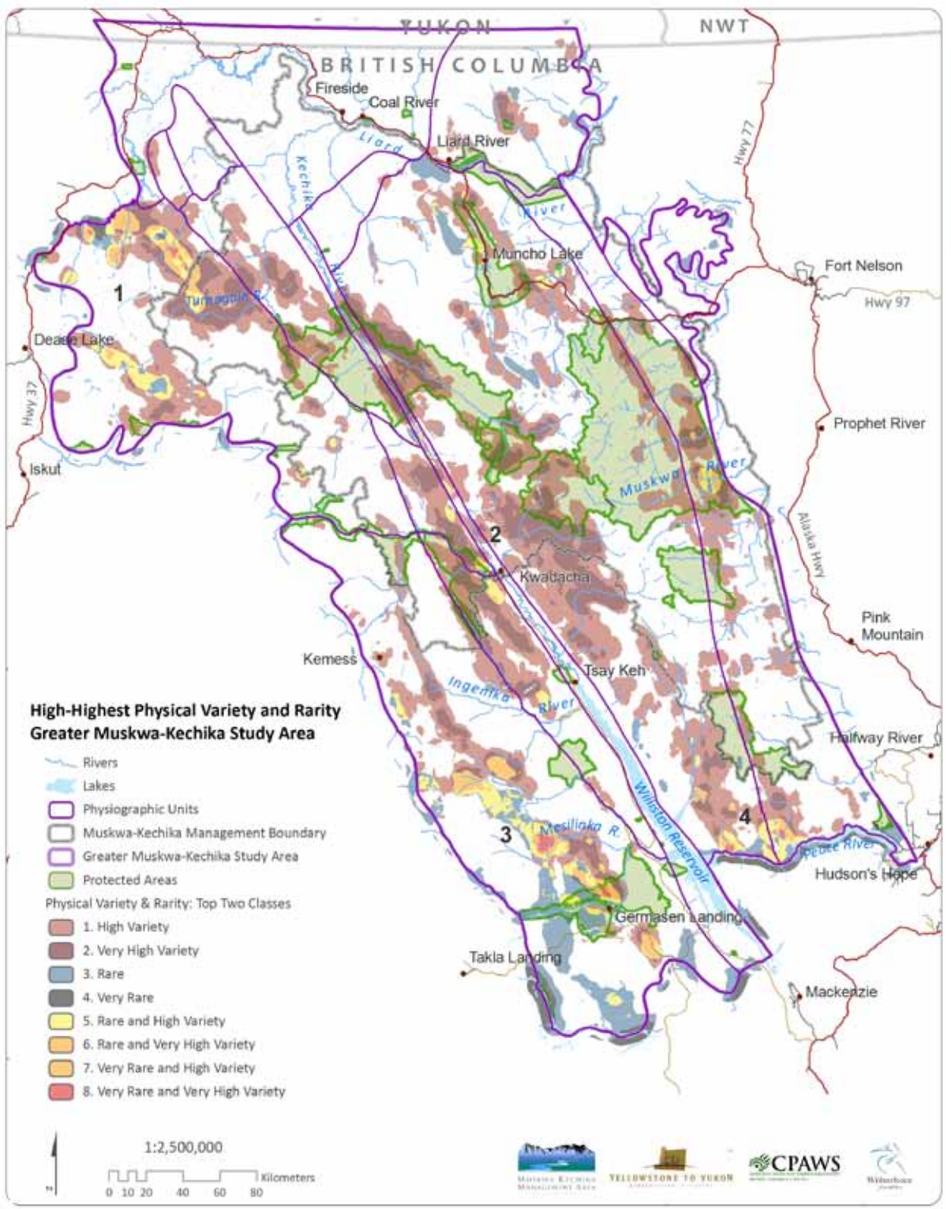
The "hotspots" of variety and rarity outside the M-KMA boundary especially are worthy of assessment for special management or as potential additional protected area candidates. These include parts of the Stikine Ranges east of Dease Lake (1), west of Kwadacha in the Finlay and Sifton Ranges (2), the Swannell Ranges in the Mesilinka watershed, north of Omineca Park (3), and the southern end of the Muskwa Ranges and Rocky Mountain foothills, north of the Peace River (4).

MAP 6
Areas With Concentrations of Enduring Features Rarity



The darkest grey areas on Map 6 have the highest concentrations of rare features. Note how many such concentrations are around the edges of the study area, outside the M-KMA boundary.

MAP 7
Areas With Concentrations of High Variety and Rarity



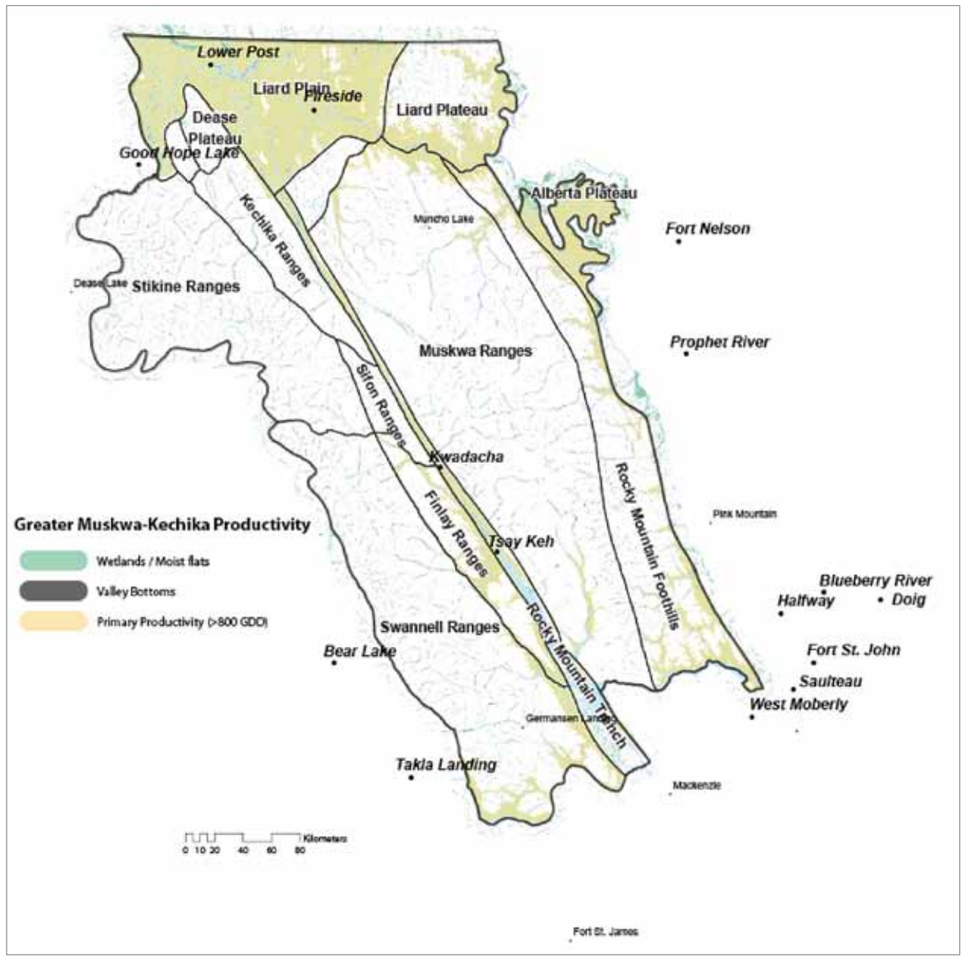
The yellow, orange and red areas on Map 7 are expected to have concentrations of high variety and rarity. The numbers 1-4 show some of the locations of variety and rarity "hotspots," described on page 10 and 11, three of which are outside the M-KMA boundary.

Biodiversity and Wilderness

Primary productivity (Map 8)

Areas with high enduring feature variety have many different growing conditions and, therefore, often have high biodiversity. Areas with high biological productivity, for example wetlands, lakes and river floodplains, also support many wildlife species, yet may be missed by an enduring features analysis. Low elevation areas with gentle landforms support productive forest, dotted with wetlands and drained by major streams and rivers. Such areas are often key wildlife habitat—biological "hotspots" with an abundance and variety of species—and serve as important wildlife corridors. Because areas of high primary productivity often exist in large expanses of fairly uniform landscapes, they may be missed by assessments identifying only areas of high physical variety. Therefore, this assessment also modeled for highly productive landscapes.

MAP 8
Areas of High Primary Productivity



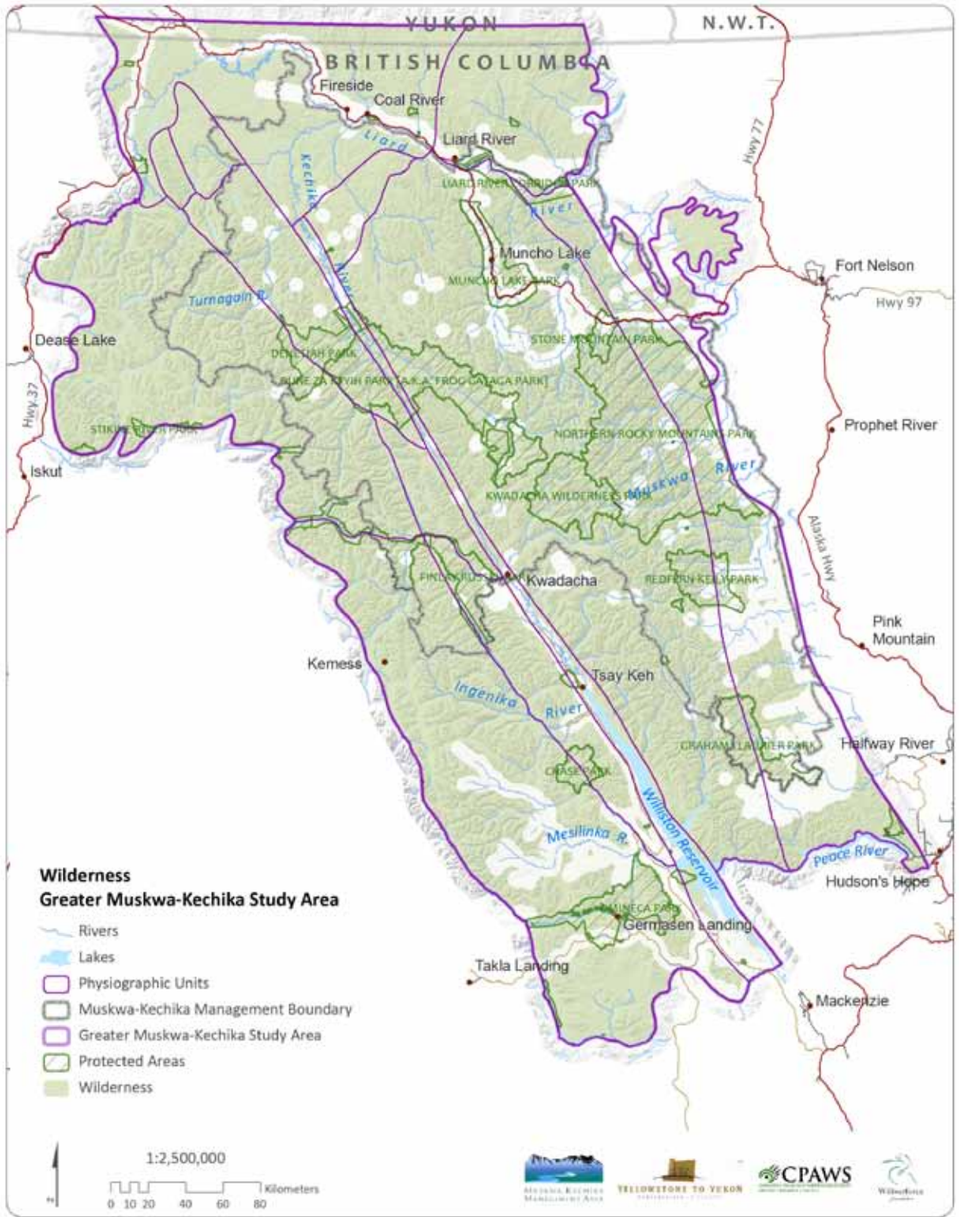
Why wilderness matters (Map 9)

Wilderness, often defined as a large area without roads, is one of the most important features of the M-KMA. Today the land has a limited "human footprint." Maintaining these wilderness characteristics is one of the primary goals of the M-KMA management plan. Conservation of wilderness complements the goal of protecting the variety of life. Wilderness areas serve as benchmarks of intact ecosystems, and they are natural reservoirs of wildlife and plant communities. Wilderness has an important role to play in serving as a sanctuary within which plants and animals can be buffered from the effects of climate change.

Map 9 shows that the core of the greater M-KMA ecosystem is still largely intact wilderness, as shown in green. The white buffered corridors and small white circles show the existing disturbed areas. Most of these disturbed area result from the Alaska Highway and related access roads, the Williston Reservoir, and roads in the Mesilinka River area. The scattered small white circles may include resource exploration sites, mines, and lodge-based tourism sites.

Since 2004, there has been little change in overall human influence in the Muskwa-Kechika study area. The most significant new disturbance is seen in the southwest part of the greater Muskwa-Kechika area, mostly related to forestry activities. However, new proposals for roads, resource exploration or wind energy production, if approved, would change the extent of wilderness within the M-KMA.

MAP 9
Wilderness and Existing Protected Areas



The green colour on Map 9 shows the existing wilderness area within the M-KMA, with the white showing where there is an existing human footprint such as roads, forestry operations, or resource exploration sites. In January, 2012, The Kaska Nation and the BC Government agreed to a new protected area in the Horseranch Range, northeast of Dease Lake.

Wildlife and connectivity (Maps 10-12)

Maintaining biodiversity and healthy wildlife populations depends both on protecting core habitats that meet basic needs for food and shelter, and also on the maintenance of the ability of animals to move among them, called "connectivity." Connectivity allows interbreeding among many populations to maintain genetic diversity; sustains predator-prey systems; enables seasonal and long term migration; and even allows movement of wildlife from less accessible, less hunted areas into those used more frequently by hunters. We studied the most suitable habitats for four species (caribou, moose, mountain goat and sheep), and mapped the location of the most important wildlife corridors. This Summary includes only the caribou connectivity map.

On Maps 10 and 12, the black lines show the shortest or "easiest" distance between the best caribou habitat: the darker the line, the higher the quality of the habitat in the corridor. The red colour highlights concentrations of connectivity for caribou through their best habitat. The darker the red, the more important is the area as a hub for caribou habitat linkages. These are caribou connectivity "hotspots."

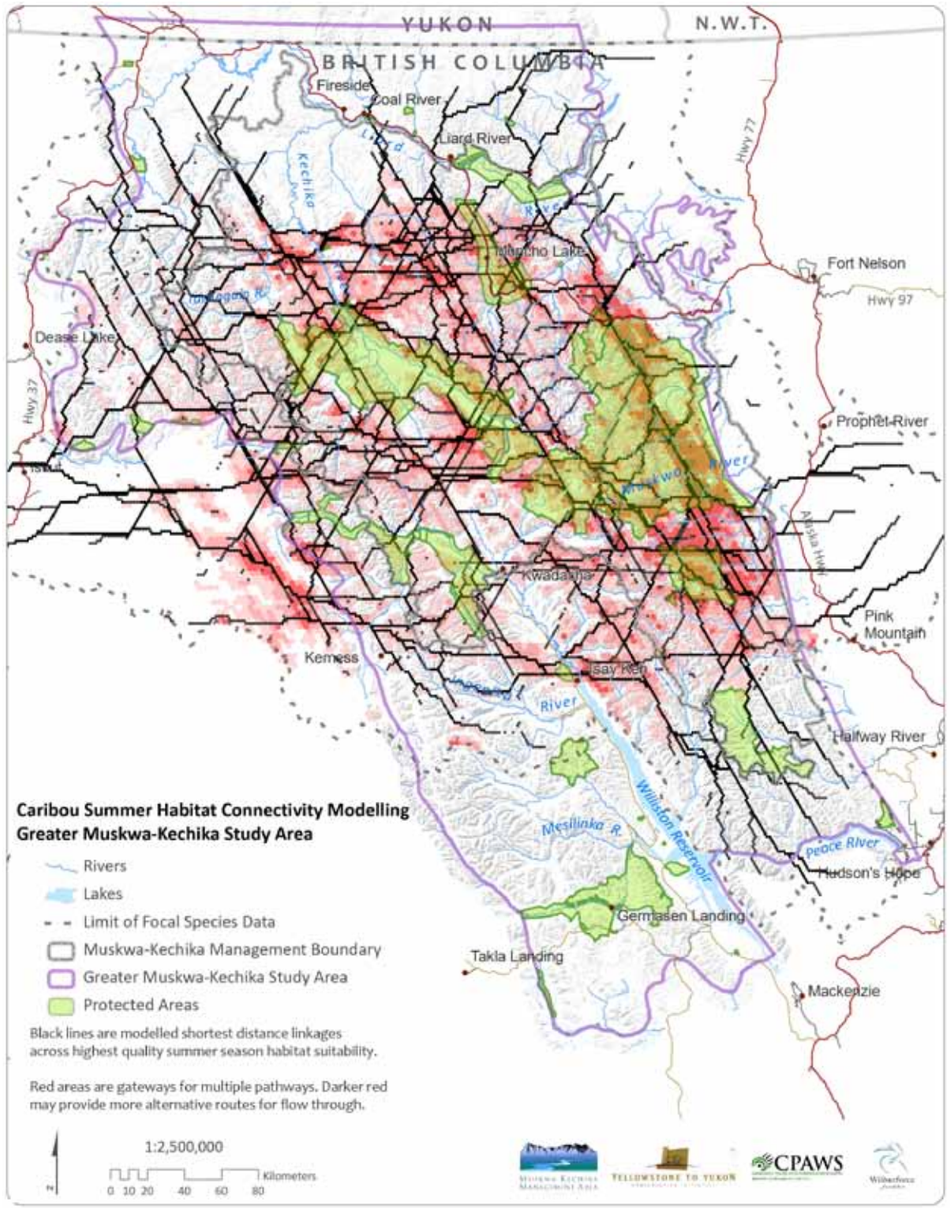
In a future where the climate has changed, species will likely survive wherever today's habitat (or something similar) is still present. Species will face greater challenges where habitat that they use today is not available in the future, and access routes to future habitat are blocked. These wildlife connectivity maps will help land managers review development proposals that may affect future wildlife movement.

Map 12, the close up wildlife connectivity map for caribou in the Tuchodi and Gataga River areas, is based on summer habitat suitability mapping shown in green on Map 11. The darkest green tones show the best quality habitat for caribou during the growing season.

For a full description of how the wildlife connectivity maps were created, and to see the full map set including moose, sheep and mountain goats, please refer to the full report at www.y2y.net.

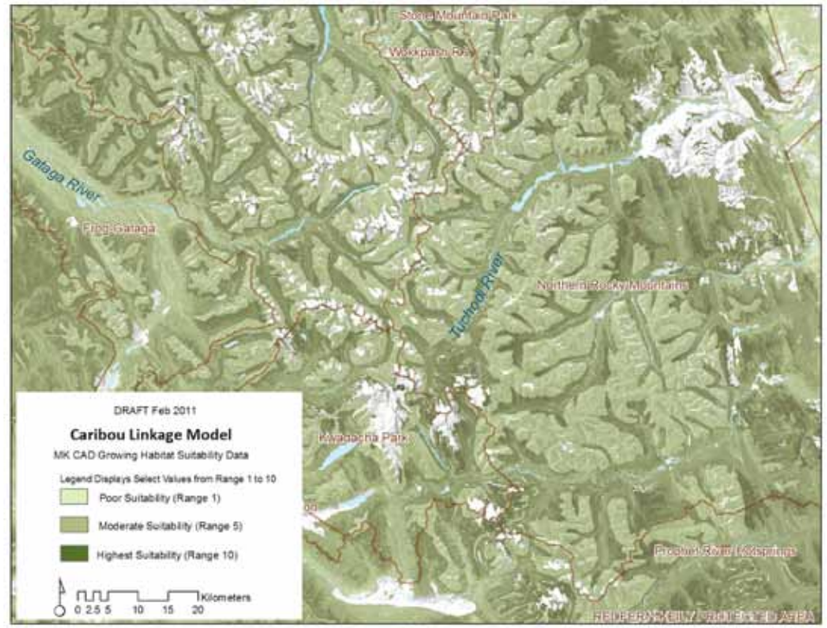
Maintaining caribou populations depends on protecting core habitats and the ability of animals to move among them.
Wayne Sawchuk

MAP 10
Caribou Connectivity Model with Existing Protected Areas

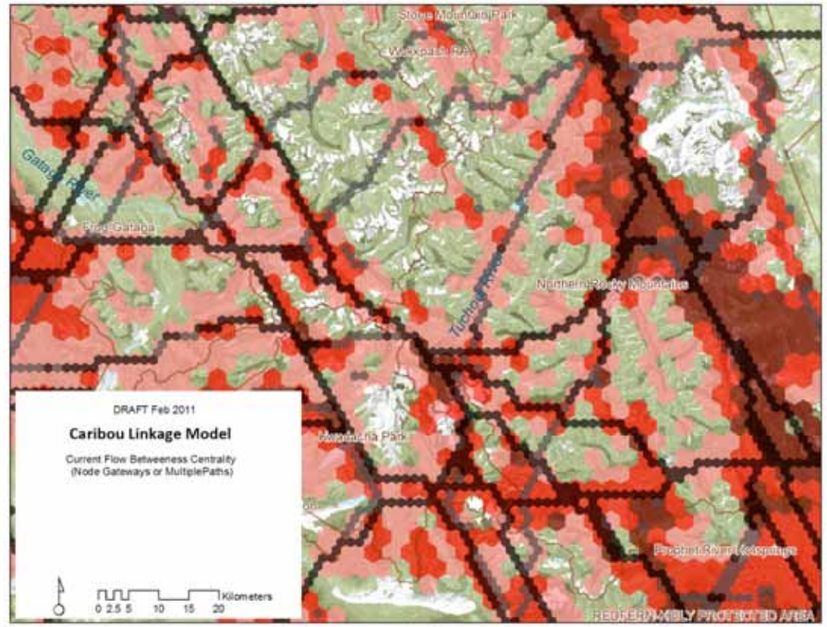


Red areas on Map 10 show caribou "gateways" or areas of high activity for caribou. The black lines in this connectivity model shows key caribou pathways based on summer habitat suitability. The green colour shows the location of protected areas.

MAP 11
Growing Season Habitat for Caribou in the Tuchodi and Gataga River Areas



MAP 12
Wildlife Linkage Model for Caribou in the Tuchodi & Gataga River Areas



The black lines on Map 12, a close up of the caribou connectivity model in the Tuchodi and Gataga River areas, show key caribou movement pathways. Red areas show caribou "gateways" or areas of high activity for caribou. These are in the same area as the best habitat shown in Map 11.

Climate Change Assessment

Adapting to climate change

The future climate in the M-KMA region will likely be warmer and wetter, with the mean annual temperature increasing by 3˚C. These changes will have widespread but variable ecological effects. For example, in an alpine or boreal forest area where the average temperature increases from below to above 0˚C, soils will start to warm up, permafrost (if present) will slowly melt, biological productivity will increase, and the vegetation will respond accordingly. Change in the types of plants that grow there could be so dramatic that the terms 'alpine' and 'boreal forest' no longer may apply.

Projected ecological upheaval from climate change (Map 13)

As the climate in northern BC changes, there will be disruptions in plant and animal relationships. For example, some alpine ecosystems found at higher elevations will be taken over by scrubby plants and trees from lower down. In general, forests will remain over much of the area, but they will be made up of different kinds of trees. The amount of land above tree line will shrink. Large lakes and streams should remain while small shallow ones could dry up or fill in.

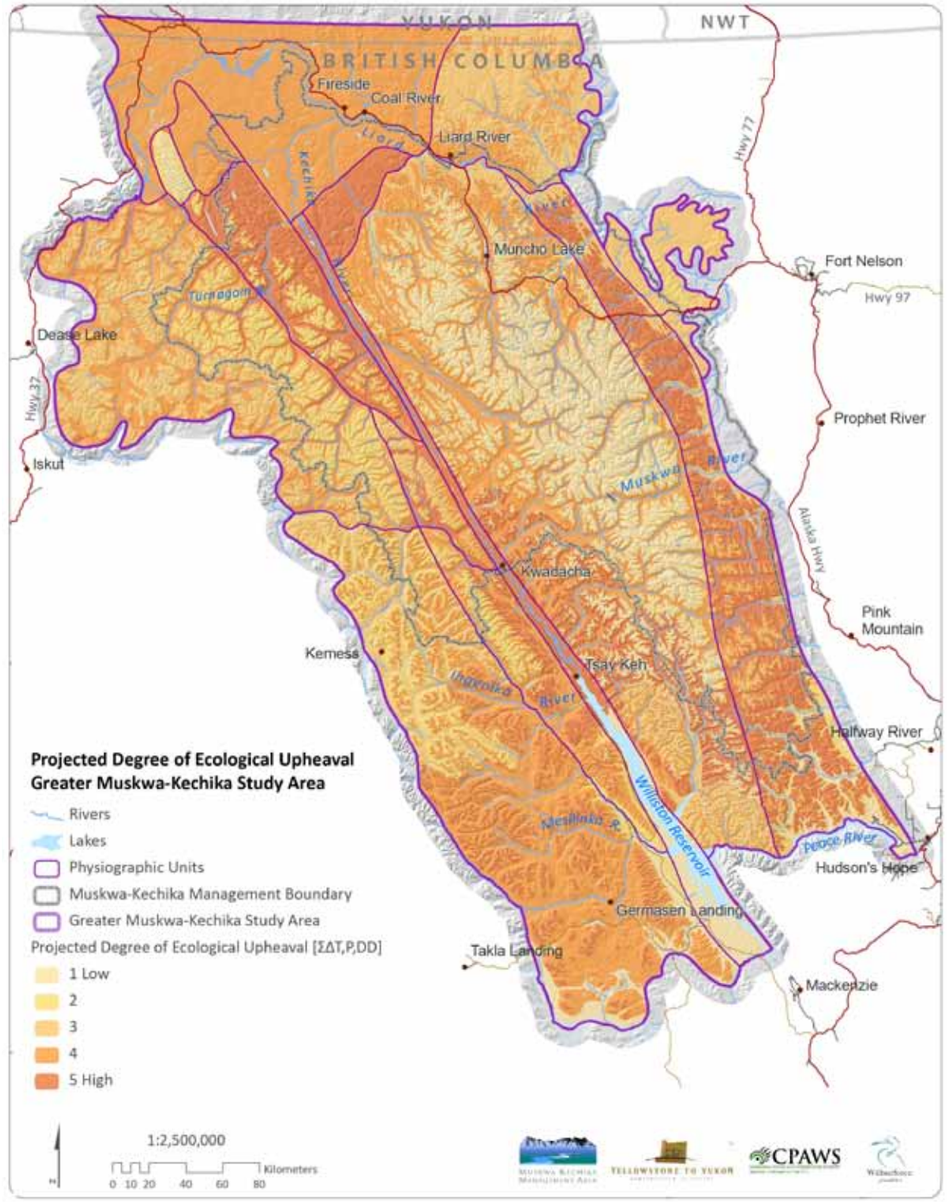
Where areas have a projected high degree of disruption, we need to allow for plants and animals to move or adapt to the new conditions by keeping their habitats intact and maintaining their ability to move among them. Areas with projected low upheaval are potential sanctuaries from climate change for species that use such habitat today.

We modeled these scenarios using projected changes in temperature, precipitation and growing season, resulting in maps that could provide broad guidance to land managers on the potential impacts of climate change. Map 13 shows the relative degree of ecological upheaval to 2050 projected over the study area, with the darker orange areas projected to change the most, and the lighter beige areas the least.

Woodland caribou on the move near Muncho Lake in the M-KMA.

Juri Peepre

MAP 13
Projected Ecological Upheaval from Climate Change



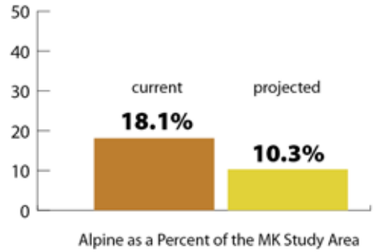
Map 13 shows the relative degree of ecological upheaval projected over the study area to 2050, with the darker coloured areas the least.

Projected alpine habitat changes (Maps 14-17)

As the climate warms, the tree-line on the mountains begins to move up into the shrub belt, and shrubs begin to move up into alpine tundra. The start of this rise in tree-line and loss of alpine can be noticed already in some places. Where the mountains are high enough that the climate will still be too cold for trees and shrubs, alpine tundra ecosystems will persist, although they will be smaller in area. Where the slopes are not high enough, over time the alpine will be replaced by shrubby plants. The report provides maps and tables showing a projected 8% decline in alpine zones relative to the greater M-KMA by the year 2050.

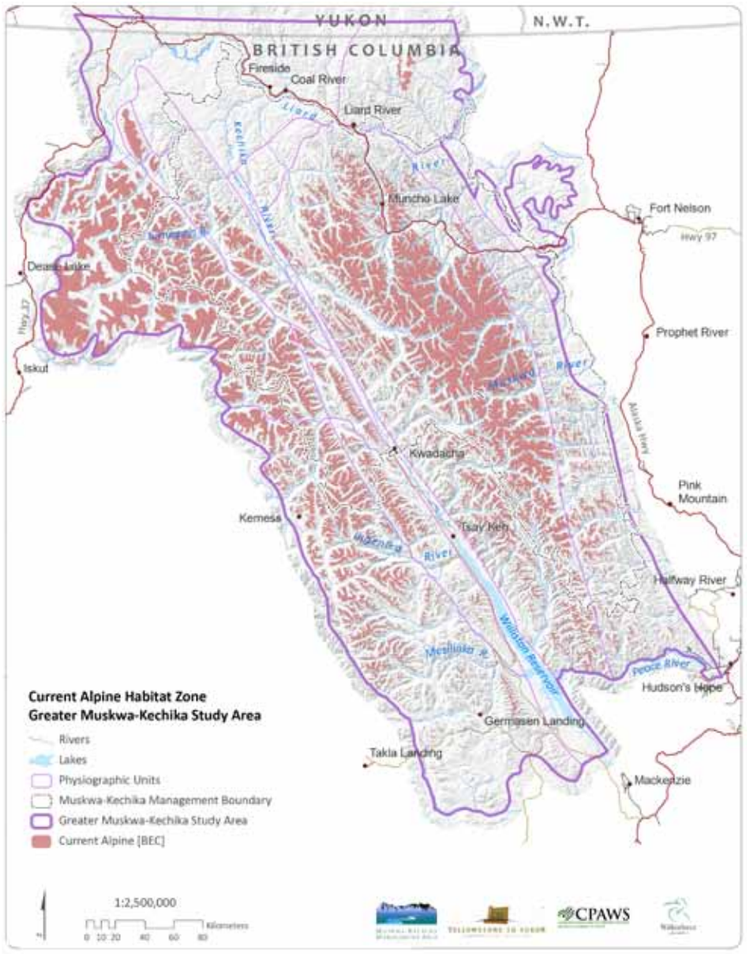
Maps 14 and 15 show the current and projected future location and extent of alpine vegetation in the M-KMA study area. Current alpine in the region generally occurs above 1450-1550 m. This contrasts with a future scenario in 2050, when a projected increase in mean annual temperature of 3 degrees Celsius could shift the lowest elevation at which alpine occurs up to 1600-1800m (or even 2000m), for example along the eastern slopes of the Rocky Mountains.

Table 1 shows the alpine zone as a percent of the M-KMA study area, with the current area covering 18.1%, projected to decline to 10.3%, an overall loss of 43% in alpine area. Some areas will lose more alpine area than others. For example, the Liard Plateau is projected to lose 95% of its alpine, and the Rocky Mountain Foothills could lose 94%. Faring better with respect to loss of alpine, the Muskwa Ranges are still projected to lose close to 30% of the existing alpine area.

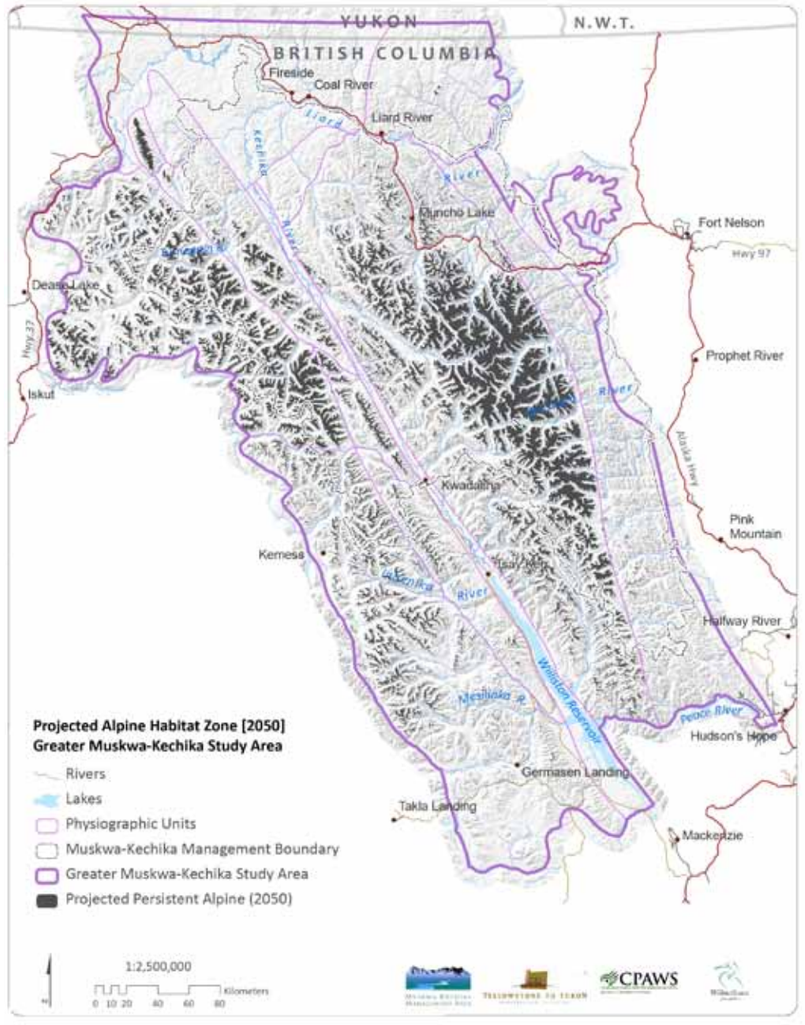


Alpine as a Percent of the MK Study Area

TABLE 1
Projected Decline in Alpine Habitat

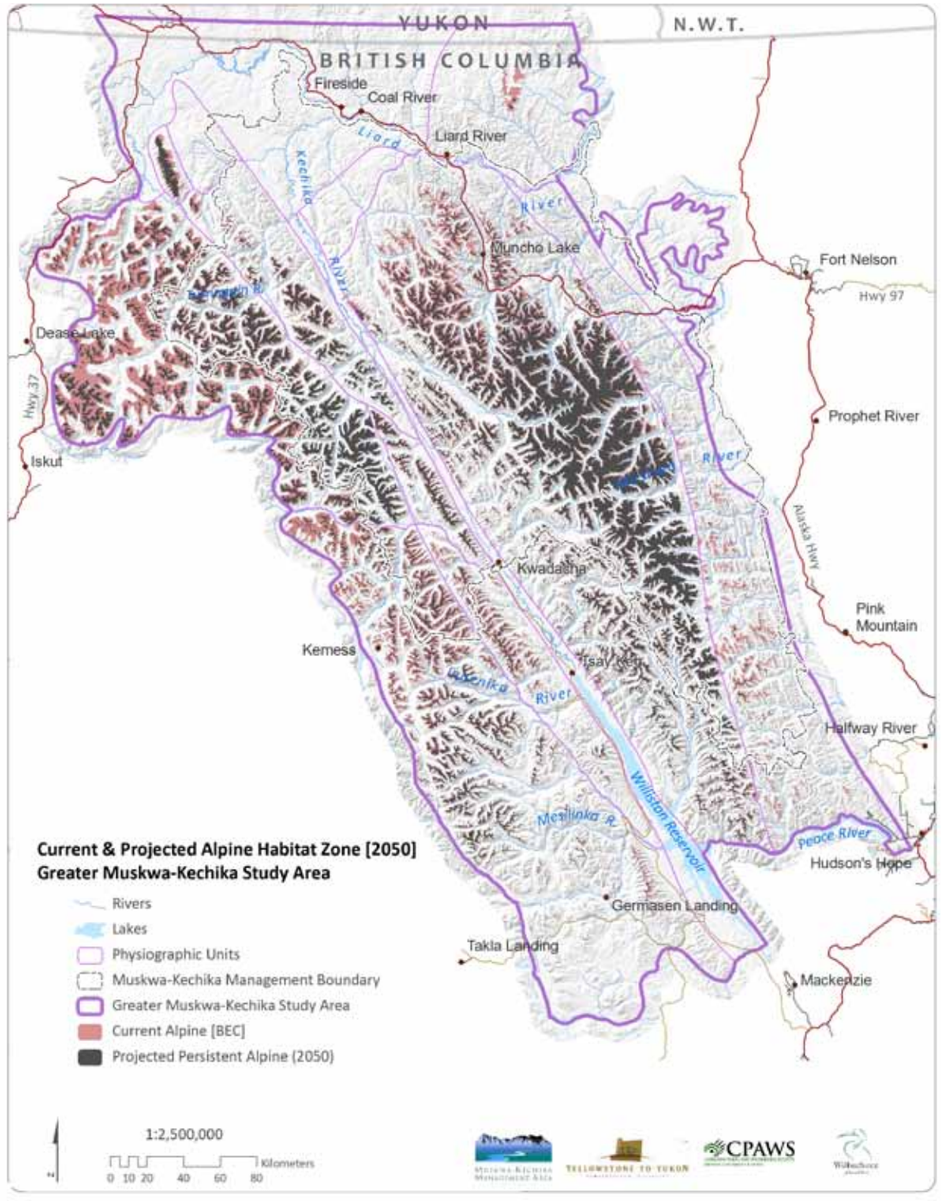


MAP 14
Current Alpine Habitat Zone



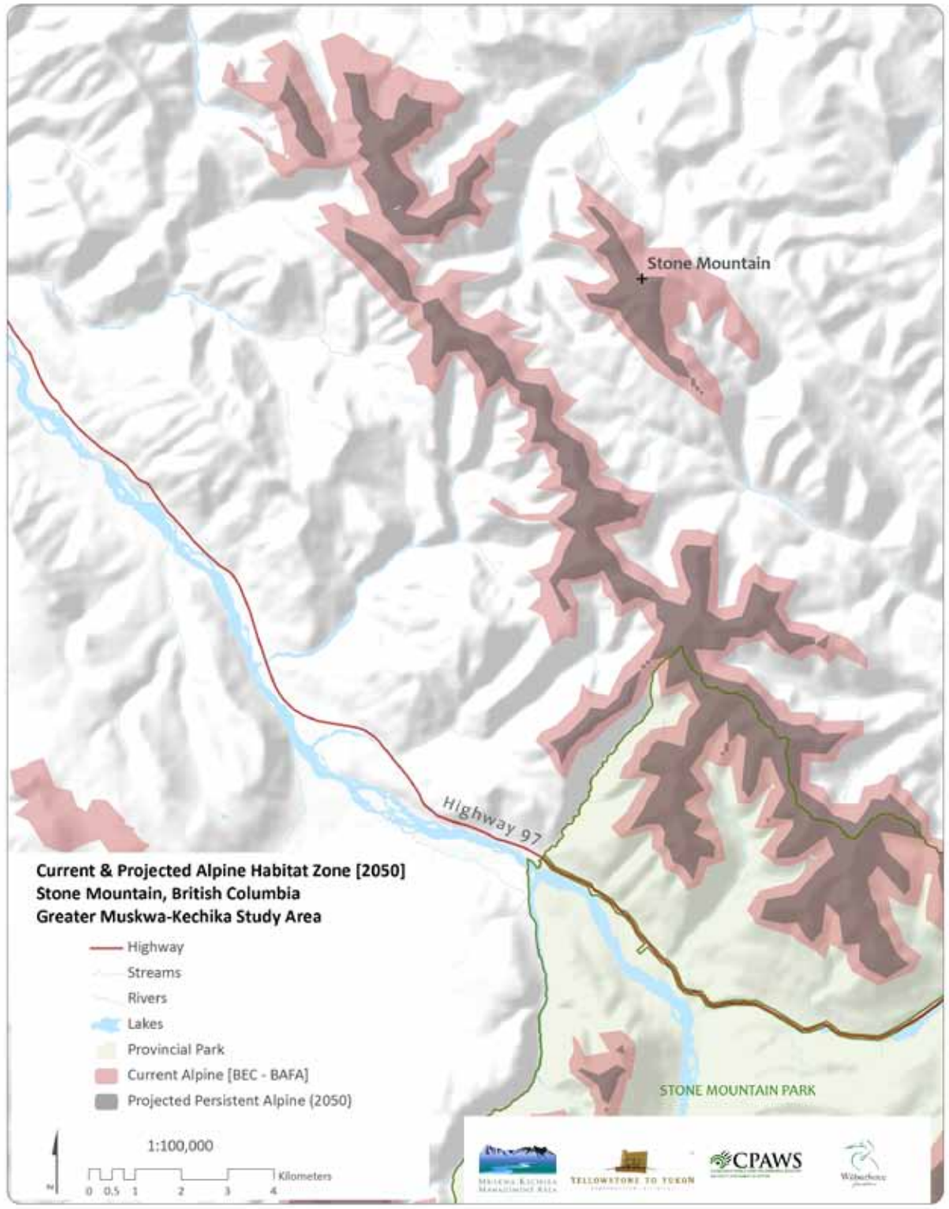
MAP 15
Projected Persistent Alpine Habitat Zone – 2050

MAP 16
Current and Projected Persistent Alpine Zone



The combined red and dark brown colours on Map 16 show areas of alpine conditions today and projected to 2050. The red areas of alpine will likely disappear with climate change. In the red areas there will be less alpine habitat available for wildlife that depend on it, such as caribou.

MAP 17
Current and Projected Alpine Zone - Stone Mountain Area



The pink colour on Map 17 shows the area of alpine projected to disappear by 2050.

Protected Areas

Existing protected areas (See Table 2)

About 27% of the M-KMA is fully protected today, while more protected lands are located in the study area outside the M-KMA. To ensure the protection of all diverse life forms a protected areas network should represent the variety of lands in the region. In the M-KMA, many of the mountainous lands are well represented, while others such as productive plateaus and plains have little or no protection. For example, the percent of protected lands varies from highs of 25-27% in the Rocky Mountain Foothills and Muskwa Ranges to lows of either none or less than 1% in the Alberta Plateau and Rabbit Plateau. See Table 2.

Scientific studies recommend that anywhere from 25% to 75% of a landscape be protected to ensure adequate protection of biodiversity and connectivity. The median protected area recommendation lies above 50%.

Our assessment of existing protected areas in the M-KMA provides a picture of where the most significant gaps in protection are located. The assessment points to the need for special land use management in areas with concentrations of high enduring feature variety and/or rarity, in areas with little or no representation of typical enduring features, in areas that have high use as "gateways" of wildlife connectivity, and in lands with high productivity.

Management for Biodiversity and Climate Change Adaptation

Planning for long term biodiversity conservation and climate change adaptation calls for a holistic approach to land management. The recommendations in the main report provide advice to the M-KMA Advisory Board, which in turn may make recommendations to the BC government on implementing the proposed actions.

The report's recommendations include the following:

- Maintain the ecological health of high conservation value lands that are not represented in protected areas;
- Conserve existing wilderness;
- Implement an M-KMA climate change adaptation strategy to meet long term conservation goals;
- Enhance communications and public awareness of the M-KMA, and the conclusions and recommendations in this report.

These recommendations are also meant for other land managers and levels of government, such as First Nations and communities, who may be developing land use plans. Resource and tourism businesses also have a role to play in considering the study findings, as do non-government organizations and the general public. Ensuring the ecological health of the M-KMA now and through long term climate change is the responsibility of all.

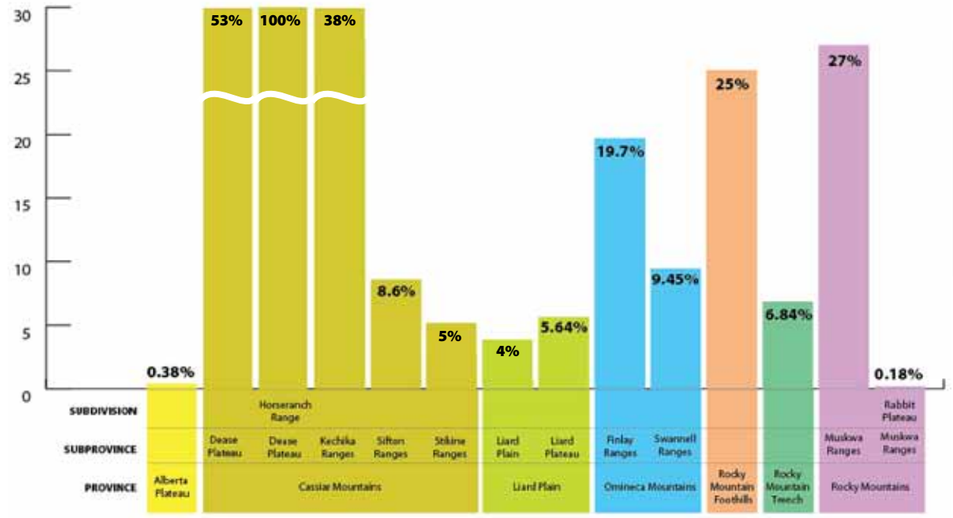


TABLE 2
The per cent of land protected in each physiographic unit

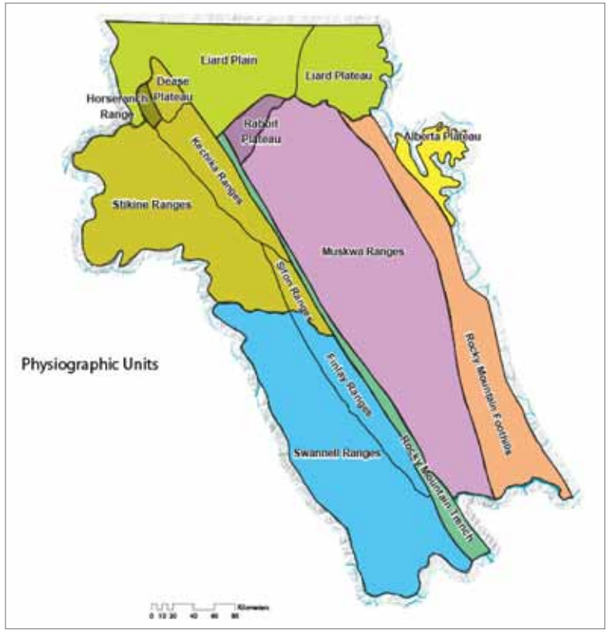
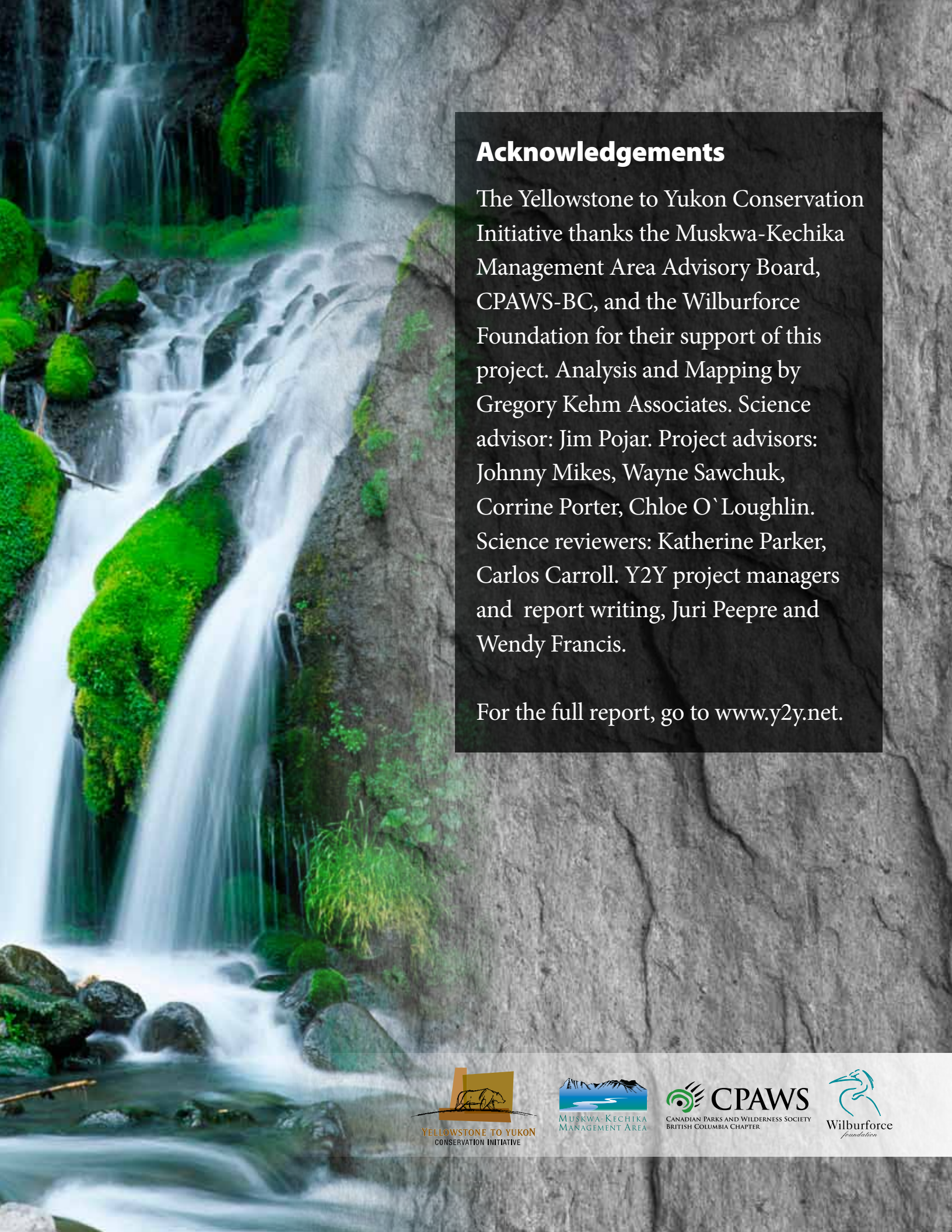


Table 2 shows the extent of protected lands in each physiographic unit, while the map below it shows the distribution of physiographic units across the study area.



Acknowledgements

The Yellowstone to Yukon Conservation Initiative thanks the Muskwa-Kechika Management Area Advisory Board, CPAWS-BC, and the Wilburforce Foundation for their support of this project. Analysis and Mapping by Gregory Kehm Associates. Science advisor: Jim Pojar. Project advisors: Johnny Mikes, Wayne Sawchuk, Corrine Porter, Chloe O`Loughlin. Science reviewers: Katherine Parker, Carlos Carroll. Y2Y project managers and report writing, Juri Peepre and Wendy Francis.

For the full report, go to www.y2y.net.

YELLOWSTONE TO YUKON CONSERVATION INITIATIVE

MUSKWA-KECHIKA MANAGEMENT AREA

CPAWS
CANADIAN PARKS AND WILDERNESS SOCIETY
BRITISH COLUMBIA CHAPTER

Wilburforce foundation