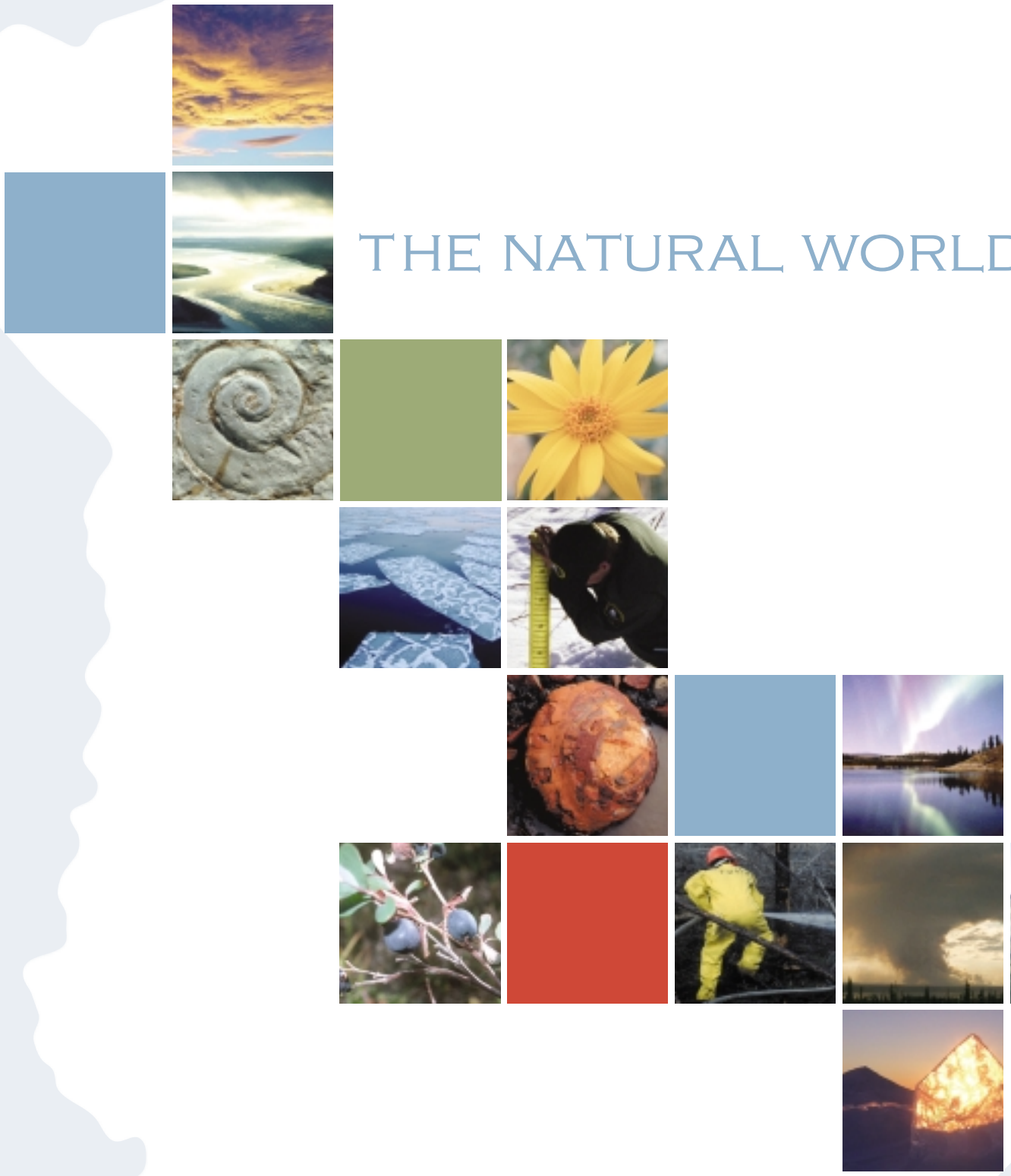


THE NATURAL WORLD

This land is our source of survival. Our grandfathers, our fathers, and we the elders of today have all strived on the land. I myself have been committed to living on the land. So when we speak of the land, we speak nothing but the truth. It is as if we are speaking of our own hearts.

Yes, the land is very important to us. Not only do we dwell on it, but also the wildlife survives on it. As humans, we survive by eating the wildlife. That also is a way of life.

Water, wildlife, caribou, moose, beaver, muskrat, and fish. These are all life sustaining for us. We can't allow these resources to be mismanaged. We have to be constantly aware of our responsibility for proper land management...We can't break our connection to nature.

from Sahtu Land Use Plan Board - Building a Vision for the Land (1999

GEOMORPHOLOGY: THE SHAPE OF THE SAHTU LANDSCAPE

A geological province is an extensive region with distinctive characteristics that differentiate it from surrounding areas. A shield is an large area of very ancient rocks that have been levelled by erosion. A platform the part of a continent covered by flat-lying or gently tilted rock and underlain by very ancient rocks consolidated before deposition of the overlying layer. The rocks of the platform layer are usually sedimentary. An orogenic belt is a part of the continent where the Earth's crust has been deformed, leading to the creation of a mountain range.There are four geological provinces found within the Sahtu: the Cordillera, Interior Platform and Bear provinces. These large regions are each found within even larger geomorphic regions respectively: Rocky Mountain Cordillera, Interior Plains, Canadian Shield and Arctic Platform. To be identified as a geomorphic region, each must have three major characteristics – a large connected area with similar geological features, landforms that have been shaped by similar processes and common geological structure with a shared geological history.

GEOLOGICAL PROVINCES

The Arctic Platform extends under the islands of the Arctic archipelago, between the Innuitian Orogen and the Shield. Some of its strata may contain oil and natural gas.

The Bear Province forms part the Canadian Shield, mostly made of Pre-Cambrian igneous and metamorphic rocks. Rocks 2.5 billion years old once formed mountains, but have since eroded. Often exposed within the Canadian Shield, these rocks are also found beneath most of the more recent geomorphic regions such as the Interior Plains.

The Cordillera includes the Mackenzie and the Franklin Mountains, part of the western chain of mountains stretching through North and South America. During the Wisconsin ice age, 25,000 years ago, the Cordillera in the Sahtu was heavily glaciated, It became mostly ice free approximately 10,000 years ago, leaving river terraces and alluvial fans.

The Interior Platform underlies most of the Sahtu. Part of its thick layer of sedimentary rocks contains ancient fossils deposited by advancing and receding oceans after the end of the Pre-Cambrian era (1/2 billion years ago).


Cordillera


Interior Platform


Canadian Shield

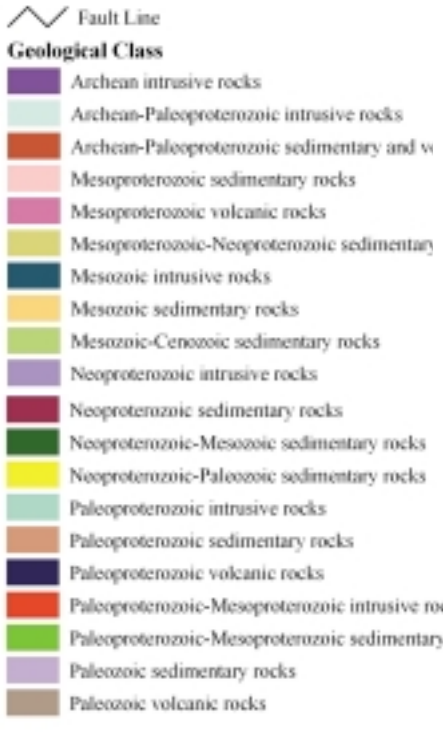
BEDROCK GEOLOGICAL MAP: Intact, solid bedrock at or near the earth's surface

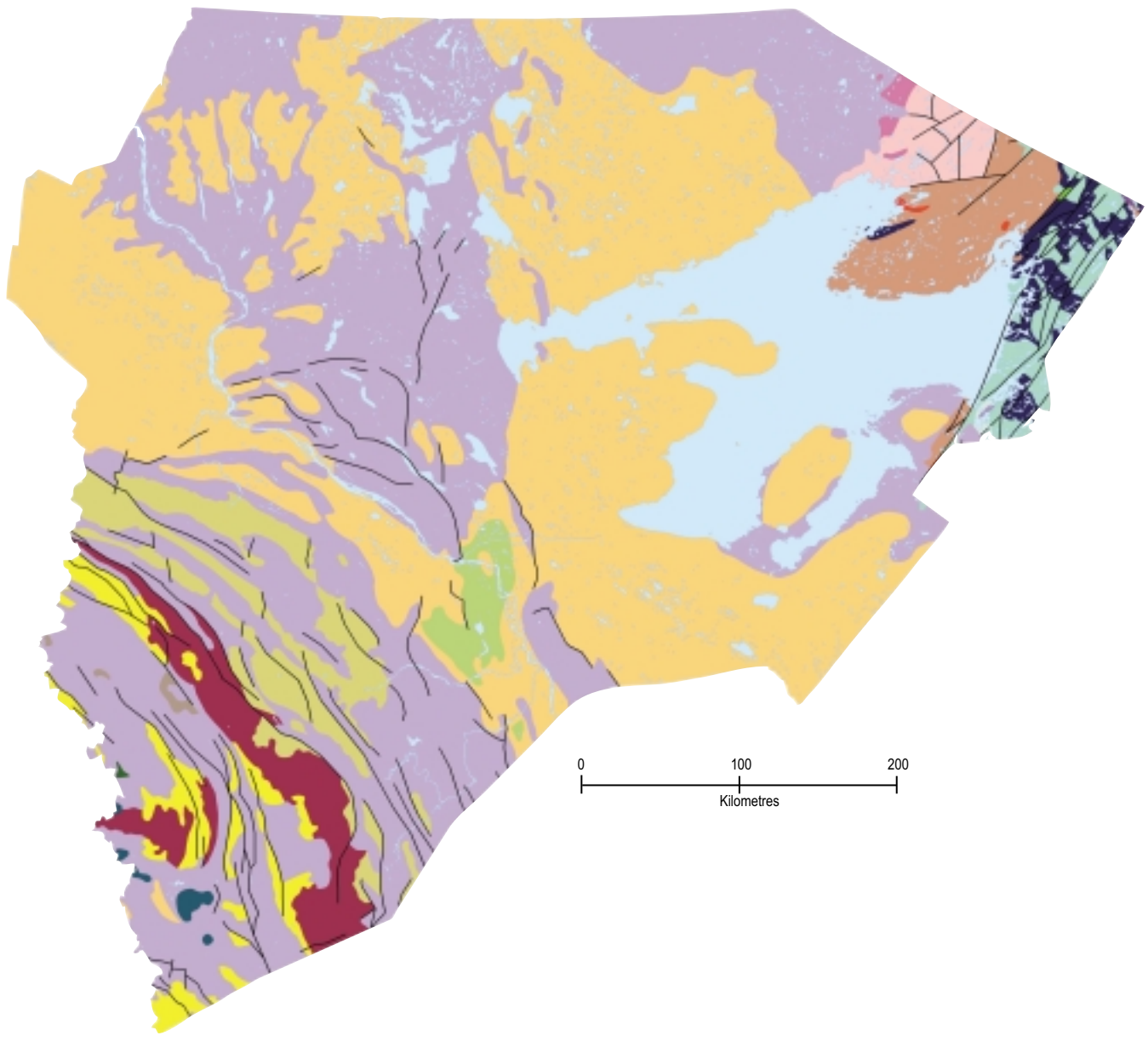
Intrusive Rock - Igneous rock formed by the entrance of magma into preexisting rock

Igneous Rock - Formed from molten (melted) or partly molten material that has cooled and solidified

SedimentaryRock - Formed from the consolidation of solid fragments from rocks or organic remains, or by precipitation of minerals from solution

Volcanic (extrusive)Rock - Igneous rock formed from lava the flowed out onto the Earth's surface, characterized by rapid solidification and grains barely visible to the naked eye.





GLACIATION

Much of the landscape we see in the Sahtu today has been shaped by glaciation. Very thick sheets of ice (some as much as a kilometre or more in height) once covered much of the Sahtu. While parts of Canada weathered at least five glaciation periods, geological records indicate that the Wisconsin Laurentide Ice Sheet (25,000 years ago) reached the Mackenzies. These grew and shrank, and finally melted away scraping and scouring the bedrock and leaving behind thick deposits of gravel and sand dotted with boulders.

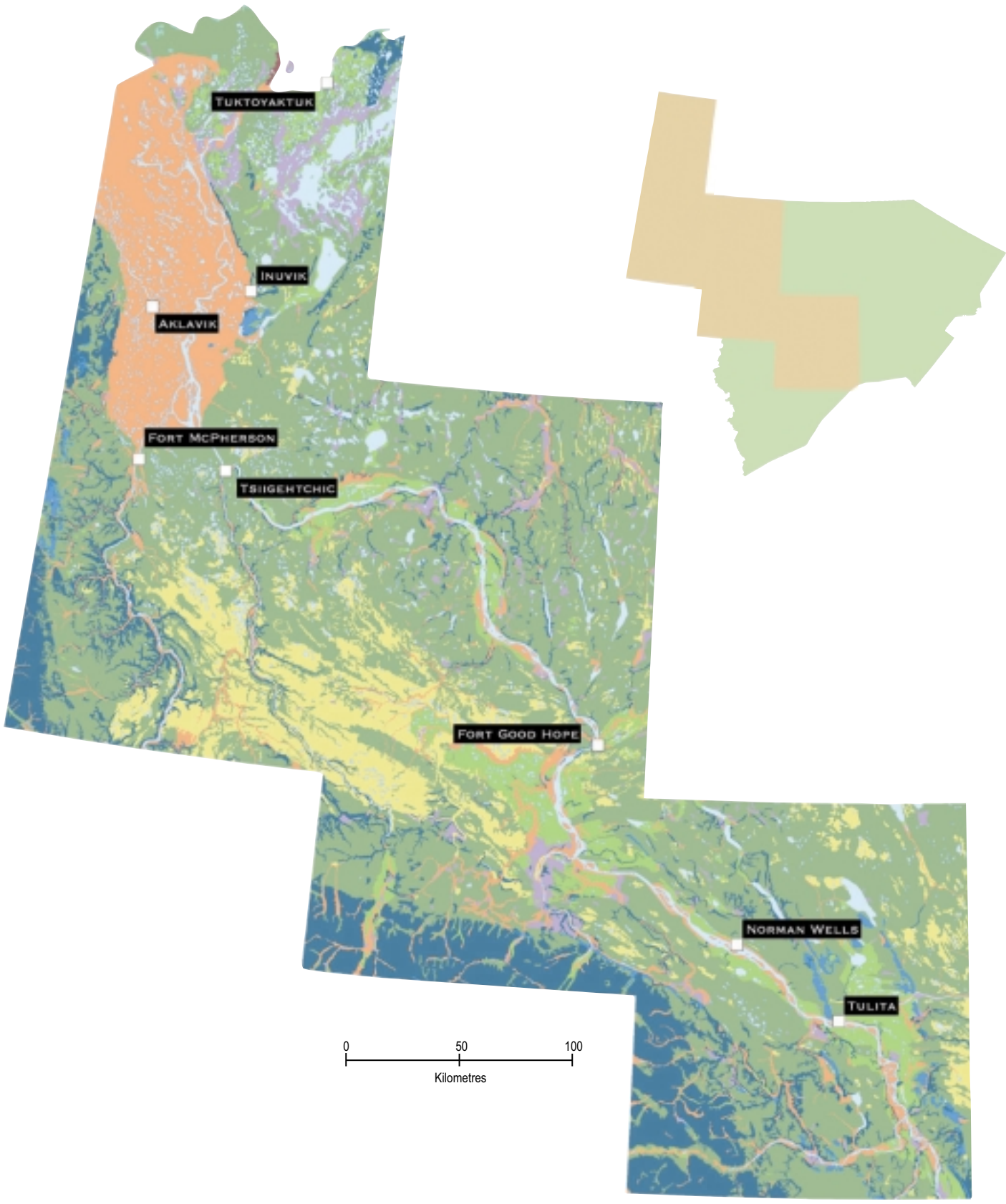
SURFICIAL GEOLOGY

Surficial material is the sediment deposited by ice, water, wind and gravity during the ice ages through to the present (Quaternary period). Because permafrost underlies much of the Sahtu, most surficial deposits are generally frozen or contain ground ice.

Much of the Sahtu, especially within the Interior Platform has a thin to thick cover of glacial till which either blankets the underlying bedrock or creates a hummocky, rolling landscape.

SURFICAIL GEOLOGY MAP showing the compostion of surface layers, such as soil, exposed bedrock, or glacial deposits.

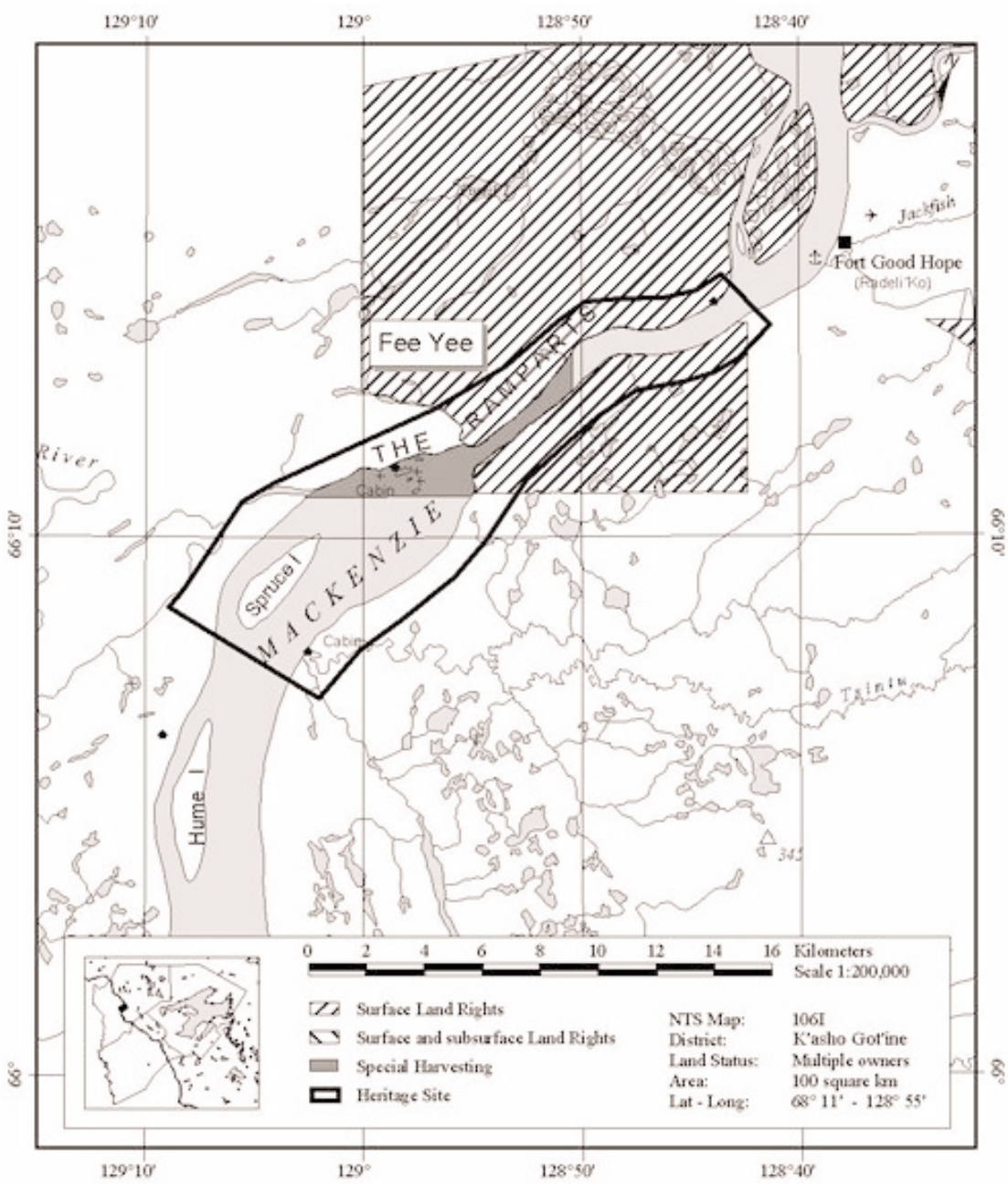
- ALLUVIAL DEPOSIT - land counterpart of a delta: an assemblage of sediments marking place where a stream moves from a steep gradient to a flatter gradient and suddenly loses transporting power
- COLLUVIAL DEPOSIT - fan shaped deposit of sediment built up as a result of landslide deposition from debris flows
- EOLIAN DEPOSIT - pertains to earth material transported and deposited by the wind including dune sands, sand sheets, silt and sand-sized aggregates
- GLACIOFLUVIAL DEPOSIT - material, commonly stratified, moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice
- GLACIAL DEPOSIT - material moved by glaciers
- LACUSTRINE DEPOSIT - stratified materials deposited in lake waters and later become exposed either by the lowering of the water level or by the elevation of the land
- MARINE DEPOSIT - materials deposited by the action of the sea and then left on dry land due to the lowering of the water level or raising of the land
- ORGANIC DEPOSIT - generally high concentration of organic carbon deposit, formed mainly by the accumulation of organic materials
- BEDROCK DEPOSIT - exposed rock from underlying geology of bedrock



Fee Yee / The Ramparts

Fee Yee is a formation of high limestone cliffs located up the Mackenzie River from Fort Good Hope. Here the river cuts through sedimentary bedrock, harder than the alluvial materials in most of the rest of its valley. Fee Yee is an important domestic fishery and was historically used as a refuge for local people to defend against raiding parties of Inuit travelling from the Arctic coast.

Wichididelle, an important culture-hero for the people of Fort Good Hope, created the topographic features at Fee Yee while chasing the giant beavers, and other creatures from the land.



The Ramparts rapids [located at the head of the Ramparts] were created when Wichididelle threw rocks at a giant beaver. There's also a place where he laid down for a nap—his head and footprints can still seen today. The small waterfall is where he had a pee. These places are close [to Fort Good Hope].... There's a fish camp with cliffs close by where he took a bear. He continued his travels until he got to Bear River where he killed some beavers and pegged their skins on Bear Rock. His arrows can still be seen in the river near Tulita. They'll remain this way until the end of time.

His boat is located above the rapids [Spruce Island is said to be his overturned boat]. He said in the legends that he would return one day for it. The giant did return for his boat once but he met the wolverine and told him his intentions to return to this land to get his boat, and also that there should be more people for him to eat. The wolverine told him, "Everything remains the same as when he left, not many people there at all." So the giant turned back and forgot his plans to come back. His boat is still there.

Sahtu Heritage Places and Sites Joint Working Group, Rakekée Gok'é Godi: Places We Take Care Of.

CLIMATE

Solar radiation by the Earth's surface and atmosphere is key to the climate of the Sahtu. The strength of this radiation is determined primarily by latitude. Snow cover, clouds and large variation in hours of daylight and sun elevation during the year are also factors.

The heat of the sun is constantly redistributed between regions by air circulation. In the winter, the Sahtu is dominated by air flowing from the polar region. The Mackenzie Mountains protect this air mass from milder, moist Pacific air. The low sun angles ensure low solar input.

In general, the Sahtu has long, cold winters and relatively short, cool summers. The average temperature in January ranges from -20º C to -30º C, while the average temperature in July ranges from 10º C to 15º C. Annual precipitation varies from 200 mm in the barrenlands to 700 mm in the mountains. The summer and winter cycle is very pronounced and is separated by spring break-up and autumn freeze-up.

In the summer, the air circulation pattern alters. Artic air recedes, allowing low pressure cells to gain access from the southwest. Along with this change, the air flow from the south combine with the long hours of sunlight make the Sahtu, especially in the Mackenzie Valley, the warmest for its latitude in all of Canada.

Temperature inversion, when the cooling of air temperature with altitude is reversed, is a common phenomenon in the Mackenzie Valley. Inversions in Norman Wells can result in air temperatures at the top of the Franklin Mountains (approx. 1000 m) 10 degrees warmer than at ground level.

Precipitation in the Sahtu is restricted partly because of the rain-shadow effect of the Mackenzie Mountains. Average precipitation throughout the Sahtu is 300-400 mm annually. Precipitation decreases at the more northern latitudes, tapering off to 250 mm at the northern boundary.

Low pressure systems enter the Sahtu, typically from two major routes. Air flow originating in the northern Pacific Ocean moves through the Alaskan valleys into the Yukon and then into the Mackenzie Valley, proceeding south. Air moving directly south from the Beaufort Sea mixes with this Pacific flow to form the primary pathway.

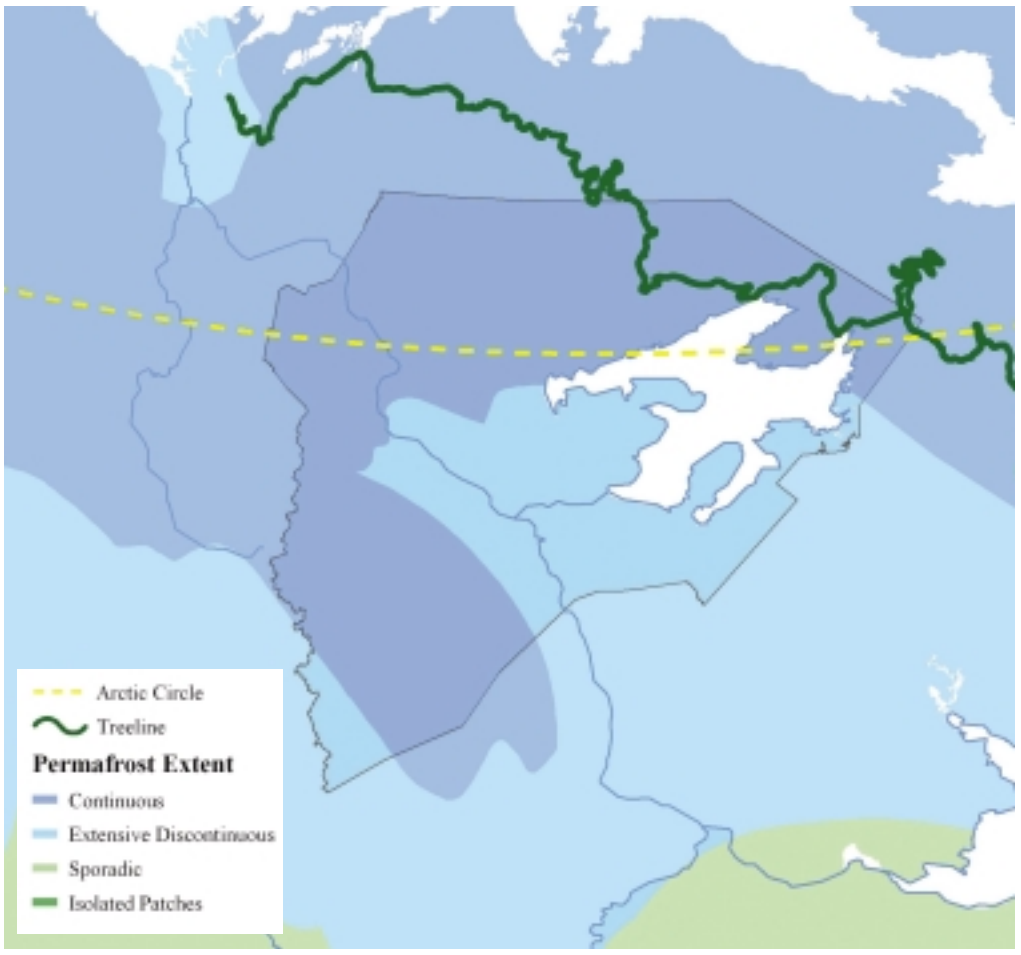
The second air mass flows from south in the Pacific Ocean through various breaks in the Cordillera and finally moving north through the Liard Valley or along the Taiga Plains further east.

Daily rainfall is typically light with few days exceeding 5 mm. Heavy daily rains from localized storms in the summer can exceed 50 mm.

By November, precipitation primarily falls as snow. Mean monthly snowfall rises sharply and then diminishes through the winter months as the artic high stabilizes and prevents humid air from the Pacific from moving in. Even as snowfall decreases, snow accumulation steadily increases throughout the winter due to lack of any significant thaws. Maximum snowpack depth is reached in March. A more rapid decrease in the snowpack then occurs over the spring season.

Early winter ice forming along Great Bear Lake shoreline

PERMAFROST



The Sahtu lies entirely within the permafrost region of northwestern Canada. The temperature of the ground is continuously below 0°C over significant proportions of the area. Therefore most moisture in the ground occurs as ground ice. This ground ice occurs in many forms, most often as fillings in the pores of soils; however, it can also form much more massive bodies, such as ice wedges and layers up to several metres thick. The ground surface undergoes annual deep seasonal thawing and freezing with summer's heat and extreme winter cold. Both the presence of ground ice and surface thaws and freezes have major effects on the landscape on roads, construction and development in the Sahtu.

WINDCHILL

Wind Speed (km/hr)	Temperature (°C)											
	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50
5	4	-2	-7	-13	-19	-24	-30	-36	-41	-47	-53	-58
10	3	-3	-9	-15	-21	-27	-33	-39	-45	-51	-57	-63
15	2	-4	-11	-17	-23	-29	-35	-41	-48	-54	-60	-66
20	1	-5	-12	-18	-24	-31	-37	-43	-49	-56	-62	-68
25	1	-6	-12	-19	-25	-32	-38	-45	-51	-57	-64	-70
30	0	-7	-13	-20	-26	-33	-39	-46	-52	-59	-65	-72
35	0	-7	-14	-20	-27	-33	-40	-47	-53	-60	-66	-73
40	-1	-7	-14	-21	-27	-34	-41	-48	-54	-61	-68	-74
45	-1	-8	-15	-21	-28	-35	-42	-48	-55	-62	-69	-75
50	-1	-8	-15	-22	-29	-35	-42	-49	-56	-63	-70	-76
55	-2	-9	-15	-22	-29	-36	-43	-50	-57	-63	-70	-77
60	-2	-9	-16	-23	-30	-37	-43	-50	-57	-64	-71	-78
65	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79
70	-2	-9	-16	-23	-30	-37	-44	-51	-59	-66	-73	-80
75	-3	-10	-17	-24	-31	-38	-45	-52	-59	-66	-73	-80
80	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81

WHAT IS WIND CHILL?

Wind Chill is the cooling sensation caused by the combined effect of temperature and wind. Our bodies insulate us somewhat from the outside temperature by warming up a thin layer of air close to our skin. When the wind blows, this protective layer is taken away. Energy is needed for our bodies to warm up a new layer. If each layer keeps getting blown away, our skin temperature will drop. Wind also makes you feel colder by evaporating moisture on your skin, drawing more heat away from your body.

In parts of the country with a milder climate, a wind chill warning is issued at -35° C. Most of Canada hears a warning at about –45° C. Residents of the arctic regions have grown more accustomed to cold, severe conditions and are warned at about –50° C.

WHERE IS THE COLDEST WIND CHILL IN CANADA?

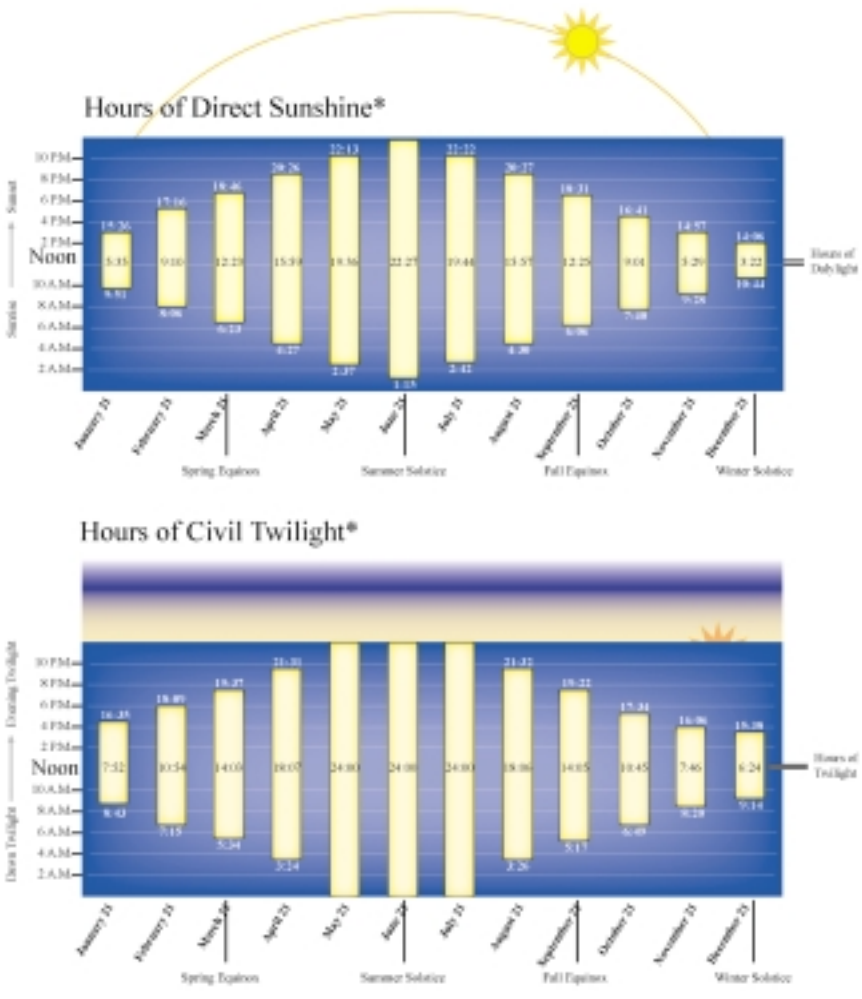
The coldest wind chill on record occurred at Kugaaruk (formerly Pelly Bay), Nunavut, on January 13, 1975. The air temperature was -51°C, and the 56 km/h winds produced a wind chill of -78° C.

The above table shows the relative drop in temperature at varying wind speeds.

Sunrise and sunset conventionally refer to the times when the upper edge of the disk of the sun is on the horizon, considered unobstructed relative to the location of interest. Atmospheric conditions are assumed to be average, and the location is assumed to be in a level region on the Earth's surface.

Civil twilight is defined to begin in the morning and end in the evening, when the center of the sun is geometrically 6 degrees below the horizon. This is the limit at which twilight illumination is sufficient, under good weather conditions, for terrestrial objects to be clearly distinguished; at the beginning of morning civil twilight, or end of evening civil twilight, the horizon is clearly defined and the brightest stars are visible under good atmospheric conditions, in the absence of moonlight or other illumination.

In the morning, before the beginning of civil twilight and in the evening, after the end of civil twilight, artificial illumination is normally required to carry on ordinary outdoor activities. Complete darkness, however, ends sometime prior to the beginning of morning civil twilight and begins sometime after the end of evening civil twilight.



Sun dogs, also called mock suns or "parhelia", are colored, luminous spots caused by the refraction of light by ice crystals in the atmosphere. These bright spots form at points on the solar halo, 22 degrees on either side of the sun and at the same elevation.

Sundogs are visible when the sun is near the horizon (therefore seen during the winter months) and on the same horizontal plane as the observer and the ice crystals. As sunlight passes through the ice crystals, it is bent by 22 degrees before reaching our eyes. This bending of light results in the formation of a sundog.

The difference between sundogs and sun halos is the result of the orientations of the ice crystals. If the sun passes through the hexagonal crystals when their flat faces are horizontal a sundog is observed. If the hexagonal crystals are randomly oriented, a halo is observed.

Sundogs over Great Bear Lake

photo by Morris Neyelle, Deline

Aurora Borealis, or Northern Lights, are distributed along a narrow band encircling the North Pole. The Sahtu lies within the auroral zone, in which the Lights are most often seen.

The Aurora Borealis is an electrical discharge powered by a "generator" composed of the solar 'plasma particle' wind and the earths magnetosphere.

As the solar wind blows towards the earth from the sun, a cavity known as the magnetosphere is formed when the plasma meets an invisible obstacle of the earth's magnetic field. The earth's magnetic lines above the polar region fan out and connect to the solar wind's magnetic lines at the magnetosphere's boundary. The solar wind blows around this boundary across the connected field lines, generating power up to 1,000 billion watts. When this current of (mostly) electrons collides with atoms and molecules in the upper atmosphere, they emit the characteristic northern lights. The whole process is comparable to neon lighting.

(Adapted from the GNWT Resource Wildlife and Economic Development: www.gov.nt.ca/RWED/

Aurora Borealis

TEMPERATURE

In general, the Sahtu has long, cold winters and relatively short, cool summers. The average temperature in January ranges from -20º C to -30º C, while the average temperature in July ranges from +10º C to +15º C. Annual precipitation varies from 200mm in the barrenlands to 700mm in the mountains.

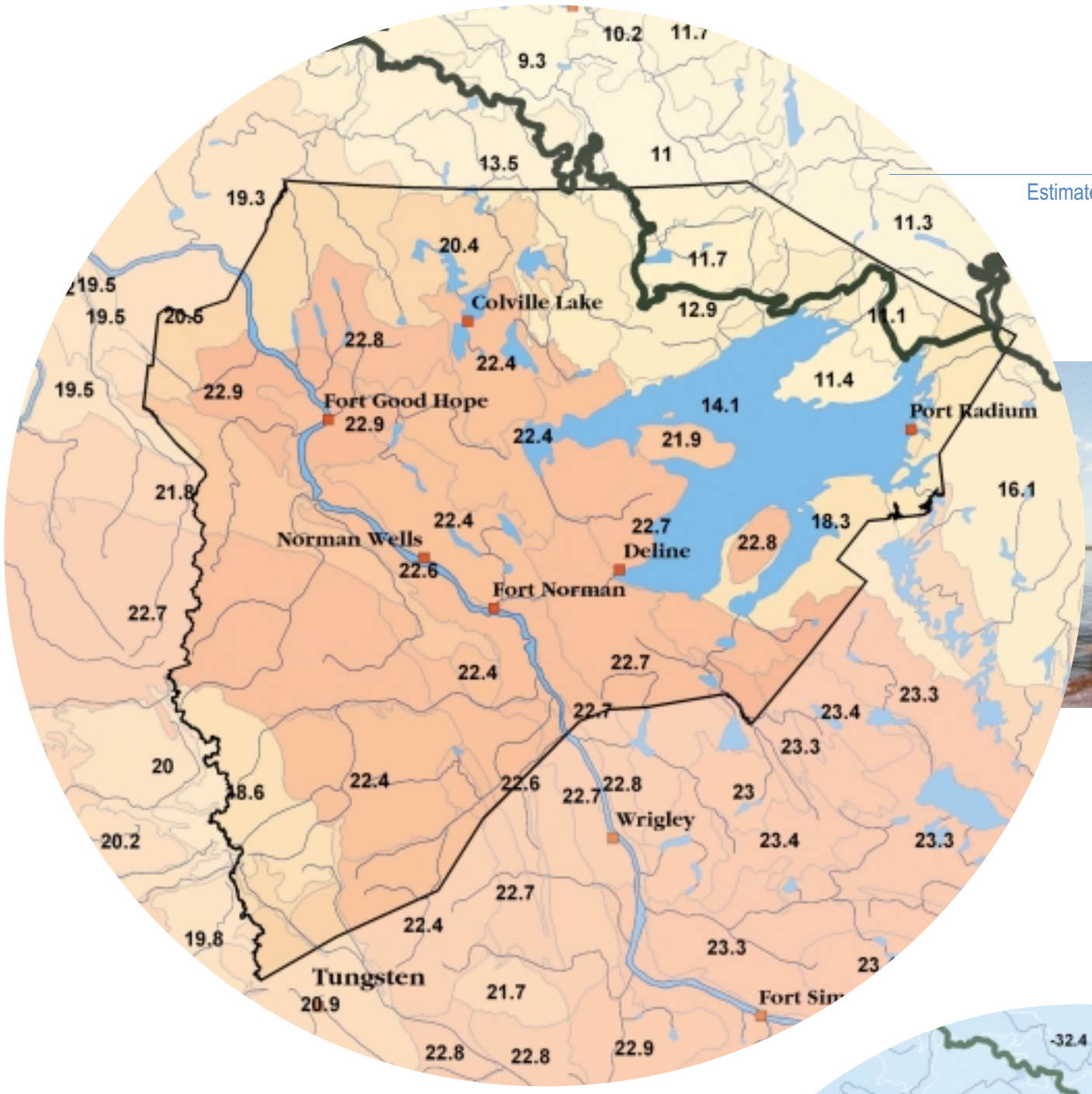
Mean monthly temperatures tend to be relatively uniform, however there are regional variations. Temperature inversions, when the cooling of air temperature with altitude is reversed, is a common winter phenomenon in the Mackenzie Valley. Inversions in Norman Wells can result in air temperatures at the top of the Franklin Mountains (approx. 1000 m) 10 degrees C warmer than at ground level. The area surrounding Great Bear Lake is cooler in the summer than the Mackenzie Valley. The lake's large water body, whose temperature rarely exceeds 5°C, creates a cooling effect on the surrounding air mass. Throughout the 20th century, mean annual temperatures for most recording stations in the Sahtu have on average risen between 1 and 2 degrees Celsius.

Fall can turn to winter quickly. In two days, ice has begun to form in Keith Arm on Great Bear Lake.

This model estimates the mean daily temperature of each ecozone based on an interpretation of data collected from weather stations in the region. The maximum and minimum temperatures of each day at each weather station are averaged to obtain the mean daily temperature. The mean daily temperatures are then averaged over a 30-year period (where available) for every day of the year.

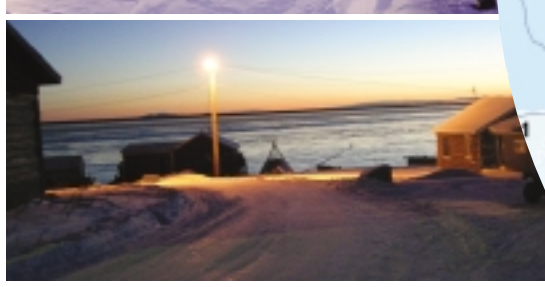
SUMMER TEMPERATURES

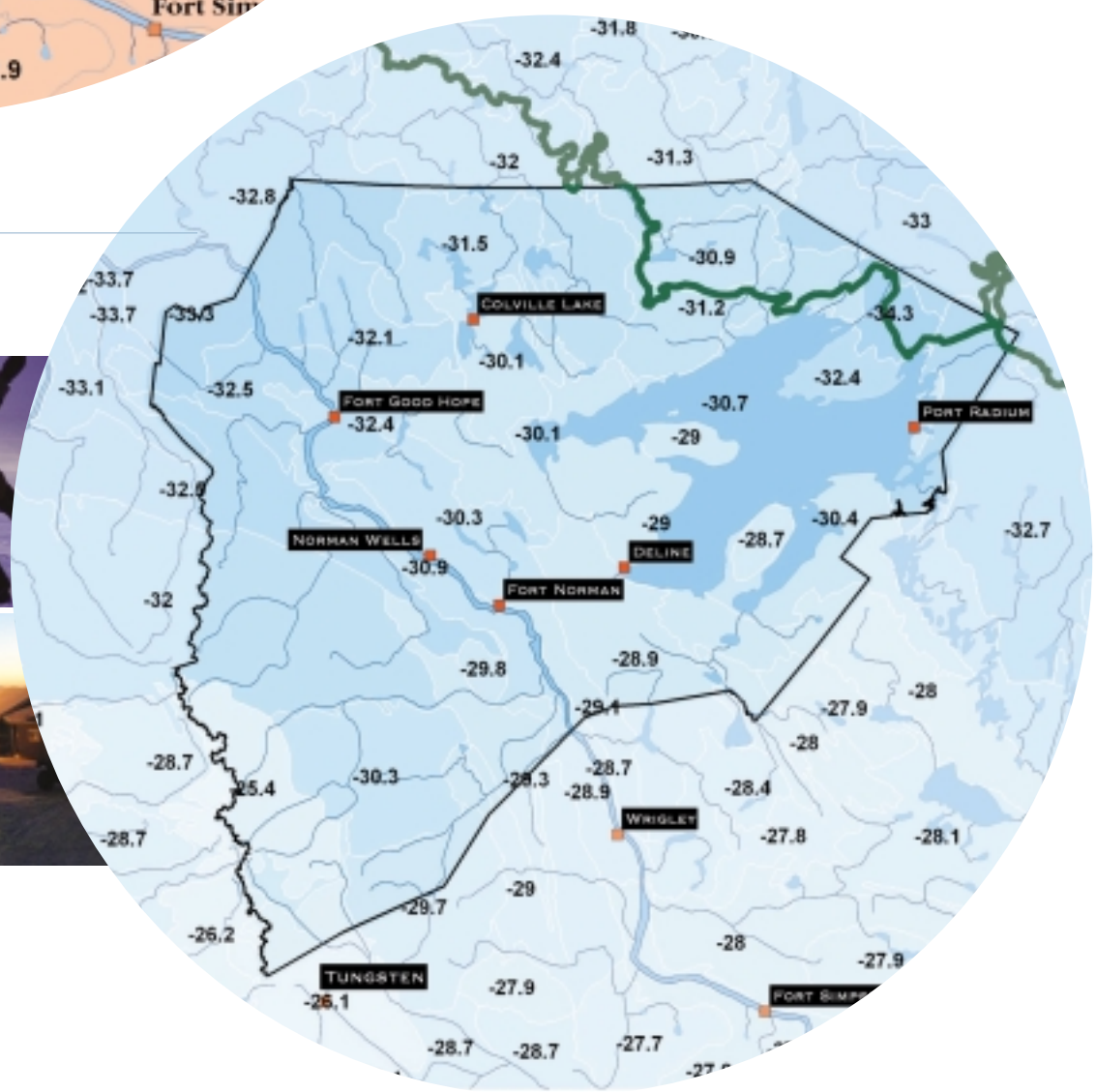
Estimated average daily high temperature in July.



..AND IN THE DARKNESS OF WINTER

Estimated average daily high temperature in February.

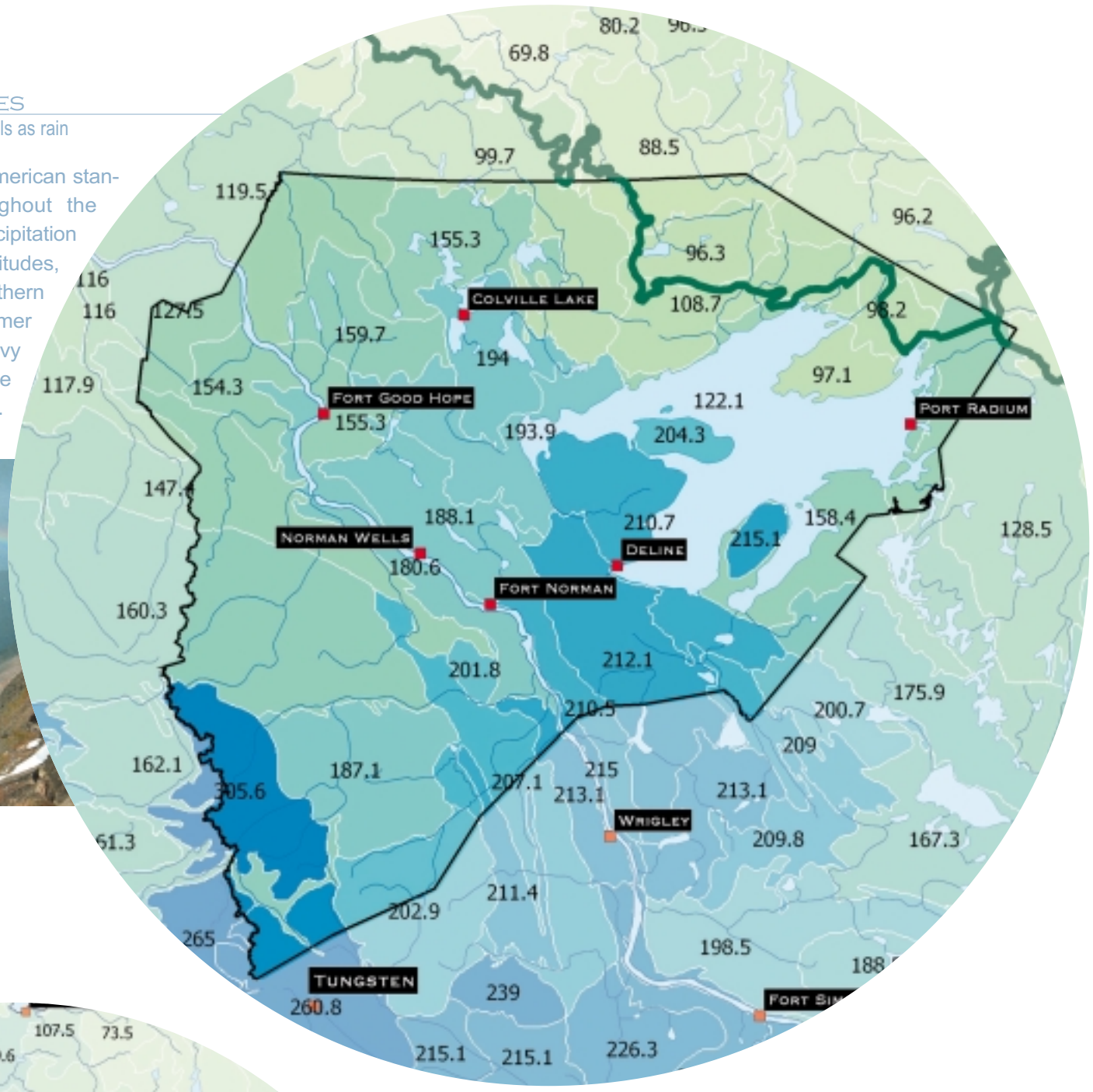


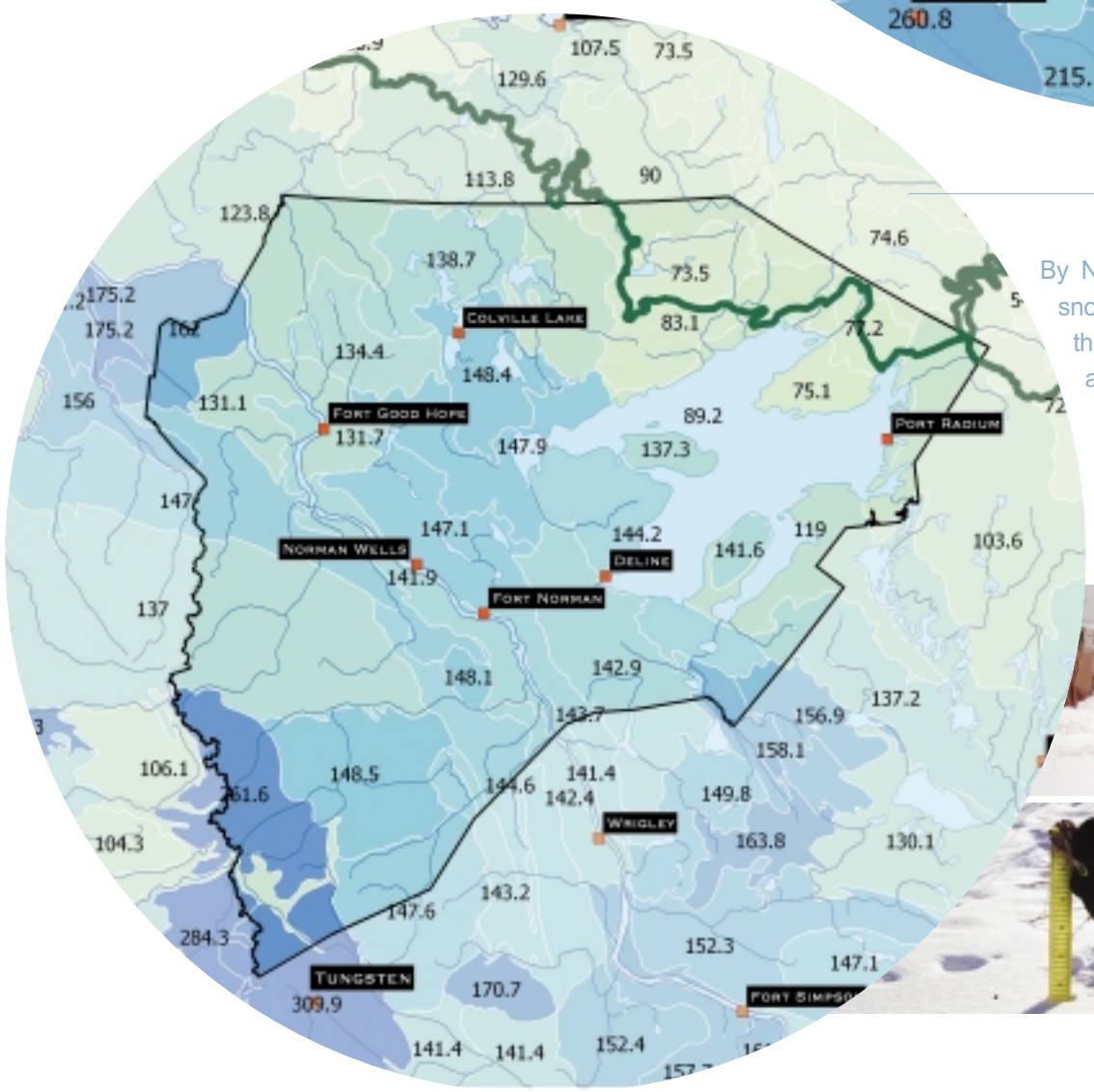


TOTAL RAINFALL IN MILLIMETRES

Estimated average annual precipitation that falls as rain

Snow and rainfall are low by North American standards. Average precipitation throughout the Sahtu is 300-400 mm annually. Precipitation decreases at the more northern latitudes, tapering off to 250 mm at the northern boundary. Daily rainfall in the warmer months rarely exceeds 5 mm. Heavy daily rains from localized storms in the summer however can exceed 50 mm.





TOTAL SNOWFALL IN MILLIMETRES

Estimated average average annual snowfall throughout the Sahtu

By November precipitation primarily falls as snow. Mean monthly snowfall rises sharply in the autumn and then diminishes through the winter months as the artic high stablilizes and prevents humid air from the Pacific from moving in. Even as snowfall decreases snow accumulation steadily increases throughout the winter due to lack of any significant thaws. Maximum snowpack depth is reached in March then a more rapid decrease in the snowpack occurs as summer approaches.

WATERSHEDS

Watersheds are areas of land containing a common set of streams and rivers that all drain into a single larger body of water, such as a larger river, a lake or an ocean. The Mackenzie River watershed which drains into the Beaufort Sea is one of the largest watersheds in the world. Large watersheds like the Mackenzie are commonly termed basins. All the rivers that drain into the Mackenzie, large and small, are part of the Mackenzie Basin Watershed, but also have their own smaller watersheds. Not only does water run into the streams and rivers from the surface of a watershed, but it also filters through the soil eventually draining into the streams and rivers.

THE MACKENZIE RIVER BASIN

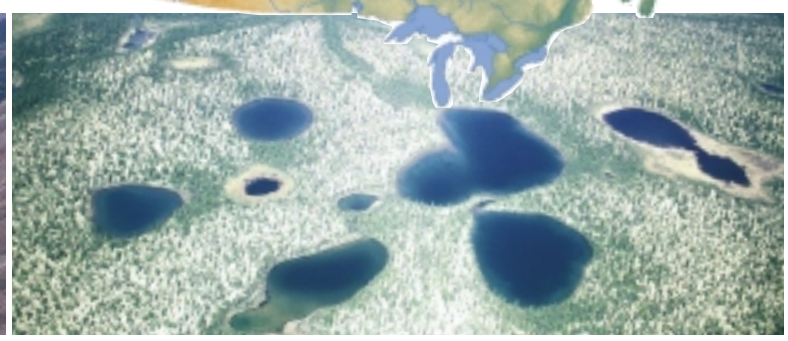
The Mackenzie River Basin begins at the headwaters of the Peace and Athabasca Rivers, and ends 4,200 kilometres later at the Beaufort Sea. The watershed is 1.8 million square kilometres in size, and drains one-fifth of Canada's land-base.

The Mackenzie River or Deh Cho (Big Water) begins at Great Slave Lake, forging a wide, 1,738 kilometre watercourse, heading "down north" across the Arctic Circle to the Beaufort Sea. Along the way, the Deh Cho's warm, shallow water passes boreal and taiga forest. Finally, its heavy burden of sand and silt is deposited into the channels, lakes and sandbars of the Mackenzie Delta which provides vital habitat for many Arctic species. Millions of migrating birds use the Mackenzie River valley as their main migratory route toward the delta.

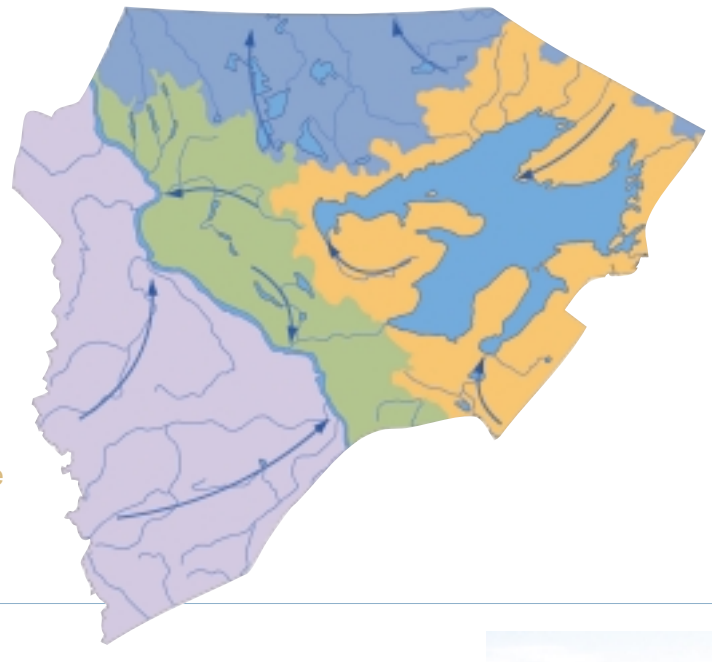
Mackenzie River

Great Bear River

Keele River



WHERE THE WATER FLOWS



The Sahtu can be seen as having four major directions of waterflow:

1) The **West Mackenzie Region**, in which water flows down from the Mackenzie mountains and whose watersheds drain into the west side of the Mackenzie River

2)The **East Mackenzie Region**, in which water flows eastward and whose watersheds flow into the Mackenzie River on it's east side.

3) The **Arctic Region**, in which water flows northward and whose watersheds flow directly into the Arctic ocean.

4)The **Great Bear Region**, in which all water flows into Great Bear Lake which then empties intothe Mackenzie River via Great Bear River.

BREAKUP *Lisa-marie Pierrot, Fort Good Hope, 2000*

I am going to tell you a story from when I was about six or seven years old. There is only so much that I can remember from when I was that age and younger. My family, some of my aunties and uncles, and my grandparents went out on the land for spring hunt. We's stay along the Mackenzie River at a place (across from) Grandview :

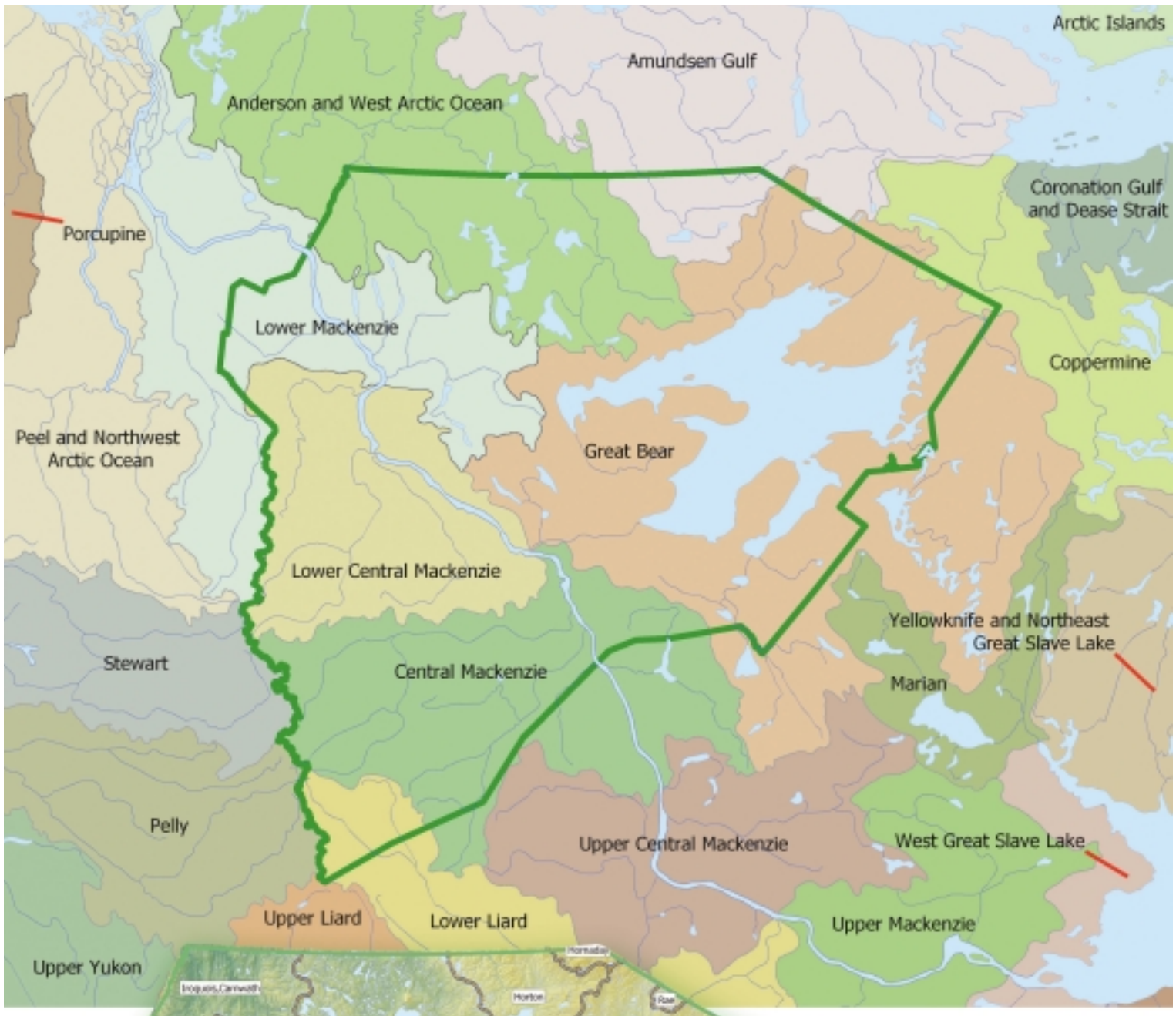
Here is one moment I will never forget, because it was so exciting. The ice was almost ready to go. One early morning, my dad and uncle went out hunting. They were gone all day. Everyone was sitting around after a hard day of work, when all of a sudden the ice cracked in half It slowly started to move.

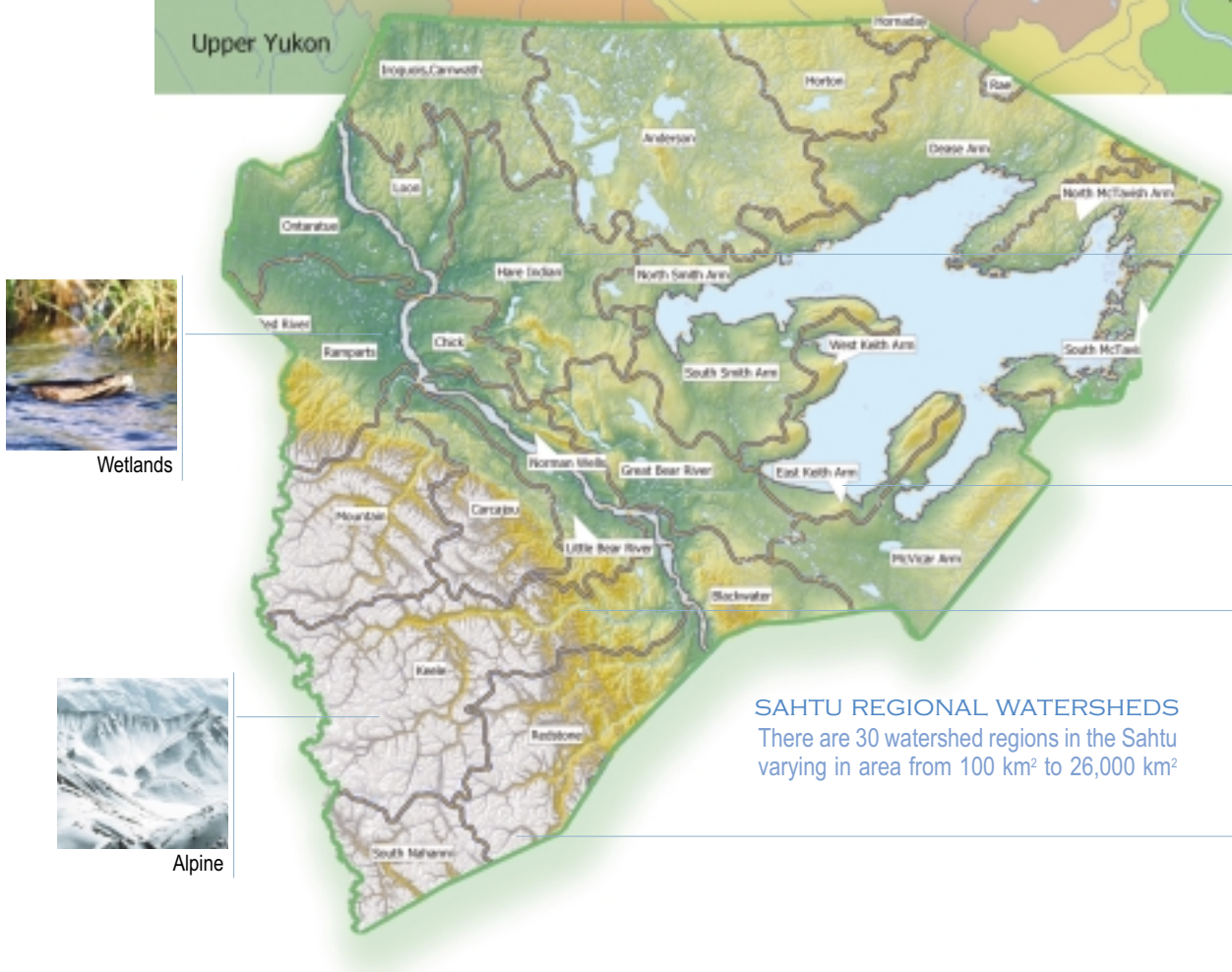
We all started to get very frightened because my dad and uncle were still not back from their hunt. The rest of us sat around in an endless wait for my dad and uncle, calling all the places we could to see if anyone up river had seen them. Finally we saw a little black dot at the end of the point on the river. Sure enough, it was them.

I can't really remember what had happened next, but what I do remember was that while the ice was moving, I was standing along the riverbank, watching a good friend of the family running on the ice while it was still moving. She saved our skiddoo from drowning. Somebody had left it on the ice before it started to move. We were very thankful that we had her there with us. If not, we would have never had a skiddoo for next winter.

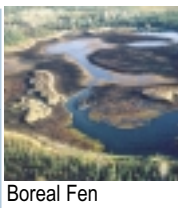
Spring break-up, Deline

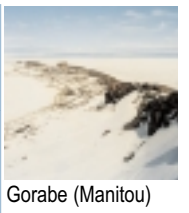
MAJOR WATERSHEDS FOUND IN THE SAHTU AND SURROUNDING REGIONS

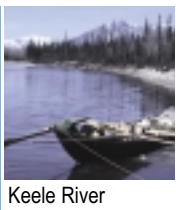




Wetlands


Boreal Fen


Gorabe (Manitou)

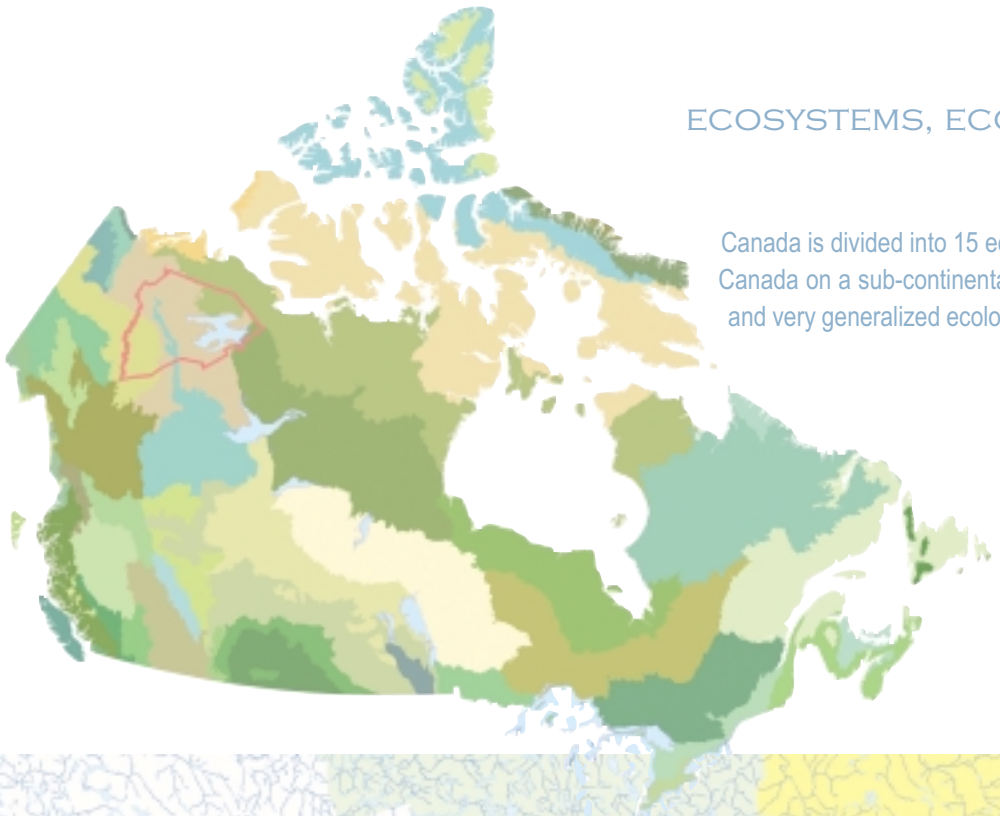

Keele River

Alpine


Mackenzie Mountains

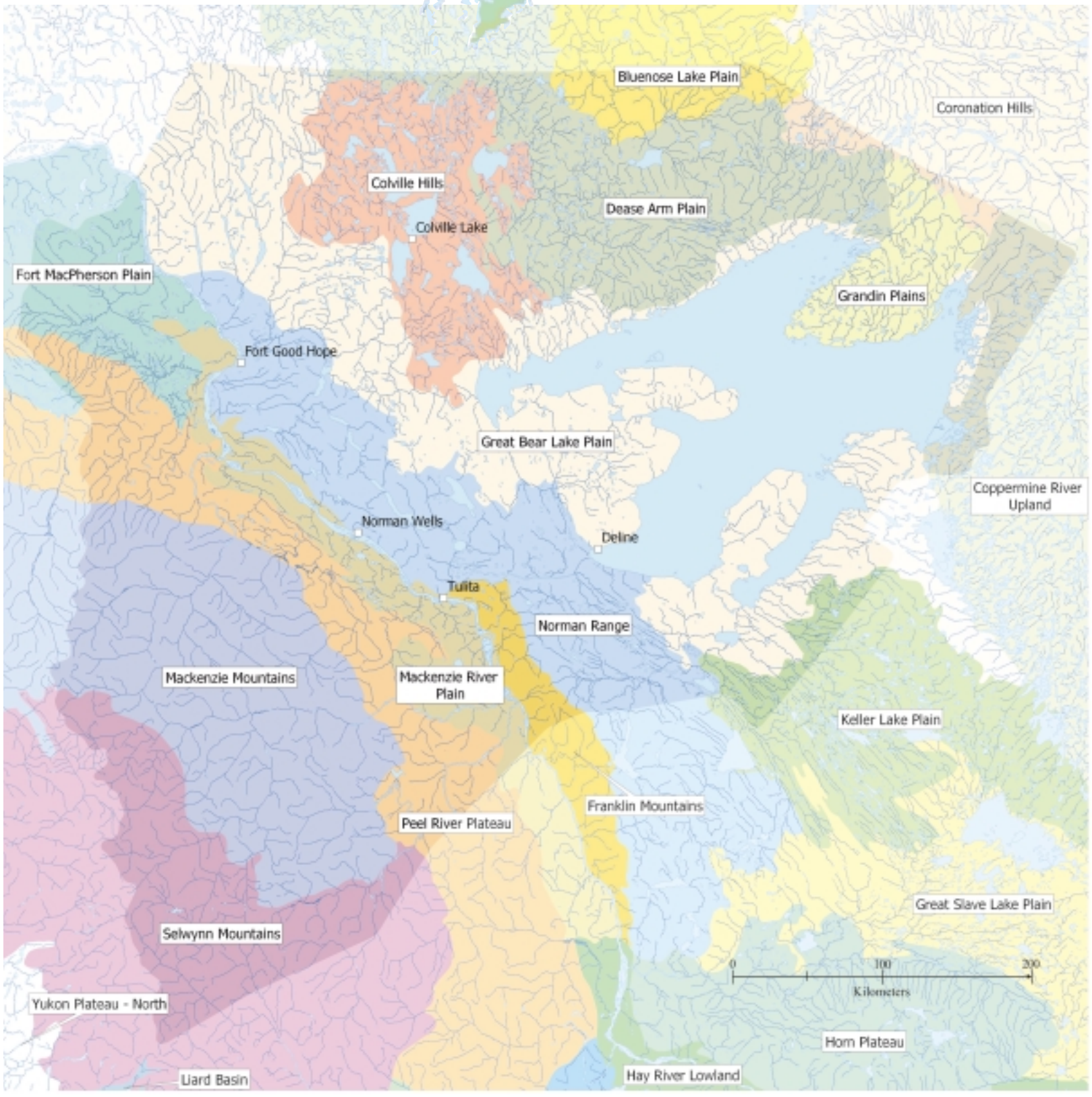
SAHTU REGIONAL WATERSHEDS

There are 30 watershed regions in the Sahtu varying in area from 100 km^2 to 26,000 km^2



ECOSYSTEMS, ECOZONES AND ECOREGIONS

Canada is divided into 15 ecozones. At the top of the hierarchy, ecozone defines the ecological mozaic of Canada on a sub-continental scale. They represent an area of the earth's surface representative of large and very generalized ecological units characterized by interactive and adjusting abiotic and biotic factors.



ECOPROVINCE
A subdivision of an ecozone characterized by major assemblages of structural or surface forms, faunal realms, and vegetation, hydrology, soil, and macro climate. There are 53 ecoprovines in Canada

ECOREGION
A subdivision of an ecoprovince characterized by distinctive regional ecological factors, including climate, physiography, vegetation, soil, water, and fauna. There are 194 ecoregions in Canada
The Sahtu has 15 ecoregions.

ECODISTRICT
Subdivision of an ecoregion is characterized by a distinctive assemblage of relief, landforms, geology, soil, vegetation, water bodies and fauna. Canada has 1021 ecodistricts.

The Sahtu has four ecozones represented within its boundaries:

Southern Arctic - short cool summers; mean daily July temperature + 1^0 C; mean daily January temperature - 30^0 C; annual precipitation 250 to 500 mm

Taiga Plains - long cold winters; mean daily July temperature + 10 to 15^0 C; mean daily January temperature - 22.5 to -3 0^0 C; 250 to 500 mm precipitation

Taiga Sheild - short cool summers; mean daily july temperature + 7.5 to + 17.5; mean daily January temperature - 17.5 to -27.5; 250-500 mm annual precipitation

Taiga Cordillera - summers warm in south, short and cool in north; mean daily July temperatur + 12 to + 15^0 C; mean daily January temp. - 25 to - 30^0 C; 300-700 mm annual precipitation

ECOREGIONS OF THE SAHTU

DEASE ARM PLAIN

Located north of Great Bear Lake, Dease Arm Plain is classified as having a high subarctic ecoclimate. Tall shrub tundra, usually consisting of dwarf birch and willow, is the most common vegetative cover. The southern boundary of the ecoregion encompasses the area of tundra and subarctic forest transition, where open, very stunted stands of black spruce and tamarack with secondary quantities of white spruce and ground cover of dwarf birch, willow, ericaceous shrubs, cottongrass, lichen, and moss, are predominant. This ecoregion's rolling surface, which is generally below about 300 m elevation, is covered by glacial drift and outwash. A number of hills reach about 460 m. A wide range of Cryosolic soils, as well as Eutric and Dystric Brunisolic soils, have formed on hummocky to undulating, loamy glacial till. Organic landforms are usually high-centred lowland polygons.

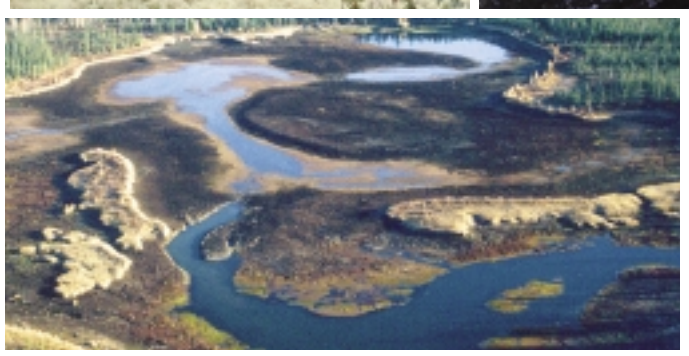
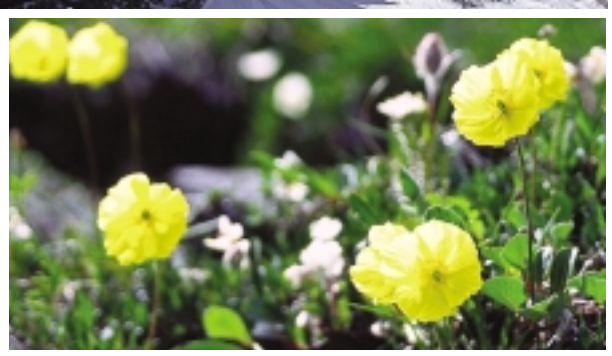
NORMAN RANGE

The Norman Range lies between the Mackenzie River and Great Bear Lake Plains. This large region has a low subarctic ecoclimate. Vegetation is dominated by open stands of black spruce with an understory of dwarf birch, Labrador tea, lichen, and moss. Drier and warmer sites tend to have more white spruce, paper birch, and some aspen. Wet sites are usually covered with bog-fen vegetation such as dwarf black spruce, Labrador tea, ericaceous shrubs, and mosses. The Norman Range forms a series of north-south-trending, linear, relatively low ridges, largely of resistant Palaeozoic carbonates, and reaching elevations of about 1040 m asl. Great Bear Plain, composed of Cretaceous strata, has a rolling surface generally below 500 m asl. The surface of the ecoregion is covered with steeply sloping to undulating glacial drift, colluvium, and organic deposits in the form of polygonal peat plateaus. Turbic and Organic Cryosols, as well as Eutric Brunisols, are the dominant soils.

FRANKLIN MOUNTAINS

The Franklin Mountain ecoregion and its low subarctic ecoclimate extends from Tulita down past Wrigly. The predominant vegetation is open stands of black spruce with an understory of dwarf birch, Labrador tea, lichen, and moss. Drier and warmer sites tend to have more white spruce, paper birch, and some aspen. Wet sites are usually covered with bog-fen vegetation such as dwarf black spruce, Labrador tea, ericaceous shrubs, and mosses. The Franklin Mountains form a series of linear, relatively low ranges and ridges, largely composed of resistant carbonates, that reach elevations of about 1525 m. This ecoregion's surface is covered with steeply sloping glacial drift, colluvium, and organic deposits in the form of polygonal peat plateaus. Turbic Cryosols, Eutric Brunisols, and Organic Cryosols are the dominant soils.



COLVILLE HILLS

Surrounding Colville Lake this ecoregion also has a high subarctic ecoclimate. The dominant vegetation is open, stunted stands of black spruce and tamarack with secondary quantities of white spruce, and a ground cover of dwarf birch, willow, ericaceous shrubs, cottongrass, lichen, and moss. Poorly drained sites usually support tussocks of sedge, cottongrass, and sphagnum moss. Low shrub tundra, consisting of dwarf birch and willow, is also common. The Colville Hills embrace several ridges of Palaeozoic carbonate strata that stand above the surrounding plains. The hills and ridges enclose basins which contain several large lakes in a netlike pattern with meshes of 15 km or more across. The lowlands lie at about 245–300 m above sea level (asl), whereas sinuous ridges reach elevations of 670 m. This hummocky to undulating plain is also characterized by extensive polygonal peat plateaus. Organic and Turbic Cryosols and Dystric Brunisols are the dominant soils in the ecoregion.

FORT MCPHERSON PLAIN

Another ecoregion classified as having a high subarctic ecoclimate Fort Mcphereson Plain's predominant vegetation consists of open, very stunted stands of black spruce and tamarack with secondary quantities of white spruce. It has a ground cover of dwarf birch, willow, ericaceous shrubs, cottongrass, lichen, and moss. Like the Colville Hills the poorly drained sites usually support tussocks of sedge, cottongrass, and sphagnum moss and the low shrub tundra consists of dwarf birch and willow. Cretaceous shale lie below the surface, and incorporates a broad, shallow basin in its southwestern section at about 120 m asl. In the northeast, isolated hills rise to about 460 m, where it consists of Palaeozoic carbonate rocks. Both the Arctic Red and the Ontaratue rivers follow deeply incised valleys through to the Mackenzie River. Turbic and Organic Cryosols with some Static Cryosols developed on level to undulating morainal and organic deposits are the dominant soils. Unfrozen Dystric and Eutric Brunisolic soils also occur. Wetlands cover over 25% of the area in the north of the ecoregion, over 50% of the area in the south.

GRANDIN PLAINS

The Grandin Plains cover the entire area on the east side of Great Bear Lake known as ?ehdaɬla (Caribou Point). The eoregion has a high subarctic ecoclimate. The latitudinal limits of tree growth are reached along its eastern boundary. The dominant vegetation is open, very stunted stands of black spruce and tamarack with secondary quantities of white spruce, and a ground cover of dwarf birch, willow, ericaceous shrubs, cottongrass, lichen, and moss. Low shrub tundra consists of dwarf birch and willow and poorly drained sites typically support tussocks of sedge, cottongrass, and sphagnum moss. Wetlands of peat plateau bogs, and ribbed and horizontal fens cover approximately 25% of the ecoregion. The Grandin Plain is covered by undulating glacial drift, raised beaches, and outwash deposits. Turbic Cryosols with Static and Organic Cryosols developed on loamy morainal and organic deposits are the dominant soils. Brunisolic soils have developed on unfrozen materials. The Grandin Plains also include a small portion of Great Bear Plain that is largely composed of Cretaceous shale.

GREAT BEAR LAKE PLAIN

This high subarctic ecoregion stretches across the widest section of the Sahtu and encopmasses the community of Deline. The latitudinal limits of tree growth are reached along its northern boundary. The predominant vegetation consists of open, very stunted stands of black spruce and tamarack with secondary quantities of white spruce and a ground cover of dwarf birch, willow, ericaceous shrubs, cottongrass, lichen, and moss. Like many of the Sahtu's ecoregions, the poorly drained sites support tussocks of sedge, cottongrass, and sphagnum moss and the low shrub tundra, consists of dwarf birch and willow. Composed of flat-lying Cretaceous shale and Devonian limestone strata, the surface of this ecoregion is generally below 310 m asl. As elevations gradually increase southward, entrenched river channels lie some 60–150 m below the surrounding surface. The ecoregion is generally covered by undulating glacial drift and outwash deposits. Turbic Cryosols with Static and Organic Cryosols developed on organic deposits with deep permafrost are the dominant soils. Unfrozen Organic and Brunisolic soils also occur.

KELLER LAKE PLAIN

Keller Lake Plain extends into a small portion of the region along the Sahtu's eastern edge. It is classified as having a low subarctic ecoclimate. The main vegetation is open stands of black spruce with an understory of dwarf birch, Labrador tea, lichen, and moss. Drier and warmer sites tend to have more white spruce, paper birch, and some aspen. Wet sites are usually covered with bog-fen vegetation such as dwarf black spruce, Labrador tea, ericaceous shrubs, and mosses. Wetlands cover over 25% of this ecoregion, which also includes the southeastern portion of Great Bear Plain and the northern section of Great Slave Plain. Composed of Cretaceous shale, its surface is generally below 310 m asl and is covered by undulating, peat-covered glacial drift and outwash deposits. Turbic and Organic Cryosols developed on organic and loamy morainal deposits are the dominant soils in the ecoregion.

MACKENZIE RIVER PLAIN

The Mackenzie River Plain is unique in the Sahtu with its subhumid high boreal ecoclimate. The ecoregion is a broad, rolling, drift-covered plain lying between the Mackenzie and Franklin mountains, into which the Mackenzie River is entrenched. Native vegetation consists predominantly of medium to tall, closed stands of black spruce and jack pine with an understory of feathermoss, bog cranberry, blueberry, Labrador tea, and lichens. White spruce, balsam fir, and trembling aspen occur in the warmer, more moist sites in the southern section of the region. Drier sites have more open stands of black spruce and jack pine. Low, closed and open stands of black spruce, ericaceous shrubs, and sphagnum mosses dominate poorly drained, peat-filled depressions. Wetlands cover 25–50% of the ecoregion, and are characteristically peat plateau bogs, and ribbed and horizontal fens. Dominant soils in the ecoregion are Organic and Turbic Cryosols and Eutric and Dystric Brunisols with some Regosols that have developed on terraced to rolling morainal, alluvial, lacustrine, and organic deposits.

PEEL RIVER PLATEAU

This high subarctic ecoregion is the plateau that rises above the Mackenzie River Plains to the Mackenzie Mountains. The predominant vegetation is open, very stunted stands of black spruce and tamarack with secondary quantities of white spruce, and a ground cover of dwarf birch, willow, ericaceous shrubs, cottongrass, lichen, and moss. Poorly drained sites usually support tussocks of sedge, cottongrass, and sphagnum moss. The low shrub tundra supports dwarf birch and willow. The surface of this ecoregion is characterized by truncated and upturned edges of Palaeozoic and Mesozoic strata, forming terraces, and rounded plateaus. Some portions of the ecoregion in the southwest are unglaciated, but most of its surface is covered by thin, discontinuous, hummocky to dissected glacial drift and organic deposits. Wetlands are present on over 25% of the ecoregion, characterized by peat plateau bogs, and ribbed and horizontal fens. Turbic and Organic Cryosols with some Eutric Brunisols and Static Cryosols are the dominant soils in the ecoregion.

MACKENZIE MOUNTAINS

The Mackenzies show evidence of localized alpine and valley glaciation. The region is characterized by alpine tundra at upper elevations and subalpine open woodland vegetation at lower elevations. Alpine vegetation consists of lichens, mountain avens, intermediate to dwarf ericaceous shrubs, sedge, and cottongrass in wetter sites. Barren talus slopes are common. Subalpine vegetation consists of discontinuous open stands of stunted white spruce and occasional alpine fir in a matrix of willow, dwarf birch, and Labrador tea. The Ogilvie Mountains, composed of Palaeozoic and Proterozoic sedimentary strata intruded by granitic stocks, reach 2134 m asl in elevation. The Wernecke Mountains are formed of phyllite and nearly horizontal carbonate rocks carved by glaciation. They are divided into several ranges by broad northwesterly-trending valleys. Alluvium, fluvioglacial deposits, and morainal veneers and blankets are dominant in the region. Rock outcrops are common at higher elevation. Turbic Cryosols with some Dystric Brunisols and Regosols occur on steeply sloping colluvium.

SELWYN MOUNTAINS

For the most part this northern extension of the Rocky Mountains in the southern most tip of the Sahtu is a rugged mountain wilderness. The highest mountains found in the Northwest Territories occur in this ecoregion. The ecoregion is characterized by alpine tundra at upper elevations and by subalpine open woodland vegetation at lower elevations. Alpine vegetation consists of crustose lichens, mountain avens, dwarf willow, and ericaceous shrubs; sedge and cottongrass are associated with wetter sites. Barren talus slopes are common. Subalpine vegetation consists of discontinuous open stands of stunted white spruce, and occasional alpine fir and lodgepole pine, in a matrix of willow, dwarf birch, and northern Labrador tea with a ground cover of moss and lichen. Sedge, cottongrass, and mosses occur in wet sites. The Selwyn Mountains, which have been extensively glaciated, are composed of Palaeozoic and Proterozoic strata intruded by granitic stocks. They are divided into several ranges by broad, northwesterly-trending valleys. Some contain alpine and valley glaciers. Mount Keele, at 2950 m asl, is the most outstanding peak. Local alpine glaciers exist in the highest ranges of this ecoregion. Bare rock outcrops and rubble are common at higher elevation. Dystric and Eutric Brunisols on alluvial, fluvioglacial, and morainal veneers and blankets are dominant in the region. Static and Turbic Cryosols with Dystric Brunisols or Regosols are developed on upper-elevation, steeply-sloping colluvium.

COPPERMINE RIVER UPLAND

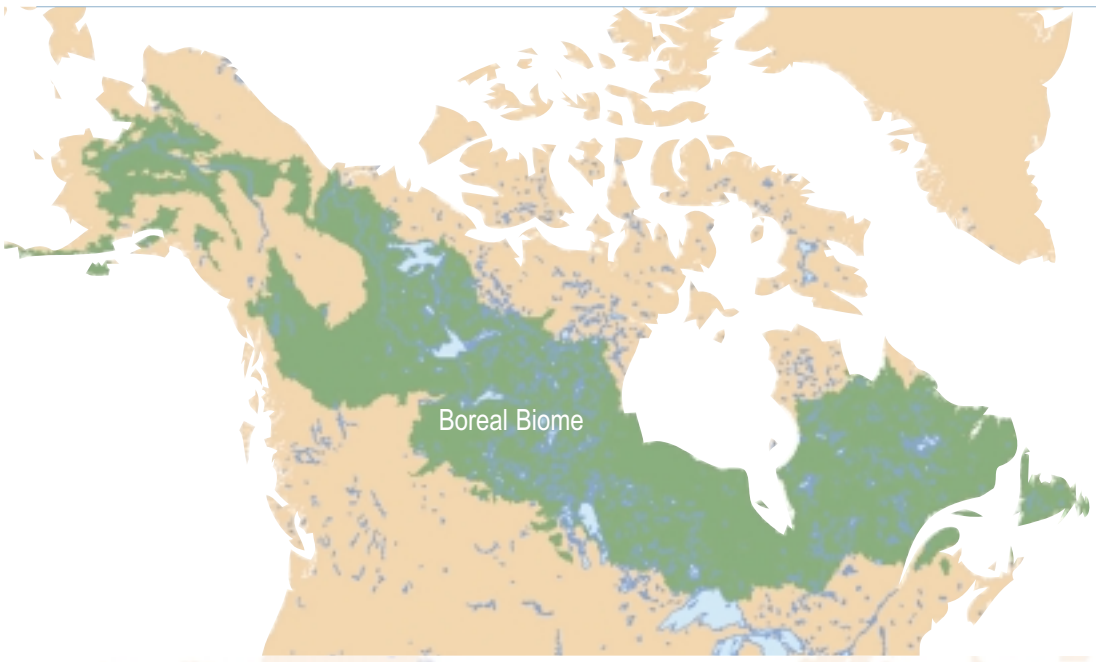
The Coppermine River Upland the edges into the upper eastern area of the Sahtu is predominantly a high subarctic ecoclimate region. It is part of the tundra and boreal forest transition, where the latitudinal limits of tree growth are reached. The predominant vegetation consists of open, very stunted stands of black spruce and tamarack with secondary quantities of white spruce and a ground cover of dwarf birch, willow, ericaceous shrubs, cottongrass, lichen, and moss. Poorly drained sites typically support tussocks of sedge, cottongrass, and sphagnum moss. Low shrub tundra, consisting of dwarf birch and willow, is also common. This ecoregion includes the western half of the Bear-Slave Upland, which consists mainly of massive Archean rocks that form broad, sloping uplands, plateaus, and lowlands. The surface is typical of the bare rock parts of the Shield. Numerous lakes fill the lowlands, and rounded rocky hills reach 490 m asl in elevation. Bare rock outcrops are common, and Dystric Brunisols with some Turbic, Static, and Organic Cryosols are the dominant soils in the ecoregion. The soils have formed on discontinuous veneers and blankets of hummocky to rolling, sandy morainal, fluvioglacial, and organic deposits.

BLUENOSE LAKE PLAIN

The Bluenose Lake Plain along the Sahtu's north east edge has a low arctic ecoclimate. Shrub tundra vegetation forms a nearly continuous cover, consisting of dwarf birch, willow, northern Labrador tea, Dryas spp., and Vaccinium spp. Tall dwarf birch, willow, and alder occur on warm sites; wet sites are dominated by sphagnum moss and sedge. Much of the ecoregion is underlain by nearly flat-lying, Paleozoic carbonates and late Proterozoic sediments. The landscape surface reaches elevations of 365–610 m asl, the higher parts being in the south. The western portion of the region is rocky where exposed bedrock outcroppings are common. Eastern sections are covered by rolling to undulating glacial drift. With few exceptions, lakes are small and scattered. Streams gather size northward and become entrenched 60–120 m below the surface. Turbic Cryosols developed on rolling glacial moraine are the dominant soils, and are underlain by continuous permafrost with medium to high ice content in the form of ice wedges.

CORONATION HILLS

A thin edge of the Coronation Hills occupies the northeast section of the Sahtu. Like the Bluenose Lake Plains it is classified as having a low arctic ecoclimate. The nearly continuous cover of shrub tundra vegetation consists of dwarf birch, willow, northern Labrador tea, Dryas spp., and sedge tussocks. Tall dwarf birch, willow, and alder occur on warm sites; wet sites are dominated by willow and sedge. The southern boundary of the region has a mix of tundra vegetation and open, dwarf coniferous forest. The ecoregion is composed of large, rounded, low hills and lowlands consisting of Palaeozoic carbonates and stratified, down-faulted, and folded Proterozoic sediments. Surfaces range in elevation 200–600 m asl in Coronation Hills. Turbic and Static Cryosols developed on undulating to ridged glacial tills, fluvioglacial, and marine deposits are the dominant soils in the ecoregion. Organic Cryosols are associated with organic materials composing peat plateaus and high centre polygons.



BOREAL BIOME

Much of the Sahtu is located in the boreal or “northern” forest – Canada’s largest biome. The boreal biome occupies 35% of the total Canadian land area and 77% of Canada’s total forest land, stretching between northern tundra and southern grassland and mixed hardwood trees. Named after Boreas, the Greek god of the North Wind, the boreal biome starts in the Yukon Territory, forming a band almost 1000 kilometres wide, and sweeps southeast towards Newfoundland. To its north is the treeline, and beyond that the tundra of the Arctic.

By far, the most dominant tree species are conifers, which are well-adapted to the harsh climate and thin, acidic soils. Black and White Spruce are characteristic species of this region along with Tamarack, Jack Pine and Balsam Fir. There are also deciduous trees, which are at times mixed in among the conifers, especially in more southern areas - they may include White Birch and Poplars. Over 200 bird species breed here, as well as being home to species such as Caribou, Lynx, Black Bear, Moose, Coyote, Timber Wolf and recovering populations of Wood Bison.

Also characteristic of the boreal biome are innumerable water bodies: bogs, fens, marshes, shallow lakes, rivers and wetlands, mixed in among the forest, and holding a vast amount of water. The winters are long and severe while summers are short, though often warm.

TREELINE

There is evidence that the treeline once extended well north of Inuvik and the Arctic coast some 9000 years ago; it was of course pushed many hundreds of miles to the south, into what is now the central USA, by ice ages in the not so distant past.

Trees grow farther north through the Sahtu along the Mackenzie Valley up to the Mackenzie Delta almost to the shores of the Beaufort Sea, farther than anywhere else in Canada. The Mackenzie River and Valley create a micro-climate that is much friendlier to tree growth than other places at the same latitude.

It is a lack of summer warmth that sets a northern limit to tree growth. This explains why the treeline does not lie neatly along a parallel of latitude. It runs diagonally south-eastward from a point just north of Inuvik, to the southeast corner of the NWT.

The treeline is controlled by the following factors:

- Active Layer
- Altitude
- Aspect/Orientation
- Climate
- Latitude
- Permafrost
- Shelter
- Soils
- Water Availability

treeline

Where the permafrost is close to the surface, the active or seasonally thawed soils are too thin to accommodate roots. A tree’s height is limited by the depth and holding power of the soil it is rooted in. Therefore, trees become shorter and smaller as the treeline is approached.

While direct economic forest resouces in the Sahtu such as logging are limited by infrastructure, population and tree size, the forests play a key role in supporting activites that remain esseantial parts of life in the Sahtu. Wood is still used by many for home heating and cabin construction. The Boreal forest also provides the habitat for wildlife which Dene and non-Dene rely on for food and income.

Deline log building project- top
Harvesting logs from the Mackenzie River - middle
Collecting winter fire wood supply - above

Fire destroys and renews. The boreal forest of the Sahtu has been shaped by fire for thousands of years. All life in these forests has in some way adapted to or, in many cases, come to rely on the presence of natural wildfire. In the heart of boreal, natural fire frequency probably ranges from 50 to 200 years. Some areas burn more frequently, some less. Below is a map showing the forest fire history of the Sahtu.

WHAT DOES FIRE DO FOR THE FOREST?

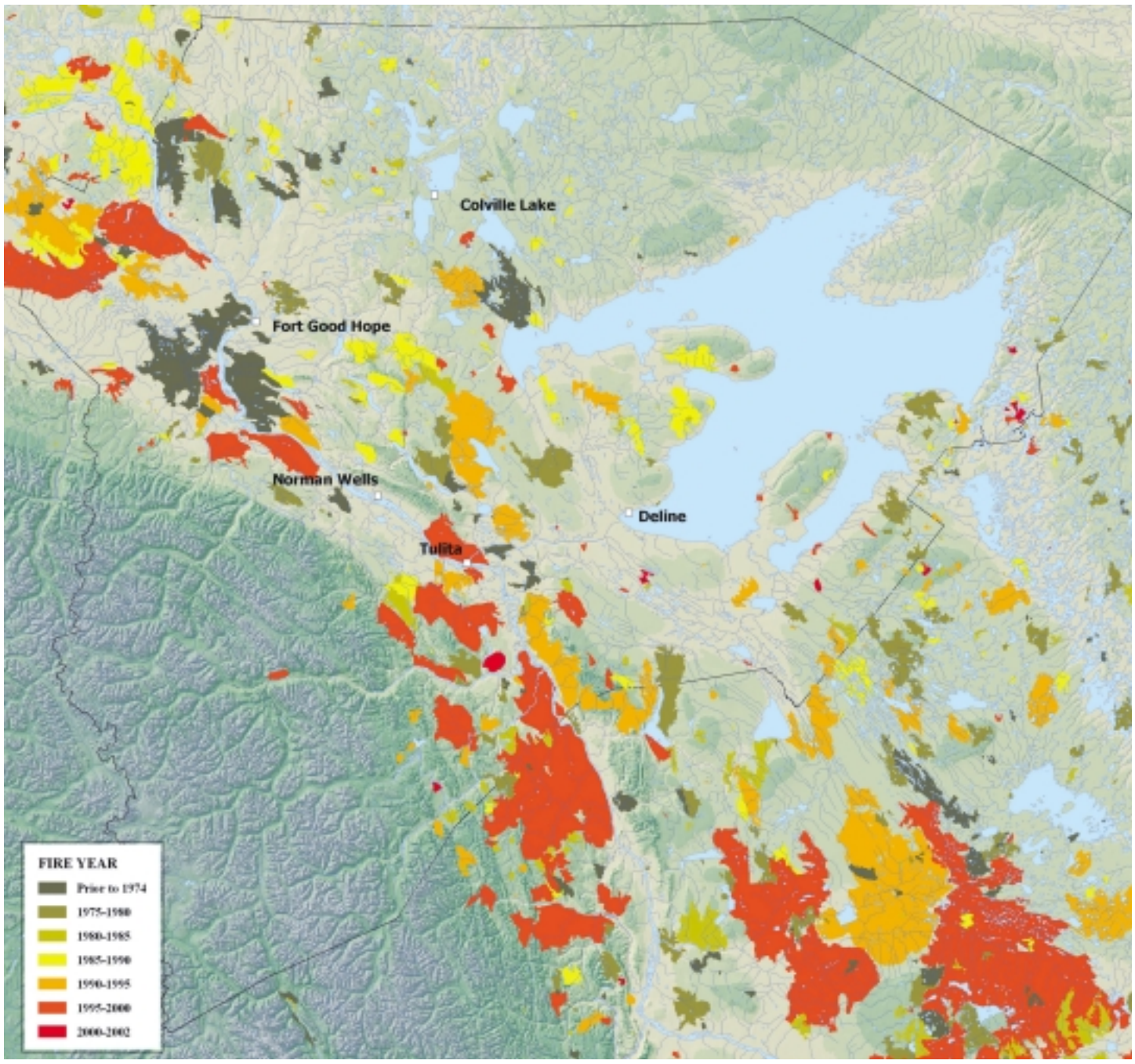
- breaks rock and builds soil
- kills pathogens and bacteria
- clears accumulated leaf (needle) litter exposing good mineral-soil seed bed
- fire blackened soil absorbs light, creating greenhouse effect for seeds and seedlings
- knocks back fire-sensitive/shade-tolerant trees
- helps re-establishment of conifer forest
- recycles nutrients locked up in leaf litter and woody debris.

Black spruce and Jack pine are well adapted to fire. Black Spruce cones tend to sit high on the tree to ensure the best chance of seed survival during a fire. Their semi-waxen seal often breaks open after a fire, allowing reseeding of the burned area.

Jack pine are thin barked and highly resinous. Biologists have described these trees as “roman candles” that can literally explode into flame. Jack pine cones only open under high heat – 50 degrees Celsuis or more – and its seedlings need the open post-fire conditions to thrive.

Natural fires can range drastically in intensity, from smouldering ground fires that slowly clear off leaf litter to searing crown fires that destroy all vegetation in their path. Interestingly, it is now widely acknowledged that our efforts to suppress wild fires may in fact be skewing the pattern of wildfires toward less frequent, but much larger, hotter fires. By allowing dead wood and other fuels to build up in the forest, we are actually setting the stage for more destructive fires.

FOREST FIRE HISTORY IN THE SAHTU



top - Tulita fire 1995
middle - water bomber demonstration
above - fire crewpreson puts out hot spot