



Lecture 3

Canada's Physical Geography

January 19, 2016

Assignment #1

De-coding Regional Identity

WEIGHT: 15%

DUE: **February 2nd, 2016**

DESCRIPTION: The assignment requires that you submit a two page report examining a region of your choice through the lens of a “cultural text”. Students will select a text (a piece of artwork, song, poem or photograph) and use it as an entry point for the identification, definition, and delimitation of a geographical region in Canada based on its features (physical, economic, political, social and/or cultural). Students are required to reference at least 3 academic/credible sources.

Assignment #1

De-coding Regional Identity

Assignments should contain the following elements:

- Your name, student number and TA Group #
- Assignment # and a **clear title** that captures the imagination
- Copy of the cultural text (e.g. image, poem, photograph, or other item; it is not included in the page count)
- Brief description of selected cultural “text”
- Go beyond a “surface read” of the cultural text. Make reference to as many features as possible (at least two of the following: physical, economic, political, social/cultural)
- Use 12 point font and double-spaced
- Bibliography is not included in the page count

Assignment #1

De-coding Regional Identity

MARKING SCHEME:

Introduction/description of your cultural text	/5
Analysis of regional features through the text	/15
Quality and clarity of writing	/2
Bibliography (completeness and quality of sources)	/3
Total	/25 marks total

Introduction

- Physical geography helps us understand the regional nature of our world
- Why is Canada's physical geography so essential to an understanding of its regional geography?
- Physical geography poses an underlying framework that shapes Canada's national and regional character

Physical Variations within Canada

- Physical geography (e.g., climate and landforms) varies across Canada
- Major landforms are the basis of 7 physiographic regions in Canada
- Regional geographers are interested in the interactive two-way relationship between people and the physical world, and how this relationship and the resultant human landscapes vary

Physical Variations within Canada, cont'd

- Physical geographers are concerned with all aspects of the physical world (physiography, climate, vegetation)
- Regional geographers are more interested in:
 - How physical geography varies and influences human settlement
 - The effect of human activities on the natural environment

Physical Variations within Canada, cont'd

- Important points:
 - Physical geography has distinct and unique regional patterns across Canada
 - Physiographic regions represent one aspect of this natural diversity
 - Climate, soils, and natural vegetation provide the basis for biodiversity across Canada
 - Human activity is changing the natural environment into an urban industrial landscape

The Nature of Landforms

- Three principal types of landforms:
 - Mountains
 - Plateaus
 - Lowlands
- These are actively shaped and reshaped by various processes:
 - Denudation
 - Weathering
 - Erosion
 - Deposition

Physiographic Regions

- A physiographic region is a large area of the earth's crust that has three characteristics:
 - It extends over a large, contiguous area with similar relief features
 - Its landform has been shaped by a common set of geomorphic processes
 - It possesses a common geological structure and history

Physiographic Regions, cont'd

- Canada has 7 physiographic regions:
 - The Canadian Shield
 - The Cordillera
 - The Interior Plains
 - The Hudson Bay Lowlands
 - The Arctic Lands
 - The Appalachian Uplands
 - The Great Lakes–St Lawrence Lowlands

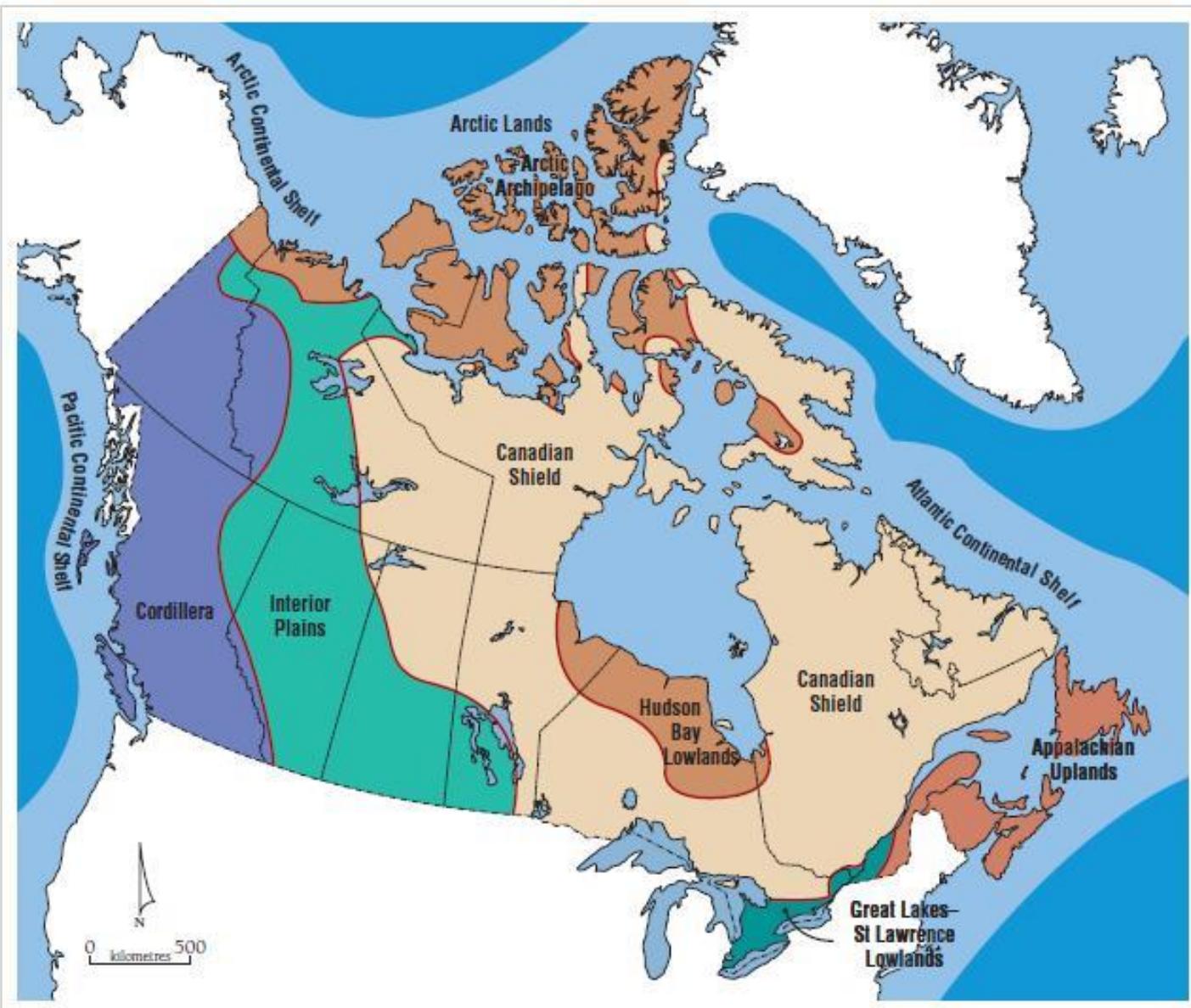


Figure 2.1 Physiographic regions and continental shelves in Canada

The seven physiographic regions are all different. The Arctic Lands is the most complex, consisting of a dozen large islands and numerous small islands that have been subjected to various geological events resulting in a mix of lowlands, uplands, and mountains. Together, these islands are known as the Arctic Archipelago. The Canadian Shield is the largest physiographic region and it extends beneath the Interior Plains, the Hudson Bay Lowlands, and the Great Lakes-St Lawrence Lowlands. The Cordillera and the Appalachian Uplands are products of plate tectonic activities—in the former case, less than 200 million years ago. The mountains of the Appalachian Uplands, on the other hand, formed nearly 500 million years ago.

Physiographic Regions, cont'd

- Each region has a different geological structure and its own topography
 - Different energy and mineral resources have shaped regional economies
 - Glaciation radically altered the geography of Canada
 - Different challenges and opportunities for human activity

Physiographic Regions, cont'd

- The Canadian Shield
 - The largest physiographic region in Canada, extending over nearly half of the country's land mass
 - Rock-like surface consists mainly of rugged, rolling upland
 - During last ice advance, surfaces were subjected to glacial erosion and deposition
 - Contains wealth of varied mineral resources



Photo 2.1

Beyond the treeline, the rugged nature of the Canadian Shield, stripped of most overlying material, exposes bare bedrock on Melville Peninsula, Nunavut. As observed in the photograph, the Laurentide Ice Sheet dramatically altered the surface by scouring, scratching, and polishing its surface. Only a few rocks and boulders were deposited when the ice sheet melted. These boulders are called erratics.

Reproduced with the permission of Natural Resources Canada 2013,
courtesy of the Geological Survey of Canada (Photo Glacially Polished and
Striated Bedrock, Melville Peninsula, Nunavut "2002-456" by Lynda Dredge)

Physiographic Regions, cont'd

- The Cordillera
 - A complex region of mountains, plateaus, and valleys that occupies over 16% of Canada
 - North–South alignment extends from southern British Columbia to Yukon; western border is Pacific Ocean
 - Formed by plate tectonics
 - The Rocky Mountains are the best known of the mountain ranges



Photo 2.3

Located along the Continental Divide between British Columbia and Alberta, the Athabasca Glacier forms part of the massive Columbia Icefield. Known as the “mother of rivers,” the meltwaters from the Columbia Icefield nourish the Saskatchewan, Columbia, Athabasca, and Fraser river systems, the waters of which empty into three oceans—the Atlantic, Arctic, and Pacific oceans.

Physiographic Regions, cont'd

- The Interior Plains
 - A vast and geologically stable sedimentary plain that covers nearly 20% of Canada
 - Considered a stable geological region
 - Beneath the surface, valuable deposits of oil and gas (fossil fuels) are in sedimentary structures known as basins



Photo 2.5

The sedimentary strata dating back to the late Cretaceous Period remain virtually undisturbed in the Alberta Badlands, but these horizontal strata have been exposed by stream erosion when vast meltwaters associated with the melting of the two ice sheets flowed through the Red Deer River and its tributaries. These quick-moving waters easily cut through soft sedimentary rocks of the Interior Plains to reach rock layers that date back to the days of dinosaurs, some 70 million years ago. The Dinosaur Trail that explores these badlands and the Royal Tyrrell Museum of Paleontology are located near Drumheller, Alberta.

Physiographic Regions, cont'd

- The Hudson Bay Lowlands
 - Comprises 3.5% of Canada
 - Consist of a thin cover of marine sediments deposited by the Atlantic Ocean 10,000–12,000 years ago
 - After ocean receded there was isostatic rebound with some water remaining
 - Permafrost is widespread
 - The youngest physiographic region
 - Has very small human settlements

Reproduced with the permission of Natural Resources Canada 2013,
courtesy of the Geological Survey of Canada (Photo Ice-wedge
polygons and thermokarst ponds in peatlands, Hudson Bay Lowlands,
Manitoba, "2001-124" by Lynda Dredge)



Photo 2.6

The Hudson Bay Lowlands is a vast wetland where the lack of slope and the presence of permafrost restrict the development of a drainage system. Consequently, this lowland is dotted with myriad ponds and lakes. Muskeg prevails while black spruce occupies the higher, better-drained land made up of terraces (old sea beaches) and drumlins. The northern half of the Hudson Bay Lowlands lies beyond the treeline.

Physiographic Regions, cont'd

- The Arctic Lands
 - Lies north of the Arctic Circle, and stretches across nearly 10% of Canada
 - A complex composite of coastal plains, plateaus, and mountains
 - Three principal sub-regions:
 - the Arctic Platform: central plateaus with sedimentary rock
 - the Arctic Coastal Plain: western edge, Yukon into NWT
 - the Innuitian Mountain Complex: eastern border
 - Ground consists of permafrost



David Nunuk/Science Photo Library

Photo 2.7

Basalt on Axel Heiberg Island, Nunavut. Basalt is a hard, black volcanic rock that, when cooled, can form various shapes, including tabular columns. Because they are resistant to erosion, basalt columns often form prominent cliffs. These weathered basalt columns date to the Paleozoic era (Table 2.1). At that geological time, North America, Greenland, and Eurasia broke into separate landmasses.

Physiographic Regions, cont'd

- The Appalachian Uplands
 - Represents only 2% of Canada's land mass
 - Found in eastern Canada
 - Consists of the northern section of the Appalachian Mountains
 - Weathering and erosion have worn down these mountains
 - PEI is exception with sandstone rock making fertile land



Cape Breton/Appalachian Uplands. Ivy Images

Photo 2.8

The Appalachian Uplands have sustained much erosion and the resulting landscape represents “worn-down” mountains. In rugged Cape Breton Highlands National Park, a table-like surface or peneplain lies between steep valleys carved by streams.

Physiographic Regions, cont'd

- The Great Lakes–St Lawrence Lowlands
 - A small but important region
 - The smallest physiographic region, comprising less than 2% of the area of Canada
 - Favourable location makes the region home to Canada's main ecumene (settled land) and manufacturing core
 - Contains some of the most fertile agricultural land in Canada



Photo 2.9

In the lower Great Lakes section of the Great Lakes–St Lawrence Lowlands, the last glaciation formed a hummocky moraine landscape with widespread till deposits. Stranded ice blocks from the last glaciation left behind depressions that became filled with water. The gently rolling landscape is underlain by limestone.

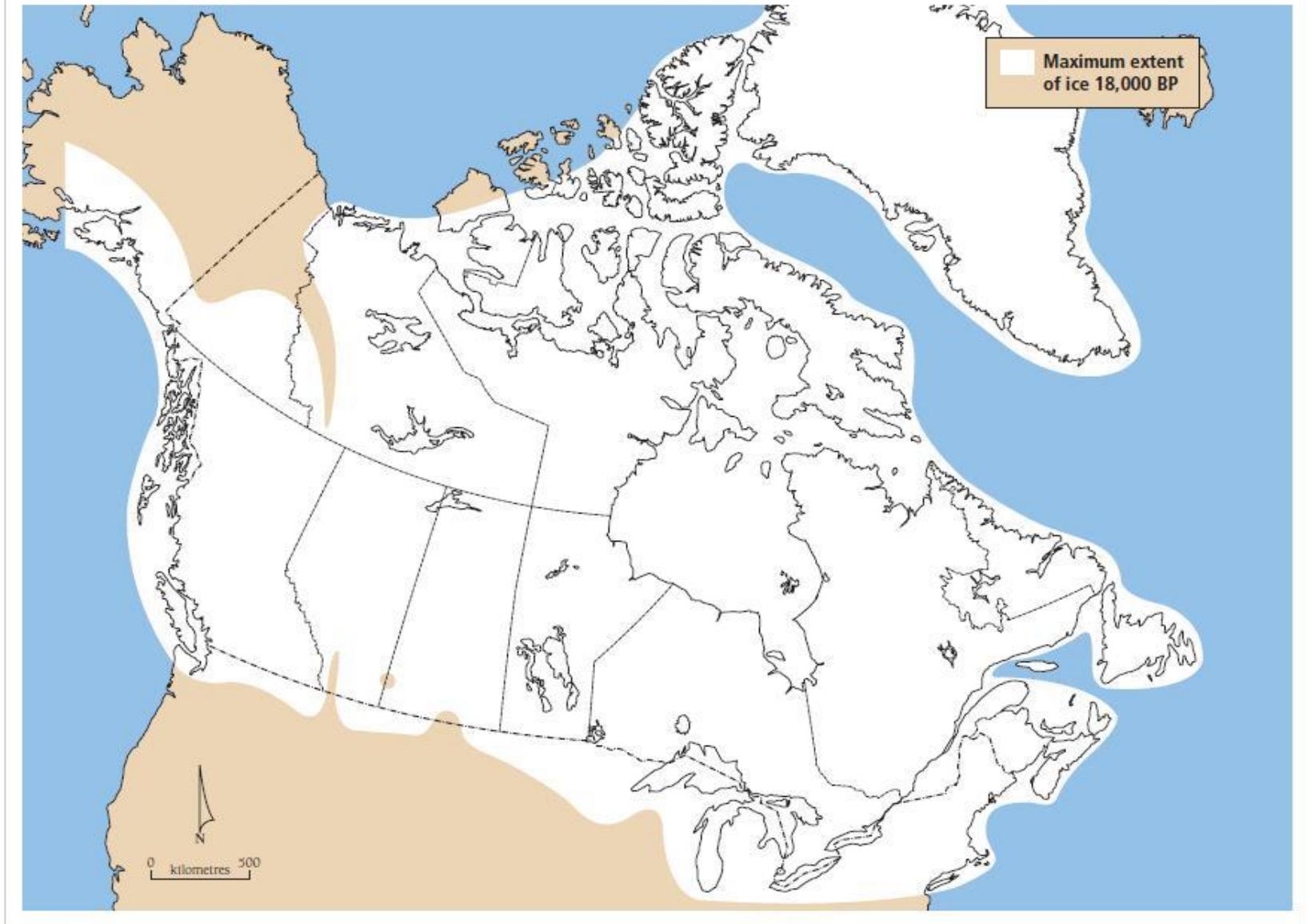


Figure 2.2 Maximum extent of ice, 18,000 BP

The last advance of the late Wisconsin ice age (the combined Laurentide and Cordillera ice sheets) covered almost all of Canada and extended into the northern part of the United States around 18,000 BP. Geologists have believed that the present “warm” climate is an interlude before the next ice age, but climate scientists see the current warming as a product of industrialization. (For more on global warming, see the discussion on this topic later in this chapter under the subheading, “Canada and Global Warming.”)

Geographic Location

- Main features of Canada include its northern location and its large longitudinal and latitudinal extent
- Implications of Canada's location for development vs. the United States
- Implications of Canada's variation in longitude and latitude
 - Standard time: 6.5 time zones across the country
 - Why?
 - Climate varies with distance from equator (latitude)

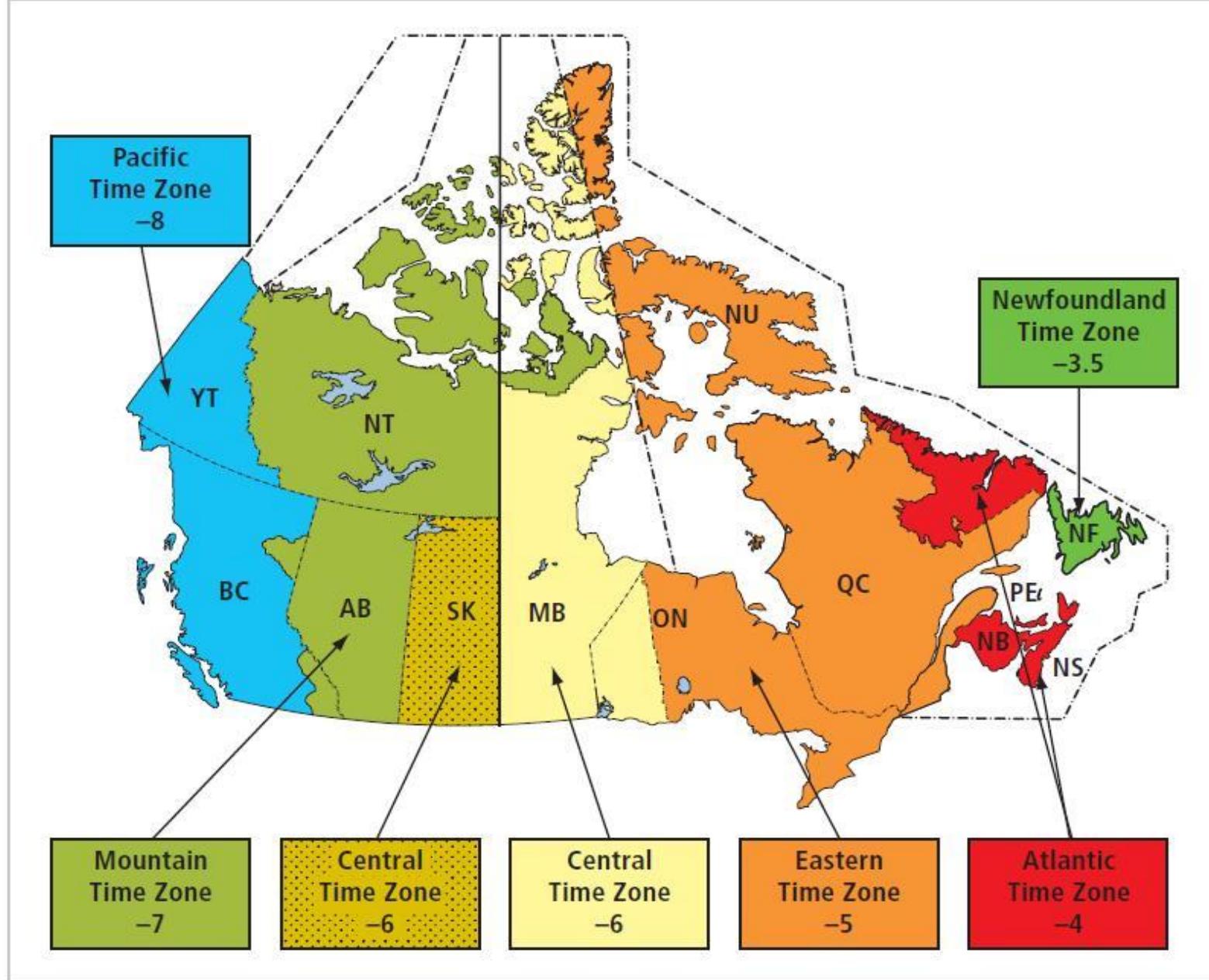


Figure 2.3 Time zones

Climate

- Climate describes average weather conditions for a specific place or region based on past weather over a very long period of time
 - Weather refers to the current state of the atmosphere with a focus on weather conditions that affect people living in a particular place for a relatively short period of time
- “Climate is what we can expect while weather is what we get”

Climate, cont'd

- Canadian climate imagined?
 - “Mon pays ce n'est pas un pays, c'est l'hiver” (“My country is not a country, it is winter”) (Gilles Vigneault)

Climate, cont'd

- Climate factors
 - Canada's climate is the product of three dominate factors:
 1. Solar energy / latitude
 2. Global circulation system: winds, air masses, and ocean currents
 3. Marine and continental air masses / “continental effect”

Climate, cont'd

- There are seven different climatic zones
- Climatic zone: an area of the earth's surface where similar weather conditions occur
- Extent determined by long-term data of annual, seasonal, and daily temperatures and precipitation

Climate, cont'd

- Canada has 7 climatic zones
 - Pacific
 - Cordillera
 - Prairies
 - Great Lakes–St Lawrence
 - Atlantic
 - Subarctic
 - Arctic
- Most of Canada is covered by Arctic and subarctic zones

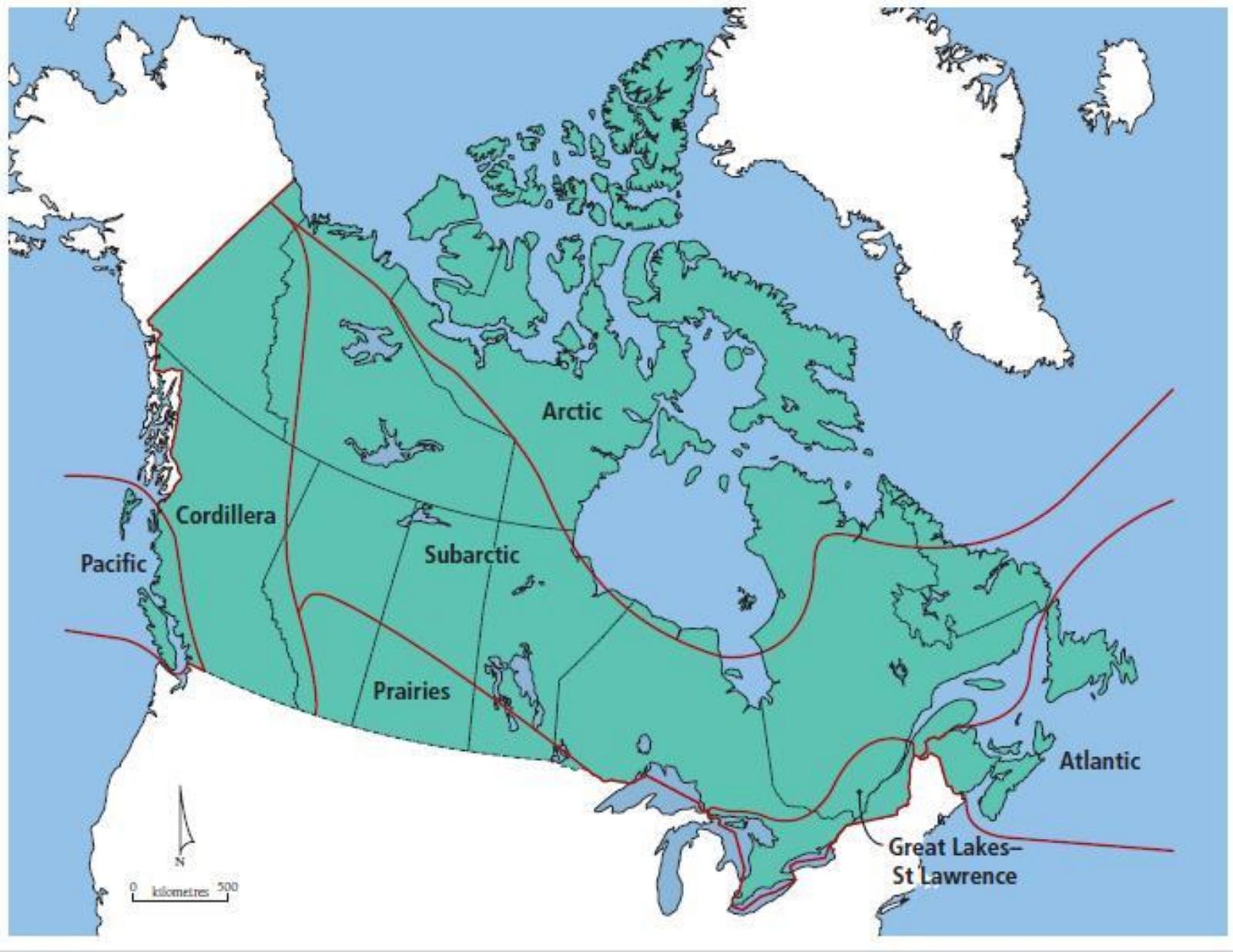


Figure 2.4 Climatic zones of Canada

Each climatic zone represents average climatic conditions in that area. Canada's most extensive climatic zone, the Subarctic, is associated with the boreal forest and podzolic soils. In spite of warmer annual temperatures over the short-term, boundaries of climatic zones remain unchanged.

Climate, cont'd

- Air masses
 - Large sections of the atmosphere with similar temperature and humidity characteristics
 - Form over source regions
 - Five air masses: Pacific, Atlantic, Gulf of Mexico, Southwest US, and Arctic
- Precipitation
 - Types: convectional, frontal, and orographic
 - Rain shadow effect

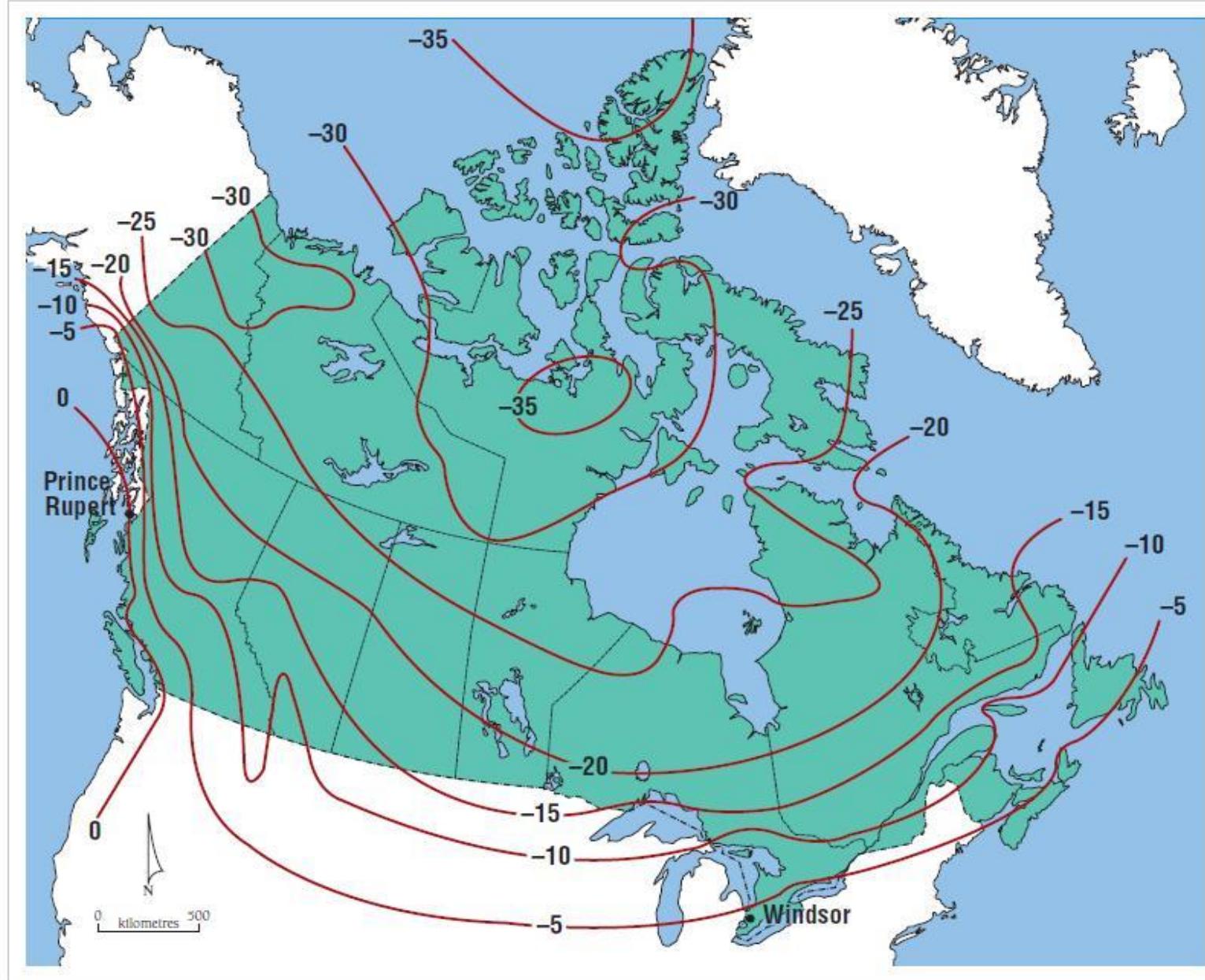


Figure 2.5 Seasonal temperatures in Celsius, January

The moderating influence of the Pacific Ocean and its warm air masses is readily apparent in the 0 to -5°C January isotherm. For example, Prince Rupert, located near 55° N , has a warmer January average temperature (0°C) than Windsor (-2°C), which is located near 42° N .

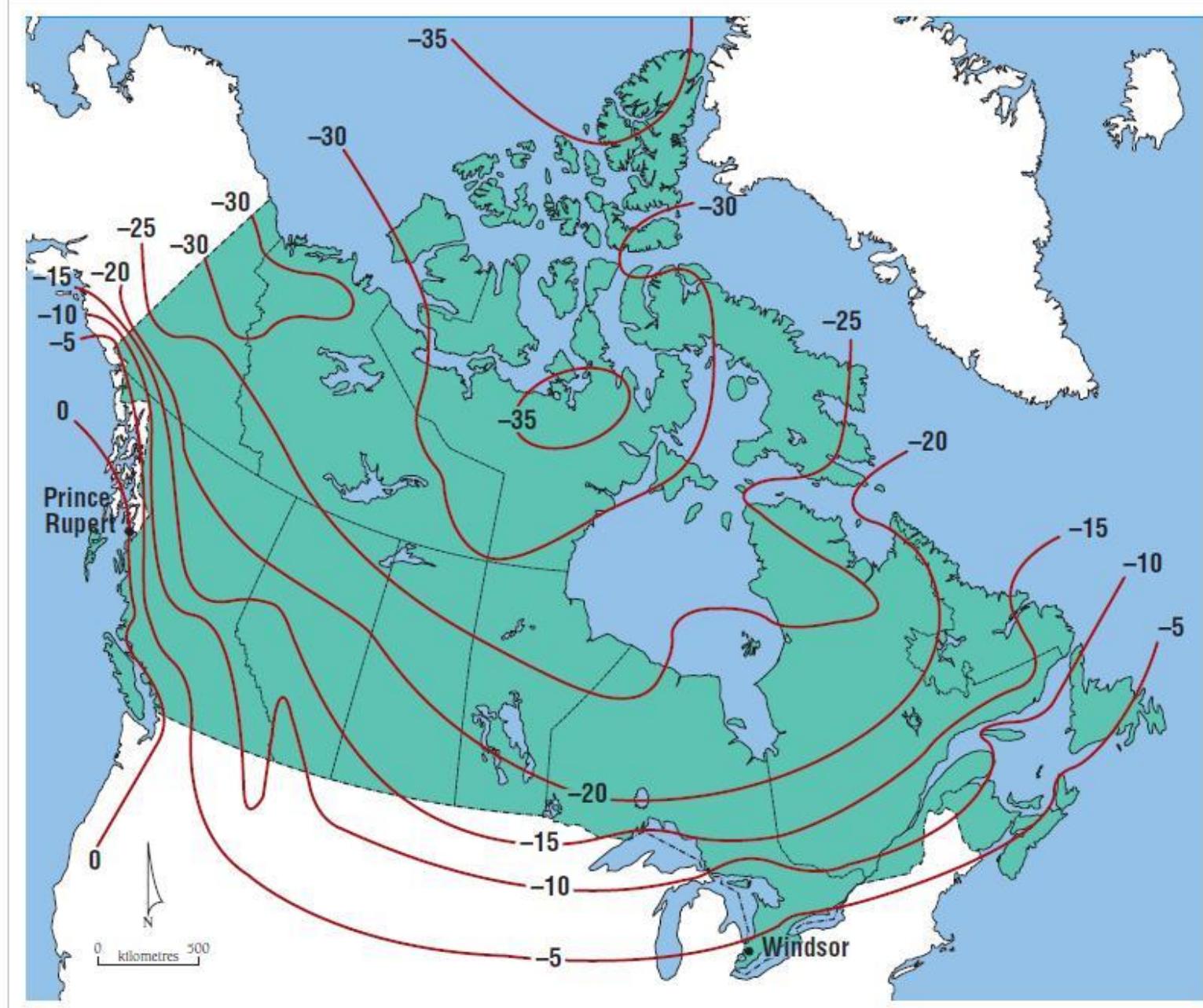


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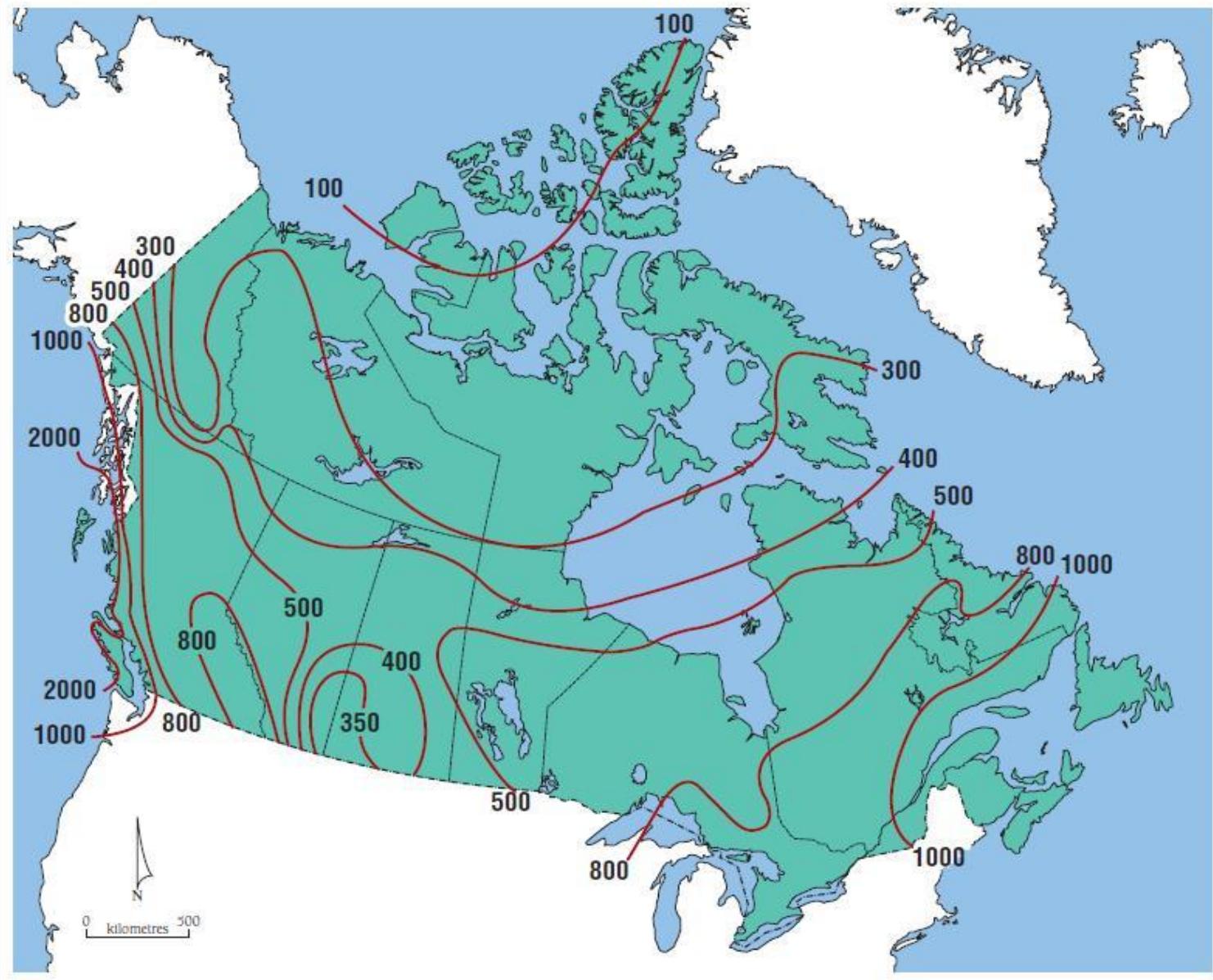


Figure 2.7 Annual precipitation in millimetres

The lowest average annual precipitation occurs in the Territorial North, indicating the dry nature of the Arctic air masses that originate over the ice-covered Arctic Ocean. The highest average annual precipitation occurs along the coast of British Columbia due to the moist marine air masses and the coastal mountains.

Climate, cont'd

- Climate, soils, and natural vegetation
 - Climate is directly related to soil order and natural vegetation
 - Influences land use and human settlement
- Extreme weather events
 - Potential increase in extreme weather events associated with rising temperatures
 - Often have a cultural impact

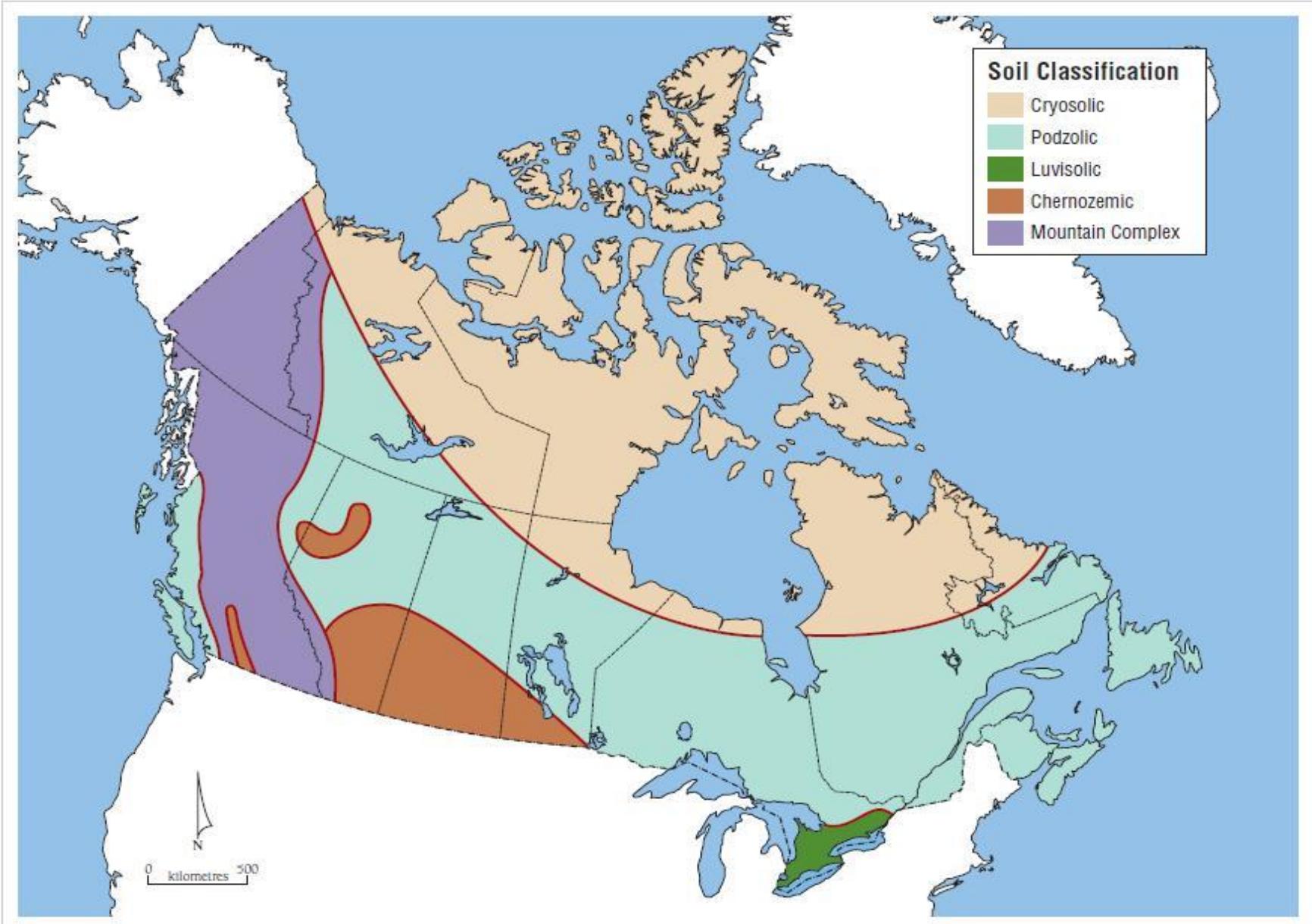


Figure 2.9 Soil zones

Most agricultural land is in luvisolic and chernozemic soil zones, which together comprise about 5 per cent of Canada's land base.

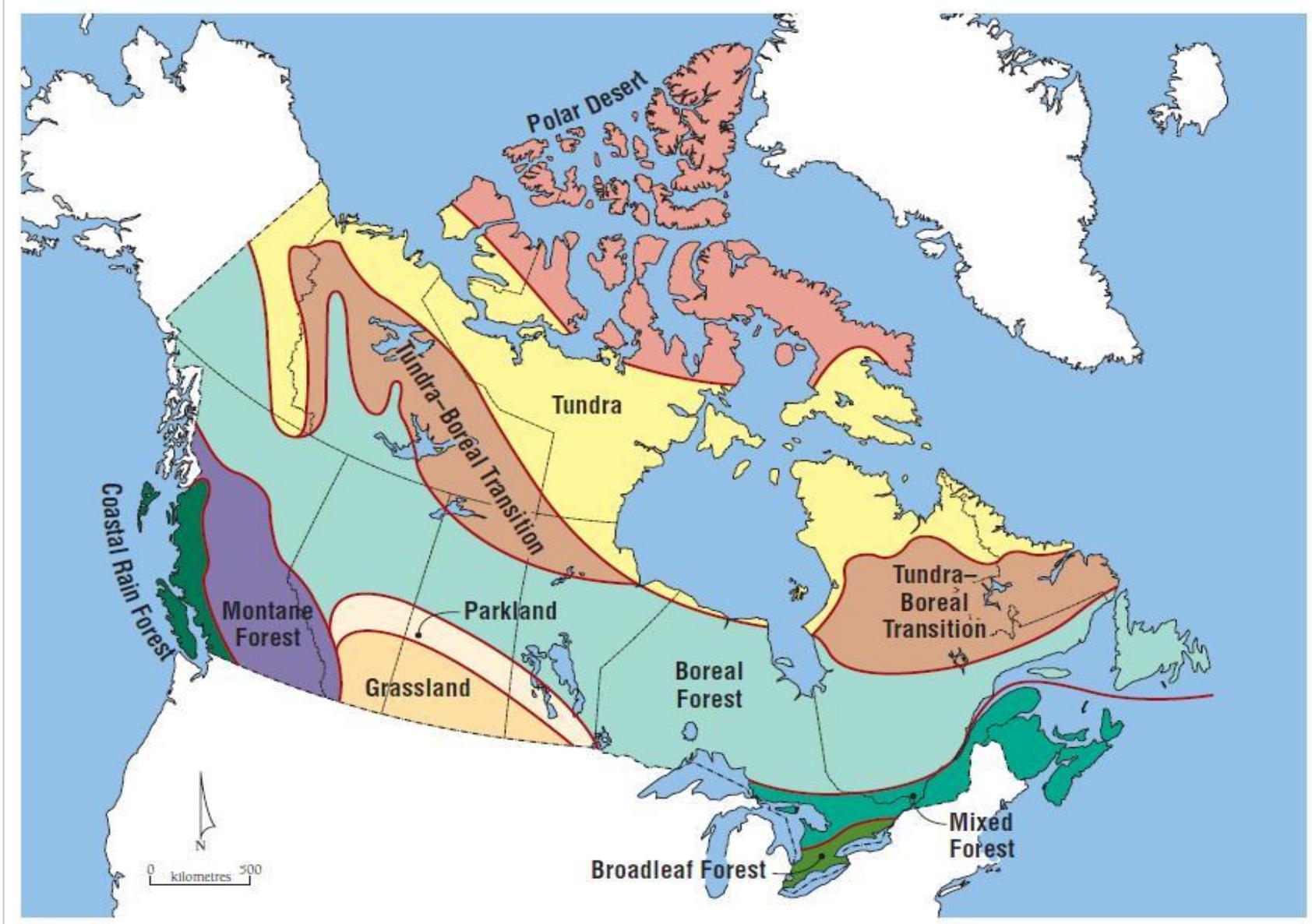


Figure 2.8 Natural vegetation zones

These natural vegetation zones have “core” characteristics, which diminish towards their edges. Transitions exist between natural vegetation zones. Two major transition zones shown here are the Tundra–Boreal Transition and the Parkland.

Climate, cont'd

- Permafrost
 - Permanently frozen ground with temperatures at or below zero for at least two years
 - Found in over two-thirds of Canada's land mass
- Four Types:
 - Alpine
 - Continuous
 - Discontinuous
 - Sporadic

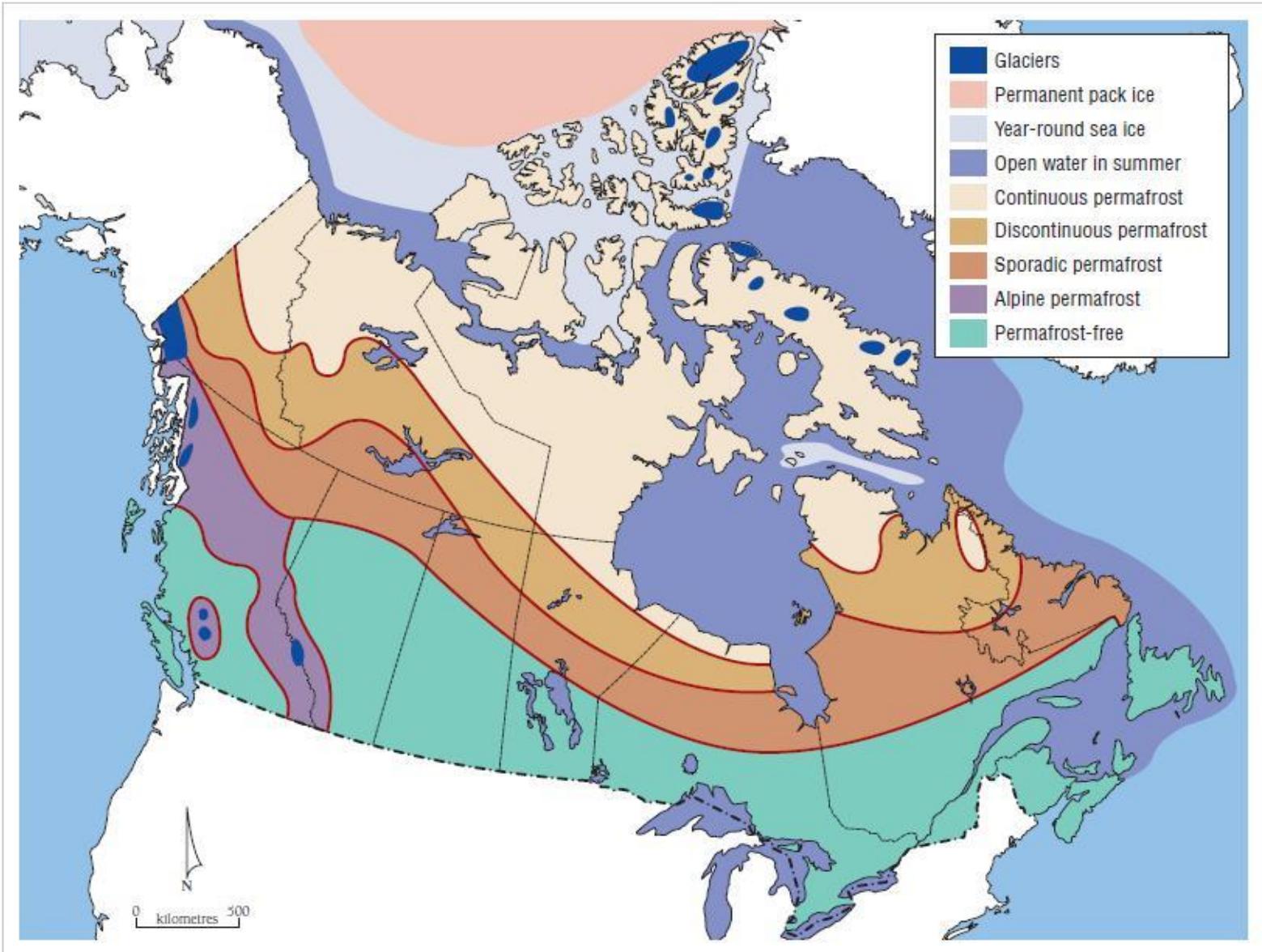


Figure 2.10 Permafrost zones

Canada's cold environment is demonstrated by the permanently frozen ground that extends over two-thirds of the country. Sea ice varies in thickness and duration. The most durable and thickest ice is found in the permanent ice pack. Lake ice disappears first in the Great Lakes while sea ice melts in the offshore waters of Atlantic Canada, and last in the Arctic Ocean. In September 2007, satellite imagery indicated that the extent of open water in the Arctic Ocean was greater than in previous decades.

Major Drainage Basins

- Canada has the longest coastline in the world
- Four major drainage basins:
 1. The Atlantic Basin
 - The third largest drainage area
 - Receives considerable precipitation
 2. The Hudson Bay Basin
 - The largest drainage basin in Canada
 - The Canadian Shield is ideal for developing hydroelectric power stations

Major Drainage Basins, cont'd

2. The Arctic Basin

- Canada's second-largest drainage basin, dominated by the Mackenzie River
- Has few hydroelectric projects due to long distance to markets

3. The Pacific Basin

- The smallest basin, but has the second-highest volume of water draining into the sea
- Has one of Canada's largest hydroelectric projects

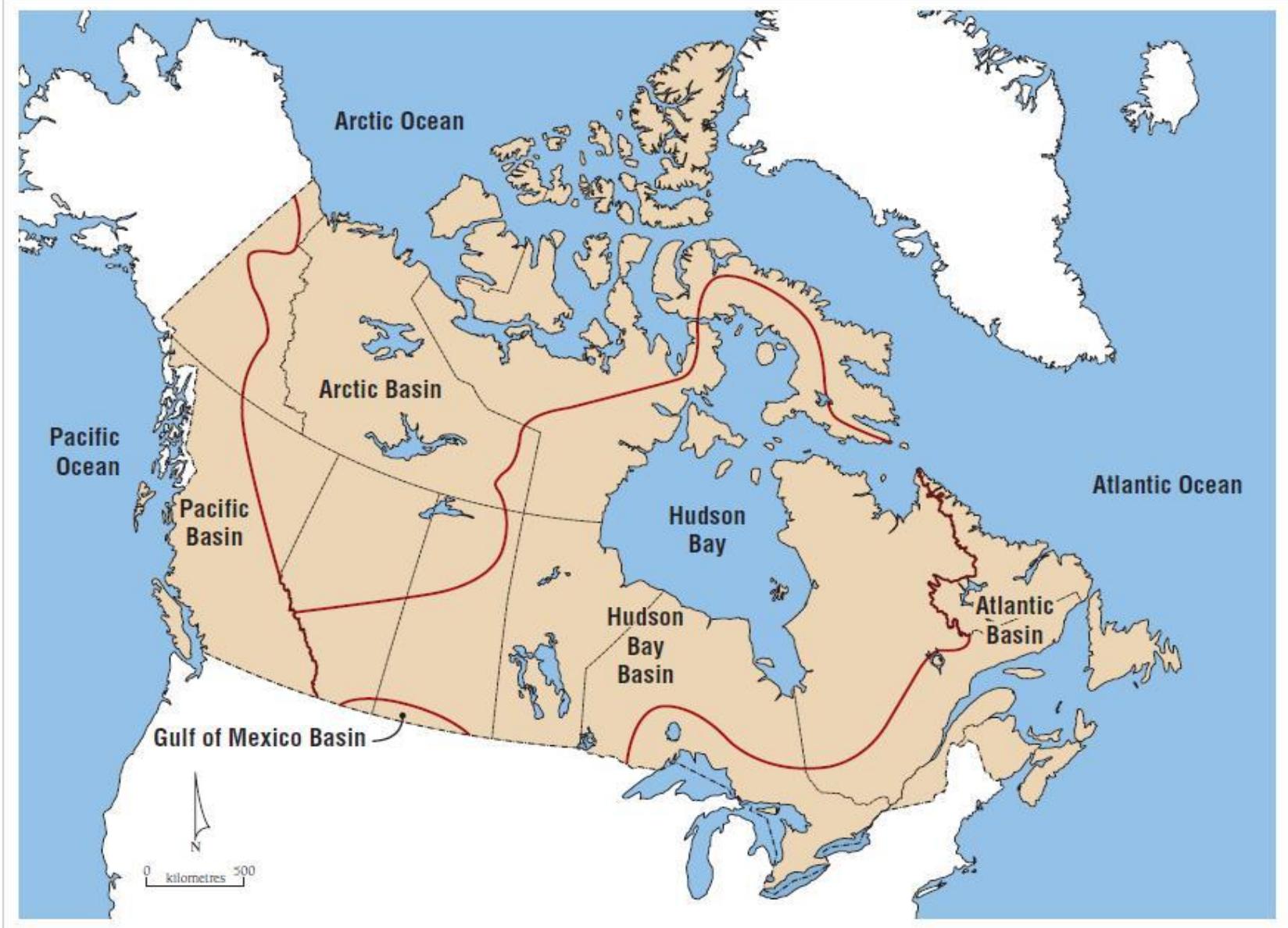


Figure 2.11 Drainage basins of Canada

The four divides determine Canada's drainage basins. They are the Continental or Great Divide, the Northern Divide, the Arctic Divide, and the St Lawrence Divide. The Hudson Bay Basin lies between three divides—the Continental Divide, the Arctic Divide, and the Northern Divide—and is by far the largest of the five basins in Canada. It also serves as a boundary between southern Alberta and British Columbia, and between northern Québec and Labrador.

Environmental Challenges

- Humans are the most active and dangerous agents of environmental change
 - Human activities have changed the natural environment into an industrial landscape
- Global warming is the greatest anthropogenic threat
 - Precipitation and warmer air masses
 - Different impacts around the world

Canada and Global Warming

- How might Canada be affected by global warming in the twenty-first century?
 - Shift in climatic zones, and inevitably vegetation, soil, and wildlife zones
 - Most dramatic changes are expected in northern Canada; loss of snow cover and ice
- How well has Canada met emissions targets?
 - Canada failed to meet its Kyoto target and withdrew from the Kyoto Accord
 - New COP 21 (UN conference) plans: limit increase to 1.5 degrees

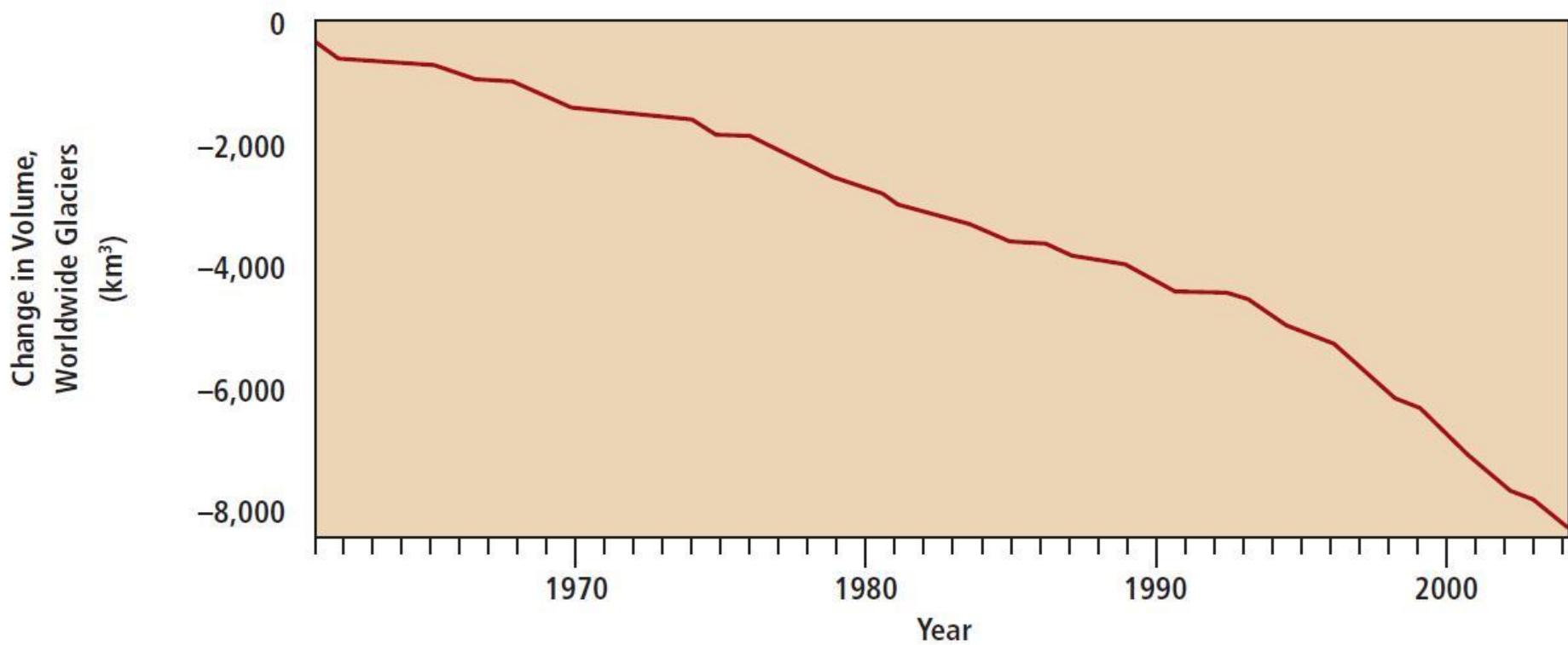


Figure 2.12 Worldwide change in volume (km³) of glaciers, 1960–2004

Source: NASA, Earth Today, at: <www.nasa.gov/vision/earth/features/index.html>.

Canada and Global Warming, cont'd

- Another environmental challenge
 - Air pollution: industrial emissions, coal-burning plants, and automobile exhaust
 - Oil sands development: Alberta is the leading province in greenhouse emissions
 - Urban smog

Canada and Global Warming, cont'd

- Solutions?
 - Establishing parks and protected areas
 - More stringent regulations
 - “Going green”: green production and consumption
 - Recycling waste products
 - Electric automobiles
 - Natural energy sources (e.g., solar and wind)