

LECTURE 2_7:

JAN. 28, 2014

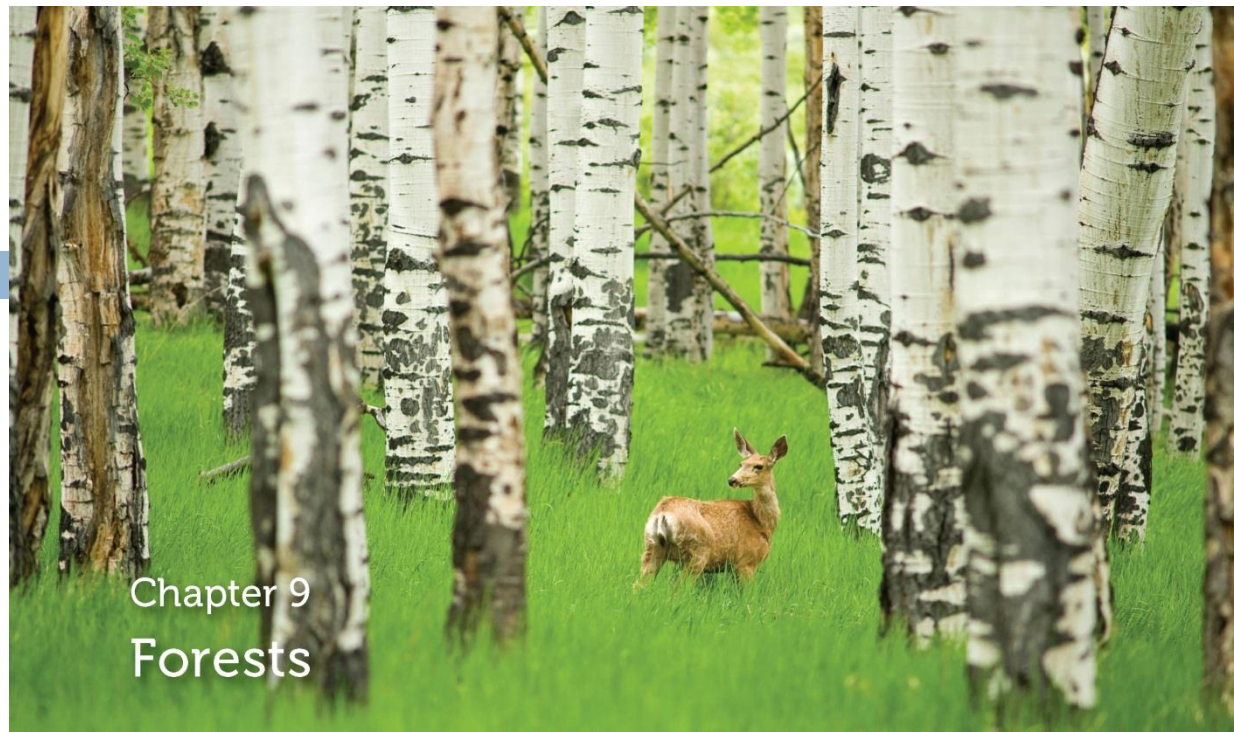
FORESTS

CANADA'S FOREST ECOSYSTEMS

Text Reference: Dearden and Mitchell (2012), Ch. 8, pp. 282-294.

T. Randall, Lakehead University, WA 2014

Outline



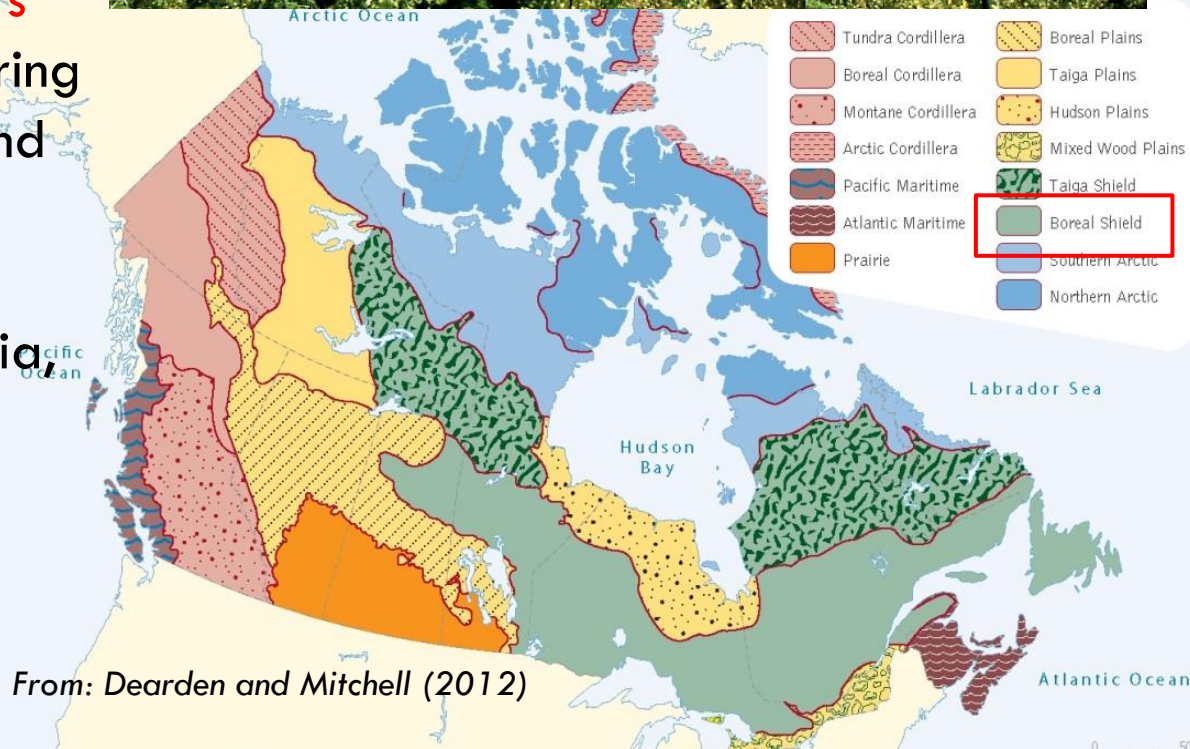
Chapter 9 Forests

From: Dearden and Mitchell (2012)

- Boreal Forest – its value
- Canadian Boreal Forest Agreement
- Canada's forested ecozones
- Forest Ecosystem Services and Products
- Looking ahead to Midterm exam (Feb 13th)

Preamble – Canada's Boreal Forest

- Boreal Shield contains about **one quarter of the world's remaining original forests**
- The Boreal is **Canada's largest ecozone**, covering almost 58% of our land mass and stretching through all provinces except PEI, Nova Scotia, and New Brunswick



Value/Importance of the Boreal Forest

Environmental

- **Ecosystem services** to the tune of \$700 billion/yr
- home to a **wide diversity of terrestrial and aquatic wildlife**
- Large areas are now experiencing a number of **serious environmental stresses**



Economic

- **Supports commercial activities** such as logging, wood fibre, and sawlog production, pulp and paper mills, and fibreboard production
- **Almost 50%** of the boreal forest is currently **allocated to industry**
- Recreation / Tourism



Boreal Forest as a Carbon Sink

- 186 billion tonnes of carbon stored in Boreal soils, water, trees and peat;
- Equivalent to **913 years' worth** of Canada's greenhouse gas emissions
- Viewed as more than **double** what is stored in tropical rain forests (see Schindler and Lee 2010);

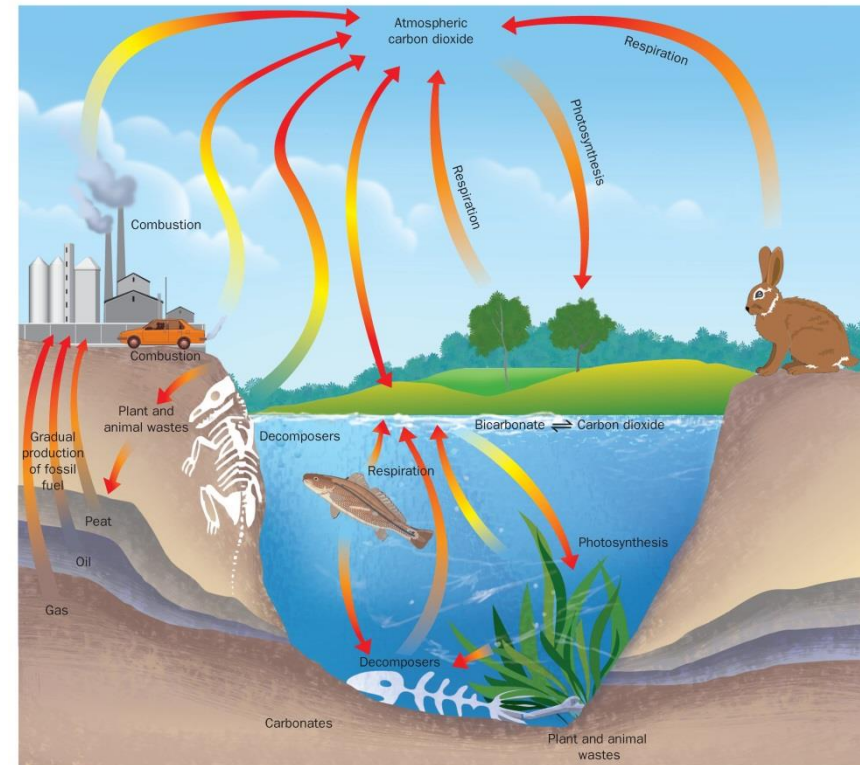


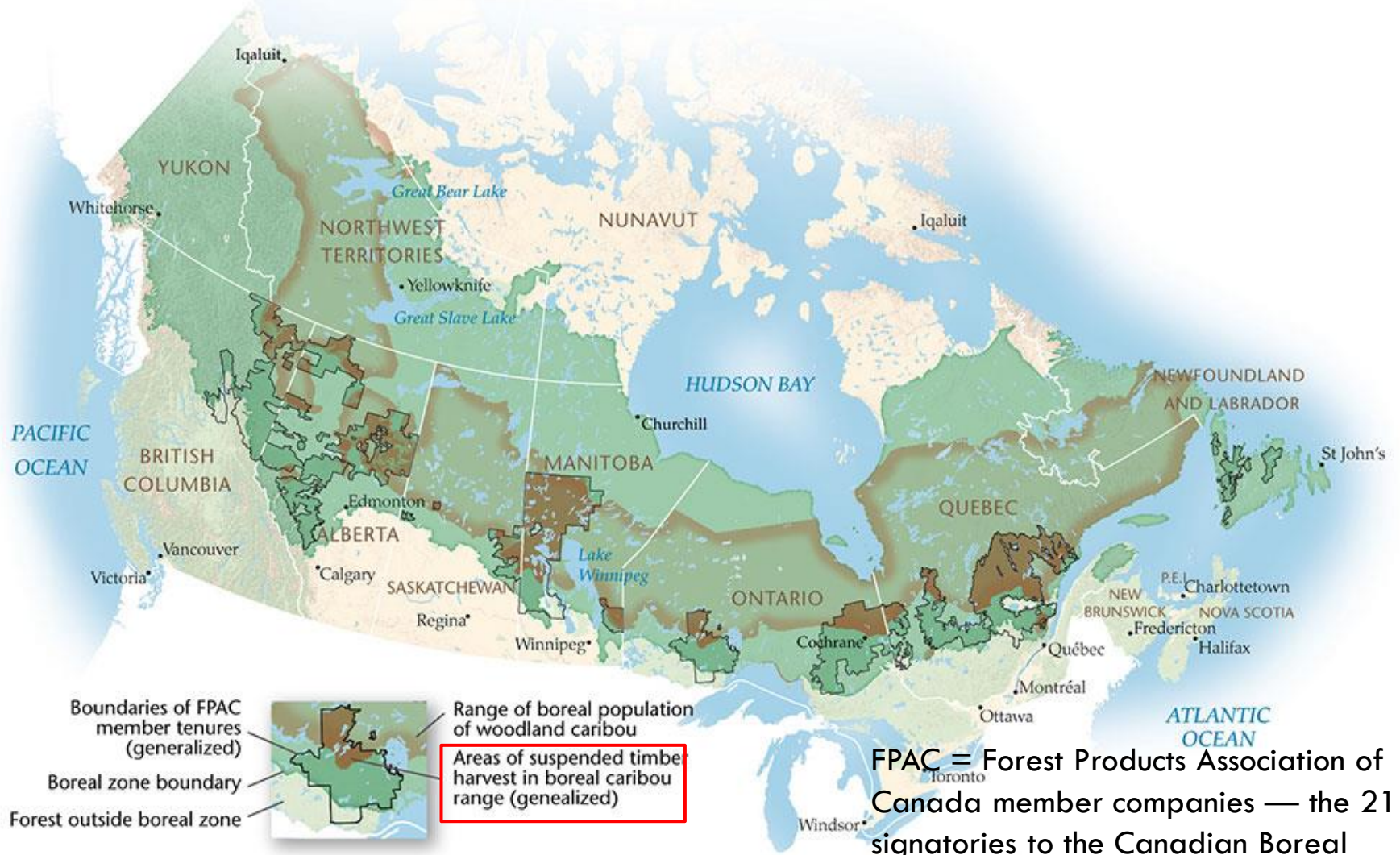
Figure 4.7 | The carbon cycle.

Figure 4.7 The carbon cycle. From: Dearden and Mitchell (2012)

Canadian Boreal Forest Agreement

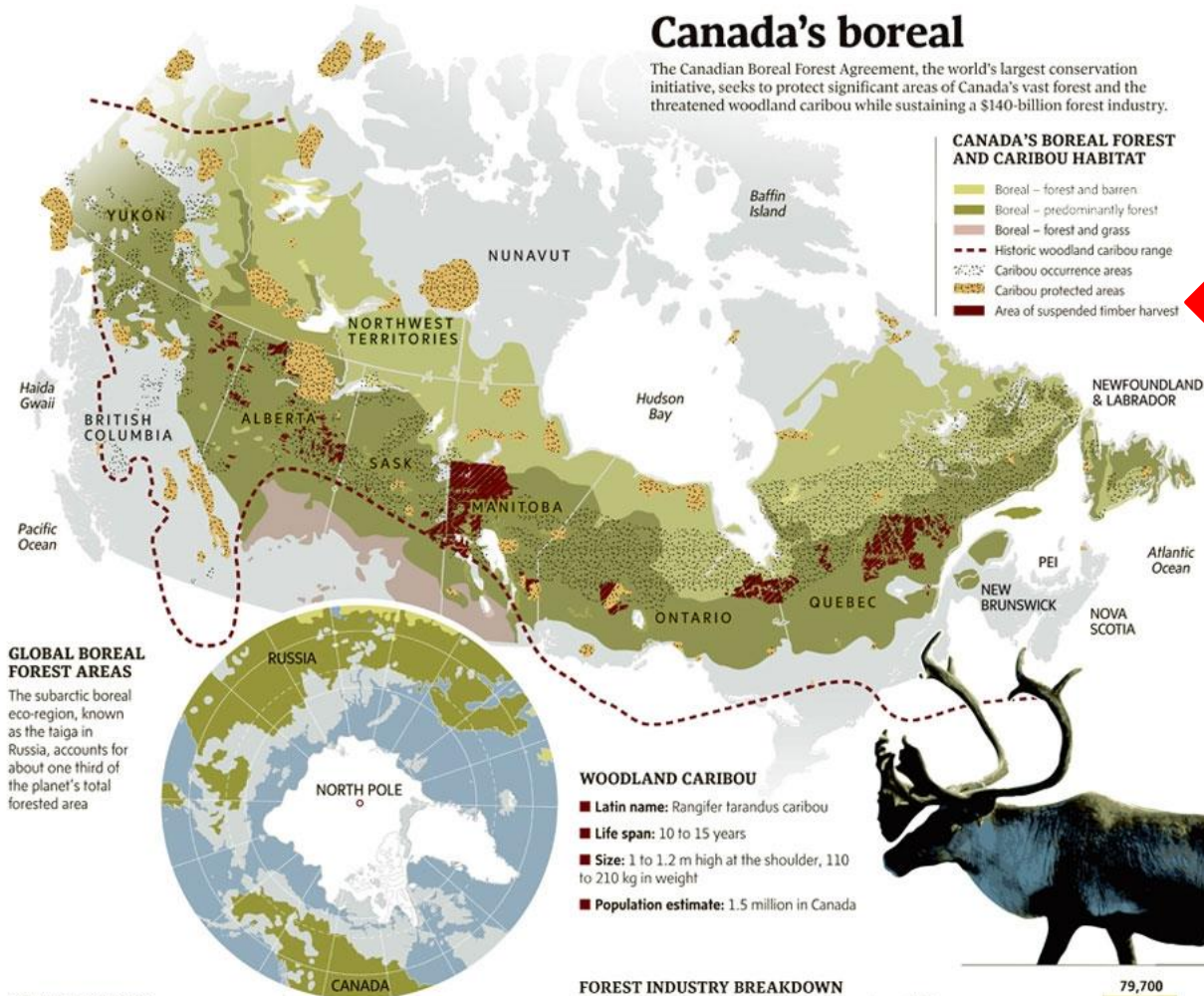
- signed on May 21, 2010, brought together environmental activists and the forestry industry for the first time;
- 21 of Canada's largest forest companies and 9 national environmental organizations;
- Has 6 strategic goals:
 1. development of world-leading boreal “on-the-ground” sustainable-forest management practices;
 2. completion of a network of protected areas that, taken as a whole, represent the diversity of ecosystems within the boreal region;
 3. protecting species at risk in the boreal forest, including the woodland caribou;
 4. reduction of greenhouse-gas emissions along the full life cycle, from the forest to the end of product life;
 5. improvement in the prosperity of the Canadian forest sector and the communities that depend on it;
 6. recognition by the marketplace (e.g., customers, investors, consumers) of the agreement.

Canadian Boreal Forest Agreement – extent and relationship to range of Woodland Caribou



Canada's boreal

The Canadian Boreal Forest Agreement, the world's largest conservation initiative, seeks to protect significant areas of Canada's vast forest and the threatened woodland caribou while sustaining a \$140-billion forest industry.

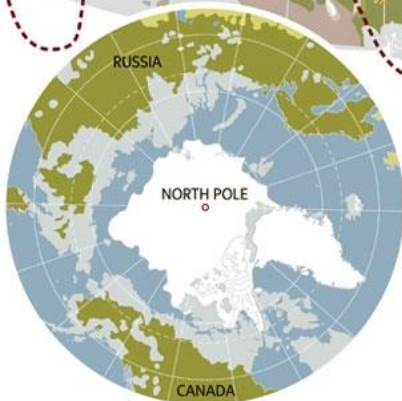


CANADA'S BOREAL FOREST AND CARIBOU HABITAT

- Boreal – forest and barren
- Boreal – predominantly forest
- Boreal – forest and grass
- Historic woodland caribou range
- Caribou occurrence areas
- Caribou protected areas
- Area of suspended timber harvest

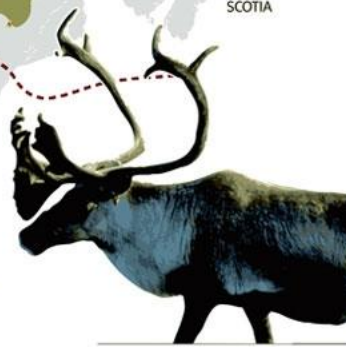
GLOBAL BOREAL FOREST AREAS

The subarctic boreal eco-region, known as the taiga in Russia, accounts for about one third of the planet's total forested area



WOODLAND CARIBOU

- **Latin name:** Rangifer tarandus caribou
- **Life span:** 10 to 15 years
- **Size:** 1 to 1.2 m high at the shoulder, 110 to 210 kg in weight
- **Population estimate:** 1.5 million in Canada



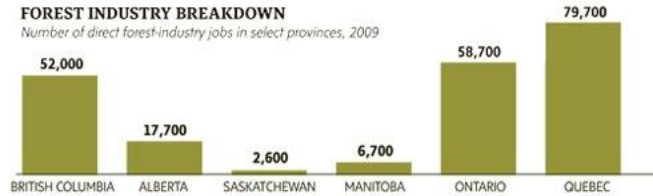
BY THE NUMBERS

77%	50%	30%	650 million
Boreal's share of Canada's forests and woodlands	Portion of Canada's 450 bird species that live in the boreal	Canada's share of the world's boreal forest	Number of seedlings planted each year in Canada

MICHAEL BRID AND JOHN SOPINSKI/ THE GLOBE AND MAIL ■ SOURCES: CANDPY; NATURE CANADA; NATURAL RESOURCES CANADA; ABITIBBOWATER; CANADIAN PARKS AND WILDLIFE SOCIETY; INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

FOREST INDUSTRY BREAKDOWN

Number of direct forest-industry jobs in select provinces, 2009



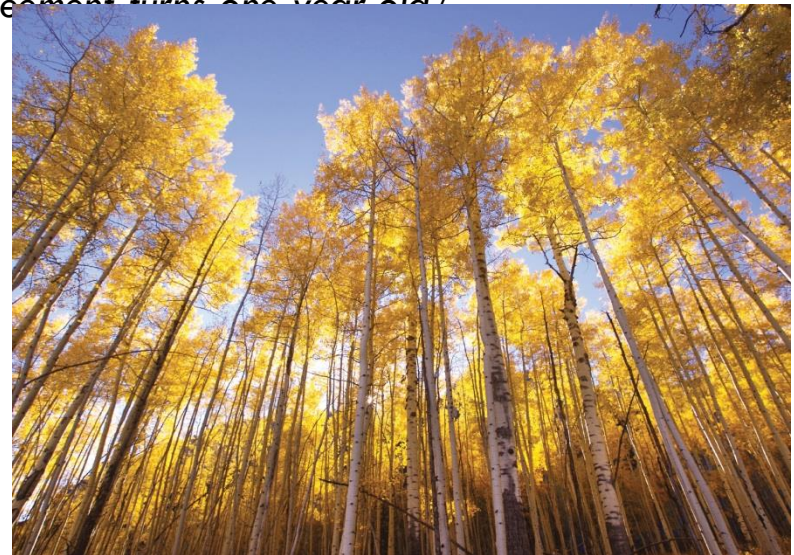
Canadian Boreal Forest Agreement

- **72 million hectares** of forest land included in the agreement
- Forest companies have committed to practice '**sustainable harvesting**' – preserving large tracts of old growth;
- Environmental organizations will **end their campaigns against Canadian forest products**;



NE of Teslin River (YK)

<http://www.davidsuzuki.org/blogs/panther-lounge/2011/0/agreement-turns-one-year-old/>

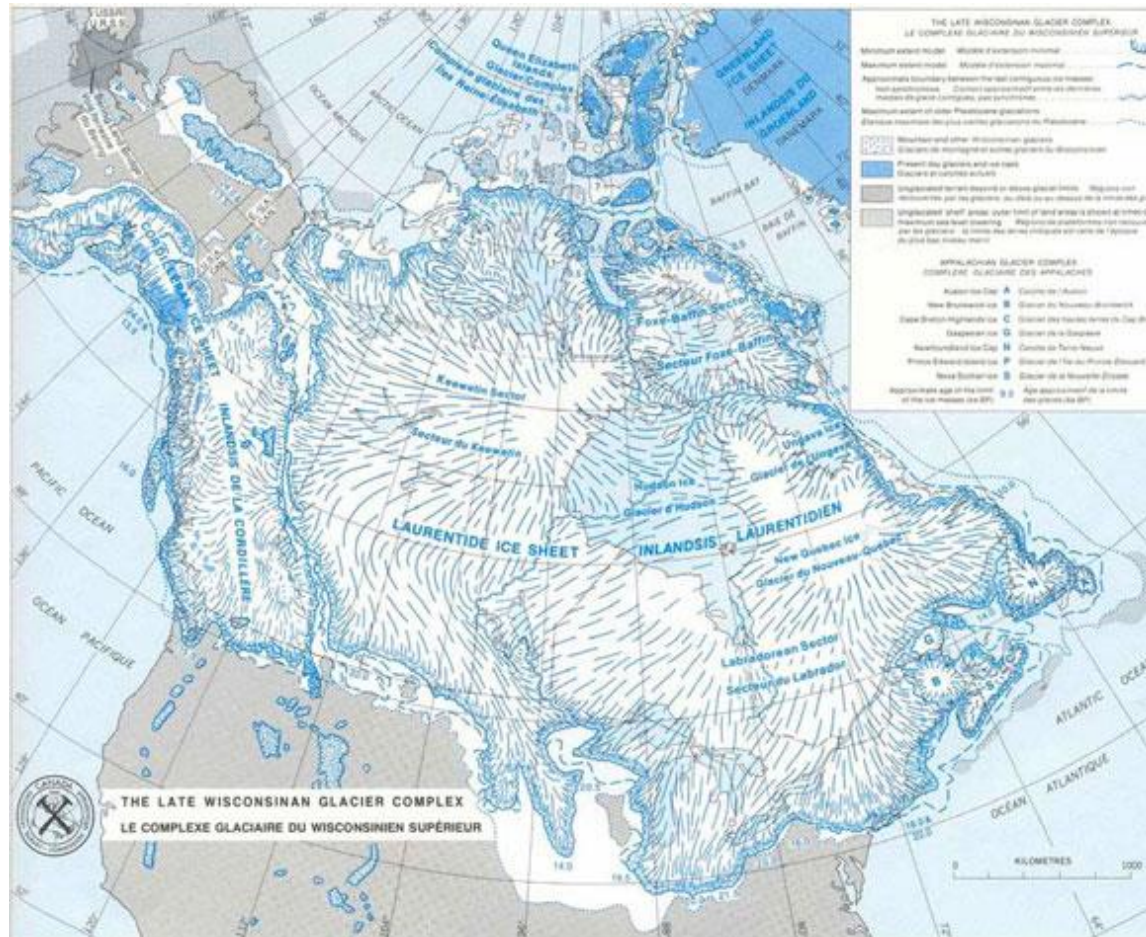


Trembling Aspen (typical of Boreal Plains)

Canada's Ecozones

- There are 15 ecozones ([Figure 9.2](#)) although the majority of Canada's forests lie within 8 of them.
- *Details:* location; characteristic flora, fauna and climate; supports commercial forestry operations?
- Relationship to recent glaciations...

Last Glacial Maximum – 2 main ice masses (Laurentide Ice Sheet and the Cordilleran Ice Sheet)



Credit to: Canadian Geological Survey; retrieved from:
<http://www.mikehorn.com/en/yep/pangaea-classroom-club/Nunavut,%20Canada%20-%20Canada%20Arctic/>

Terrestrial Ecozones of Canada

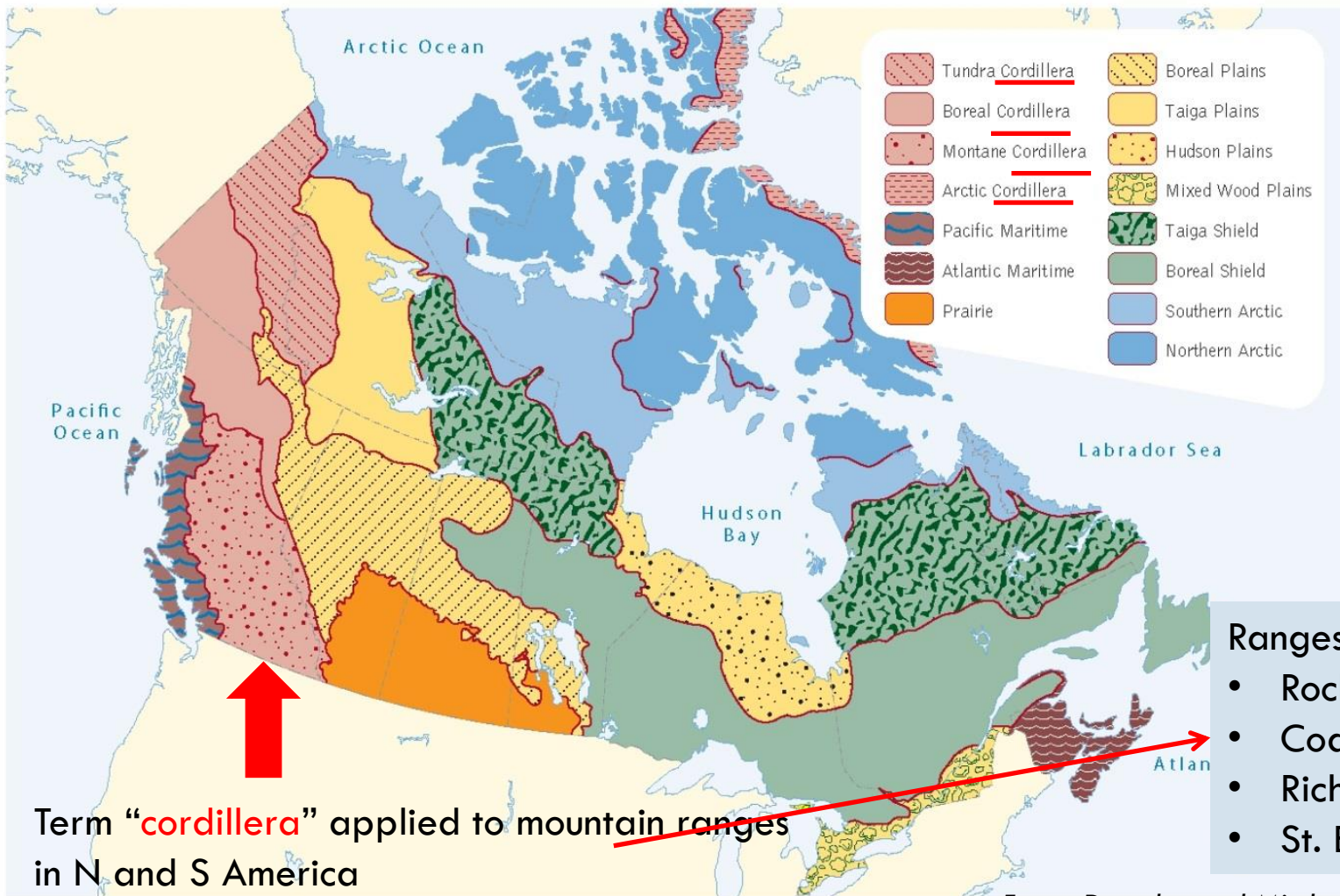


Figure 9.2 | Terrestrial ecozones of Canada. Source: Wiken (1986).

From: Dearden and Mitchell (2012)

Boreal Cordillera

- SW Yukon; NE Brit. Col.
- St. Elias Range and Northern Rockies, separated by intermontane plains;
- Vegetation cover varies widely due to aspect (S vs. N) and elevation; tundra vegetation at higher elevations;
- Rich in resources: mining, forestry, tourism, hydro development (WAC Bennett Dam on Peace R, NE BC);
- Communities: Whitehorse, Dawson City, Ft. Nelson;



NE of Teslin River (YK)

<http://www.davidsuzuki.org/blogs/panther-lounge/2011/0/agreement-turns-one-year-old/>

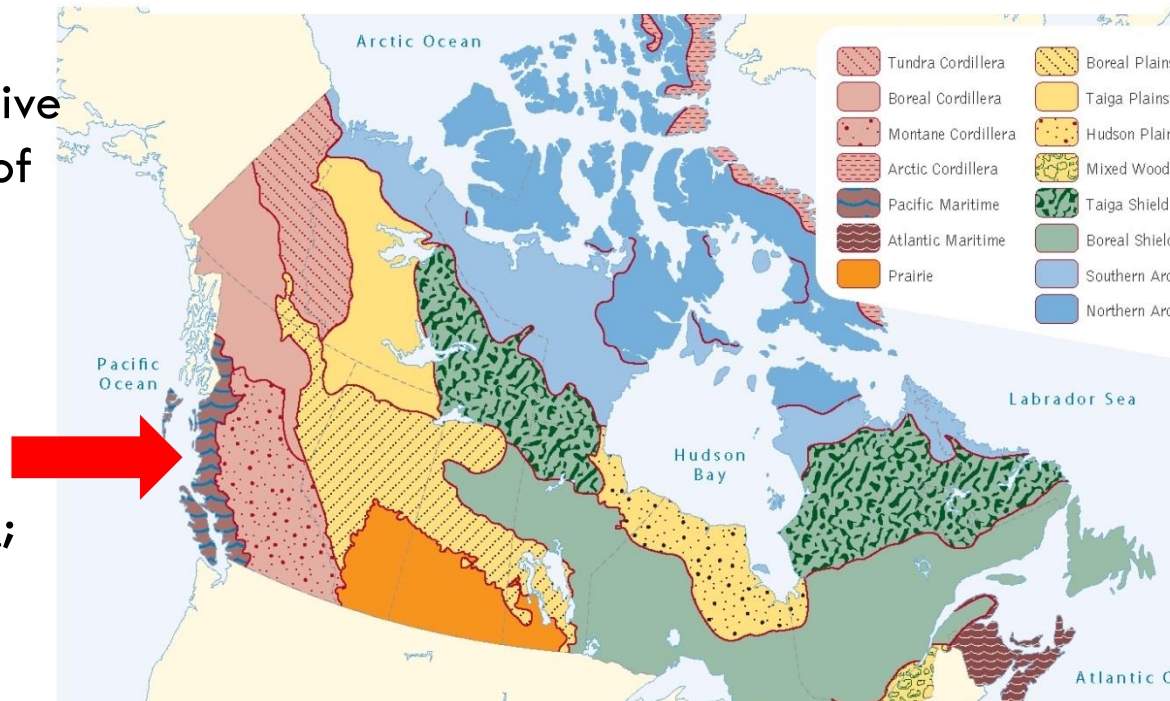


Pacific Maritime

- Coastal BC
- Coast Mountains;
- Temperate Rain Forest (up to 3000 mm precip annually) – mild wet winters; cool summers;
- Canada's most productive forests; several species can live hundreds of years; low risk of fire;
- Dominant industry: forestry, tourism,
- Communities: Vancouver; Victoria; Tofino; Ocean Falls; Nanaimo;



Cathedral Grove (Vancouver Island) – stands of Douglas Fir Source: Dearden and Mitchell (2012)





Elaho River valley, NW of Squamish, BC
– range of relief, floodplains in second
growth (easy to reach)
Credit: TR (circa 1994)

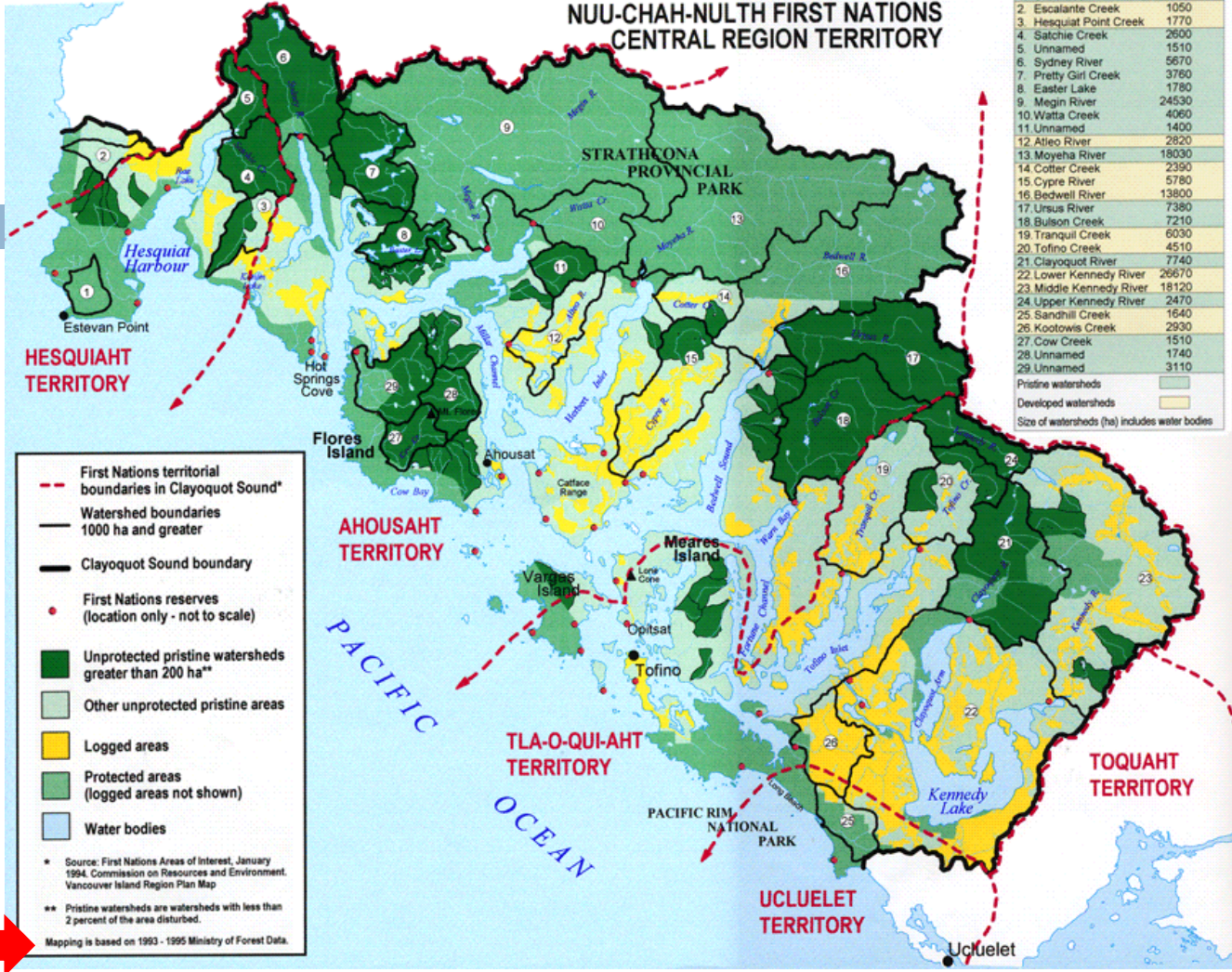


Clayoquot Sound, near Tofino
Credit: Dearden and Mitchell (2012)



PRISTINE WATERSHEDS IN CLAYOQUOT SOUND

NUU-CHAH-NULTH FIRST NATIONS CENTRAL REGION TERRITORY



Based on 1993-95 Min. of Forest Data

Clayoquot Sound on the west coast of Vancouver Island is a UNESCO world heritage site. Home to some of the most intact marine and estuarine habitats in western Canada, and the highest density of fish farms in the entire province of BC.

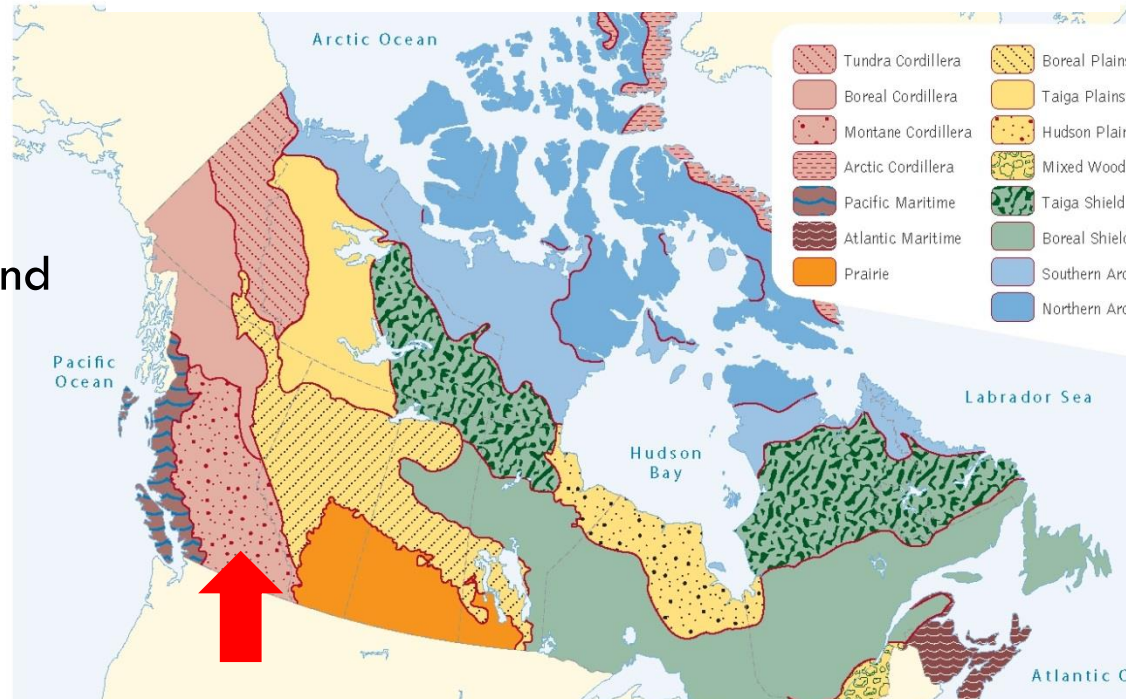
<http://ospreysteelheadnews.blogspot.ca/2011/05/new-fish-farm-proposal-for-clayoquot.html>

Montane Cordillera



Montane Cordillera ecozone, near Banff, AB Source: Dearden and Mitchell (2012)

- Interior Plateau; Okanagan; Southern Rockies
- Great range of elevation → strong contrast in temperature and moisture conditions; (semi-arid Okanagan; orographic precipitation and heavy mountain snowfalls)
- Dominant industry: forestry (north/east), mining, tourism, and agriculture
- Communities: Kelowna; Prince George, Trail, Banff



Montane Cordillera



Bee-hive Burner at a sawmill



Logs en route to a mill for processing (note small diameter logs versus coastal timber)



Semi-arid landscapes of north Okanagan valley, near Kamloops *photo credit: T. Randall (2008)*



Vineyards and orchards supported by soils and climate of BC's Okanagan valley. <http://travelsnapshots.files.wordpress.com/2010/06/okanagan-valley.jpg>

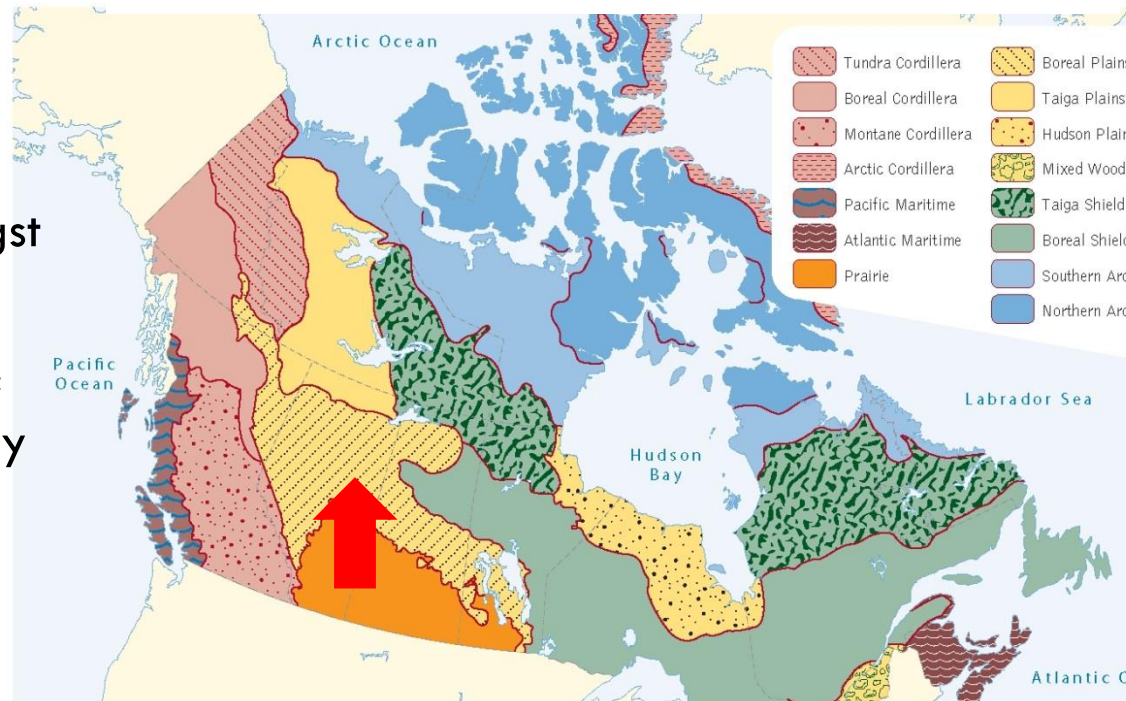
Boreal Plains



Trembling Aspen (typical of Boreal Plains)

Source: Dearden and Mitchell (2012)

- SE Yukon, NE BC, northcentral AB, SK and MB
- Generally flat to underlating surface of former glacial plain and outwash area
- Generally cooler and wetter than southern prairies;
- Tree spp: tamarack, jack pine, black and white spruce amongst various deciduous species;
- Dominant industry: agriculture; oil and gas production; forestry
- Communities: Edmonton, Ft. St John, BC; Ft McMurray,



Boreal Plains



Fort McMurray, AB (source: Royal LePage)

This image illustrates the **breadth of boreal destruction associated with tar sands exploration.**

http://www.huffingtonpost.ca/andrew-weaver/eu-law-oil-canada_b_1288264.html

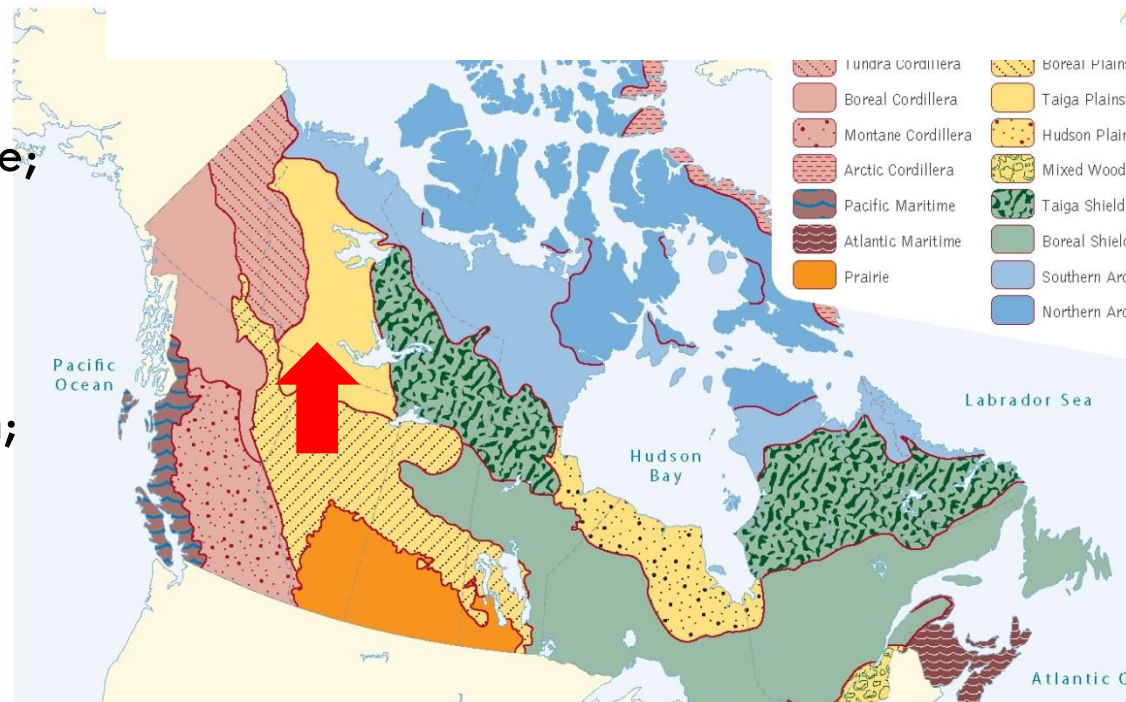


Taiga Plains

- East of the Richardson Mts, including the Mackenzie R. Valley and Great Bear and Great Slave lakes;
- Lies between southern boundary of the tundra and the closed-crown coniferous forest to the south;
- Cold and relatively dry climate;
- Extensive wetland areas;
- Dominant industry: subsistence hunting, trapping, & fishing; some mining and oil extraction;
- Communities: Ft Smith, Inuvik NWT,

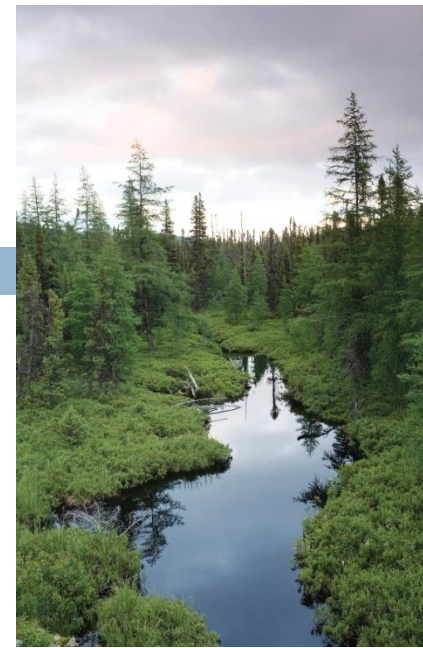


Wetlands of the Canadian Shield

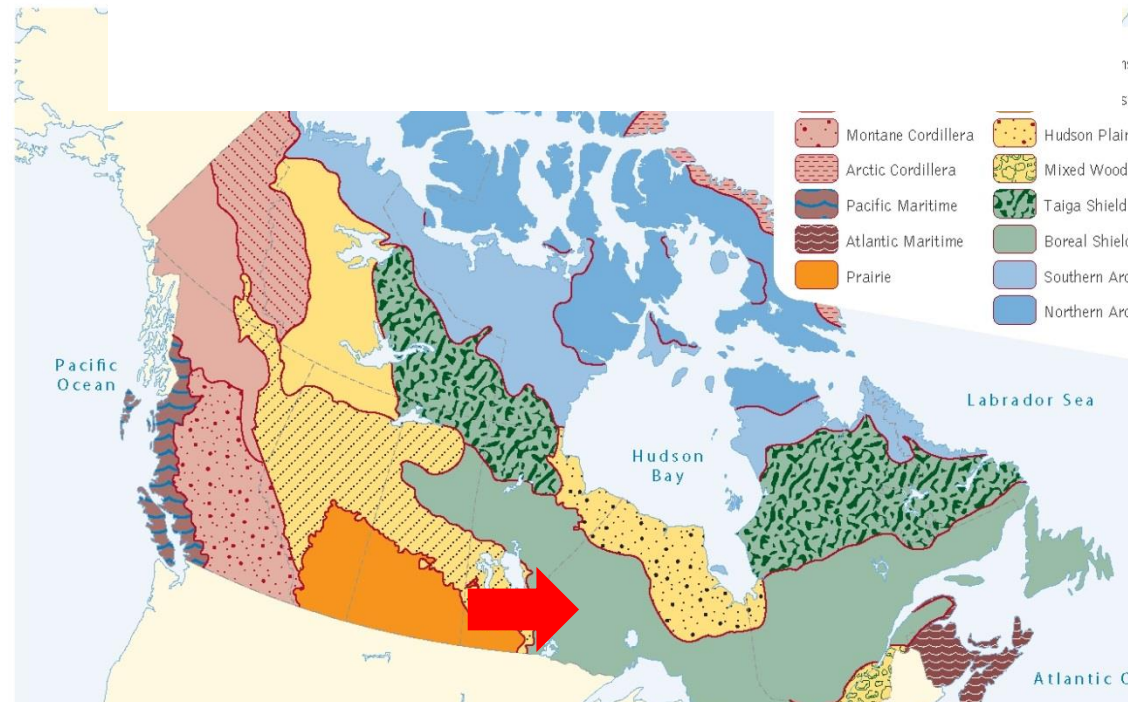


Boreal Shield

- Largest ecozone (SK to NF);
- Cold winters; summer warm to hot;
- Irregular, rocky glaciated terrain with many lakes;
- Dominant industry: forestry; mining; fishing;
- Communities: Thunder Bay, Kenora, Sudbury, Gaspé Peninsula, Ottawa,



Boreal Forest (numerous outcrops, lakes and muskeg)



Thin soils and polished rock surfaces are typical of Canadian Shield Landscapes



Mixed Wood Plains



- Southern Ontario and Quebec – highly populated;
- Mild or low topographic relief (largely a depositional zone of glacial, marine and fluvial deposits)
- Continental climate (warm, humid summers, cool winters);
- Most diverse tree coverage in Canada (>64 spp); mixed coniferous-deciduous (Red & White Pine, Oak, Maple, ...)
- Dominant industry: service industries; manufacturing;
- Communities: those in the Windsor-Quebec City corridor,

Mixed Wood Plains

Source: Dearden and Mitchell (2012)

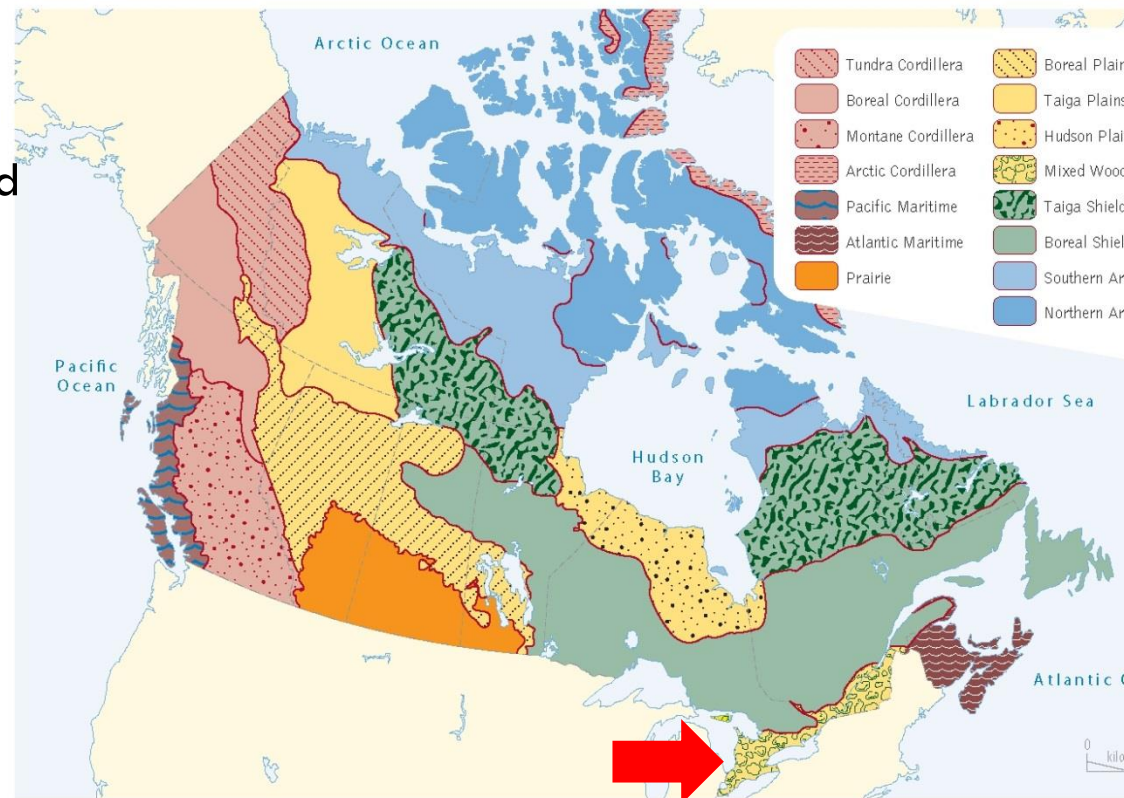


Figure 9.2 | Terrestrial ecozones of Canada. Source: Wiken (1986).

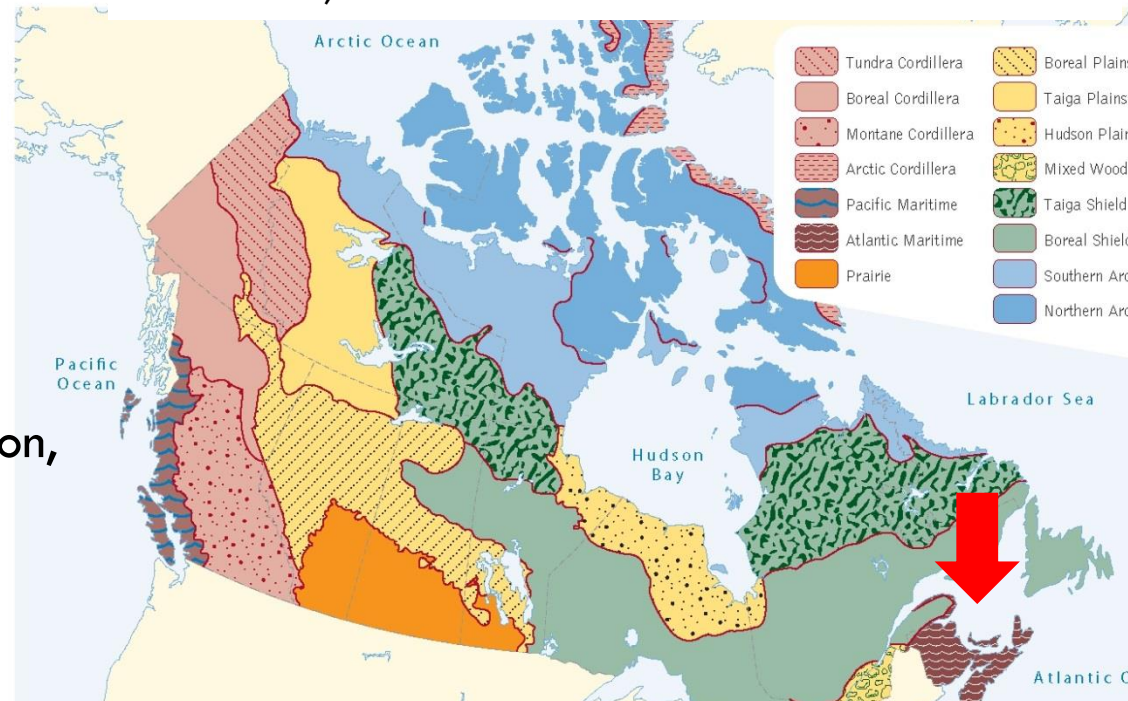
Atlantic Maritime

- South of Gulf of St Lawrence, including NB, PEI and NS;
- Strong marine influence on climate (cool, moist) – snowy, stormy winters;
- Mixed coniferous-deciduous stands typically
- Dominant industry: forestry, agriculture (potatoes, fruit), mining;
- Communities: Fredericton, Charlottetown, Halifax, Moncton,



Atlantic Maritime Ecozone

Photo credit; Sara Lourie



Forest Ecosystem Services and Products



Forest Ecosystem Services and Products

- As stated earlier, Canada's forest ecosystems provide a **variety of beneficial services** including, but not limited to:
 - ▣ nutrient and water cycling
 - ▣ carbon sequestration
 - ▣ waste decomposition
- Their vastness means they provide **significant contributions at a global scale**, examples...
 - ▣ It is estimated that **20% of the world's water** originates in Canada's forests;
 - ▣ The forests are also **major carbon sinks** (50,000 million tonnes on storage with 72 million tonnes uptake annually)
- **Tourism and related recreational opportunities**: millions of Canadians travel each year to participate in nature-related recreational activities (estimated to **employ 245,000** people and contributes **\$12 billion to Canada's GDP**)

Dearden and Mitchell (2012); NRTEE (2003b cited in D and M, 2012)

Forest Ecosystem Services and Products

- Climate moderating effect of plant communities:
 - ▣ Similar to effect of urban street trees
 - ▣ contrast clearcut to intact forest areas



Street trees, shading (cooling effect) example from Hell's Kitchen part of Manhattan. *Photo credit: T. Randall (Nov. 2011)*



Dearden and Mitchell (2012)

Forest Ecosystem Services and Products

- Biological communities also protect against **extremes of flood and drought** and **maintain water quality**;

Forested Slopes

- Holds soil in place
- Interrupts precipitation, retaining much
- Greater percolation into the water table

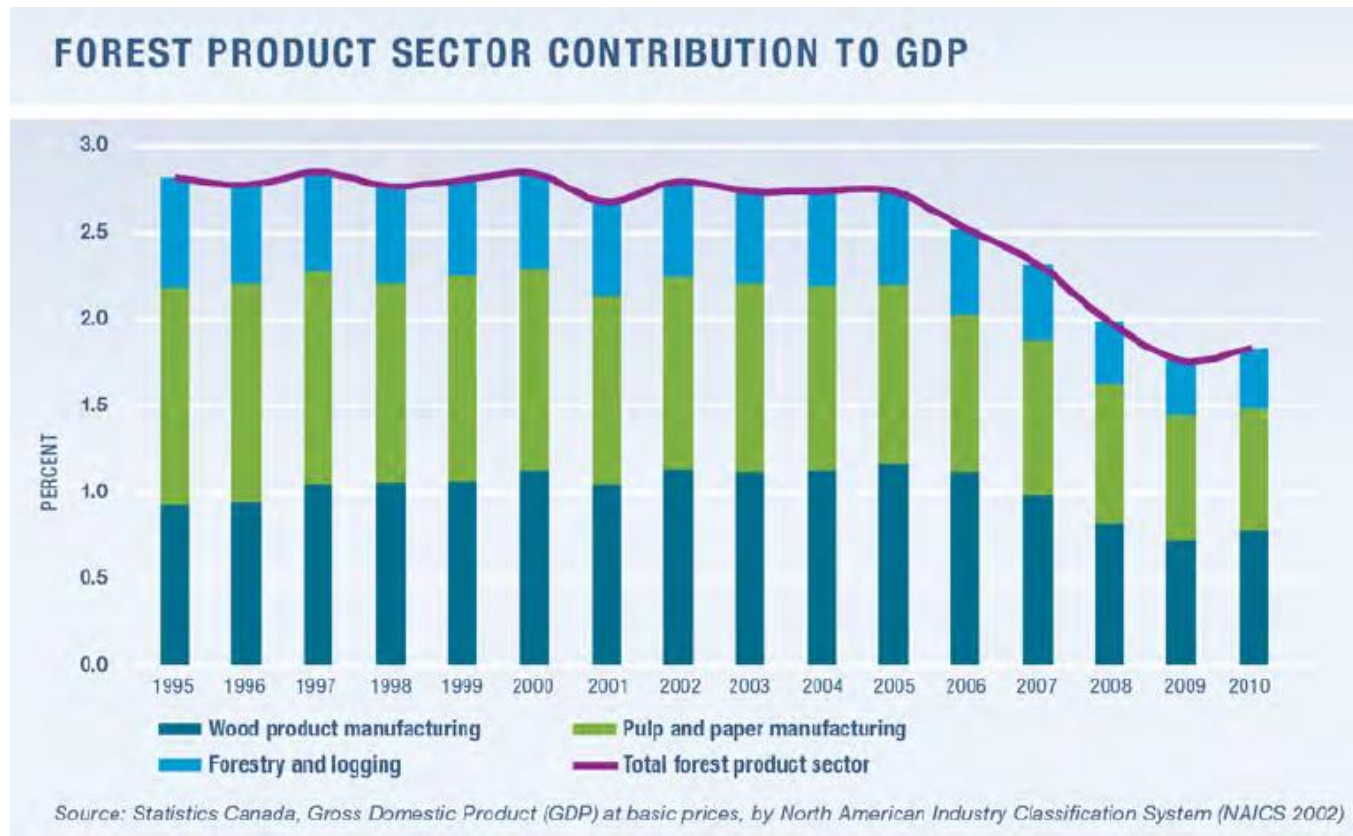
Clear cut Slopes

- Hotter
- No/less interception of precipitation (increased speed of runoff and change in flood behaviour of streams)
- Water table effects

Forest Ecosystem Services and Products

- *Non-timber forest products (NFTPs)* are commodities such as wild rice, mushrooms and berries, maple syrup, edible nuts, furs and hides, medicines, ornamental cuttings, and seeds
 - ▣ Contribute \$1 billion/yr to the economy;
 - ▣ These are renewable (with careful planning)
- *Timber forest products* provide substantial economic benefits;
 - ▣ Canada: world's leading forest-product exporter (~15.9% of global trade)
 - ▣ For 200+ Canadian communities, forestry is >50% of economic base
- The Canadian forestry industry was(?) also a frequent flashpoint for conflict
 - e.g., Carmanah, Temagami, and Clayquot in the 1990s

Changing forest sector (hints at future lec)



**Changing revenue and employment in the forestry sector
1995 to 2010.**

Source: NR Canada 2011

Looking Ahead to the next lecture

Read ahead (pp. 294-302, Chpt. 9, “Forests”)

“Forest Management Practices”

**** Print yourself a blank map of Canada (from Lecture 2-6) for next Map Literacy activity;**

Looking Ahead to the **Mid-term Exam**

Thursday, February 13th, 2014

- **Type of Questions** (multiple choice, map literacy question)
- **Content** (to be discussed on Thursday, February 4th) – but will cover lectures up to and including Feb. 6th (first lecture on Agriculture, chpt. 10)

References

- Dearden, P and Mitchell, B. 2012. *Environmental Change and Challenge*, Fourth Edition, Don Mills, Ontario: Oxford University Press {Chapter 9: 'Forests'}
- Natural Resources Canada (NRCan) 2011. The State of Canada's Forests: Annual Report. Accessed at: <http://cfs.nrcan.gc.ca/pubwarehouse/pdfs/32683.pdf>