

LECTURE 2_8:
JAN. 30, 2014

FORESTS

FOREST MANAGEMENT PRACTICES & MAP LITERACY 3 (MQ.3)

Text Reference: Dearden and Mitchell (2012), Ch. 8, pp. 294-302.

T. Randall, Lakehead University, WA 2014

Outline



From: Dearden and Mitchell (2012)

- Activity: Map Literacy List #3
- Forest Management Practices
 - ▣ Commonly practiced silvicultural methods in Canada {Clear-cutting; Seed tree; Shelterwood; Selection}
- Improved FMPs
 - ▣ **Case study**: BC Forest Practices Code

Map Literacy 3

Forest lectures

January 30, 2014



Map Literacy (list 3, January 30, 2014)

Communities, Jurisdictions

1. Tofino, BC
2. Prince George, BC
3. Okanagan Valley
4. Fort McMurray
5. Sudbury
6. Marathon, ON

Natural Features

1. Pacific Rim National Park
2. Clayoquot Sound
3. Canadian Shield
4. Richardson Mts.
5. Coast Mts.

Basics (4):

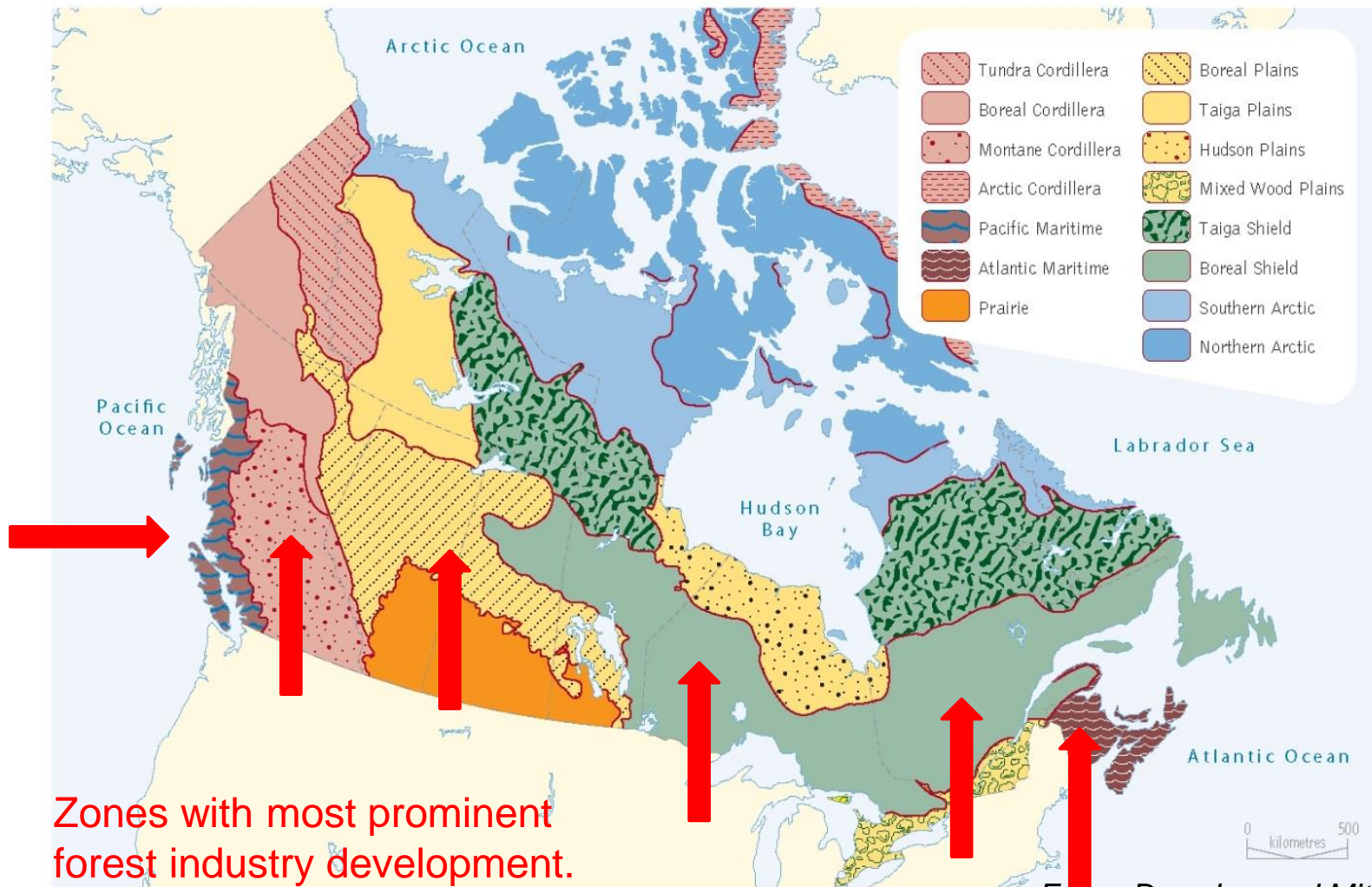
- Victoria; Fredericton; Regina; Nunavut



Recall from Last Lecture

Forested Terrestrial Ecozones, especially Boreal
Ecosystem services and economic benefits

Terrestrial Ecozones of Canada



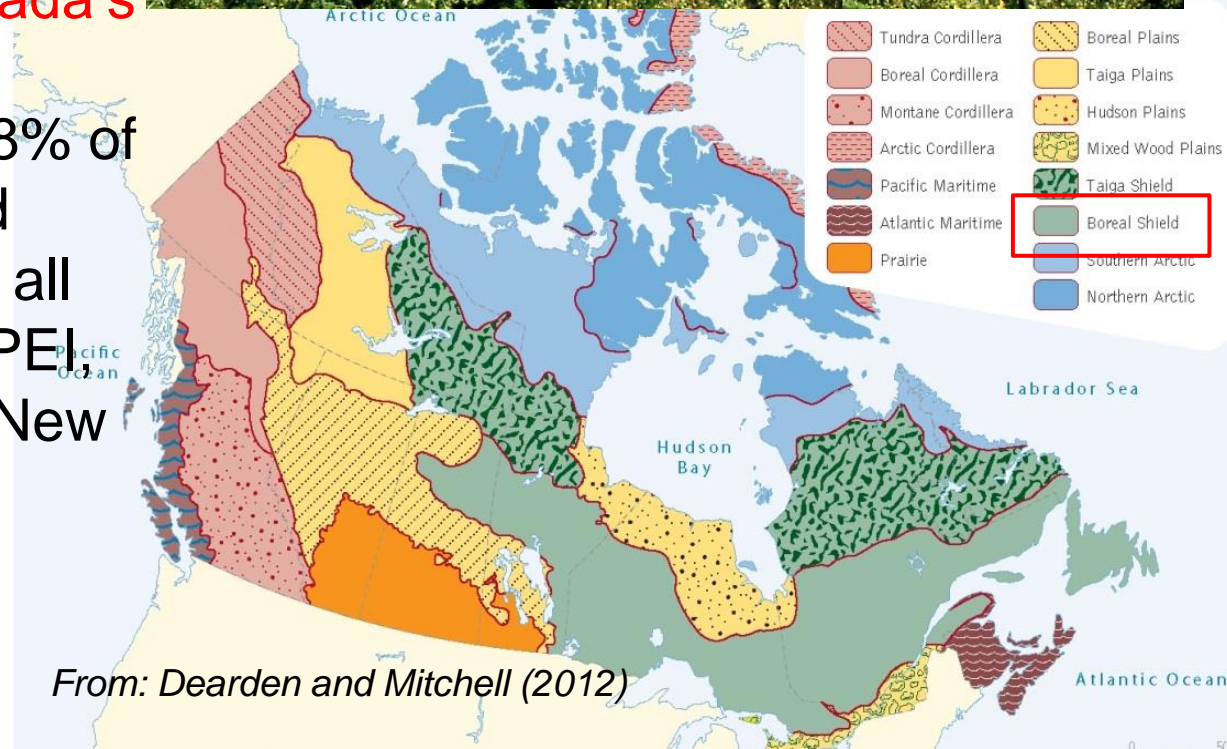
Zones with most prominent forest industry development.

From: Dearden and Mitchell (2012)

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

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



Forest Management Practices

Rates of Conversion
Annual Allowable Cut
Sustained Yield
Forest Management Plans
Silviculture Systems
Reclamation Plans



Felling – MFR



Yarding – MFR



Loading – MFR

Preamble: FMPs (1)

- **Forest management is mainly a provincial responsibility**, with governments managing forest resources on behalf of the public through agreements with private logging companies;
- **forest tenures**: refer to the conditions governing forest ownership and use;

Rates of government ownership of forest land relatively high in Canada vs Europe

Jurisdiction	% forest land owned by Gov't	% privately owned	
		(by individuals)	(by corporations)
British Columbia	96%	small	small
Canada	95%	small	small
Finland	31%	62%	6%
Sweden	25%	50%	25%

Table based on Hanna, K in Dearden and Mitchell (p.294)

Preamble FMPs (2)

- **“rate of conversion”** of natural to managed forests ... one of the more controversial issues in Canadian forestry
- Each province establishes an **annual allowable cut** (AAC), the amount of timber that is allowed to be cut annually from a specified area
- The AAC should reflect the **long-run sustained yield** (LRSY) of a given unit of land, or what that land should yield in perpetuity; **this varies by forest ecozone** (cf. Pac. Maritime versus Boreal Plain) **and site characteristics within each zone** (valley floor versus valley wall);
- But ... there is a difference in monetary returns gained from the ‘first cut’ versus ‘second’ and subsequent cuts ... **there has been a tendency to ‘convert’ forests at rates higher that can be supported biologically;**

Calculation of the AAC



From: Dearden and Mitchell (2012)

- One needs the rotation period for each forest type – called the **culmination age**. (e.g., for Douglas Fir, 90 years on a low site; 117 yrs on a high site in coastal BC, Washington state; Curtis [1995]).
- AAC also varies widely due to ratio of old-growth to second-growth timber included in the proposed cutting unit;
- **Old-growth forests** have very high timber volumes, while **second growth** on these sites will have much lower volumes
- This is known as the **falldown effect** and **results in AACs up to 30 per cent lower** as old-growth forests are eliminated

From: Dearden and Mitchell (2012)

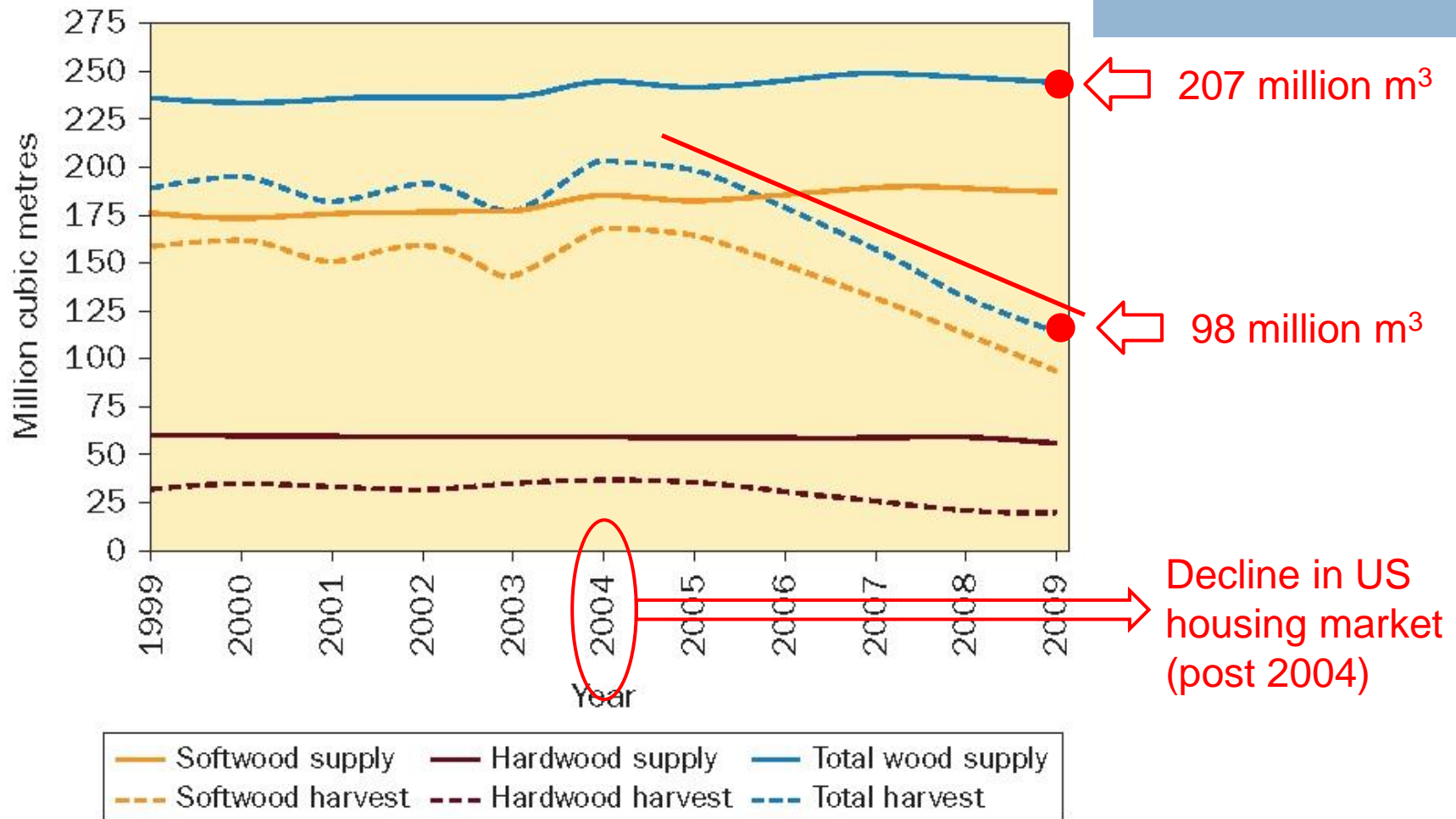
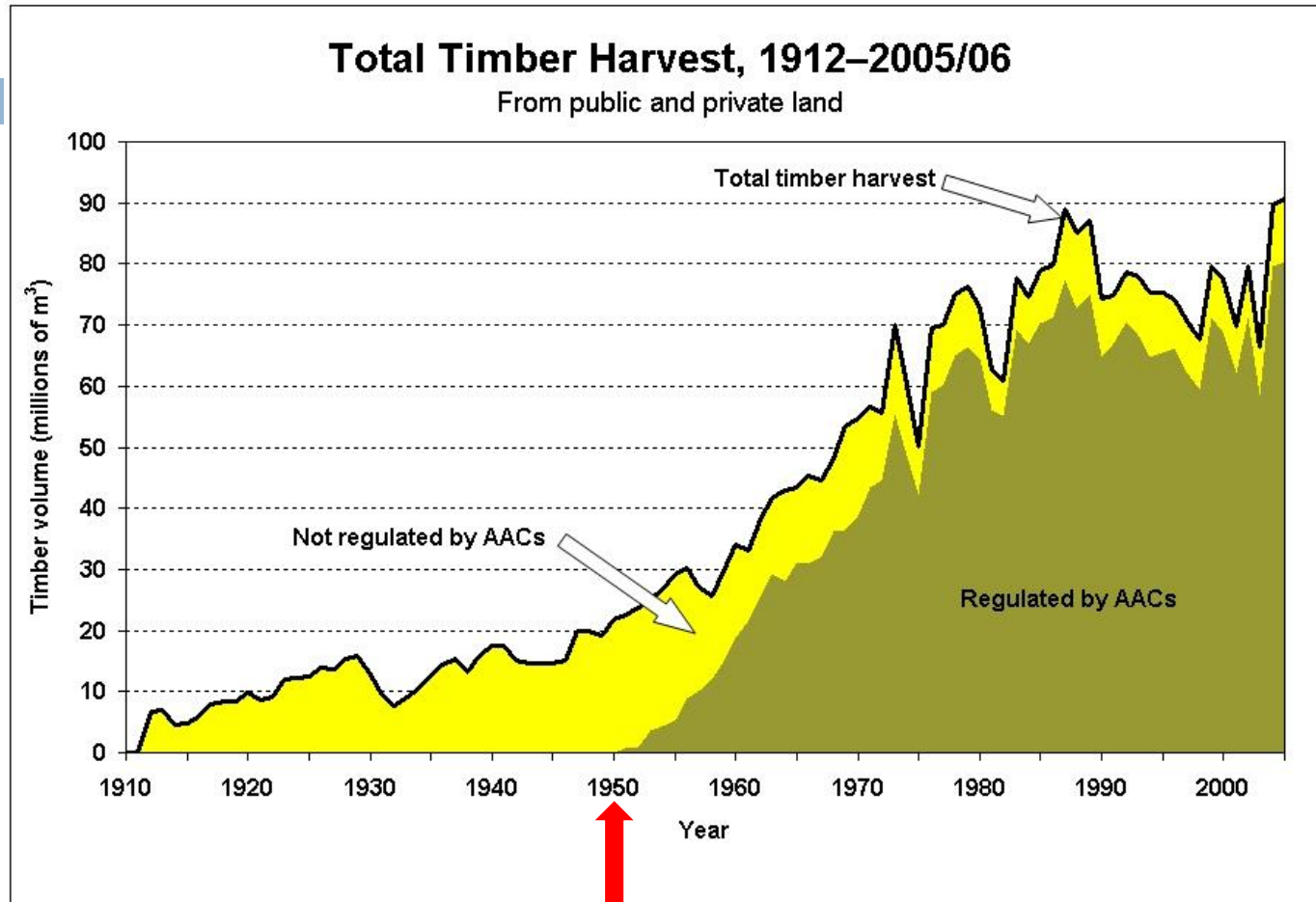


Figure 9.3 | Annual harvest versus supply deemed sustainable for harvest. Source: Natural Resources Canada, (2011: 33).

Growth in BC timber harvest (20th Century)

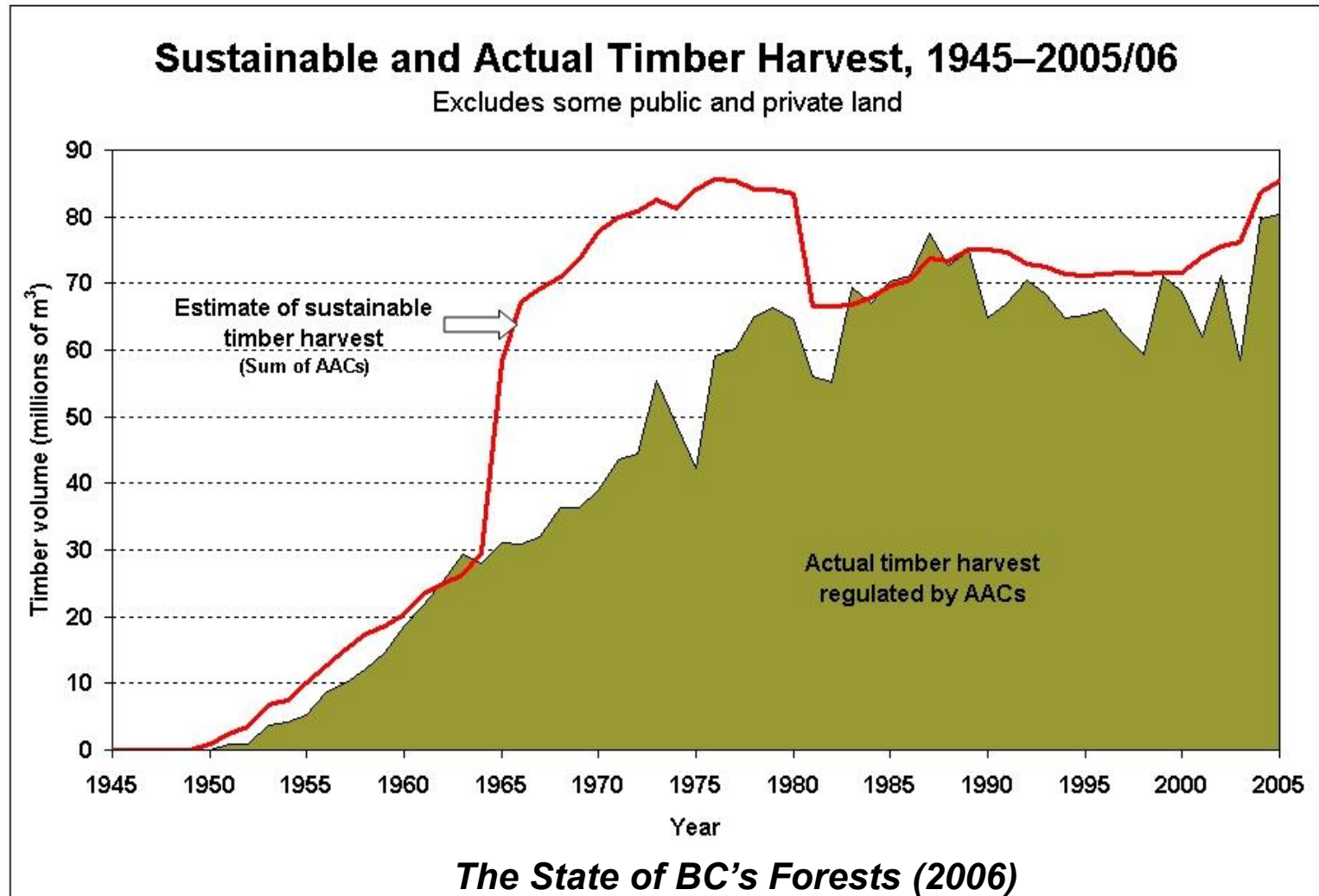


Beginning in 1949, the BC government set allowable annual cuts (AACs) to regulate harvest levels on public land and some private land

The State of BC's Forests (2006)

<http://www.for.gov.bc.ca/hfp/sof/2006/13.htm>

Actual vs Sustainable Harvest (AAC)



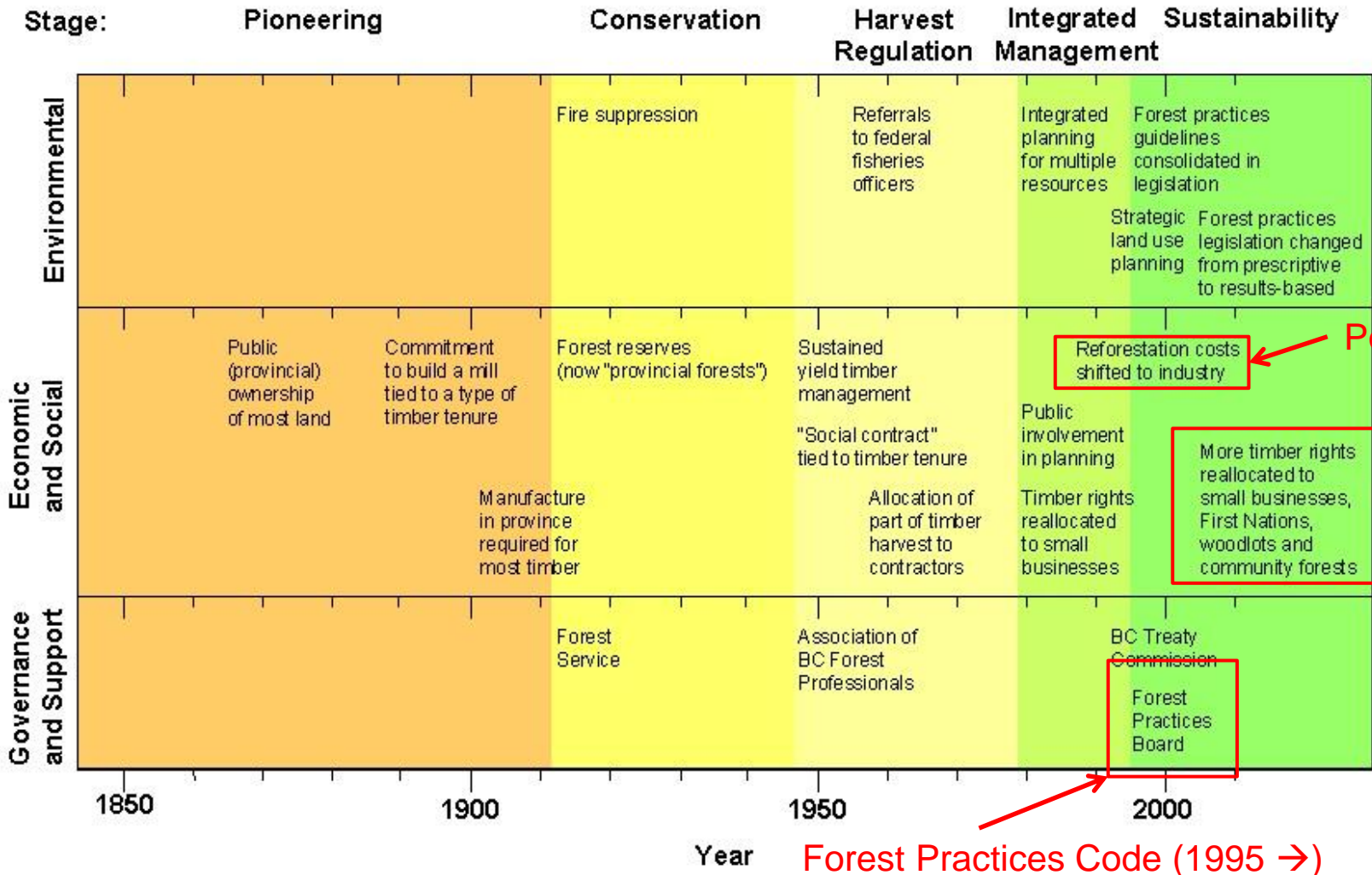
The State of BC's Forests (2006)

<http://www.for.gov.bc.ca/hfp/sof/2006/13.htm>

State and Trend

- Each forest management unit's AAC represents a sustainable harvest level that balances environmental, economic and social considerations.
- In the last 10 years, the average harvest regulated by AACs was 68 million m³ per year, or 10% less than the sustainable level (sum of AACs) of 77 million m³ per year. Among the causes for this difference are market fluctuations and delays in forest planning.
- AACs are the maximum average level of harvests for a five-year period. Within this period, actual harvests may exceed AACs for a short period, if offset by lower subsequent harvests.
- In the last few years, AACs of some management units have been increased to address the current mountain pine beetle epidemic with pest control measures and salvage programs. Decreases in the AACs of these units are projected for the future.
- AACs have also changed to reflect :
 - new harvesting and milling technologies (increases in the 1960s, 1970s and 1980s);
 - new legislation (the decrease around 1980),
 - and the establishment of new parks and forest practices (the decrease in the early 1990s).

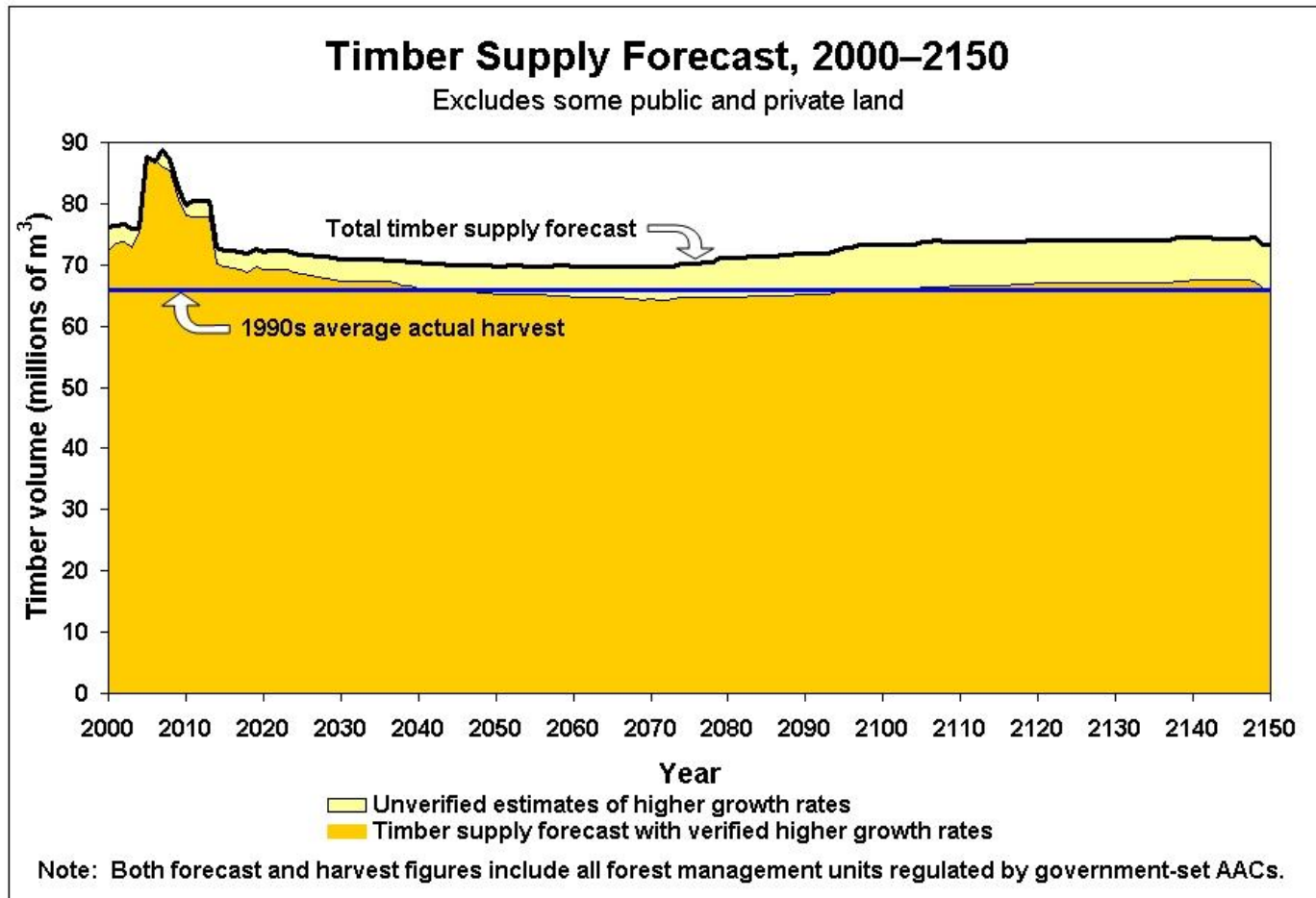
Elements of Sustainable Forest Management in Forest Law, 1850–2004



The State of BC's Forests (2006)

<http://www.for.gov.bc.ca/hfp/sof/2006/13.htm>

What is the provincial timber supply forecast?



The State of BC's Forests (2006)

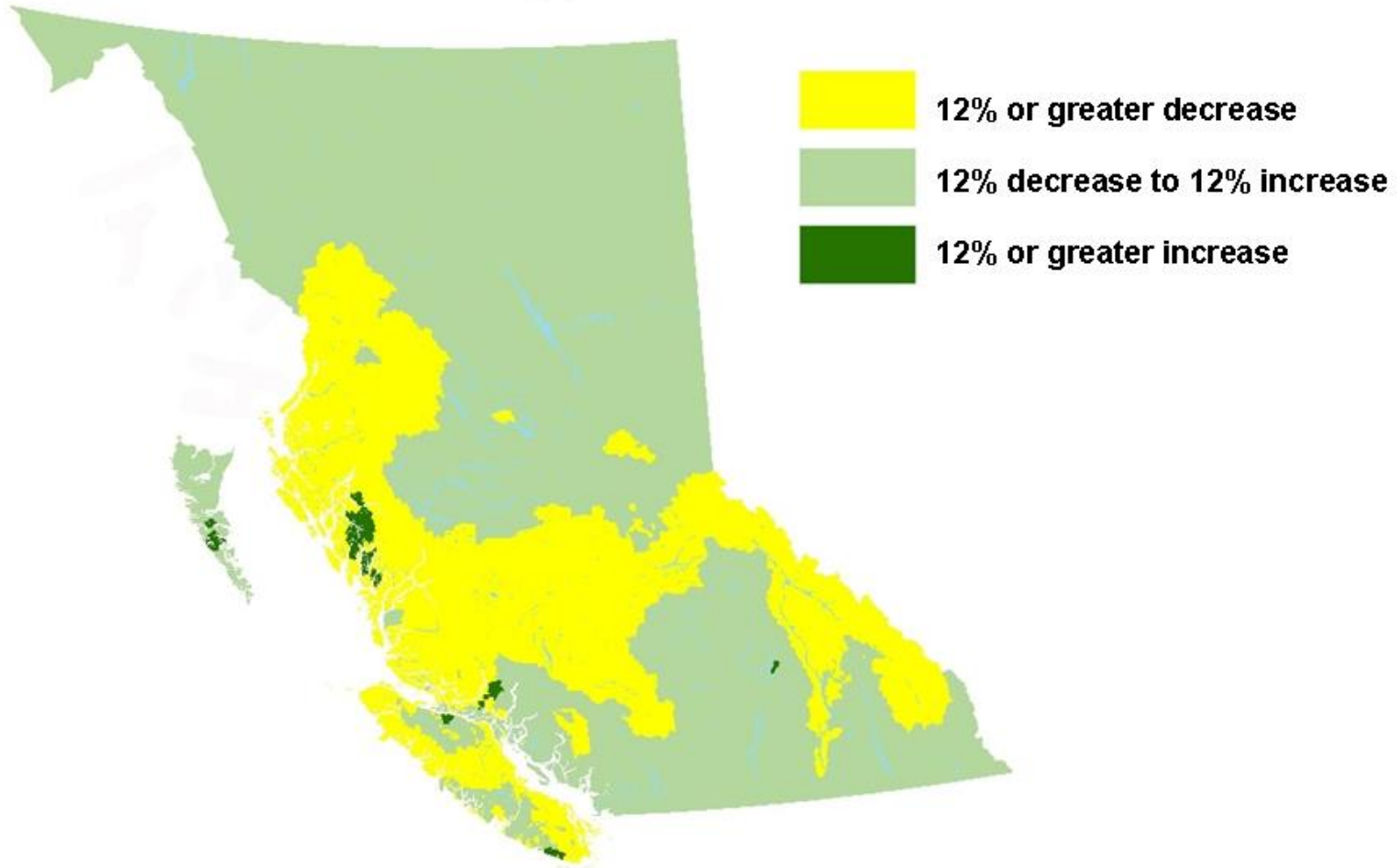
<http://www.for.gov.bc.ca/hfp/sof/2006/13.htm>

State and Trend (2000 to 2150 estimates)

- forecasts are influenced by many factors:
 - ▣ past harvest levels; the current mountain pine beetle epidemic; the shift to harvesting more second-growth forests; and estimates of future growth rates.
 - ▣ Current harvests are based on accumulated volumes in older forests. **Future harvests will rely on the faster growth of second-growth forests.**
- Increases in AACs, for pest control measures and salvage programs, the provincial timber supply forecast peaks at 89 million m³ per year in 2007, or 34% above the average actual harvest of 66 million m³ per year in the 1990s (before the AAC increases).
- A decrease to 73 million m³ per year is projected in 2014, followed by further decreases until 2060. **The forecast remains between 6% and 13% higher than the average actual harvest in the 1990s.**

Local Timber Supply Forecast, 2000–2050

Timber Supply Areas and Tree Farm Licences



The State of BC's Forests (2006)

<http://www.for.gov.bc.ca/hfp/sof/2006/13.htm>

Silviculture Systems

- **Silviculture**: directing the establishment, composition, growth and quality of forest stands;
 - Includes: harvesting; reforestation; site preparation
- **Harvesting Methods**: Clear-cutting; Seed tree; Shelterwood; Selection

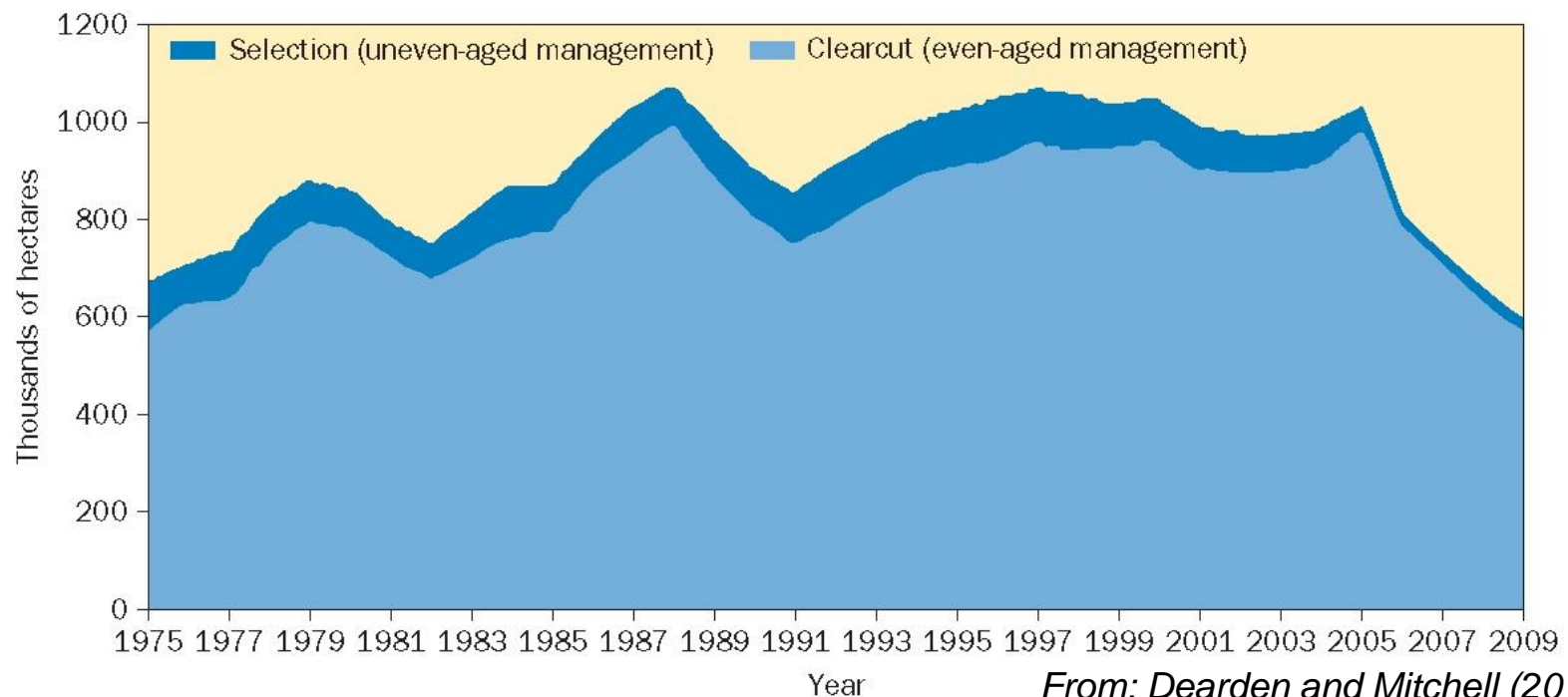


Figure 9.4 | Silviculture: Area harvested, 1975–2009. Source: National Forestry Database, Silviculture—National Tables, at: nfdp.ccfm.org/silviculture/national_e.php.

Clear-Cutting



(top-left) **Elaho R. valley** (near Squamish, BC) (~1994, credit: TR); (top-right) **Toba Inlet, Coastal BC** – note heli-cutblocks regenerating (~1995, credit: TR); (right) **generic clear-cut** credit to Dearden and Mitchell (2012)





Felling – MFR



Yarding – MFR



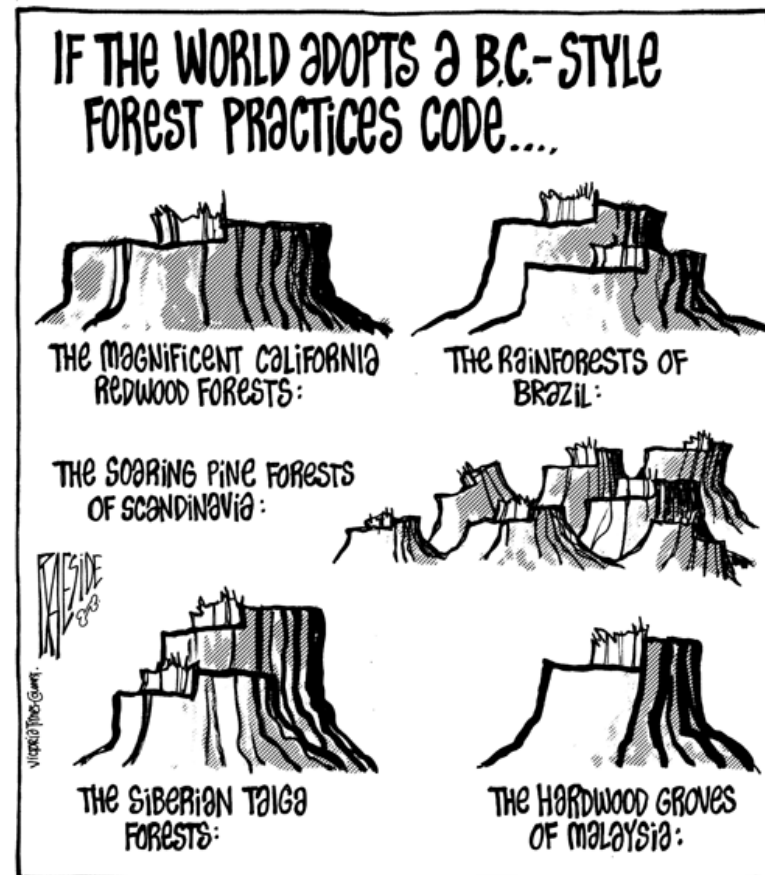
Loading – MFR

The State of BC's Forests (2006)

<http://www.for.gov.bc.ca/hfp/sof/2006/13.htm>

Clear-Cutting

- Increased use since 1970s vs. Selection
- Has caused a **great deal of conflict** in Canada (as in other parts of the world);
- Cutblocks are **aesthetically unappealing** and can have significant environmental impact;
- Pressure from EU resulted in BC reforming forest practices with the introduction of its **Forest Practices Code** in 1995.



Clear-Cutting – environmental challenges (next lecture)



Clear-Cutting – environmental challenges (next lecture)



“Second Growth: Environment activists need help to succeed in protecting rivers and forests” Article by: Bill Henderson (Aug. 2011) www.rabble.ca

Vancouver Island - 1860



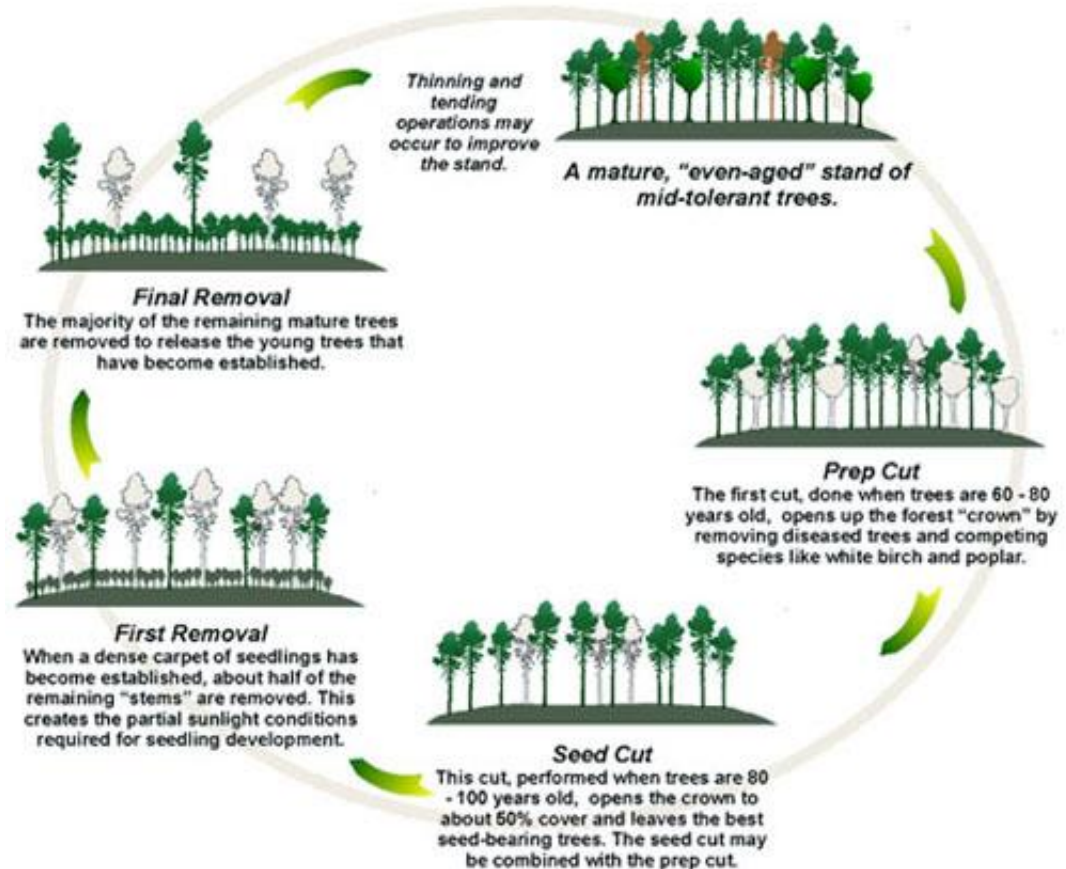
Vancouver Island - 2007

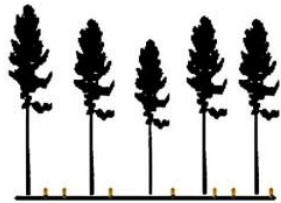


Shelterwood (Partial cuts)

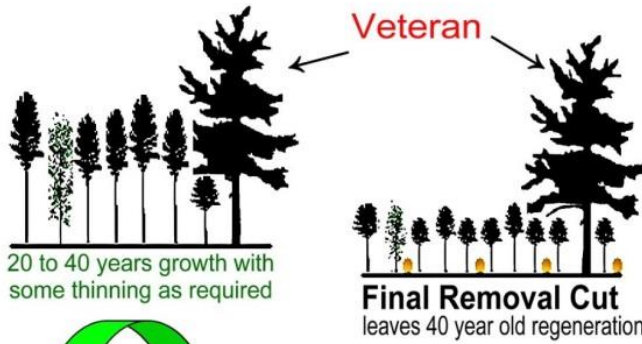


- involves the complete removal of a stand in a series of cuts
- is used with mid-tolerant species, those can tolerate partial shade as saplings, but also require some sunlight in order to thrive (e.g. Oak, White Pine)
- Results in even-aged stands





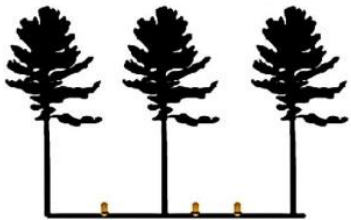
Preparation Cut
leaves trees 61-80 years old



Final Removal Cut
leaves 40 year old regeneration



20 years for crown development



Regeneration Cut
leaves trees 81-100 years old



20 years for natural regen to establish under protection (artificial regen may augment natural)

20 years for regen growth



First Removal Cut
leaves trees 101-120 years old and regen up to 20 years old

Source:
OntarioTreeMarkers.ca



Selective Logging

- Periodic harvesting of selected trees of various ages in a stand;
 - ▣ Valuable mature trees; or poorly shaped, unhealthy, damaged trees
- Objective is to maintain an **uneven-aged, mixed-species** forest stand;



Merv Wilkinson (1913-2011)

Owner/Steward/Eco-forester of Wildwood Forest, Nanaimo, BC (from 1938 to 2003) and promoter of sustainable forestry practices.



Selective Logging

- (++) Maintains recreation, scenic values, minimizing biodiversity losses;
- (--) Applicable to shade-tolerant tree species (e.g., sugar maple, western red cedar, balsam fir), requires skilled-work force; complex and costly system to plan and implement;

Wildwood Forest, Nanaimo, BC

<http://www.youtube.com/watch?v=XV5T6tvMkUA>

Reforestation Efforts

- Canada's forests, at point one, **considered so vast** that little thought given to managed reforestation; changed ~1985
- Previously, clear-cuts and slash piles **burned on site**, with land left to re-generate naturally;
- Deficit (in 2009): (Dearden and Mitchell, 2012)
 - ▣ Land area harvested 600,000 ha
 - ▣ Land area replanted/reseeded 450,000 ha
 - ▣ Land area defoliated by insects 15,200,000 ha
 - ▣ Land area burned by fires 3,200,000 ha

-150,000 ha

Reforestation Efforts

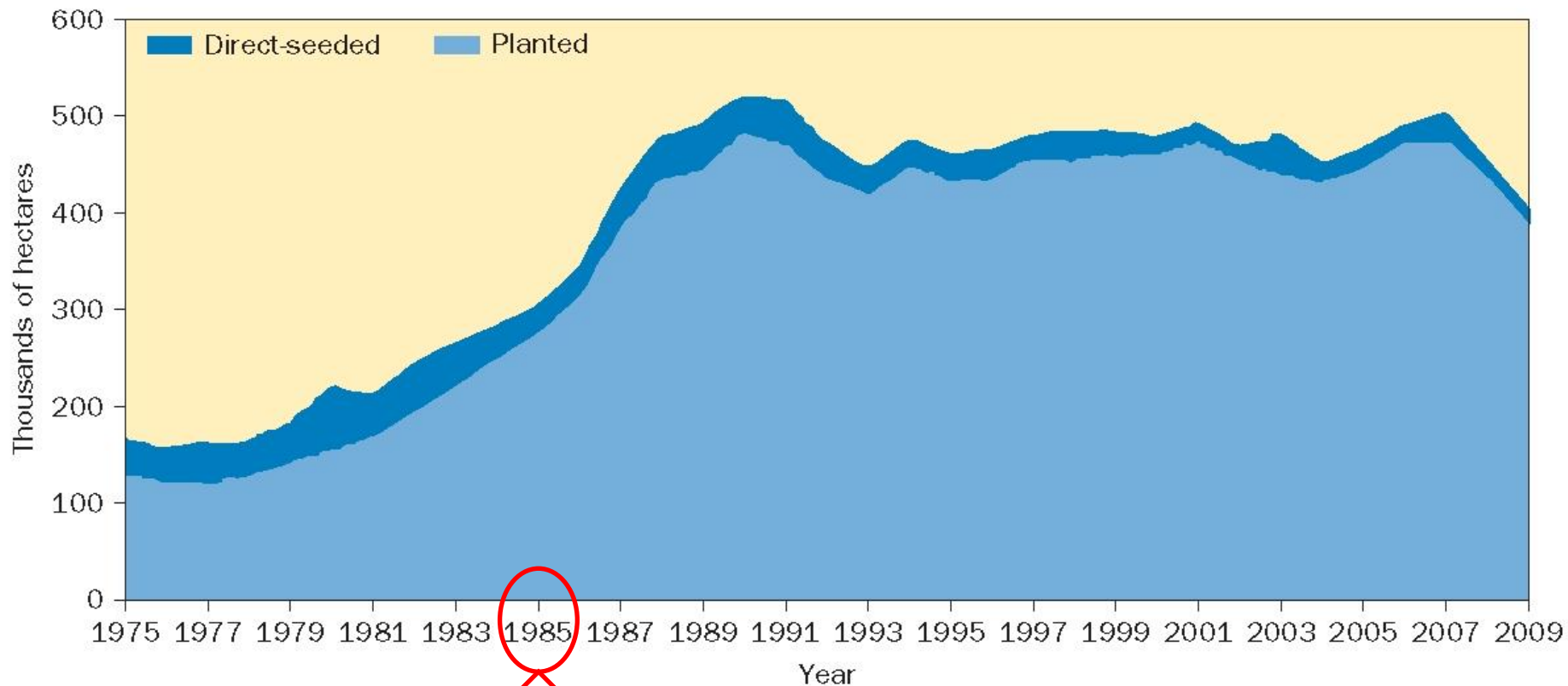


Figure 9.5 | Area planted or direct-seeded, 1975–2009. Source: National Forestry Database, Silviculture—National Tables, at: nfdp.ccfm.org/silviculture/national_e.php.

From: Dearden and Mitchell (2012)

Magnitude of Forest Disturbance (natural and other)

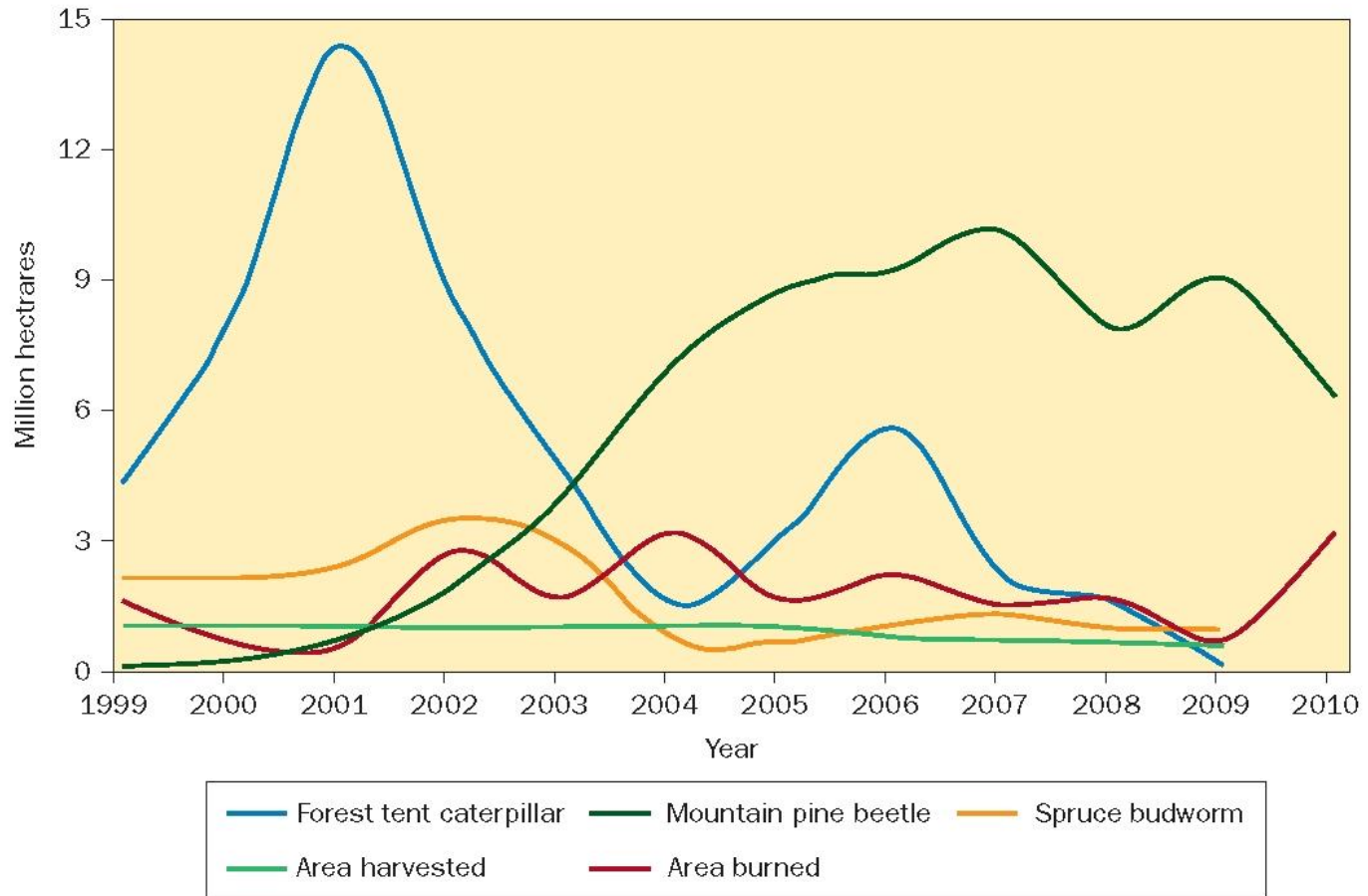


Figure 9.6 | Area of forest disturbed by fire, insects, and harvesting. Source: Natural Resources Canada (2011: 26).

From: Dearden and Mitchell (2012)

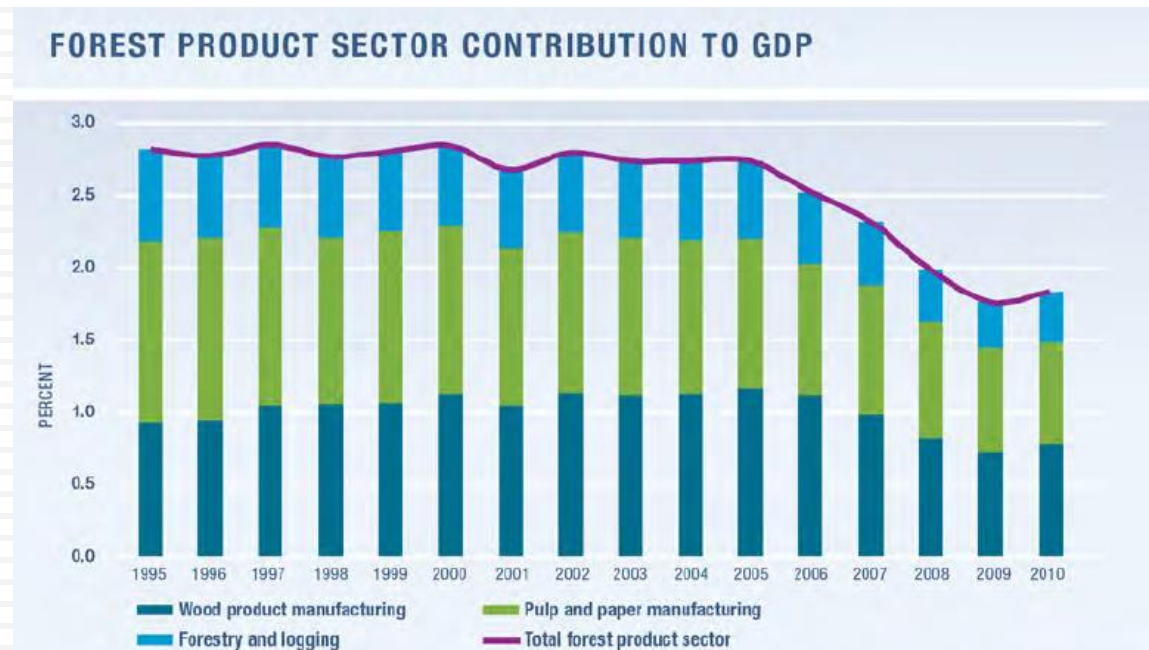
Looking Ahead to the next lecture

Read ahead (pp. 302-320, Chpt. 9, “Forests”)

“Environmental and Social Impacts of Forest Management Practices”

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

Source: NR Canada 2011



Source: Statistics Canada, Gross Domestic Product (GDP) at basic prices, by North American Industry Classification System (NAICS 2002)

References

- Dearden, P and Mitchell, B. 2012. *Environmental Change and Challenge*, Fourth Edition, Don Mills, Ontario: Oxford University Press {Chapter 9: 'Forests'}
- Curtis, RO, 1995. Extended rotations and culmination age of coast Douglas-fir: old studies speak to current issues. Res. Pap. PNW-RP-485. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 49 p.
- <http://www.sudburyforest.com/silvicsystems.html>, date accessed Jan 29, 2014

The Vermilion
Forest Management
Company Ltd.

Managing the FSC Certified Sudbury Forest

