



Forestry Department

Food and Agriculture Organization of the United Nations

**GLOBAL FOREST RESOURCES
ASSESSMENT 2010**

COUNTRY REPORT

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The Forest Resources Assessment Programme

Sustainably managed forests have multiple environmental and socio-economic functions important at the global, national and local scales, and play a vital part in sustainable development. Reliable and up-to-date information on the state of forest resources - not only on area and area change, but also on such variables as growing stock, wood and non-wood products, carbon, protected areas, use of forests for recreation and other services, biological diversity and forests' contribution to national economies - is crucial to support decision-making for policies and programmes in forestry and sustainable development at all levels.

FAO, at the request of its member countries, regularly monitors the world's forests and their management and uses through the Forest Resources Assessment Programme. This country report forms part of the Global Forest Resources Assessment 2010 (FRA 2010).

The reporting framework for FRA 2010 is based on the thematic elements of sustainable forest management acknowledged in intergovernmental forest-related fora and includes variables related to the extent, condition, uses and values of forest resources, as well as the policy, legal and institutional framework related to forests. More information on the FRA 2010 process and the results - including all the country reports - is available on the FRA Web site (www.fao.org/forestry/fra).

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The Global Forest Resources Assessment Country Report Series is designed to document and make available the information forming the basis for the FRA reports. The Country Reports have been compiled by officially nominated country correspondents in collaboration with FAO staff. Prior to finalisation, these reports were subject to validation by forestry authorities in the respective countries.

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1 Table T1 – Extent of Forest and Other wooded land

1.1 FRA 2010 Categories and definitions

Category	Definition
Forest	Land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds <i>in situ</i> . It does not include land that is predominantly under agricultural or urban land use.
Other wooded land	Land not classified as “Forest”, spanning more than 0.5 hectares; with trees higher than 5 meters and a canopy cover of 5-10 percent, or trees able to reach these thresholds <i>in situ</i> ; or with a combined cover of shrubs, bushes and trees above 10 percent. It does not include land that is predominantly under agricultural or urban land use.
Other land	All land that is not classified as “Forest” or “Other wooded land”.
Other land with tree cover (Subordinated to “Other land”)	Land classified as “Other land”, spanning more than 0.5 hectares with a canopy cover of more than 10 percent of trees able to reach a height of 5 meters at maturity.
Inland water bodies	Inland water bodies generally include major rivers, lakes and water reservoirs.

1.2 National data

1.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Canada’s Forest Inventory 2001 (CanFI2001)	H	Forest area	2001	

1.2.2 Classification and definitions

National class	Definition
Forest ^a	A plant community predominantly of trees and other woody vegetation, growing more or less closely together.
Forest land ^b	Land primarily intended for growing, or currently supporting, forest. Includes temporarily nonforested lands such as clear-cut lands.
Treed wetland	Land having a water table at, near, or above the soil surface, or which is saturated for a long enough period to promote wetland or aquatic processes, and which supports tree cover.
Treed muskeg/ treed bog	Peat-dominated wetlands covered or filled with poorly to moderately decomposed Sphagnum-derived peats and with tree cover amounting to 10 % or more crown closure.
Forested wetland/ swamp	Wooded wetlands dominated by 25% or greater cover of trees or tall shrubs and characterized by periodic flooding and nearly permanent subsurface water flow through various mixtures of mineral sediments and peat.
Scattered treed	Land classified from satellite imagery (SPOT-VGT) as mixed mosaic forest cover; treed open land; woodland-cropland; cropland-woodland.
Treed rock	Rock with a very shallow soil, supporting semi-stagnated or stagnated trees. At least 10% of the area (by crown closure) will be tree covered, although these sites do not produce merchantable stands.

Small island/ shelter belt	Area of trees less than 2 hectares in size, or a line of trees (windbreak).
Alpine forest	High elevation forest located adjacent to alpine areas (http://www.for.gov.bc.ca/his/isis/user_guide/append_c/a_c_14.htm)
Wooded prairie / aspen parkland	Wooded prairie are open fields in regeneration advanced enough that it has become a wooded prairie, an intermediate step between the "open field" and "forest" in the regeneration process. Eventually with time, this habitat will disappear to be replaced by forest. Open native grasses with sparse trees. (Kouchibouguac National Park data conversion document)
Wind swept / stunted	Very open with sparse, discontinuous stunted trees
Recreation	Golf courses, camp grounds, recreational sites

^a Haddon, B.D. (ed.). 1988. Forest Inventory Terms in Canada. Third Edition. Forestry Canada, Petawawa National Forestry Institute, Chalk River, Ontario.

^b Gray, S.L.; Power, K. 1997. Canada's forest inventory 1991: the 1994 version – technical supplement. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, Victoria, BC. Information Report BC-X-363. 73 p.

1.2.3 Original data

Land class	Area (1000 ha)
Forest	310 134
Other wooded land	
Vegetated treed	655
Vegetated treed wetland	37 224
Vegetated treed wetland - treed muskeg/treed bog	35 191
Vegetated treed wetland - forested wetland/swamp	1 776
Vegetated treed scattered	5 411
Vegetated treed scattered - treed rock	1 473
Vegetated treed scattered - small island/shelter belt	46
Vegetated treed scattered - alpine forest	4 381
Vegetated treed scattered - wooded prairie/aspen parkland	0
Vegetated treed scattered - windswept/stunted	5 621
Vegetated treed - recreation	174
Other wooded land (subtotal)	91 951
Other land	480 016
...of which with tree cover	n/a
Inland water bodies	88 284
Unclassified	8 692
Total	979 077

1.3 Analysis and processing of national data

1.3.1 Calibration

The total area of 979 077 thousand ha in the above table is from CanFI2001 and does not match the total area for Canada from Statistics Canada and FAOSTAT of 998 467 thousand ha. No attempt was made to prorate the CanFI2001 area to the Statistics Canada or FAOSTAT area in this or any other table. Rather, the difference was attributed to “Other land.”

1.3.2 Estimation and forecasting

It should be noted that not all of the data in CanFI 2001 are up-to-date, and in some cases the data is more than 25 years old. About 20 per cent of the data submitted for CanFI 2001 was also used in CanFI 1991. CanFI2001 therefore does not lend itself to forecasting. The data figures from Canada’s Forest Inventory 2001 were therefore used for all four reporting years.

1.3.3 Reclassification into FRA 2010 categories

- CanFI category “Forest” was used to report FRA 2010 category “Forest.”
- CanFI codes “Vegetated treed”, “Wetland,” “Treed muskeg/ treed bog,” “Forested wetland/ swamp,” “Scattered,” “Treed rock,” “Small island/shelter belt,” “Alpine forest,” “Wooded prairie / aspen parkland,” “Wind swept/stunted,” “Recreation” were aggregated to report FRA 2010 category “Other wooded land.”
- CanFI category “Unclassified” was included with “Other land.”

1.4 Data for Table T1

FRA 2010 categories	Area (1000 hectares)			
	1990	2000	2005	2010
Forest	310134	310134	310134	310134
Other wooded land	91951	91951	91951	91951
Other land	507266	507266	507266	507266
...of which with tree cover	NDA	NDA	NDA	NDA
Inland water bodies*	89116	89116	89116	89116
TOTAL	998467	998467	998467	998467

NDA = data are not available

* Source: Statistics Canada

1.5 Comments to Table T1

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Forest		
Other wooded land		
Other land		
Other land with tree cover		
Inland water bodies	Source FAOSTAT	

Other general comments to the table

The State of the Forests web site (http://www.nrcan-rncan.gc.ca/cfs-scf/national/what-quoi/sof/sof04/notes_e.html) states:

"The data regarding Canada's forest and other wooded land are based on Canada's Forest Inventory 2001 (CanFI 2001), which uses different categories from CanFI 1991. Comparisons between CanFI 1991 and CanFI 2001 cannot be made in a meaningful way due to a number of differences in methods and definitions in the source inventories (see text entitled "About the CanFI 2001 Statistics" in Overview section of this report)."

The Overview Section (http://www.nrcan-rncan.gc.ca/cfs-scf/national/what-quoi/sof/sof04/overview_e.html) provides more detail:

"Since CanFI 2001 differs from the previous inventory (CanFI 1991) in a number of ways; these data cannot be compared meaningfully. Definitions and methodologies have been changed, the inventory coverage has been extended to include all of Canada's land area, and more land cover classes are used to reflect a focus on the forest rather than on timber. Measurement methodology has also been changed, particularly in northern Canada. In 1991, forest area north of 60° was determined using maps generated in the early 1980s or before. CanFI 2001, on the other hand, uses a satellite interpretation, which improves our ability to differentiate forest from non-forest areas. As a result, some areas that were previously thought to be forest are, in fact, not forested. These differences mean that comparisons between the 1991 and 2001 CanFI inventories would be misleading."

The area of forest reported in FRA 2000 corresponded to the area of "timber-productive" forest in Canada's Forest Inventory 1991, while the area of other wooded land corresponded to the area of "timber-unproductive" forest in CanFI1991. CanFI2001 was designed to avoid a value-laden classification system focused on timber and to more closely reflect the classification system used in FRA. It does not use these categories.

Expected year for completion of ongoing/planned <u>national forest inventory and/or RS survey / mapping</u>	
Field inventory	Ongoing ¹
Remote sensing survey / mapping	

¹ A new national forest inventory has been designed and is being implemented to address new business demands and evolving needs. The NFI, which replaces CanFI, a periodic compilation of existing information from across the country, is a plot-based design consisting of permanent observational units located on a national grid. The purpose of the NFI is to assess and monitor the extent, state and sustainable development of Canada's forests in a timely and accurate manner. By collecting and reporting information to a set of uniform standards, it allows for consistent reporting across the country on Canada's land base to establish a baseline of the state of Canada's forest resources and how they are changing over time. Describing the forest resources in terms of their basic characteristics provides the flexibility for the NFI to address both immediate needs and unforeseen emerging issues. In addition to providing consistent estimates for traditional forest inventory attributes, the NFI provides a framework for collecting additional data relevant to sustainable forest management (e.g., socioeconomic indicators), as well as data related to forest health (e.g., insect damage, disease infestation), biodiversity, and forest productivity.

The NFI was established between 2000 and 2006. The data have been compiled and are being analyzed to produce baseline statistics. Inventory data and reports from the new inventory, as well as complete documentation, will be available on the NFI website (<http://nfi.nfis.org>) in 2009. The ongoing measurement of the NFI is under way, and is designed to provide inventory data and an assessment of the current status and change of the forest resources on a 5-year cycle.

2 Table T2 – Forest ownership and management rights

2.1 FRA 2010 Categories and definitions

Category	Definition
Public ownership	Forest owned by the State; or administrative units of the public administration; or by institutions or corporations owned by the public administration.
Private ownership	Forest owned by individuals, families, communities, private co-operatives, corporations and other business entities, private religious and educational institutions, pension or investment funds, NGOs, nature conservation associations and other private institutions.
Individuals (<i>sub-category of Private ownership</i>)	Forest owned by individuals and families.
Private business entities and institutions (<i>sub-category of Private ownership</i>)	Forest owned by private corporations, co-operatives, companies and other business entities, as well as private non-profit organizations such as NGOs, nature conservation associations, and private religious and educational institutions, etc.
Local communities (<i>sub-category of Private ownership</i>)	Forest owned by a group of individuals belonging to the same community residing within or in the vicinity of a forest area. The community members are co-owners that share exclusive rights and duties, and benefits contribute to the community development.
Indigenous / tribal communities (<i>sub-category of Private ownership</i>)	Forest owned by communities of indigenous or tribal people.
Other types of ownership	Other kind of ownership arrangements not covered by the categories above. Also includes areas where ownership is unclear or disputed.
Categories related to the holder of management rights of public forest resources	
Public Administration	The Public Administration (or institutions or corporations owned by the Public Administration) retains management rights and responsibilities within the limits specified by the legislation.
Individuals/households	Forest management rights and responsibilities are transferred from the Public Administration to individuals or households through long-term leases or management agreements.
Private institutions	Forest management rights and responsibilities are transferred from the Public Administration to corporations, other business entities, private co-operatives, private non-profit institutions and associations, etc., through long-term leases or management agreements.
Communities	Forest management rights and responsibilities are transferred from the Public Administration to local communities (including indigenous and tribal communities) through long-term leases or management agreements.
Other form of management rights	Forests for which the transfer of management rights does not belong to any of the categories mentioned above.

2.2 National data

2.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Canada's Forest Inventory (CanFI 2001)	H	Ownership	2001	

2.2.2 Classification and definitions

National class	Definition
Federal crown	Crown land within the jurisdiction of the federal government, except for land under the jurisdiction of Indian and Northern Affairs Canada
Native	Land within an Indian Reserve or Indian Settlement
Provincial/territorial crown	Crown land within the jurisdiction of a provincial or territorial government, or Indian and Northern Affairs Canada
Municipal	Land that is the property of a municipality or other government agency
Private unspecified	Land owned by corporations or individuals at an unknown scale of operation
Private industrial	Land owned by a large corporate industry for commercial forestry purposes
Private non-industrial	Land owned by corporations or individuals that may or may not be used for commercial forestry purposes

2.2.3 Original data

Ownership	Area (1000 hectares)	
	Forest	Other wooded land
Unknown ownership	8	0
Federal crown - other	5 179	1 046
Federal crown - native	1 220	237
Provincial crown	279 004	88 722
Municipal	184	7
Public	285 587	90 012
Private unspecified	1 748	64
Industrial private	3 928	84
Nonindustrial private	18 862	1 791
Private	24 538	1 939
Total	310 134	91 951

2.3 Analysis and processing of national data

2.3.1 Reclassification into FRA 2010 categories

Public ownership includes "Federal crown", "Native", "Provincial/territorial crown", and "Municipal".

Private ownership includes "Private unspecified", "Private industrial" and "Private non-industrial".

Private ownership ...of which owned by private business entities and institutions includes "Private industrial".

Private ownership ...of which owned by individuals includes "Private unspecified", and "Private non-industrial".

2.4 Data for Table T2

Table 2a - Forest ownership

FRA 2010 Categories	Forest area (1000 hectares)		
	1990	2000	2005
Public ownership	285 587	285 587	285 587
Private ownership	24538	24538	24538
...of which owned by individuals	20 610	20 610	20 610
...of which owned by private business entities and institutions	3928	3928	3928
...of which owned by local communities	0	0	0
...of which owned by indigenous / tribal communities	0	0	0
Other types of ownership	8	8	8
Total	Canada 310134	310134	310134

Note: If other types of ownership is reported, please specify details in comment to the table.

Does ownership of trees coincide with ownership of the land on which they are situated?	<input checked="" type="checkbox"/>	Yes
	<input type="checkbox"/>	No
If No above, please describe below how the two differ:		

Table 2b - Holder of management rights of public forests

FRA 2010 Categories	Forest area (1000 hectares)		
	1990	2000	2005
Public Administration	285 587	285 587	285 587
Individuals	0	0	0
Private corporations and institutions	0	0	0
Communities	0	0	0
Other	0	0	0
TOTAL	285 587	285 587	285 587

2.5 Comments to Table T2

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Public ownership		
Private ownership		
Other types of ownership		
Management rights		

Other general comments to the table

3 Table T3 – Forest designation and management

3.1 FRA 2010 Categories and definitions

Term	Definition
Primary designated function	The primary function or management objective assigned to a management unit either by legal prescription, documented decision of the landowner/manager, or evidence provided by documented studies of forest management practices and customary use.
Protected areas	Areas especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means.
Categories of primary designated functions	
Production	Forest area designated primarily for production of wood, fibre, bio-energy and/or non-wood forest products.
Protection of soil and water	Forest area designated primarily for protection of soil and water.
Conservation of biodiversity	Forest area designated primarily for conservation of biological diversity. Includes but is not limited to areas designated for biodiversity conservation within the protected areas.
Social services	Forest area designated primarily for social services.
Multiple use	Forest area designated primarily for more than one purpose and where none of these alone is considered as the predominant designated function.
Other	Forest areas designated primarily for a function other than production, protection, conservation, social services or multiple use.
No / unknown	No or unknown designation.
Special designation and management categories	
Area of permanent forest estate (PFE)	Forest area that is designated to be retained as forest and may not be converted to other land use.
Forest area within protected areas	Forest area within formally established protected areas independently of the purpose for which the protected areas were established.
Forest area under sustainable forest management	To be defined and documented by the country.
Forest area with management plan	Forest area that has a long-term (ten years or more) documented management plan, aiming at defined management goals, which is periodically revised.

3.2 National data

3.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Canada's Forest Inventory 2001 (CanFI 2001)	H	Ownership and status	2001	
Metafore's Forest Certification Resource Centre, www.certifiedwood.org	H	Areas certified	2009	

3.2.2 Classification and definitions

National class	Definition
Federal crown	Crown land within the jurisdiction of the federal government, except for land under the jurisdiction of Indian and Northern Affairs Canada
Native	Land within an Indian Reserve or Indian Settlement
Provincial/territorial crown	Crown land within the jurisdiction of a provincial or territorial government, or Indian and Northern Affairs Canada
Municipal	Land that is the property of a municipality or other government agency
Private unspecified	Land owned by corporations or individuals at an unknown scale of operation
Private industrial	Land owned by a large corporate industry for commercial forestry purposes
Private non-industrial	Land owned by corporations or individuals that may or may not be used for commercial forestry purposes
Reserved	Areas that by law are not available for timber harvesting.
Nonreserved	Areas whose management may include timber harvesting. Policies or regulations may constrain timber harvesting.
Nonreserved – assigned	Nonreserved Crown-owned areas no longer under the direct, immediate control of the Crown. Includes Crown land that has been leased or licensed to private agencies.
Nonreserved – retained	Nonreserved Crown-owned areas under the direct, immediate control of the Crown.
Nonreserved – other	Nonreserved private areas whose management may include timber harvesting.
Forest area under sustainable forest management	All crown forest area. This does not imply that private forest land is not under sustainable forest management.

3.2.3 Original data

Ownership	Status	Forest area (1000 ha)	Other wooded land area (1000 ha)	FAO Class
Federal	Reserved	4 567	813	Conservation of biodiversity
	Nonreserved - assigned	298	216	Multiple purposes
	Nonreserved - retained	311	17	Multiple purposes
	Nonreserved - other	3	0	Multiple purposes
	Unknown	1	0	Multiple purposes
Native	Reserved	2	0	No or unknown function
	Nonreserved - assigned	357	86	No or unknown function
	Nonreserved - retained	852	151	No or unknown function
	Nonreserved - other	8	0	No or unknown function
Provincial/territorial	Reserved	10 717	2 337	Conservation of biodiversity
	Nonreserved - assigned	70 132	11 533	Multiple purposes
	Nonreserved - retained	196 482	74 482	Multiple purposes
	Nonreserved - other	546	57	Multiple purposes
	Unknown	1 127	314	Multiple purposes
Municipal	Reserved	2	0	No or unknown function
	Nonreserved - retained	6	-	No or unknown function
	Nonreserved - other	172	6	No or unknown function
	Unknown	4	1	No or unknown function
Private unspecified	Nonreserved - other	1 743	62	No or unknown function
	Unknown	5	2	No or unknown function
Private industrial	Reserved	1	0	Production
	Nonreserved - other	3 926	84	Production

Private nonindustrial	Reserved	8	1	No or unknown function
	Nonreserved - other	18 855	1 790	No or unknown function
Unknown	Unknown	8	0	No or unknown function
Total		310 134	91 951	

3.3 Analysis and processing of national data

3.3.1 Estimation and forecasting

The data from 2001 have been used for 1990, 2000, 2005 and 2010. No forecasting is attempted in this report.

3.3.2 Reclassification into FRA 2010 categories

The following table describes how the CanFI2001 data were reclassified to the designated primary functions:

Designated function	Ownership	Status
Production	Industrial	All categories
Protection soil, water	Not available	Not available
Conservation of biodiversity	Federal and provincial	Reserved
Social services	Not available	Not available
Multiple purposes	Federal and provincial	Not reserved
No or unknown function	All other categories	All categories

3.4 Data for Table T3

Table 3a – Primary designated function

FRA 2010 Categories	Forest area (1000 hectares)			
	1990	2000	2005	2010
Production	3928	3928	3928	3928
Protection of soil and water	0	0	0	0
Conservation of biodiversity	15284	15284	15284	15284
Social services	0	0	0	0
Multiple use	268899	268899	268899	268899
Other (please specify in comments below the table)	0	0	0	0
No / unknown	22023	22023	22023	22023
TOTAL	310134	310134	310134	310134

Table 3b – Special designation and management categories

FRA 2010 Categories	Forest area (1000 hectares)			
	1990	2000	2005	2010
Area of permanent forest estate	285587	285587	285587	285587
Forest area within protected areas	24859	24859	24859	24859
Forest area under sustainable forest management	285 587	285 587	285 587	285 587
Forest area with management plan	NDA	NDA	NDA.	NDA

Note: No attempt was made to forecast the area under sustainable forest management to 2010.

3.5 Comments to Table T3

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Production		
Protection of soil and water	Legislation, regulation or policy exists in most jurisdictions regarding harvesting in riparian areas and on steep slopes. These areas are typically narrow in width or small in size and not identified as separate types on forest maps. As a result, it is difficult to provide an area estimate. The area is included in the Multiple use category.	
Conservation of biodiversity		
Social services		
Multiple use		
Other		
No / unknown designation		
Area of permanent forest estate	This category includes forest land under public ownership, including “Federal crown”, “Native”, “Provincial/territorial crown”, and “Municipal”.	
Forest area within protected areas	There are approximately 27.8 million ha of protected areas without geographic information. This means that no land cover information can be extracted from the database for these areas. Therefore, the figure provided above does not include an estimate of the forest area within this 27.8 million ha.	
Forest area under sustainable forest management	This category includes forest land under public ownership, including “Federal crown”, “Native”, “Provincial/territorial crown”, and “Municipal”.	Private forest land is not included. This does not imply that private forest lands are not under sustainable forest management. Many large privately owned forest lands are certified to one of three internationally recognized certification systems used in Canada.
Forest area with management plan		

Other general comments to the table

4 Table T4 – Forest characteristics

4.1 FRA 2010 Categories and definitions

Term / category	Definition
Naturally regenerated forest	Forest predominantly composed of trees established through natural regeneration.
Introduced species	A species, subspecies or lower taxon, occurring <u>outside</u> its natural range (past or present) and dispersal potential (i.e. outside the range it occupies naturally or could occupy without direct or indirect introduction or care by humans).
Characteristics categories	
Primary forest	Naturally regenerated forest of native species, where there are no clearly visible indications of human activities and the ecological processes are not significantly disturbed.
Other naturally regenerated forest	Naturally regenerated forest where there are clearly visible indications of human activities.
Other naturally regenerated forest of introduced species (sub-category)	Other naturally regenerated forest where the trees are predominantly of introduced species.
Planted forest	Forest predominantly composed of trees established through planting and/or deliberate seeding.
Planted forest of introduced species (sub-category)	Planted forest, where the planted/seeded trees are predominantly of introduced species.
Special categories	
Rubber plantations	Forest area with rubber tree plantations.
Mangroves	Area of forest and other wooded land with mangrove vegetation.
Bamboo	Area of forest and other wooded land with predominant bamboo vegetation.

4.2 National data

4.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
National Forestry Database http://nfdp.ccfm.org/data/comp_67e.html	H	Planted forests		
Canada's Forest Inventory 2001 (CanFI 2001)	H	Status: Accessed		

4.2.2 Classification and definitions

National class	Definition
Reserved	Areas that by law are not available for timber harvesting
Nonreserved	Areas whose management may include timber harvesting. Policies or regulations may constrain timber harvesting.
Accessed	The presence of a transportation route (road, rail, or water) within or on the border of a CanFI cell. No implication of economic accessibility for timber harvesting is intended.
Not accessed	

4.2.3 Original data

See table under chapter 3.2.3.

Area of planted forest (hectares) per year.

1988	431676
1989	444061
1990	481292
1991	469011
1992	434434
1993	419338
1994	445928
1995	434360
1996	432415
1997	454753
1998	453440
1999	460269
2000	459029
2001	470534
2002	450886
2003	435200
2004	431421
2005	440302
2006	463420
2007	451318

4.3 Analysis and processing of national data

4.3.1 Calibration

Not needed.

4.3.2 Estimation and forecasting

The same figures have been used for the area of primary forest for the four reporting periods.

4.3.3 Reclassification into FRA 2010 categories

The “reserved plus not accessed” is classified as “Primary forest”. The remaining area is classified as “Other naturally regenerating forest”. The “Other naturally regenerating forest” is reduced by the amount of forest predominantly composed of trees established through planting.

4.4 Data for Table T4

Table 4a

FRA 2010 Categories	Forest area (1000 hectares)			
	1990	2000	2005	2010
Primary forest	165448	165448	165448	165448
Other naturally regenerated forest	143329	138866	136638	135723
...of which of introduced species	ID	ID	ID	ID
Planted forest	1357	5820	8048	8963
...of which of introduced species	ID	ID	ID	ID
TOTAL	310134	310134	310134	310134

Figures for the area planted are from 1988 to 2007. The area planted has not been projected to 2010. The last available statistics are for 2007 and these numbers are reflected in the 2010 column.

ID = Insufficient data (i.e., data are not available)

Table 4b

FRA 2010 Categories	Area (1000 hectares)			
	1990	2000	2005	2010
Rubber plantations (Forest)	0	0	0	0
Mangroves (Forest and OWL)	0	0	0	0
Bamboo (Forest and OWL)	0	0	0	0

4.5 Comments to Table T4

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Primary forest	The “reserved” plus “not accessed” is classified as primary forest.	
Other naturally regenerating forest		
Planted forest	Establishment of a forest by setting out seedlings, transplants, or cuttings in an area. Native trees are used predominantly in planting and seeding programs to regenerate harvested forest lands. Some jurisdictions explicitly exclude the use of exotic species for regeneration of forest land, while other jurisdictions have elected to use selected species in certain circumstances. The area of harvested land planted with exotics across Canada accounts for less than 1% in most years. Similarly, there is very limited use of exotic species for afforestation.	
Rubber plantations		
Mangroves		
Bamboo		

Other general comments to the table

5 Table T5 – Forest establishment and reforestation

5.1 FRA 2010 Categories and definitions

Term	Definition
Afforestation	Establishment of forest through planting and/or deliberate seeding on land that, until then, was not classified as forest.
Reforestation	Re-establishment of forest through planting and/or deliberate seeding on land classified as forest.
Natural expansion of forest	Expansion of forests through natural succession on land that, until then, was under another land use (e.g. forest succession on land previously used for agriculture).

5.2 National data

5.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Environment Canada. 2008. National Inventory Report 1990-2006: Greenhouse Gas Sources and Sinks in Canada. Environment Canada, Ottawa, Ontario, pp. 620. ISBN: 978-1-100-11176-6. Cat. no.: En81-4/2006E	H			

5.2.2 Classification and definitions

National class	Definition
Afforestation	Direct human-induced conversion of land that has not been forested for a period of at least 50 years to forest land through planting, seeding and/or human induced promotion of natural seed sources
Reforestation	Reforestation is 'the direct human-induced conversion of non-forested land to forested land through planting, seeding and/or the human-induced promotion of natural seed sources, on land that was forested, but that has been converted to non-forested land'. In the first commitment period of the Kyoto Protocol, reforestation activities have been defined as reforestation of lands that were not forested on 31 December 1989, but have had forest cover at some point during the past 50 years (Angelsen 2008).

Source: International Panel on Climate Change, Good Practice Guidance for Land Use, Land-Use Change and Forestry, http://www.ipcc-nggip.iges.or.jp/public/gpplulucf/gpplulucf_files/Glossary_Acronyms_BasicInfo/Glossary.pdf

5.2.3 Original data

Afforestation		
Year	Annual Area (000ha)	5-Year Average Area (000ha)
1990	11.90	10.60
1991	10.70	
1992	9.20	
1993	10.70	
1994	10.00	
1995	9.90	9.28
1996	7.50	
1997	8.30	
1998	8.10	
1999	7.40	
2000	7.90	7.52
2001	7.30	
2002	6.90	
2003	7.30	
2004	9.20	
2005	9.40	8.63

5.3 Data for Table T5

FRA 2010 Categories	Annual forest establishment (hectares/year)			...of which of introduced species ¹⁾ (hectares/year)		
	1990	2000	2005	1990	2000	2005
Afforestation	10600	7520	8630	NDA	NDA	NDA
Reforestation	NDA	NDA	NDA	NDA	NDA	NDA
...of which on areas previously planted	NDA	NDA	NDA	NDA	NDA	NDA
Natural expansion of forest	NDA	NDA	NDA	NDA	NDA	NDA

Note: The figures for the reporting years refer to the averages for the 5-year periods 1988-1992, 1998-2002 and 2003-2007 respectively.

5.4 Comments to Table T5

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Afforestation	A plantation is termed afforestation or reforestation according to differences in historical land use, but the reporting requirements are the same. In this report, both activities are referred to as afforestation.	
Reforestation		
Natural expansion of forest		

Other general comments to the table

6 Table T6 – Growing stock

6.1 FRA 2010 Categories and definitions

Category	Definition
Growing stock	Volume over bark of all living trees more than X cm in diameter at breast height (or above buttress if these are higher). Includes the stem from ground level or stump height up to a top diameter of Y cm, and may also include branches to a minimum diameter of W cm.
Growing stock of commercial species	Growing stock (see def. above) of commercial species.

6.2 National data

6.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Canada's Forest Inventory 2001 (CanFI 2001)	H	Gross merchantable volume	2001	

6.2.2 Classification and definitions

National class	Definition
Gross merchantable volume	Volume under bark of main stem excluding stump and top but including defective or decayed wood, with a certain minimum diameter (varies by province)

6.2.3 Original data

FRA Categories	Volume (million cubic meters under bark)	
	Forest	Other wooded land
	2000	2000
Gross merchantable volume	29 384	n/a

FRA Categories / Species name (Scientific name and common name)	Growing Stock in Forests (million cubic meters)
	2000
<i>Picea mariana</i> (Mill.) BSP / Black spruce	4 112
<i>Pinus contorta</i> Dougl. Ex Loud. Var. <i>latifolia</i> Engelm. / Lodgepole pine	2 912
<i>Picea glauca</i> (Moench) Voss / White spruce	2 550
<i>Populus tremuloides</i> Michx. / Trembling aspen	2 202
<i>Picea mariana</i> (Mill.) BSP and <i>Picea rubens</i> Sarg. / Black & red spruce	1 605
<i>Pinus banksiana</i> Lamb. / Jack pine	1 572
<i>Picea</i> / Spruce	1 570
<i>Populus</i> / Poplar/aspen	1 566
<i>Abies balsamea</i> (L.) Mill. / Balsam fir	1 465
<i>Betula papyrifera</i> Marsh. / White birch	1 100
Remainder of species	8 729
TOTAL	29 383

The gross merchantable volume in Canada's Forest Inventory 2001 is under bark volume.

6.3 Analysis and processing of national data

6.3.1 Calibration

To get a volume over bark, the gross merchantable volume was multiplied by the bark thickness factor of 1.1225.

6.3.2 Estimation and forecasting

The same figures were used for 1990, 2000, 2005 and 2010.

6.3.3 Reclassification into FRA 2010 categories

The definition of "gross merchantable volume" does not correspond exactly to the total growing stock category.

6.4 Data for Table T6

Table 6a – Growing stock

FRA 2010 category	Volume (million cubic meters over bark)							
	Forest				Other wooded land			
	1990	2000	2005	2010	1990	2000	2005	2010
Total growing stock	32983	32983	32983	32983				
... of which coniferous	25336	25336	25336	25336				
... of which broadleaved	7647	7647	7647	7647				
Growing stock of commercial species	NDA	NDA	NDA	NDA				

Table 6b – Growing stock of the 10 most common species

FRA 2010 category / Species name			Growing stock in forest (million cubic meters)		
Rank	Scientific name	Common name	1990	2000	2005
1 st	<i>Picea mariana</i> (Mill.)	Black spruce	4616	4616	4616
2 nd	<i>Pinus contorta</i> Dougl. Ex Loud. Var. <i>latifolia</i> Engelm.	Lodgepole pine	3268	3268	3268
3 rd	<i>Picea glauca</i> (Moench) Voss	White spruce	2863	2863	2863
4 th	<i>Populus tremuloides</i> Michx.	Trembling aspen	2472	2472	2472
5 th	<i>Picea mariana</i> (Mill.) BSP and <i>Picea rubens</i> Sarg.	Black & red spruce	1802	1802	1802
6 th	<i>Pinus banksiana</i> Lamb.	Jack pine	1764	1764	1764
7 th	<i>Picea</i>	Spruce	1763	1763	1763
8 th	<i>Populus</i>	Poplar/aspen	1758	1758	1758
9 th	<i>Abies balsamea</i> (L.) Mill.	Balsam fir	1644	1644	1644
10 th	<i>Betula papyrifera</i> Marsh.	White birch	1235	1235	1235
Remaining			9798	9798	9798
TOTAL			32983	32983	32983

The growing stock is gross merchantable volume in Canada's Forest Inventory 2001 multiplied by the bark thickness factor of 1.1225.

Note: Rank refers to the order of importance in terms of growing stock, i.e. 1st is the species with the highest growing stock. Year 2000 is the reference year for defining the species list and the order of the species.

Table 6c – Specification of threshold values

Item	Value	Complementary information
Minimum diameter (cm) at breast height ¹ of trees included in growing stock (X)	7.0 to 17.5	
Minimum diameter (cm) at the top end of stem for calculation of growing stock (Y)		
Minimum diameter (cm) of branches included in growing stock (W)		
Volume refers to "above ground" (AG) or "above stump" (AS)	AS	

¹ Diameter at breast height (DBH) refers to diameter over bark measured at a height of 1.30 m above ground level or 30 cm above buttresses if these are higher than 1 m.

6.5 Comments to Table T6

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Total growing stock	The definition of “gross merchantable volume” does not correspond exactly to the total growing stock category.	
Growing stock of broadleaved / coniferous		
Growing stock of commercial species		
Growing stock composition	Our database does not let us extract information by specific species, since this information was not always available from all source inventories. Some data sources provided only general species, or grouped species, or some general and some specific. For some we have no species information (data from satellite imagery) except general coniferous, mixedwood, or broadleaved.	

Other general comments to the table

7 Table T7 – Biomass stock

7.1 FRA 2010 Categories and definitions

Category	Definition
Above-ground biomass	All living biomass above the soil including stem, stump, branches, bark, seeds, and foliage.
Below-ground biomass	All biomass of live roots. Fine roots of less than 2mm diameter are excluded because these often cannot be distinguished empirically from soil organic matter or litter.
Dead wood	All non-living woody biomass not contained in the litter, either standing, lying on the ground, or in the soil. Dead wood includes wood lying on the surface, dead roots, and stumps larger than or equal to 10 cm in diameter or any other diameter used by the country.

7.2 National data

7.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Canada's Forest Inventory 2001 (CanFI 2001)	H	biomass		

7.2.2 Classification and definitions

National class	Definition
Forest ^a	A plant community predominantly of trees and other woody vegetation, growing more or less closely together.
Forest land ^b	Land primarily intended for growing, or currently supporting, forest. Includes temporarily nonforested lands such as clear-cut lands.
Treed wetland	Land having a water table at, near, or above the soil surface, or which is saturated for a long enough period to promote wetland or aquatic processes, and which supports tree cover.
Treed muskeg/ treed bog	Peat-dominated wetlands covered or filled with poorly to moderately decomposed Sphagnum-derived peats and with tree cover amounting to 10 % or more crown closure.
Forested wetland/ swamp	Wooded wetlands dominated by 25% or greater cover of trees or tall shrubs and characterized by periodic flooding and nearly permanent subsurface water flow through various mixtures of mineral sediments and peat.
Scattered treed	Land classified from satellite imagery (SPOT-VGT) as mixed mosaic forest cover; treed open land; woodland-cropland; cropland-woodland.
Treed rock	Rock with a very shallow soil, supporting semi-stagnated or stagnated trees. At least 10% of the area (by crown closure) will be tree covered, although these sites do not produce merchantable stands.
Small island/ shelter belt	Area of trees less than 2 hectares in size, or a line of trees (windbreak).
Alpine forest	High elevation forest located adjacent to alpine areas (http://www.for.gov.bc.ca/his/isis/user_guide/append_c/a_c_14.htm)

Wooded prairie / aspen parkland	Wooded prairie are open fields in regeneration advanced enough that it has become a wooded prairie, an intermediate step between the "open field" and "forest" in the regeneration process. Eventually with time, this habitat will disappear to be replaced by forest. Open native grasses with sparse trees. (Kouchibouguac National Park data conversion document)
Wind swept / stunted	Very open with sparse, discontinuous stunted trees
Recreation	Golf courses, camp grounds, recreational sites

7.2.3 Original data

Land class	Area (1000 ha)	Biomass (million t)
Forest	310 134	27 297.80
Other wooded land		
Vegetated treed	655	5.94
Vegetated treed wetland	37 224	623.78
Vegetated treed wetland - treed muskeg/treed bog	35 191	708.42
Vegetated treed wetland - forested wetland/swamp	1 776	9.90
Vegetated treed scattered	5 411	25.17
Vegetated treed scattered - treed rock	1 473	0.92
Vegetated treed scattered - small island/shelter belt	46	0.02
Vegetated treed scattered - alpine forest	4 381	5.51
Vegetated treed scattered - wooded prairie/aspen parkland	0	0.00
Vegetated treed scattered - windswept/stunted	5 621	0.92
Vegetated treed - recreation	174	14.18
Other wooded land (subtotal)	91 951	1 394.77

Biomass includes an estimate of the stem wood, stem bark, branches and foliage biomass.

7.3 Analysis and processing of national data

7.3.1 Calibration

Same calibration and reference area were used as described in section 1 – Extent of forest and other wooded land.

7.3.2 Estimation and forecasting

Biomass was estimated by applying non-linear models, logistic models and look-up tables to the CanFI2001 database. For forest land, the models convert merchantable volume to above-ground estimates of biomass, whereas the look-up tables contain average biomass values for various combinations of classifiers for those areas that are treed, but contain little to no merchantable volume (other wooded land). All the methods are described in the Canadian Forest Service's report BC-X-411 entitled Model-based, volume-to-biomass conversion for forested and vegetated land in Canada, 2007.

This publication is available on the Internet (http://bookstore.cfs.nrcan.gc.ca/detail_e.php?recid=12586848).

7.3.3 Reclassification into FRA 2010 categories

- CanFI category "Forest" was used to report FRA 2010 category "Forest."
- CanFI codes "Vegetated treed", "Wetland", "Treed muskeg/treed bog," "Forested wetland/swamp," "Scattered," "Treed rock," "Small island/ shelter belt," "Alpine forest," "Wooded prairie/aspen parkland," "Wind swept/stunted," and "Recreation" were aggregated to report FRA 2010 category "Other wooded land."

7.4 Data for Table T7

FRA 2010 category	Biomass (million metric tonnes oven-dry weight)							
	Forest				Other wooded land			
	1990	2000	2005	2010	1990	2000	2005	2010
Above-ground biomass	27298	27298	27298	27298	1 394	1 394	1 394	1 394
Below-ground biomass	6 668	6 668	6 668	6 668	n.a.	n.a.	n.a.	n.a.
Dead wood	2527.	2527	2527.	2527	n.a.	n.a.	n.a.	n.a.
TOTAL	36493	36493	36493	36493	1 394	1 394	1 394	1 394

7.5 Comments to Table T7

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Above-ground biomass	Understory vegetation (trees < 1.3 m in height, and shrubs and plants) are not included in the estimates.	
Below-ground biomass	Below-ground biomass was derived by multiplying the total per hectare biomass in each record in the CanFI2001 database by the fraction that coniferous volume (and broadleaved volume) is of total volume, then applying the equations in Li et al. (2003) to get the per hectare biomass of the roots of the coniferous and broadleaved species. Multiplication by the area of the record yielded the total biomass of the roots for each species type, and summing these gives the total root biomass for each record. This total root biomass was summed for the country, and the results are entered in the table above. There is no information to calculate the below-ground contribution of the non-merchantable biomass.	
Dead wood	Biomass for deadwood is only available at this time for standing dead trees. As a result, it is an underestimate of the biomass in deadwood.	

Other general comments to the table

References Cited:

Boudewyn, P., Song, X., Magnussen, S., Gillis, M.D. 2007. Model-based, volume-to-biomass conversion for forested and vegetated land in Canada. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, Victoria, BC. Information Report BC-X-411. 111 p.

Li, Z., Kurz W.A., Apps, M.J., Beukema, S.J. 2003. Belowground biomass dynamics in the Carbon Budget Model of the Canadian Forest Sector: recent improvements and implications for the estimation of NPP and NEP, Can. J. For. Res. 33: 126-136

8 Table T8 – Carbon stock

8.1 FRA 2010 Categories and definitions

Category	Definition
Carbon in above-ground biomass	Carbon in all living biomass above the soil, including stem, stump, branches, bark, seeds, and foliage.
Carbon in below-ground biomass	Carbon in all biomass of live roots. Fine roots of less than 2 mm diameter are excluded, because these often cannot be distinguished empirically from soil organic matter or litter.
Carbon in dead wood	Carbon in all non-living woody biomass not contained in the litter, either standing, lying on the ground, or in the soil. Dead wood includes wood lying on the surface, dead roots, and stumps larger than or equal to 10 cm in diameter or any other diameter used by the country.
Carbon in litter	Carbon in all non-living biomass with a diameter less than the minimum diameter for dead wood (e.g. 10 cm), lying dead in various states of decomposition above the mineral or organic soil.
Soil carbon	Organic carbon in mineral and organic soils (including peat) to a specified depth chosen by the country and applied consistently through the time series.

8.2 National data

8.2.1 Data sources

Carbon stock and stock change analyses are currently limited to Canada's managed forest but work is in progress to expand these estimates to the entire forest area. Estimates do not include carbon stocks on recently deforested lands (forest land converted to other land categories), nor do they include estimates of recently afforested lands (land converted to forest land). The area afforested since 1990 is less than 0.1% of the area of managed forest (White and Kurz 2005).

Estimates reported here are derived from the same data and analyses that are the basis of Canada's National Greenhouse Gas Inventory Report 2009 (Environment Canada, 2009) that has been submitted to the UNFCCC secretariat in April 2009. Additional analyses are reported in Stinson et al. (in review).

Methodological details for Canada's National Forest Carbon Monitoring, Accounting and Reporting System (NFCMARS) are provided in Environment Canada (2009) and Kurz and Apps (2006).

8.2.2 Classification and definitions

"Managed Forest" for the purpose of UNFCCC reporting is defined as the area potentially available for harvesting, forest area managed for other purposes (such as parks), and forest areas subject to fire suppression.

8.2.3 Original data

Calculation of Canada's forest carbon budget is based on federal, provincial or territorial forest inventory information, including yield tables, as well as forest management and disturbance information for wildfires and major insect species.

Details of data sources and processing steps are described in Environment Canada 2009 (and earlier versions of the annual report).

FRA 2010 Categories	Forest area (1000 hectares)			
	1990	2000	2005	2010
Managed Forest at the end of reporting year (UNFCCC reporting)	230,081	229,666	229,476	229,402*
Total forest area (as of table T1)	310,134	310,134	310,134	310,134

*2010 = 2007 estimates

Area estimates are “end of year” estimates for areas of “forest land remaining forest land” (in accordance with IPCC definitions used in UNFCCC reporting). Area changes are the result of land removals through deforestation (conversion to other land uses) and additions from land that is reverting back to forest land. (We follow the UNFCCC convention of adding land back to forest land 20 years after afforestation).

8.3 Analysis and processing of national data

8.3.1 Calibration

The annual production of a National Greenhouse Gas Inventory report requires compliance with IPCC Good Practice Guidance. This includes quality control and quality assurance activities at all data processing steps.

The core model of Canada’s National Forest Carbon Monitoring Accounting and Reporting System is the Carbon Budget Model of the Canadian Forest Sector (CBM-CFS3, Kurz et al. 2009). Various components of this model have been calibrated against a large number of field measurements from a variety of sources. Further calibration and parameter revisions of the model are planned using newly obtained information from Canada’s new National Forest Inventory.

8.3.2 Estimation and forecasting

We did not provide projections for 2010 because, in Canada’s forests, the future carbon stocks are highly dependent on the rates of natural disturbances. Because these are highly variable between years and are not predictable in advance, we provided elsewhere probability distributions of future carbon emissions and removals that would result in a range of possible carbon stock values for 2010 (see for example Kurz et al. 2008 a, b). The last available estimates are for 2007 and these are reported in the 2010 column of the tables.

8.3.3 Reclassification into FRA 2010 categories

Not applicable.

8.4 Data for Table T8

FRA 2010 Category	Carbon (Million metric tonnes)							
	Forest				Other wooded land			
	1990	2000	2005	2010	1990	2000	2005	2010
Carbon in above-ground biomass	11,471	11,499	11,255	11,162				
Carbon in below-ground biomass	2,813	2,818	2,766	2,746				
Sub-total: Living biomass	14,283	14,317	14,021	13,909				
Carbon in dead wood	4,753	4,535	4,646	4,683				
Carbon in litter	11,427	11,548	11,635	11,666				
Sub-total: Dead wood and litter	16,180	16,083	16,281	16,349				
Soil carbon	19,691	19,709	19,723	19,729				
TOTAL	50,155	50,109	50,025	49,988				

Soil depth (cm) used for soil carbon estimates	100
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2010 = 2007 estimates

The figures in Table 8 refer only to Canada’s managed forest area (see above table for forest area statistics).

8.5 Comments to Table T8

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Carbon in above-ground biomass	Includes all aboveground tree biomass but does not include other vegetation such as shrubs, herbs, grasses or mosses.	Biomass pools have been increasing from 1990 to 2000, followed by decreases to 2005 as natural disturbances, in particular Mountain Pine Beetle have increased in recent years.
Carbon in below-ground biomass	Includes live coarse and fine roots.	
Carbon in dead wood	Includes standing dead trees and their branches, coarse and fine woody debris and dead root.	Dead wood and litter have been nearly stable from 1990 to 2000 but have increased to 2005 as insects have killed trees that have not been salvaged and have not yet decomposed.
Carbon in litter	Includes litter and humic layers of forest floor.	
Soil carbon	Includes all organic carbon in soils, excluding live fine roots and excluding peat.	Soil carbon stocks have increased slightly despite a small reduction in forest area resulting from deforestation activities.

Other general comments to the table

Canada uses definitions for forest carbon pools that follow closely those of the IPCC Good Practice Guidance Report (IPCC 2003), and that have since been adopted by the FAO. Details of the definitions of biomass and dead organic matter pools used in Canada are described in Table 2 of Kurz et al. 2009.

Data are based on the “Managed Forest” definition by the UNFCCC.

References Cited:

Environment Canada 2009. National Inventory Report 1990—2006: Greenhouse Gas Sources and Sinks in Canada. Environment Canada, Ottawa, Ontario,

Intergovernmental Panel on Climate Change (IPCC), 2003. Penman, J., et al. (Eds.), Good Practice Guidance for Land Use, Land-Use Change and Forestry. Institute for Global Environmental Strategies, Hayama, Japan. (also available at <http://www.ipcc-nggip.iges.or.jp>).

Kurz, W.A. and M.J. Apps. 2006. Developing Canada’s National Forest Carbon Monitoring, Accounting and Reporting System to meet the reporting requirements of the Kyoto Protocol, Mitigation and Adaptation Strategies for Global Change, 11: 33–43.

Kurz, W.A., Dymond, C.C., White, T.M., Stinson, G., Shaw, C.H., Rampley, G.J., Smyth, C., Simpson, B.N., Neilson, E.T., Trofymow, J.A., Metsaranta, J., Apps, M.J., 2009. CBM-CFS3: a model of carbon-dynamics in forestry and land-use change implementing IPCC standards, Ecological Modelling 220: 480-504, doi:10.1016/j.ecolmodel.2008.10.018.

Kurz, W.A, C.C. Dymond, G. Stinson, G. J. Rampley, E.T. Neilson, A. L. Carroll, T. Ebata, and L. Safranyik, 2008a, Mountain pine beetle and forest carbon feedback to climate change, Nature 452:987-990, doi:10.1038/nature06777.

Kurz, W.A., G. Stinson, G.J. Rampley, C.C. Dymond and E.T. Neilson, 2008b, Risk of natural disturbances makes future contribution of Canada’s forests to the global carbon cycle highly uncertain. Proceedings of the National Academy of Sciences, 105: 1551-1555. doi:10.1073/pnas.0708133105

Stinson, G., W.A. Kurz, E.T. Neilson, J.M. Metsaranta, C.C. Dymond, G.J. Rampley, C. Boisvenue, B.N. Simpson, T.M. White, C.E. Smyth, and D. Blain. In review, Carbon budget and greenhouse gas balance of Canada's managed forest 1990-2007, (we anticipate that this paper will be through the review process well before the FRA is published).

White, T.M. and W.A. Kurz. 2005. Afforestation on private land in Canada from 1990 to 2002 estimated from historical records, *The Forestry Chronicle*, 81: 491-497.

9 Table T9 – Forest Fires

9.1 FRA 2010 Categories and definitions

Category	Definition
Number of fires	Average number of vegetation fires per year in the country.
Area affected by fire	Average area affected by vegetation fires per year in the country.
Vegetation fire (supplementary term)	Any vegetation fire regardless of ignition source, damage or benefit.
Wildfire	Any unplanned and/or uncontrolled vegetation fire.
Planned fire	A vegetation fire regardless of ignition source that burns according to management objectives and requires limited or no suppression action.

9.2 National data

9.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
National Forestry Database http://nfdp.ccfm.org/data/comp_31e.html	H	Number of fires, Area burned	1970 to present	
CIFFC annual reports http://www.cifc.ca/	H	Number of fires, Area burned	1987 to present	

9.2.2 Original data

Area burned

Year	hectares		Average in 1000 ha
1988	1,336,056		
1989	7,559,572		
1990	934,435	Average 1988-1992	2,457
1991	1,584,730		
1992	868,655		
1993	1,967,701		
1994	6,295,957		
1995	7,095,103		
1996	1,854,926		
1997	630,700		
1998	4,614,287		
1999	1,624,611		
2000	665,331	Average 1998-2002	2,060
2001	626,420		
2002	2,770,408		
2003	1,743,436		
2004	3,183,814		
2005	1,671,524		
2006	2,223,579		
2007	1,661,174	Average 2003-2007	2,097

Number of fires

Year	fires		Average number of fires
1988	10,741		
1989	12,185		
1990	10,111	Average 1988-1992	10,486
1991	10,327		
1992	9,068		
1993	6,043		
1994	9,763		
1995	8,486		
1996	6,349		
1997	6,148		
1998	10,723		
1999	7,632		
2000	5,349	Average 1998-2002	7,864
2001	7,753		
2002	7,861		
2003	8,230		
2004	6,680		
2005	7,865		
2006	9,713		
2007	6,324	Average 2003-2007	7,762

Source: *Compendium of Canadian Forestry Statistics; Table 3.1 Forest Fire Statistics by Province/Territory/Agency, 1970–2007; Updated: March 13, 2009*
 (http://nfdp.ccfm.org/data/comp_31e.html)

2007 data from CIFFC (http://www.cifc.ca/images/stories/pdf/2007_Canada_Report.pdf)

9.3 Analysis and processing of national data

9.3.1 Reclassification into FRA 2010 categories

Breakdown into forest, woodland and other:

National Fire Database (spatial data provided by fire management agencies and collected by CFS) overlaid on land cover -

2005: SPOT VGT Land Cover 2000 <ftp://ftp.ccrs.nrcan.gc.ca/ad/EMS/Landcover2000/>

2000: AVHRR Land Cover 1998 <ftp://ftp.ccrs.nrcan.gc.ca/ad/EMS/landcover98>

1990: AVHRR Land Cover 1998 (more suitable (pre-1988) land cover not available)

The results are approximate. The land cover is from coarse spatial resolution sources and land cover classes do not correspond well with the definitions of forest and woodland.

9.4 Data for Table T9

Table 9a

FRA 2010 category	Annual average for 5-year period					
	1990		2000		2005	
	1000 hectares	number of fires	1000 hectares	number of fires	1000 hectares	number of fires
Total land area affected by fire	2457	10486	2060	7864	2097	7762
... of which on forest	1473	8428	1567	6412	1230	5497
... of which on other wooded land	813	844	387	587	619	1010
... of which on other land	171	1214	106	865	248	1256

Table 9b

FRA 2010 category	Proportion of forest area affected by fire (%)		
	1990	2000	2005
Wildfire	NDA	99.4	99.6
Planned fire	NDA	0.6	0.4

9.5 Comments to Table T9

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Area affected by fire		The annual area burned in Canada is highly variable. The statistics presented here are not sufficient to infer a long-term trend, but reflect the very large areas burned in 1989 and 1998.
Number of fires		The annual number of fires has been declining, primarily because of decreases in the number of lightning-caused fires.
Wildfire / planned fire	<p>In Canada, fire statistics that are routinely reported include cause (lightning, human or unknown) and response (full, modified, observation, etc.) These statistics are important in characterizing forest fire in Canada and highlighting the fact that fire is (or can be) a natural phenomenon and not a disaster.</p> <p>A prescribed fire is described as any fire deliberately used for prescribed burning; usually set by qualified fire management personnel according to a predetermined burning prescription. In some cases, a wildfire that may produce beneficial results in terms of the attainment of forest management and other land use objectives may be allowed to burn under certain burning conditions according to a predefined burning prescription, with limited or no suppression action, and as such may be considered a form of prescribed fire.</p>	

Source: Canadian Interagency Forest Fire Centre, **Glossary of Forest Fire Management Terminology**, <http://www.cifc.ca/images/stories/pdf/GlossaryEN.pdf>

Other general comments to the table

Grass fires on the prairies are not included in the Canadian fire statistics. These fires are handled by municipal fire agencies, with the provincial agencies assisting when necessary. This represents a gap in Canada's reporting of "vegetation fires". However, the area burned by these fires would be a tiny fraction of the total. Grass fires that burn within the forested area (i.e. the area where provincial agencies have jurisdiction) are included in the statistics.

10 Table T10 – Other disturbances affecting forest health and vitality

10.1 FRA 2010 Categories and definitions

Term	Definition
Disturbance	Damage caused by any factor (biotic or abiotic) that adversely affects the vigour and productivity of the forest and which is not a direct result of human activities.
Invasive species	Species that are non-native to a particular ecosystem and whose introduction and spread cause, or are likely to cause, socio-cultural, economic or environmental harm or harm to human health.
Category	Definition
Disturbance by insects	Disturbance caused by insect pests.
Disturbance by diseases	Disturbance caused by diseases attributable to pathogens, such as bacteria, fungi, phytoplasma or virus.
Disturbance by other biotic agents	Disturbance caused by biotic agents other than insects or diseases, such as wildlife browsing, grazing, physical damage by animals, etc.
Disturbance caused by abiotic factors	Disturbances caused by abiotic factors, such as air pollution, snow, storm, drought, etc.

10.2 National data

10.2.1 Data sources

References to sources of information	Quality H/M/L	Variable(s)	Year(s)	Additional comments
National Forestry Database http://nfdp.ccfm.org/compendium/insects/index_e.php	H	Area within which Moderate to Severe Defoliation Occurs, Including Area of Beetle-killed Trees	1975 to present	<p>Researchers and managers try to use the most up-to-date methods of data collection and analysis and every effort is made to ensure that the data represent the actual forest conditions. However, the data should be treated with caution as the basic information varies greatly from place to place. The sketch mapping techniques are often imprecise and forest inventory data in some parts of the country are more recent than others. As well, standards of data collection and processing differ across the country.</p> <p>A forested area may be defoliated by more than one insect, and this often results in overlap of the reported figures. The area within which there is moderate to severe defoliation can also include relatively small non-forested areas, roads, cultivated areas, small lakes, or burned areas. Areas reported as defoliated may include patches that differ in the degree of defoliation</p>

				severity. Areas of tree mortality caused by an insect attacking one or more species may include other tree species, which subsequently die from exposure because the stand is opened. Finally, some areas of defoliation may be missed in the surveys.
Hall, J.P. and B.H. Moody (compilers). 1994. Forest depletions caused by insects and diseases in Canada 1982–1987. Forest Insect and Disease Survey, Canadian Forest Service, Natural Resources Canada, Ottawa, ON. http://www.pfc.cfs.nrcan.gc.ca/diseases/CTD/index_e.html	H			No estimates have been published on the area affected by diseases since 1987.
The State of Canada's Forests Annual Report 2008	H		2008	http://canadaforests.nrcan.gc.ca/rpt#pi

10.2.2 Original data

Area disturbed by insects

Year	hectares		1000 ha
1988	15,529,239		
1989	18,893,285		
1990	20,192,887	Average 1988-1992	26,112
1991	33,895,109		
1992	42,051,244		
1993	20,631,626		
1994	11,617,320		
1995	12,967,416		
1996	71,20,434		
1997	40,97,758		
1998	5,232,355		
1999	10,262,906		
2000	15,398,540	Average 1998-2002	14,831
2001	22,600,979		
2002	20,662,585		
2003	20,474,297		
2004	13,115,747		
2005	15,980,970	Average 2003-2006	17,273
2006	19,521,937		

Source: *Compendium of Canadian Forestry Statistics; Table 4.1 Area a within which Moderate to Severe Defoliation Occurs Including Area of Beetle-killed Trees by Insects and Province/Territory, 1975–2007*
 Updated: September 10, 2008 (http://nfdp.ccfm.org/data/comp_41e.html)

Woody invasive species.

Threat to	Common name	Scientific name	Distribution	Invasive potential
Integrity of forest ecosystems	Norway maple	<i>Acer platanoides</i>	ON, QC, NL	L
	Garlic mustard	<i>Alliaria petiolata</i>	BC, ON, QC	H
	Scotch broom	<i>Cytisus scoparius</i>	BC, NS, PEI	P
	Tatarian honeysuckle	<i>Lonicera tatarica</i>	ON, NL, NS, NB, PEI	L
	White mulberry	<i>Morus alba</i>	ON	L
	Norway spruce	<i>Picea abies</i>	Eastern Canada	P
	Scots pine, Scotch pine	<i>Pinus sylvestris</i>	BC, SK, AB, MB, ON, QC, NL, NB, NS, PEI	L
	Glossy buckthorn	<i>Rhamnus frangula</i>	MB, ON, QC, NB, NS, PEI	H
	English Ivy	<i>Hedera helix</i>	BC, ON	L
	Common gorse	<i>Ulex europaeus</i>	BC	?
Natural regeneration of plants	Silver birch	<i>Betula pendula</i>	BC, MB, ON, NS, PEI	L
	Diffuse knapweed	<i>Centaurea diffusa</i>	YT, BC, AB, ON	P
	Spotted knapweed	<i>Centaurea maculosa</i>	BC, AB, SK, MB, ON, QC, NL	P
	Bull thistle	<i>Cirsium vulgare</i>	BC, SK	?
Urban forests or open areas	Wild chervil	<i>Anthriscus sylvestris</i>	NL, NS, NB, QC, ON, BC	?
	Ground ivy	<i>Glechoma hederacea</i>	BC, AB, SK, MB, ON, QC, NL, NB, NS, PEI	?
	English holly	<i>Ilex aquifolium</i>	BC	?
	Privet	<i>Ligustrum vulgare</i>	ON	P
	White poplar	<i>Populus alba</i>	BC, AB, SK, MB, ON, QC, NL	L
	European buckthorn	<i>Rhamnus cathartica</i>	BC, SK, ON, QC, NS, PEI	H
	Black locust	<i>Robinia pseudo-acacia</i>	Southern Canada	L
	Siberian elm	<i>Ulmus pumila</i>	Frequently planted as urban tree	P

L=low level invasive; H=high level invasive; P=potentially invasive, ?=unknown
 YT=Yukon Territory, BC= British Columbia, AB=Alberta, SK=Saskatchewan. MN=Manitoba, ON=Ontario, QC=Quebec, NB=New Brunswick, NS=Nova Scotia, PEI=Prince Edward Island, NL=Newfoundland and Labrador

There is insufficient area data to complete this table.

Source: 2005, *Criteria and Indicators of Sustainable Forest Management in Canada; Table 1.2e Selected alien plant species associated with forests in Canada* (<http://www.ccfm.org/ci/rprt2005/English/etpg46.htm>).

10.3 Data for Table T10

Table 10a – Disturbances

FRA 2010 category	Affected forest area (1000 hectares)		
	1990	2000	2005 (4 yr. avg.)
Disturbance by insects	26112	14831	17273
Disturbance by diseases	NDA	NDA	NDA
Disturbance by other biotic agents	NDA	NDA	NDA
Disturbance caused by abiotic factors	NDA	NDA	NDA
Total area affected by disturbances	NDA	NDA	NDA

Notes: The figures for the reporting years refer to the averages of annually affected areas for the 5-year periods 1988-1992, 1998-2002 and for the 4 year period 2003-2006 respectively.

The total area affected by disturbances is not necessarily the sum of the individual disturbances as these may be overlapping.

Estimates for disease losses are not currently available.

Estimates of the area affected by abiotic disturbances (e.g., wind damage, ice storm, air pollutants) are not currently available.

Table 10b – Major outbreaks of insects and diseases affecting forest health and vitality

Description / name	Tree species or genera affected (scientific name)	Year(s) of latest outbreak	Area affected (1000 hectares)	If cyclic, approx. cycle (years)
Mountain Pine Beetle	<i>Pinus contorta</i> Dougl.	2006	9 243 408	
Forest Tent Caterpillar	<i>Populus tremuloides</i> Michx.	2006	5 094 703	

Note: Area affected refers to the total area affected during the outbreak.

Since the late 1990s, the mountain pine beetle has attacked more than 10 million hectares of lodgepole pine forests in the British Columbia Interior. If the trend continues, 80 percent of the province's mature pine forest will be killed by 2013.

Of concern now is the beetle's unprecedented appearance farther north and east in British Columbia and Alberta, outside its historical range. This spread is due to several factors: prevailing winds that have carried the beetle east across the Rockies; hot, dry summers that have made forests more vulnerable to attack; warmer winters that have enabled beetle broods to survive; and a high volume of older (so more susceptible) lodgepole pine.

In 2007, the Canadian Forest Service (CFS) of Natural Resources Canada gathered federal and provincial forest managers and scientists for a risk assessment of the beetle's threat to the boreal and eastern pine forests. Their findings will help forest decision makers plan for and manage the risks of an expanded beetle infestation:

- *Biological barriers to expansion.* It appears that the mountain pine beetle is already encroaching on the boreal forest, and there are no biological roadblocks in its way. The pine species that dominate boreal and eastern stands are just as susceptible to beetle attack as lodgepole pine. And the blue-staining fungi that accompany the beetle and actually kill the tree are similarly at home in boreal pine species.
- *Climate will play a role.* The climate in regions east of the Rocky Mountains where the beetle is spreading is less favourable to the pest because of more frequent cold snaps that kill overwintering beetles. This should reduce the short-term risk of an outbreak flaring across the boreal. But it is already apparent that we cannot rely on weather to control the beetle. In the long term, if climate change brings conditions more favourable to the beetle, the situation could become epidemic.
- *Forest Structure may reduce the rate of spread.* Pine stands in the boreal zone are more fragmented, less dense and younger than pine stands in the British Columbia Interior. These traits should make boreal forests less susceptible to damaging infestations.

<http://canadaforests.nrcan.gc.ca/>

Table 10c – Area of forest affected by woody invasive species

Scientific name of woody invasive species	Forest area affected 2005 (1000 hectares)
<i>Alliaria petiolata</i>	
<i>Rhamnus frangula</i>	
<i>Rhamnus cathartica</i>	
Total forest area affected by woody invasive species	

There is insufficient data to complete this table.

10.4 Comments to Table T10

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Disturbance by insects	The figures included under “Forest” correspond to both Forest and Other wooded land as it was not possible to make separate estimates for these categories.	
Disturbance by diseases		
Disturbance by other biotic agents		
Disturbance caused by abiotic factors		
Major outbreaks	Mountain pine beetle	
Invasive species		

Other general comments to the table

11 Table T11 – Wood removals and value of removals

11.1 FRA 2010 Categories and definitions

Category	Definition
Industrial roundwood removals	The wood removed (volume of roundwood over bark) for production of goods and services other than energy production (woodfuel).
Woodfuel removals	The wood removed for energy production purposes, regardless whether for industrial, commercial or domestic use.

11.2 National data

11.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
National Forestry Database	H		1988 to 2006	Used for volume of removals
Statistics Canada	H			Used for total value
				Unit value calculated by using total value divided by total volume.

11.2.2 Classification and definitions

National class	Definition
Logs	Stem of a tree after it has been felled; the raw material from which lumber, plywood, and other wood products are processed.
Bolts	Raw material used in the manufacture of shingles and shakes; short logs to be sawn for lumber or peeled for veneer
Pulpwood	Wood used to produce pulp used in the manufacture of paper products. Pulpwood is usually wood that is too small, of inferior quality, or the wrong species to be used in the manufacture of lumber or plywood.
Other industrial roundwood	Includes poles, pilings, and other products still in the round.

11.2.3 Original data

Industrial roundwood removals

Year	cubic metres (under bark)		Average cubic metres
1988	184327		
1989	182104		
1990	156398	Average 1988-1992	168 154
1991	154200		
1992	163742		
1993	169576		
1994	177382		
1995	183156		
1996	177949		
1997	183551		
1998	173915		
1999	195355		
2000	198917	Average 1998-2002	188 875
2001	182945		
2002	193243		
2003	178211		
2004	205129		
2005	200250		
2006	179196	Average 2003-2006	190 697

Woodfuel removals

Year	cubic metres (under bark)		Average cubic metres
1988	6289		
1989	6150		
1990	6169	Average 1988-1992	6 336
1991	6681		
1992	6389		
1993	6423		
1994	5879		
1995	5340		
1996	5425		
1997	5199		
1998	3042		
1999	2903		
2000	2927	Average 1998-2002	2 933
2001	2908		
2002	2885		
2003	2843		
2004	2789		
2005	3045		
2006	2905	Average 2003-2006	2 896

Source: Compendium of Canadian Forestry Statistics; Table 5.4 Net Merchantable Volume of Roundwood Harvested by Ownership, Category, and Province/Territory, 1975-2006; Updated: September 11, 2008 (http://nfdp.cfm.org/data/comp_51e.html)

11.3 Data for Table T11

FRA 2010 Category	Industrial roundwood removals			Woodfuel removals		
	1990	2000	2005 (4 yr. avg.)	1990	2000	2005 (4 yr. avg.)
Total volume (1000 m ³)	188 753	212 012	214 057	7 112	3 292	3 251
... of which from forest						
Unit value (local currency / m ³ o.b.)	48	67	76	NDA	NDA	NDA
Total value (1000 local currency)	9 060 144	14 204 804	16 268 332	NDA	NDA	NDA

Note: The figures for the reporting years refer to the averages of annually affected areas for the 5-year periods 1988-1992, 1998-2002 and for the 4-year period 2003-2006 respectively.

Estimation

The factor applied to the original data to obtain values “over bark” is 12.25% (i.e. original values are multiplied by 1.1225).

	1990	2000	2005
Name of local currency	Canadian dollar	Canadian dollar	Canadian dollar

11.4 Comments to Table T11

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Total volume of industrial roundwood removals		
Total volume of wood fuel removals	Data on wood fuels total value and unit value are not available.	
Unit value	Calculated by using the total value divided by total volume.	
Total value	Statistics Canada 1. Annual Survey of Manufactures and the Annual Survey of Forestry for 1990 and 2000 data; Value of shipments 2. Annual Survey of Manufactures and Logging; Revenue from Goods manufactured for 2005.	

Other general comments to the table

The value and volume for industrial roundwood are from different sources and may not directly correspond.

12 Table T12 – Non-wood forest products removals and value of removals

12.1 FRA 2010 Categories and definitions

Term	Definition
Non-wood forest product (NWFP)	Goods derived from forests that are tangible and physical objects of biological origin other than wood.
Value of NWFP removals	For the purpose of this table, value is defined as the market value at the site of collection or forest border.

NWFP categories

Category
<u>Plant products / raw material</u>
1. Food
2. Fodder
3. Raw material for medicine and aromatic products
4. Raw material for colorants and dyes
5. Raw material for utensils, handicrafts and construction
6. Ornamental plants
7. Exudates
8. Other plant products
<u>Animal products / raw material</u>
9. Living animals
10. Hides, skins and trophies
11. Wild honey and bee-wax
12. Wild meat
13. Raw material for medicine
14. Raw material for colorants
15. Other edible animal products
16. Other non-edible animal products

12.2 National data

12.2.1 Data sources

1. Statistics Canada. 2008. Cansim Table 002-001 (Farm cash receipts) and Table 001-0008 (Production and farm value of maple products).
2. Statistics Canada. 2008. Farm Cash Receipts. Agriculture Economic Statistics. Catalogue no. 21-011-X. Statistics Canada. Agriculture Division. Farm Income and Prices Section. 42p.
3. Statistics Canada. 2007. Fur Statistics. Catalogue no. 23-013-X. Statistics Canada. Ministry of Industry. 34p.
4. a) National Forestry Database. Forest Products-National table. http://pndf.ccmf.org/products/national_e.php.
b) Natural Resources Canada. Canada's Forest Statistical Data. <http://canadeforests.nrcan.gc.ca/statsprofile/production>.
5. Agriculture and Agri-Food Canada. 2008. Canadian Horticulture Sector - 2007 Crop Year. Performance Overview. Agriculture and Agri-Food Canada's Horticulture and Special Crops Division. <http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1220620491639&lang=eng>

12.3 Data for Table T12

Rank	Name of product	Key species	Unit	NWFP removals 1990		NWFP category
				Quantity	Value (1000 local currency)	
1 st	Maple products (including syrup, sugar, taffy and butter)	<i>Acer saccharum</i> and other species of <i>Acer</i>	litres	13.97 million ¹⁻⁴	73 286 ¹⁻⁴	1
2 nd	Christmas trees (plantations and natural stands)	<i>Abies balsamea</i> , <i>Pseudotsuga menziesii</i> , other <i>Abies sp.</i> , <i>Picea sp.</i> , and <i>Pinus sp.</i>	tree	5.4 million ⁴	51 472 ⁴	6
3 rd	Wild pelts	Beaver, coyote/prairie wolf, fox, marten, muskrat, otter, raccoon, skunk, squirrel, etc.	number	735 251 ¹	15 484 ¹	10
4 th	Wild blueberries	<i>Vaccinium angustifolium</i>	tonne	N/A*	N/A*	1
All other plant products					N/A	
All other animal products					N/A	
TOTAL					140 242	

* N/A = Data are not available for this year

** = In natural stands only, quantity is 1.5 millions trees⁴ and value of removal is 11 910 000⁴\$

Rank	Name of product	Key species	Unit	NWFP removals 2000		NWFP category
				Quantity	Value (1000 local currency)	
1 st	Maple products (including syrup, sugar, taffy and butter)	<i>Acer saccharum</i> and other species of <i>Acer</i>	litres	33.4 million ⁴	151 747 ¹⁻⁴	1
2 nd	Wild blueberries	<i>Vaccinium angustifolium</i>	tonne	39 755 ⁵	58 895 ⁵	1
3 rd	Christmas trees (plantations and natural stands)	<i>Abies balsamea</i> , <i>Pseudotsuga menziesii</i> , other <i>Abies sp.</i> , <i>Picea sp.</i> , and <i>Pinus sp.</i>	tree	2.7 million ⁴	37 366 ¹⁻⁴	6
4 th	Wild pelts	Beaver, coyote/prairie wolf, fox, marten, muskrat, otter, raccoon, skunk, squirrel, etc.	number	877 599 ¹⁻³	20 637 ¹⁻³	10
All other plant products					N/A	
All other animal products					N/A	
TOTAL					268 645	

** = In natural stands only, value of removal is 14 851 000¹\$

Rank	Name of product	Key species	Unit	NWFP removals 2005		NWFP category
				Quantity	Value (1000 local currency)	
1 st	Maple products (including syrup, sugar, taffy and butter)	<i>Acer saccharum</i> and other species of <i>Acer</i>	litres	28.1 million ¹⁻⁴	193 305 ¹⁻⁴	1
2 nd	Wild blueberries	<i>Vaccinium angustifolium</i>	tonne	43 633 ⁵	62 015 ⁵	1
3 rd	Christmas trees (plantations and natural stands)	<i>Abies balsamea</i> , <i>Pseudotsuga menziesii</i> , other <i>Abies sp.</i> , <i>Picea sp.</i> , and <i>Pinus sp.</i>	tree	2.1 million ⁴	32 639 ¹⁻⁴	6
4 th	Wild pelts	Beaver, coyote/prairie wolf, fox, marten, muskrat, otter, raccoon, skunk, squirrel, etc.	number	942 596 ¹⁻³	31 415 ¹⁻³	10
All other plant products					N/A	
All other animal products					N/A	
TOTAL					319 374	

** = In natural stands only value of removal is 15 405 000¹\$

	1990, 2000, 2005
Name of local currency	Canadian dollar

12.4 Comments to Table T12

Variable / category	Comments related to data, definitions, etc.
10 most important products	
Other plant products	
Other animal products	
Value by product	
Total value	

Other general comments to the table

13 Table T13 – Employment

13.1 FRA 2010 Categories and definitions

Category	Definition
Full-time equivalents (FTE)	A measurement equal to one person working full-time during a specified reference period.
Employment	Includes all persons in paid employment or self-employment.
Paid employment	Persons who during a specified reference period performed some work for <u>wage or salary</u> in cash or in kind.
Self-employment	Persons who during a specified reference period performed some work for <u>profit or family gain</u> in cash or in kind (e.g. employers, own-account workers, members of producers' cooperatives, contributing family workers).

13.2 National data

13.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Labour Force Survey, Statistics Canada	H	Labour	1990, 2000, 2005	

13.2.2 Classification and definitions

National class	Definition
Timber Tract Operations	<p>This industry comprises establishments primarily engaged in the operation of timber tracts, for the purpose of selling standing timber.</p> <p>Example Activities</p> <ul style="list-style-type: none"> • Forestry farms • Timber crop operations • Timber tract operations <p><i>Exclusion(s):</i> Establishments primarily engaged in:</p> <ul style="list-style-type: none"> • growing short-rotation woody crops such as Christmas trees and cottonwood for pulpwood, where the typical life cycle for growing and harvesting is ten years or less (11142, Nursery and Floriculture Production) • cutting timber (11331, Logging); and • holding timber property as real property and not for sale of timber (53119, Lessors of Other Real Estate Property)
Forest Nurseries and Gathering of Forest Products	<p>This industry comprises establishments with two different production processes: those primarily engaged in growing trees for the purpose of reforestation, and those primarily engaged in gathering forest products.</p> <p><i>Exclusion(s):</i> Establishments primarily engaged in:</p> <ul style="list-style-type: none"> • gathering maple sap (11199, All Other Crop Farming).

	<p><i>Example Activities</i></p> <p>Balsam needles, gathering of Barks, gathering of Cone gathering service Forest nurseries Gathering of forest products (e.g., gums, barks, seeds) Ginseng, gathering of Gum (i.e., forest product) gathering of Moss, gathering of Nurseries for reforestation growing trees Tree seeds gathering Wild berry picking Wild rice gathering</p>
Logging	<p>This industry comprises establishments primarily engaged in cutting timber, producing rough, round, hewn, or riven wood, and producing wood chips in the forest. Establishments primarily engaged in cutting and transporting timber are also included in this industry.</p> <p><i>Exclusion(s):</i> Establishments primarily engaged in:</p> <ul style="list-style-type: none"> trucking timber (48422, Specialized Freight (except Used Goods) Trucking, Local or 484233, Forest Products Trucking, Long Distance)
Support Activities for Forestry	<p>This industry comprises establishments primarily engaged in performing particular support activities related to harvesting timber.</p> <p><i>Example Activities</i></p> <p>Cruising timber Forestfire fighting services Log hauling in the bush (i.e., within the logging limits) Pest control services, forestry Reforestation services Timber cruising Timber valuation</p>

Source: *Statistics Canada. 2008. North American Industry Classification System Canada 2007. Statistics Canada – Catalogue No. 12-501-XPE. 771 p.*

13.2.3 Original data

Employment by industry (NAICS), Annual Averages

NAICS	1990	2000	2005
1131 – Timber Tract Operations	Confidential	Confidential	Confidential
1132 – Forest Nurseries & Gathering of Forest Products	Confidential	Confidential	Confidential
1133 – Logging	51 800	56 400	45 500
1153 – Support Activities for Forestry	20 200	29 400	23 200
Total *	73 400	86 500	69 500

* Total includes NAICS codes 1131, 1132, 1133, 1153.

Source: *Labour Force Survey, Statistics Canada, Special Extraction*

13.3 Analysis and processing of national data

13.3.1 Reclassification into FRA 2010 categories

NAICS codes

1131 – Timber Tract Operations

1132 – Forest Nurseries & Gathering of Forest Products

1133 – Logging were aggregated for reporting under “Primary production of goods” as was 1153 – Support Activities for Forestry.

13.4 Data for Table T13

FRA 2010 Category	Employment (1000 years FTE)		
	1990	2000	2005
Employment in primary production of goods	73.4	86.5	69.5
...of which paid employment	59.0	68.3	55.2
...of which self-employment	14.3	18.1	14.3
Employment in management of protected areas	NDA	NDA	NDA

13.5 Comments to Table T13

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Employment in primary production of goods	Due to data confidentiality, figures for Timber Tract Operations and Forest Nurseries and Gathering of Forest Products are not included per sector. The total does however include data for these.	Employment rose by 17.8% between 1990 and 2000, followed by a decline of 19.7% by 2005. Throughout this period, harvest volumes rose, indicating an increase in productivity in the sector.
Paid employment / self-employment		The share of self-employed workers within the industry has risen slightly since 1990, reflecting an increased reliance on contract and other arms-length employment.
Employment in management of protected areas		Data are not available.

Other general comments to the table

14 Table T14 – Policy and legal framework

14.1 FRA 2010 Categories and definitions

Term	Definition
Forest policy	A set of orientations and principles of actions adopted by public authorities in harmony with national socio-economic and environmental policies in a given country to guide future decisions in relation to the management, use and conservation of forest and tree resources for the benefit of society.
Forest policy statement	A document that describes the objectives, priorities and means for implementation of the forest policy.
National forest programme (nfp)	A generic expression that refers to a wide range of approaches towards forest policy formulation, planning and implementation at national and sub-national levels. The national forest programme provides a framework and guidance for country-driven forest sector development with participation of all stakeholders and in consistence with policies of other sectors and international policies.
Law (Act or Code) on forest	A set of rules enacted by the legislative authority of a country regulating the access, management, conservation and use of forest resources.

14.2 Data for Table T14

Indicate the existence of the following (2008)			
Forest policy statement with national scope	X	Yes	
		No	
If Yes above, provide:	Year of endorsement	2008	
	Reference to document	<i>A Vision for Canada's Forests: 2008 and Beyond</i> http://ccfm.org/english/coreproducts-nextnscf.asp	
National forest programme (nfp)		Yes	
	X	No	
If Yes above, provide:	Name of nfp in country		
	Starting year		
	Current status	In formulation	
		In implementation	
		Under revision	
Process temporarily suspended			
Reference to document or web site			
Law (Act or Code) on forest with national scope	Yes, specific forest law exists		
	Yes, but rules on forests are incorporated in other (broader) legislation		
	No, forest issues are not regulated by national legislation.		
If Yes above, provide:	Year of enactment		
	Year of latest amendment		
	Reference to document		

In case the responsibility for forest policy - and/or forest law-making is decentralized, please indicate the existence of the following and explain in the comments below the table how the responsibility for forest policy- and law-making is organized in your country.		
Sub-national forest policy statements	X	Yes
		No
If Yes above, indicate the number of regions/states/provinces with forest policy statements	12	
Sub-national Laws (Acts or Codes) on forest	X	Yes
		No
If Yes above, indicate the number of regions/states/provinces with Laws on forests	12	

14.3 Comments to Table T14

Variable / category	Jurisdiction	Comments related to data, definitions, etc.
Forest policy statement with national scope		
National forest programme (nfp)		
Law (Act or Code) on forest with national scope		
Sub-national forest policy statements		
Sub-national Laws (Acts or Codes) on forest		

Other general comments to the table
<p>Below are Web links to legislation in jurisdictions across Canada.</p> <p>Newfoundland and Labrador - http://www.nr.gov.nl.ca/forestry/legislation/ Prince Edward Island - http://www.peigov.ca/law/statutes/pdf/f-14.pdf Nova Scotia - www.gov.ns.ca/legislature/legc/index.htm New Brunswick - http://www.gnb.ca/0062/acts/acts/c-38-1.htm Quebec - http://www2.publicationsduquebec.gouv.qc.ca/home.php Ontario - http://www.mnr.gov.on.ca/en/Business/Forests/2ColumnSubPage/STEL02_163862.html Manitoba - http://web2.gov.mb.ca/laws/statutes/ccsm/f150ei.php Saskatchewan - http://www.environment.gov.sk.ca/legislation/ Alberta - http://www.gov.ab.ca/qp/ British Columbia - http://www.for.gov.bc.ca/tasb/legsregs/comptoc.htm Yukon - http://www.emr.gov.yk.ca/forestry/forest_resources_act.html Northwest Territories - http://www.justice.gov.nt.ca/Legislation/SearchLeg&Reg.shtml</p>

15 Table T15 – Institutional framework

15.1 FRA 2010 Categories and definitions

Term	Definition
Minister responsible for forest policy-making	Minister holding the main responsibility for forest issues and the formulation of the forest policy.
Head of Forestry	The Head of Forestry is the Government Officer responsible for implementing the mandate of the public administration related to forests.
Level of subordination	Number of administrative levels between the Head of Forestry and the Minister.
University degree	Qualification provided by University after a minimum of 3 years of post secondary education.

15.2 Data for Table T15

Table 15a – Institutions

FRA 2010 Category	2008	
Minister responsible for forest policy formulation : please provide full title	The Honourable Lisa Raitt - Minister of Natural Resources Canada The Honourable Kathy Dunderdale - Minister of Intergovernmental Affairs and Natural Resources, Government of Newfoundland and Labrador The Honourable John MacDonell - Minister of Natural Resources, Government of Nova Scotia The Honourable Richard E. Brown - Minister of Environment, Energy and Forestry, Government of PEI The Honourable Wally Stiles - Minister of Natural Resources, Government of New Brunswick The Honourable Nathalie Normandeau - Minister of Natural Resources and Wildlife, Government of Quebec The Honourable Michael Gravelle, Minister of Northern Development, Mines and Forestry, Government of Ontario The Honourable Stan Struthers - Minister of Conservation, Government of Manitoba The Honourable Nancy Heppner - Minister of Environment, Government of Saskatchewan The Honourable Ted Morton - Minister of Sustainable Resource Development, Government of Alberta The Honourable Pat Bell - Minister of Forests and Range, Government of British Columbia The Honourable Brad Cathers - Minister of Energy Mines and Resources, Government of the Yukon The Honourable J. Michael Miltenberger - Minister of Environment and Natural Resources, Government of the Northwest Territories The Honourable Mr. Daniel Shewchuk - Minister of Environment, Government of Nunavut	
Level of subordination of Head of Forestry within the Ministry		1 st level subordination to Minister
	X	2 nd level subordination to Minister
		3 rd level subordination to Minister
		4 th or lower level subordination to Minister
Other public forest agencies at national level	Canada	Parks Canada Indian and Northern Affairs Canada
Institution(s) responsible for forest law enforcement	YT	Ministry of Energy, Mines and Resources

NT	Ministry of Environment and Natural Resources
NU	Ministry of Environment
NL	Ministry of Intergovernmental Affairs and Natural Resources
PE	Ministry of Environment, Energy and Forestry
NB	Ministry of Natural Resources
NS	Regional Services Branch of the Department of Natural Resources
QC	Bureau du Forestier en Chef (BFEC) Agences de mise en valeur des forêts privées Société de protection contre les insectes et maladies (SOPFIM) Société de protection des forêts contre le feu (SOPFEU)
ON	Ministry of Northern Development, Mines and Forestry Ministry of Natural Resources
SK	Ministry of Environment
AB	Forestry Division, Alberta Sustainable Resource Development.
BC	Compliance and Enforcement Branch of the B.C. Ministry of Forests and Range

Table 15b – Human resources

FRA 2010 Category	Human resources within public forest institutions					
	2000		2005		2008	
	Number	%Female	Number	%Female	Number	%Female
Total staff						
...of which with university degree or equivalent						

Notes:

1. Includes human resources within public forest institutions at sub-national level
2. Excludes people employed in State-owned enterprises, education and research, as well as temporary / seasonal workers.

15.3 Comments to Table T15

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Minister responsible for forest policy formulation		
Level of subordination of Head of Forestry within the Ministry		
Other public forest agencies at national level		
Institution(s) responsible for forest law enforcement		
Human resources within public forest institutions		

Other general comments to the table

Forest management responsibility rests with provincial and territorial governments in Canada. The level of forestry responsibility for the 13 provincial/territorial and 1 federal government departments is at the 2nd level.

16 Table T16 – Education and research

16.1 FRA 2010 Categories and definitions

Term	Definition
Forest-related education	Post-secondary education programme with focus on forests and related subjects.
Doctor's degree (PhD)	University (or equivalent) education with a total duration of about 8 years.
Master's degree (MSc) or equivalent	University (or equivalent) education with a total duration of about five years.
Bachelor's degree (BSc) or equivalent	University (or equivalent) education with a duration of about three years.
Technician certificate or diploma	Qualification issued from a technical education institution consisting of 1 to 3 years post secondary education.
Publicly funded forest research centers	Research centers primarily implementing research programmes on forest matters. Funding is mainly public or channelled through public institutions.

16.2 National data

16.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Statistics Canada Census	H		1996, 2001, 2006	Graduation of students in forest-related education.

16.3 Data for Table T16

FRA 2010 Category	Graduation ¹⁾ of students in forest-related education					
	2000 *		2005 **		2008	
	Number	%Female	Number	%Female	Number	%Female
Master's degree (MSc) or equivalent	1 520	18.75	2 175	28.97	NDA	NDA
Bachelor's degree (BSc) or equivalent	8 940	17.34	8 555	18.00	NDA	NDA
Forest technician certificate / diploma	12 965	15.58	18 405	22.68	NDA	NDA
FRA 2010 Category	Professionals working in publicly funded forest research centres ²⁾					
	2000		2005		2008	
	Number	%Female	Number	%Female	Number	%Female
Doctor's degree (PhD)	NDA	NDA	NDA	NDA	NDA	NDA
Master's degree (MSc) or equivalent	NDA	NDA	NDA	NDA	NDA	NDA
Bachelor's degree (BSc) or equivalent	NDA	NDA	NDA	NDA	NDA	NDA

Notes:

1. Graduation refers to the number of students that have successfully completed a Bachelor's or higher degree or achieved a certificate or diploma as forest technician.
 2. Covers degrees in all sciences, not only forestry.
- * Data collected from the 2001 Population Census.
 ** Data collected from the 2006 Population Census.

16.4 Comments to Table T16

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Graduation of students in forest-related education	Data are collected from the Statistics Canada Population Census conducted every 5 years with the latest conducted in 2006. The figures in the Forest technician certificate/diploma are slightly higher in 2006 due to a change in categories included for forestry by Statistics Canada.	
Professionals working in public forest research centres		

Other general comments to the table

17 Table T17 – Public revenue collection and expenditure

17.1 FRA 2010 Categories and definitions

Category	Definition
Forest revenue	All government revenue collected from the domestic production and trade of forest products and services. For this purpose, forest products include: roundwood; sawnwood; wood-based panels; pulp and paper; and non-wood forest products. As far as possible, this should include revenue collected by all levels of government (i.e. central, regional/provincial and municipal level), but it should exclude the income of publicly owned business entities.
Public expenditure	All government expenditure on forest related activities (further defined below).
Operational expenditure (sub-category to Public expenditure)	All government expenditure on public institutions solely engaged in the forest sector. Where the forest administration is part of a larger public agency (e.g. department or ministry), this should only include the forest sector component of the agency's total expenditure. As far as possible, this should also include other institutions (e.g. in research, training and marketing) solely engaged in the forest sector, but it should exclude the expenditure of publicly owned business entities.
Transfer payments (sub-category to Public expenditure)	All government expenditure on direct financial incentives paid to non-government and private-sector institutions, enterprises communities or individuals operating in the forest sector to implement forest related activities.
Domestic funding	Public expenditure funded from domestic public financial resources, including: retained forest revenue; forest-related funds; and allocations from the national budget (i.e. from non-forest sector public revenue sources).
External funding	Public expenditure funded from grants and loans from donors, non-governmental organisations, international lending agencies and international organisations, where such funds are channelled through national public institutions.

17.2 National data

17.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
National Forestry Database	H		Averages for 2000 and 2005	From the statement of revenues from the sale of timber on Provincial Crown land.

17.2.2 Original data

Forest revenue

Year	Revenues		Revenues
1998	1 815 417		
1999	2 301 457		
2000	1 795 711	Average 1998-2002	1 854 803
2001	1 579 021		
2002	1 782 407		
2003	1 423 409		
2004	1 916 003		
2005	1 532 742		
2006	1 529 329	Average 2003-2006	1 600 371

Source: Compendium of Canadian Forestry Statistics; Table 8.1 Statement of Revenues from the Sale of Timber from Provincial Crown Land, 1990-2007; Updated: September 11, 2008 (nfdp.ccfm.org/data/comp_81e.html)

17.3 Data for Table T17

Table 17a - Forest revenues

FRA 2010 Categories	Revenues (1000 local currency)	
	2000	2005 (2003-2006)
Forest revenue	1 795 711	1 532 742

Table 17b - Public expenditure in forest sector by funding source

FRA 2010 Categories	Domestic funding (1000 local currency)		External funding (1000 local currency)		Total (1000 local currency)	
	2000	2005	2000	2005	2000	2005
Operational expenditure						
Transfer payments						
Total public expenditure						
If transfer payments are made for forest management and conservation, indicate for what specific objective(s) - Please tick all that apply.	<input type="checkbox"/>	Reforestation				
	<input type="checkbox"/>	Afforestation				
	<input type="checkbox"/>	Forest inventory and/or planning				
	<input type="checkbox"/>	Conservation of forest biodiversity				
	<input type="checkbox"/>	Protection of soil and water				
	<input type="checkbox"/>	Forest stand improvement				
	<input type="checkbox"/>	Establishment or maintenance of protected areas				
	<input type="checkbox"/>	Other, specify below				

17.4 Comments to Table T17

Variable / category	Comments related to data, definitions, etc.	Comments on the reported trend
Forest revenue	Revenues from the sale of crown timber are reported for each province and territory as appropriate to the circumstances in each jurisdiction. They include stumpage charges, rent charges, area/holding charges, reforestation levies, protection fees, permit and license fees, and sales and rentals.	
Operational expenditure		
Transfer payments		

Other general comments to the table