



Government  
of Canada

Gouvernement  
du Canada



*Montréal 2005*

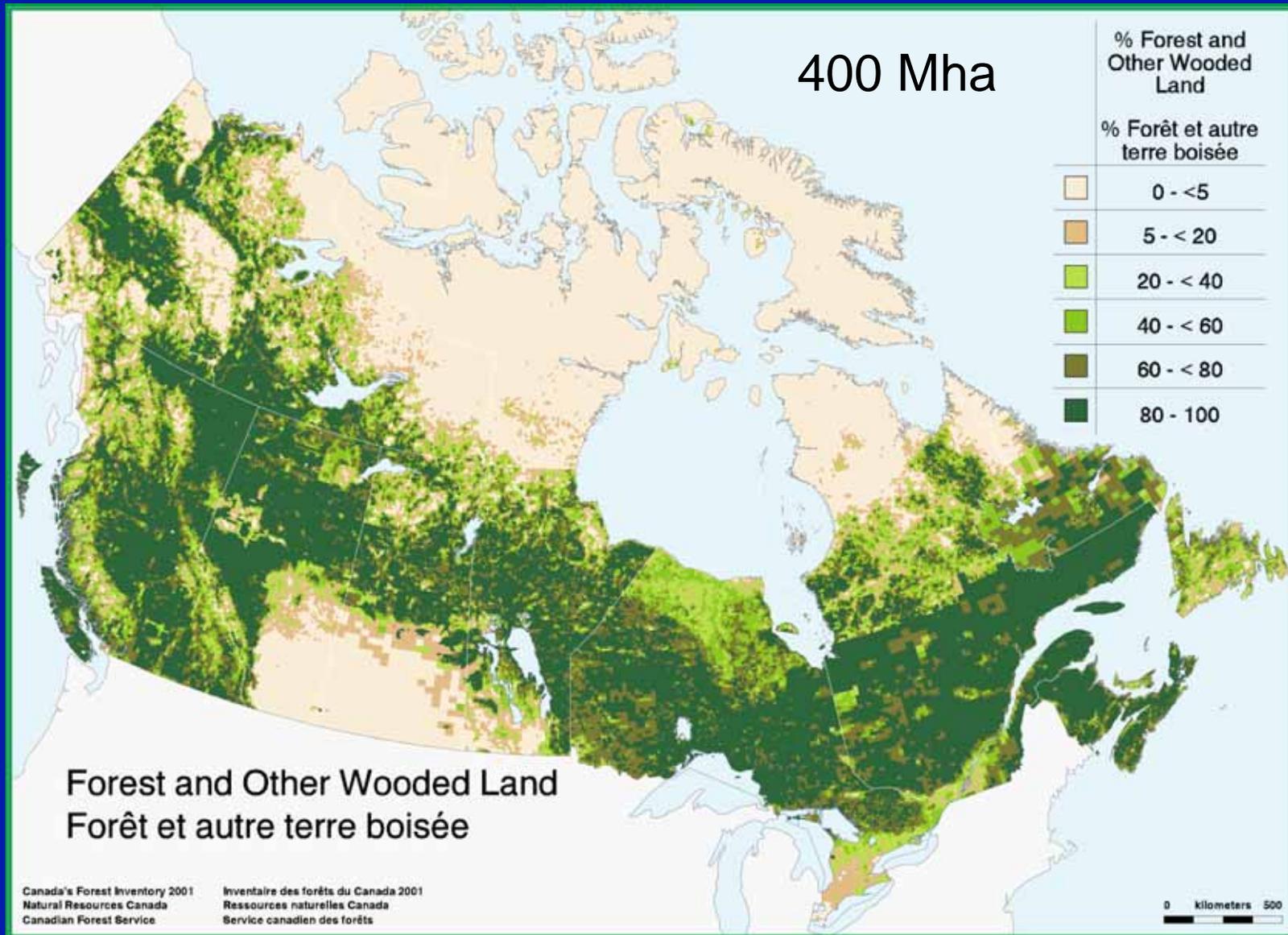
# Canada's National Forest Carbon Monitoring, Accounting and Reporting System (NFCMARS)

Werner Kurz  
Natural Resources Canada  
Canadian Forest Service



Canada

# Canada's Forests



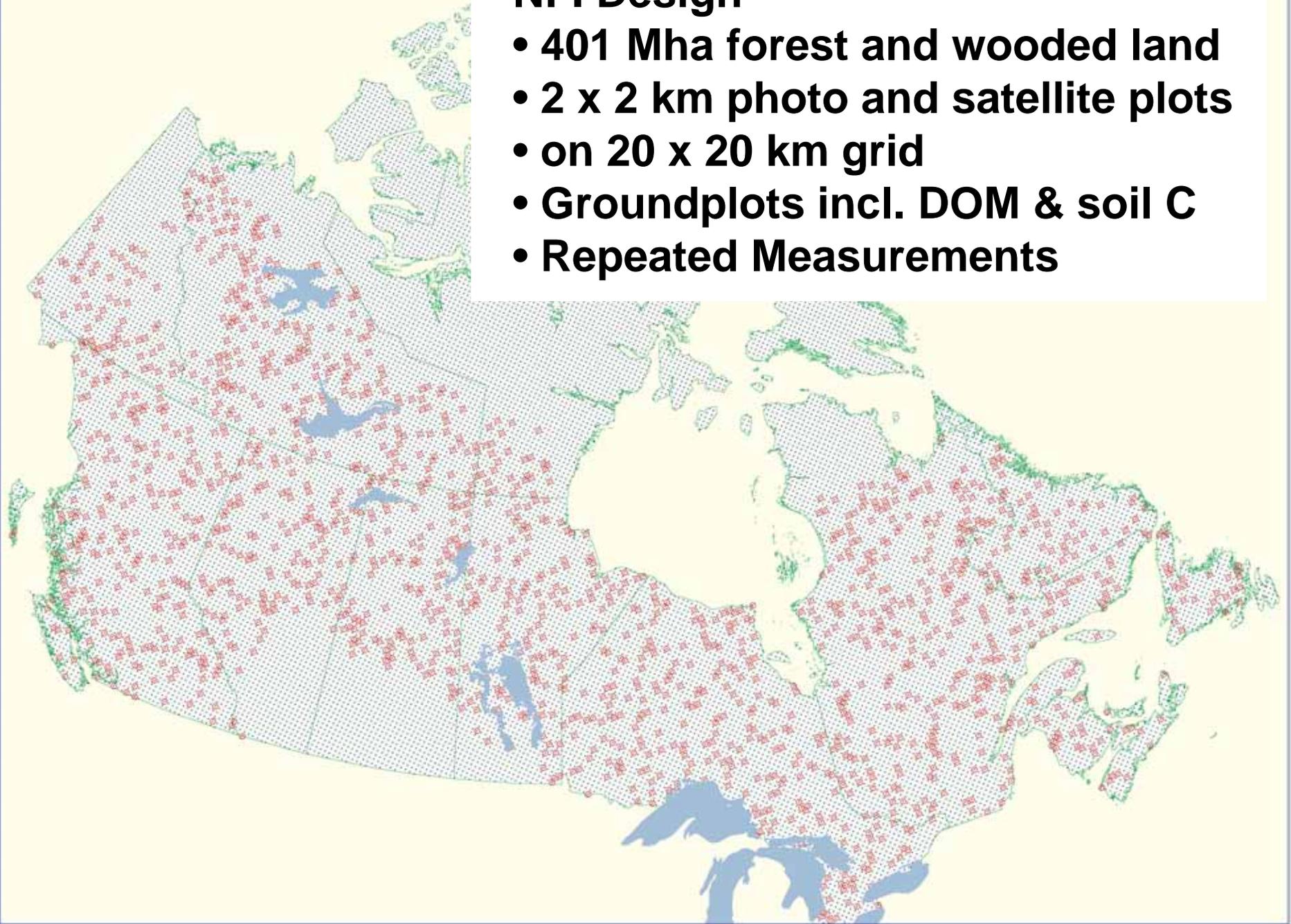
## Key Elements of Approach

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- Science-based conceptual framework is the foundation for the design, and for data synthesis and integration
- Build on forest management knowledge – data driven!
- Initially, combine one inventory with change information.
- Develop models, databases and infrastructure for projective analyses using best-available data
- Conduct scenario and sensitivity analyses
- Improve available data for use in monitoring and reporting
- System evolves with better data and new science

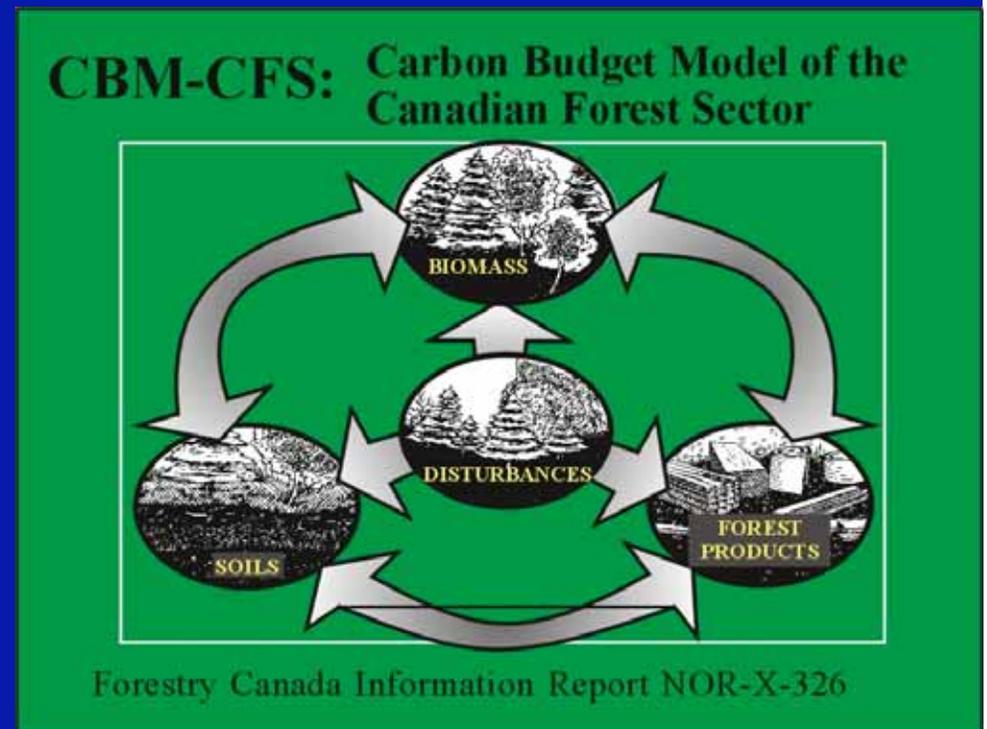
## NFI Design

- 401 Mha forest and wooded land
- 2 x 2 km photo and satellite plots
- on 20 x 20 km grid
- Groundplots incl. DOM & soil C
- Repeated Measurements



# Carbon Budget Model of the Canadian Forest Sector (CBM-CFS2)

- A national-scale model of forest ecosystem C dynamics developed to assess the past, present and future role of the Canadian forest in the global C cycle.
- Research tool
- Revised for operational use



Kurz et al. 1992

# Carbon Budget Model of the Canadian Forest Sector (CBM-CFS3)

- An operational-scale model of forest C dynamics.
- Freely available at [carbon.cfs.nrcan.gc.ca](http://carbon.cfs.nrcan.gc.ca)



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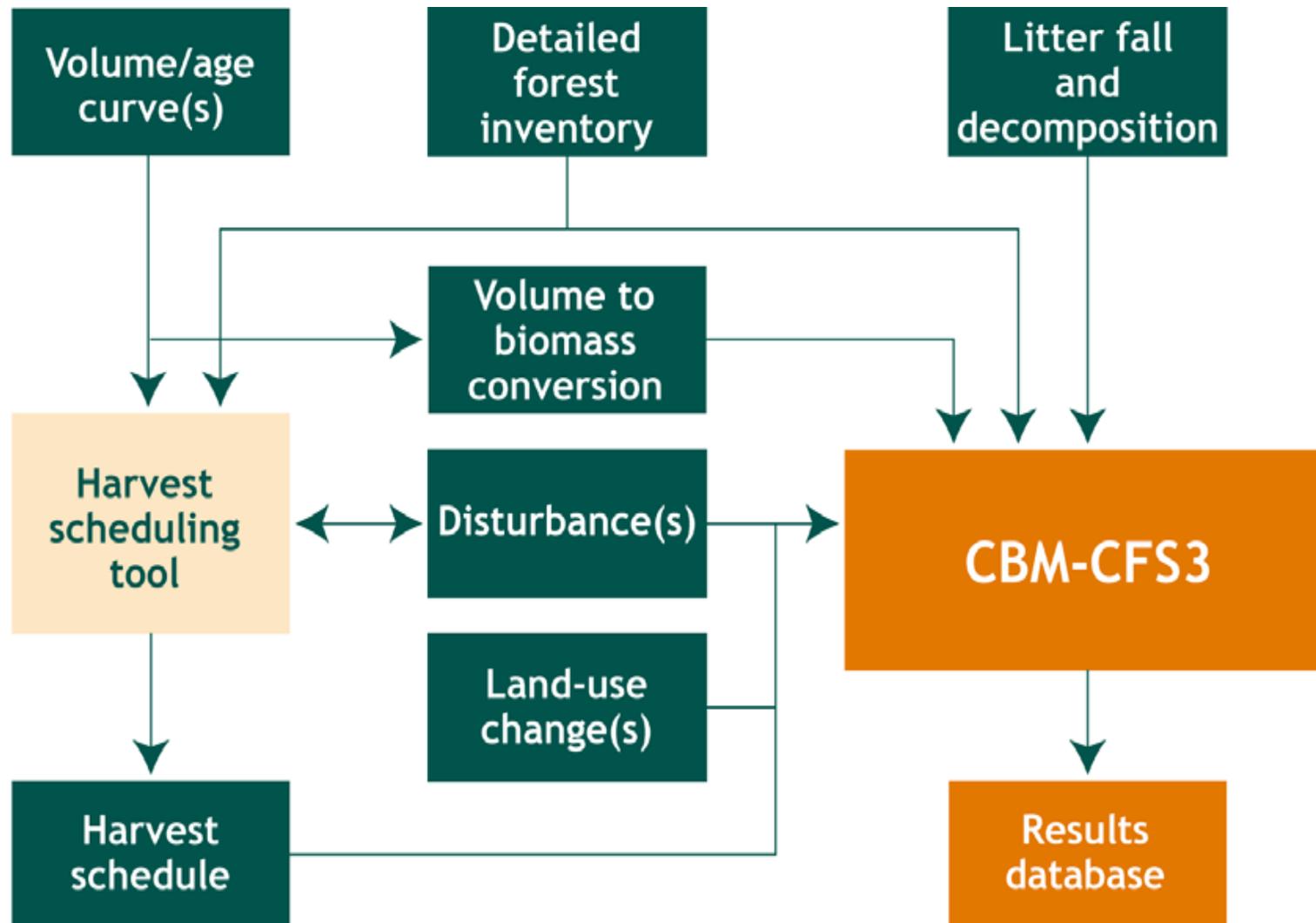


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# International Reporting Requirements

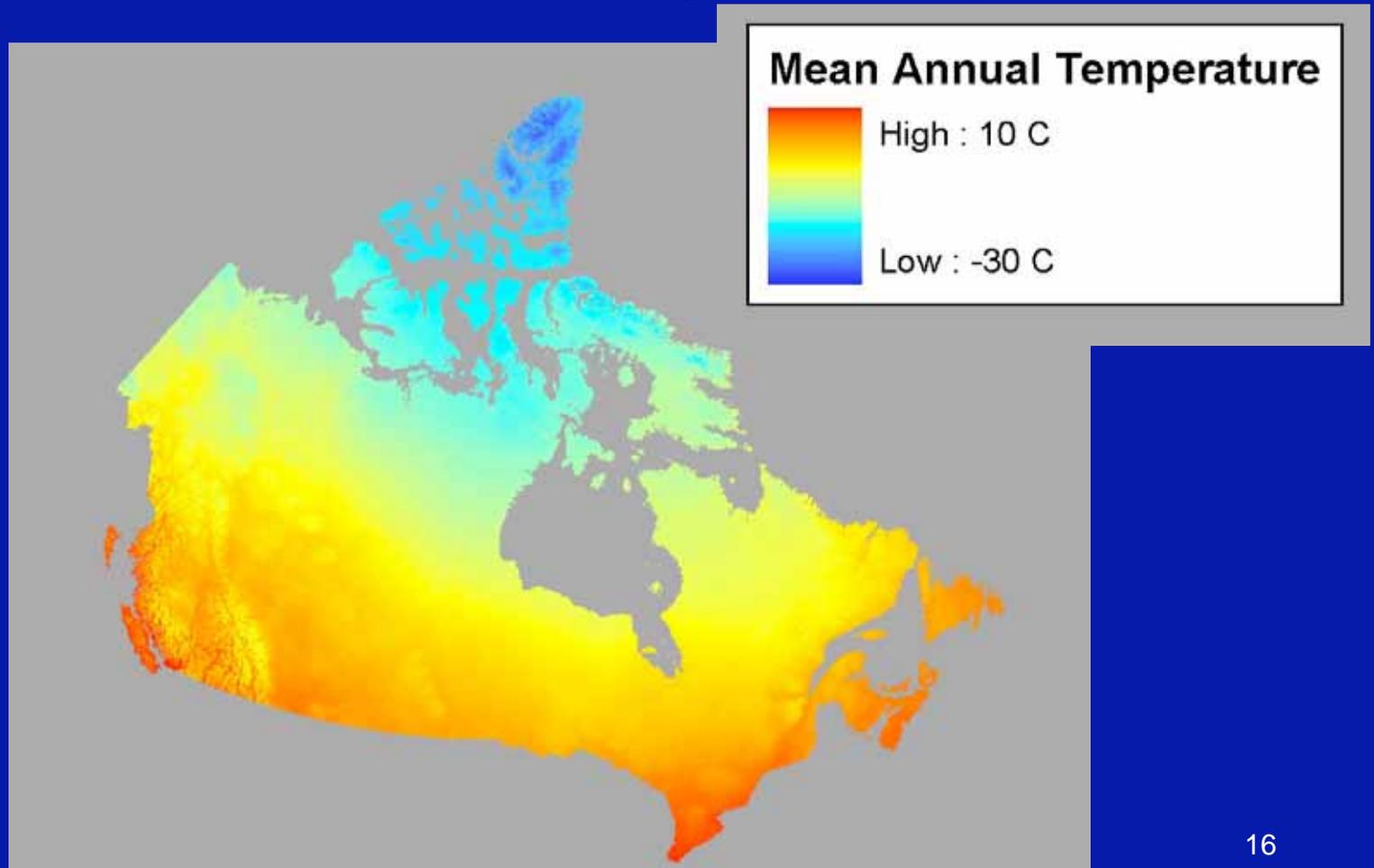
- Annual Reports of GHG emissions under the United Nations Framework Convention on Climate Change (UNFCCC) - ongoing
- Annual Reports on GHG emissions and removals under the Kyoto Protocol – starting in 2007
- Criteria and Indicators Reporting – ongoing
- Forest Inventory Reporting to FAO - ongoing
- Reporting for Certification etc.
- Goal is to integrate and coordinate reporting to ensure consistency and increase efficiencies.

# CBM-CFS3 uses Data from Forest Management Planning



## Climate Data

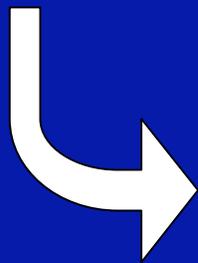
- CBM-CFS3 currently uses constant mean annual temperature (1961 to 1990 normals) for each spatial unit.



# CBM-CFS3 uses spatially-referenced information about forest conditions within Spatial Units

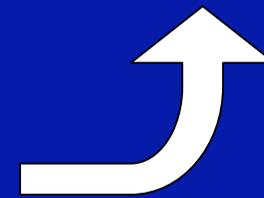


Forest Cover Polygons



Spatial Units

Stand
Records



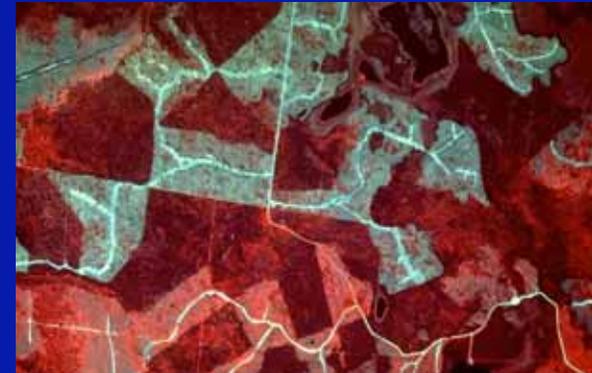
Aspatial

# Spatial Analysis Units

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- Over 2,000 spatial analysis units
- About 2.5 million records describe forest conditions
- Approach uses “best-available” inventory information for each spatial unit
- Spatial units are summarised by reporting unit (terrestrial ecozone)

# Forest C Stock Analyses

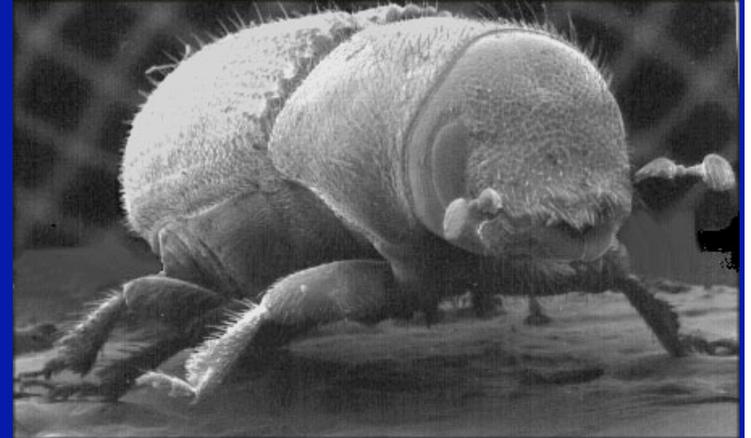


Harvesting  
Planting  
Disturbances  
Land-use change

- ← • Area affected by harvesting
  - Provincial statistics
  - Change inventories (NFI, provinces, forest industry)
  - Remote sensing

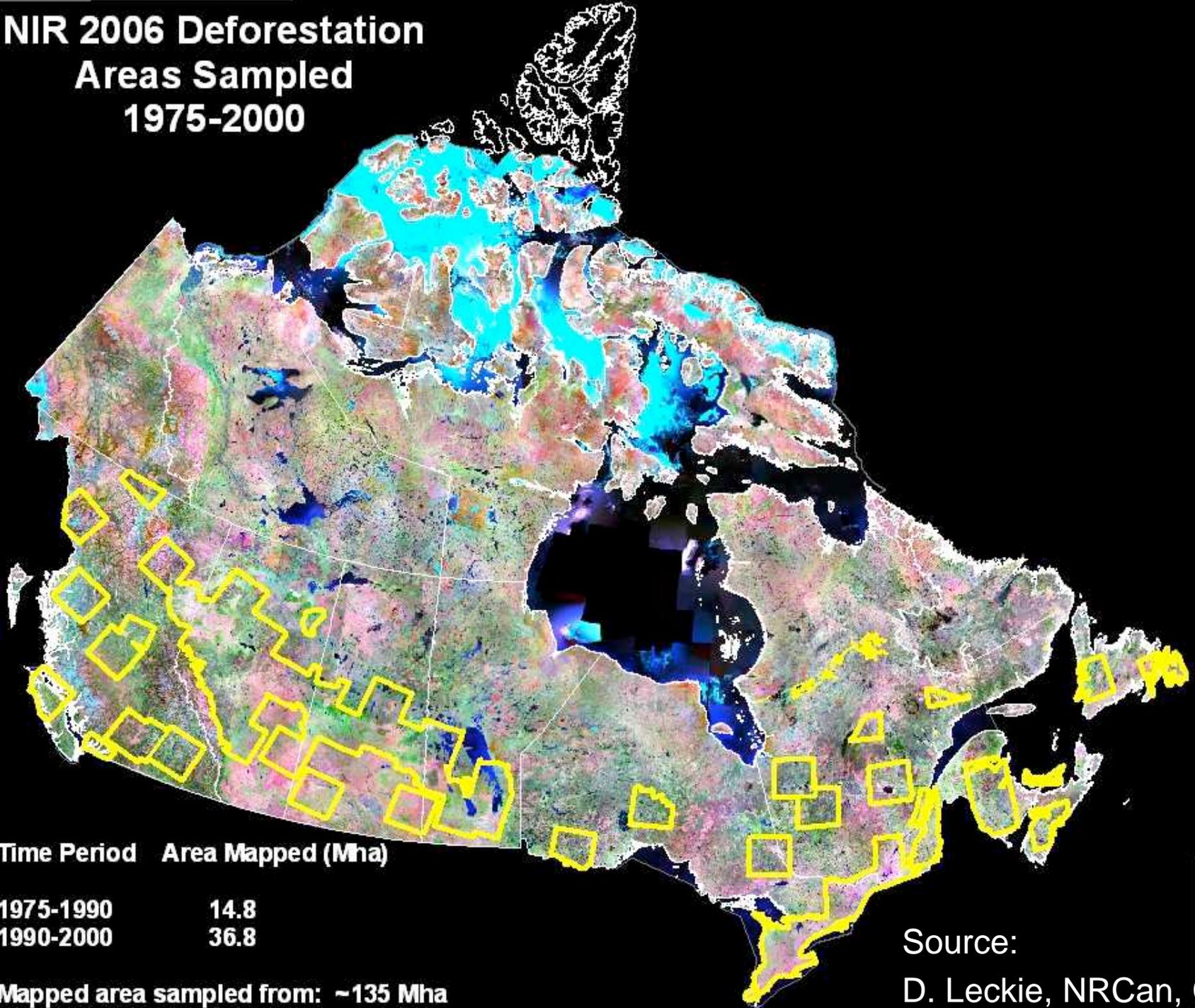
# Forest C Stock Analyses

Harvesting  
Planting  
Disturbances  
Land-use change



- ← • Area affected by fire and insects
  - Provincial statistics, change inventories
  - CFS large fires database (1959 - present)
  - Insects databases (CFS)
  - Remote sensing

# NIR 2006 Deforestation Areas Sampled 1975-2000



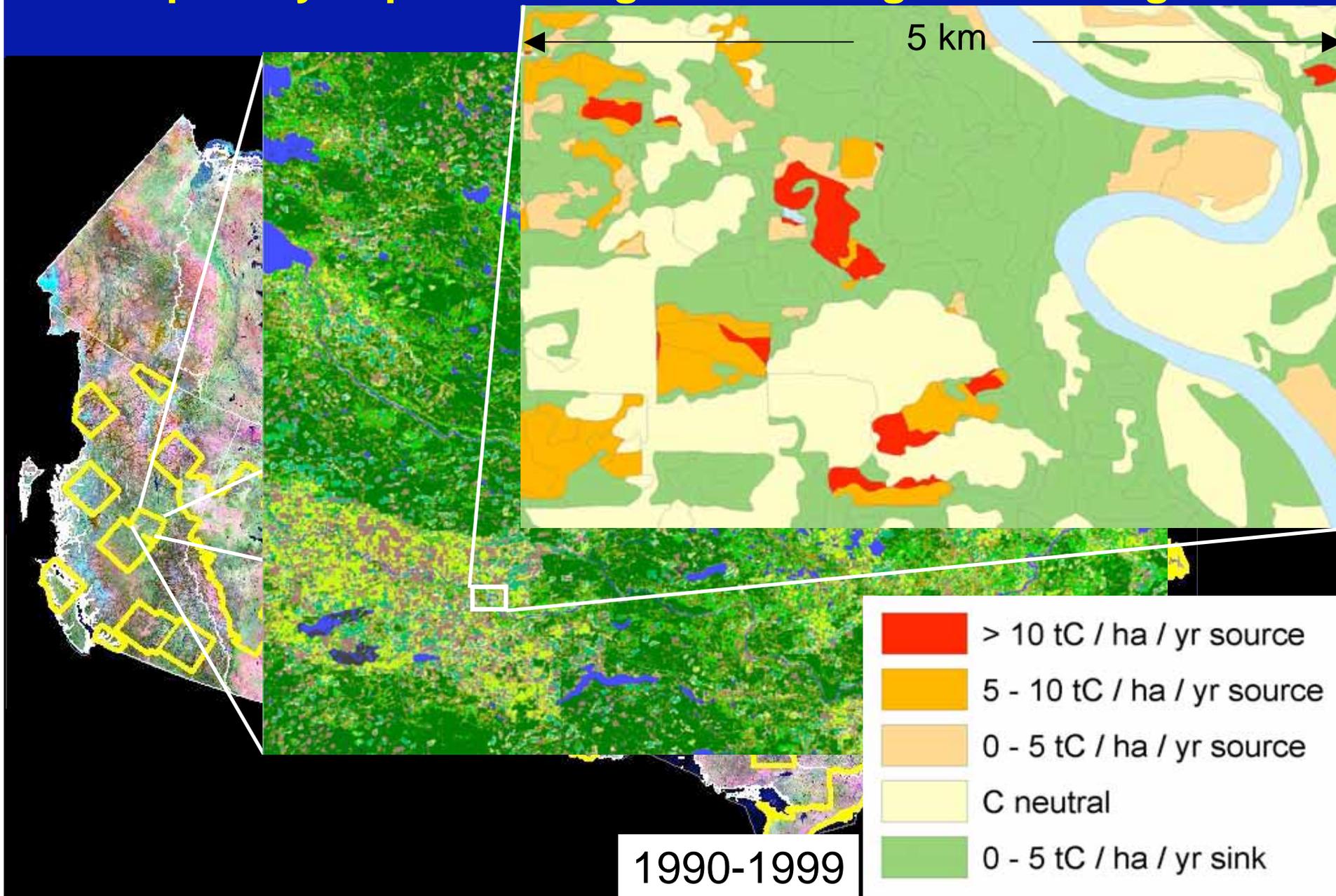
**Time Period**    **Area Mapped (Mha)**

1975-1990	14.8
1990-2000	36.8

**Mapped area sampled from: ~135 Mha**

Source:  
D. Leckie, NRCan, CFS

# Spatially-explicit Change Monitoring and C Budget



# National Afforestation Inventory

Internet-based voluntary reporting system for Afforestation  
Databases linked to CBM-CFS3 to calculate C stock changes



National Afforestation Inventory

Canada

Thomas White

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## Welcome

The National Afforestation Inventory (NAI) is an internet-based reporting system that can gather information about afforestation in Canada and provide it to the [National Forest Carbon Monitoring, Accounting and Reporting System](#).

The NAI application will allow the Canadian Forest Service (CFS) to exchange information on afforestation with afforestation practitioners over the internet. Managers of afforestation projects will be able to access and download related information such as carbon estimation and reporting protocols and specifications of information requirements from the NAI web site. They will also be able to provide information about their projects to the CFS using forms accessible through a web browser.

[Reports](#)

[Reporting Entities](#)

Last updated: Apr 12, 2004 | [Important Notices](#)

# Data Integration

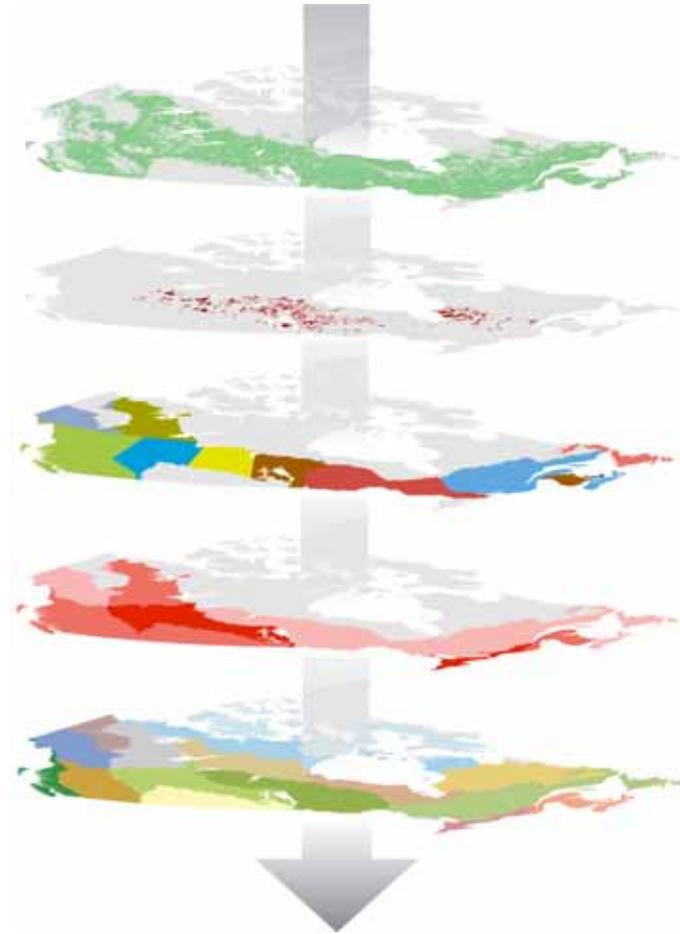
Forest inventory and growth & yield data

Natural disturbance monitoring data

Forest management activity data

Land-use change data

Ecological modelling parameters



**CBM-CFS3**

# System is compliant with IPCC GPG



INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE  
NATIONAL GREENHOUSE GAS INVENTORIES PROGRAMME



## Good Practice Guidance for Land use, Land-use Change and Forestry

# Conclusions

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- Canada's National Forest C Accounting System is under development for projection and monitoring.
- At its core is the Carbon Budget Model of the Canadian Forest Sector (CBM-CFS3).
- The new National Forest Inventory will improve inventory data and contribute to change monitoring.
- Remote sensing based programmes are used to determine annual area burned and area deforested over multi-year periods.

# Conclusions

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- Afforestation is monitored through voluntary reporting.
- Several ongoing and planned scientific activities will improve the modelling framework.
- A programme of continuous improvement is identifying, quantifying and reducing uncertainties, as much as is practicable.