

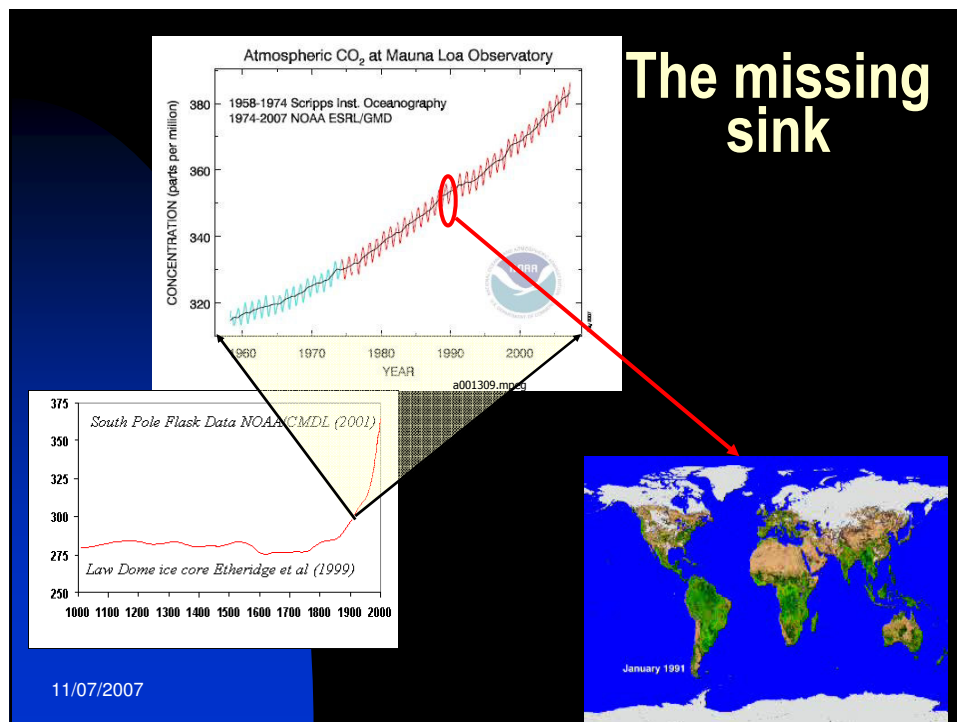
How can we see the carbon from the trees?

The potential use of NFI data for developing a state-of-the-art National forest carbon reporting system



Overview

- Are forests a sink?
- UNFCCC and Kyoto
- CARBWARE
- NFI uses
- Recommendations



Kyoto and UNFCCC

- Target 13% above 1990-base year level (eq 56MtCO₂)
1st Commitment period 2008-2012
 - National emissions 23% above 1990 level (NIR 2004)
- Article 3.3, forest activities since 1990
 - Offset required reduction by 16% (preliminary estimate)
- Convention reporting- all forests
- 5 carbon pools
 - Aboveground biomass
 - Belowground biomass
 - Litter
 - Dead Wood
 - Soils

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Reporting compliance to IPCC guidelines:

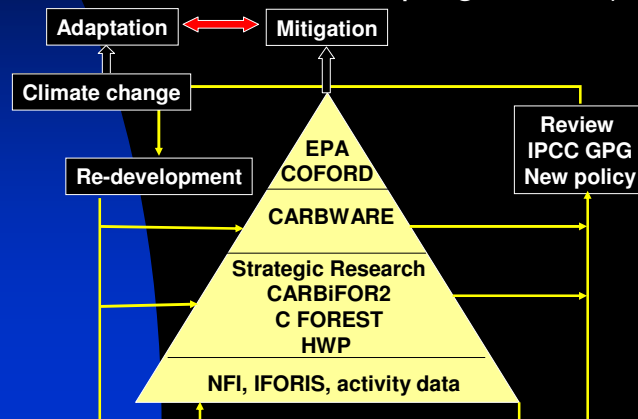
- 1) Complete
- 2) Transparent
- 3) Accuracy and uncertainty
- 4) Consistent
- 5) Comparable
- 6) Reflect national circumstances
- 7) Based on National data where possible

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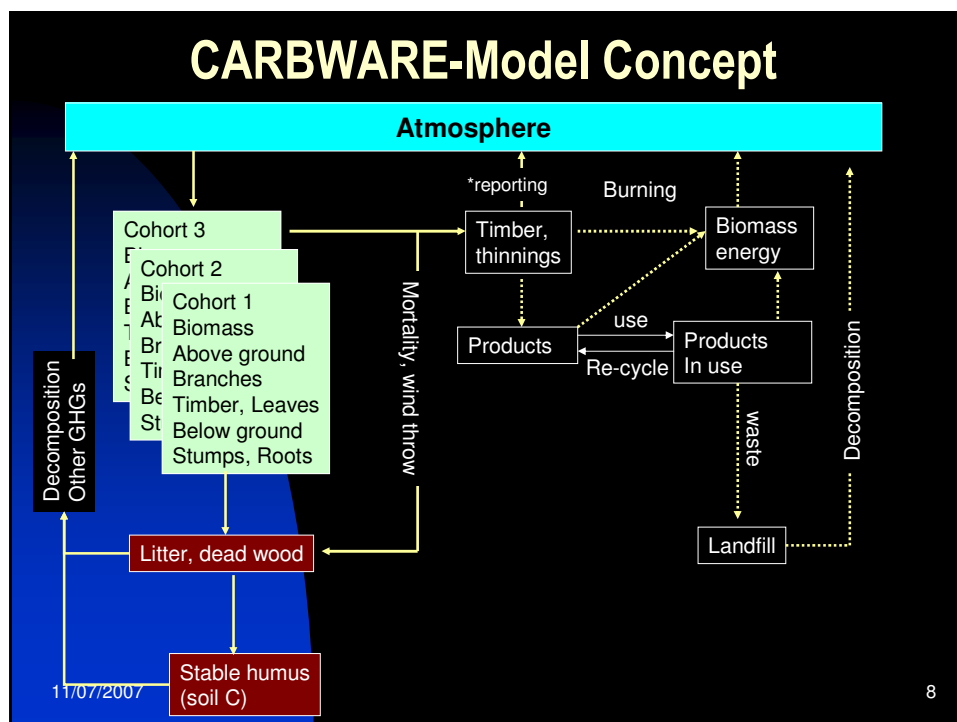
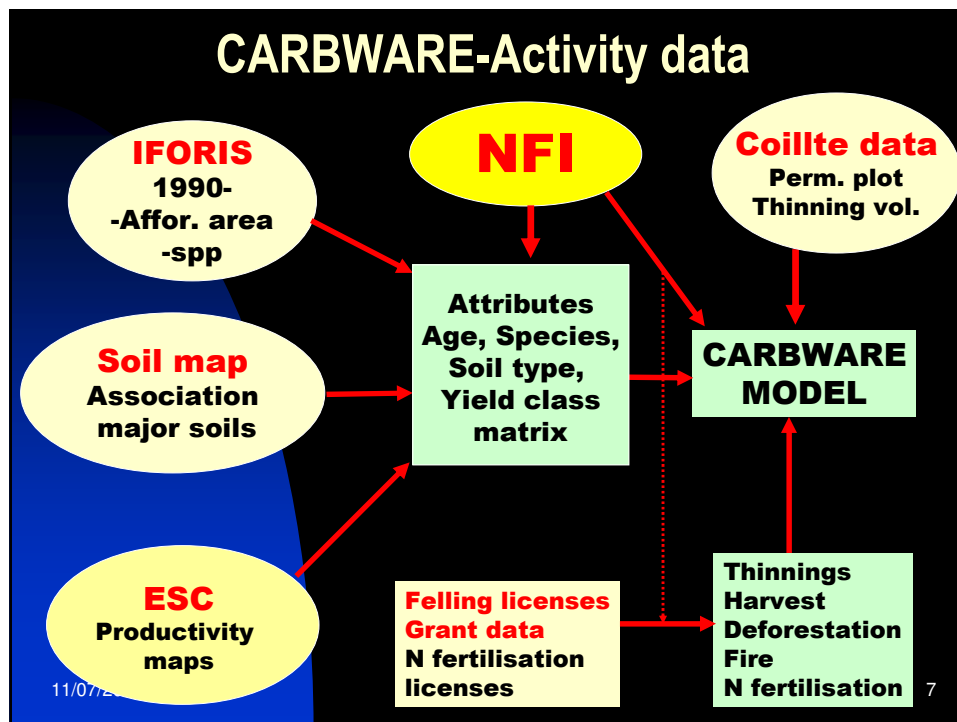
CARBWARE

- Initial estimates associated with large uncertainty
 - Lack of forest inventory statistics
 - Use of generalised stand level yield models
 - Poor characterisation of 5 C pool
- New NFI data and research programme (COFORD)



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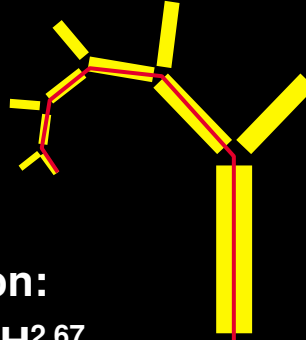
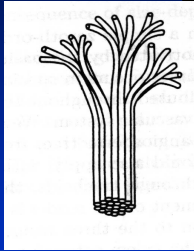
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CARBWARE-Biomass functions

“all the branches of a tree at every stage of its height, when put together, are equal in thickness to the trunk below them” da Vinci

The pipe theory



Prediction:
 $\text{Mass} \propto \text{DBH}^{2.67}$

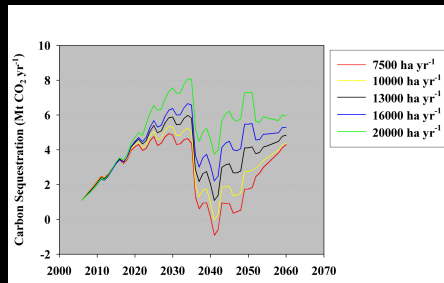
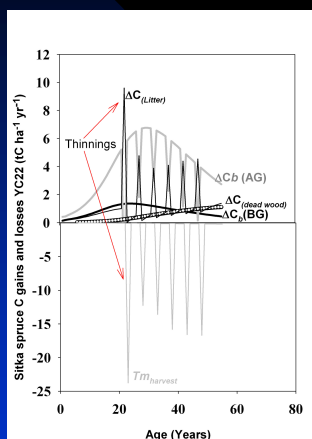
Biomass scales with diameter at breast height (DBH)
Model improved if include height and crown characteristics (competition factors)

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CARBWARE-Outputs/Deliverables

- GPG-LULUCF compliant reporting method
- Scenario analysis
 - ◆ Forecast
 - ◆ Policy/ Financial



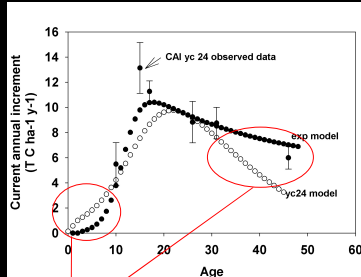
- ◆ Climate change
- ◆ End product use

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NFI opportunities-Growth Models

- Currently use generalised stand-level growth models

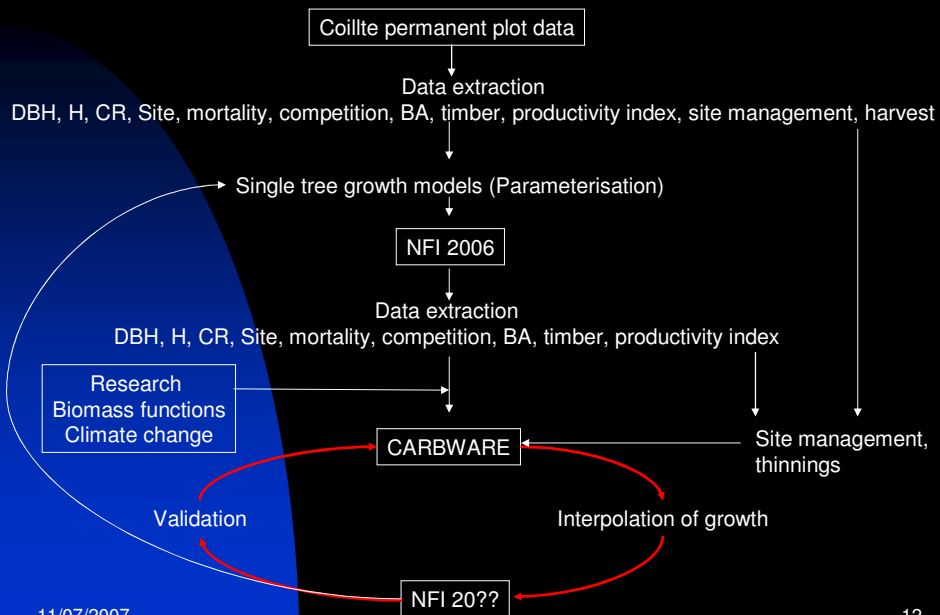


- Large degree of uncertainty (~30% RMSE)
 - Stand management
 - No data on younger trees/stands
- Single-tree growth models
 - Applicable to mixed unconventional management
 - Accounts for site index, climate, competition etc.
 - NFI compatible

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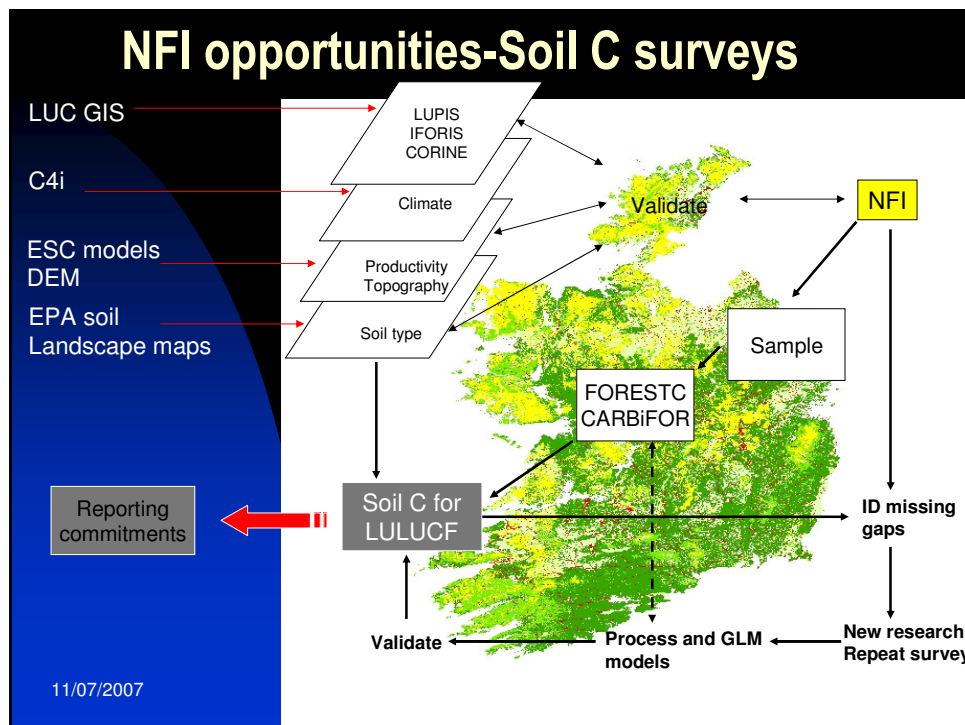
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Single tree-Growth Models



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NFI opportunities-Soil C surveys

- The unknown C pool

i Soil sample NFI plots

- ★ Mineral soils- sink
- ★ Peat soils- source

- Soil surveys
 - ★ NFI plots
 - ★ Paired plot (model C stock change)
 - ★ Repeat measurements
- Validate soil-landscape models
 - ★ EPA soils map

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NFI opportunities*

■ CARBWARE

- ◆ Validation and parameterisation of growth models
 - Single tree growth (parameterisation)
- ◆ Estimation of litter and dead wood pools
- ◆ Basis for soil C stock changes
- ◆ Validation thinning, management scenario assumptions
- ◆ Definition and description of soil-spp-age-area matrix

■ Related uses

- ◆ Validation of soil and productivity maps
- ◆ Parameterisation/Validation of climate change productivity models
- ◆ Source of information for extending a range of model predictions
- ◆ Identify gaps in knowledge

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* **Assuming repeat inventory**

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Room for improvement

- Repeat inventory essential
- NFI Software include carbon pool estimates
 - ◆ User definable parameterisation (not embedded in software)
- Include productivity index- easily understood by public
- Heuristic models (limited H and CR)
- Increase sampling frequency of H and crown measurements taken in plots with small trees
 - ◆ Large error in estimating C stock in young stands (NB Kyoto reporting)
- Uncertainty analysis including model errors for timber and carbon stock estimates

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