



# Measuring and Reporting Forest Carbon

## The Key to Forestry's Inclusion in the Carbon Pollution Reduction Scheme

---

20 August 2008

# Contents

---

- Carbon pools and carbon accounting overview
- Examples of how carbon pools change
- Approaches to carbon accounting
- CPRS unknowns
- Recommended next steps.

# Scale of Impact from Sale of Sequestered Carbon

Effect on the internal rate of return (IRR) on an ex-pasture site may be dramatic.

Benefits derived from the time cost of money. Revenue from carbon pools occurs earlier than from sale of wood products.

Forest growers need to be ready to opt in if they are going to gain the greatest benefit.

Benefit occurs in the first rotation only.

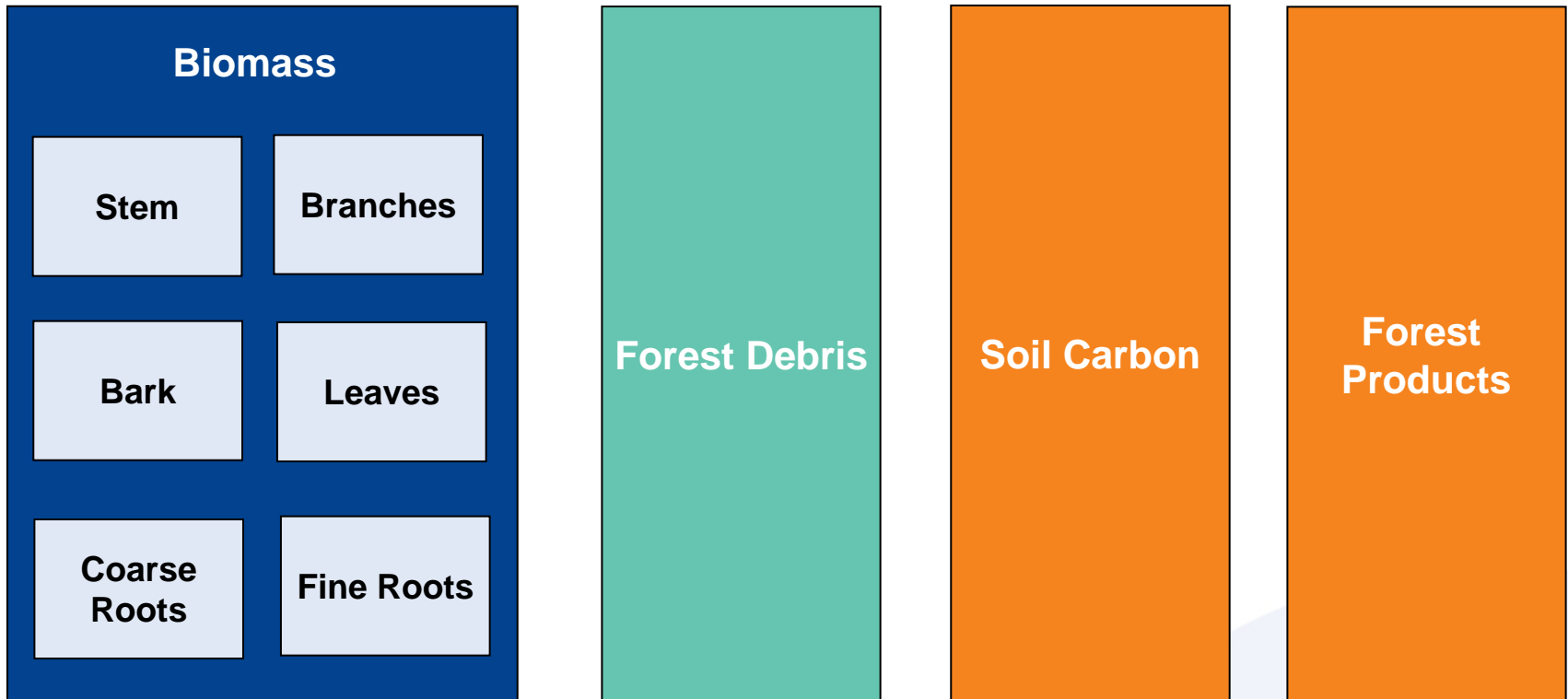
Example impact in IRR

Price of Carbon (\$/tCO <sub>2</sub> -e)	-	\$10	\$20	\$30
Hardwood Pulpwood Regime IRR	9%	12%	19%	29%
Softwood Sawlog Regime IRR	2%	4%	12%	21%

- Biomass and debris carbon pools bought and sold
- Land leased at \$250/ha
- Carbon pooling setup \$15/ha
- Carbon pooling/verification costs \$6/ha/a.

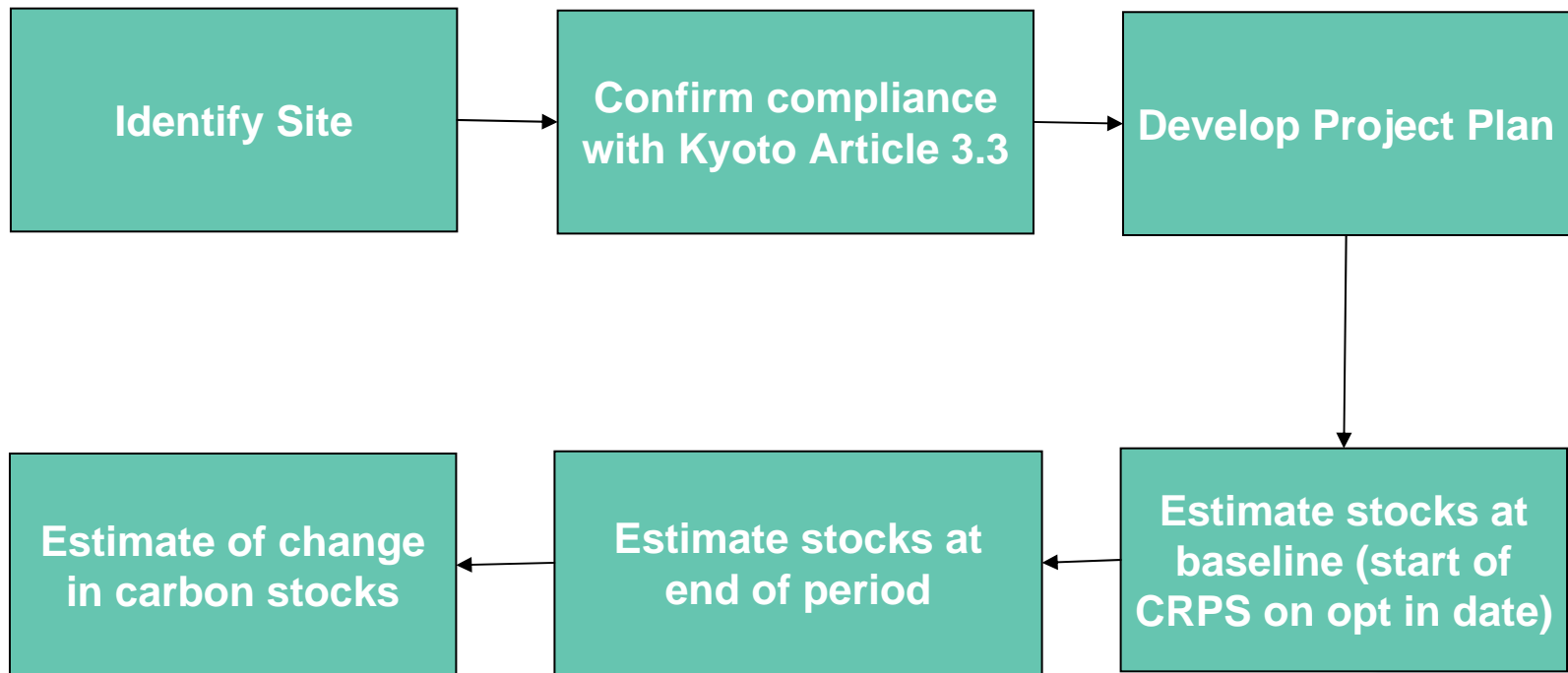
# Carbon Pools

Carbon accounting seeks to estimate changes to the stocks of carbon stored in the various parts of a forest, and downstream uses of forest products.

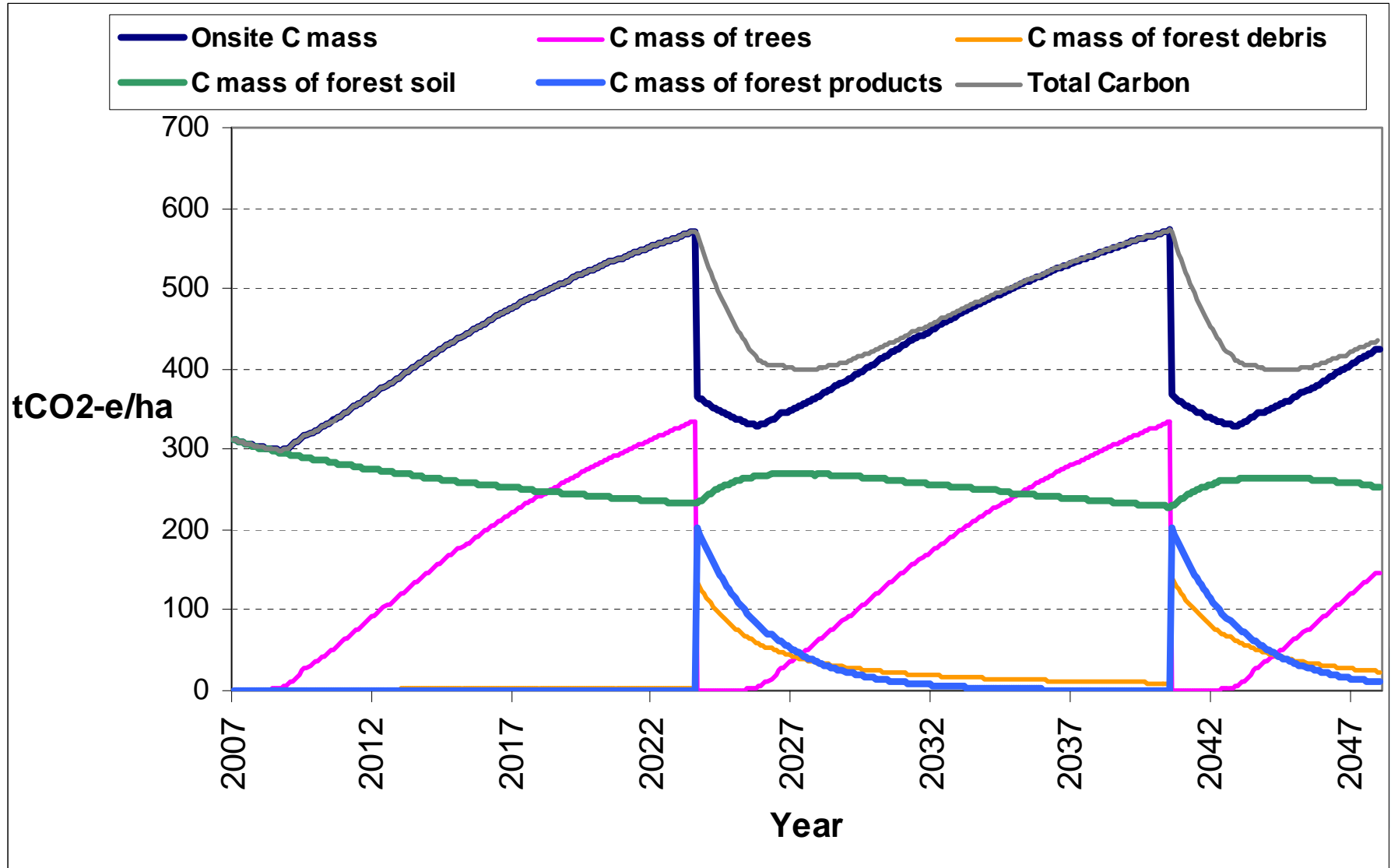


# Components and Process of a Carbon Accounting System

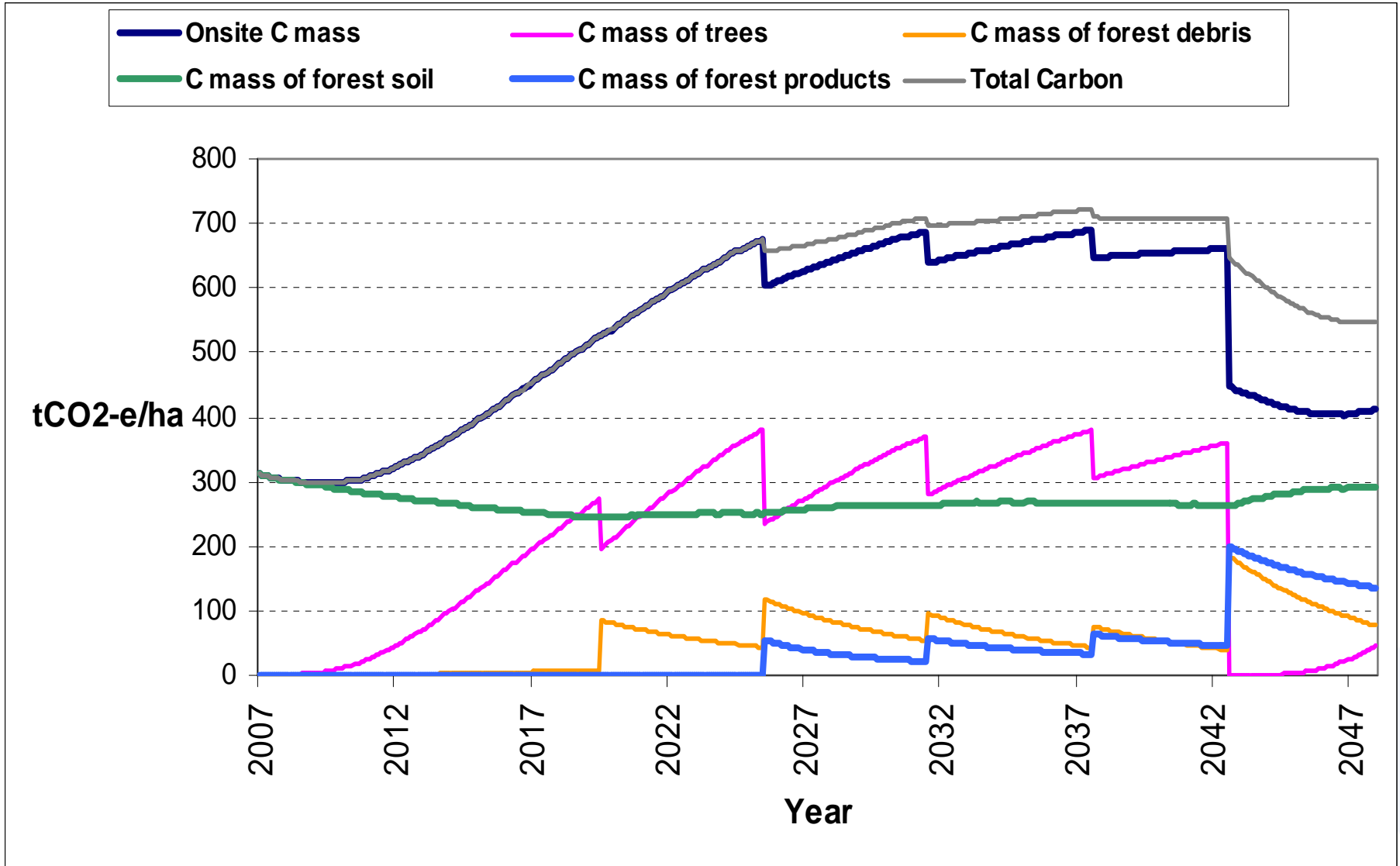
---



# Hardwood Pulpwood Regime Carbon Pools



# Softwood Sawlog Regime Carbon Pools



# Three Possible Categories of Forest Growers

---

## **Simplified**

- Small forest growers using National Carbon Accounting Toolbox (NCAT) with tree yield formula and parameters downloaded using Data Builder.

## **Mid-sized forest owners**

- Forest managers with > 2 000 ha.

## **Sophisticated forest owners**

- Large forest owners and smaller forest owners that target the carbon market
- Agents for forest owners.

# Simplified Approach

---

## Requirements

- Forest compliance with Article 3.3
- Species, location, area, planting date
- Management history e.g. fertiliser, pruning
- Stem mass, expansion parameters, C ratios derived from Data Builder.

## Issues

- May not be sufficient for verification
- May be locked in to approach
- Requires FullCAM calibrated for species and region
- NCAT appears conservative and therefore limits economic gains

## Benefits

- Auditing requirements less onerous since NCAT is conservative
- Requires minimal onsite data collection

# Mid-Sized Forest Owner

---

## Requirements

- Forest compliance with Article 3.3
- Species, location, area, planting date
- Stem mass, expansion parameters, C ratios derived from Data Builder
- Management history
- tDMT to C ratios for tree components ( stem, bark, foliage, roots)
- Estimate of stem volume (possibly with level of uncertainty)
- Parameters from FullCAM or NCAS technical reports - basic density, expansion factors
- If using forest estate software (e.g. Woodstock or Folpi) need to develop carbon yield tables
  - Parameters in FullCAM are age based not volume based.
  - Above ground biomass obtainable from NCAS tech report 41 (as a ratio of stem volume, not age) for *E. globulus* and *P. radiata*
  - Root to Shoot ratio – may still need to use age based FullCAM ratios.

## Issues

- Departure from NCAS toolbox requires more onsite data collection and verification
- Onus on forest owner.

## Benefits

- Likely to provide a less conservative estimate of carbon sequestered.

# Sophisticated Forest Manager

---

## Requirements

- Compliance with Article 3.3
- Species, location, area, planting date
- Management history
- Stem and debris mass from inventory
- Biomass expansion ratios from measurements
- Carbon content ratios for tree components ( stem, bark, foliage, roots)
- Parameters from own research - basic density, decomposition of debris

## Issues

- Likely significant onsite data collection needs
- More stringent audit and verification requirements.

## Benefits

- Likely to provide more accurate carbon estimates than other approaches, allowing for sale of more carbon.

# CPRS Unknowns

---

- Opt-in for full or part of estate
- Is baseline 2010 or opt-in date –possible wind fall gains if opt-in is for part of estate and it occurs after each clear fall.
- Need to have estimate of entire C stocks at baseline since opt-in may be considered in the future. Not possible to inventory entire estate at once. Therefore, will need to use models to estimate baseline stocks. Are in-house models o.k.? What is the alternative?
- Can credits be sold from forecasts, between modelled stocks or inventory points.
- Does soil carbon need to be accounted for?
- Who would own carbon from wood products if included? Processors have the necessary information to estimate quantities by finished product and to apply decay rates.
- Will use of any National Carbon Accounting System (NCAS) parameters be compulsory?
- Uncertainty – Probable Limit of Error (PLE) or other statistical requirements for estimates.

## Recommended Next Steps for DCC

---

### **NCAS requires further work to encompass the full range of conditions and species for commercial forestry including:**

- Knowledge of regions where species are calibrated for
- Incorporation of new species
- Carbon content of dry matter for many species
- Root to shoot ratios
- Wood product decay rates for recycling and wood products in landfills (if in CPRS)
- Further calibration of Tree Yield Formula
- Basic density
- Nitrous oxide and other gasses
- New interface and web based program
- Capacity for support and training

# Recommended Next Steps for Forest Owners

---

**Forest growers managing similar species in similar locations may share costs of research, e.g:**

- Stem to biomass expansion factors
- Root to shoot ratios
- Rates of debris breakdown
- Dry mass to carbon ratio for tree components.

## **Why?**

- Published parameters are not available for many species and regimes
- Starting with the simplified approach or generic parameters may lock companies into a sub-optimal conservative estimate
- Use of good science to provide confidence that carbon stock changes are real and hence to claim the largest verifiable carbon stocks
- Common parameters are easier to audit
- Reduce costs
- Forest managers should be ready to apply the most accurate approach from the start of the CPRS.

# Integration with Forest Estate Models

---

**Develop know-how for strategic analysis of carbon as a part of the tree growing business.**

- Evaluate when and what proportion of stocks to sell
- Balance carbon revenues with wood products revenues
- Manage risk from carbon liabilities and natural events
- Evaluate opt-in options
- Integration of carbon yield tables into forest estate models.



”  
PÖYRY