

# US Forest Greenhouse Gas Inventories and RPA Carbon Assessments

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# Climate mitigation is a game of tradeoffs



- Forest carbon changes over time
- Energy from wood or oil or coal or...?
- Imports/exports of products
- Public lands, private lands

# To manage carbon and GHGs, we must monitor them

- United Nations Framework Convention on Climate Change: Greenhouse Gas Emissions and Sinks Inventories—early 1990s
  - Like 140 other nations, the US ratified the UNFCCC and promised, by law, to report their GHG emissions and sinks annually.

# US GHG inventory covers all sectors, key sources and sinks

- US EPA lead agency
- National-level
- Base year 1990
- Annual
- Sectors: Energy; Industrial Processes; Solvent & other product use; Waste, Agriculture; Land Use, land use change, and forestry
- GHGs:  $\text{CO}_2$ ;  $\text{CH}_4$ ;  $\text{N}_2\text{O}$ ; PFC, HFC, &  $\text{SF}_6$

# Guidance for GHG inventories evolves




- Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Emissions and Sinks (1994-1996)
- IPCC Good Practice Guidance for Land Use, Land Use Change and Forestry (2001-2003)
- 2006 IPCC Revision Guidelines. Volume 4: AFOLU: Agriculture, Forestry, and Other Land Use

# Aims/principles of NGHGI guidance apply at many scales

- Transparency
  - users can replicate and assess info
- Consistency -- change real, not due to methods differences
- Comparability
- Completeness -- all sources/sinks considered, entire geographic land-base
- Accuracy -- neither over or underestimating as far as can be judged
  - uncertainties reduced as far as practicable

# Main equations



- Carbon stock = area \* carbon/area
- Activity type equation: number of animals \* emission per animal

# System boundaries are key for analyzing climate mitigation activities



- A true story: Finland then and now
- All managed lands and related activities?
- All carbon pools (above, belowground)?
- Fate of carbon beyond the forest
  - Trade (imports/exports)
  - Substitution?
- Co-benefits
- Resolution



# Managed land definition is key

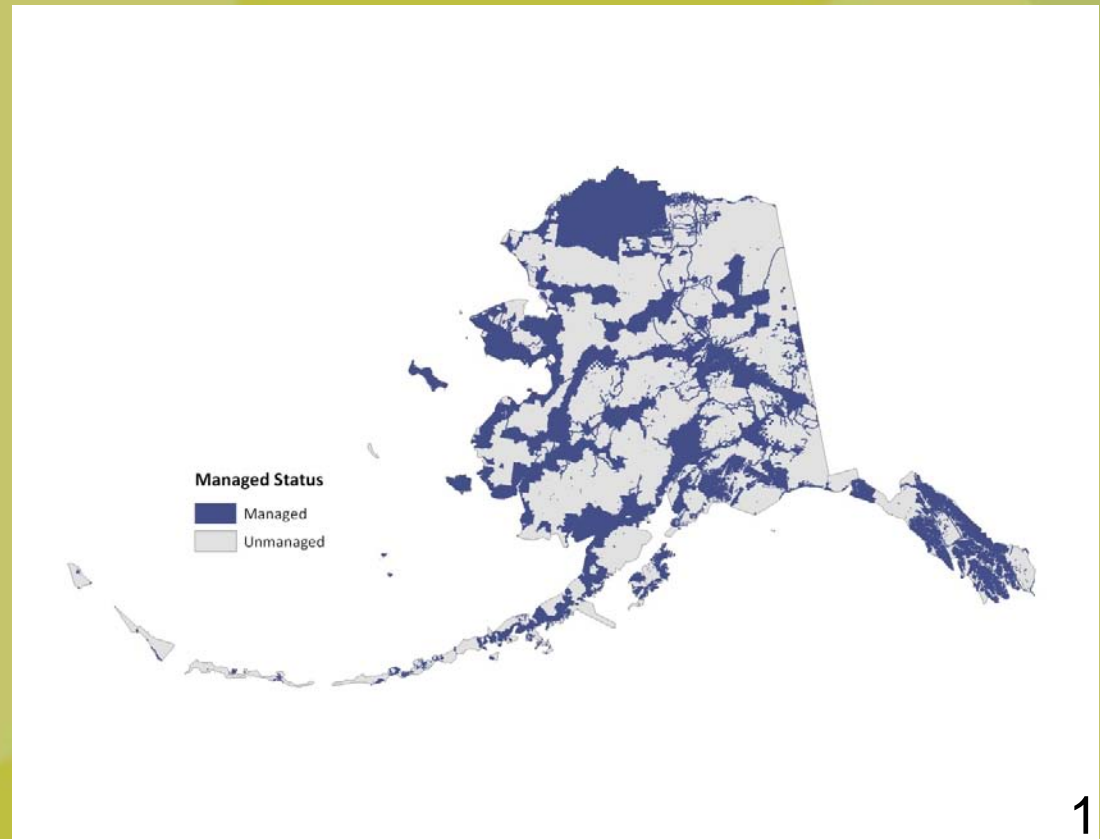
- Affected by direct human intervention
  - Includes providing social functions for personal, community or societal benefits
- All forest land in “lower 48 states” is considered managed for the purposes of the US GHG inventories



# Definition of "managed" under debate

- Unmanaged lands are largely considered inaccessible due to remoteness or to limited commercial value or both

One possible outcome of managed lands in Alaska – blue managed





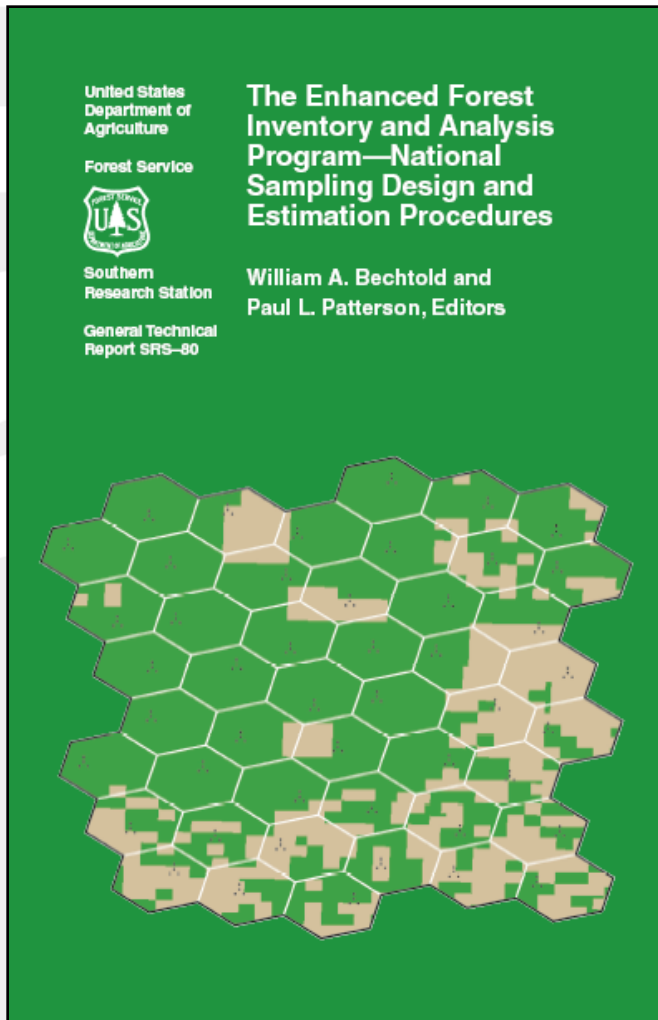
# Forest carbon



Monongahela National Forest, WV

# Forest Inventory & Analysis (FIA)

## Strategic objectives



- National design standards
- Standardized estimation
- Data released at prescribed intervals
- A national database with user-friendly access
- Nationally consistent state reports (5 years)
- Peer review/publication of outputs/procedures



# FIA Data include:

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Use of remote sensing

Ground plots

Harvested wood & products

- Utilization Studies

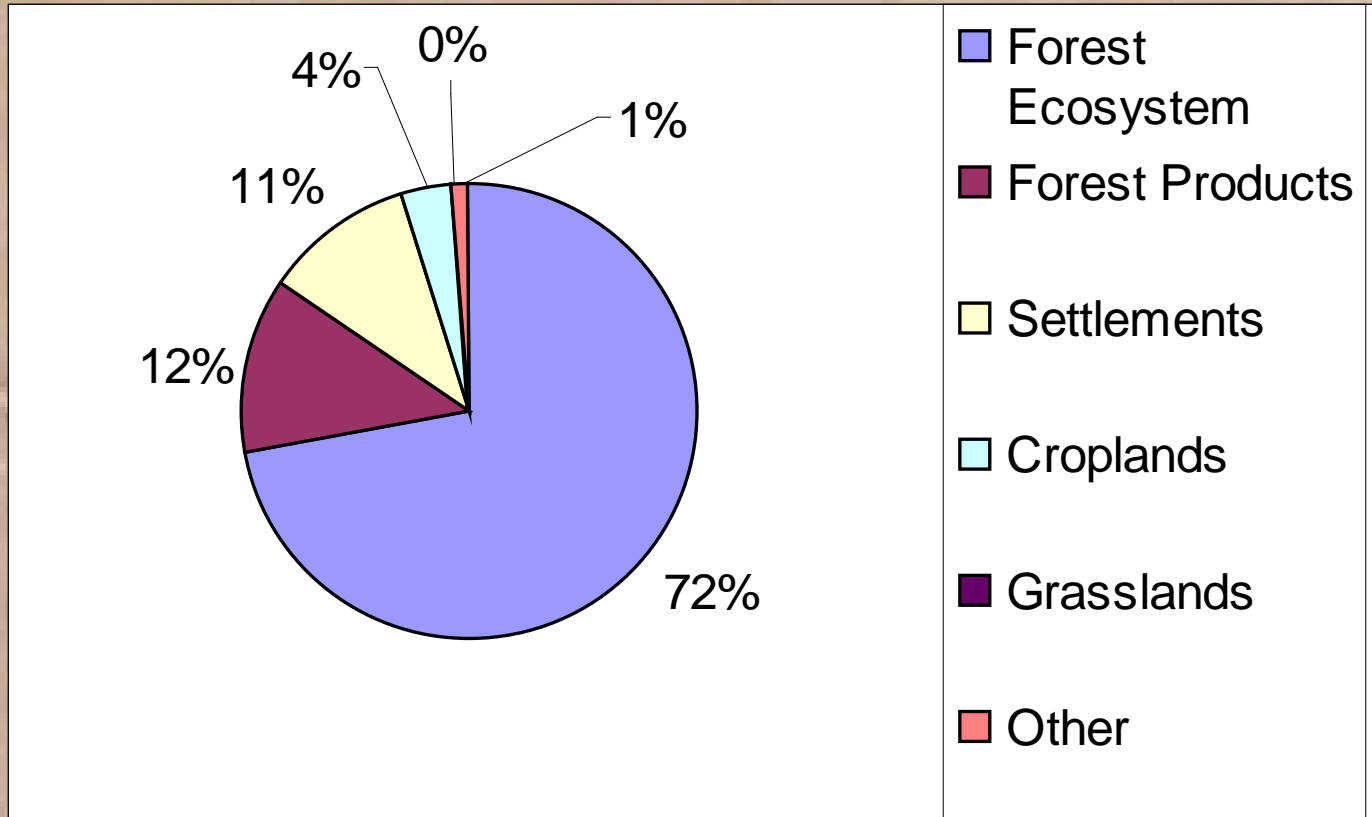
- Timber Products Output

Ownership survey

National Inventory & Monitoring

Applications Center

# % contribution to GHG inventory for land use change and forestry– all owners



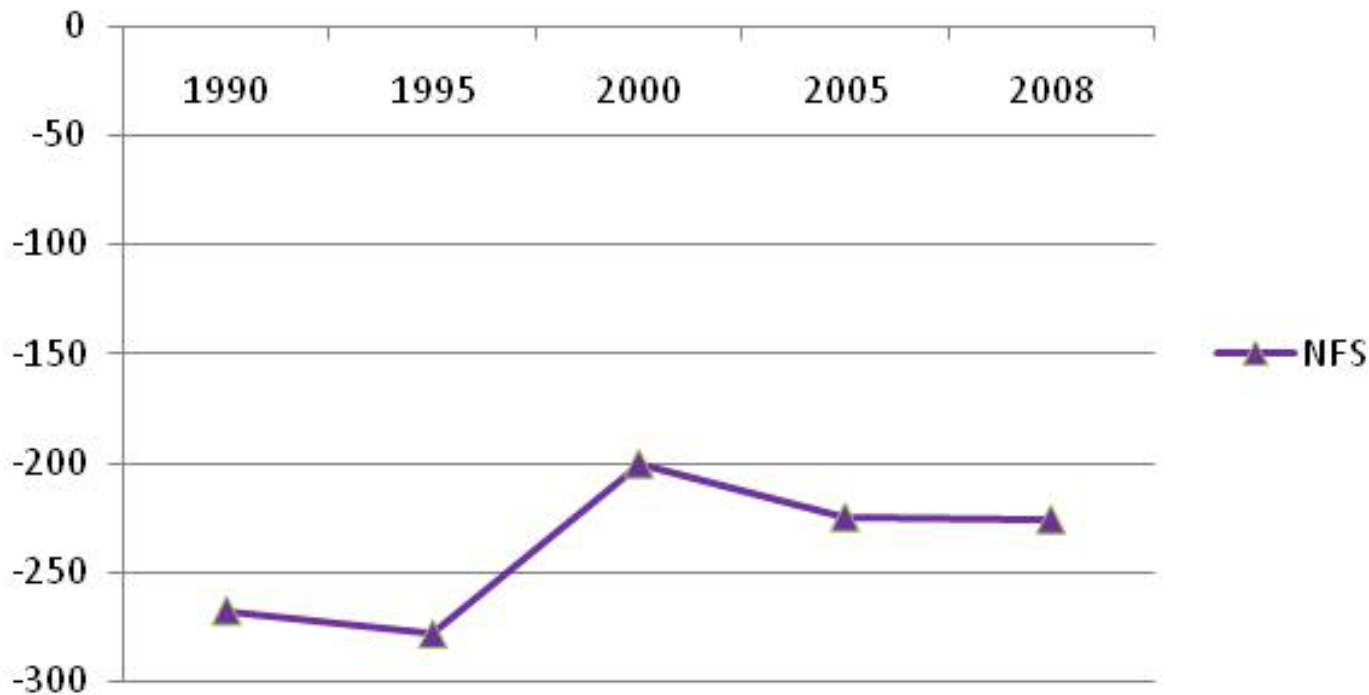
**Source: EPA (2008), Inventory of US GHG emissions and sinks  
(all are net sinks, no non-CO<sub>2</sub>)**



# About 1/3 of net sequestration within US forests are on NFS forest lands

- While about 1/5 of forestland area is in NFS ownership. CAVEATS: implicit disturbance, products

NFS net CO2 per year



# Focus of capacity



- Inventory?
- Activity accounting?
- Life cycle assessment?



# The RPA Forest Assessment is the reason the FS is the provider of US forest GHGs

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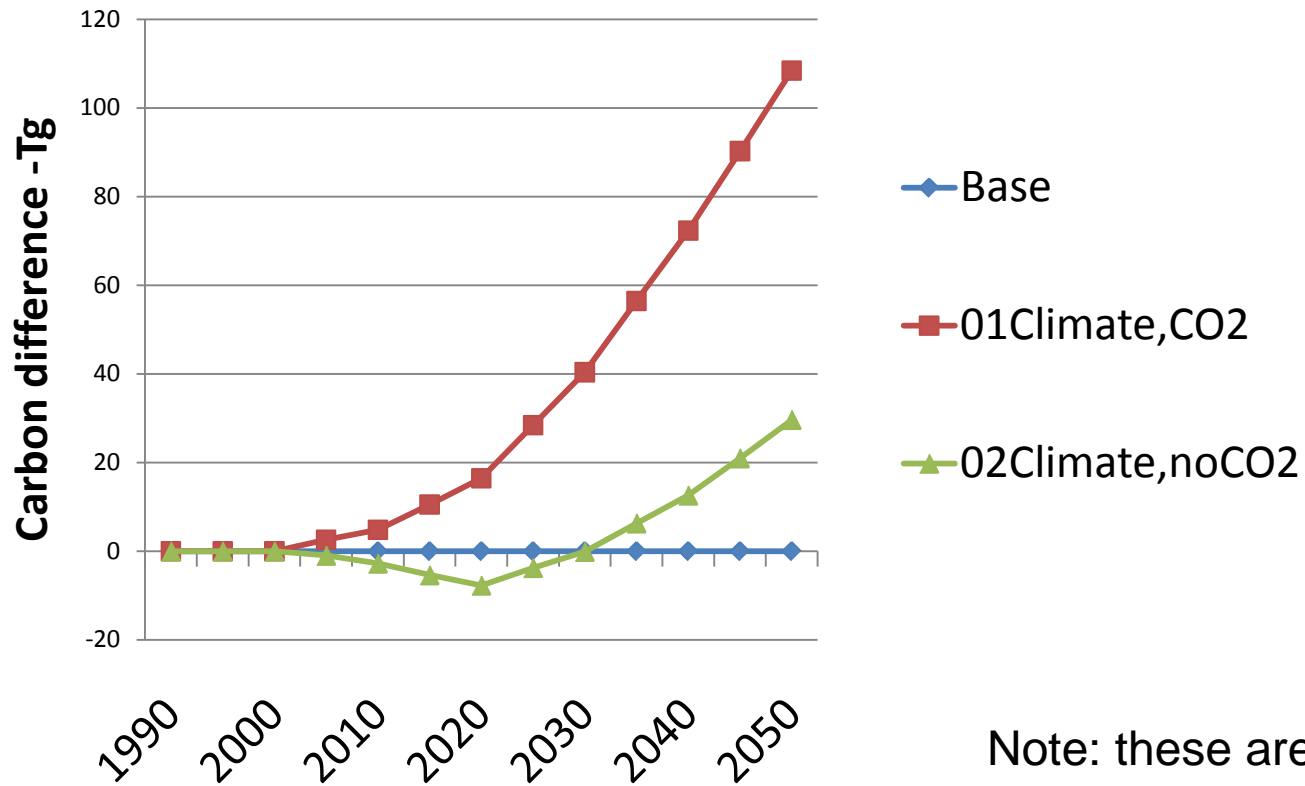
- Originally used the FORCARB model linked to the RPA timber assessment models, and HARVCARB for harvested wood products
- Advantages:
  - $C = [f(\text{biomass/ac}) = f(\text{volume/ac})] * \text{acres}$
  - The Climate Action Report needs projections
  - Special analysis
  - Needed to start in 1990

# New RPA models due 2010



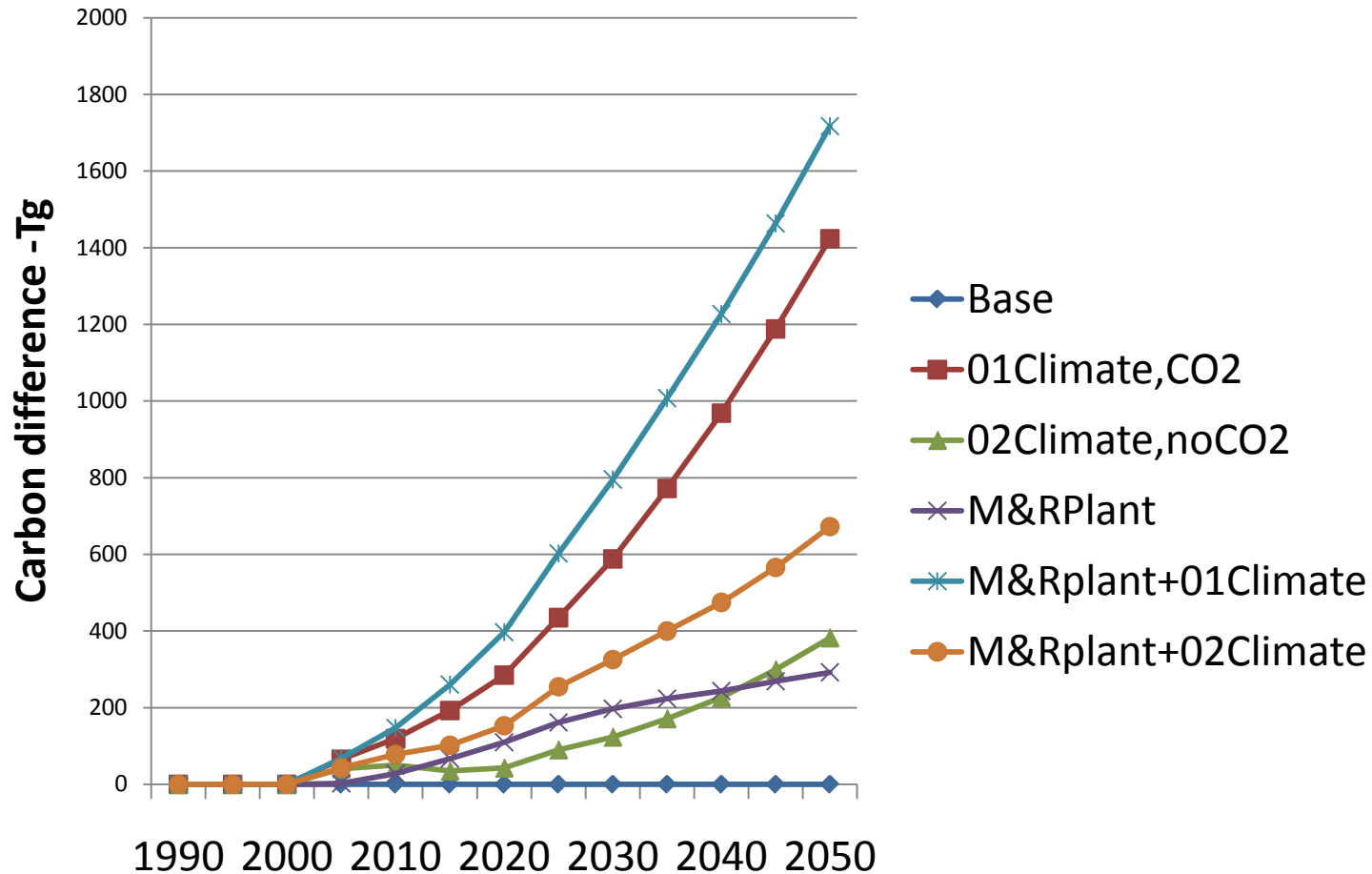
- Plot level resolution, 5-10 year projections, will include explicit fire disturbance
- Vs older system: region level resolution, 5 or 10 year projections
- Both based to great degree on FIA and economic data

# C stock change differences between 2007 RPA scenarios & base, National Forest only --forest land only



Note: these are  
Cumulative differences

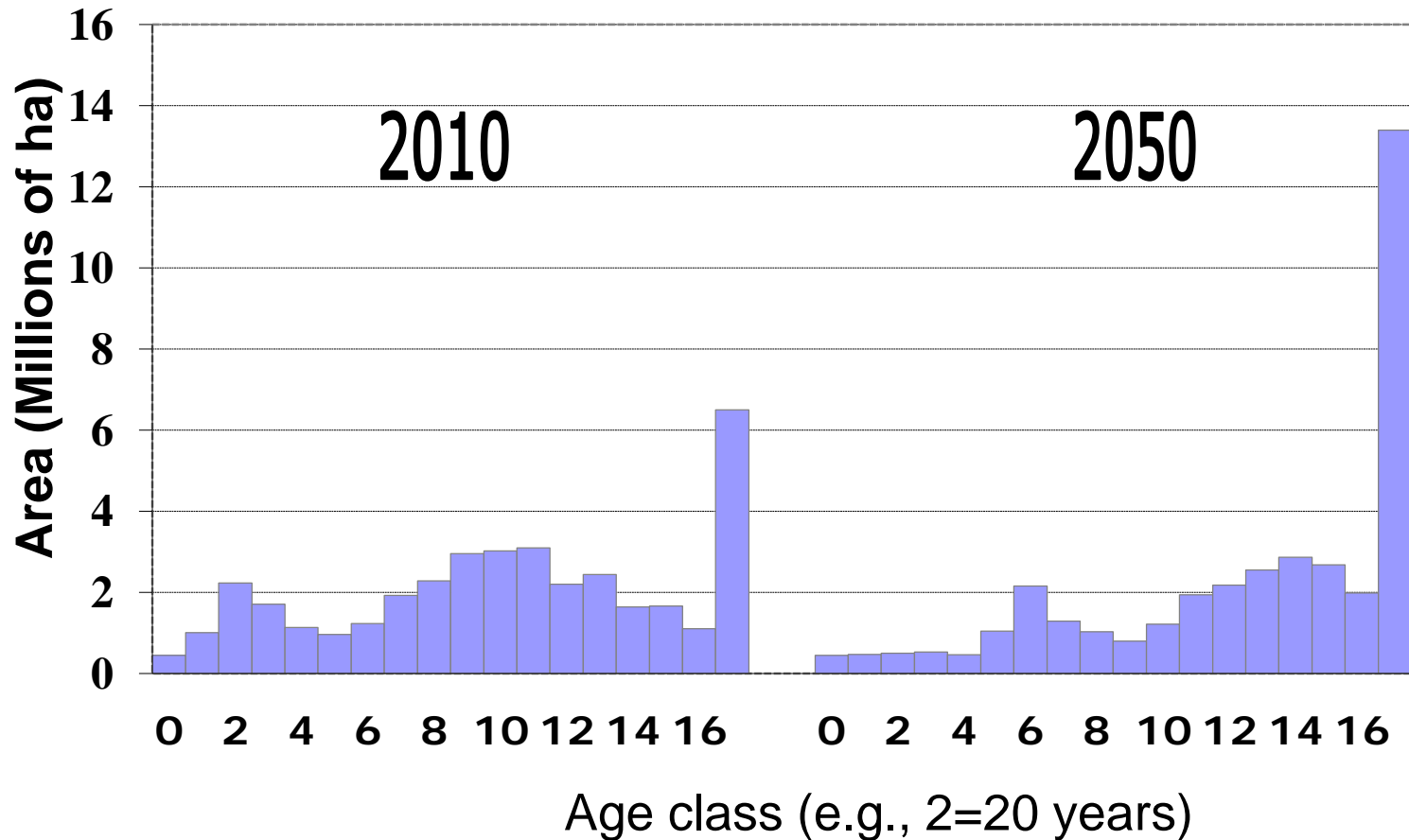
# Carbon stock change differences between 2007 RPA scenarios & base, all owners Productive forestland only



Privately owned,  
productive forest land, Base scenario (2007RPA)  
Age class distribution in terms of area (Mha)



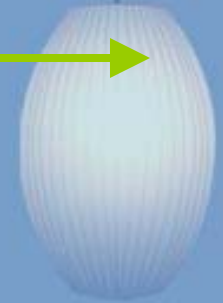
# Natl Forest System, productive forest land, Base scenario Age class distribution in terms of area



# Summary of items to consider



- System boundaries
- Managed land definitions
- Geographic and temporal scale
- Acceptable levels of uncertainty/scope
- Relationship to other efforts
- Improve as we go, how often update analysis
- Management affects carbon whether we manage for carbon or not



THANK YOU!

