Potential Trade-offs between Carbon Sequestration and Timber Harvest on U.S. Public Timberlands

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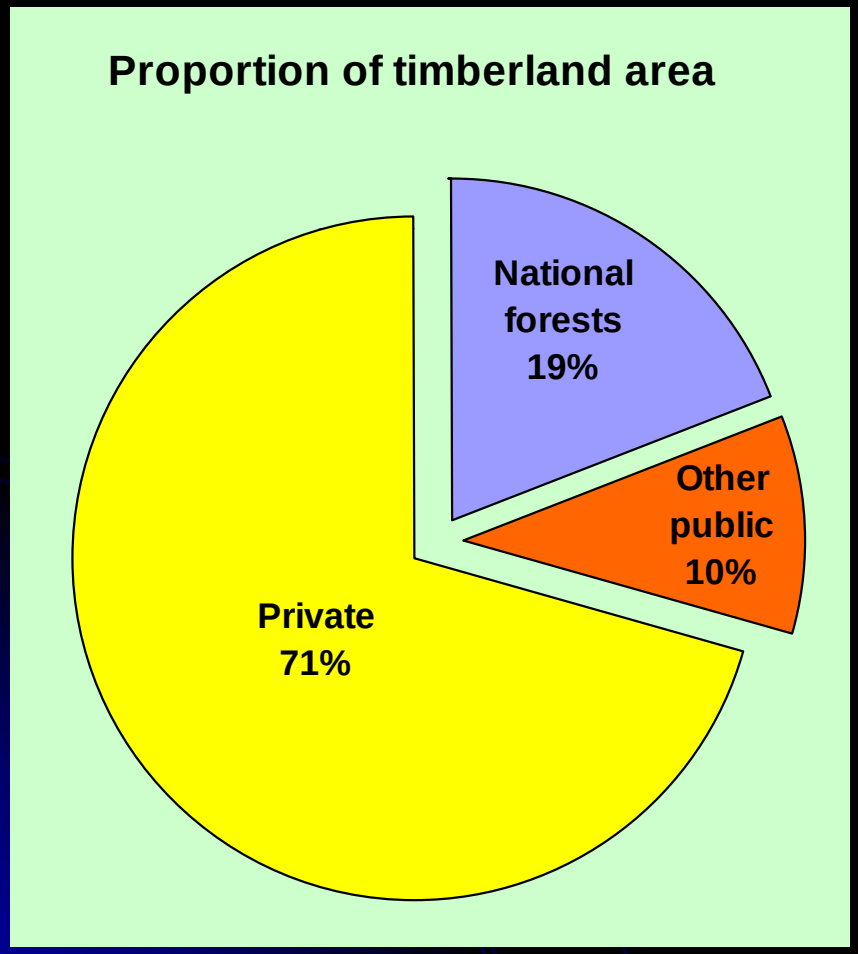
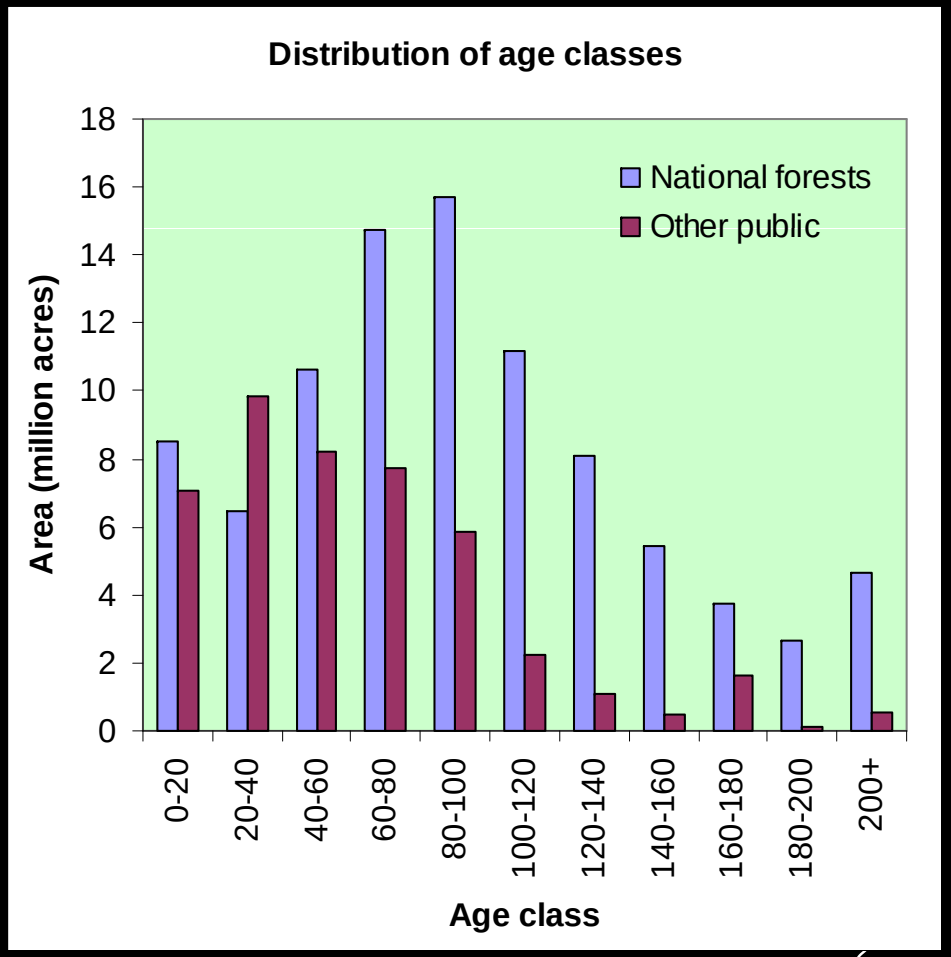
Public timberland in the U.S.





Past public forestlands C projections

- Smith and Heath (2004)
  - ATLAS simulations for public timberlands based on 1997 RPA database by modifying NIPFs growth rate
  - Public harvest projection based on TAMM
- Depro et al. (2008)
  - ATLAS modeling used in the 2000 RPA Timber Assessment (Mills and Zhou, 2003)
  - Policy scenarios: BAU, Pre-1989 harvest, No harvest
  - Natural disturbances (fire, diseases): Fixed area loss by decade
  - Harvest are distributed according to area in each age class

* Note: Similar carbon accounting method

Objectives of this study

- Examine harvest-carbon trade-offs in public lands for alternative management scenarios
  - Baseline (BAU): RPA 2000 public projection
  - No public timber harvest
  - Maximum sustainable level of timber harvests (with age class structure constraints)
- Construct timber harvest model of public timberlands in the United States
  - Exogenous public timber harvests by public owner
  - Allocate fixed harvest within public land strata assuming owners behave as cost-minimizers

Public timber harvest model

- Minimize costs of managing public timberlands (to mimic allocation of harvest across strata)
- Minimum public harvest at the RPA 2000 public harvest projection (Mills and Zhou, 2003)
- Maintaining current age class structure
  - Concern for non-market values of public timberlands
  - Five age classes (40+, 80+, 120+, 160+, and 200+) with 5% or higher area proportion by forest type
  - Minimum inventory of partially-harvested stands

Alternative policy scenarios

- No public harvest
  - Zero harvest from public timberlands after 2005
- Max sustainable public harvests
  - Minimum harvest at the recent average (2000-2004)
  - Non-declining log supply to regional log markets
  - Aggregate max harvest from National Forests
  - Regional max harvest from other public forests

Inventory & yield projection

- Public inventory data were derived from USFS Forest Inventory Analysis (FIA) and stratified (Mills and Zhou, 2003)
  - Region, ownership, forest type, and age class
- ATLAS modeling approach has been employed for existing and regenerated stands to estimate timber yield potentials (Mills and Zhou, 2003)
  - Some yield tables for existing stands are adjusted

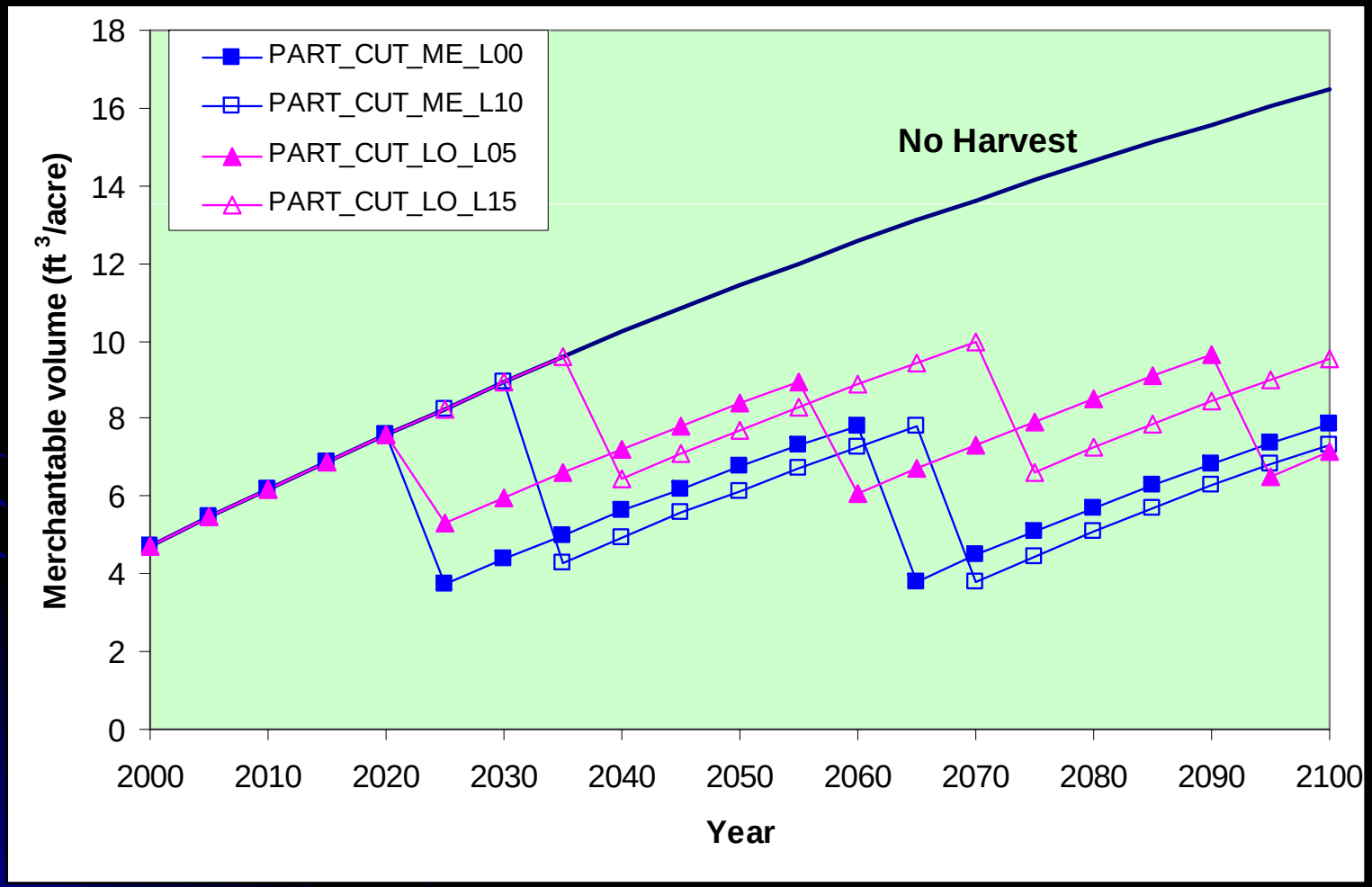
Management intensity classes (1)

- National Forests
  - Even-age management (Mills and Zhou, 2003)
  - Uneven-age management (partial cutting)
    - Existing stand: 40% (LO) or 60% (ME) with six start options
    - Regenerated stands: 40% (LO_THIN) or 60% (MED_THIN)
  - Reserved (Mills and Zhou, 2003)

- Other public forests
  - Even-age management (Mills and Zhou, 2003)
  - Uneven-age management after regeneration

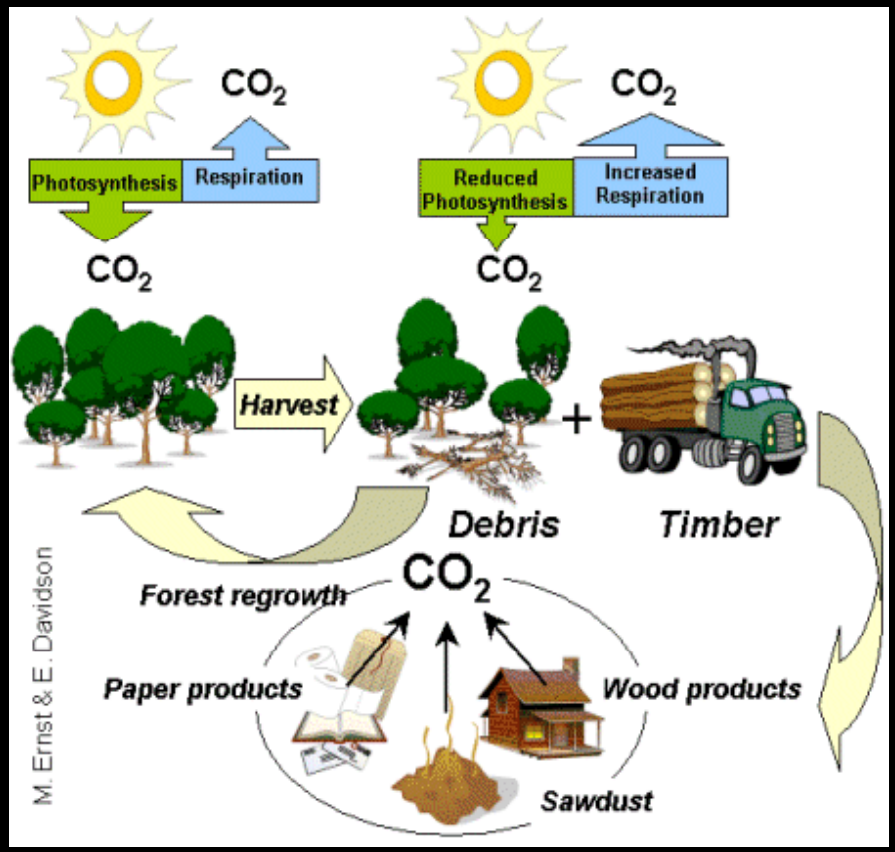
MIC (2): Partial cutting example

- Douglas-fir in PNWW (age 40-50)



Carbon accounting

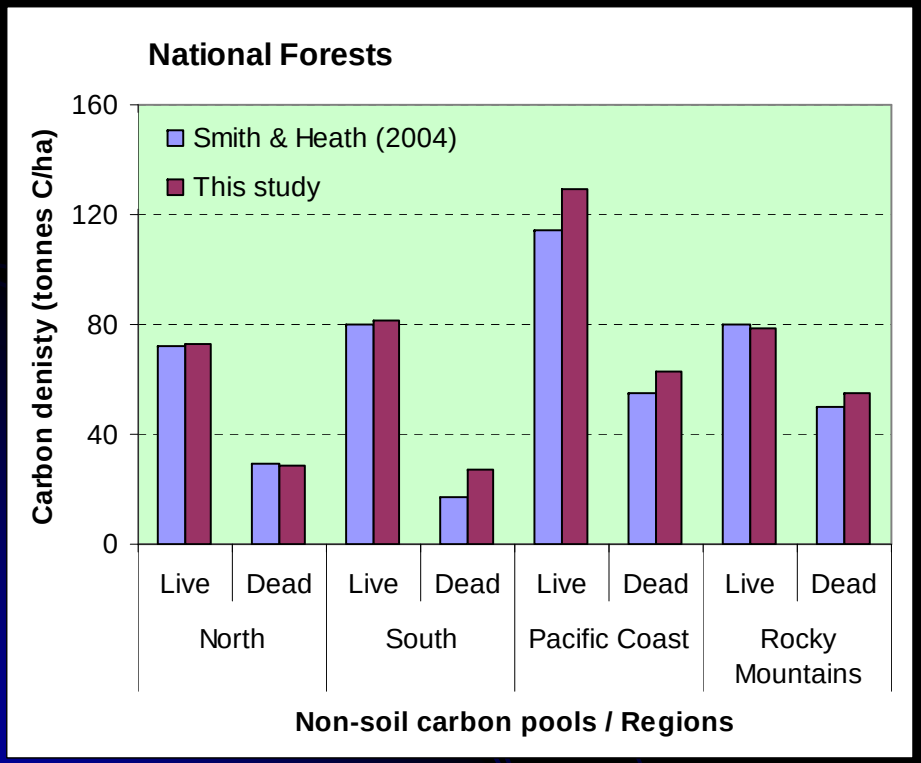
- Forestlands
  - Live & dead trees: FORCARB2 (Smith et al., 2003)
  - Forest floor: Smith & Heath (2002)
  - Understory and CWD: USEPA (2003)
  - Soil: Birdsey (1996)
  - FASOMGHG method
- Forest products: Smith et al. (2006)

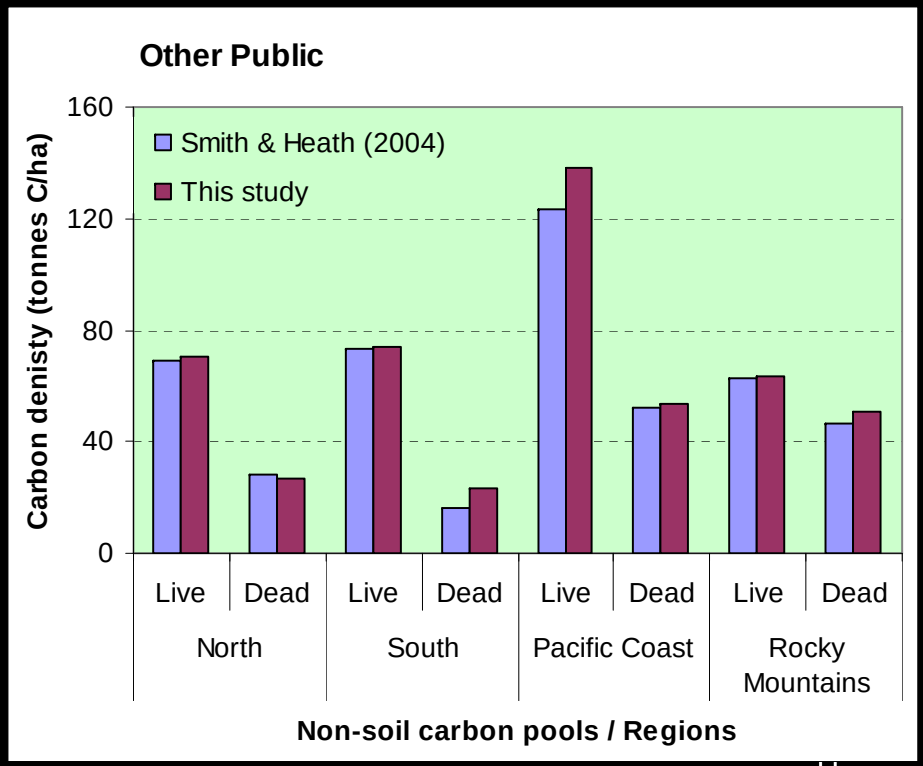


Source: http://www.whrc.org/support/index.htm
(The Woods Hole Research Center)

Results: Initial carbon density

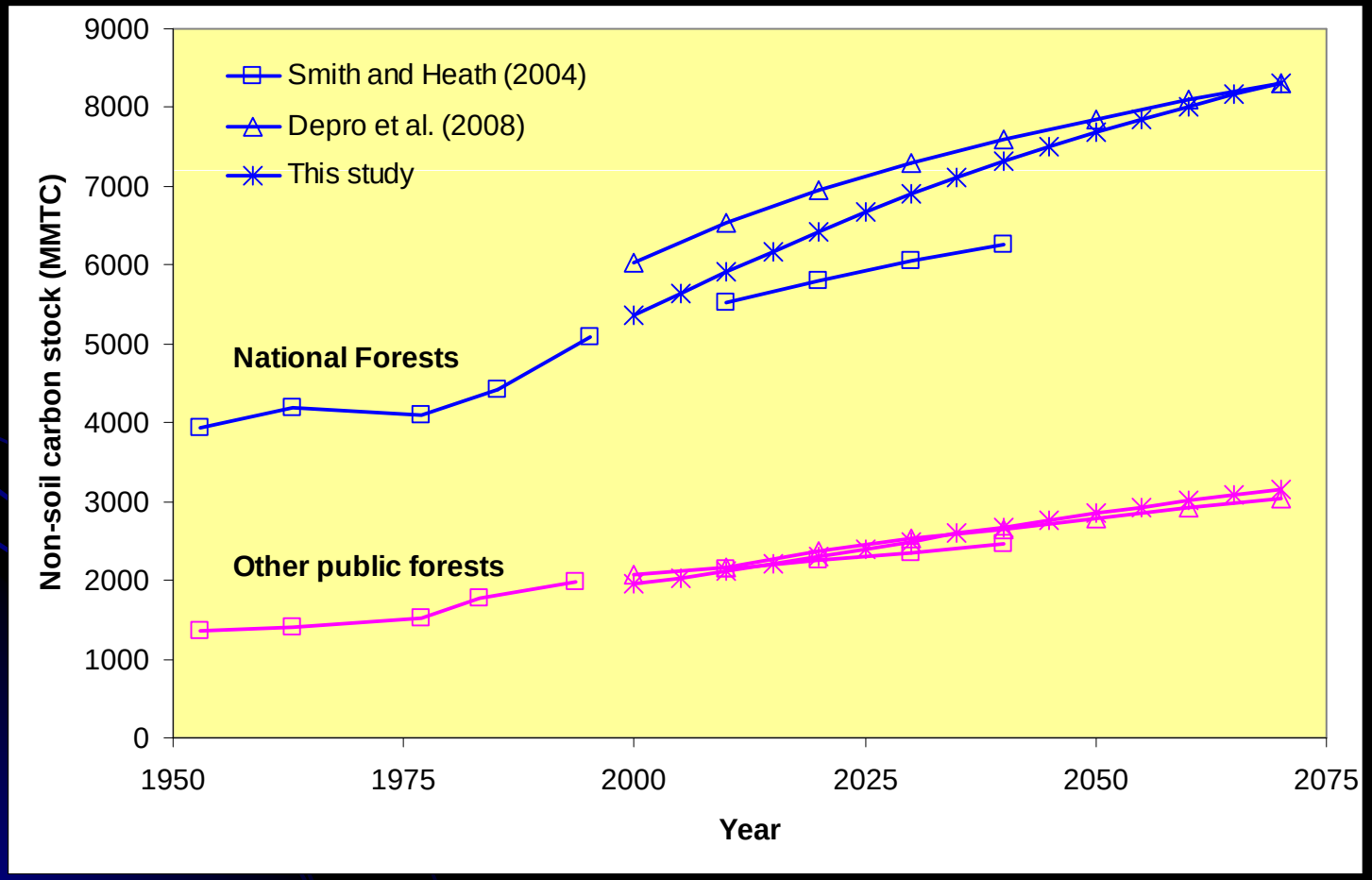
- Comparison of estimates of non-soil carbon density
  - Smith and Heath (2004) using similar accounting method
  - Inventory timing and recent update of FORCARB2 (Smith et al. 2006)





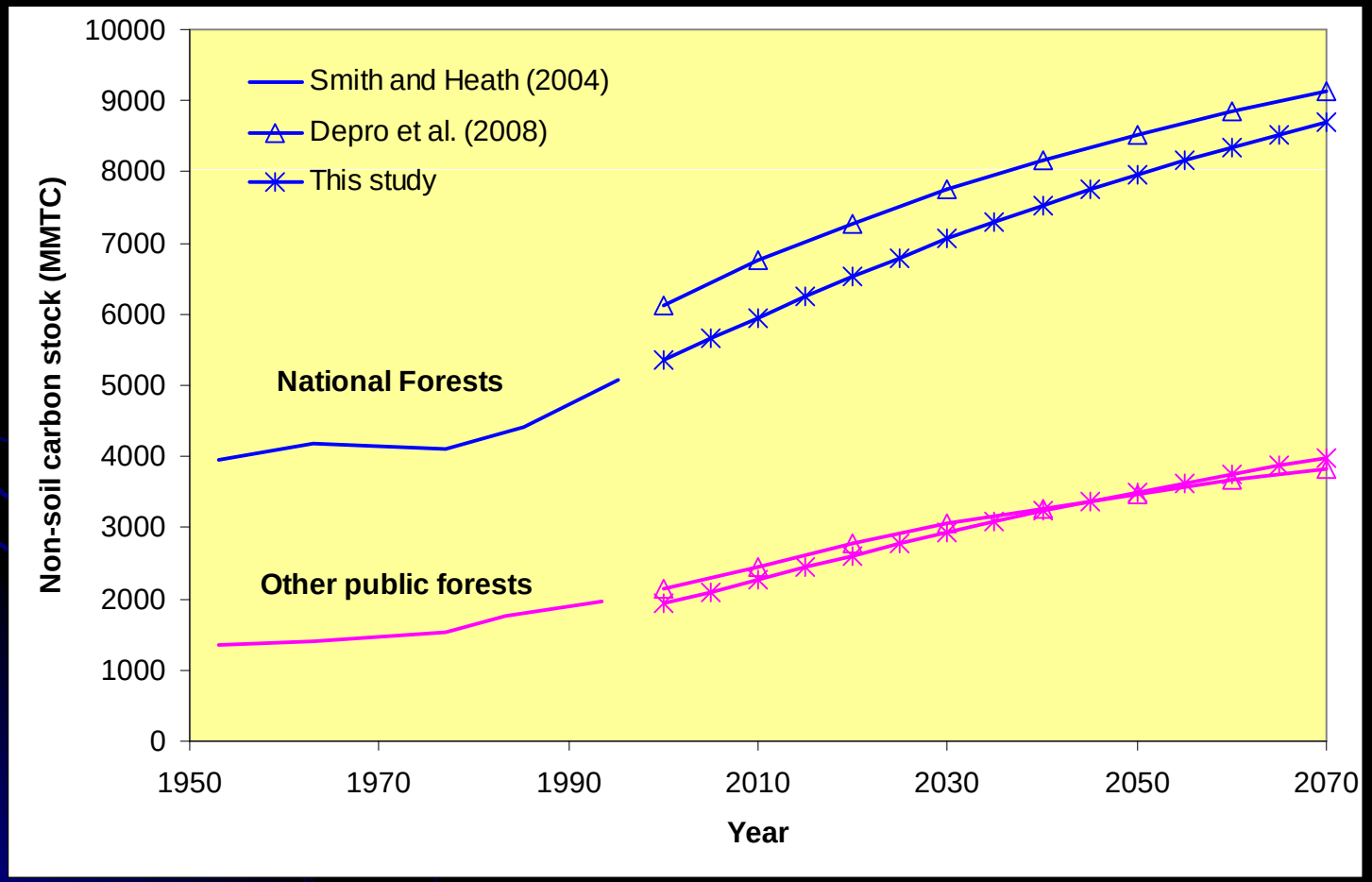
Results: Baseline C projection

- U.S. carbon stock by owner group



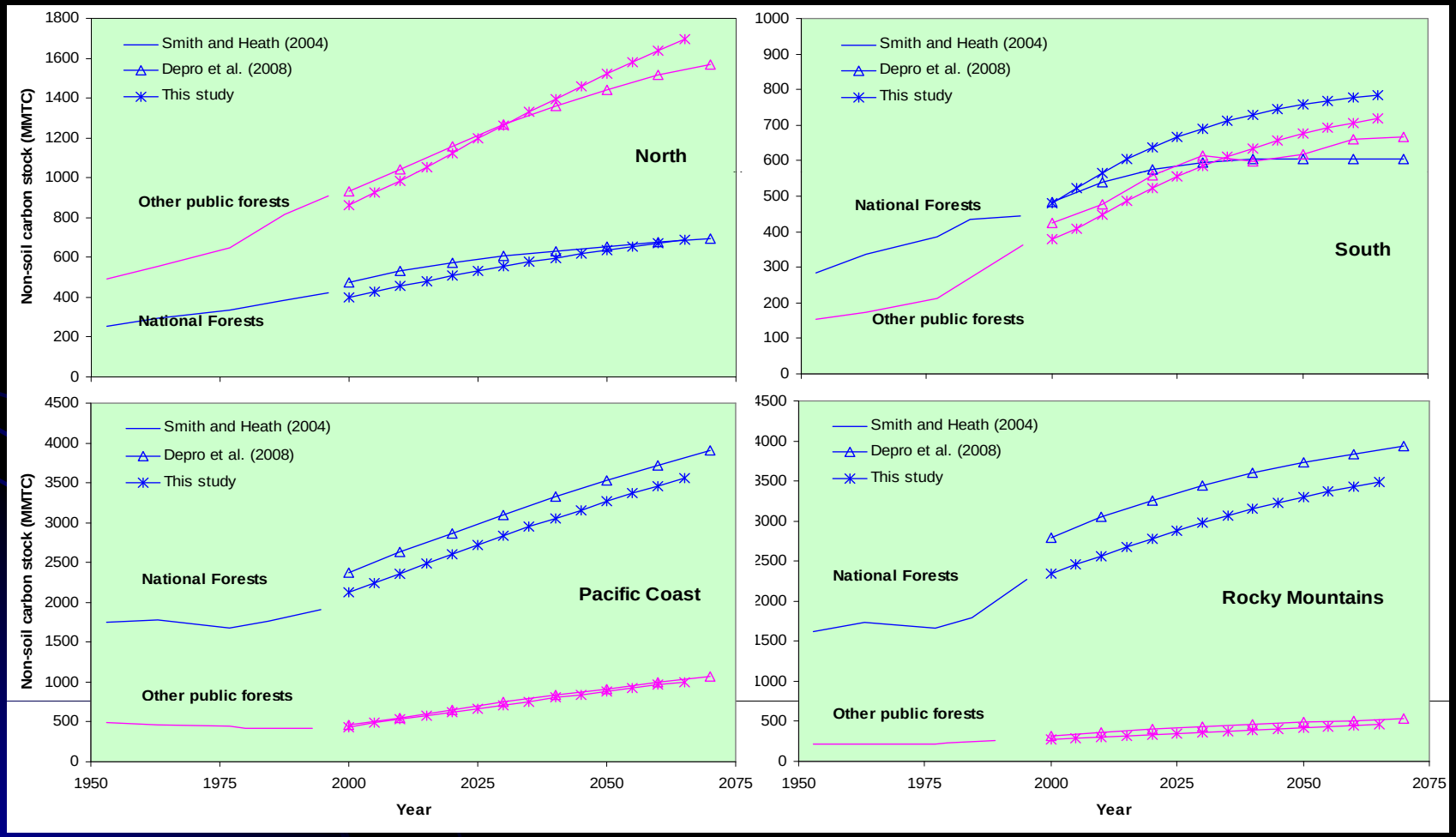
Results: No public harvests (1)

- U.S. carbon stock by owner group



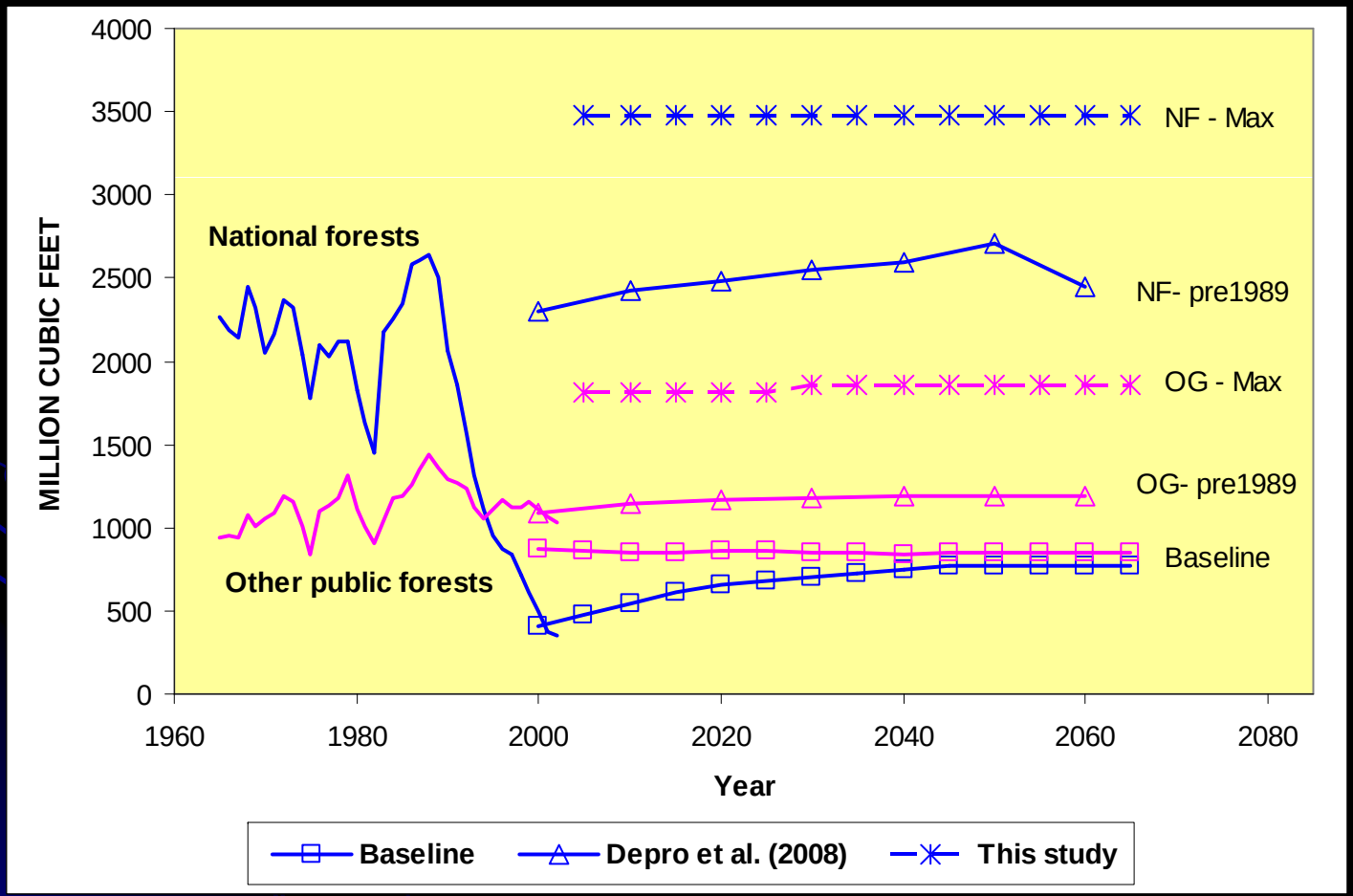
Results: No public harvests (2)

- U.S. carbon stock by region and owner group



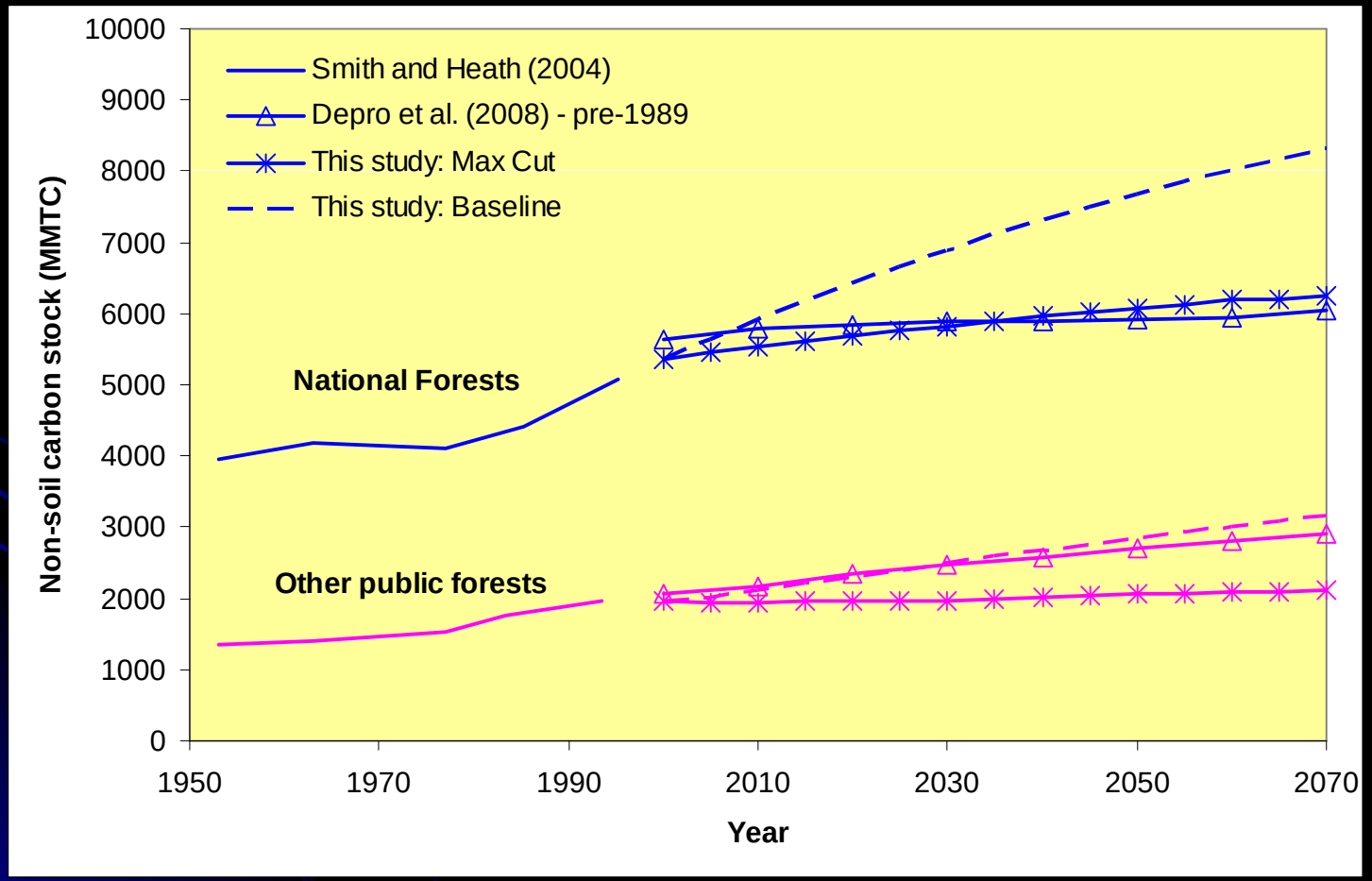
Results: Max sustainable cut (1)

- U.S. timber harvest by owner group

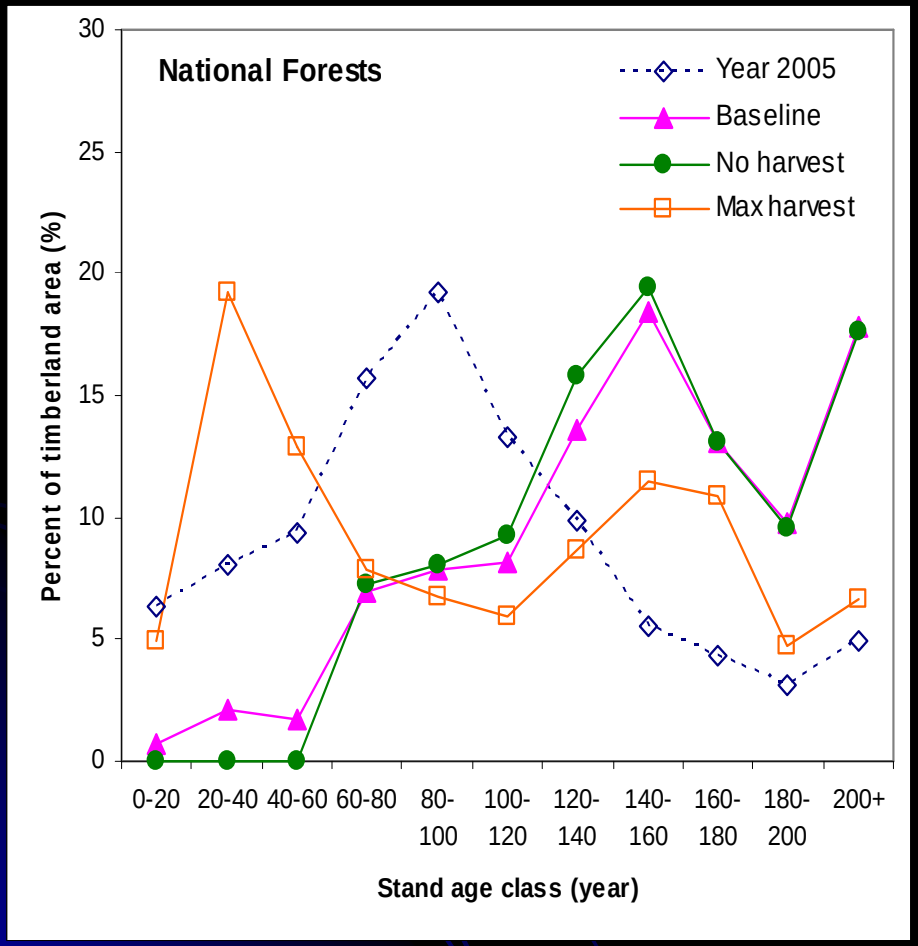


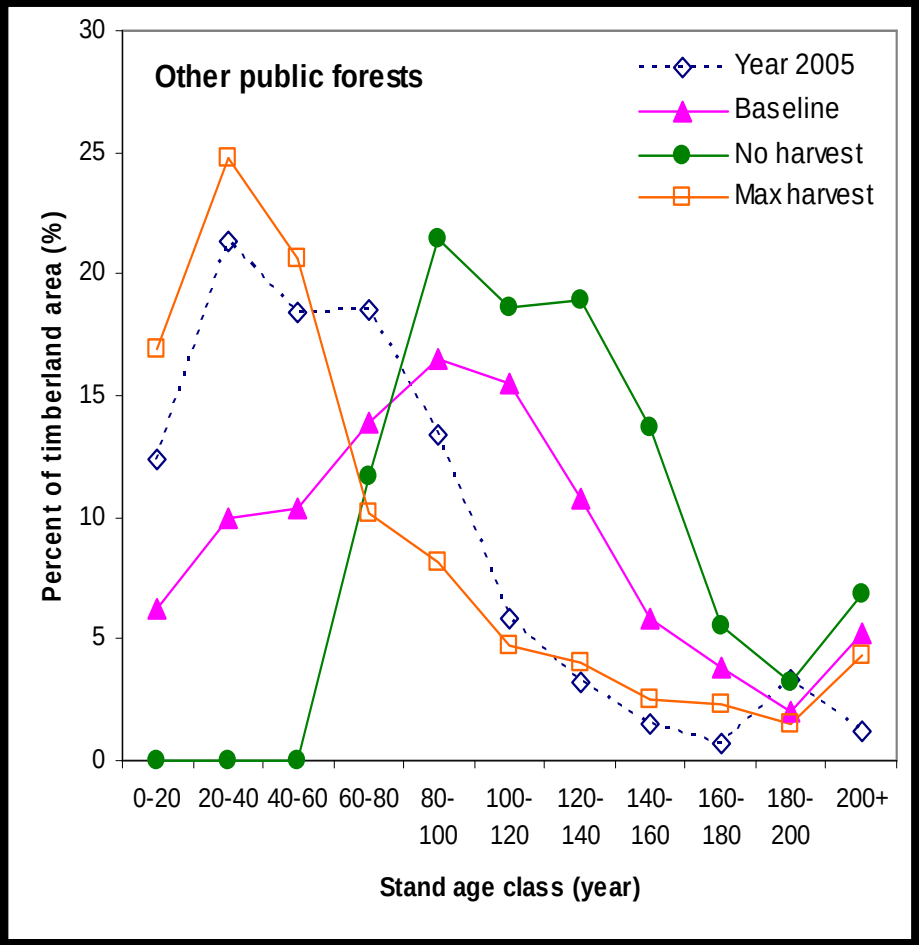
Results: Max sustainable cut (2)

- U.S. carbon stock by owner group



Results: Age class distributions in 2065

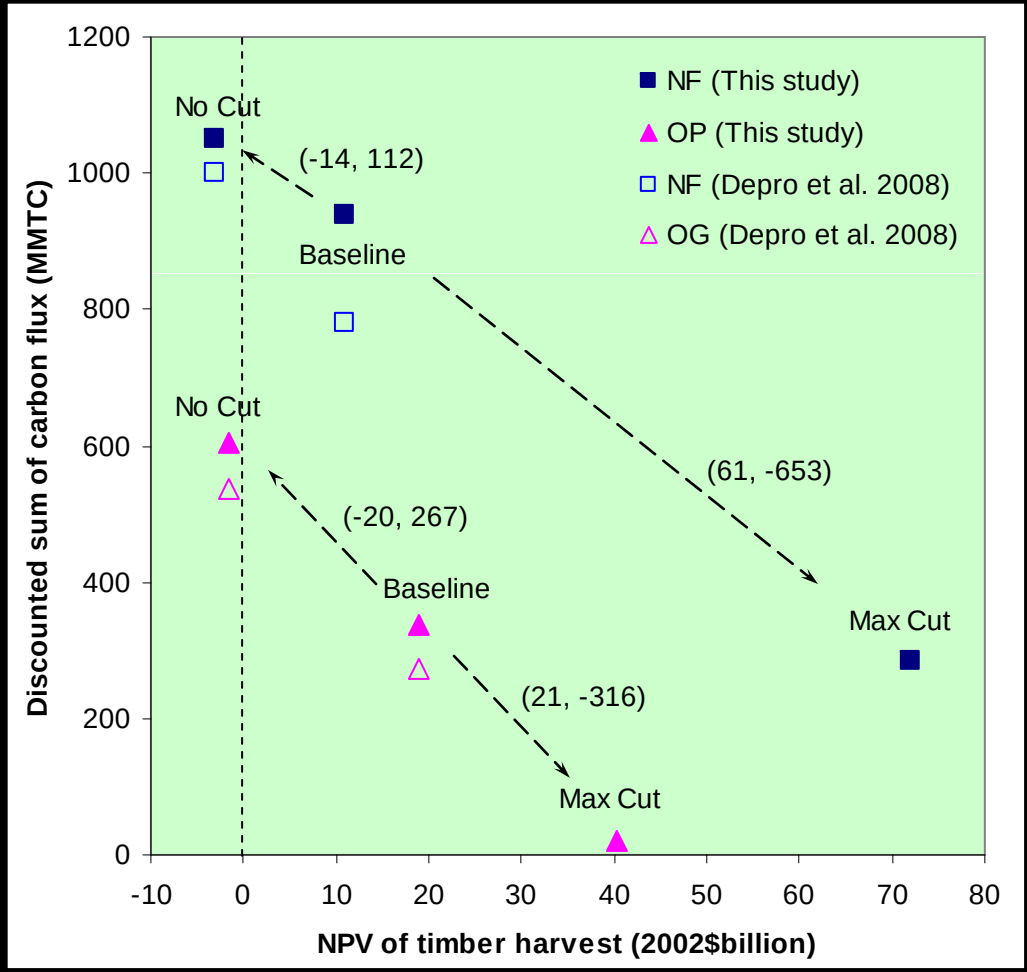




Note: Area allocated to partial cutting regimes and reserved areas are not included

Results: Trade-offs

- Baseline
  - NF: $11 billion
    0.94 BMTC
  - OG: $19 billion
    0.34 BMTC
- No public harvest
  - NF: $125 per tonne C
  - OG: $77 per tonne C
- Max sustainable cuts
  - NF: $61 billion gain
    0.65 BMTC loss
  - OG: $21 billion gain
    0.32 BMTC loss



Note: Exogenous stumpage prices (2005 RPA update)

Discussion

- Baseline carbon projections for both public ownership are substantially different from previous studies
  - Recent update of carbon equations (Smith et al. 2006)
  - Cost minimizing model keeps higher growth rate
  - Uncertainties (fire, insect) are not included in this study
- No harvest scenario shows similar carbon growth path
- Public timberland has large potential of timber harvest without reducing current carbon stock level
- Relatively higher marginal cost of sequestering carbon through no-harvest from national forests
  - Old-growth age structure (age 80+: NF 56%, OG 27%)
  - Lower inventory growth rate (average: NF 0.7%, OG 1%)