Forest management and mitigation of climate change

in search for synergies

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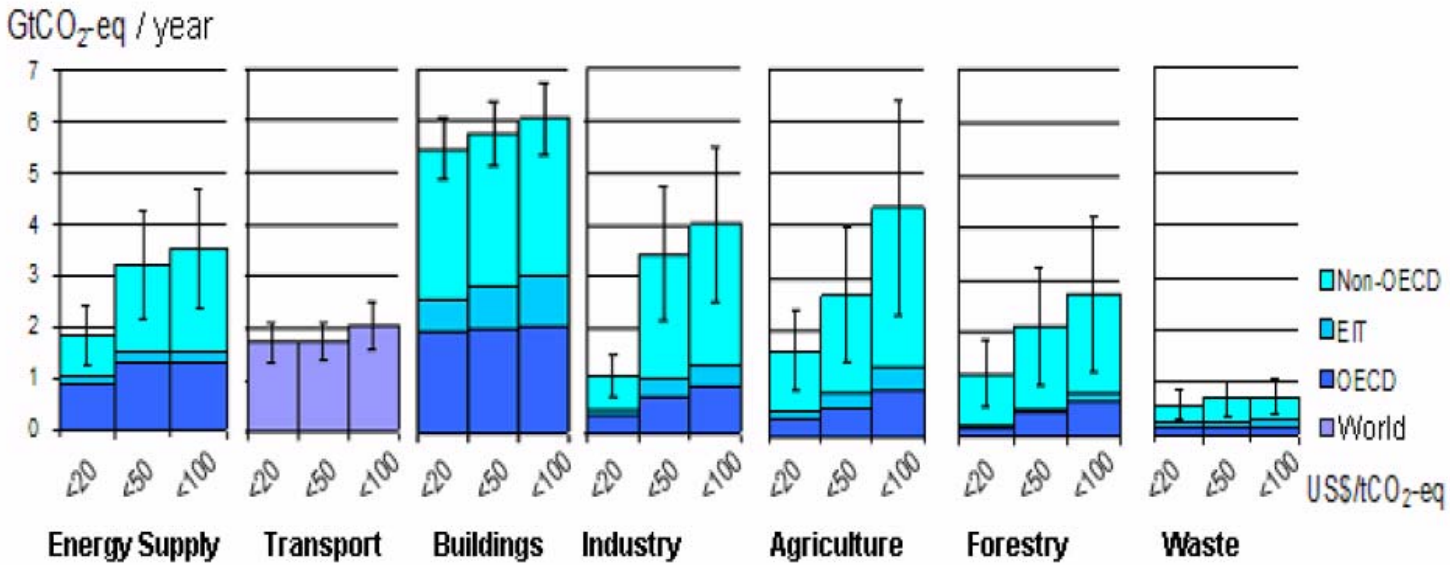
Global Mitigation Potential

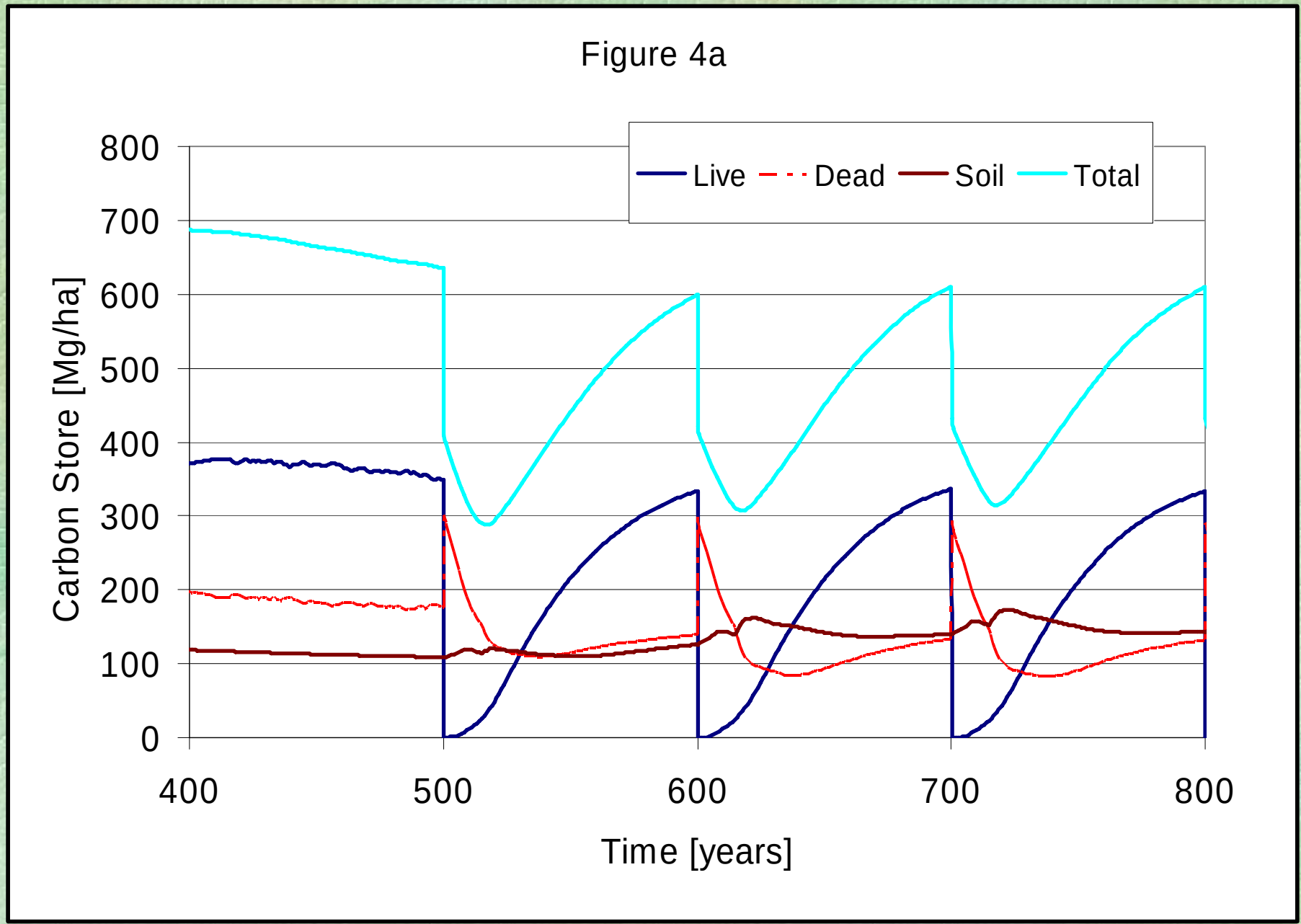


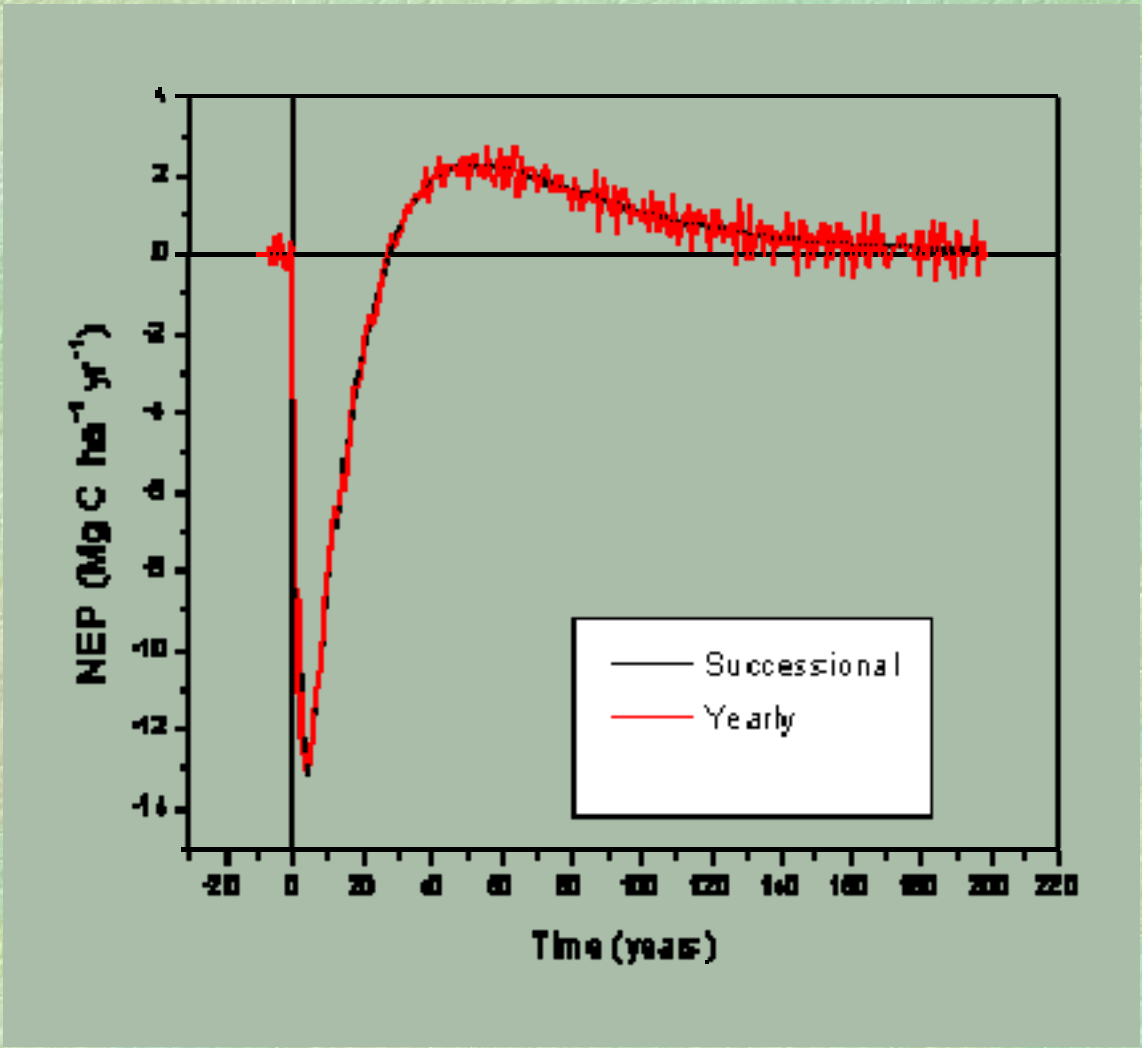
Food for thought about carbon and forest management

- Impact of management decisions on carbon stores on forest lands
  - To cut or not to cut
  - Fire management
  - Thinning
- Carbon and other management objectives
  - Synergies and trade-offs
  - Potential of forest management in the PNW

Where is Carbon?

Carbon dynamics in a forest stand

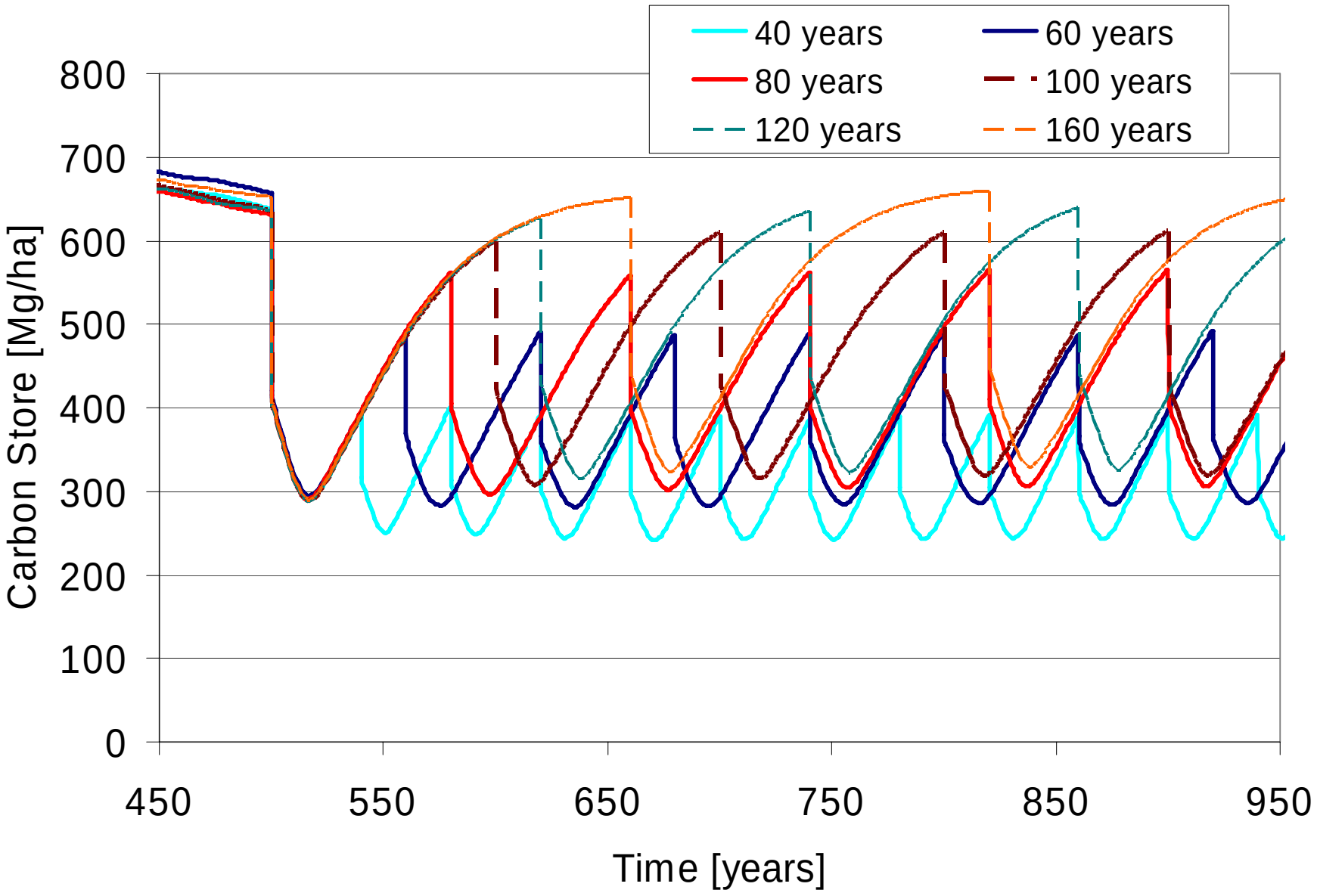


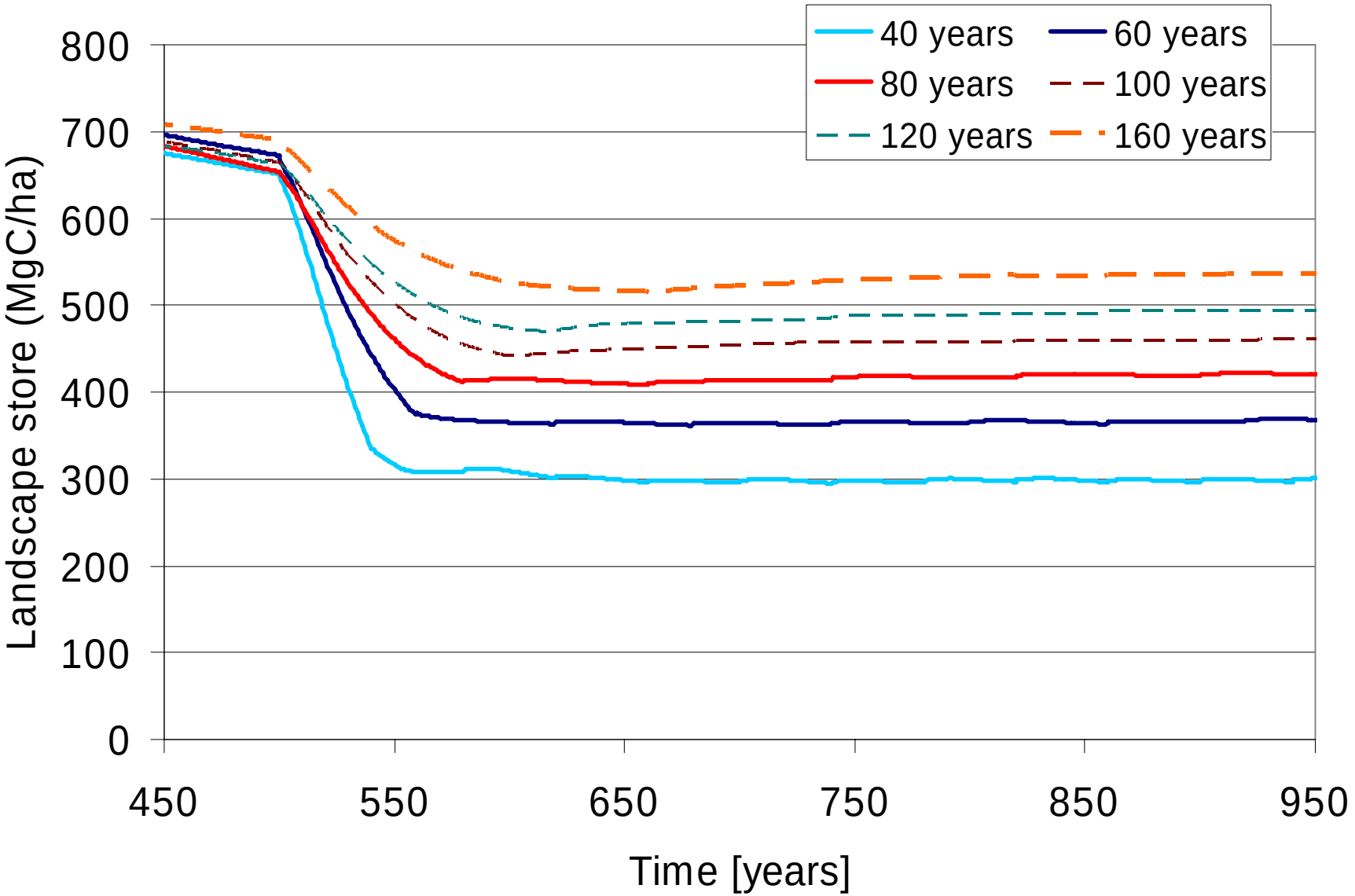


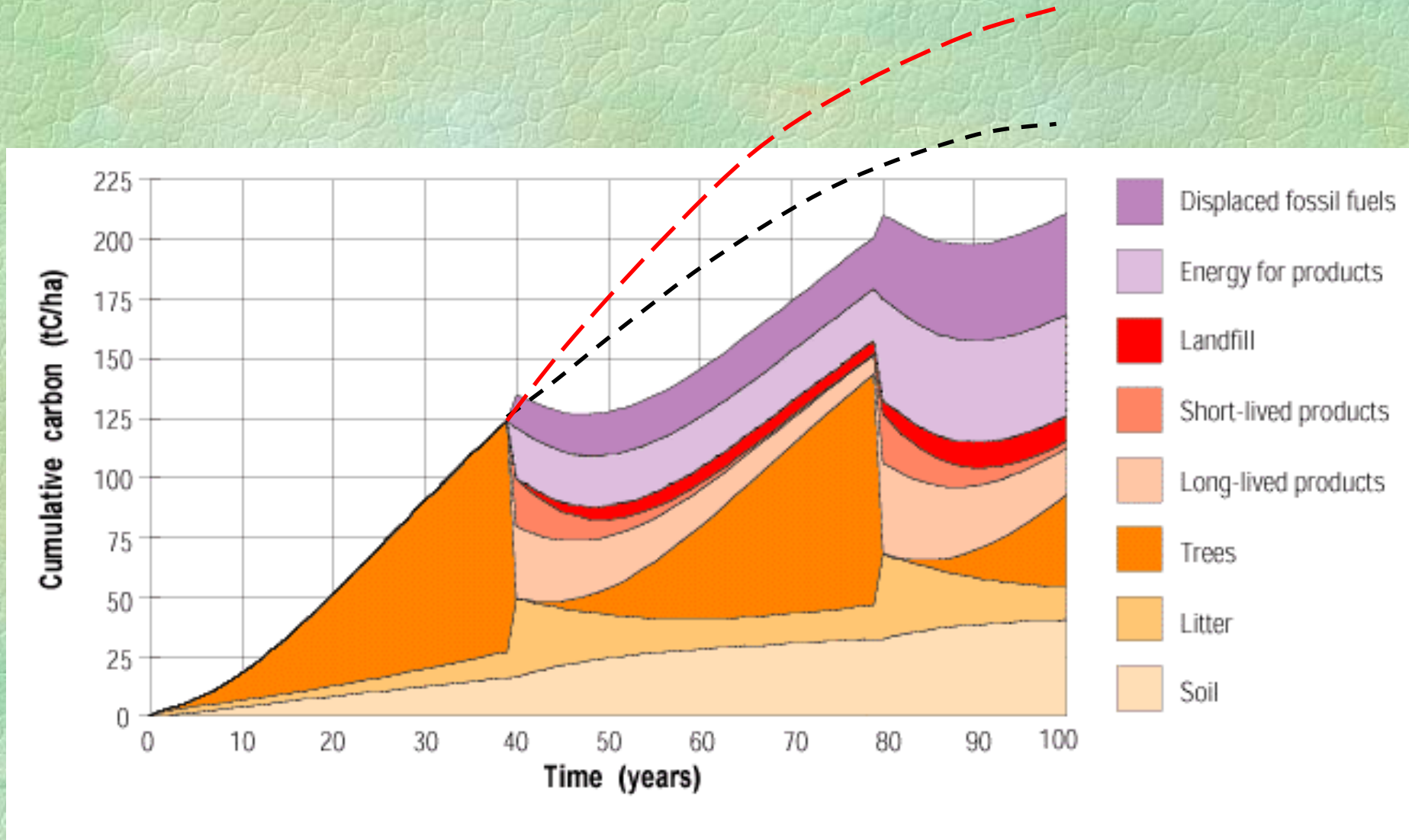
StandCarb Model output, M. Harmon (adapted from Cohen et al. 1996)

The role of disturbance

- Transfer of material from live to dead C pools and out of the forest
- Transition of forest stand from sink to source; then back to sink as new stand develops
  - an individual stand the impact depends on the selected time frame.
- Average carbon stores are constant over a landscape where a selected management option is repeated indefinitely


40 years
60 years
80 years
100 years
120 years
160 years
800
700
600
500
400
300
200
100
0
Carbon Store [Mg/ha]
450
550
650
750
850
950
Time [years]


40 years
60 years
80 years
100 years
120 years
160 years
800
700
600
500
400
300
200
100
0
Landscape store (MgC/ha)
450
550
650
750
850
950
Time [years]

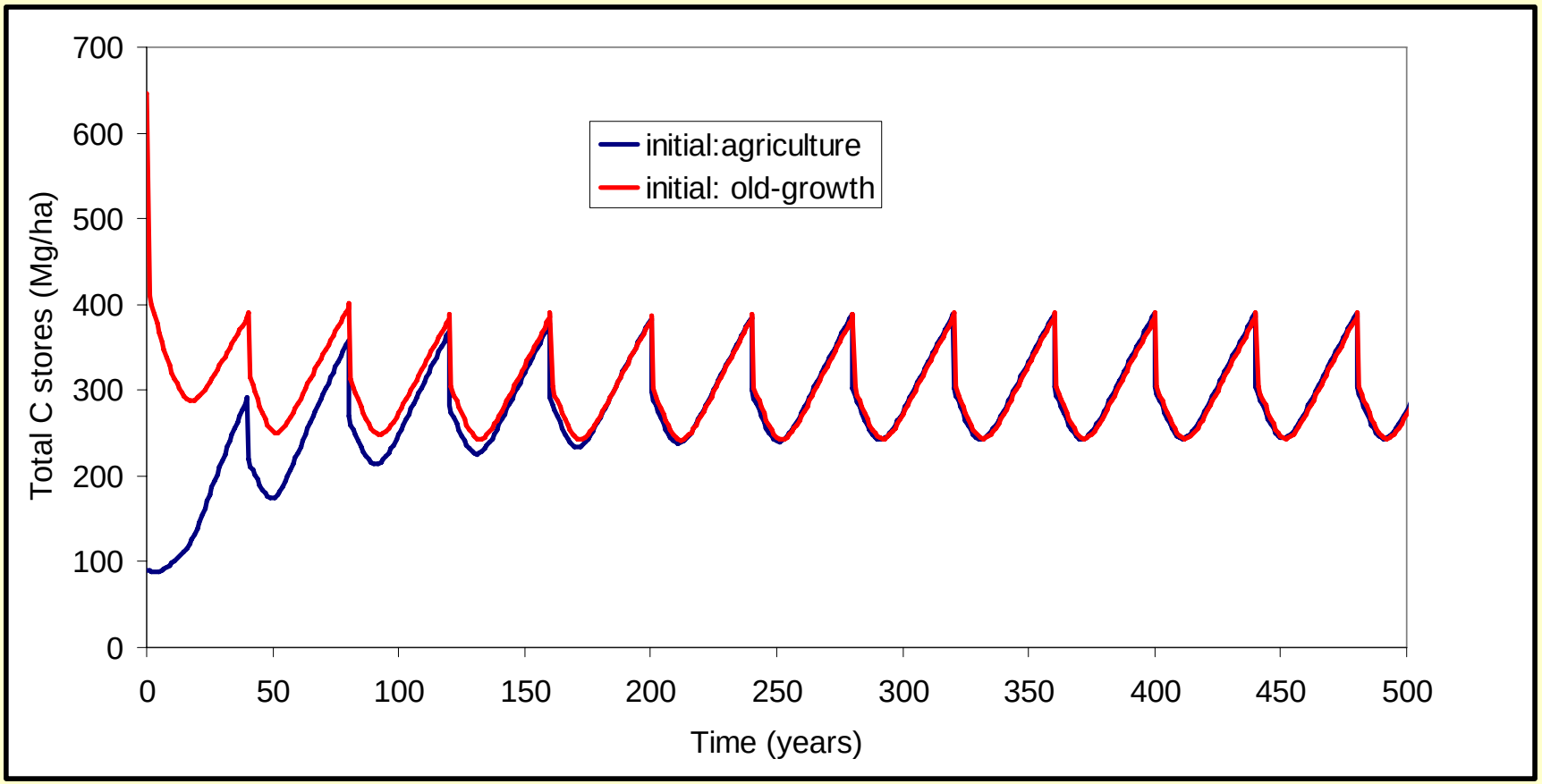


Cumulative carbon changes for a scenario involving afforestation and harvest (adapted from Marland and Schlamadinger, 1999)

Forest products sector

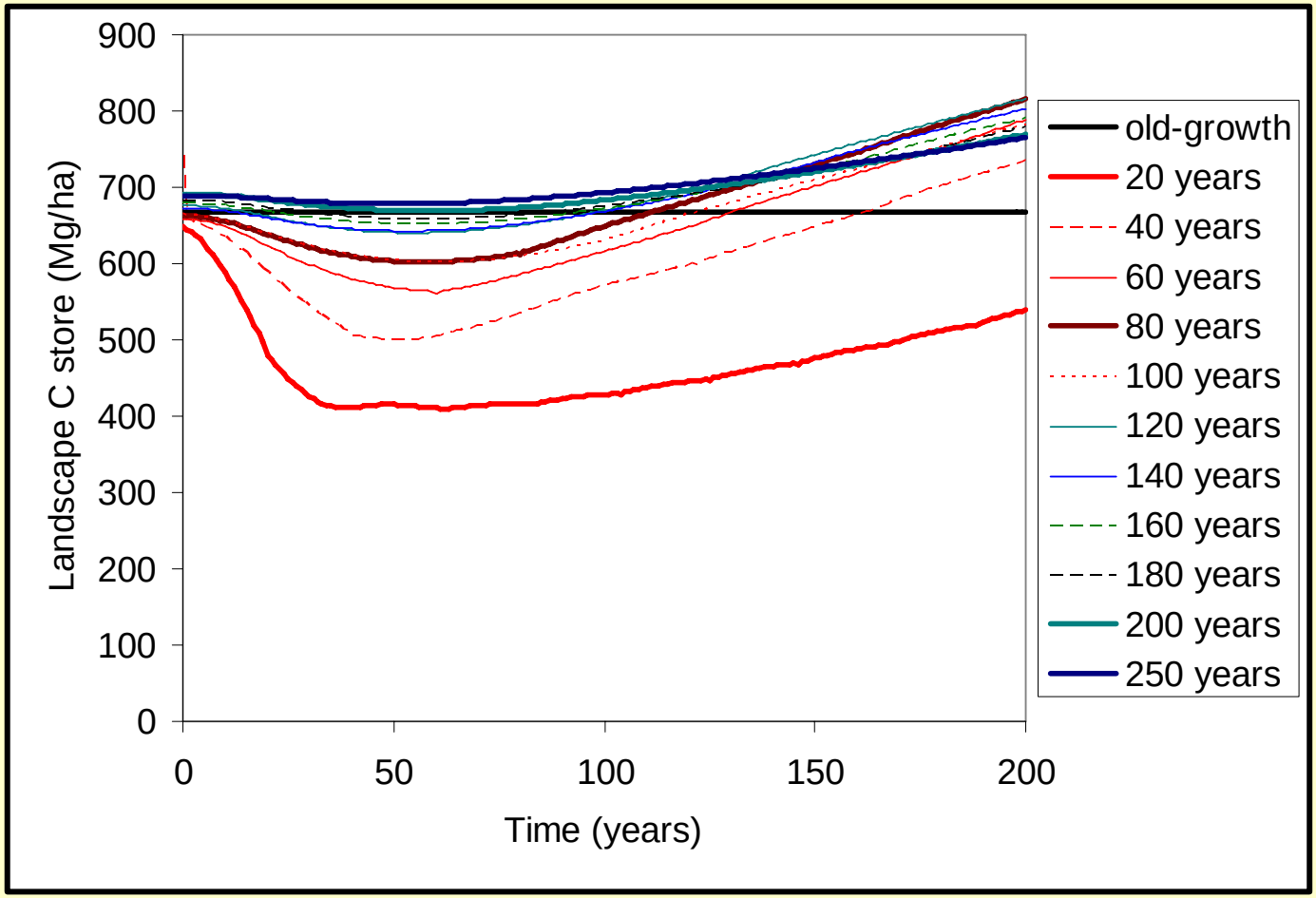
- Retains C in products
  - Rates of C loss through decomposition and combustion are similar to decomposition rates of coarse woody debris on the forest floor
- Can contribute to emission reduction in other sectors IF forest products reduce the use of fossil fuels
  - Gains are cumulative
- Net C gains (compared to no-harvest option) take many decades (or centuries) to begin

Is intensive forest management always a bad idea? NO!



40 year harvest interval

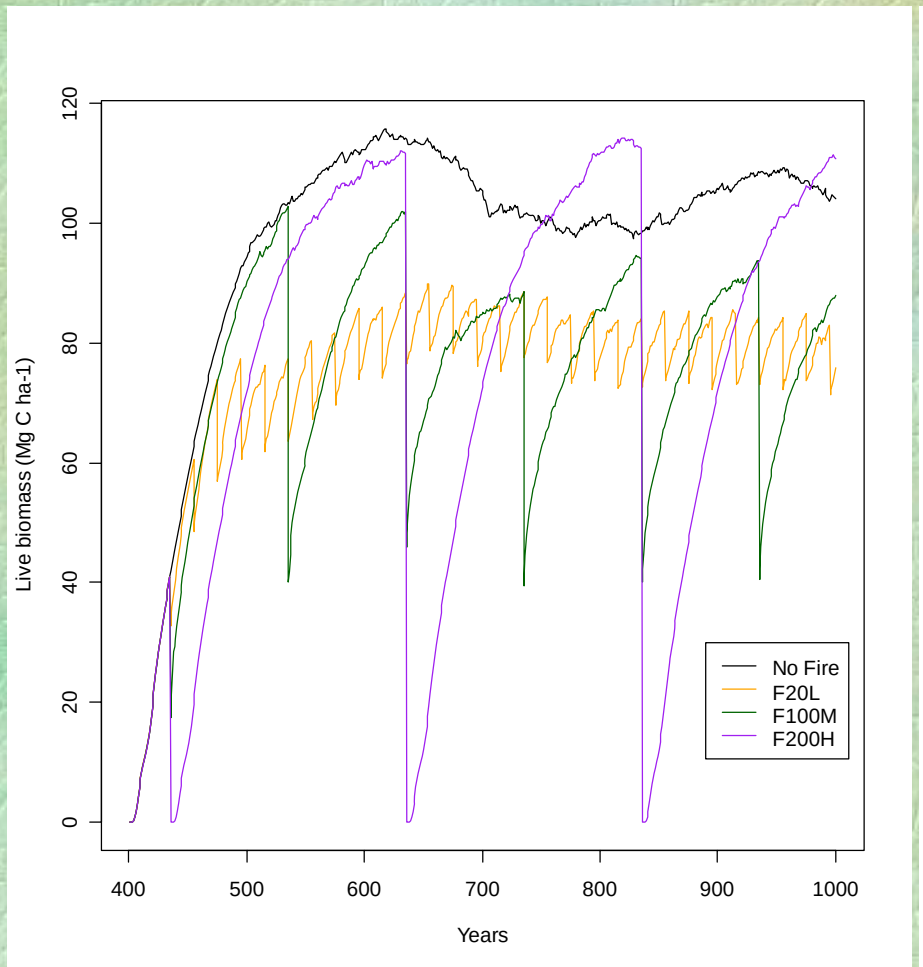
Total Carbon Balance-totals

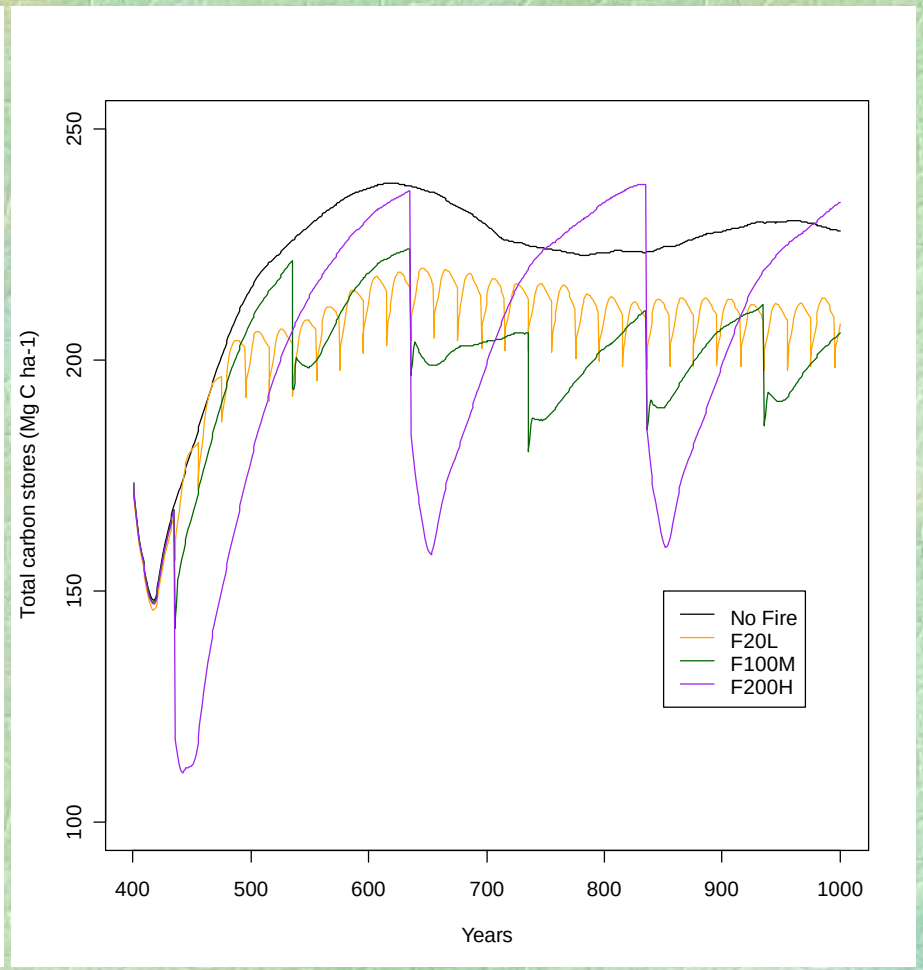


Forest products= 75% Biofuels=12% Substitution 75% of harvest

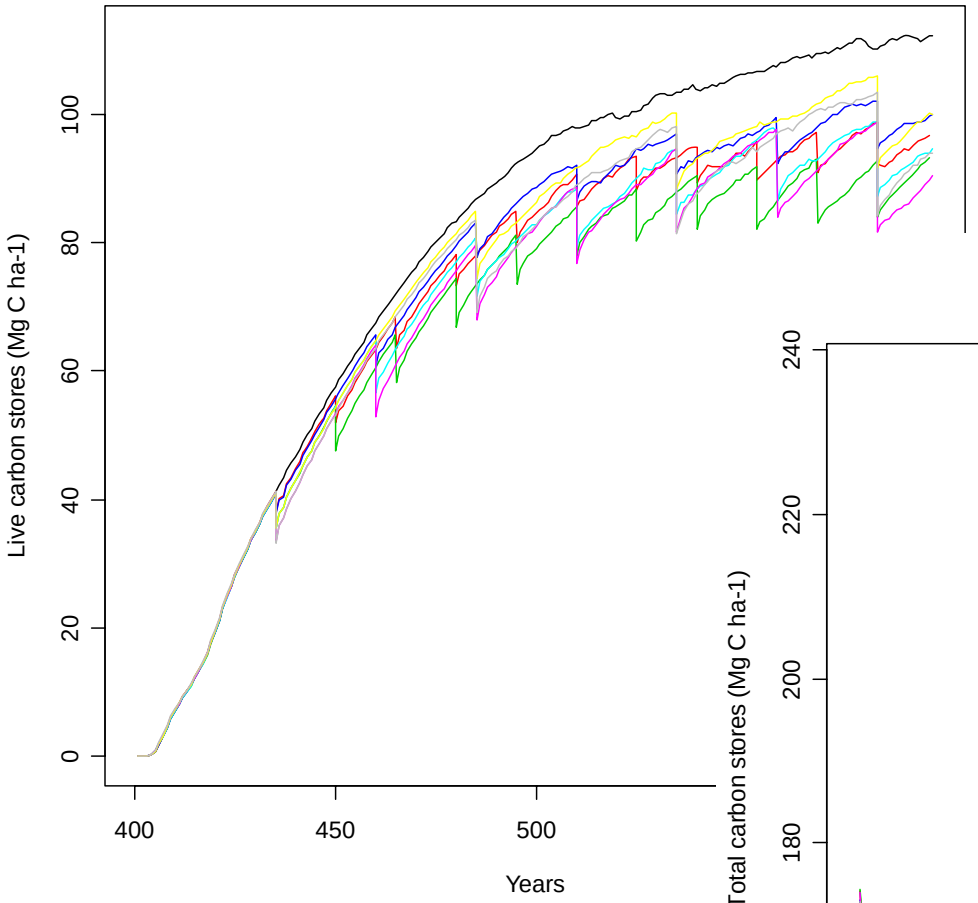
Credit: S. Conard, USDA FS

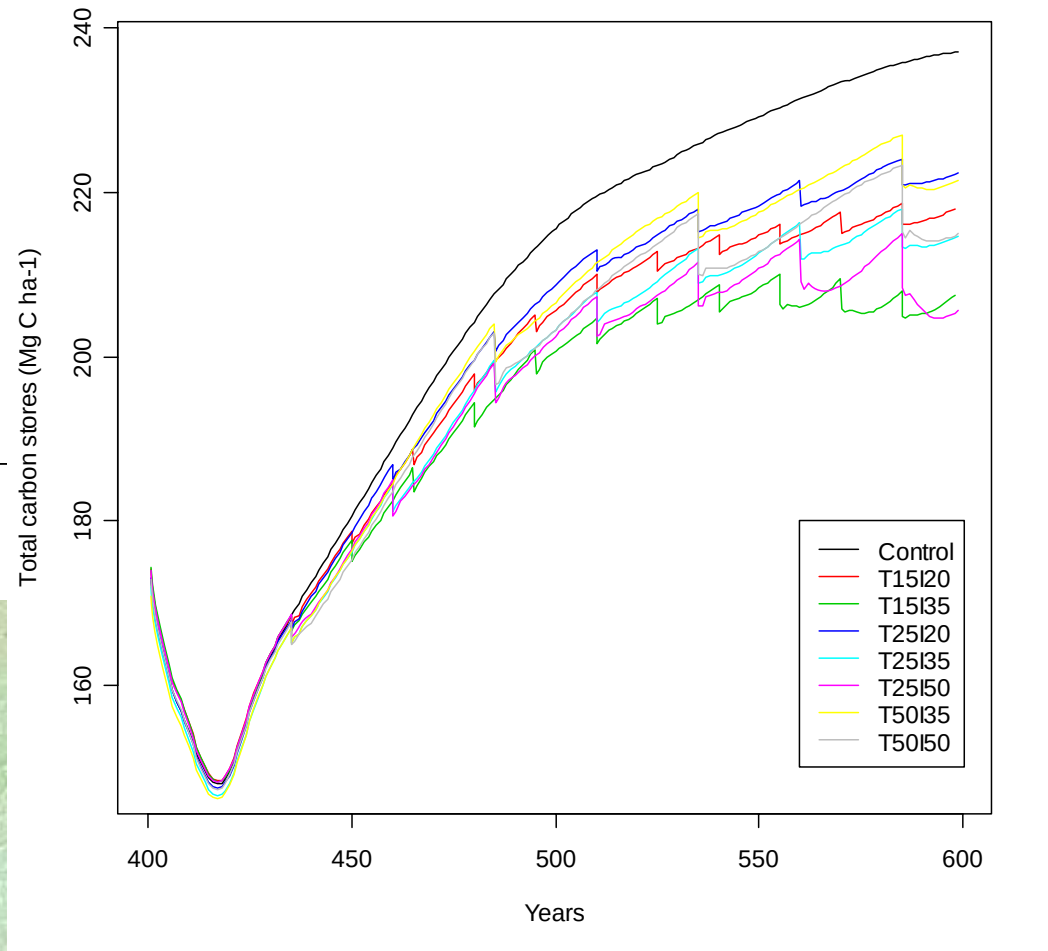
Fire frequency and severity (Ponderosa Pine forest type)



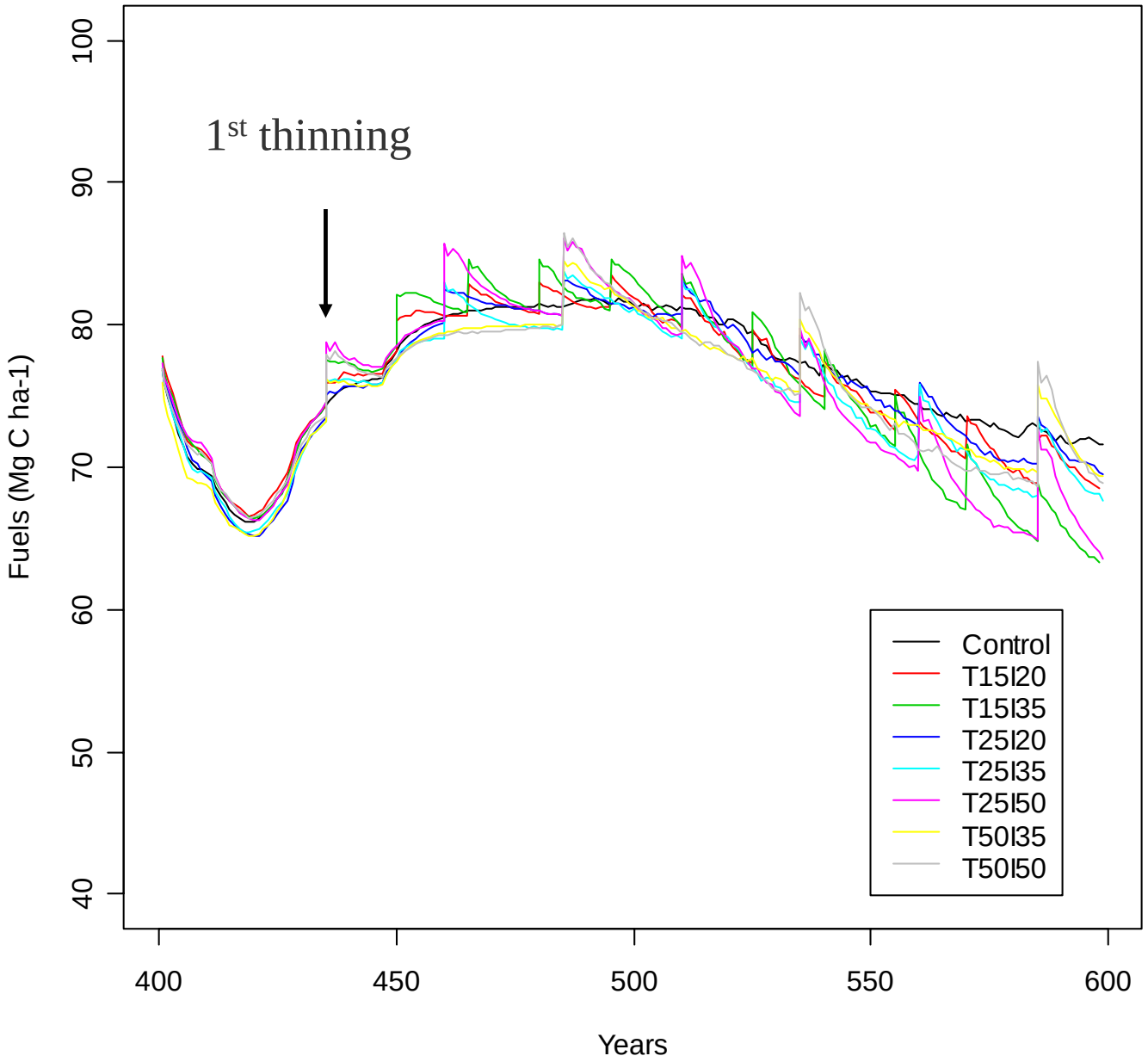


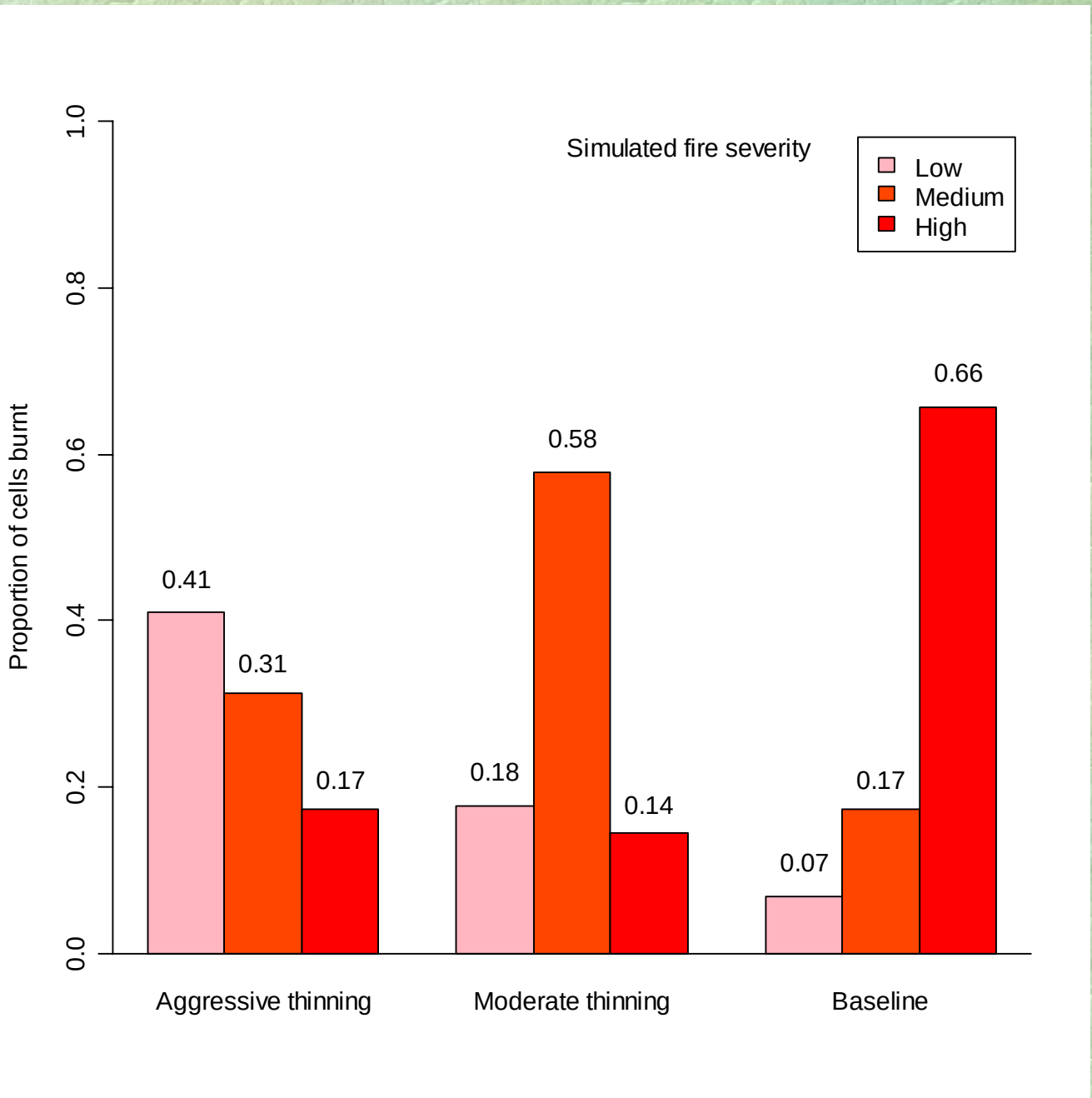
Dead trees
do not go to heaven

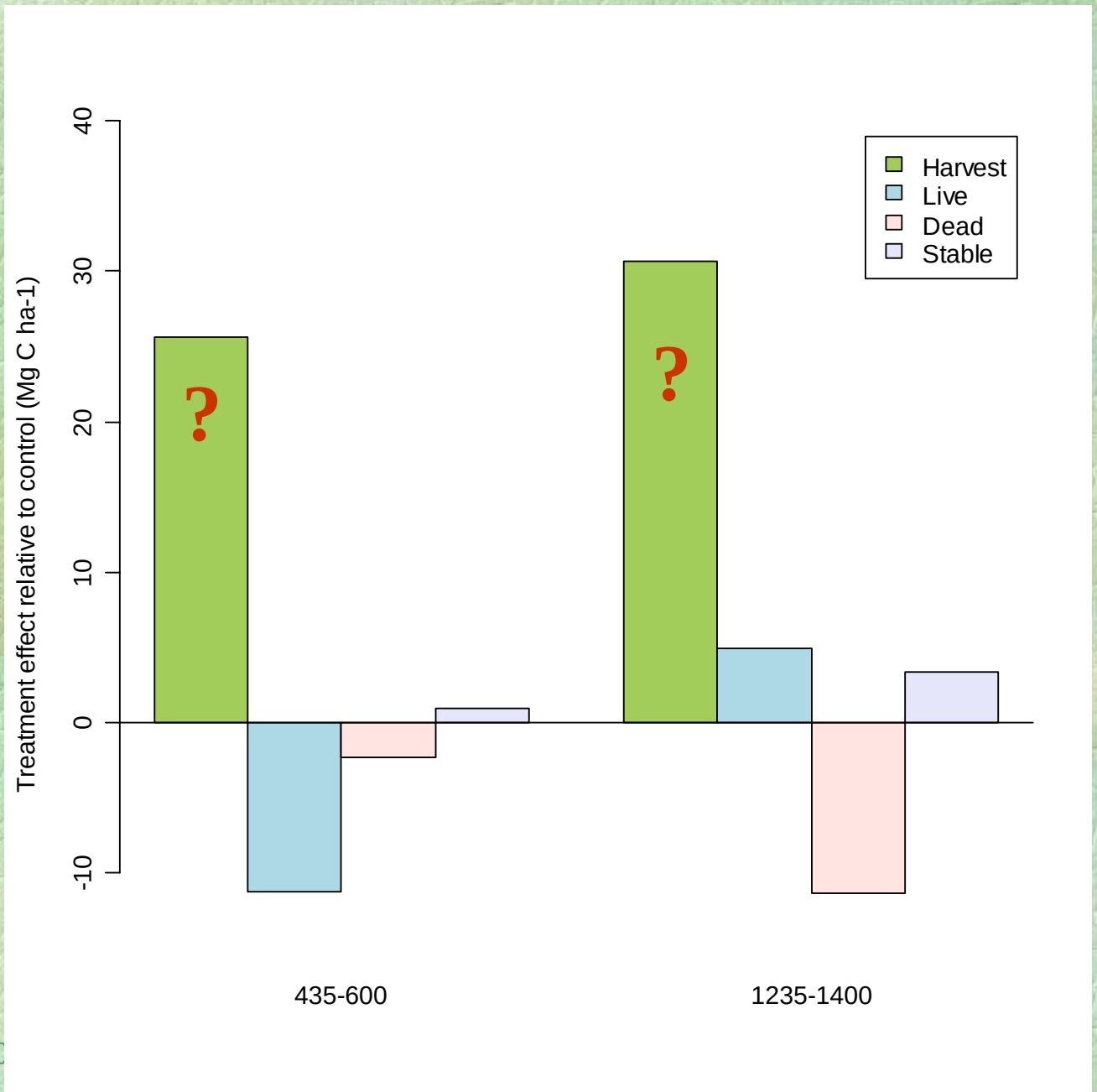

Live carbon stores (Mg C ha-1)
0
20
40
60
80
100
400
450
500
Years


Total carbon stores (Mg C ha-1)
160
180
200
220
240
400
450
500
550
600
Years
Control
T15I20
T15I35
T25I20
T25I35
T25I50
T50I35
T50I50

Thinning and fuel loads in Ponderosa Pine forest type



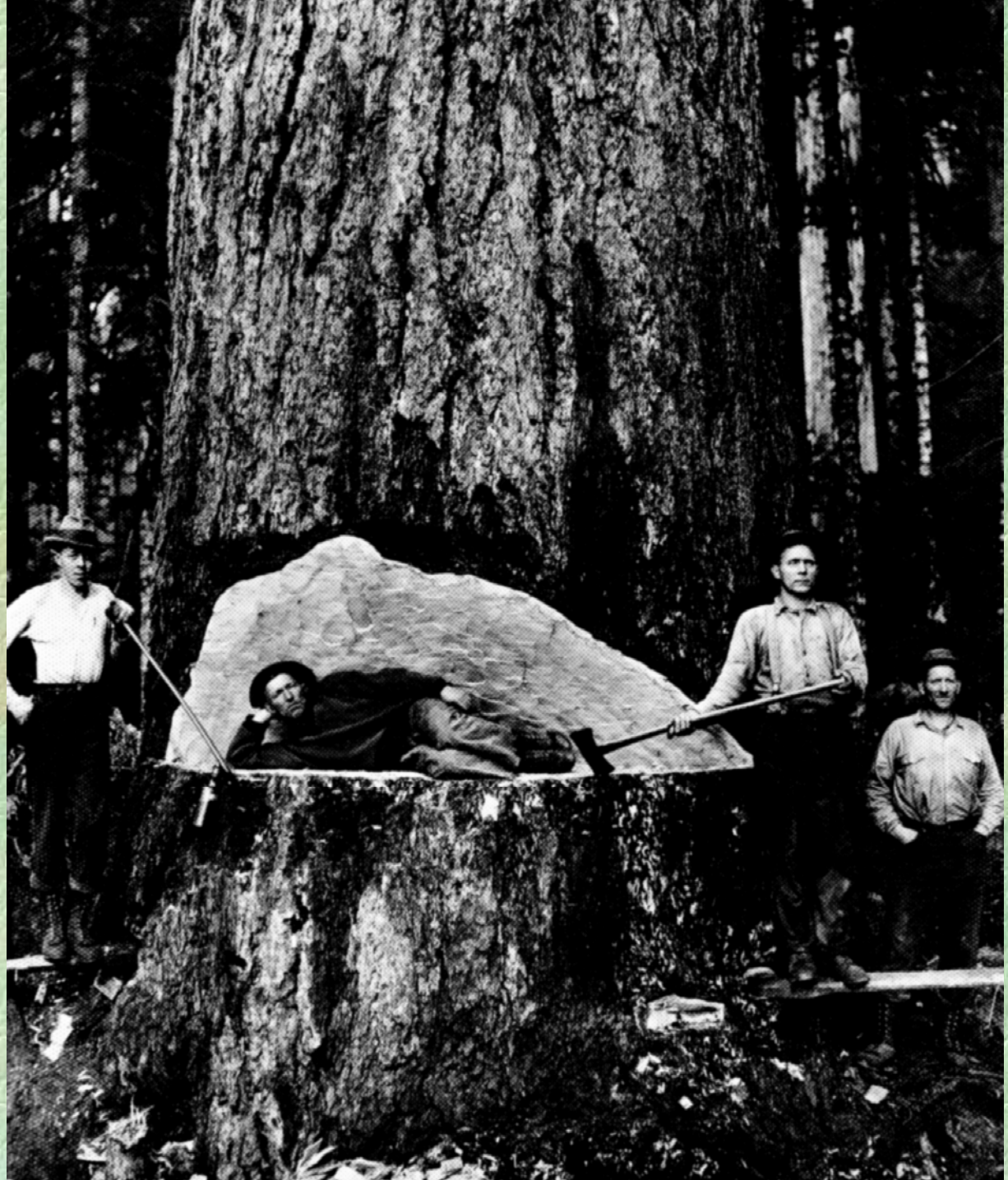

Simulated fire severity
Low
Medium
High
Proportion of cells burnt
0.0
0.2
0.4
0.6
0.8
1.0
0.41
0.31
0.17
0.18
0.58
0.14
0.07
0.17
0.66
Aggressive thinning
Moderate thinning
Baseline


Harvest
Live
Dead
Stable
Treatment effect relative to control (Mg C ha-1)
40
30
20
10
0
-10
?
?
435-600
1235-1400

- Increasing growth = Faster uptake of carbon from the atmosphere, but the effect may be smaller if
  - wood density declines
  - decay resistance is lower
  - product mix from fast-growing trees shifts towards shorter-lived wood products
  - rotation interval is shortened as growth rate increases (a primary goal of increasing growth rates)

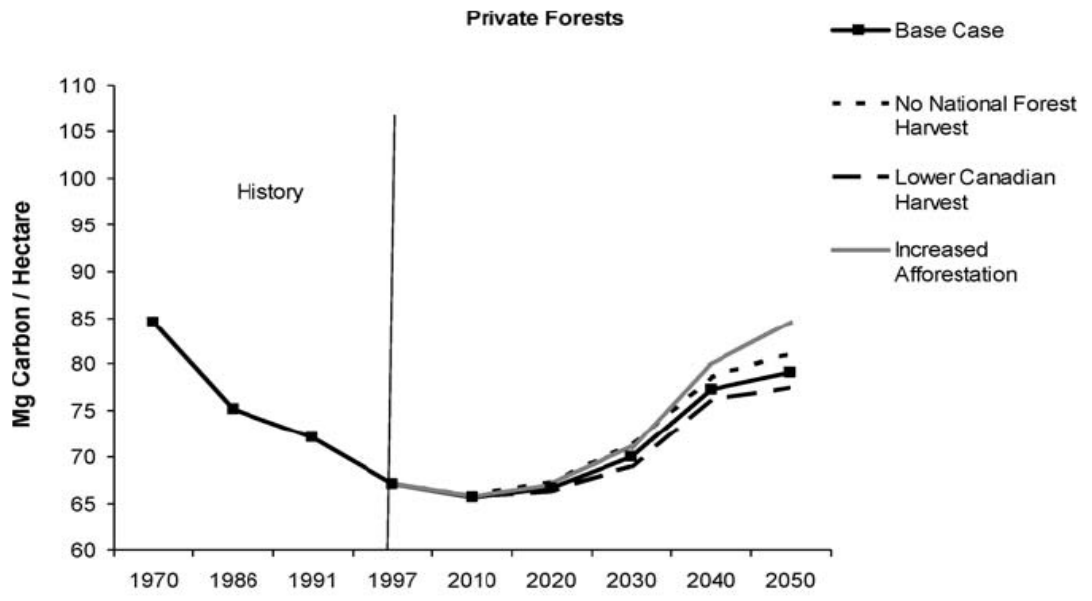
Protecting Carbon Gains against the Impacts of Future Climate Change

- ***Choice of species***
- ***Stand and landscape architecture***
- ***Plans for coping with large-scale disturbance events***



PNW Forests

- Potential to store additional carbon is among the greatest in the world
  - High productivity
  - Douglas-fir is long-lived and maintains high growth rates
  - History of forest management
    - reduced C stores between 1953 and 1993 by 24% on private industrial lands and by 7% on federal lands (Melson 2004)
    - extensive past harvest created a large cohort of young forest stands that are on track to absorb and store large quantities of carbon
- Potential to prevent C emissions is among the greatest in the world
  - Some old-growth still remains
  - Public support for forest conservation



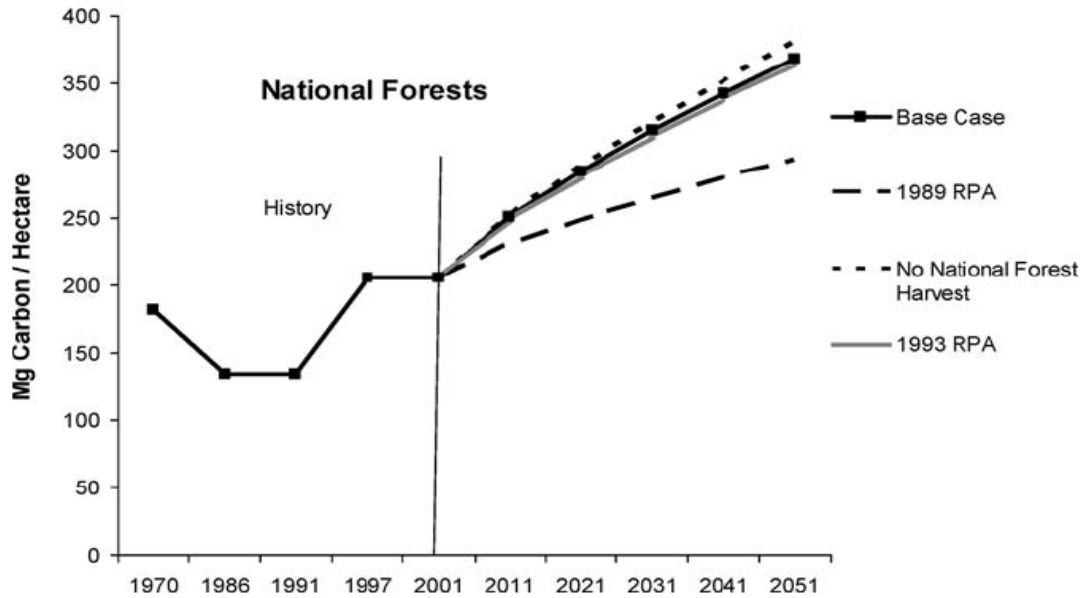


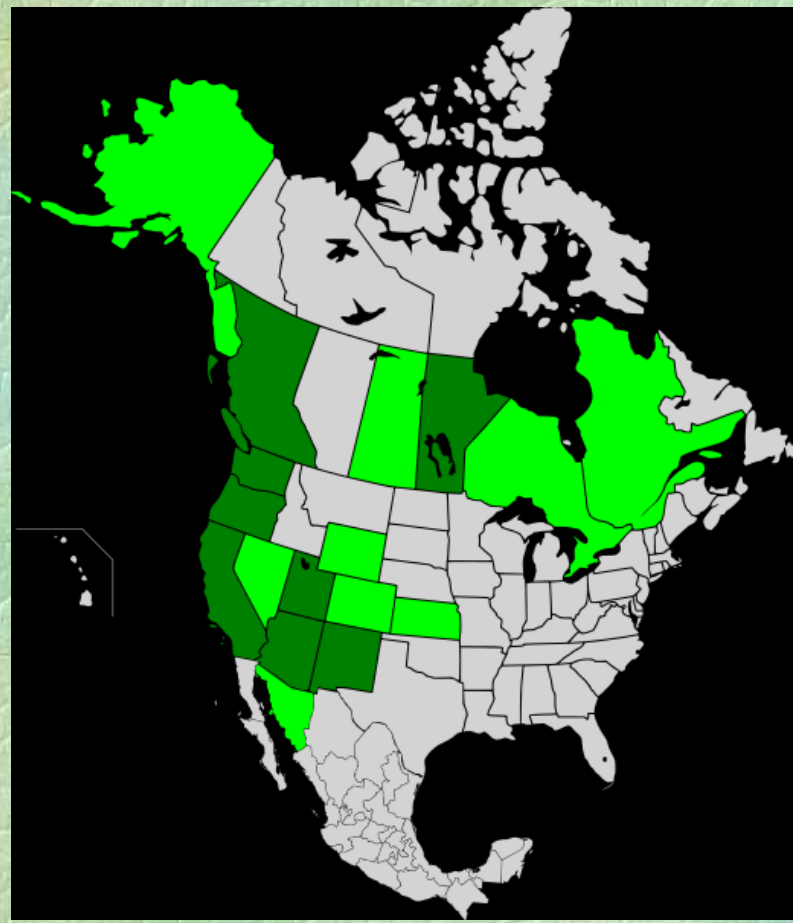
Figure 5. Historic change and future projections of carbon stores in live forest biomass for private ownerships and National Forests in the PNWW region. Units are in megagrams of carbon per hectare.

Conclusions

- Forest management is a major control on carbon balance in forest ecosystems
- To assess the management options it is critical to consider all affected ecosystem components, not just the live trees or forest products
- Key factors to consider:
  - Initial conditions
    - Old-growth
    - Agricultural land
    - Intensively managed forest
    - Burned forest
  - Target time frame
- Carbon storage is a new management objective that introduces additional considerations into decision-making
  - Many strategies that increase C stores in forests also advance forest conservation goals

Western Climate Initiative

- Statement of Goals (Aug. 22, 2007)
  - Emission reduction of 15% below 2005 levels by 2020
  - Actions in all sectors, including but not limited to: stationary sources, energy supply, residential, commercial, industrial, transportation, waste management, agriculture, and **forestry**
  - ***Emissions estimates do not include changes in biological carbon stocks due to agriculture, forestry, and land use change***



3 Biofuels & Renewable Energy

Business-friendly, cost-competitive and ready to meet a significant portion of America's energy needs, renewable energy has gone mainstream. Wind power is the fastest growing form of electricity generation in the United States, expanding at an average annual rate of more than 20 percent. Solar energy employs more than 20,000 Americans in high-tech, high-paying jobs. And clean-burning biofuels made from plants show great promise as a replacement for gasoline -- ethanol producers already make 4 billion gallons of fuel a year, and new methods for making ethanol from farm wastes or energy crops could compete with oil on a very large scale in addition to providing extra income for farmers. By 2050, renewable energy and biofuels could meet a significant chunk of our energy needs.

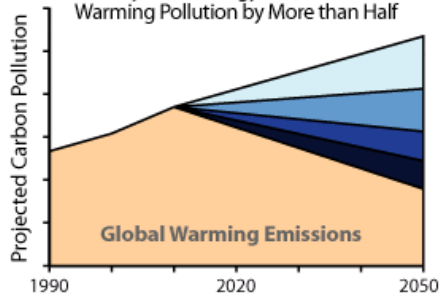
It Can Be Done:

» Wind, Solar and Biomass Energy Today
» Move Over, Gasoline: Here Come Biofuels
» A Consumer's Guide to Buying Clean Energy

Step 4: Return Carbon to the Ground.

DIAL IT DOWN.

How Today's Technology Can Cut U.S. Global Warming Pollution by More than Half



1. Boost Energy Efficiency
2. Better Cars & Smart Growth
3. Biofuels & Renewable Energy
4. Return Carbon to the Ground

Top of Feature | The Tipping Point

Thank you!