

Modeling Carbon Dynamics and their Economic Implications

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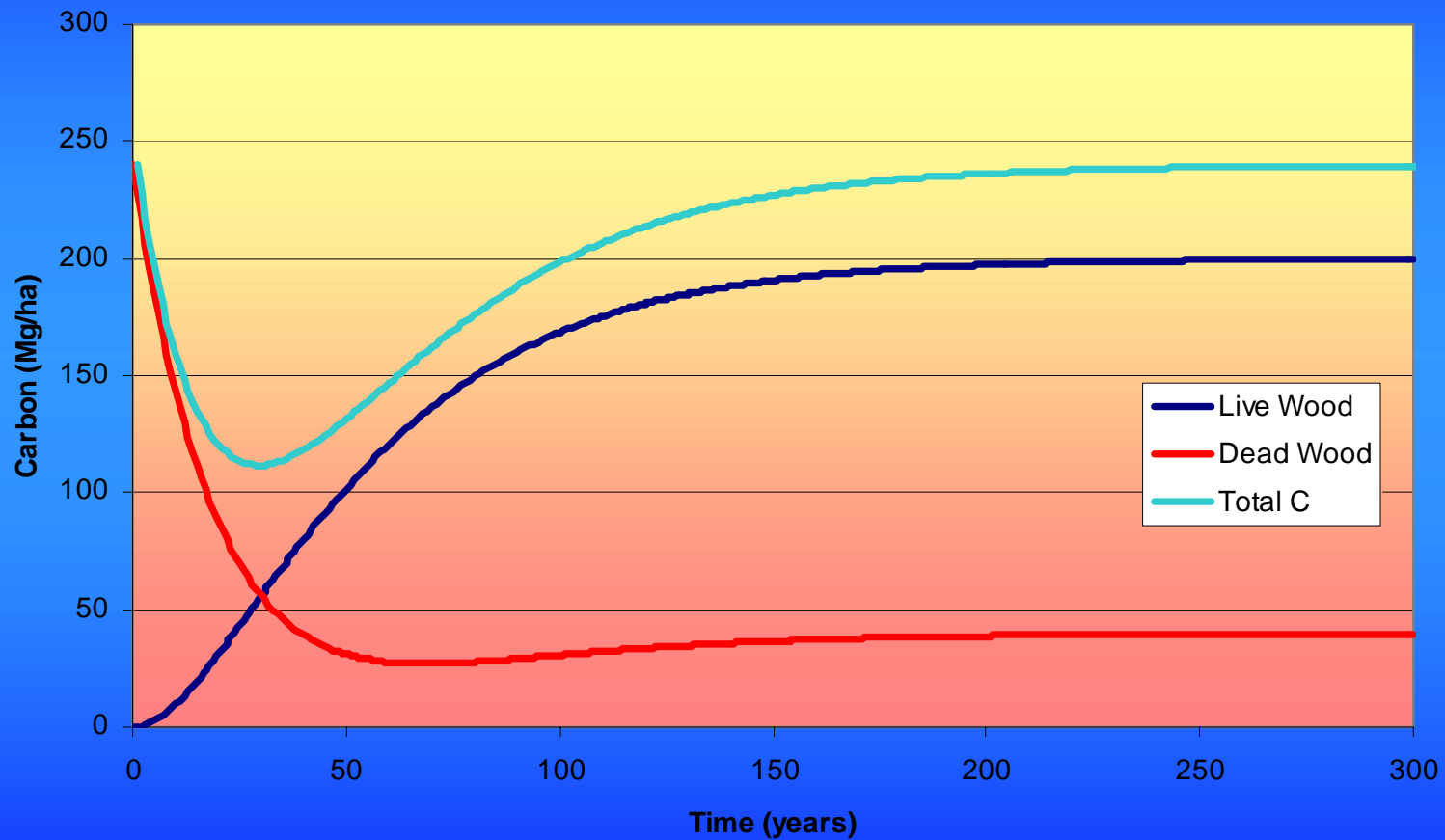




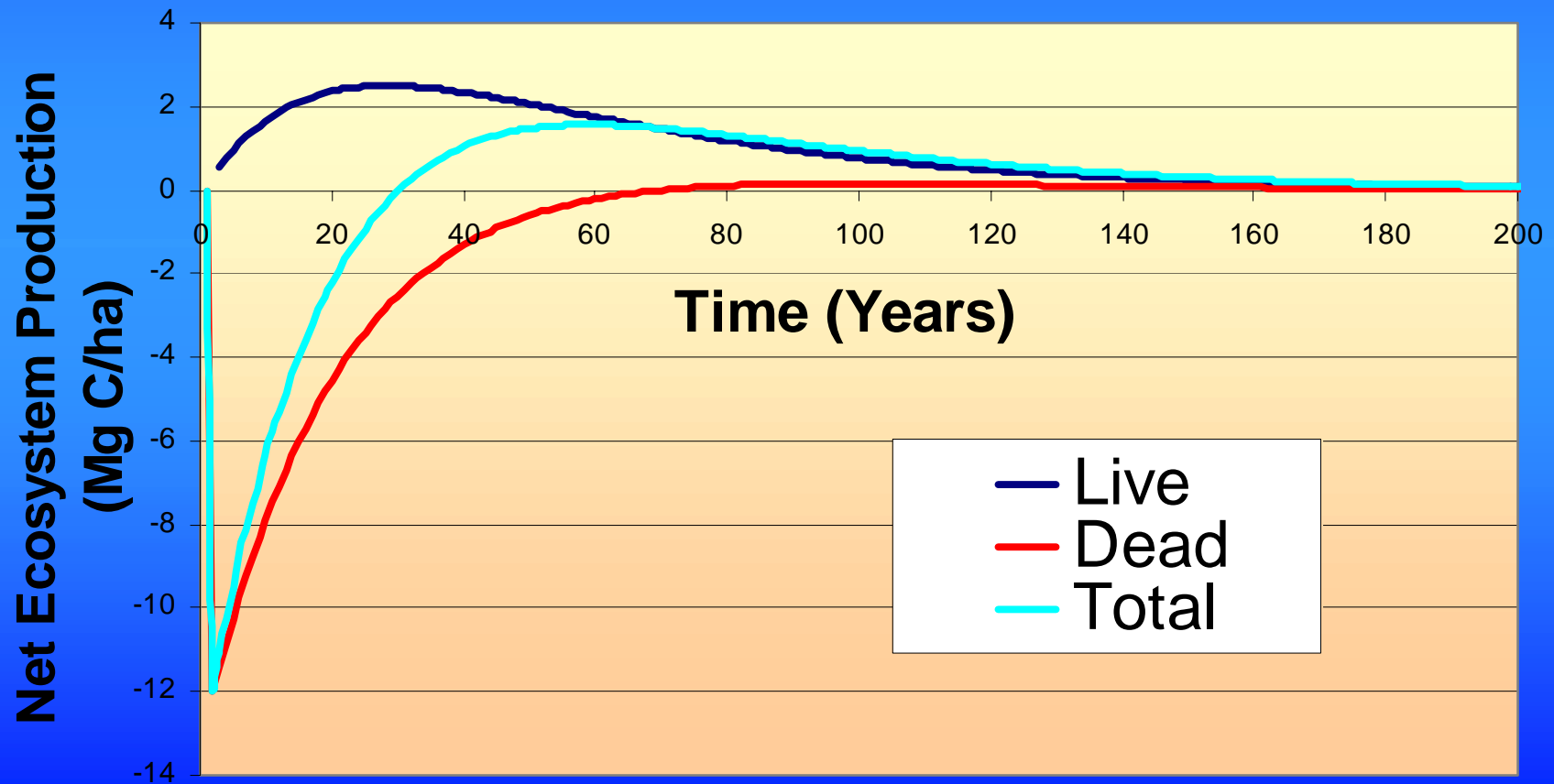
It Depends on How We Treat Them

- Deforestation
- Aforestation
- Reforestation
- New Forestation

Change in Carbon Stores



Change in Exchange of Carbon



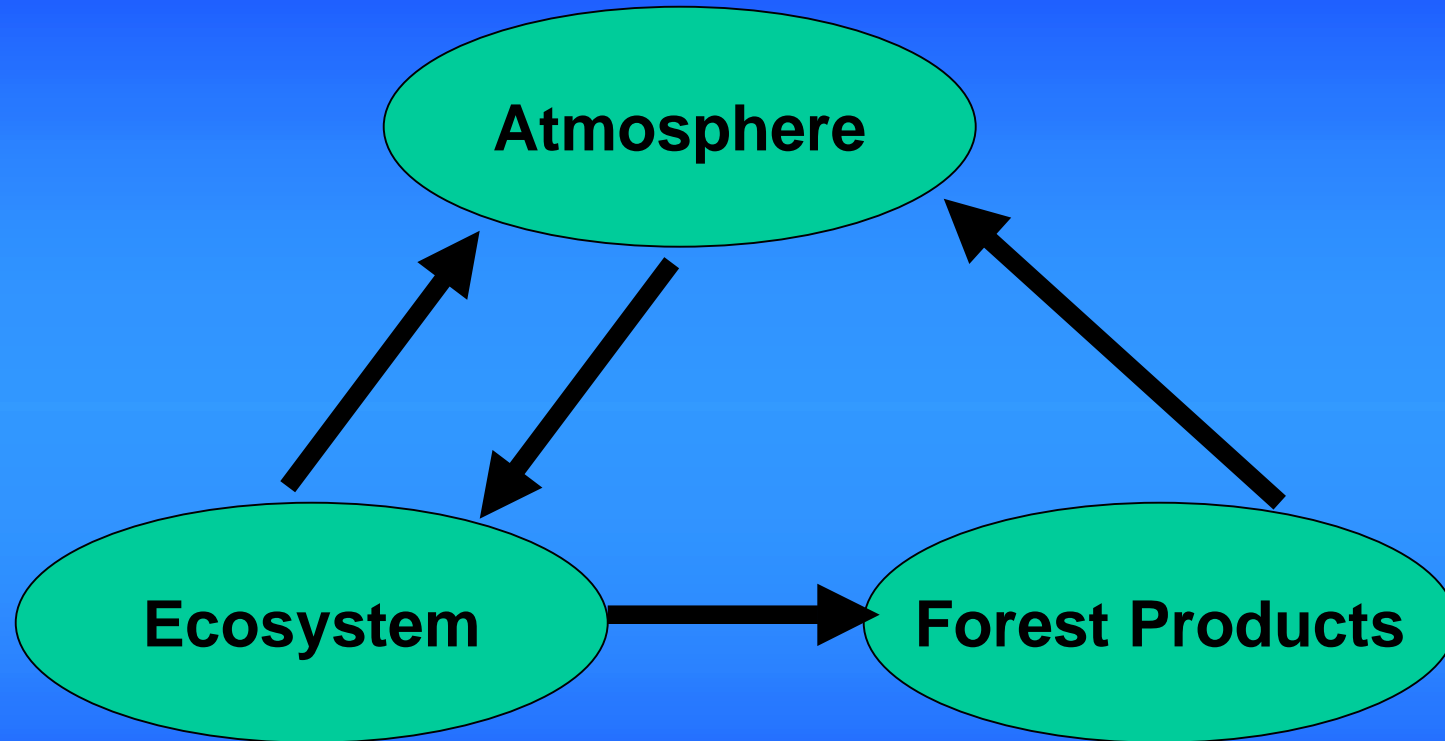
Effects on Carbon Storage of Conversion of Old-Growth Forests to Young Forests

MARK E. HARMON, WILLIAM K. FERRELL, JERRY F. FRANKLIN

Pool	60 year-old	Old-growth
Foliage	5	6
Live Wood	152	349
Roots	35	77
Detritus	26	123
Soil	56	56
Total	274	611

If Not Here Then Where Else?

Expanding the System



Two Approaches

- Measurement--Harvest and Forest Cover Maps of Oregon Forests
- Modeling-Standcarb-Micro Forest Dynamics. Computes transitions after disturbance
- Modeling-Regioncarb-Steady-state landscape. No transitions, but fast.

Two Decades of Carbon Flux from Forests of the Pacific Northwest

Estimates from a new modeling strategy

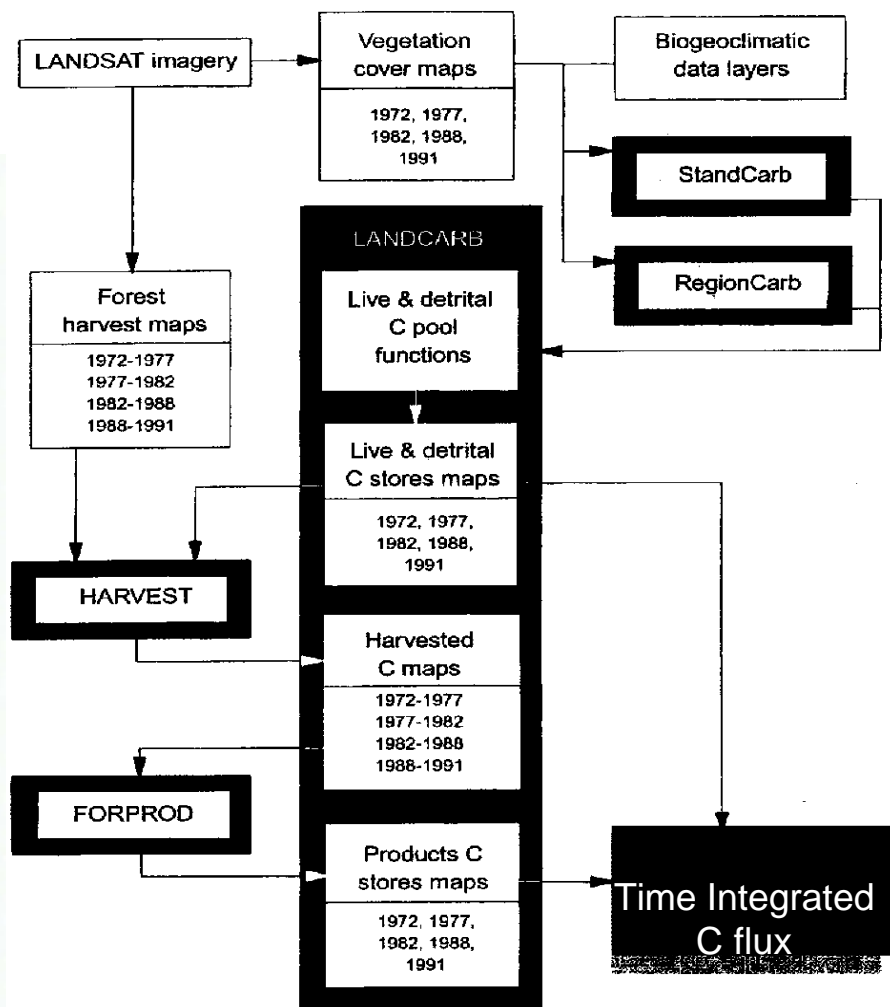
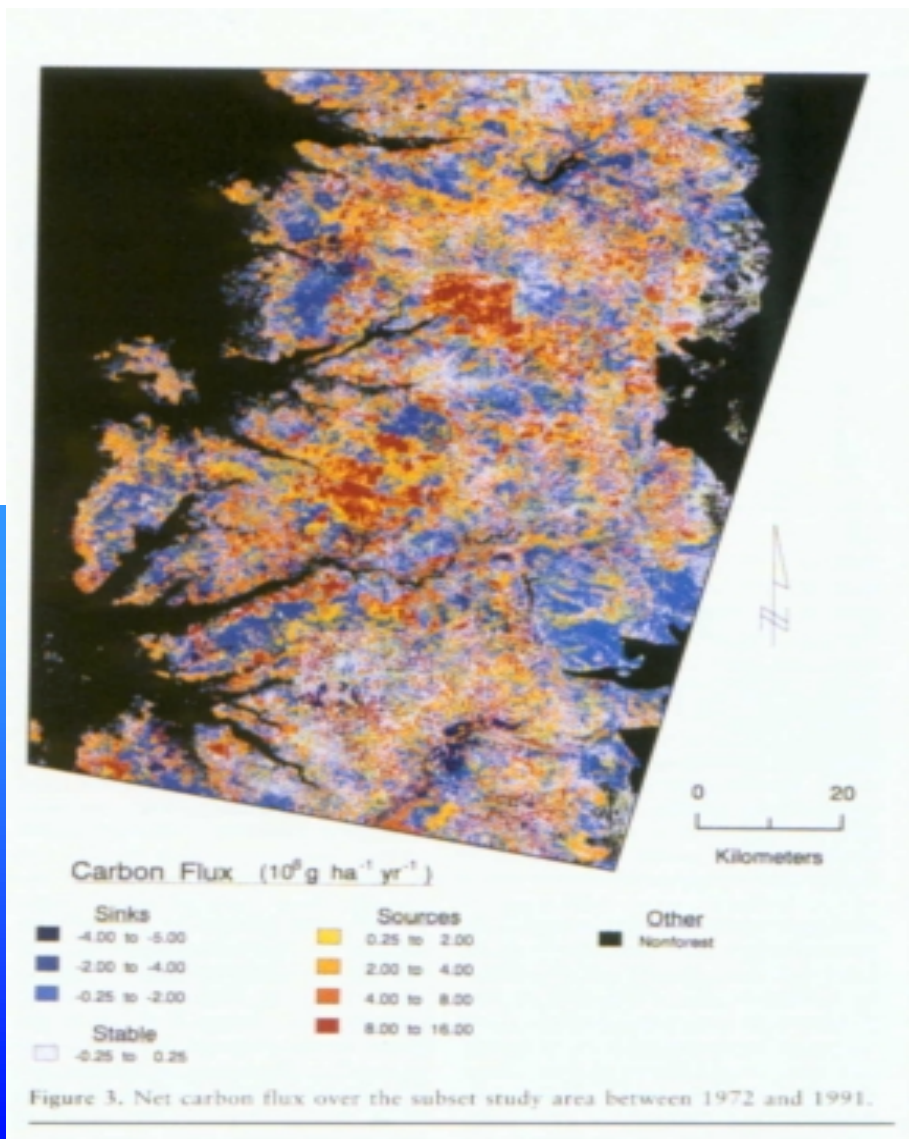


Figure 1. Schematic for the overall modeling strategy used to estimate carbon flux.

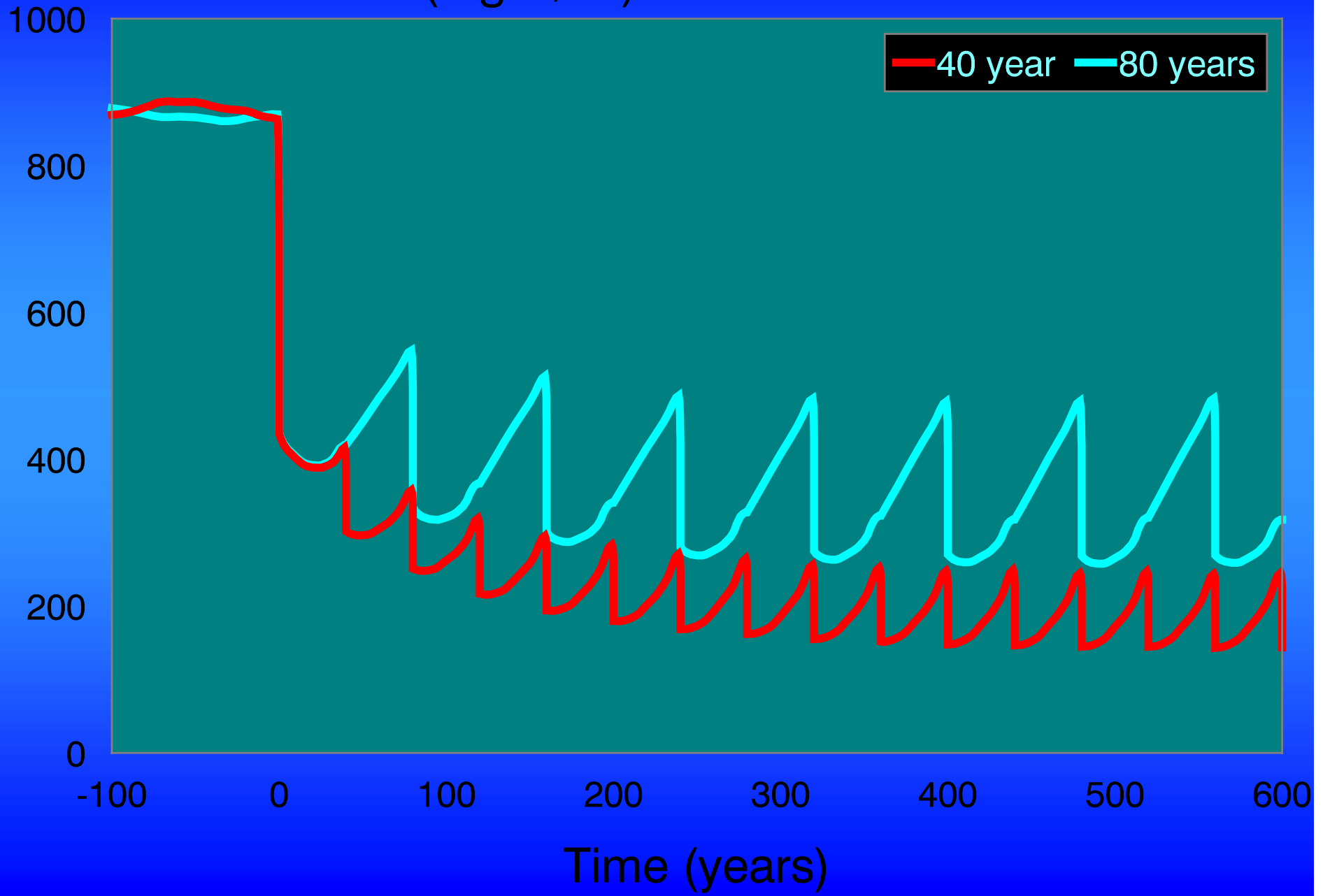
NET RESULT OF MEASUREMENT

- THREE DECADES OF PACIFIC NORTHWEST FOREST MANAGEMENT
- NET SOURCE OF ATMOSPHERIC CARBON

CARBON STORAGE SENSITIVE TO FOREST MANAGEMENT

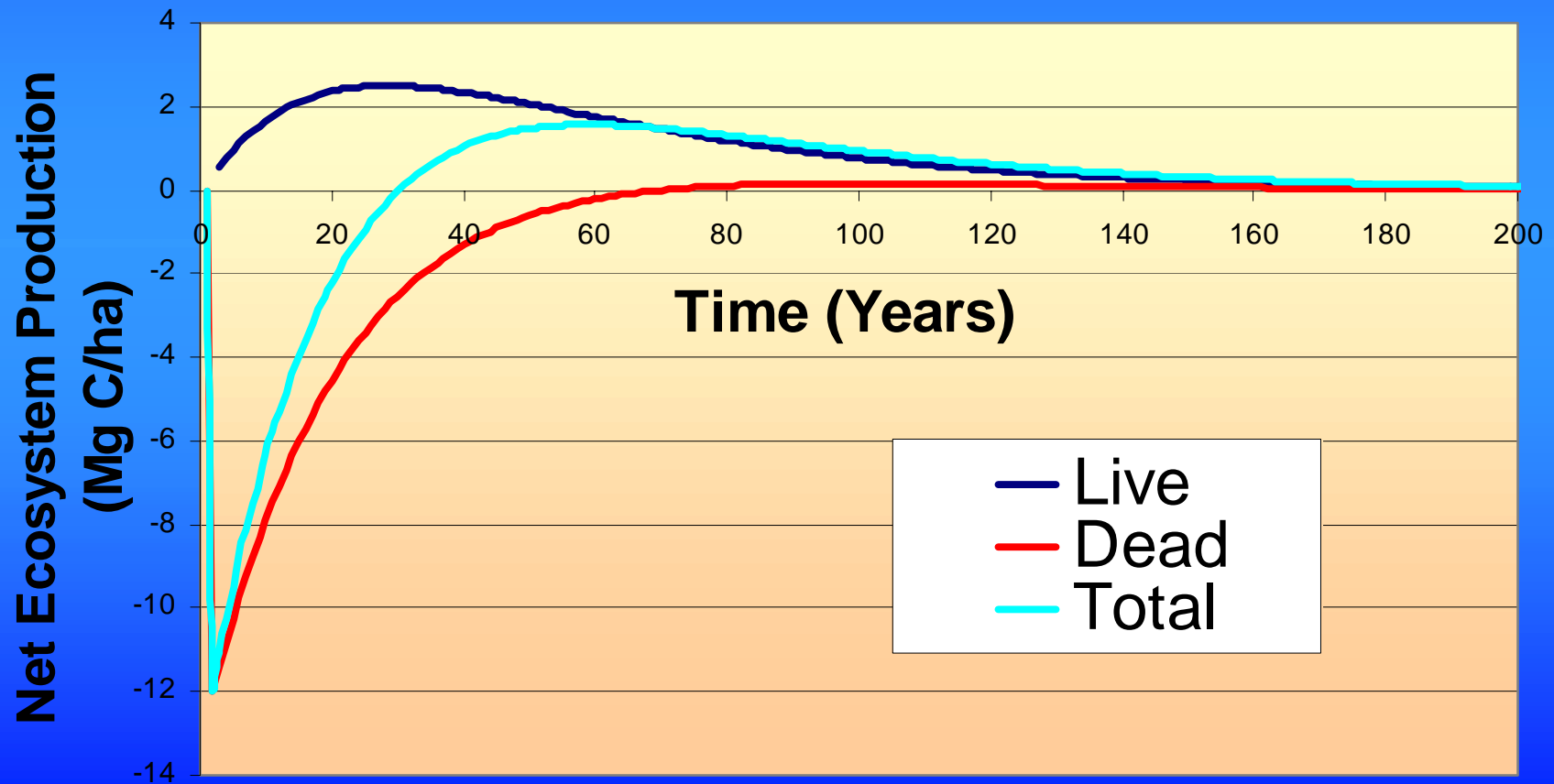
- ROTATION LENGTH
- CLEARCUTTING VERSUS OTHER METHODS
- PRE-COMMERCIAL AND COMMERCIAL THINNING
- PLANTING
- HIGH INTENSITY VERSUS LOW INTENSITY HARVESTING

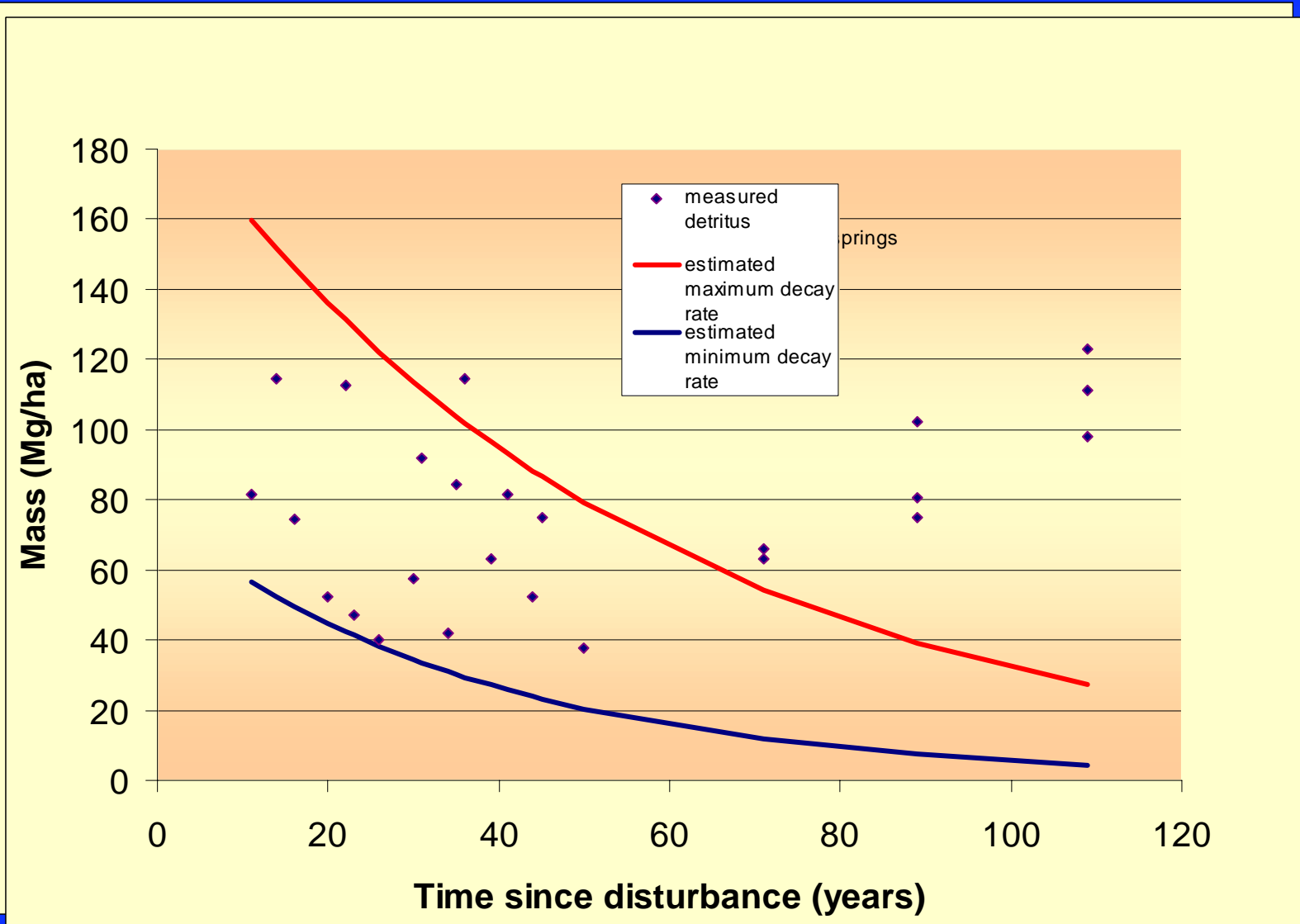
Total C stored (Mg C/ha)

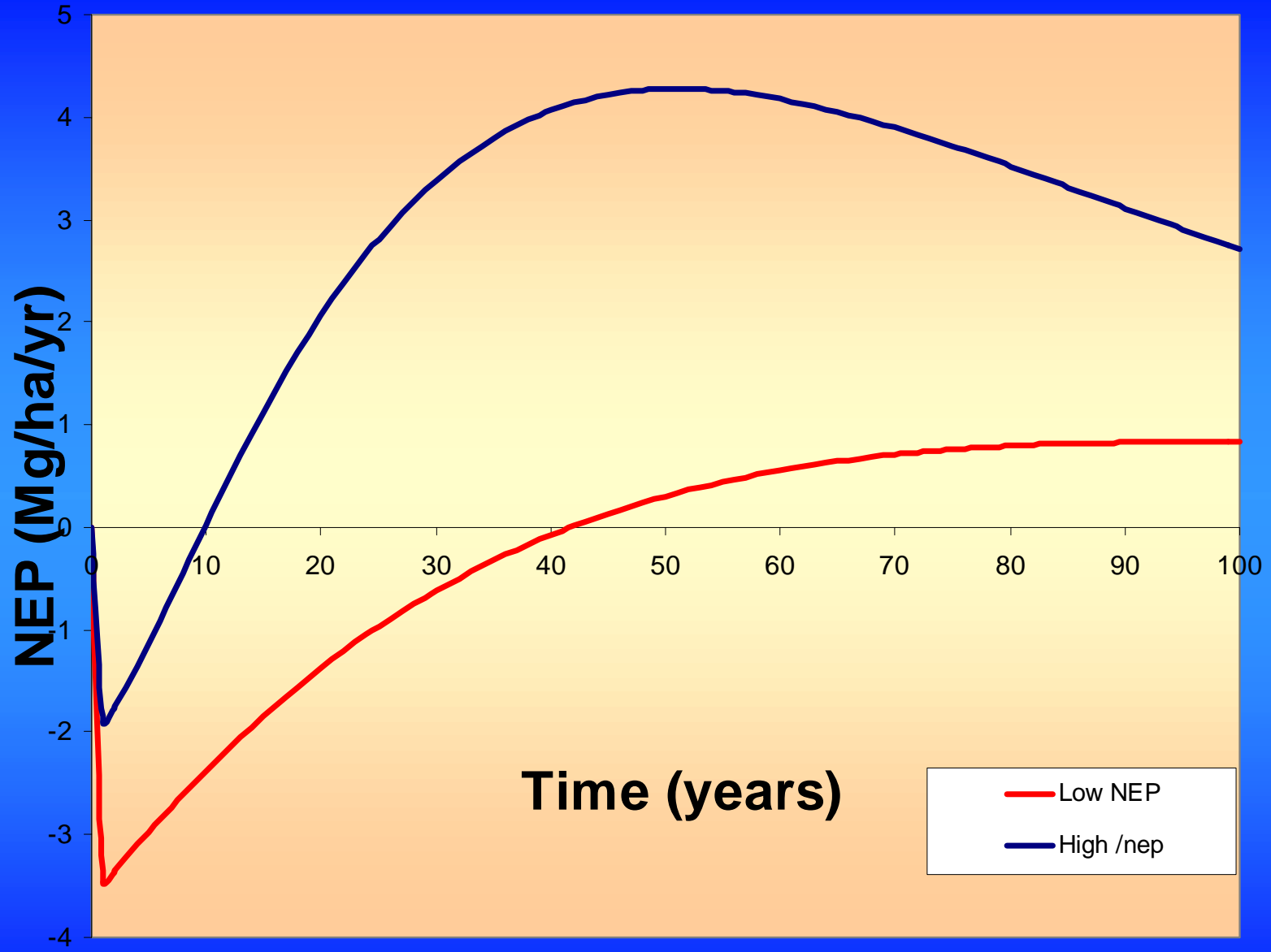


BUT ALWAYS A
TRANSITION PERIOD OF
NEGATIVE N.E.P.

Change in Exchange of Carbon

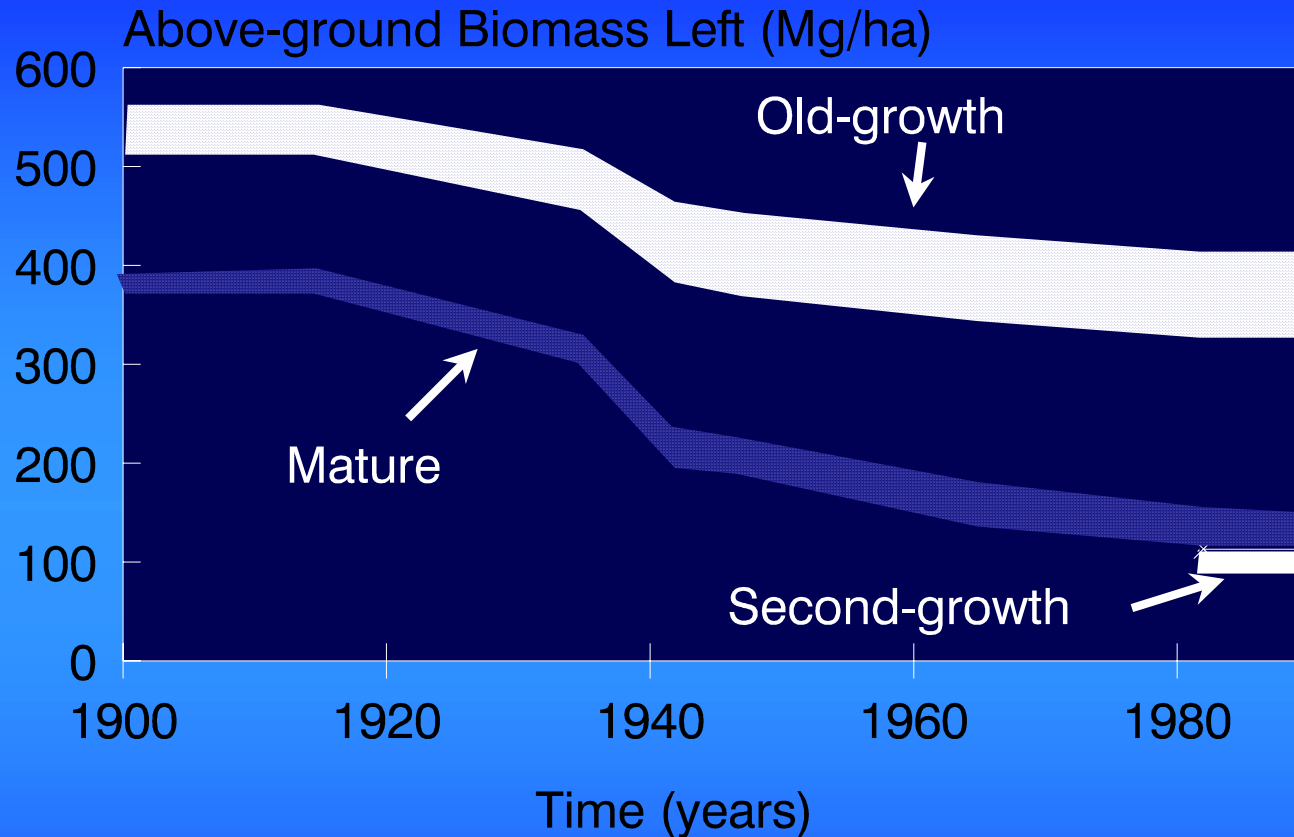






**FORESTRY PRACTICES
ARE ALWAYS CHANGING**

Historical Changes in Harvest



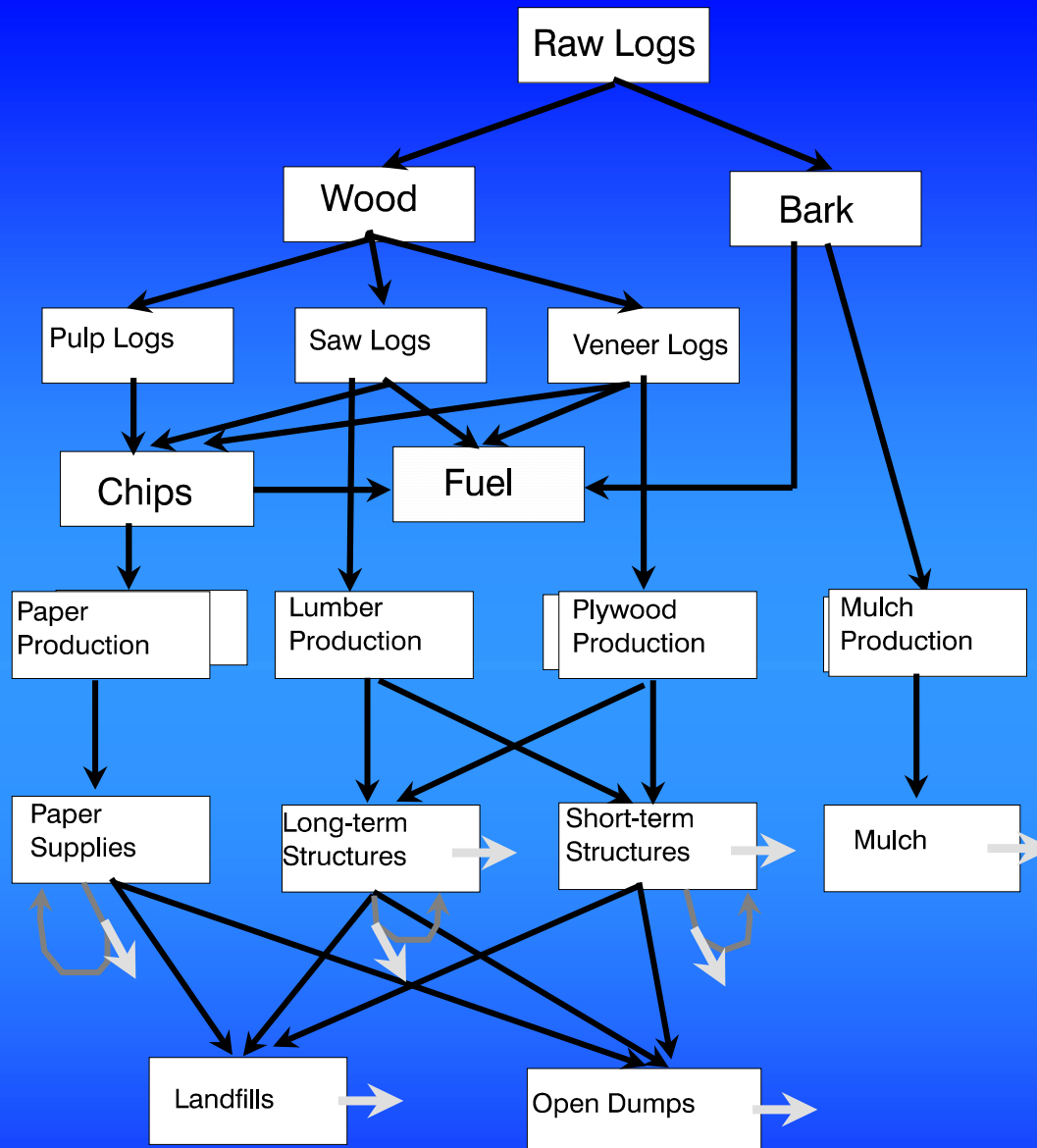
**MODELING HISTORICAL PATTERNS OF TREE
UTILIZATION IN THE PACIFIC NORTHWEST:
CARBON SEQUESTRATION IMPLICATIONS¹**

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The Changing Nature of Harvests



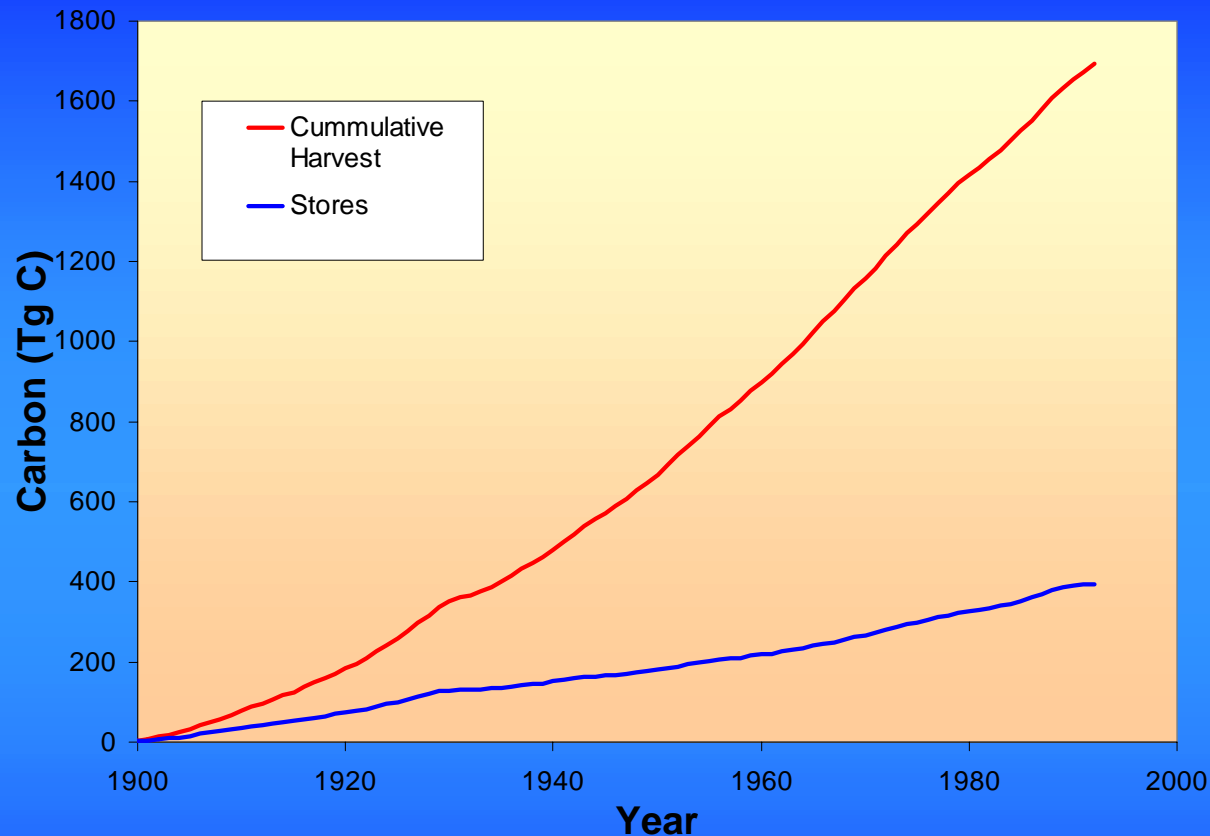
**AND FOREST PRODUCT
USE IS ALWAYS CHANGING**



→ to atmosphere

→ recycling

Only 20% of Harvest is Stored

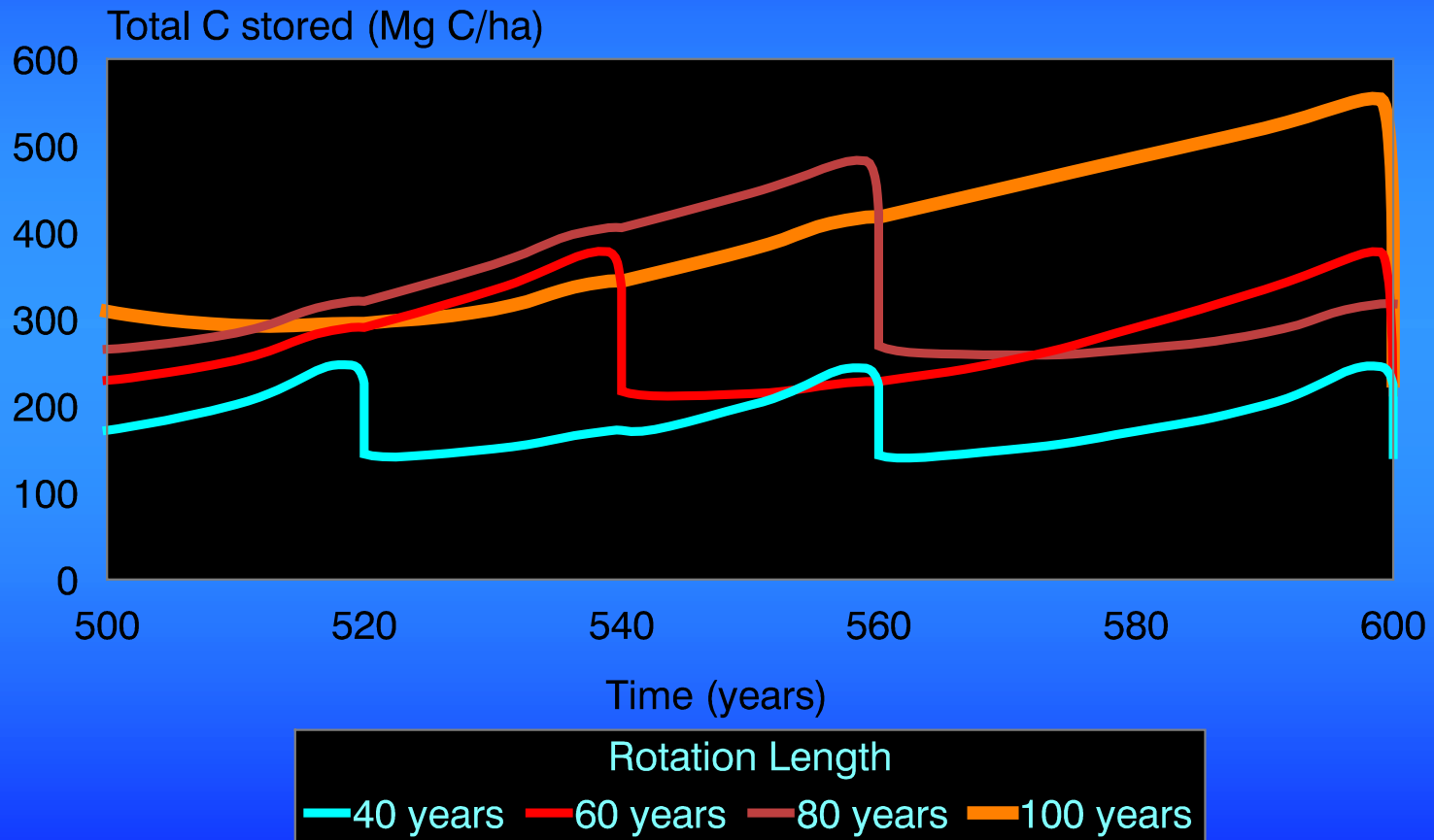


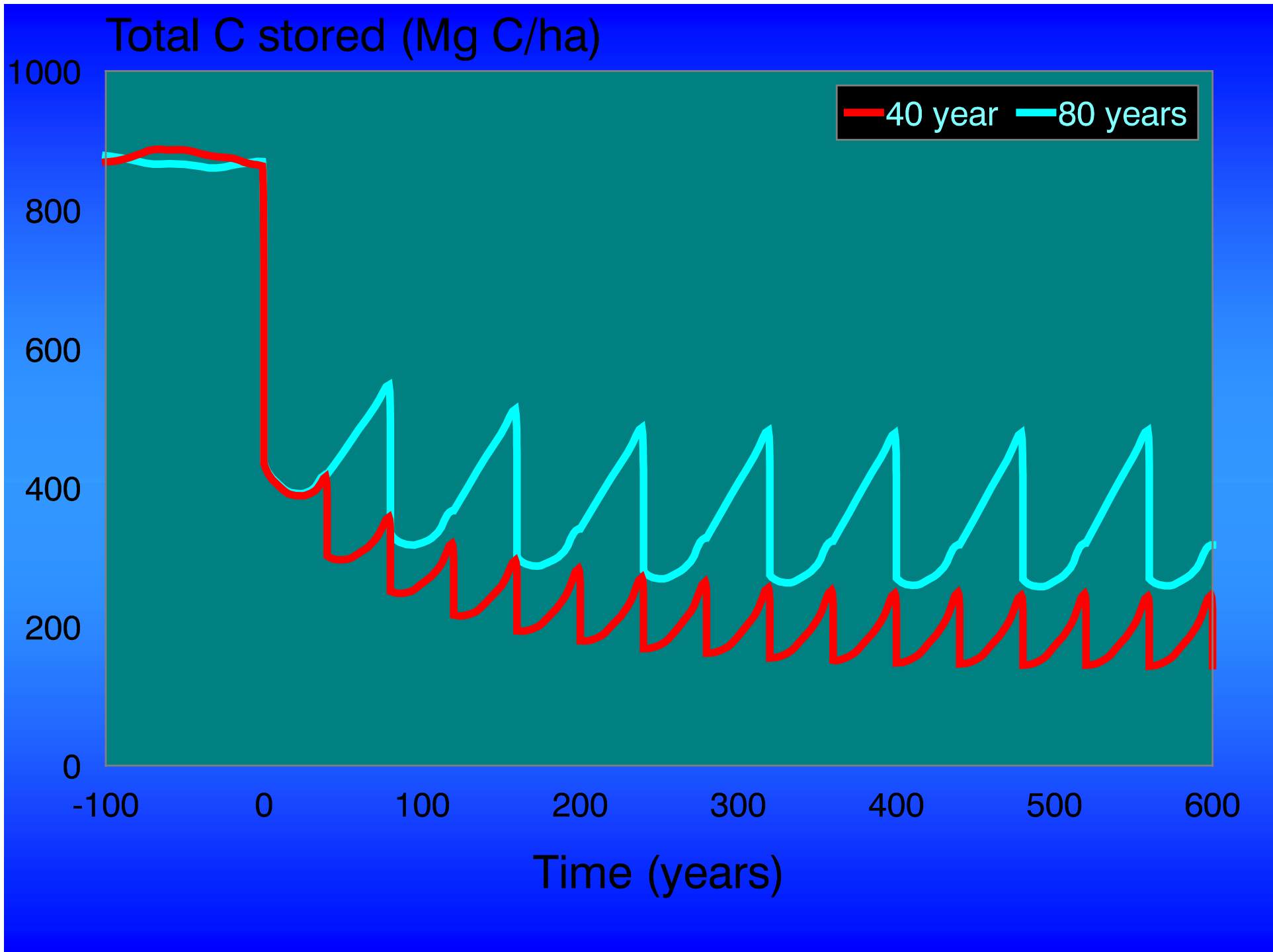
MODELING CARBON STORES IN OREGON AND WASHINGTON FOREST PRODUCTS: 1900-1992

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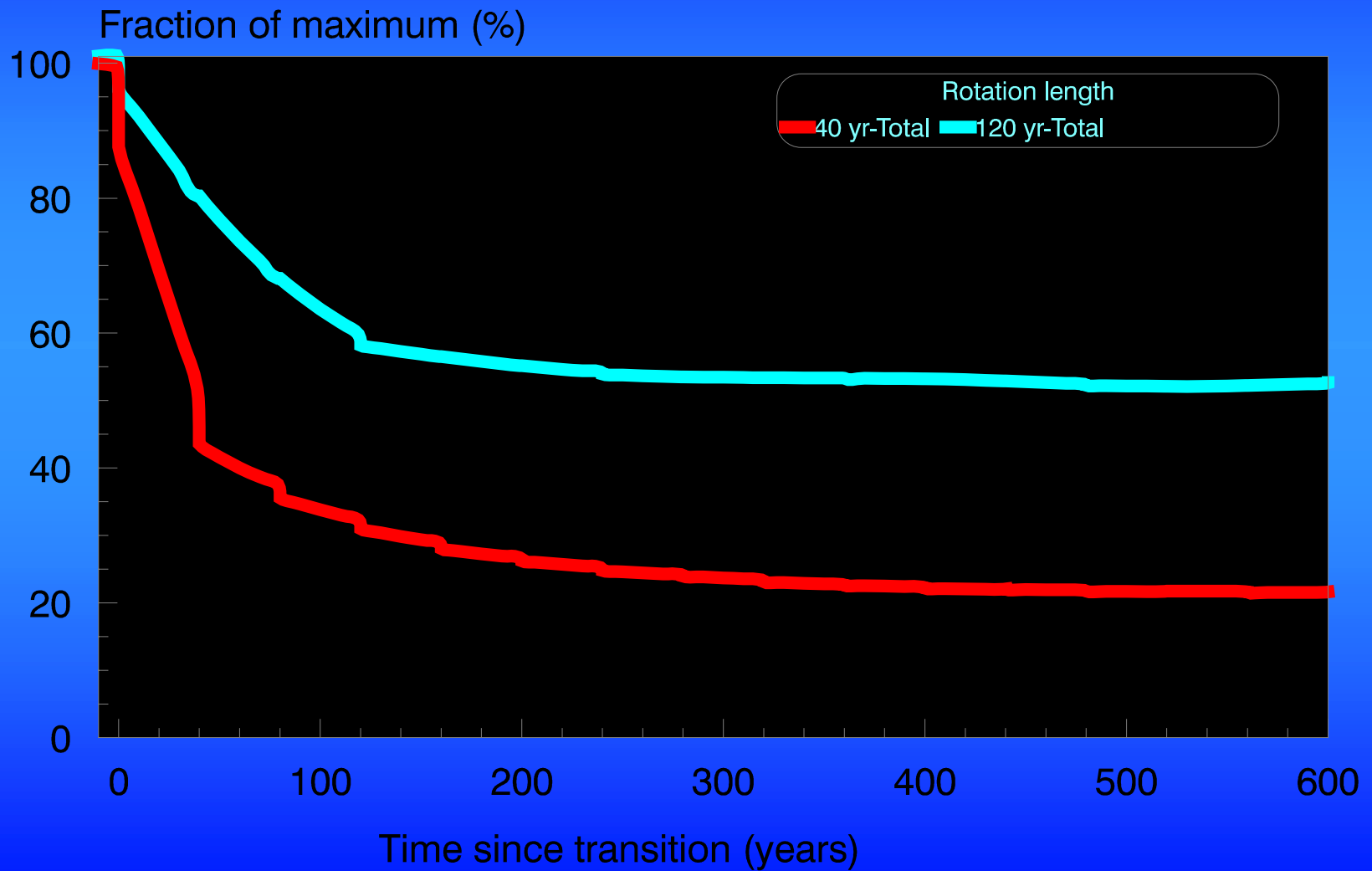
DAVID BROOKS
USDA Forest Service, Forestry Sciences Laboratory, Corvallis, OR 97331, U.S.A.

Which One Stores More Carbon??????

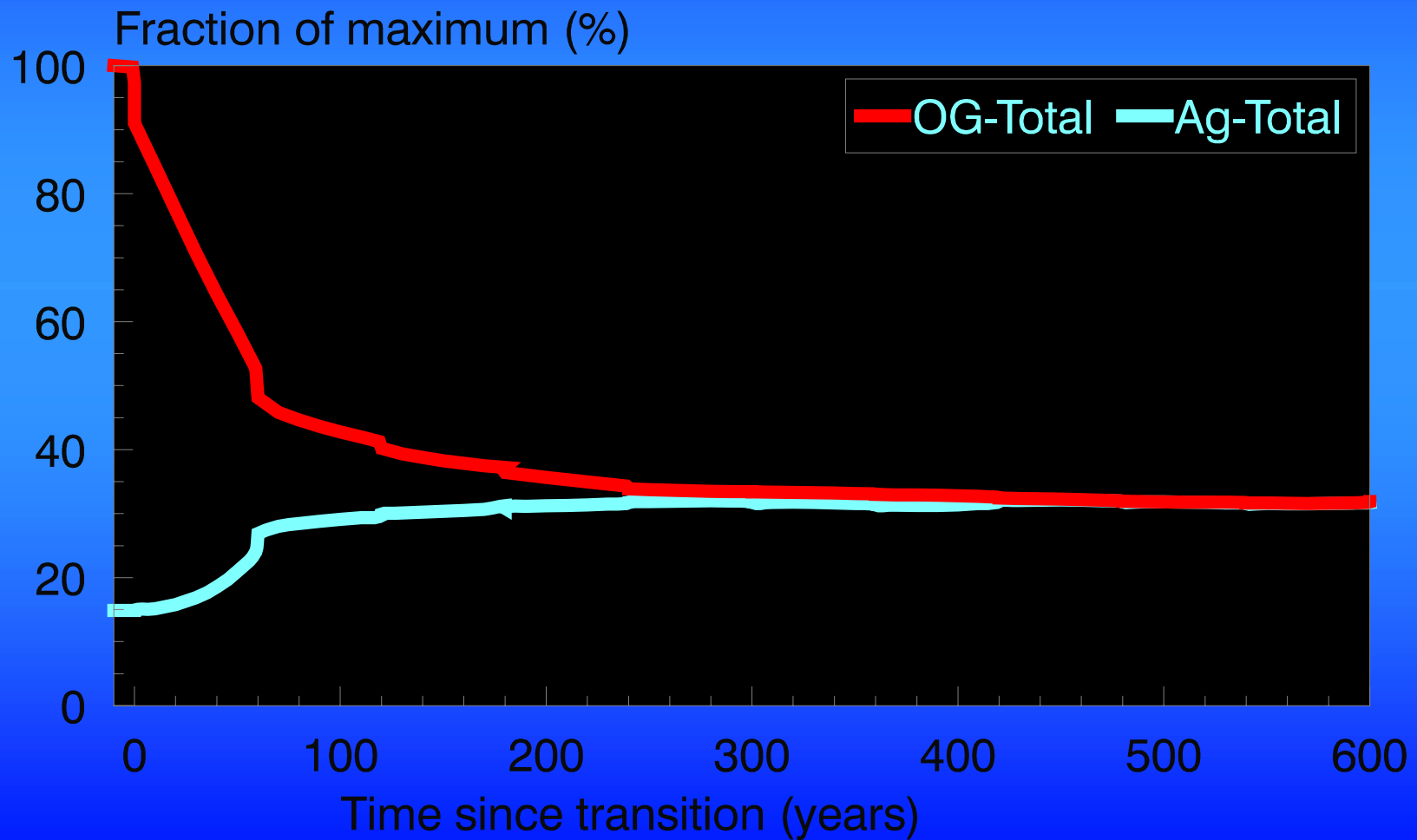




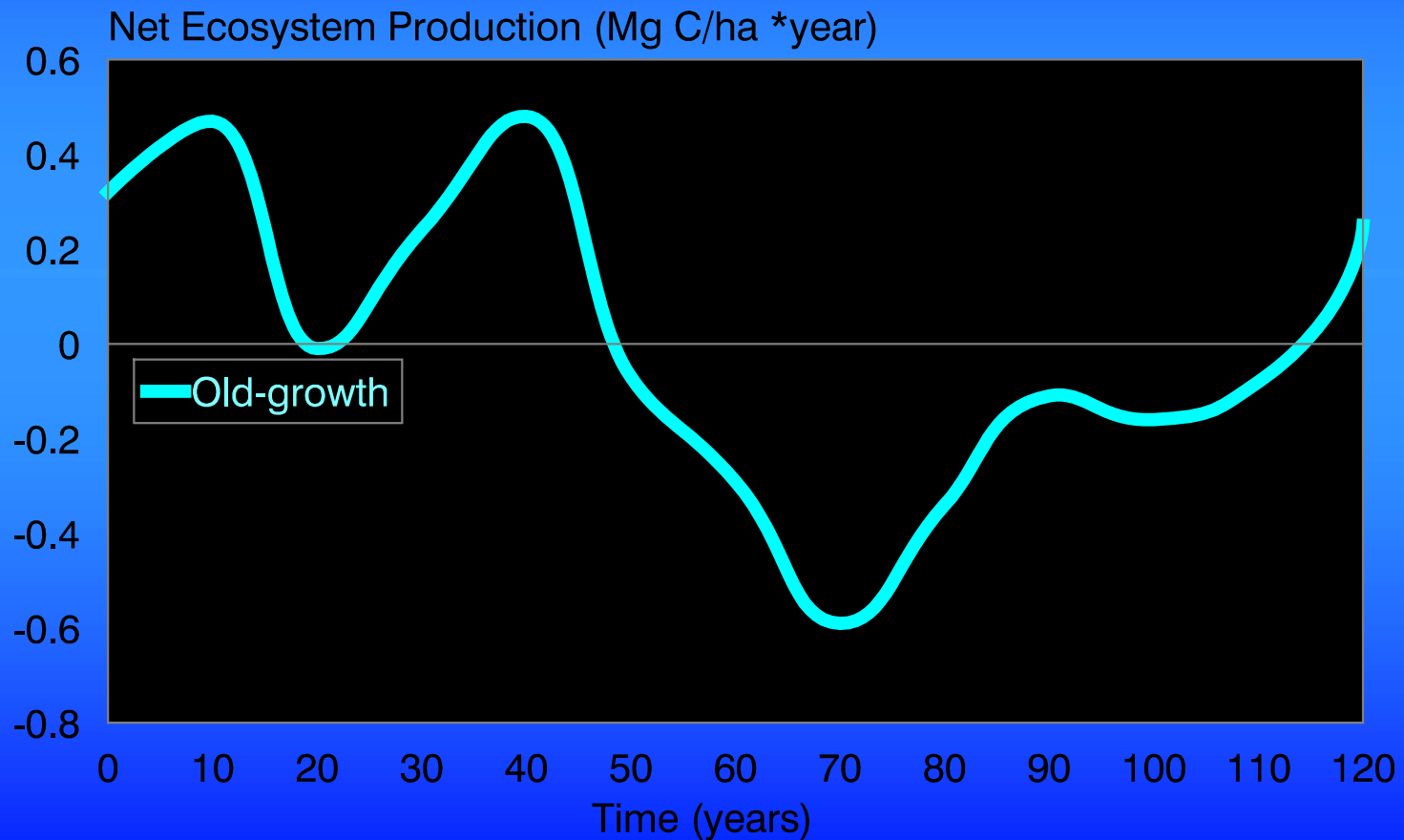
Landscape Level



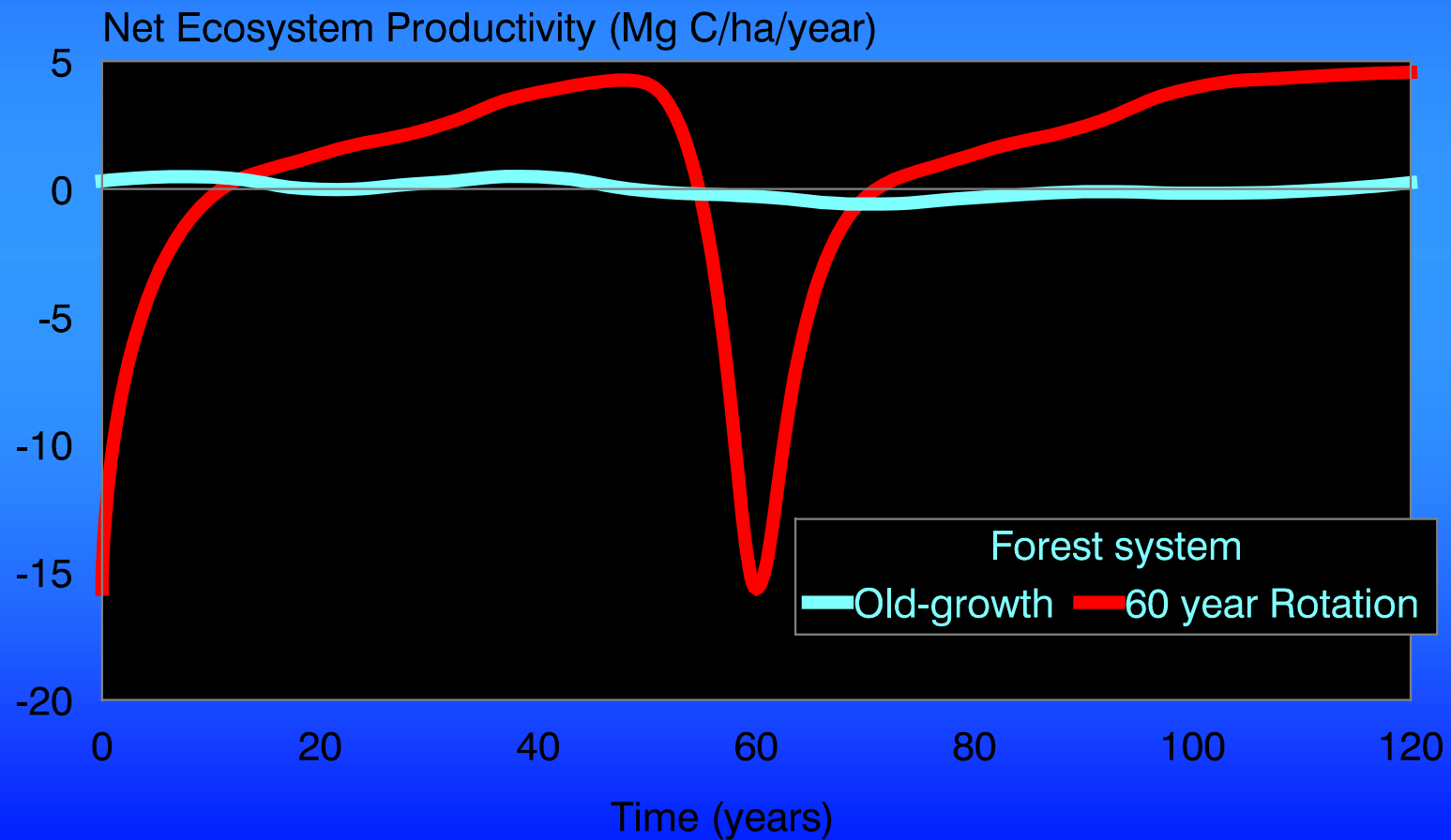
All Roads Lead to ????????



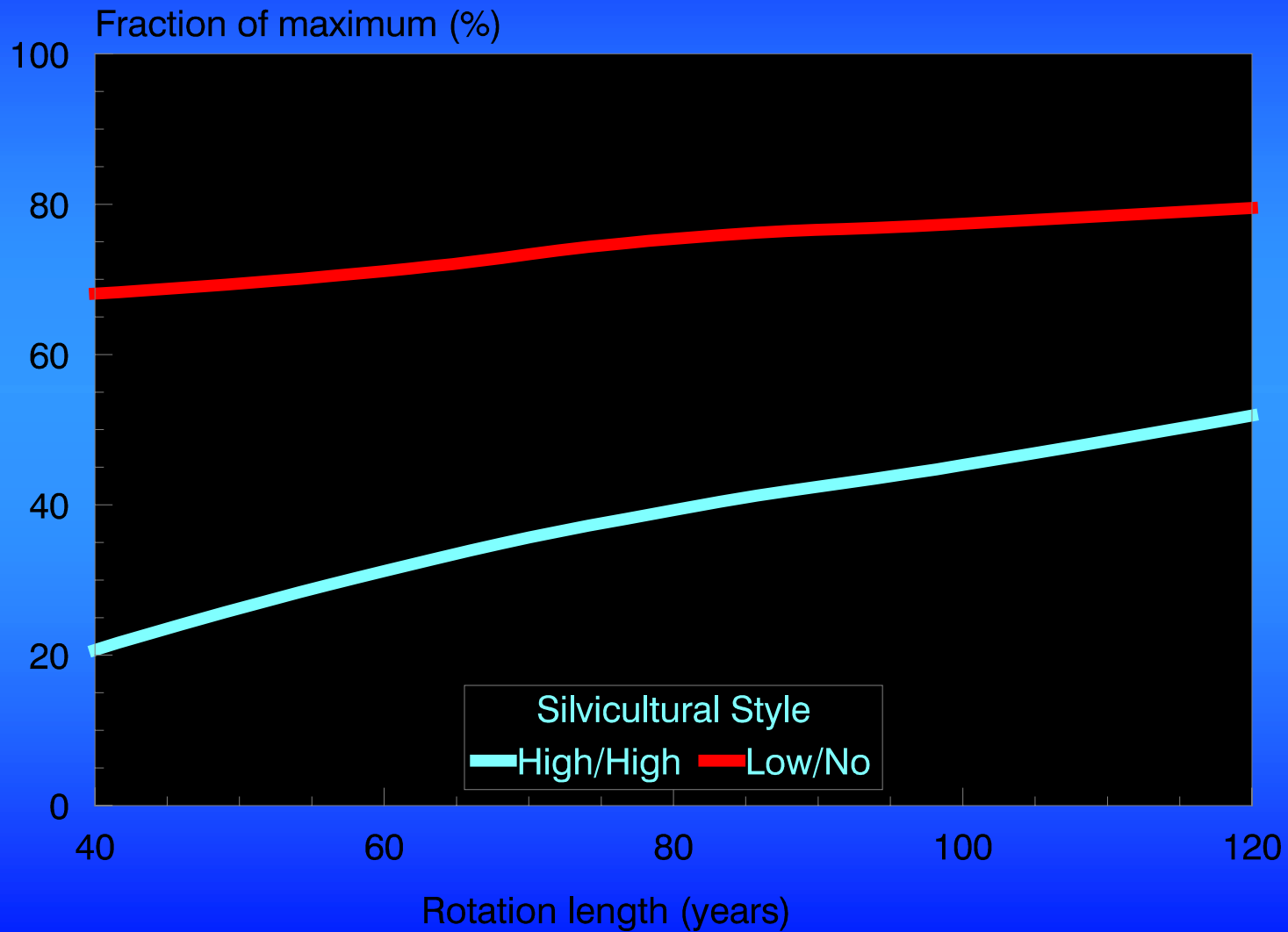
Old-growth Systems are in Balance



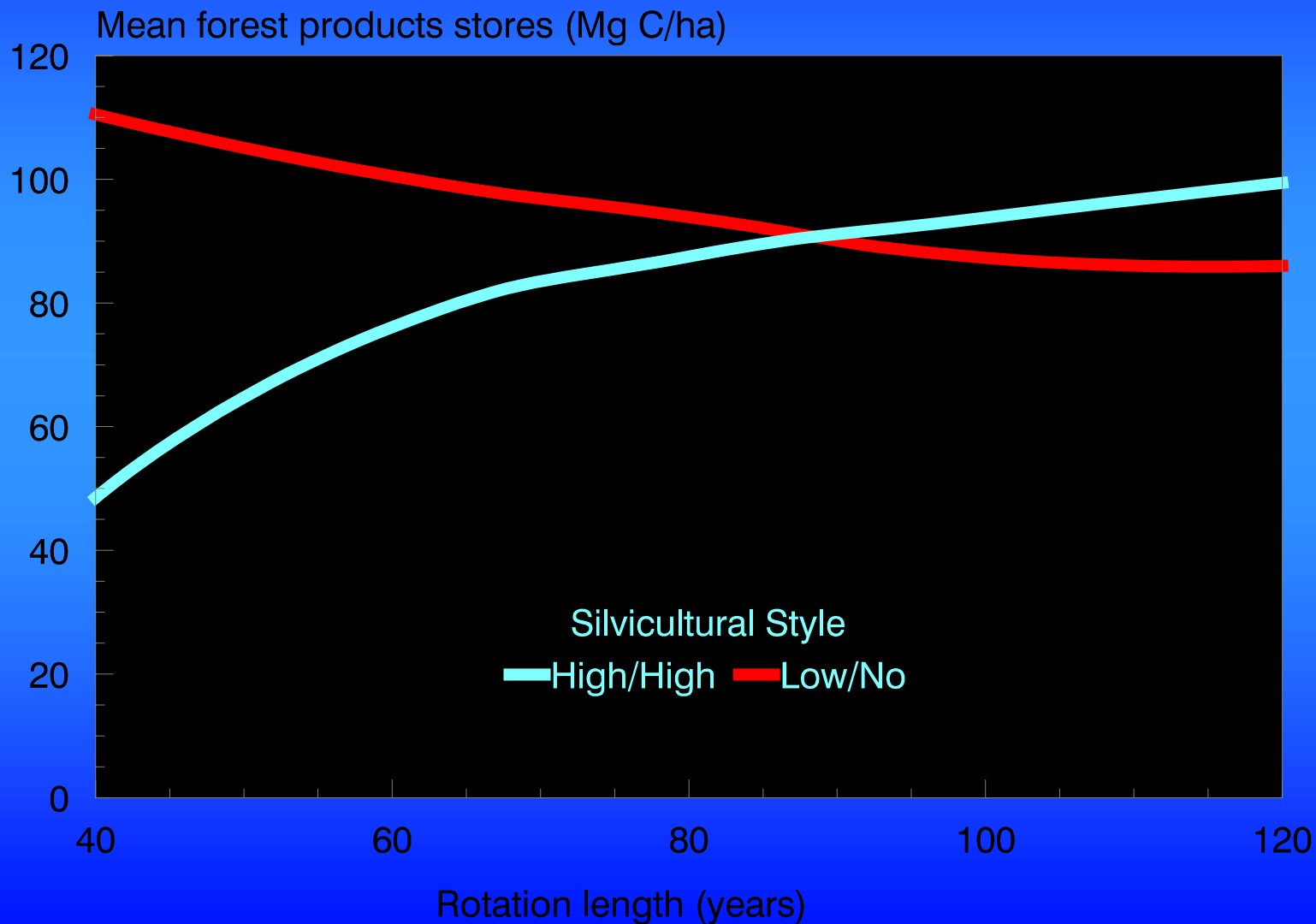
Net Exchange at Landscape Level is the Same



Can We Store More?



Do We Have to Do Without?



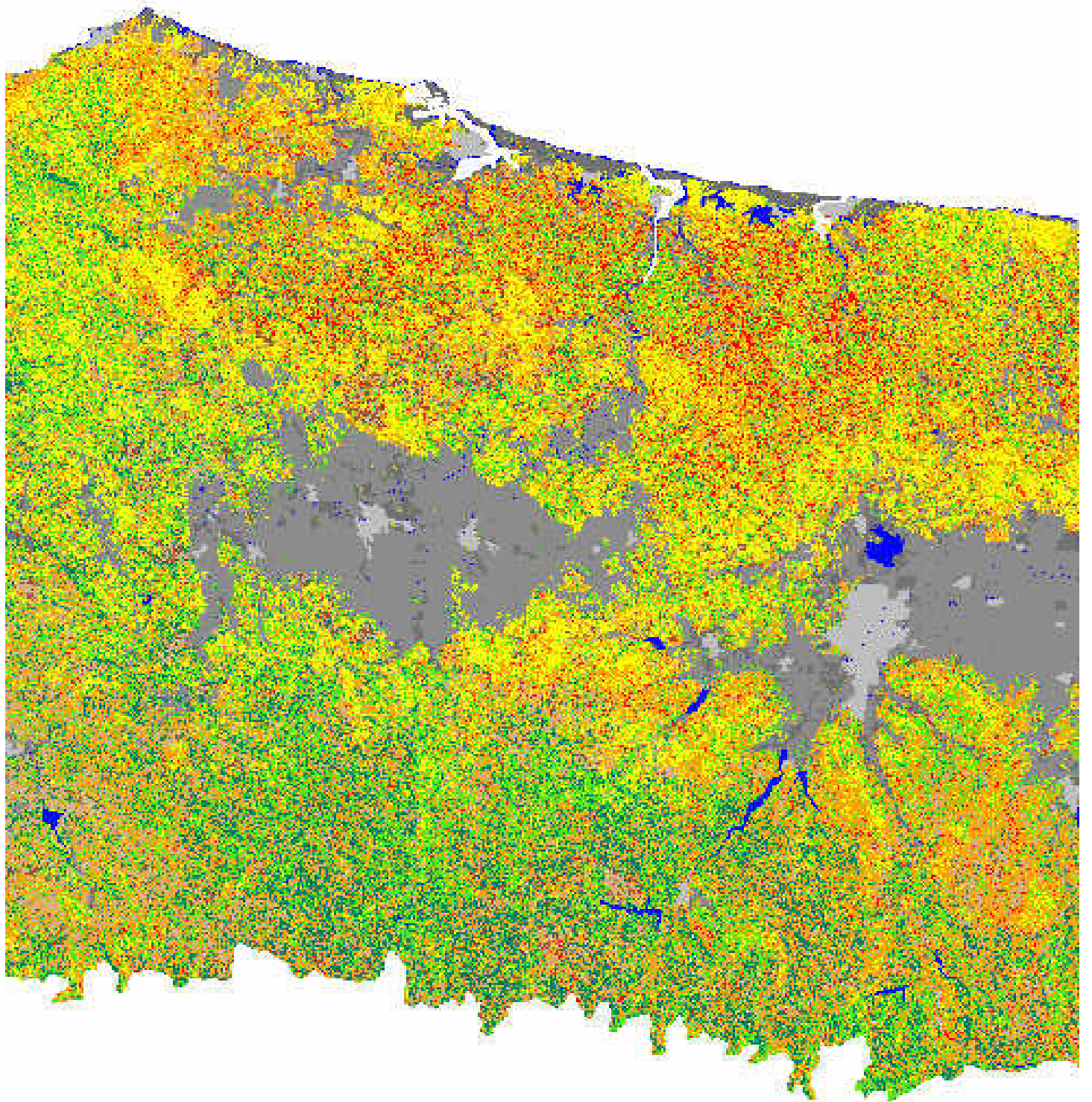
KEY PLAYERS IN FOREST MANAGEMENT

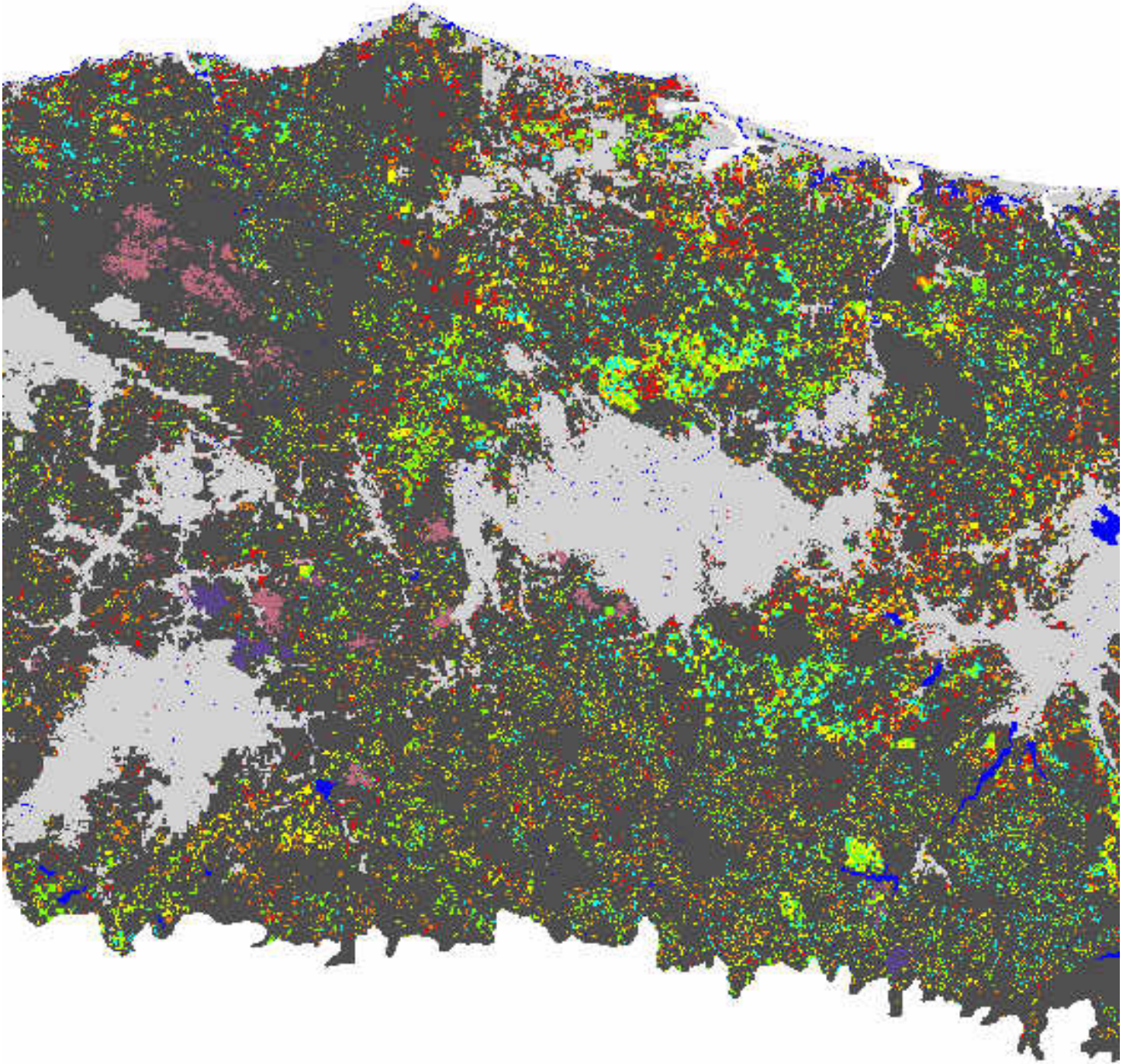
- FOREST OWNERSHIP VARIES
- FEDERAL LANDS -- 41 %
- STATE LANDS--5 %
- INDIAN LANDS--3 %
- NON-INDUSTRIAL--16 %
- INDUSTRIAL--35 %

ECONOMIC INCENTIVES FOR AT LEAST 60 % OF FOREST LANDS

3 Billion tons of Carbon

WHAT IS THE PRIVATE COST
OF STORING CARBON?????



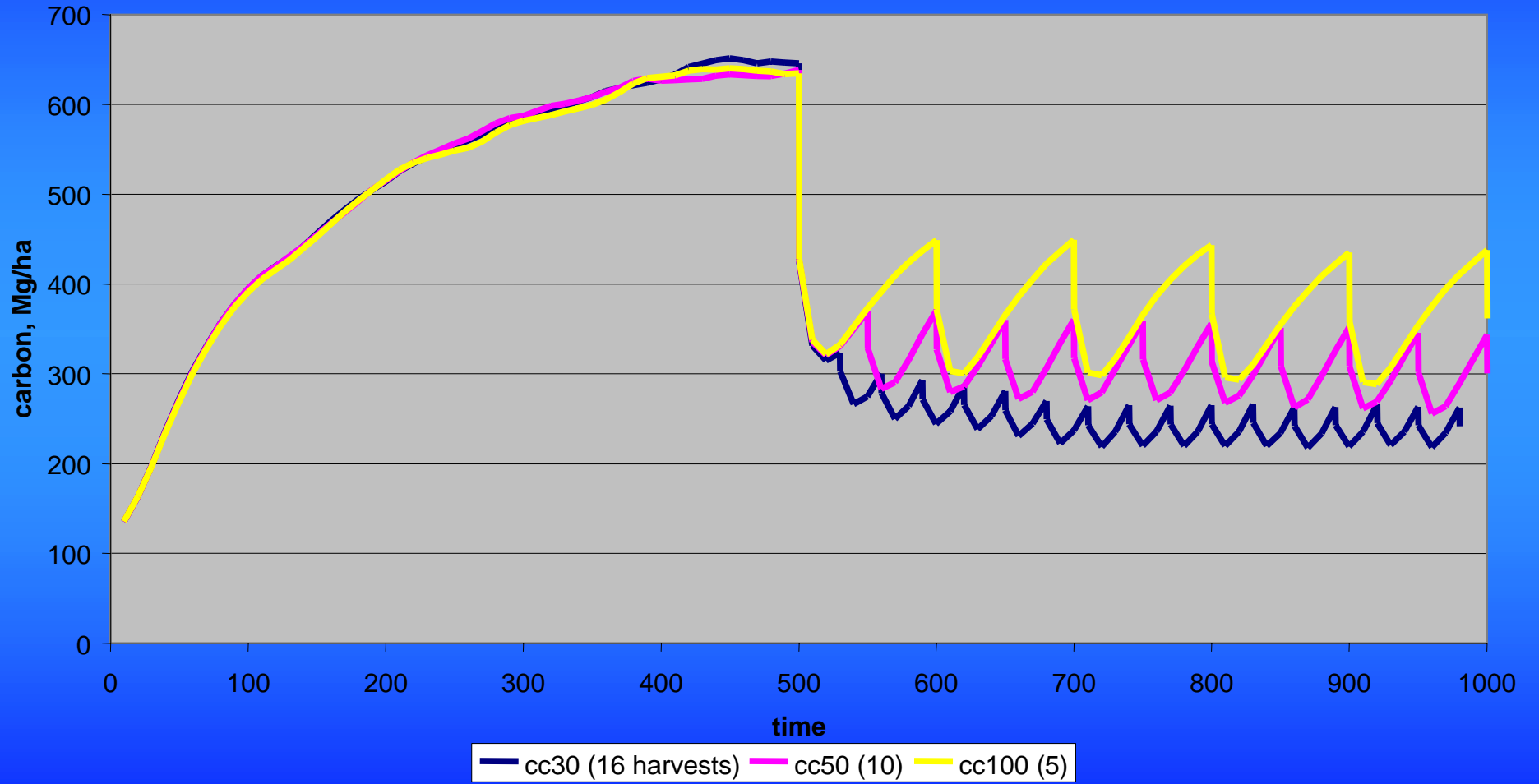


MODELLING APPROACH

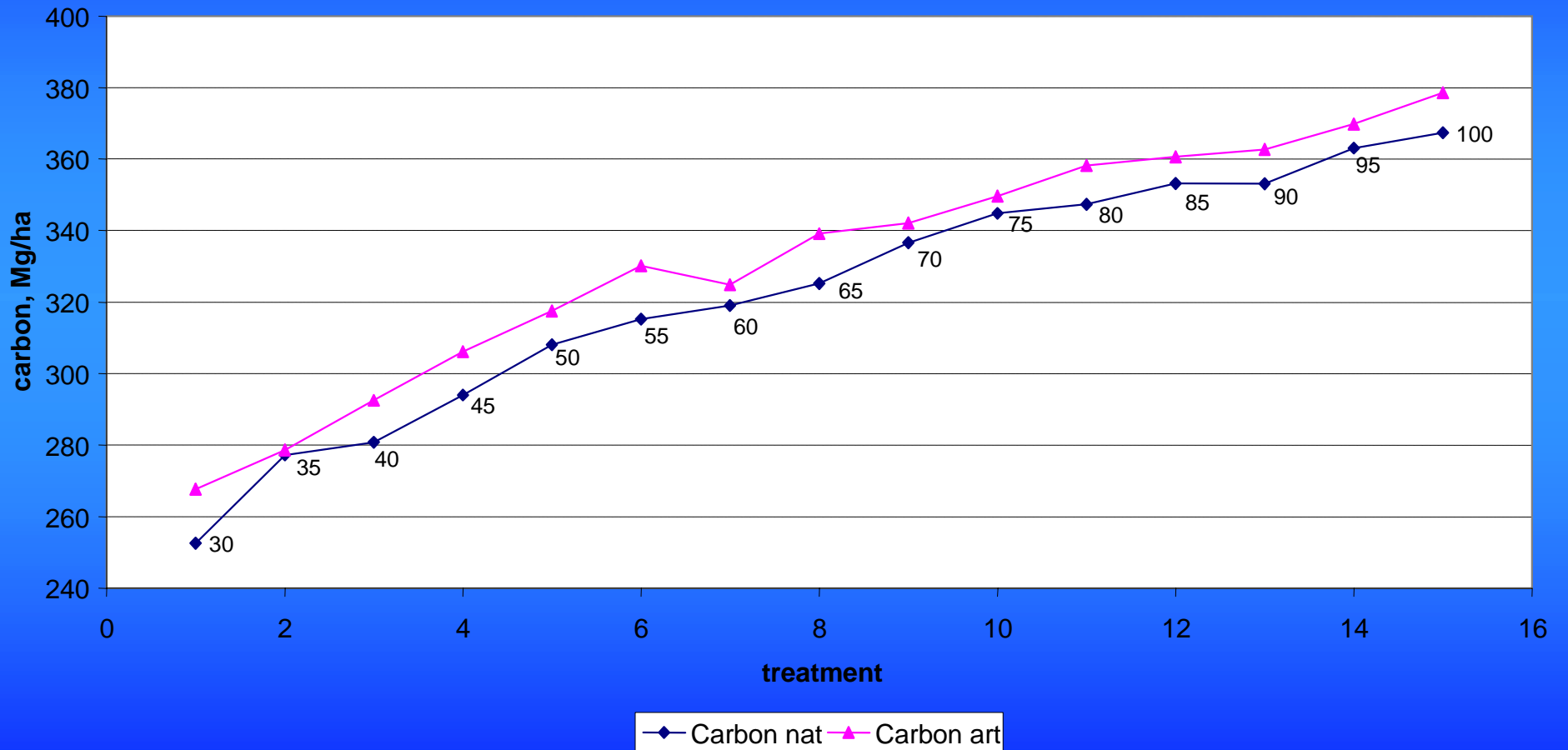
- USE STANDCARB TO SIMULATE OUTPUTS OF FORESTRY PRACTICES
- ESTIMATE NET VALUE OF THESE OUTPUTS IN A TIME SENSITIVE MANNER
- ROTATION LENGTH
- PLANTING
- PRE-COMMERCIAL THINNING
- COMMERCIAL THINNING
- HIGH INTENSITY OR LOW INTENSITY

SOME EARLY RESULTS

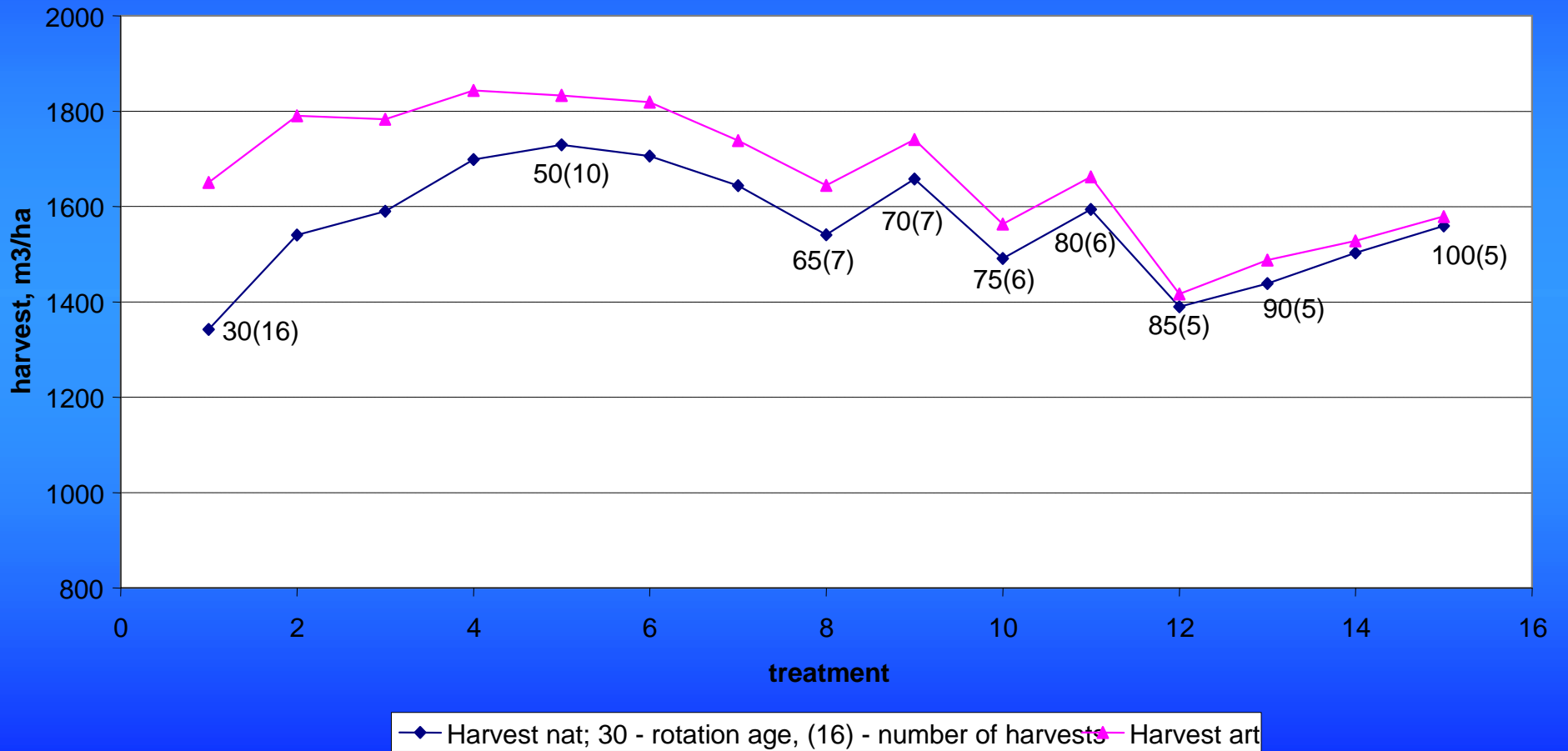
Total Carbon from Cc30, 50, 100 (no planting)



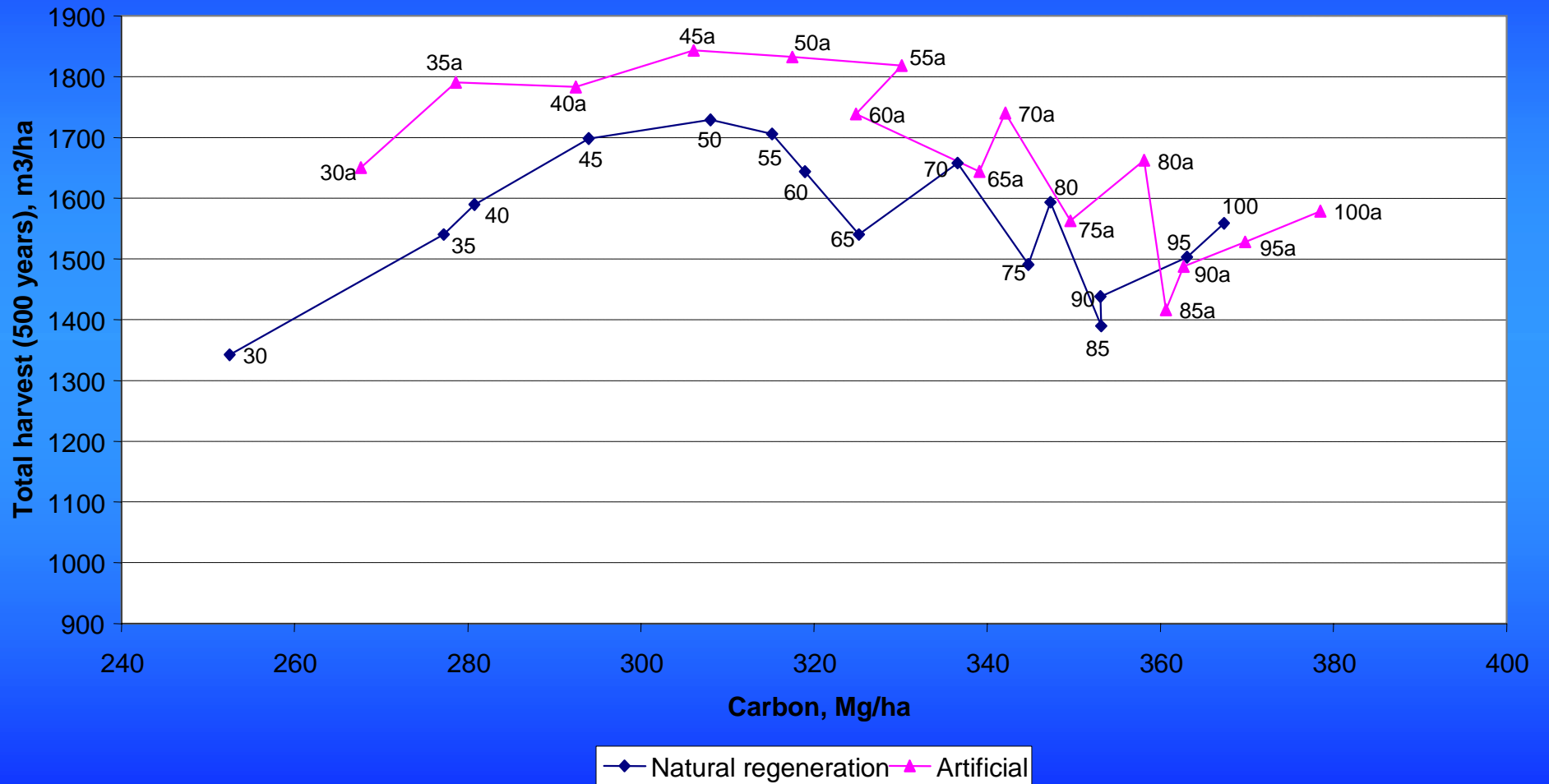
Average carbon for rotations 30 through 100 with natural and artificial regeneration



Total harvest for rotations 30 through 100 over period of 500 years



Carbon and Harvest



EARLY CONCLUSIONS

- PLANTING CAN INCREASE BOTH HARVEST AND CARBON, BUT IS IT PROFITABLE?
- AT LONG ROTATIONS, PROBABLY NOT.
- AT LONGER ROTATION HARVEST MUST BE GIVEN UP TO OBTAIN MORE CARBON STORAGE
- TREATMENT OF TERMINAL VALUES IMPORTANT

STILL TO DO

- DETAILS,
DETAILS....
- SENSITIVITY TO
MANAGEMENT
COST
PARAMETERS
- FOCUS ON ONLY
PROFITABLE
TYPES OF
MANAGEMENT
- *THORNY
PROBLEMS.....*
- *RATES OF TIME
PREFERENCE FOR
FOREST OWNERS*
- *WHAT DO
PRIVATE NON-
INDUSTRIAL
OWNERS WANT?*