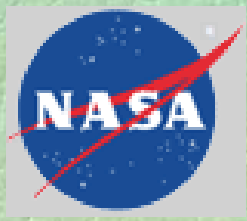


Driving Forces of Change in Regional Carbon Stocks:

Comparison of the Western Oregon, USA and St. Petersburg Region, Russia

PI: Olga N. Krankina

Department of Forest Science, Oregon State University

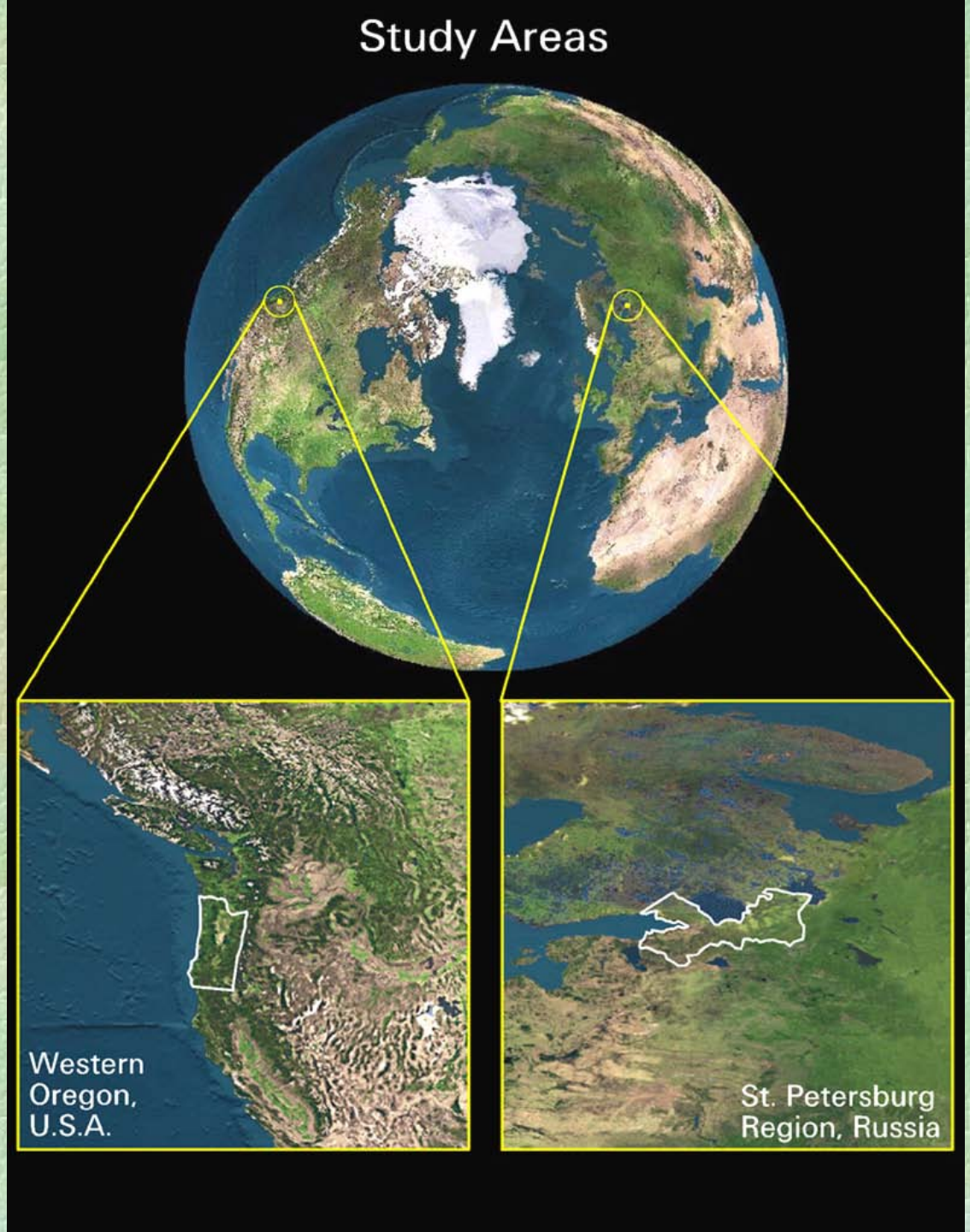
Co-Principal Investigators: Mark E. Harmon (OSU);

Warren B. Cohen, Ralph Alig (USDA Forest Service)

http://www.cof.orst.edu/cof/fs/faculty/krankina.htm

Timber harvest
million m^3
1988……23.4
1993……13.6

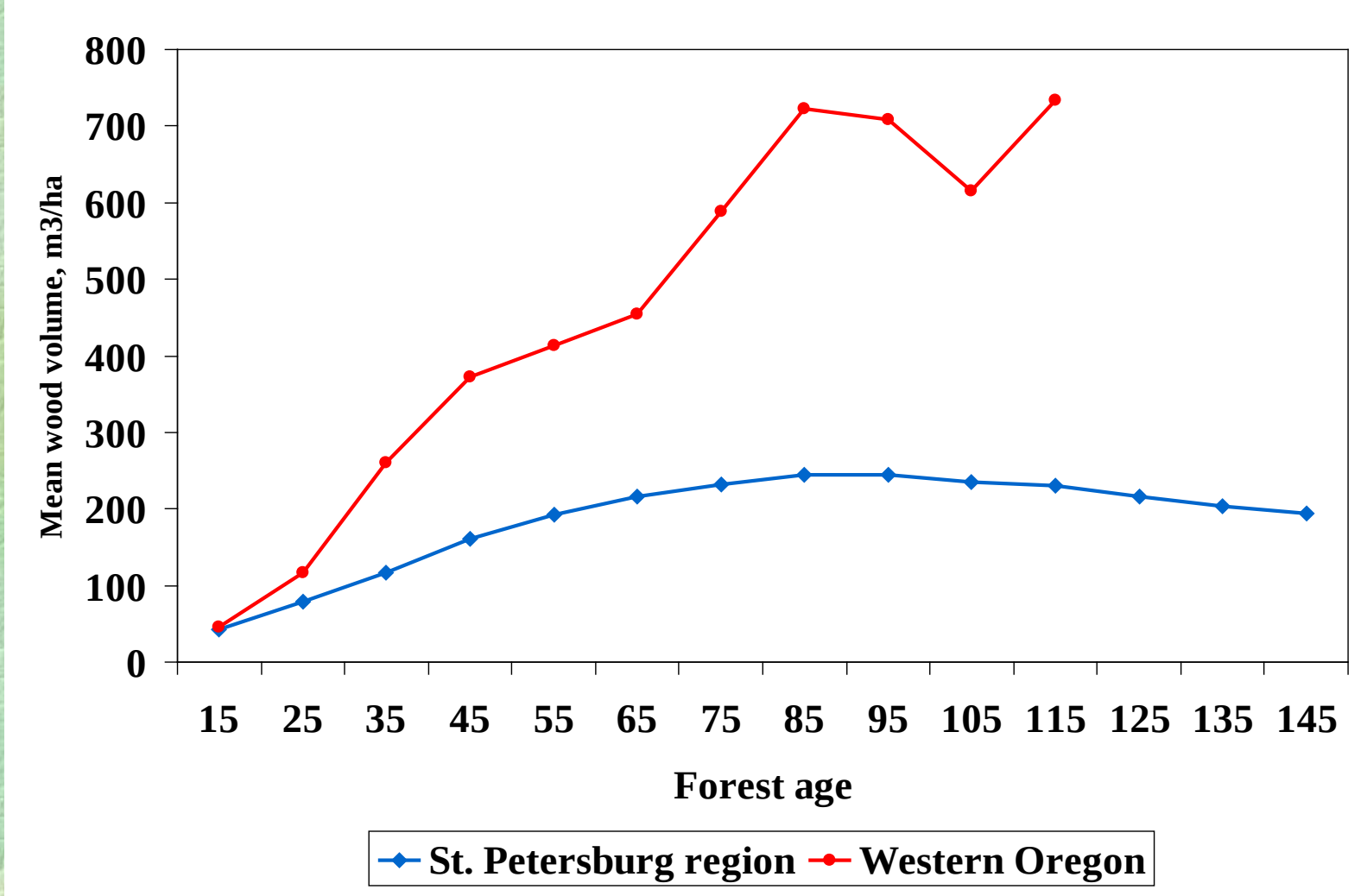
7.6 million ha



Timber harvest
million m^3
1988…….6.1
1993…….3.8

8.5 million ha

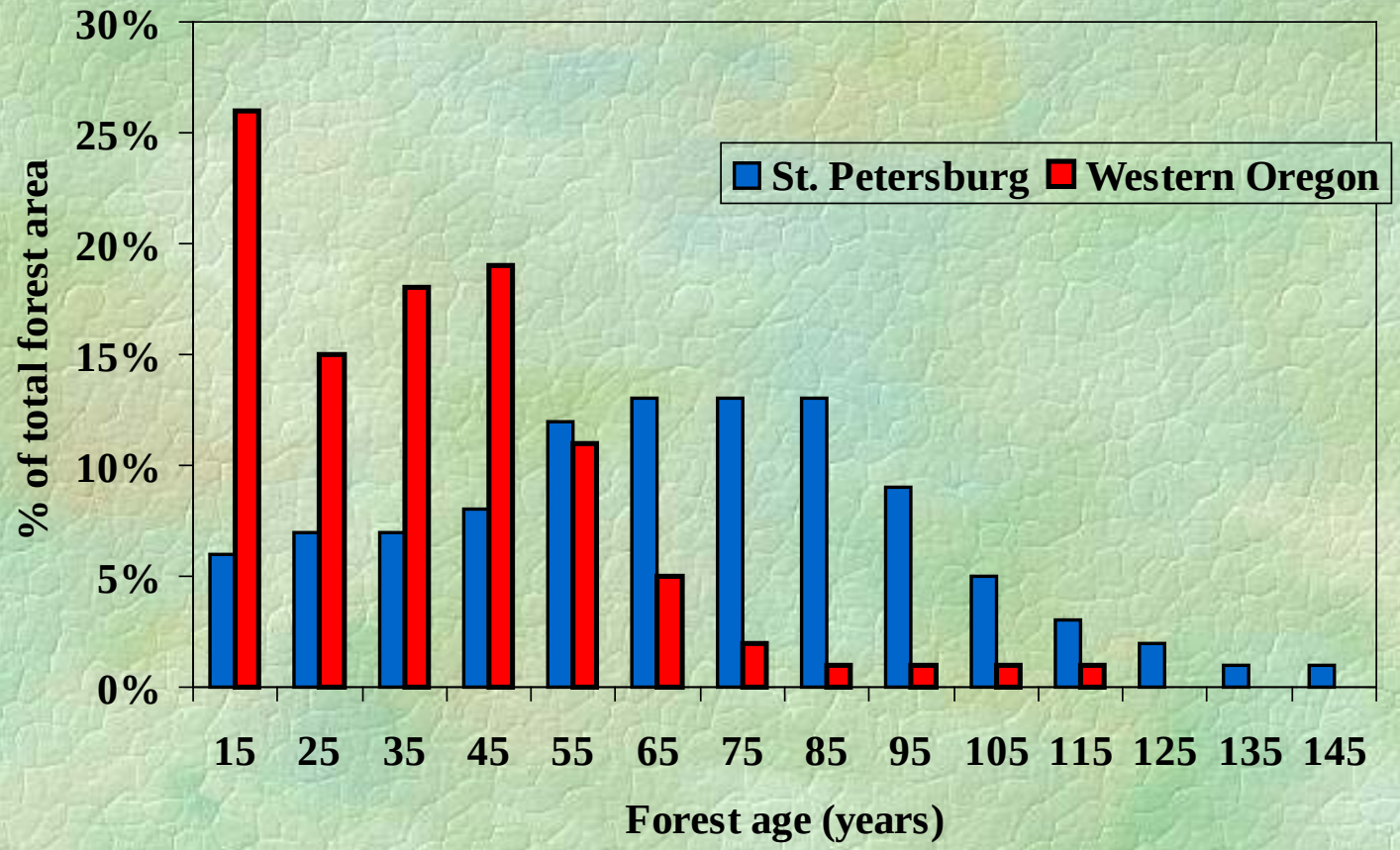
Wood volume in forest of different ages



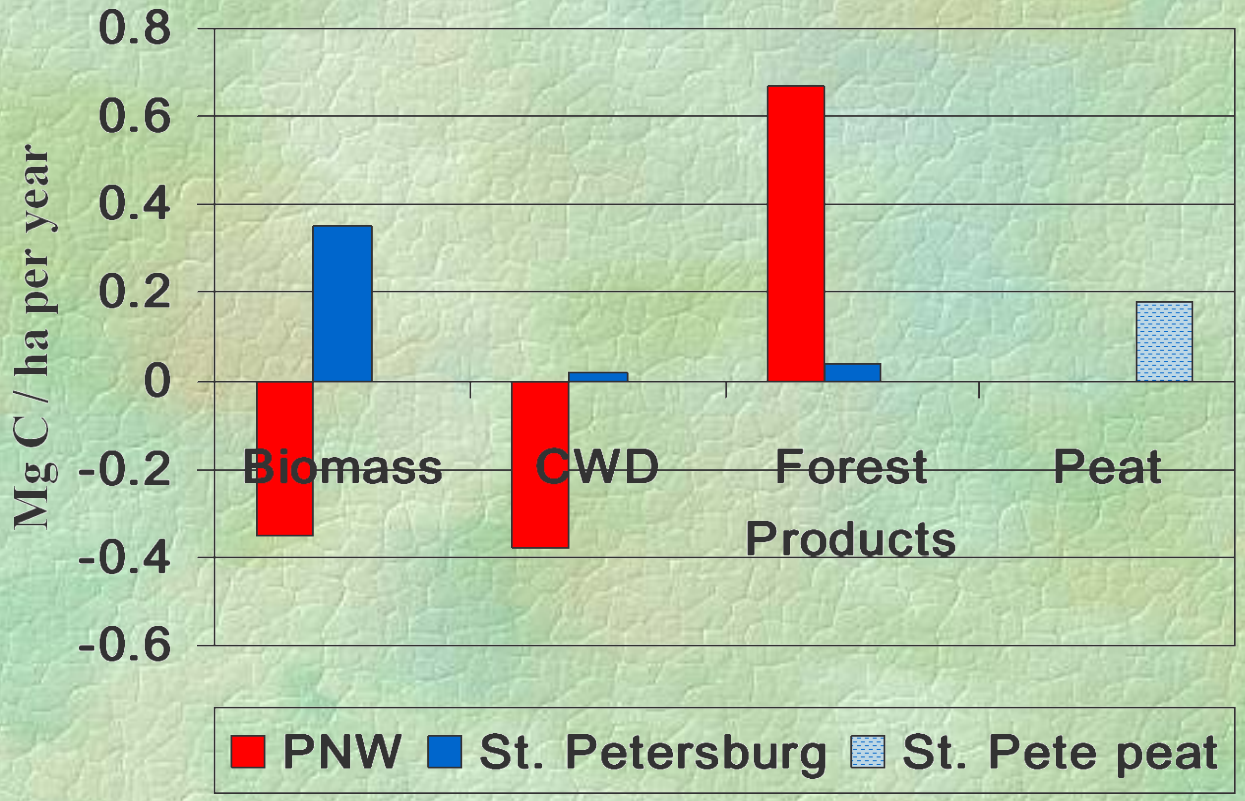
Old Douglas fir in the PNW

Scots Pine in NW Russia

Distribution of forest lands by age classes in early 1990's



Net change in C stores between 1970's and 1990's

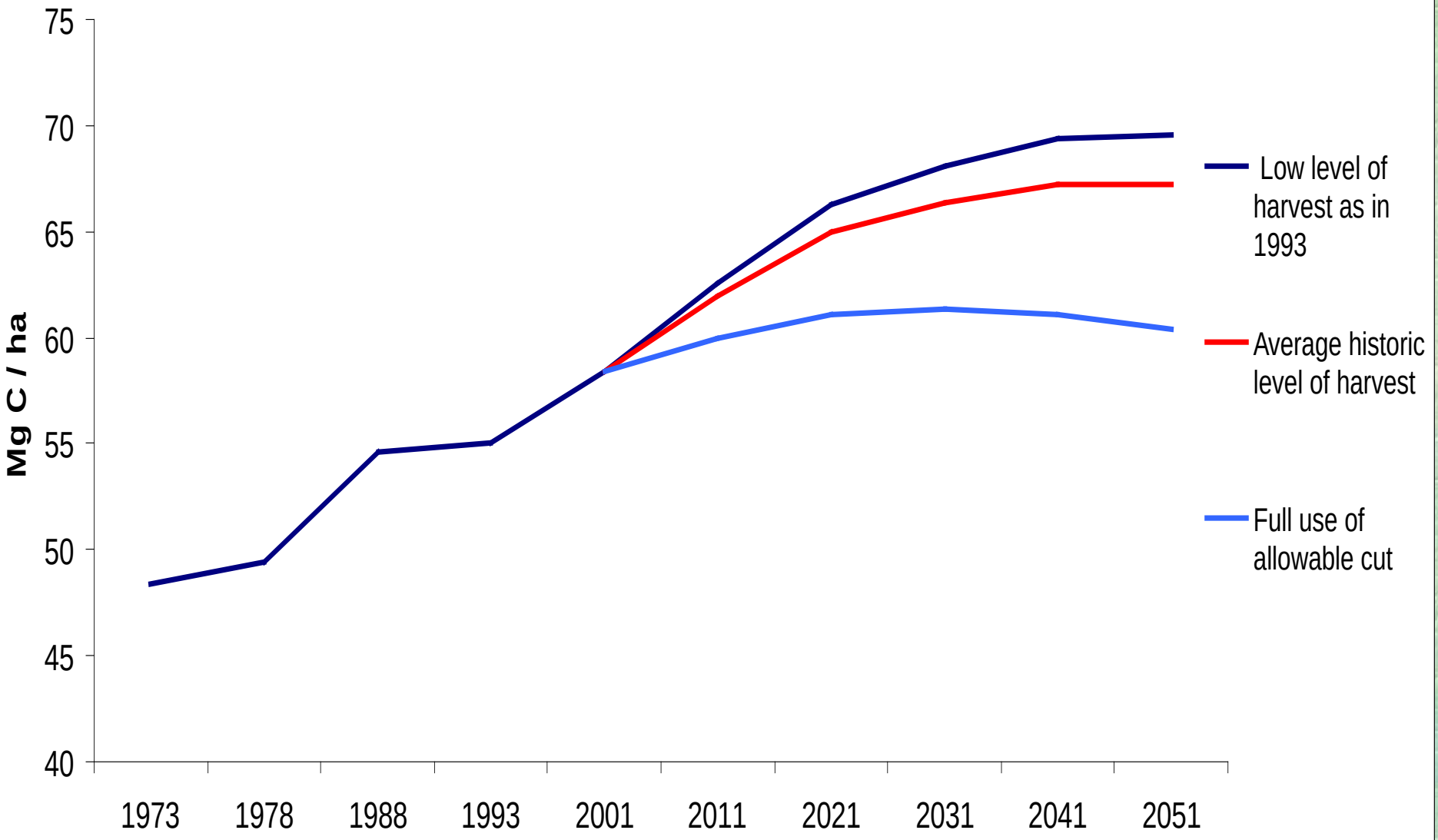


PNW –
small source of C:
0.58 Tg C per year

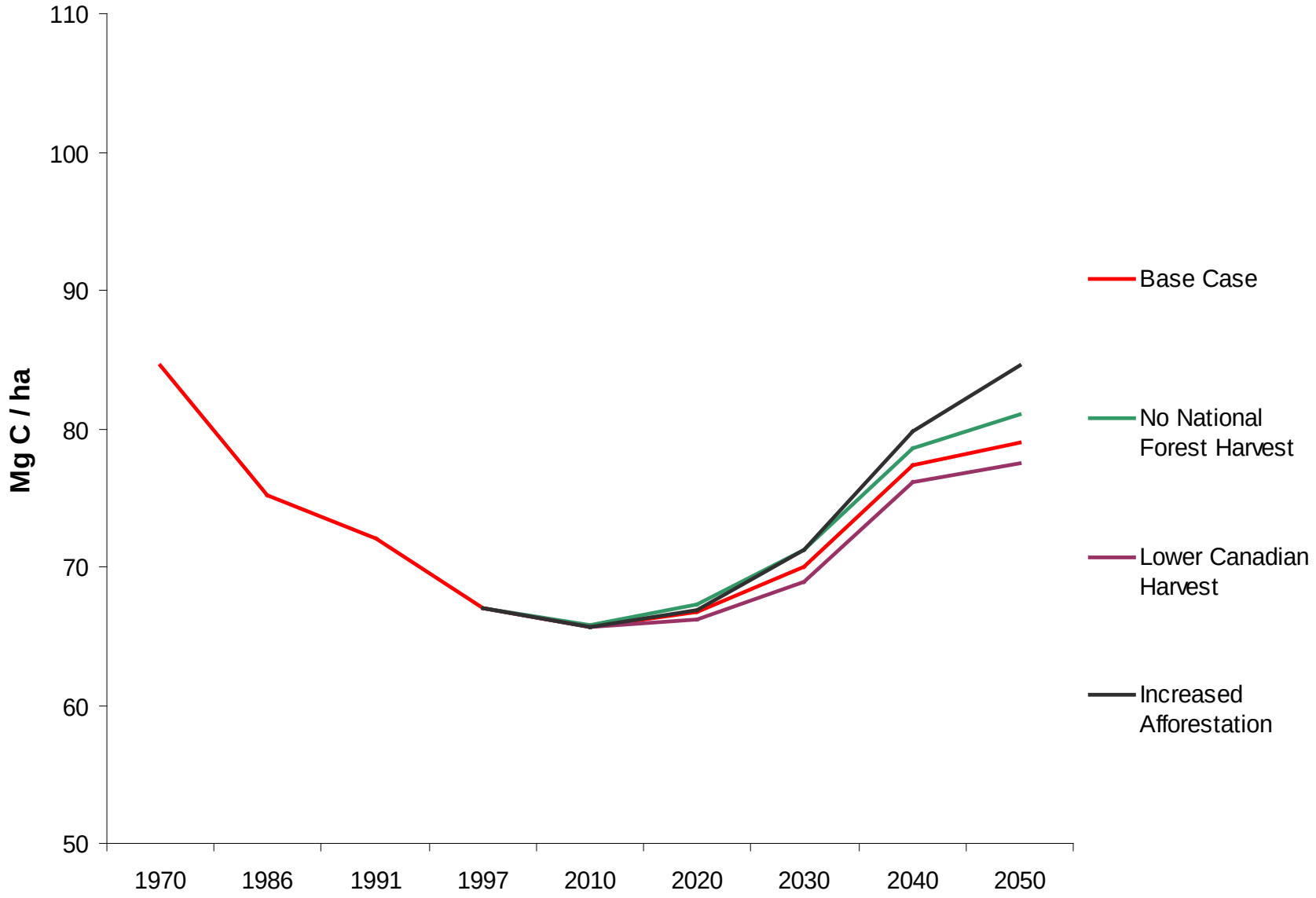
NW Russia –
active sink:
2.05 Tg C per year

Historic Change and Future Projections of Carbon Stores in Live Forest Biomass:

St. Petersburg Region

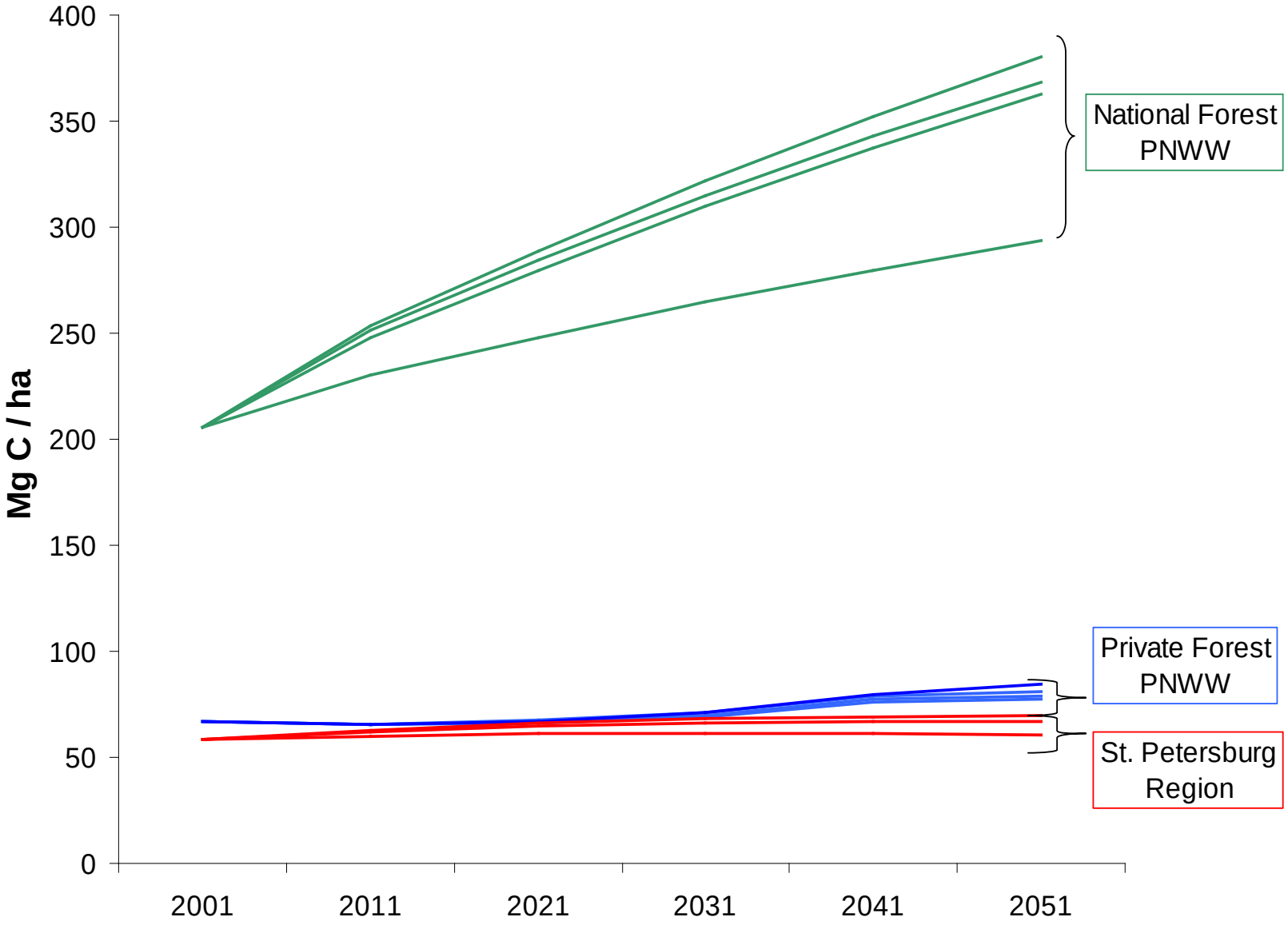


Historic Change and Future Projections of Carbon Stores in Live Forest Biomass: Pacific Northwest, Private Forests

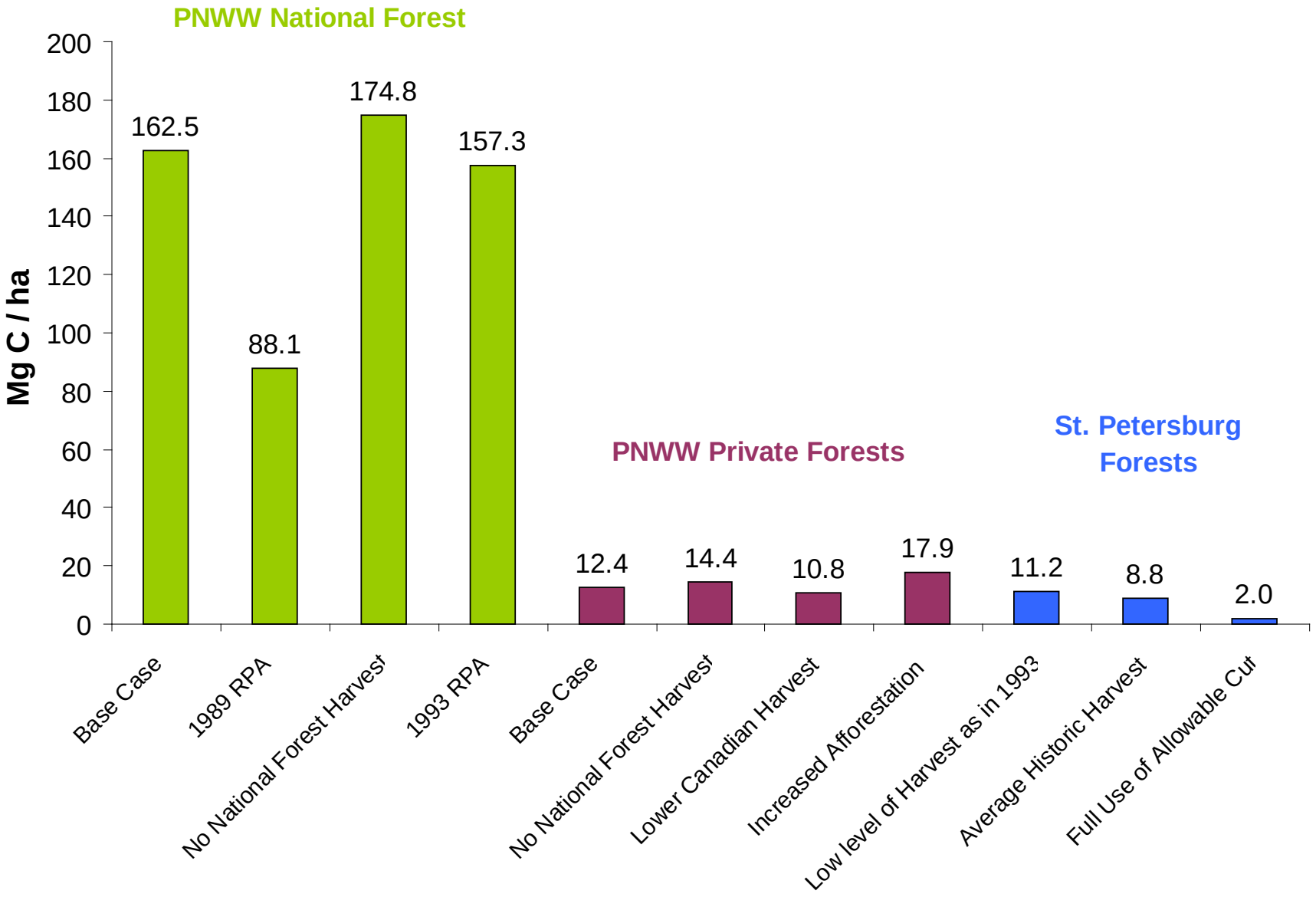


Historic Change and Future Projections of Carbon Stores in Live Forest Biomass: Pacific Northwest, National Forests

Projected Future Change in Carbon Stores

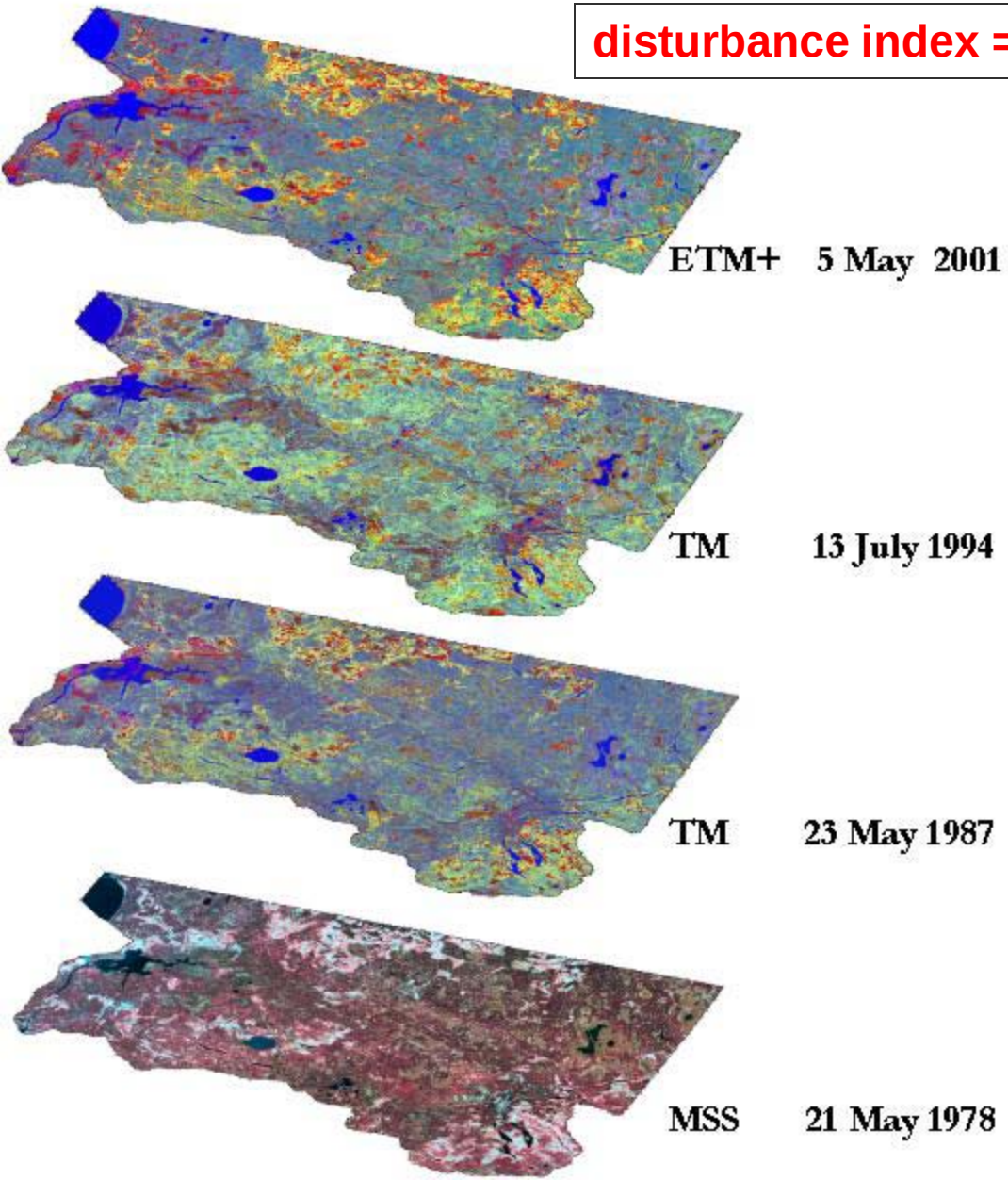


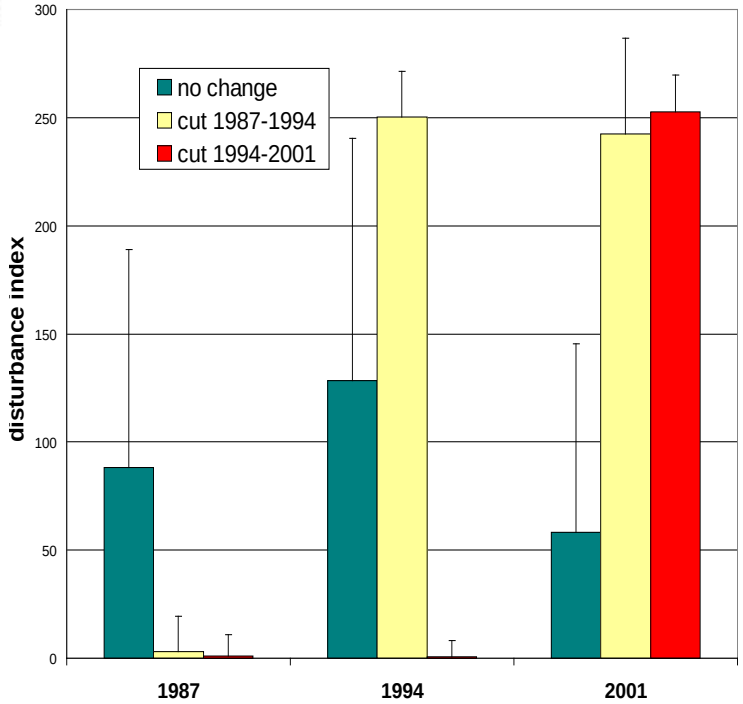
Net Change in Forest Biomass Carbon from 2001 to 2051

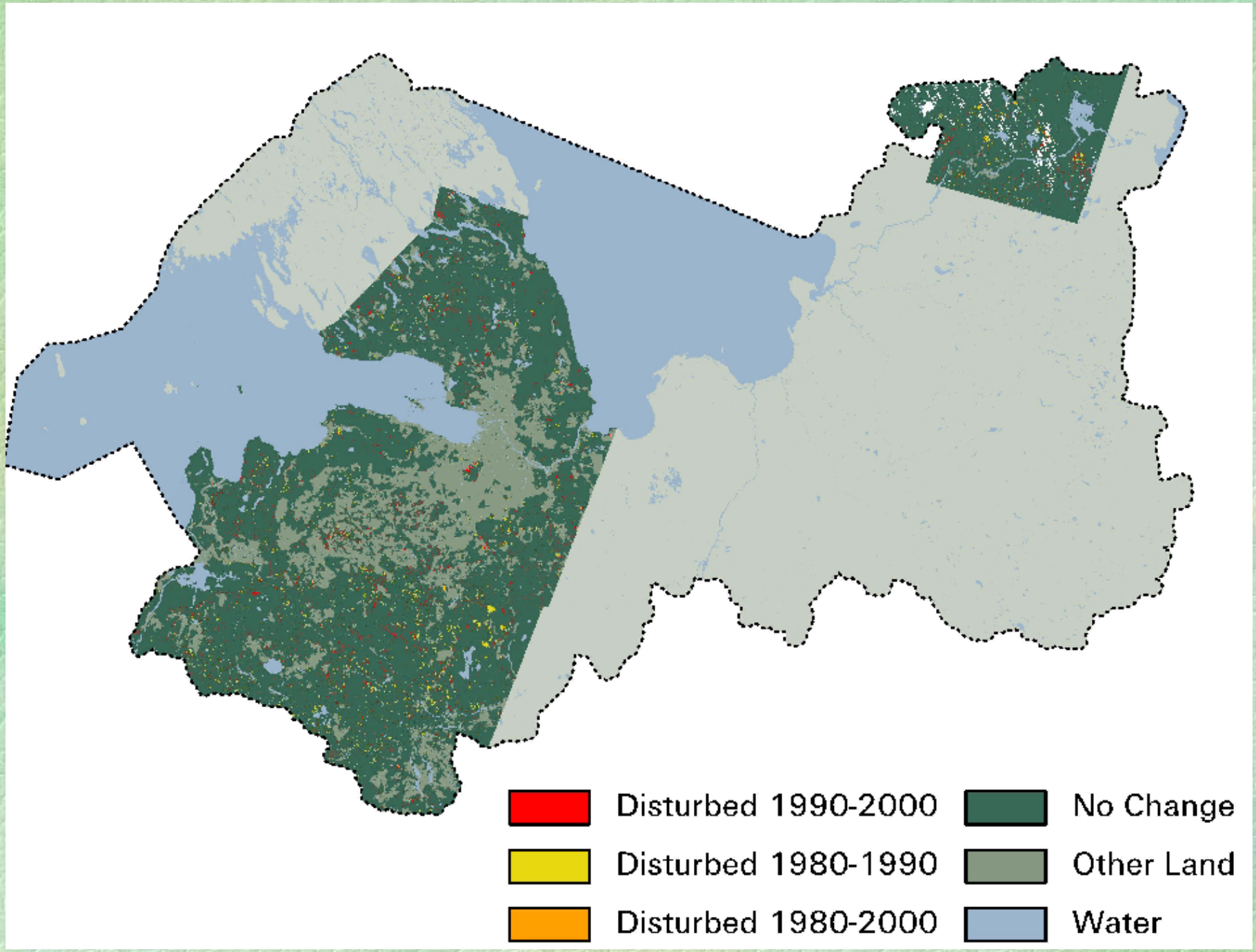


Landsat imagery (path 185 row 19) used in change detection

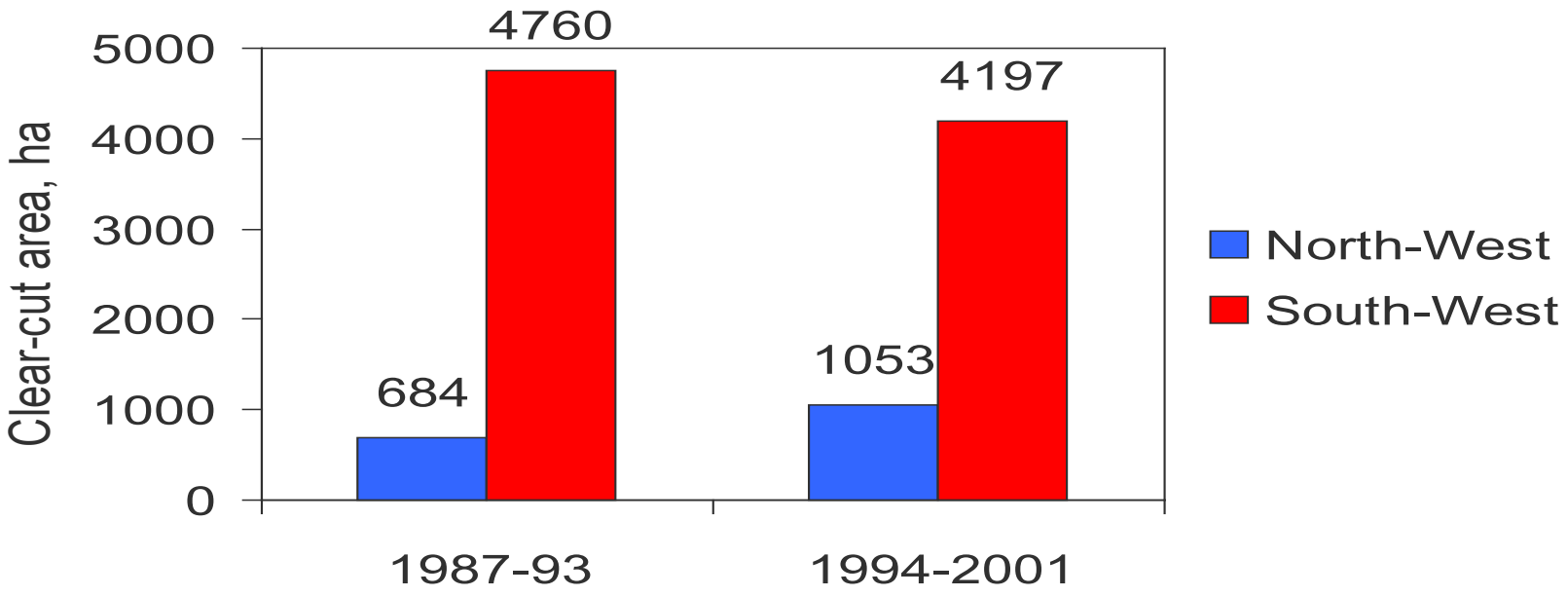
disturbance index = brightness - (greenness + wetness)



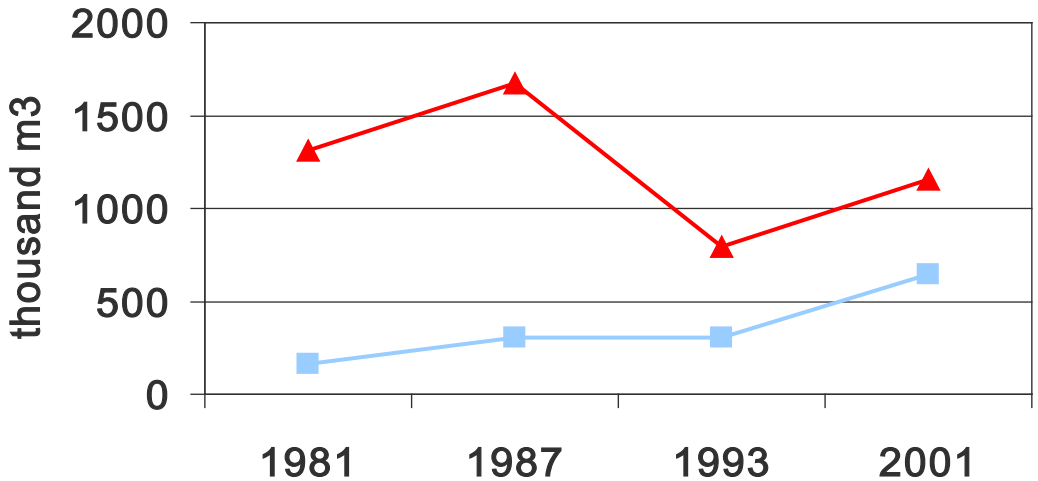


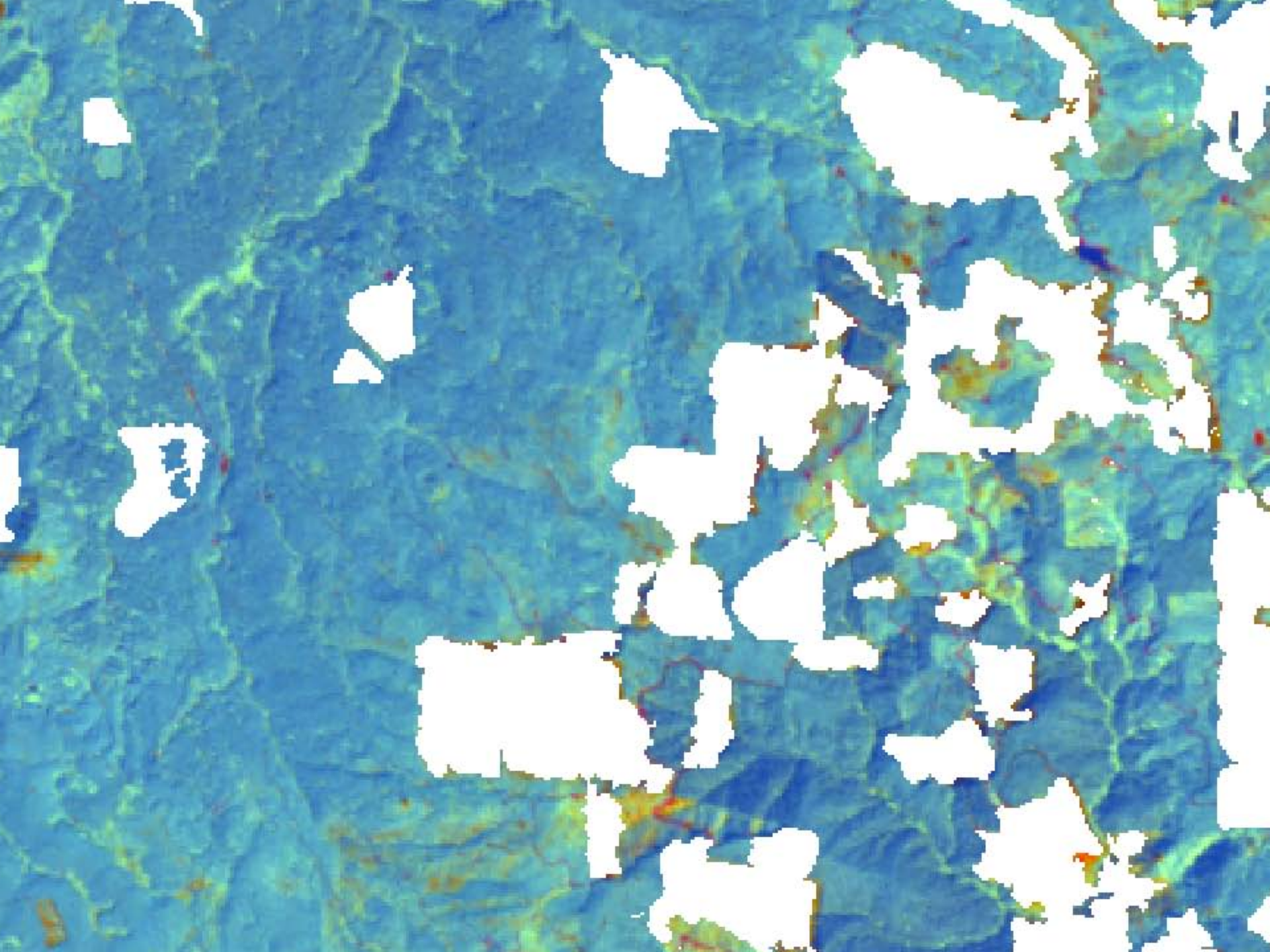

Disturbed 1990-2000
Disturbed 1980-1990
Disturbed 1980-2000
No Change
Other Land
Water

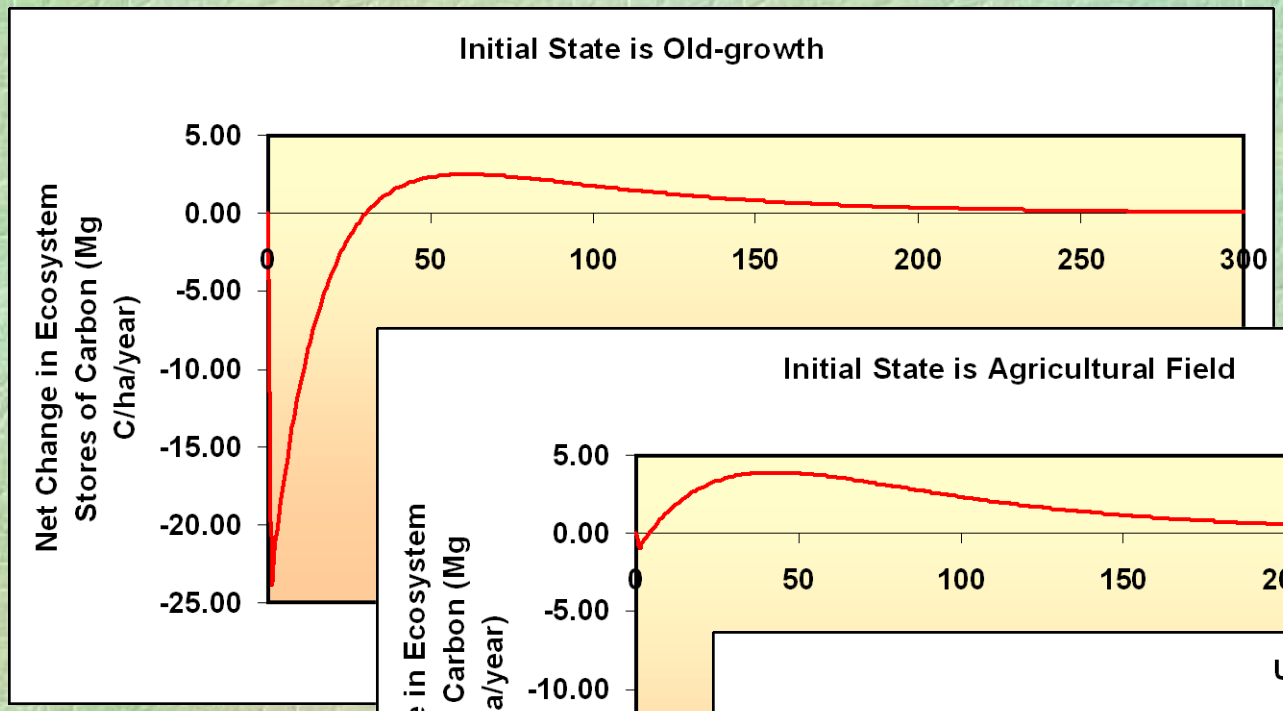
Change detection

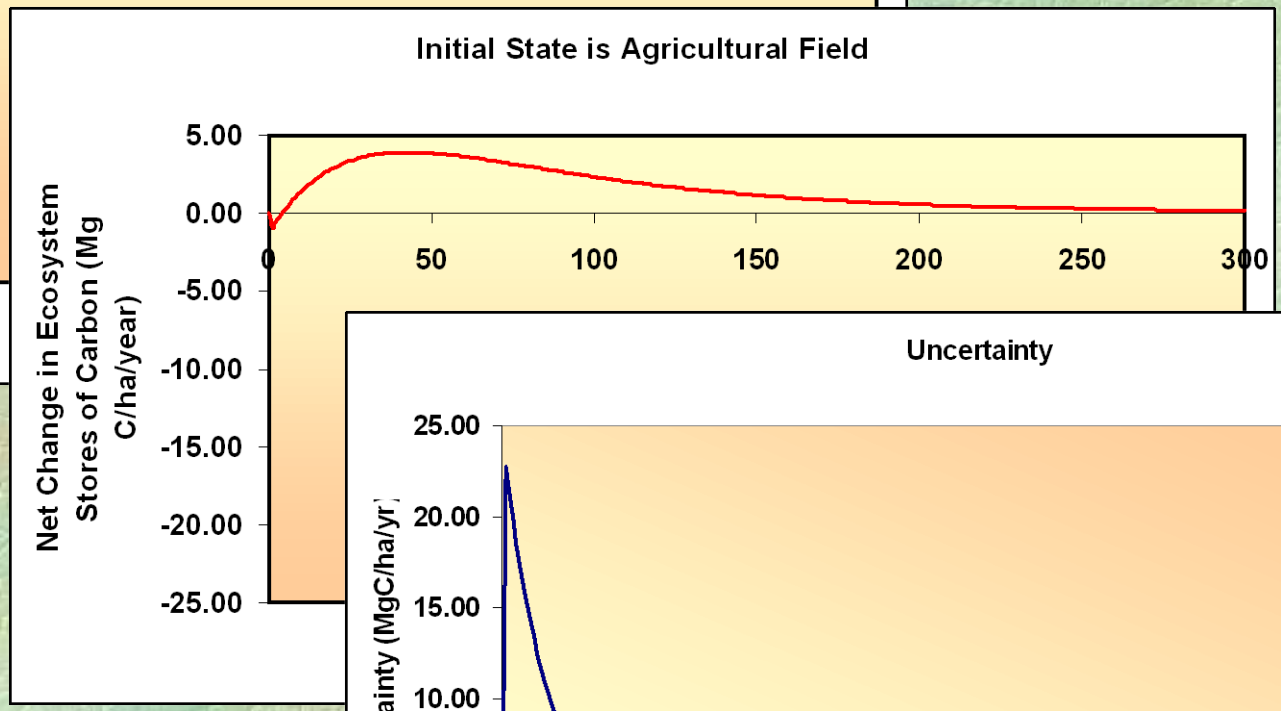


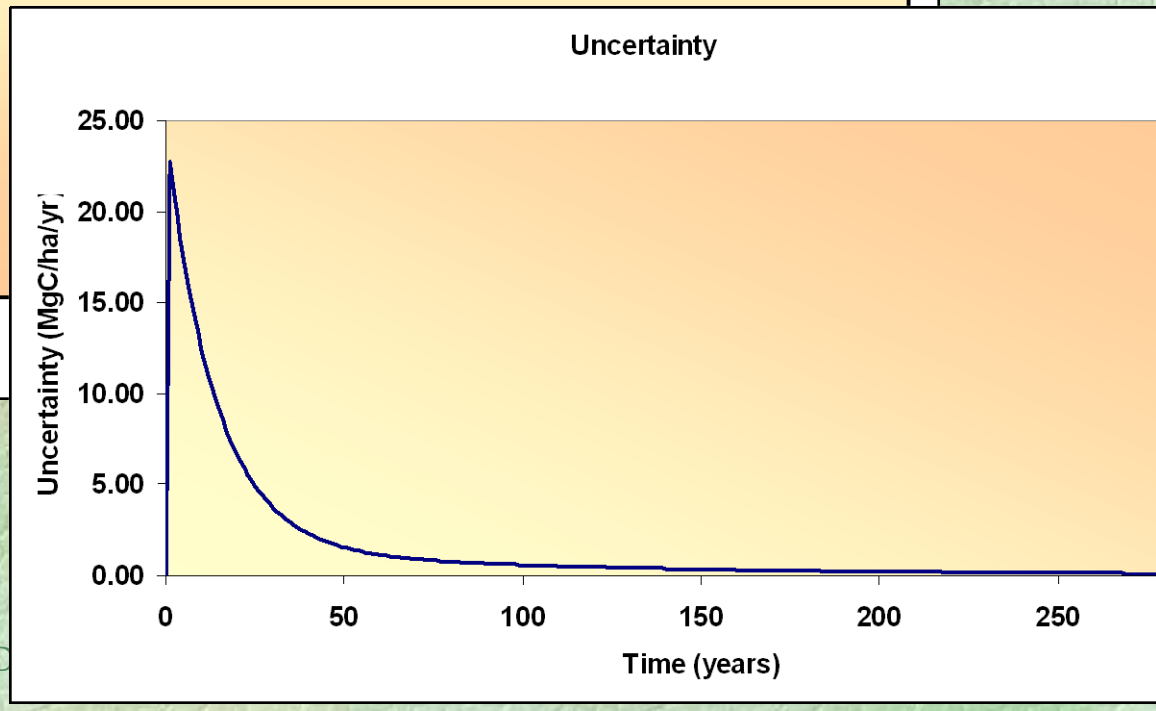
Timber harvest statistics

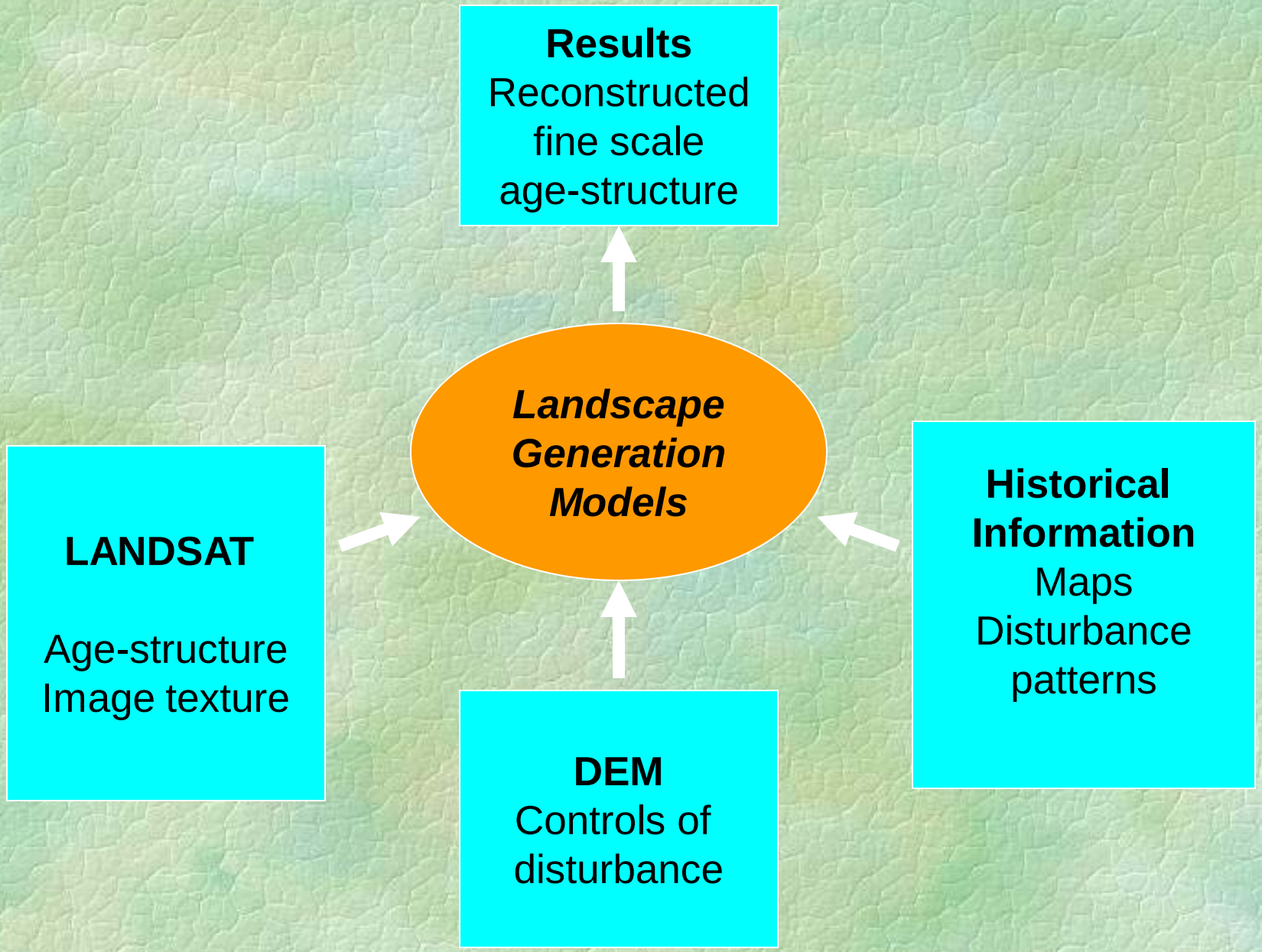




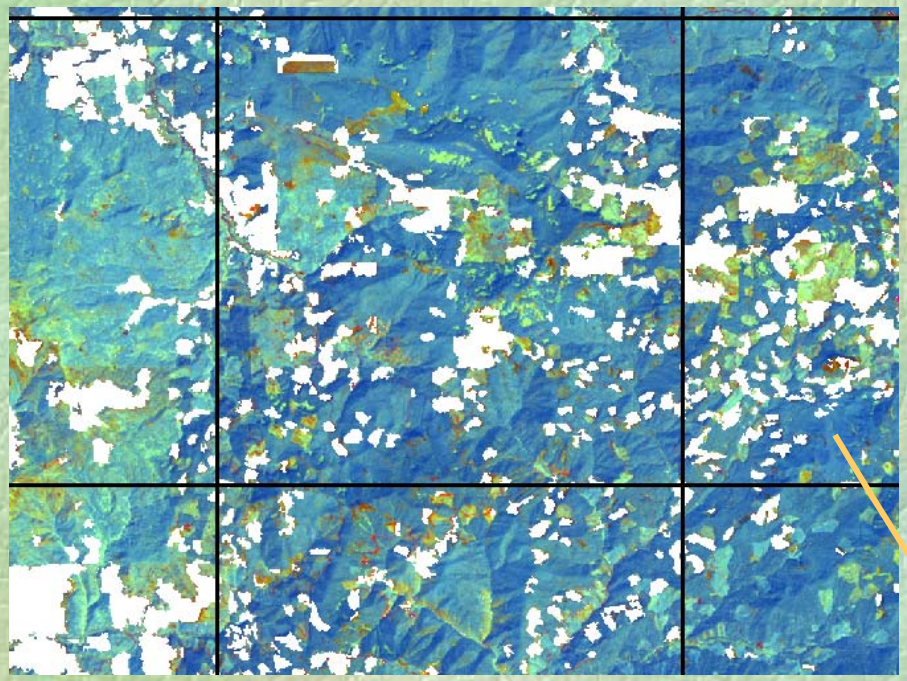

Initial State is Old-growth
Net Change in Ecosystem Stores of Carbon (Mg C/ha/year)
5.00
0.00
-5.00
-10.00
-15.00
-20.00
-25.00
0
50
100
150
200
250
300


Initial State is Agricultural Field
Net Change in Ecosystem Stores of Carbon (Mg C/ha/year)
5.00
0.00
-5.00
-10.00
-15.00
-20.00
-25.00
0
50
100
150
200
250
300


Uncertainty
Uncertainty (MgC/ha/yr)
25.00
20.00
15.00
10.00
5.00
0.00
0
50
100
150
200
250
Time (years)


Results
Reconstructed fine scale age-structure
Landscape Generation Models
LANDSAT
Age-structure
Image texture
Historical Information
Maps
Disturbance patterns
DEM
Controls of disturbance

Simplified Markov Random Field Landscape Synthesis



12.8 x 12.8 km blocks in Tasseled Cap source image

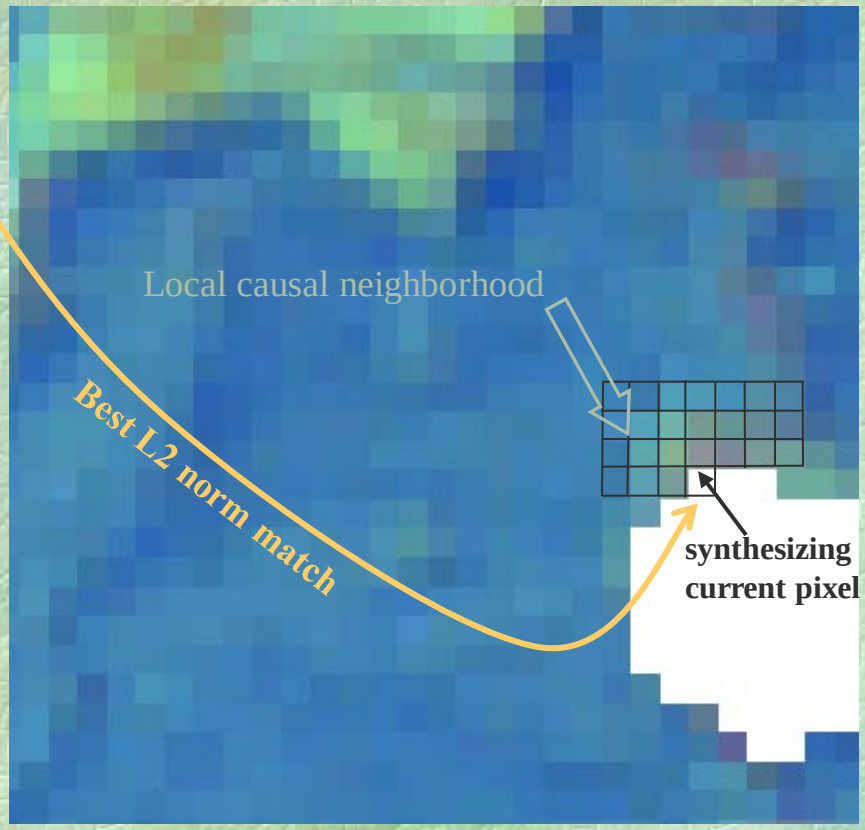
Search source image for pixel satisfying :

$$\underset{B}{MIN}\left(\sum_{N}\sum_{l}(src-dst)^2\right)$$

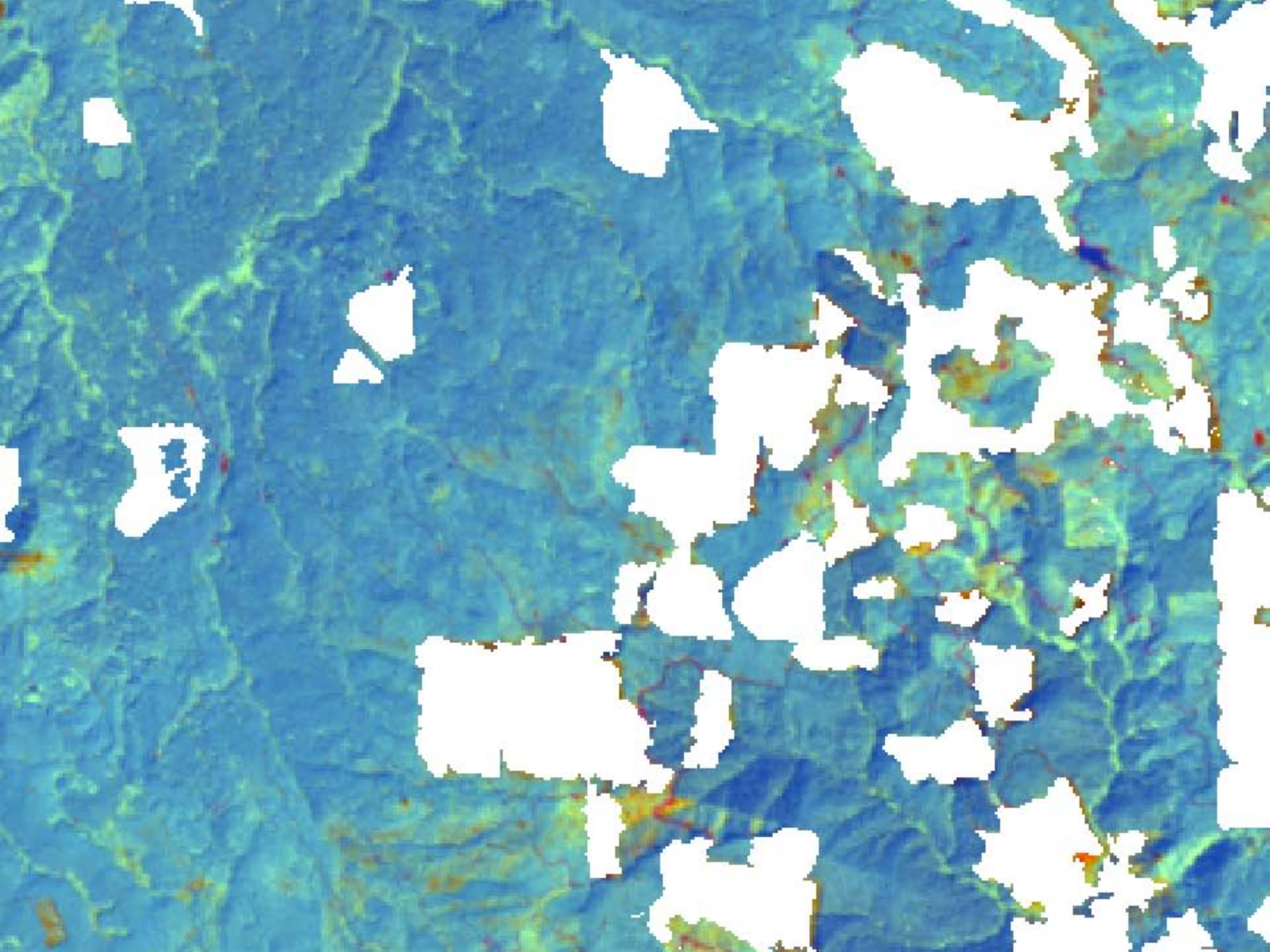
B is the current block

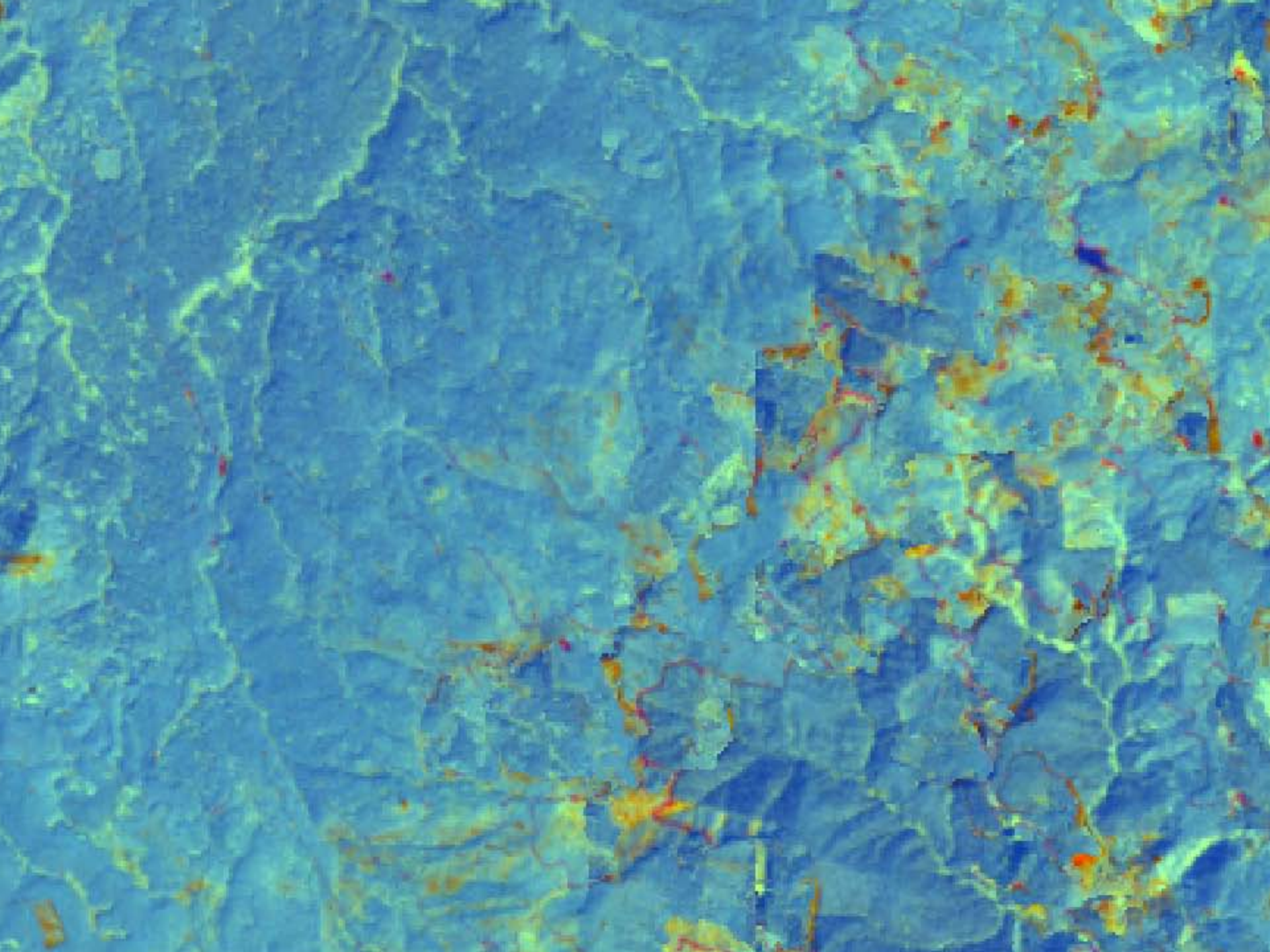
N is the local causal neighborhood

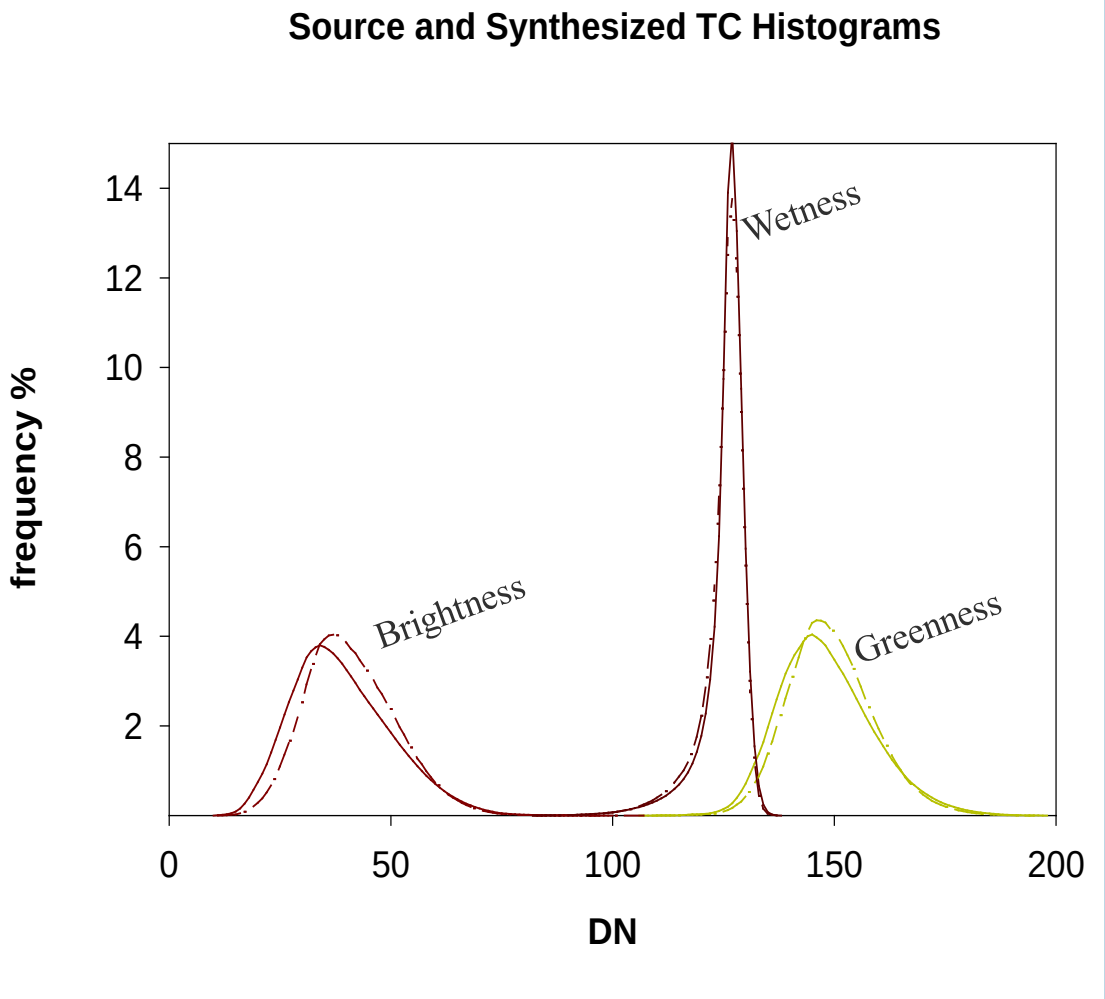
and *l* is the layer depth



Close-up of current block in resultant image





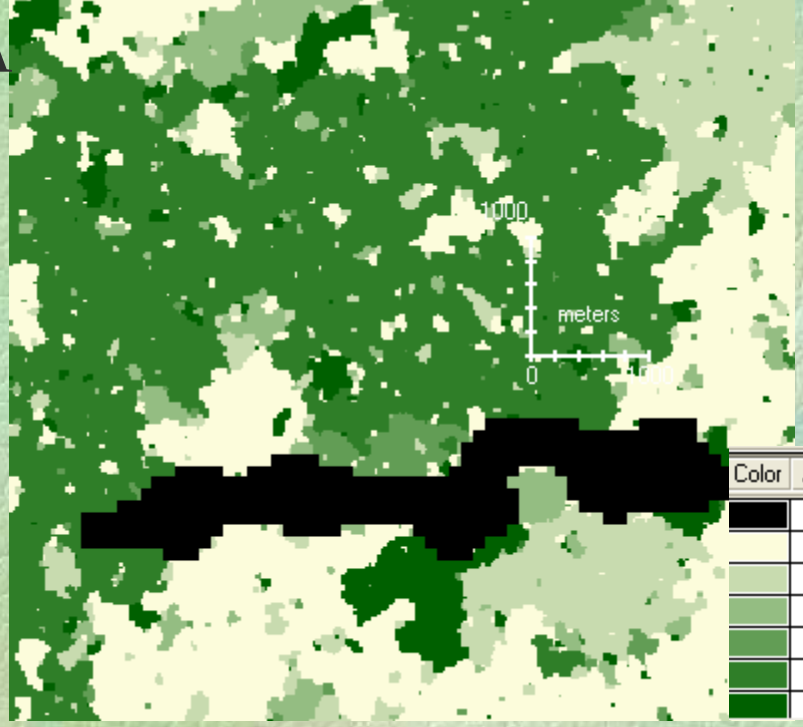


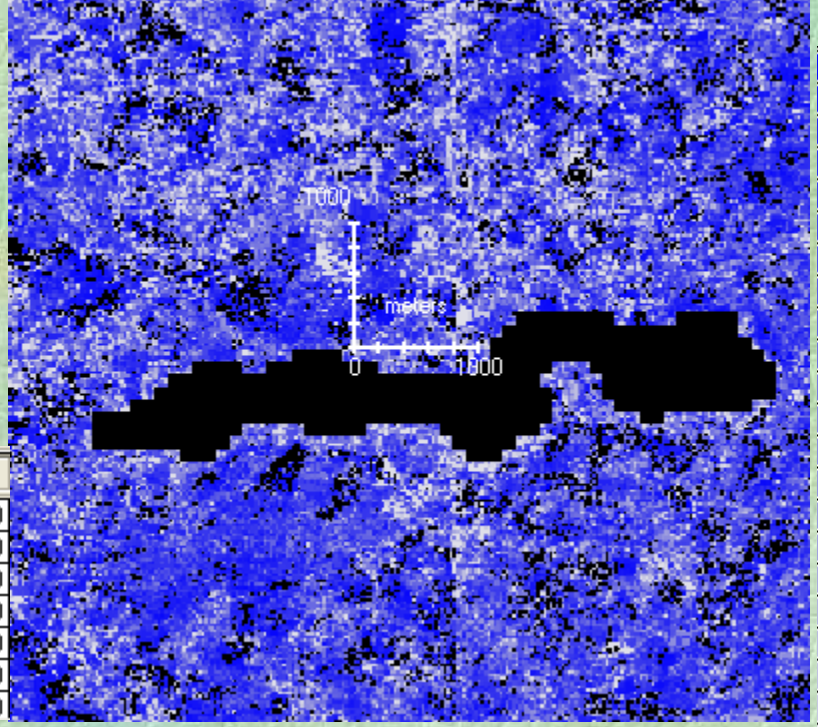
Holes: solid line

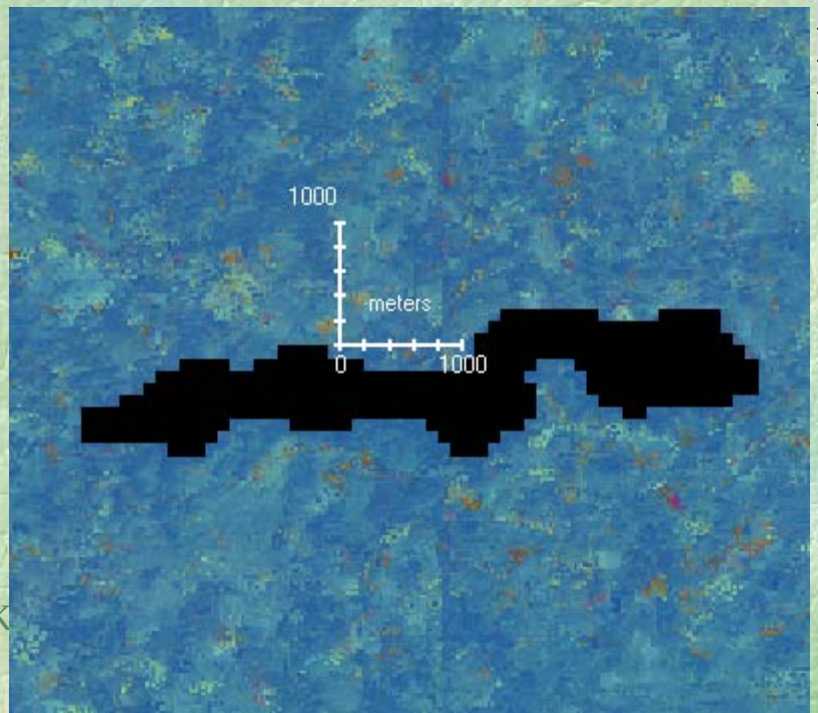
Surroundings: dashed line

Correlations between bands

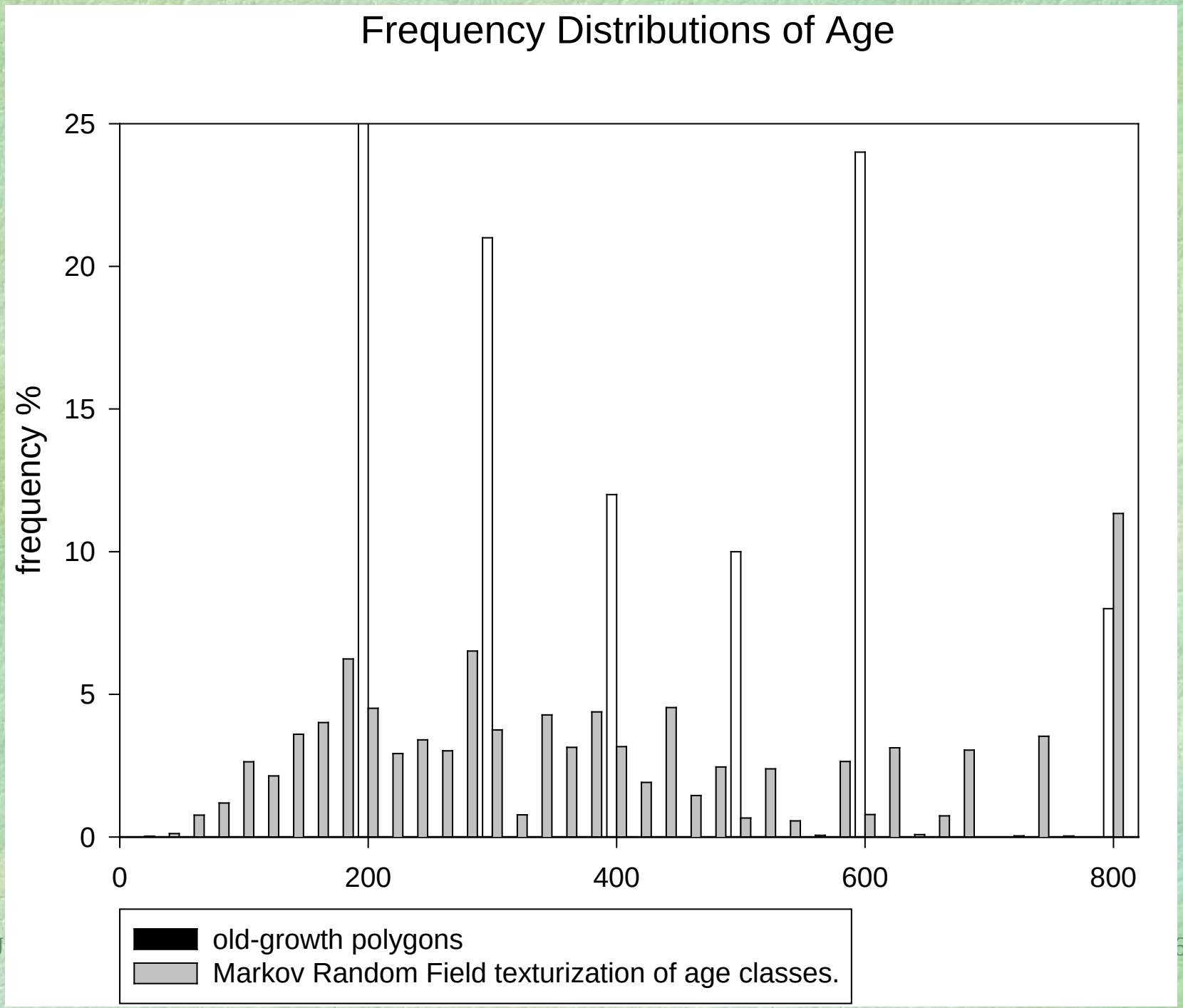
	Greenness	Wetness
Holes		
Brightness	**0.72**	**-0.42**
Greenness		**0.22**
Surroundings		
Brightness	**0.66**	**-0.47**
Greenness		**0.24**







A. Discrete age class map generated using fire history
B. Continuous age structure ***RESULT*** map.
C. Virtual Tasseled Cap ***RESULT*** co-generated with B.


Frequency Distributions of Age
frequency %
25
20
15
10
5
0
0
200
400
600
800
old-growth polygons
Markov Random Field texturization of age classes.

Credits

- **Reconstruction of past age structure (PNW)**
  - Mark Harmon, Michael Guzy, Tom Maiersperger
- **Change detection (St. Petersburg region)**
  - Warren Cohen and Maureen Duane
- **Projected change in regional carbon stores**
  - Ralph Alig, Andrew Yost (PNW)
  - Yulia Kuzminykh, Sergey Griaznov (NW Russia)

NERIN

North-European Regional Information Network

Who…?

Why…?

Where…?

What…?