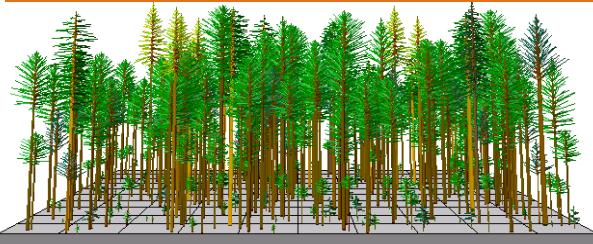




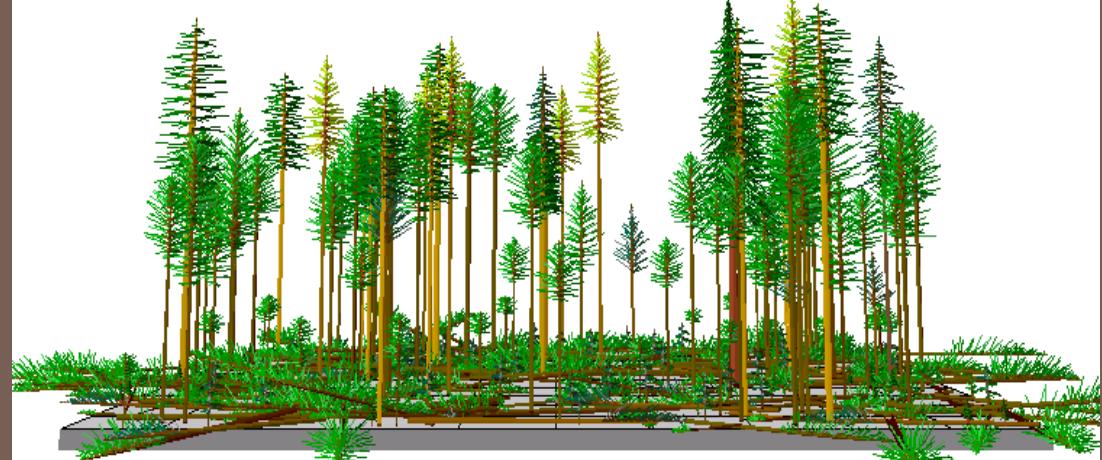
SUSTAINABLE FOREST ENERGY AND ECOSYSTEM SERVICES – ACCOUNTING FOR DECOMPOSITION

By Kristiina and Daniel Vogt

Unhealthy Forest Condition



Healthy Forest Condition



We know what this is!

BUT What is this?

How do you measure it?

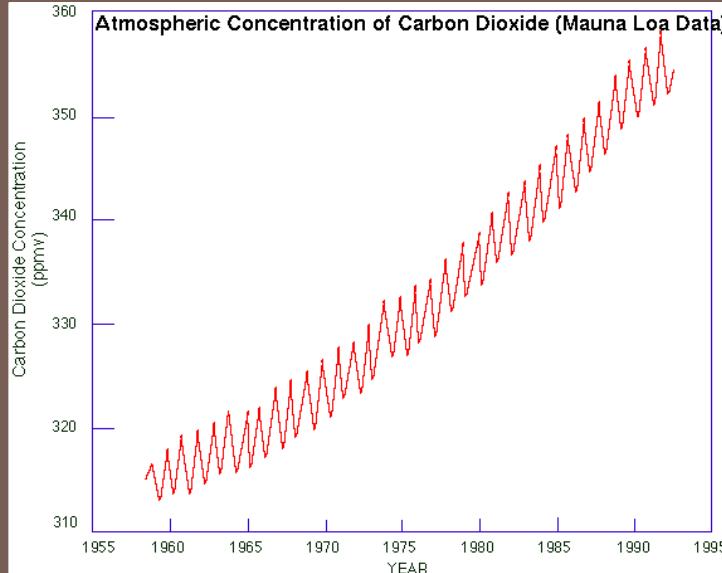


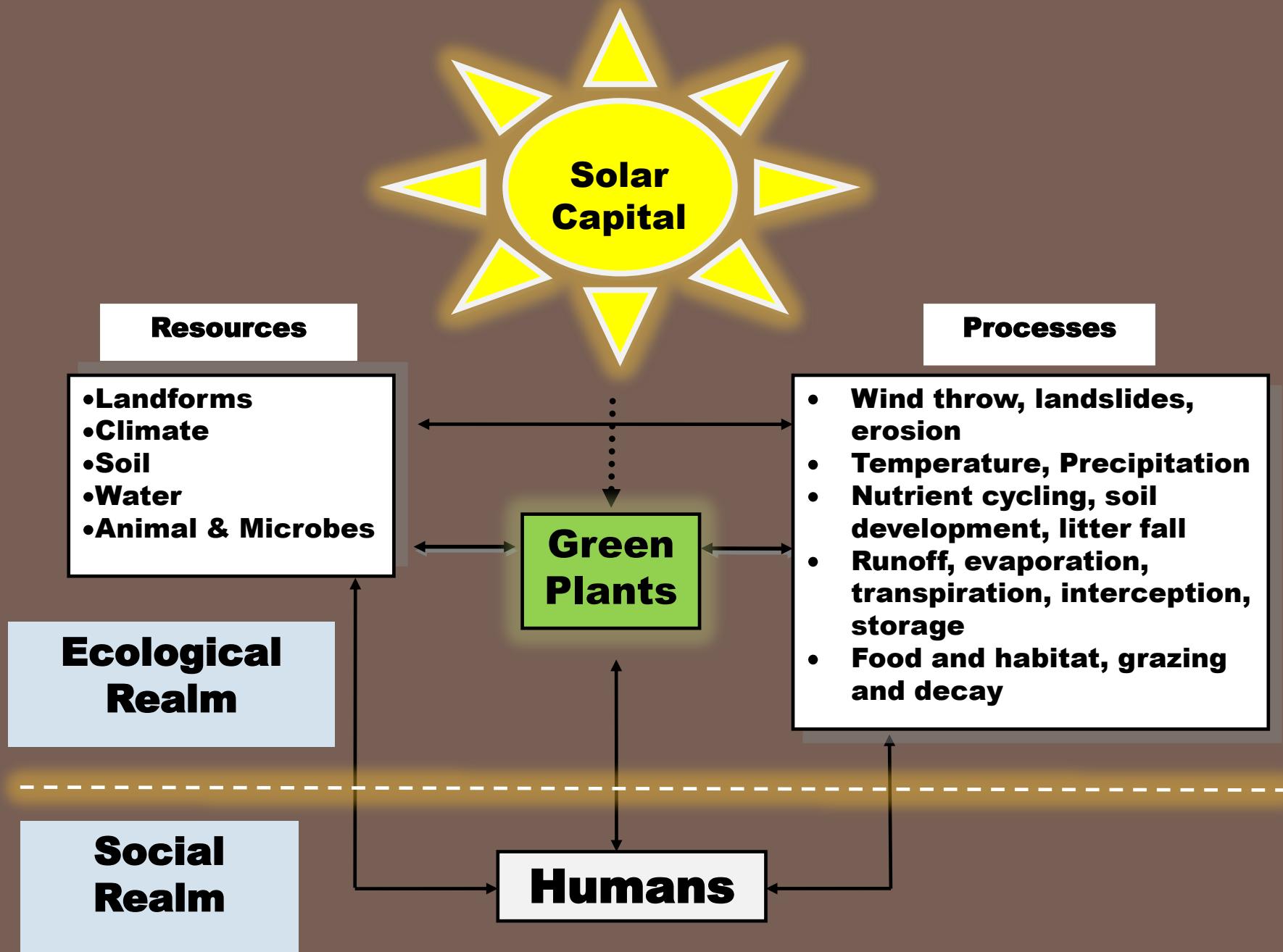
What does thinning in forest management tell us!

RULE OF THUMB: Remove MAl only each yr during each cutting cycle or 2%

Ecosystem Services: Forests

- Hydrological Services
- Climate Regulation
- Biodiversity
- Forest Products
- Aesthetic and Cultural Values



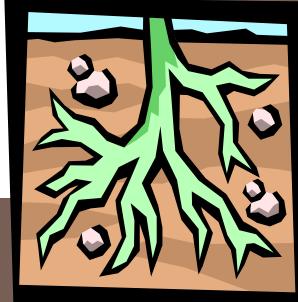


Ecosystem Function Linked to Productive Capacity and Losses from NPP

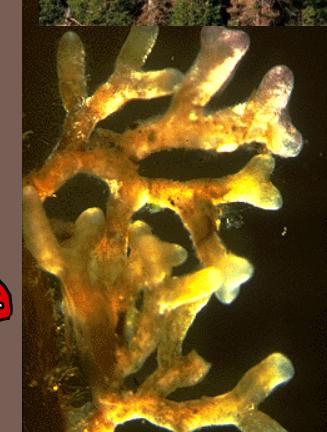
$$\text{NPP} = \Delta B + L + H$$



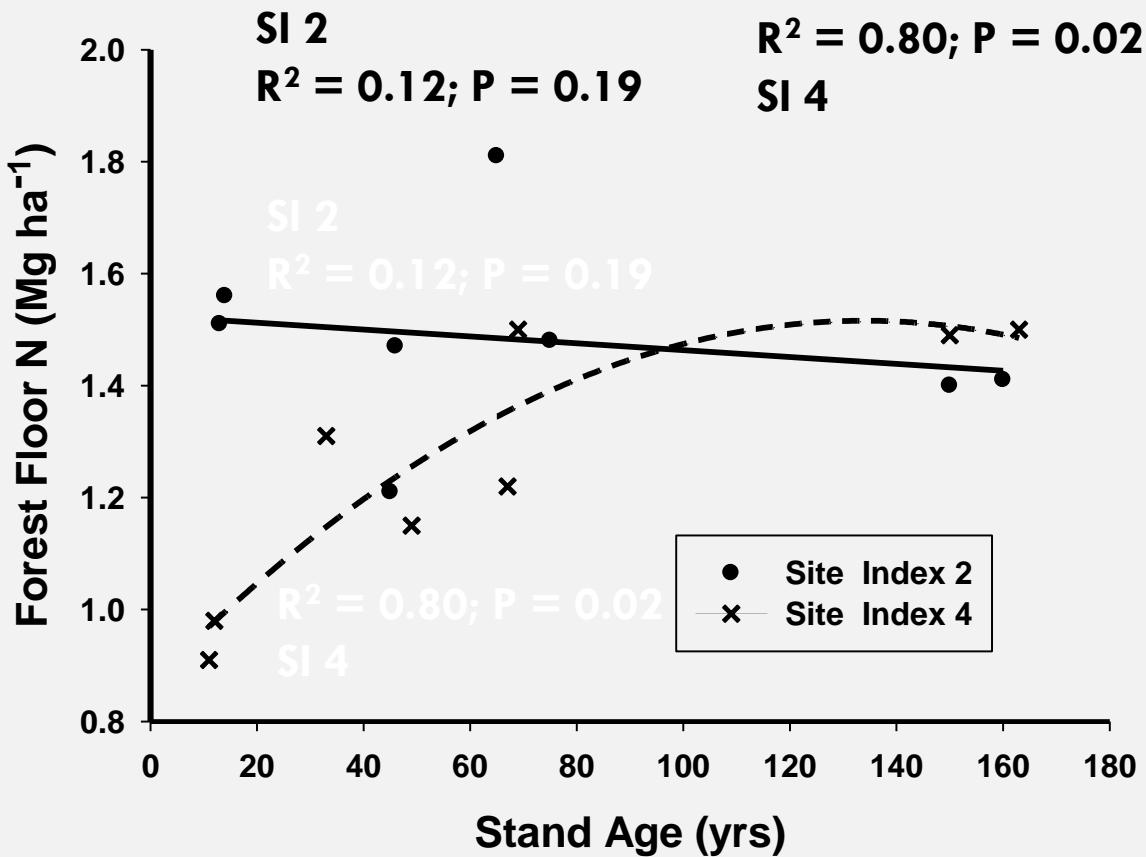
Modifiers of NPP



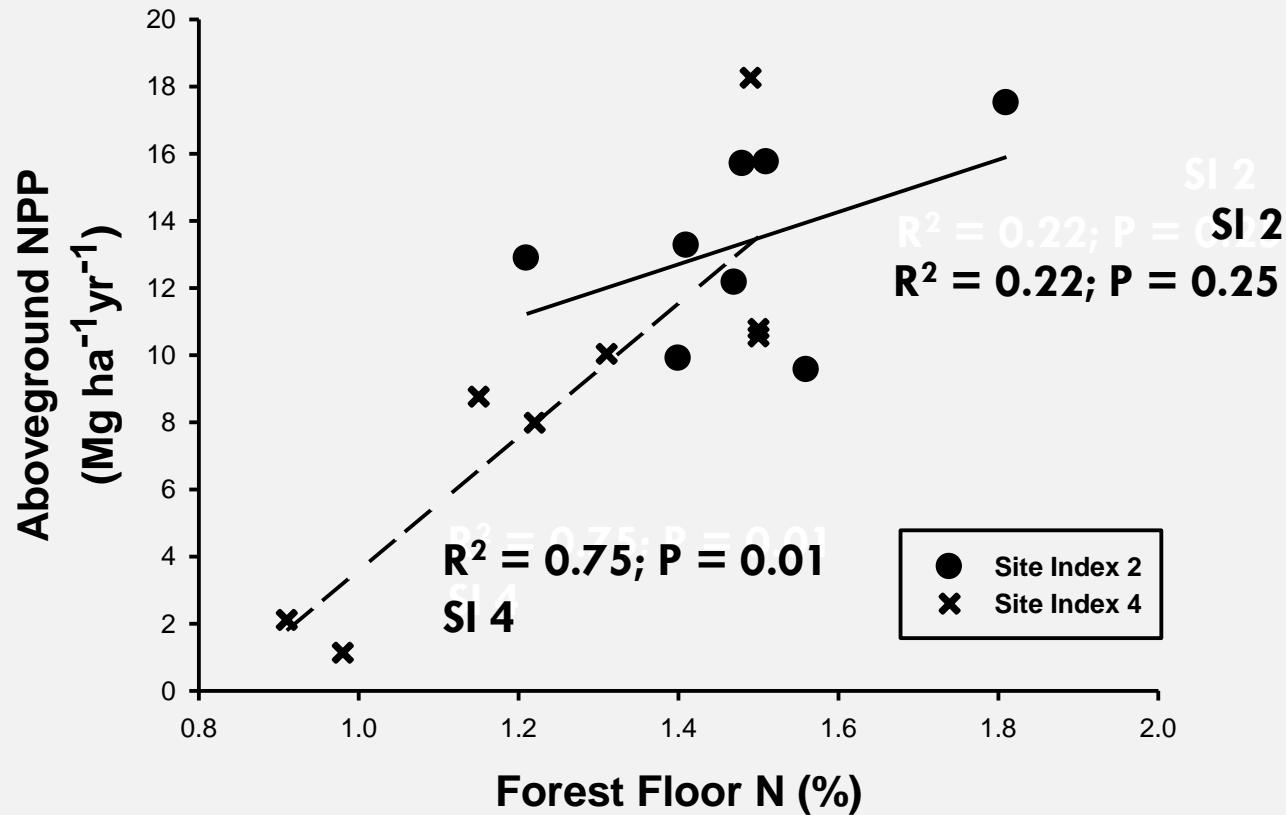
**Nutrients
Climate
Soil physical/chemical
Plant secondary
chemistry
Biological/ non-
biological
disturbances
Symbionts
Herbivores
Decomposition**



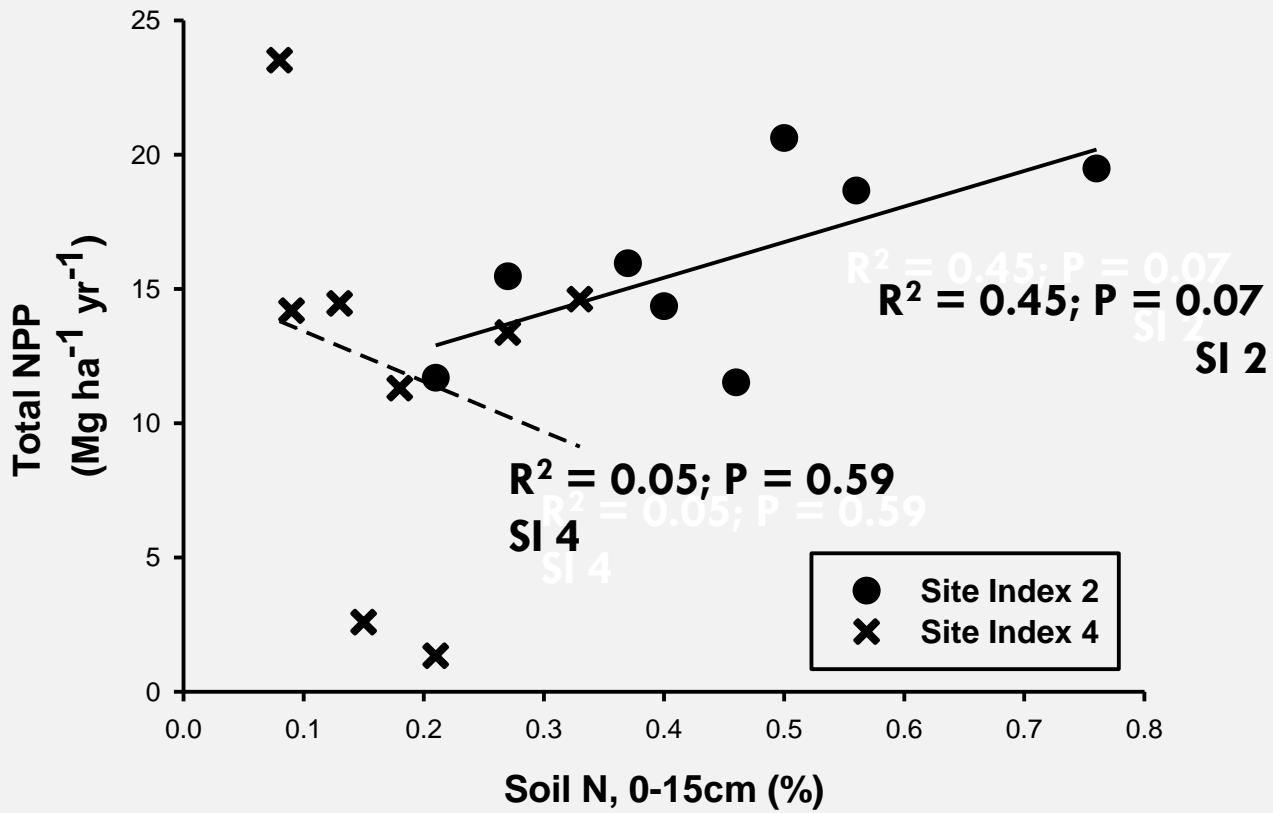
Forest Floor Nitrogen by Stand Age and Site Index



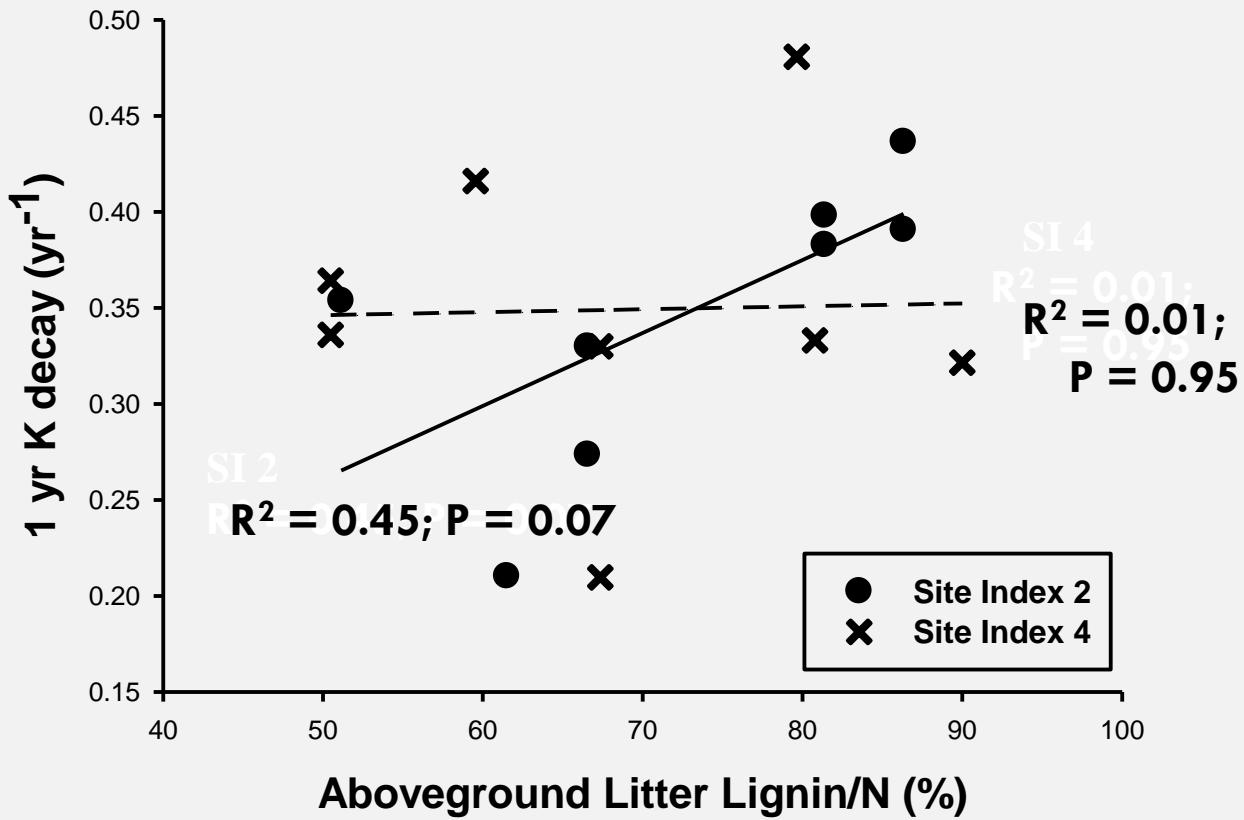
Aboveground NPP by Forest Floor N and Site Index



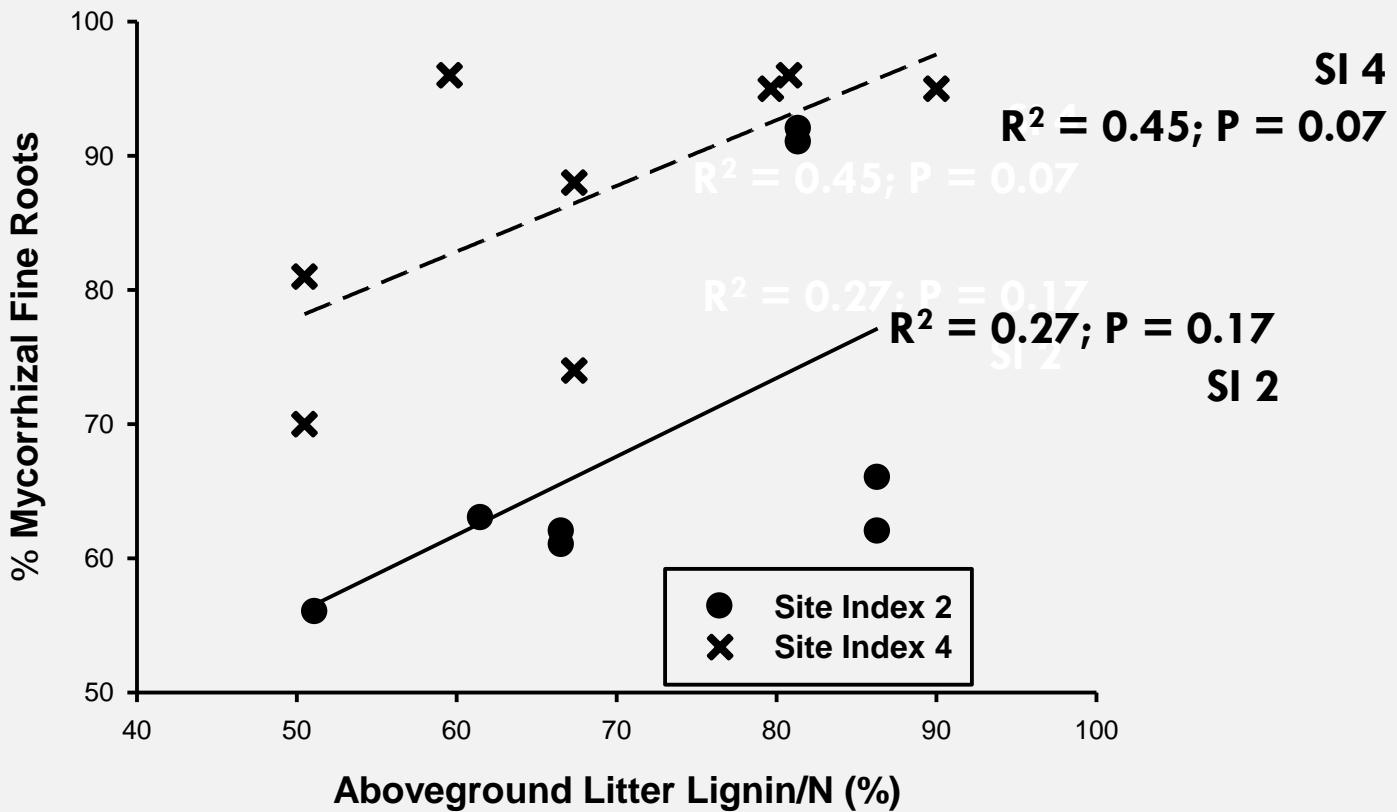
Total NPP (abv+blwgrd) by Soil N and Site Index



k Decay Constant after one year by Aboveground Litter Lignin/N and Site Index



% Mycorrhizal Fine Roots by Aboveground Litter Lignin/N and Site Index

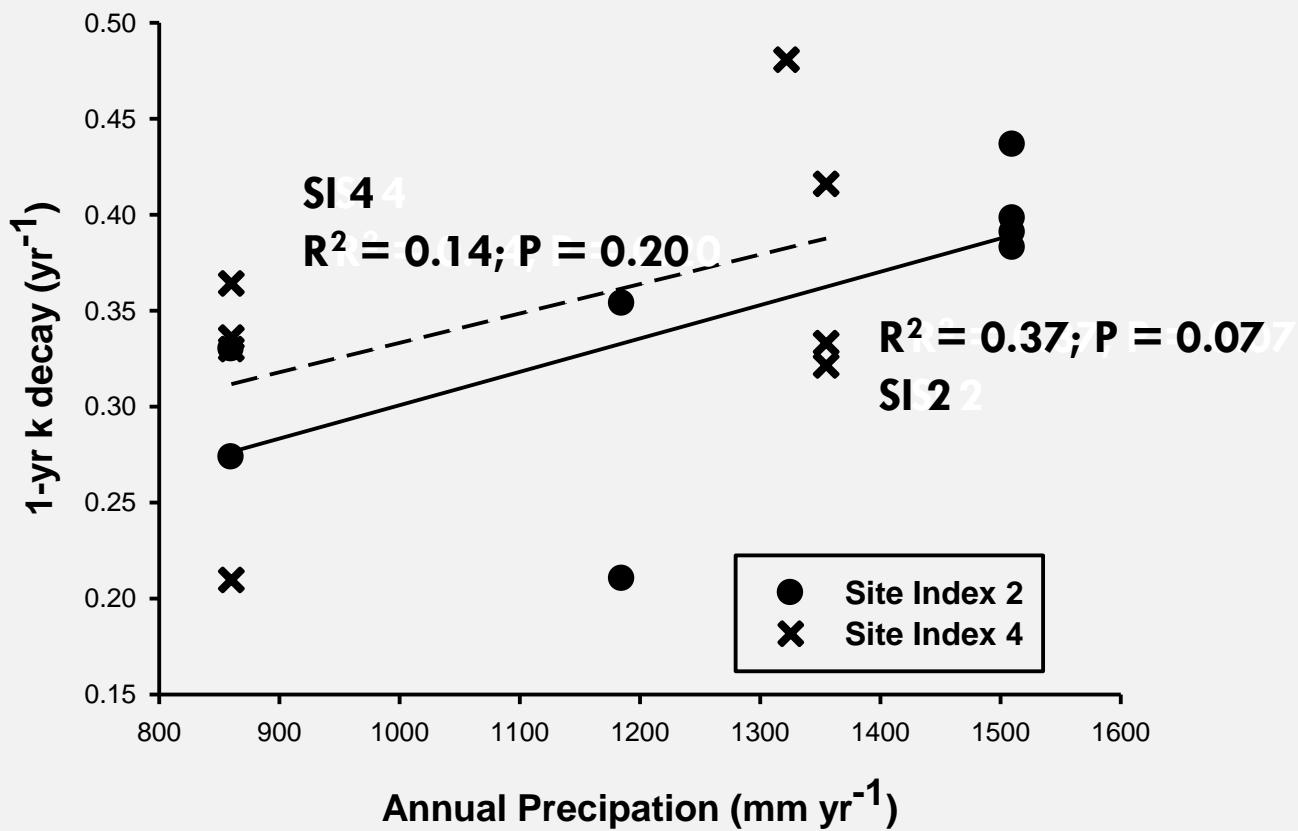


		Adaptability	
		More Adapt- able	Less Adapt- able
Resource Endowment	High	XX	
	Low		XX

Climate and soils constraints

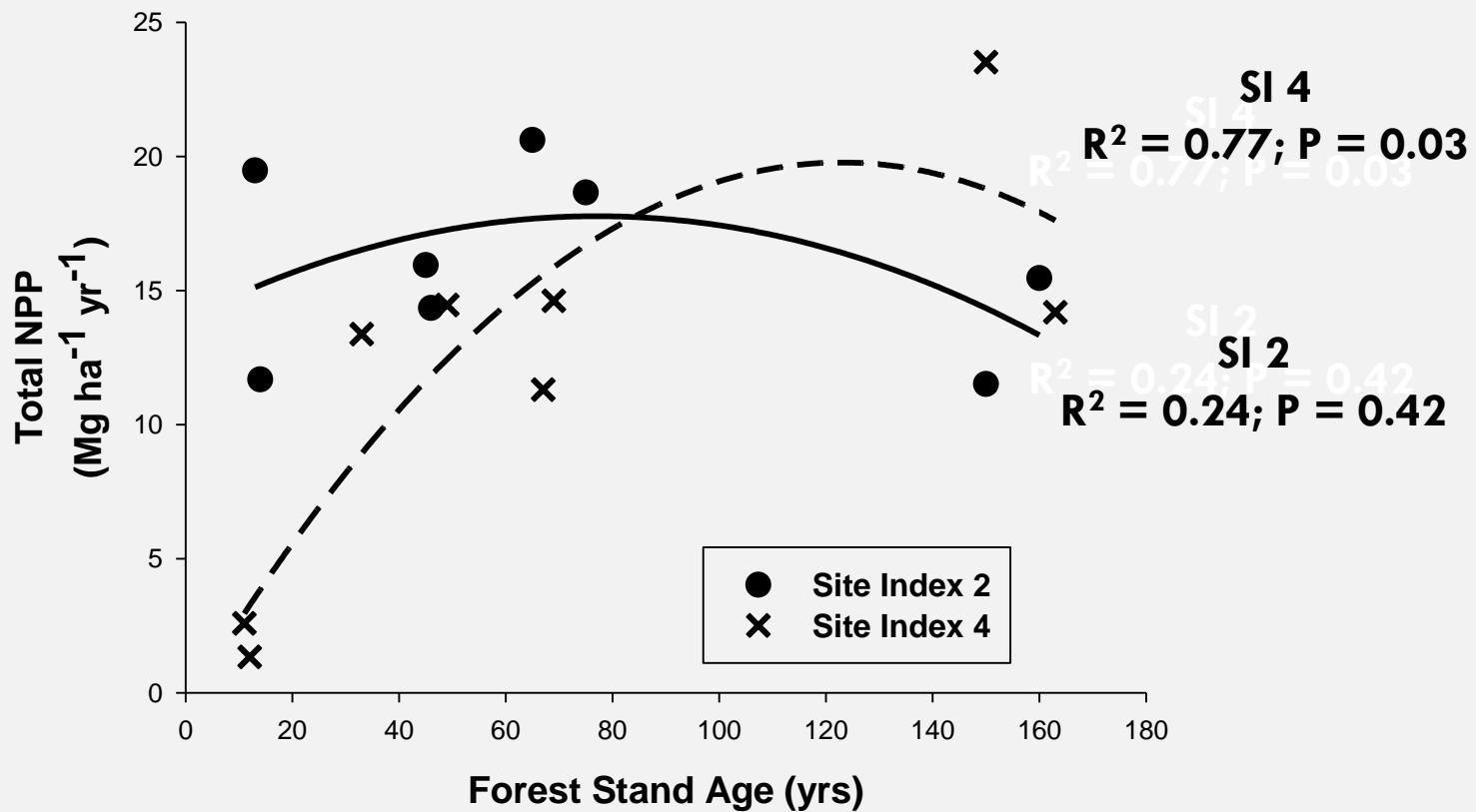


K Decay Constant after one year by Annual Precipitation and Site Index

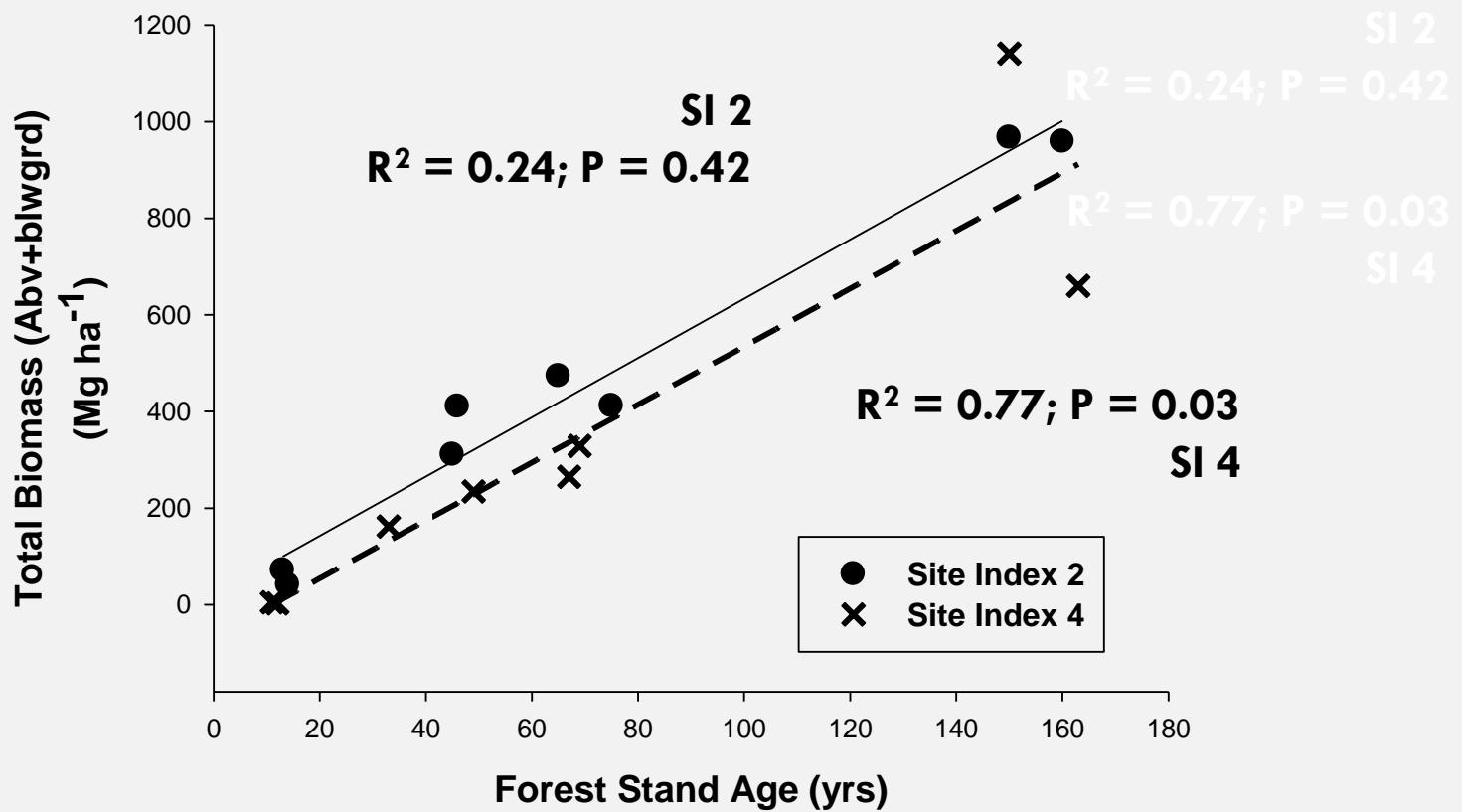


	Site Class 2 – Good Site	Site Class 4 – Poor Site
% Biomass Produced Each Year (TNPP/Total Biomass)	3%	5%
% BNPP/TNPP	16%	28%
% Roots tips Mycorrhizal	69%	87%
Total Average Biomass Accumulate each year	7 Mg/ha/yr	5 Mg/ha/yr
Total NPP average	16 Mg/ha/yr (range 11-21)	12 Mg/ha/yr (range 1-24)

Total NPP (abv+blwgrd) by Forest Stand Age and Site Index



Total Biomass by Forest Stand Age and Site Index



Correlations with ANPP, BNPP or TNPP

Site Quality 2	Site Quality 4
Soil N % (R ² = 0.41-0.47)	Tot Foliage (R ² = 0.70)
Alitter Lignin (%) (R ² = 0.49)	Alitter N (%) (R ² = 0.60)
Needle decay (R ² = 0.47)	Alitter Lignin/N (%) (R ² = 0.55)
X	FFN (%) (R ² = 0.75)
X	FFmass (R ² = 0.73)



Sustainable Ecosystem Services by maintaining **RESILIENCE** and natural adaptive processes

