Vegetation Module

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Objectives:

- Provide tools to achieve desired future condition
- Assist other modules with vegetation measurement
- Increase knowledge of group selection silviculture

Desired Future Condition

"all-age, multi-story, fire resistant forest…

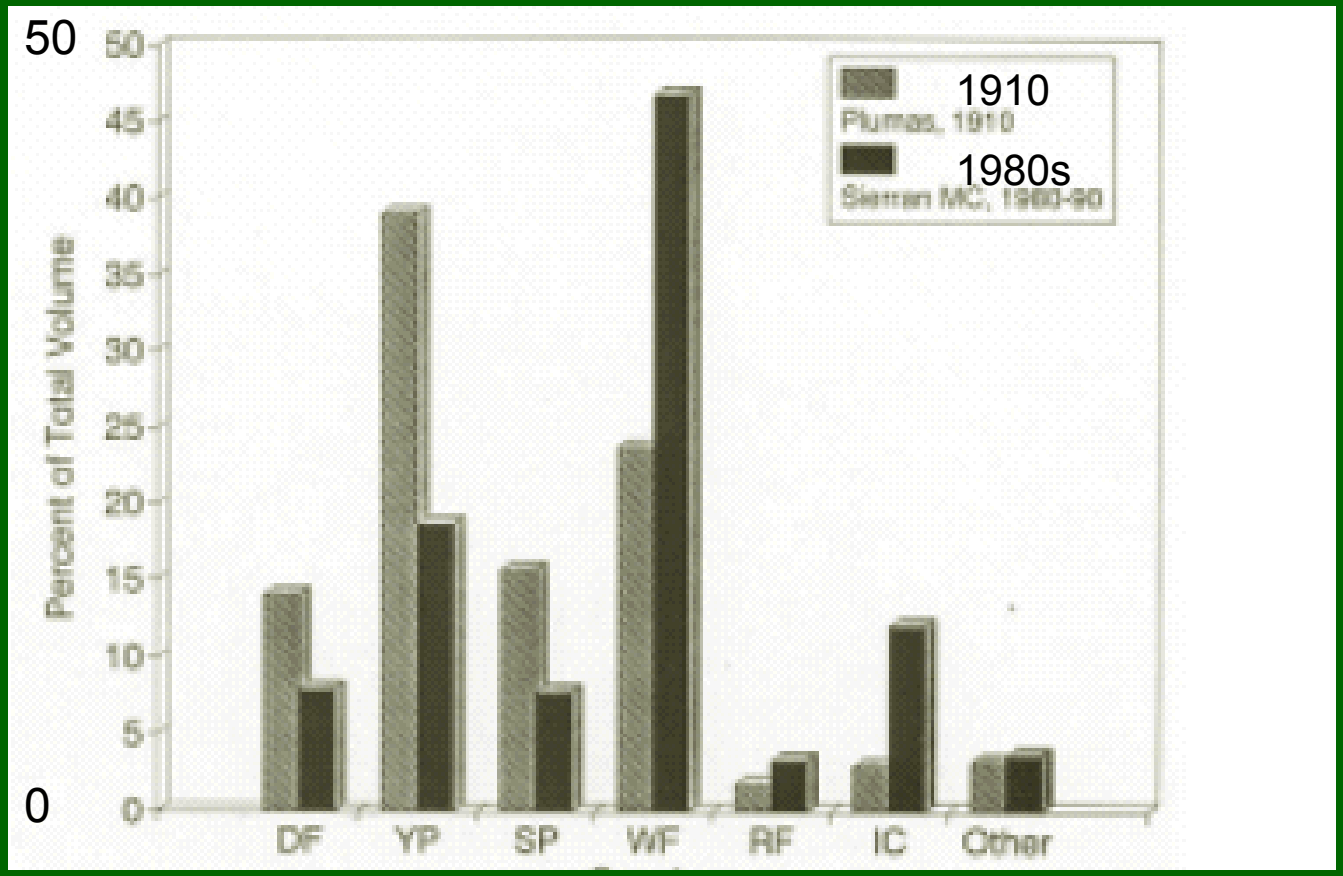
Herger Feinstein Quincy Library Group Forest Recovery Act, 1997

…approximating pre-settlement conditions."

Michael Yost, 1994. Quincy Library Group Community Stability Proposal: Silviculture, Timber Management and the Desired Future Condition

Mixed Conifer Timber Volume (% of total) by Species in Plumas NF: 1910 vs. 1980s

Percent of Total Volume

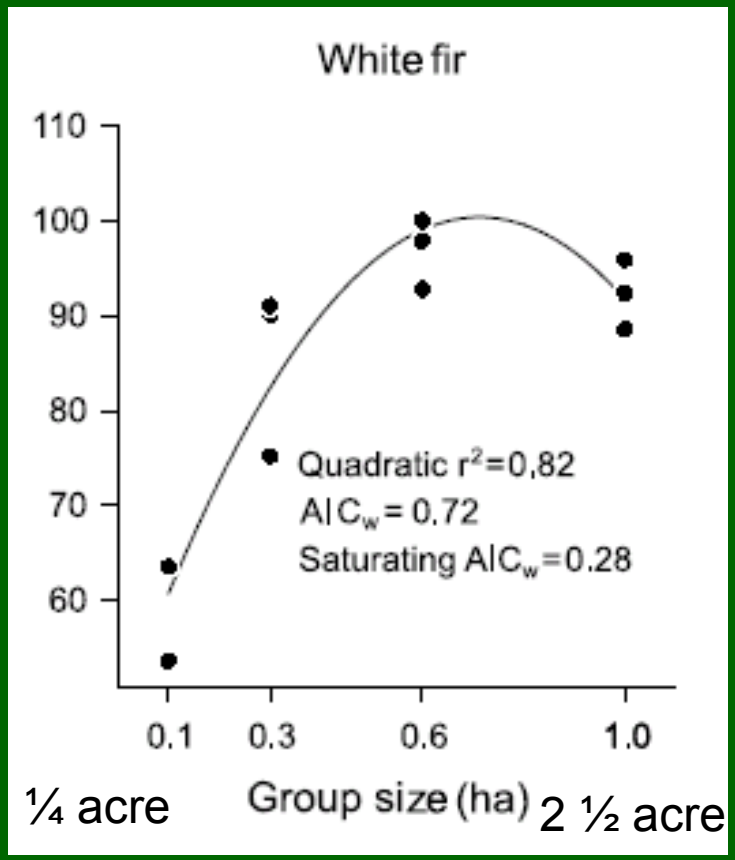


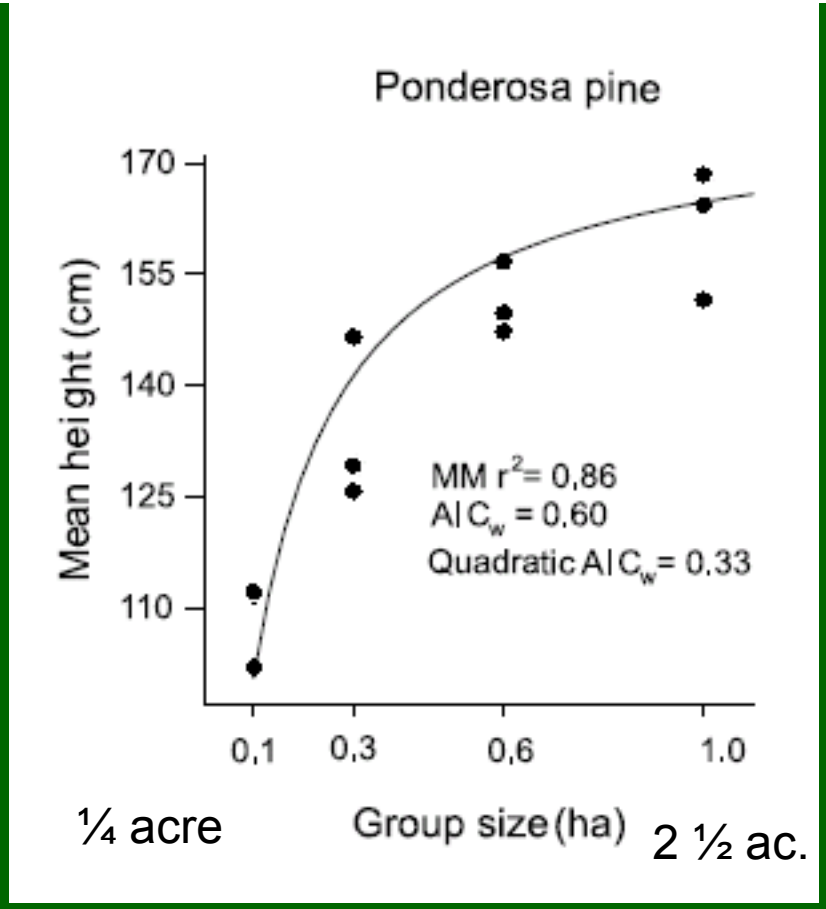
yellow pine (ponderosa, Jeffrey)

white fir

McKelvey and Johnston 1992

5-yr height growth of white fir and ponderosa saplings according to size of group selection opening





white fir always loses, ponderosa always wins

-group openings, weeding

-consistent with shade tolerance

York, Heald, Battles, & York 2004

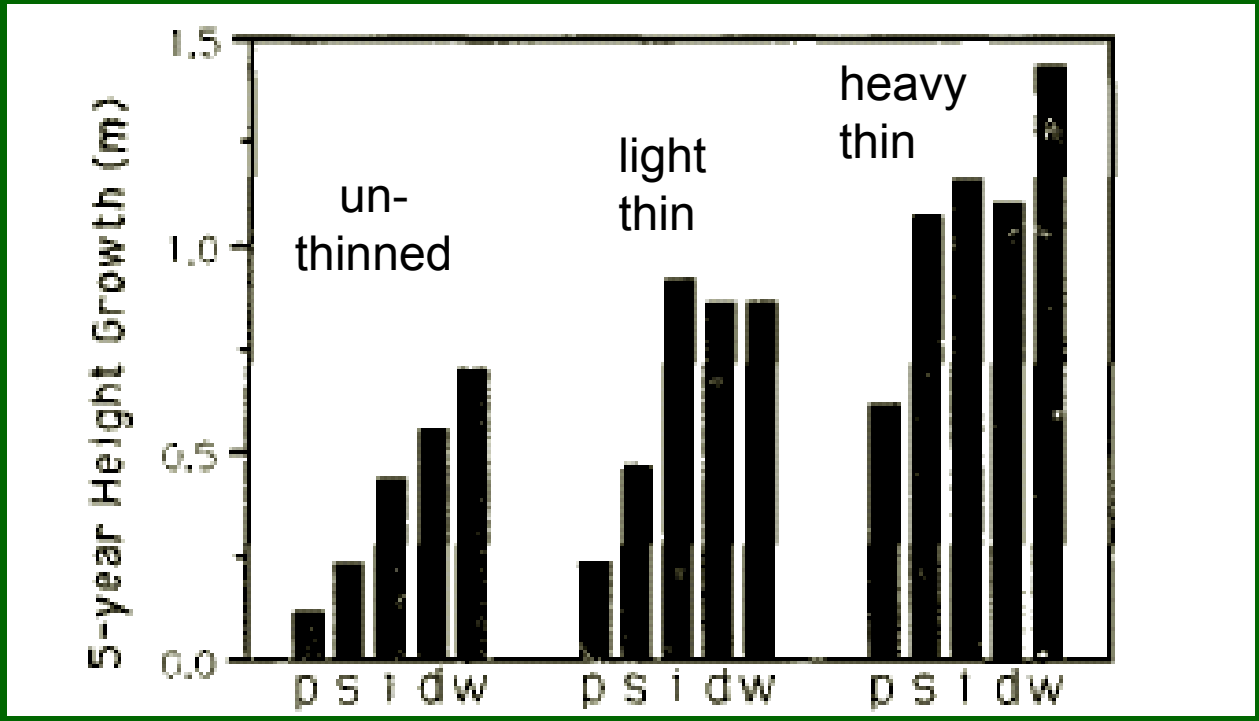
Light availability in mixed-conifer forest

55 mol/m2/d:
group selection opening

21 mol/m2/d:
large gap in stand thinned to 50% canopy cover

4 mol/m2/d
small gap in dense stand:

Mix-conifer seedling height response to thinning of overstory ponderosa pine. Foresthill, Placer County.



p ponderosa
s sugar pine
i incense cedar
d Douglas-fir
w white fir

here, white fir always wins, ponderosa always loses

Oliver and Dolph 1992

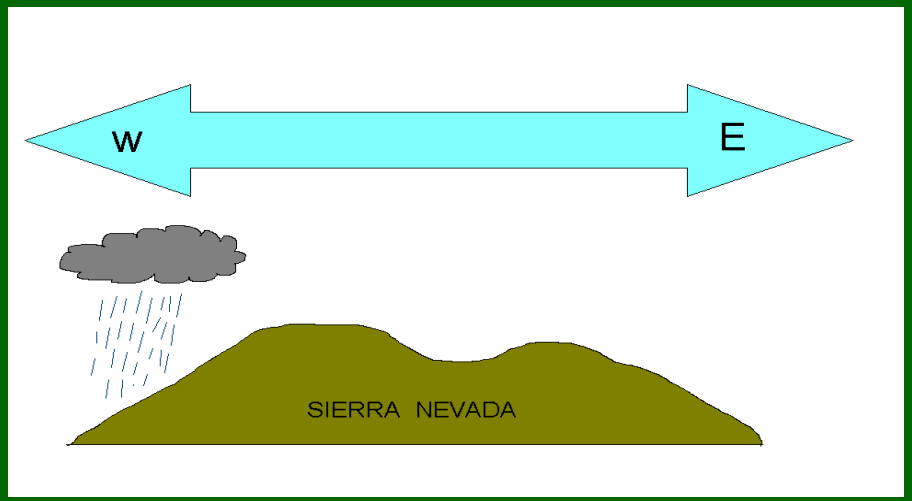
Question

- What light conditions change the competitive balance between white fir & ponderosa & associated species?

Assumption

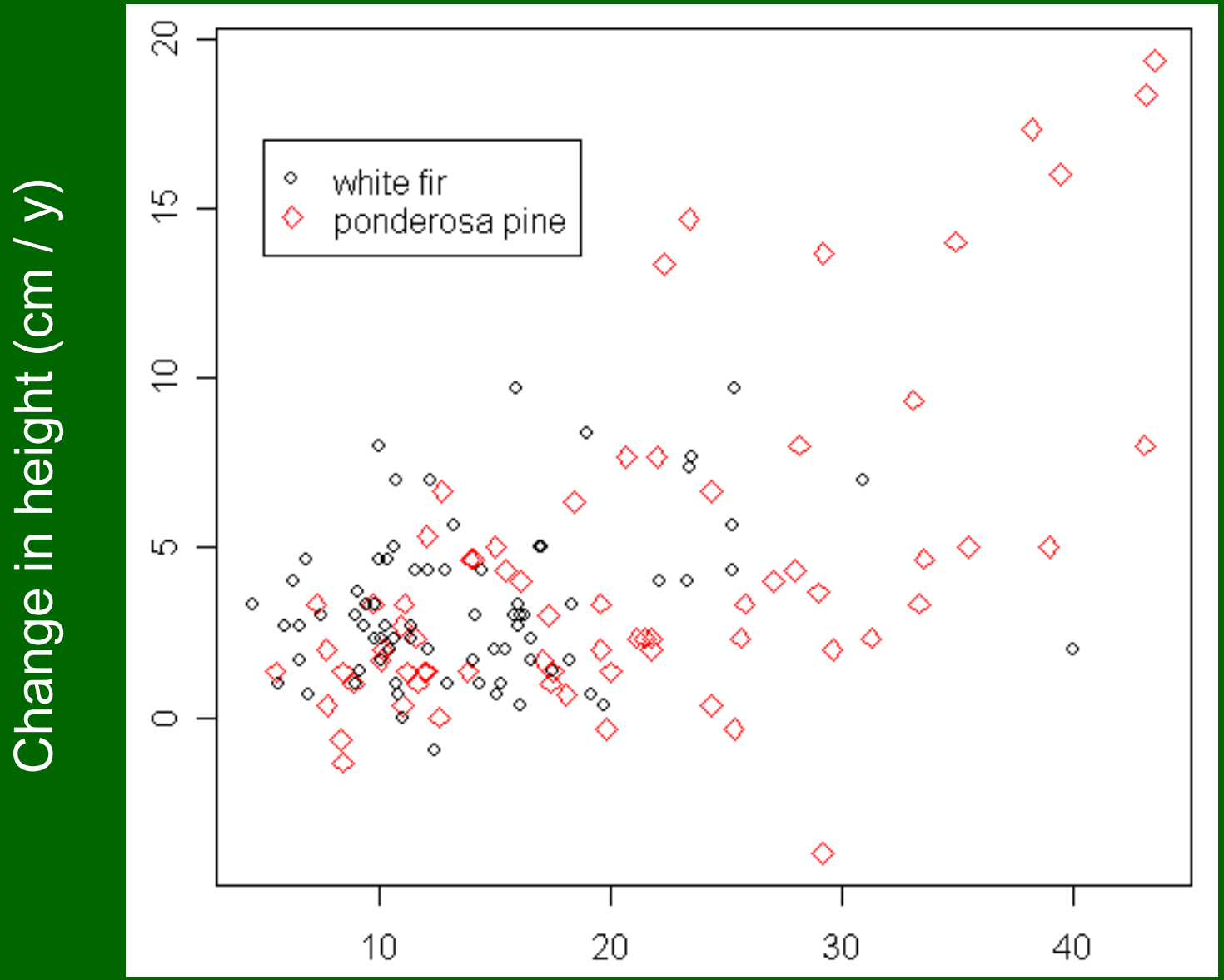
•Light, combined with shade tolerance, is the main mechanism regulating growth & competition

Seedling & Sapling Sampling

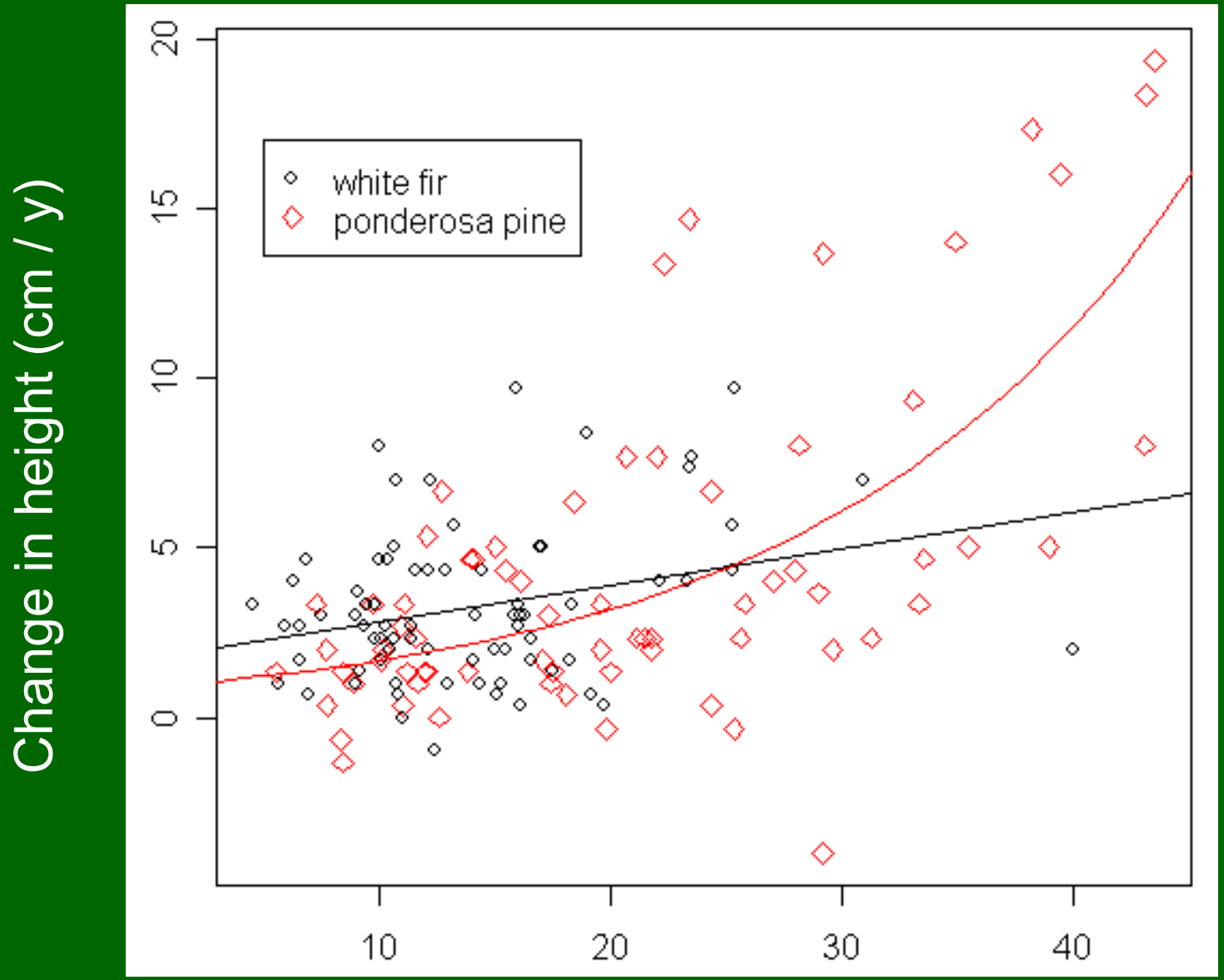


-sampled across Plumas NF rainfall gradient
-seedlings: height & diameter over 3 yrs. (light)
-saplings: diameter growth rings (light, soil water & nitrogen, pH, stem wood $\delta^{13}C$).
-analysis: relate growth to light & other factors by simple models

Height and Light: White fir vs. ponderosa seedlings



Height and Light: White fir vs. ponderosa seedlings



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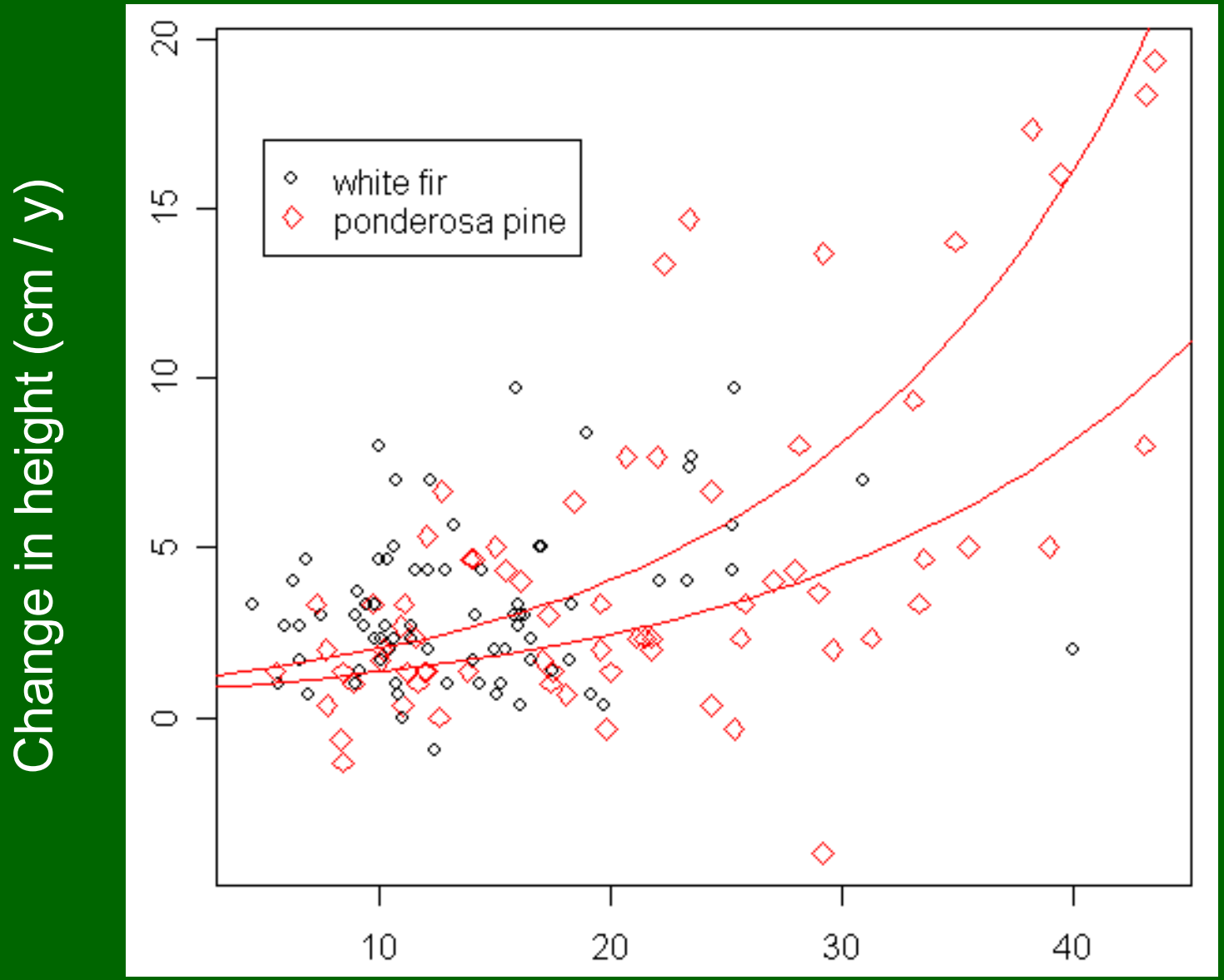

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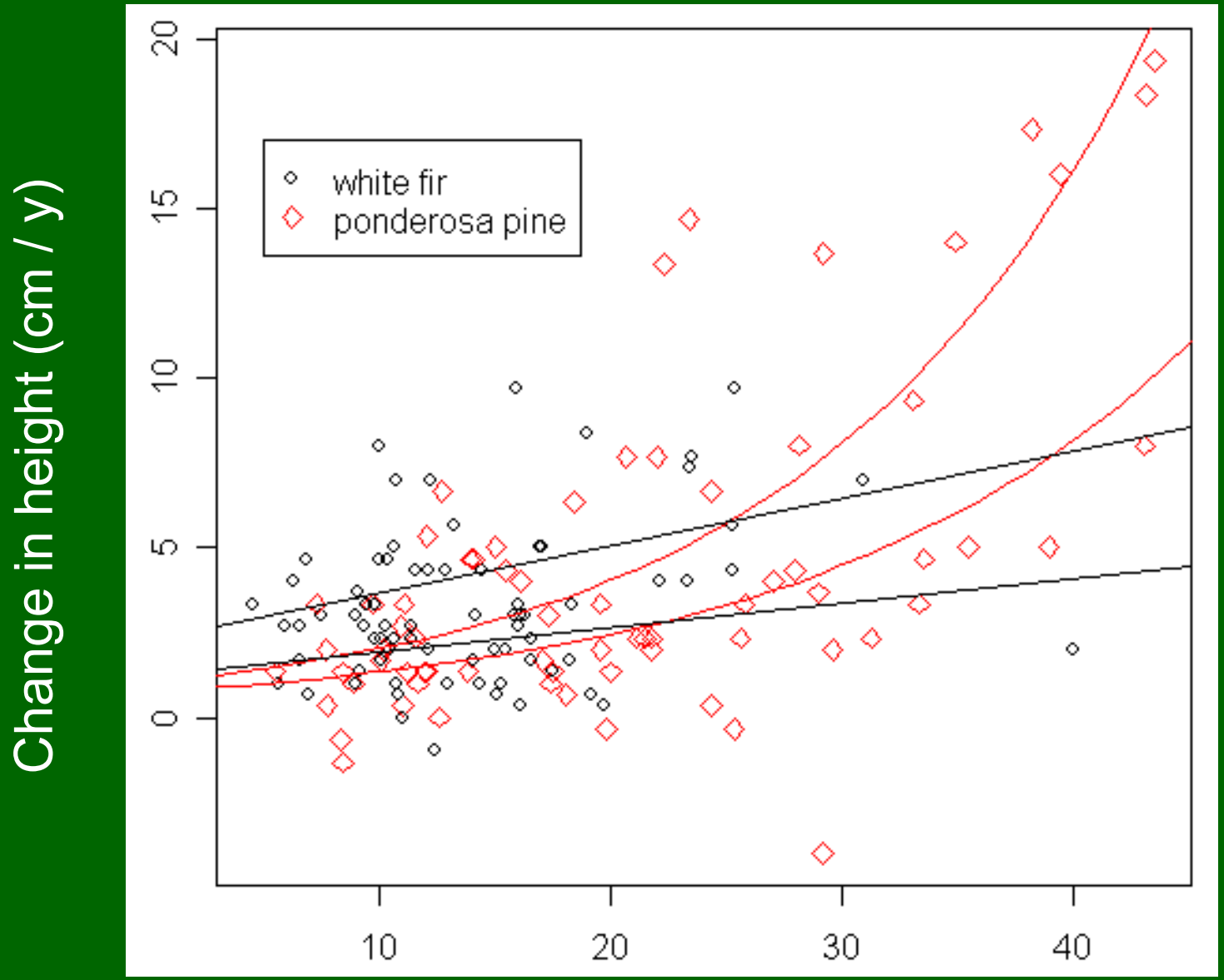

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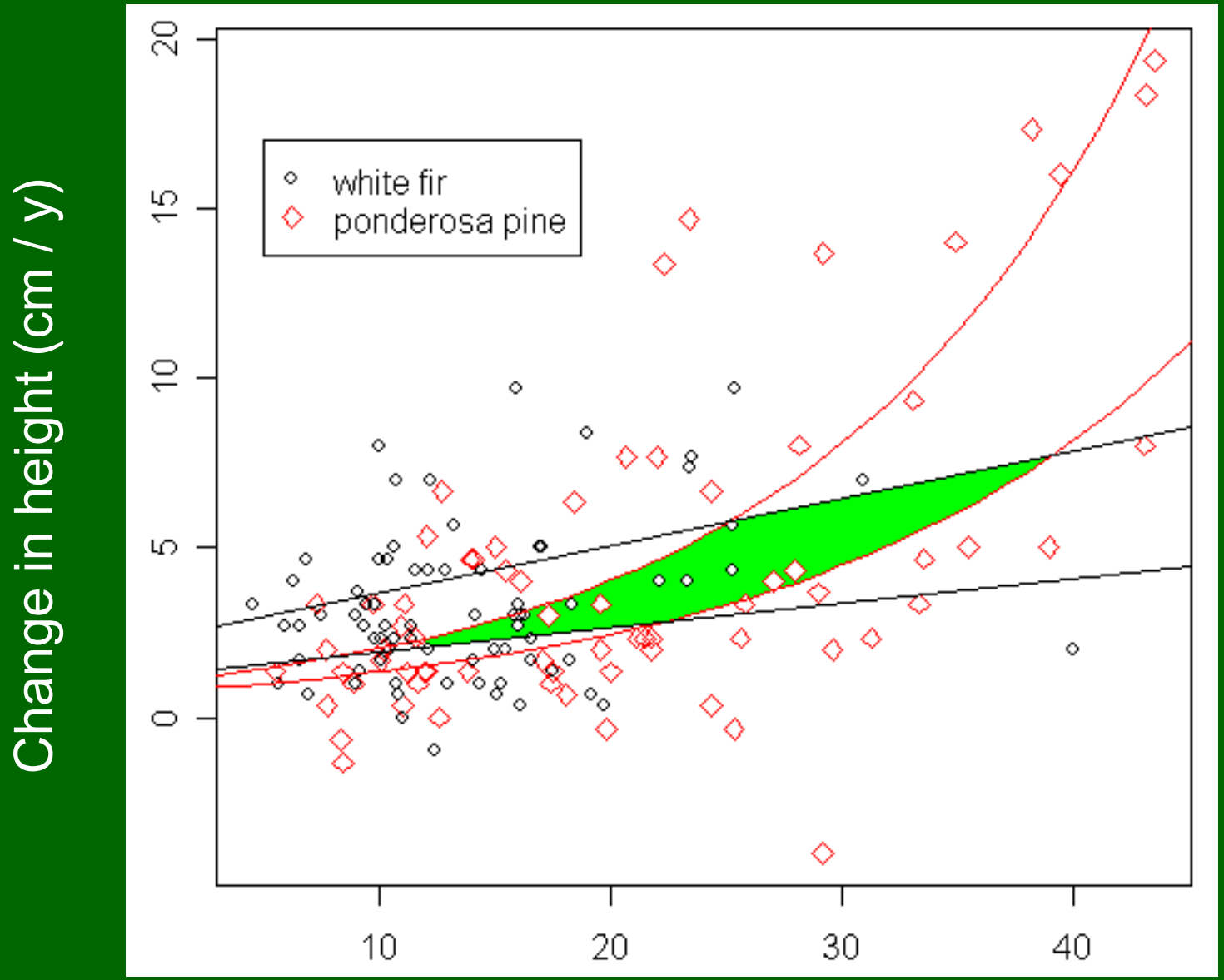
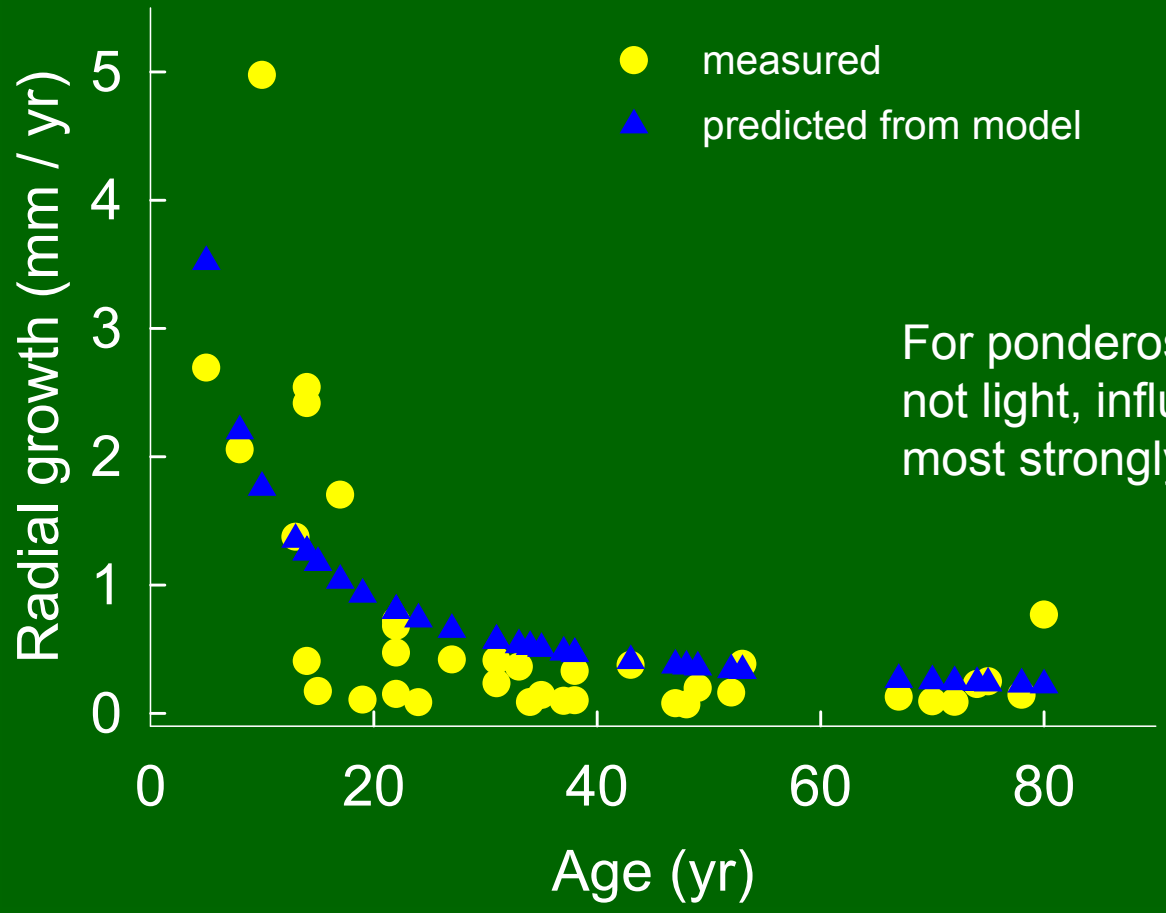


Light-dependent growth of seedlings

Species	Growth model	r^2
white fir	linear	0.08
Douglas-fir	linear	0.03
incense cedar	linear	0.09
sugar pine	linear	0.13
ponderosa	exponential	0.45
Jeffrey pine	linear	0.02
black oak	linear	0.02

Ponderosa stem growth with age (saplings, natural regeneration)



For ponderosa saplings, age, not light, influenced growth most strongly

What determined sapling stem diameter growth?

Species	**Factors**	**r^2**
white fir	$\delta^{13}C$ ↑, age ↓	0.35
Douglas-fir	soil water ↑, age ↓	0.41
incense cedar	$\delta^{13}C$ ↑, age ↓	0.57
sugar pine	age ↓	0.61
ponderosa pine	age ↓	0.51
Jeffrey pine	light ↑	0.52

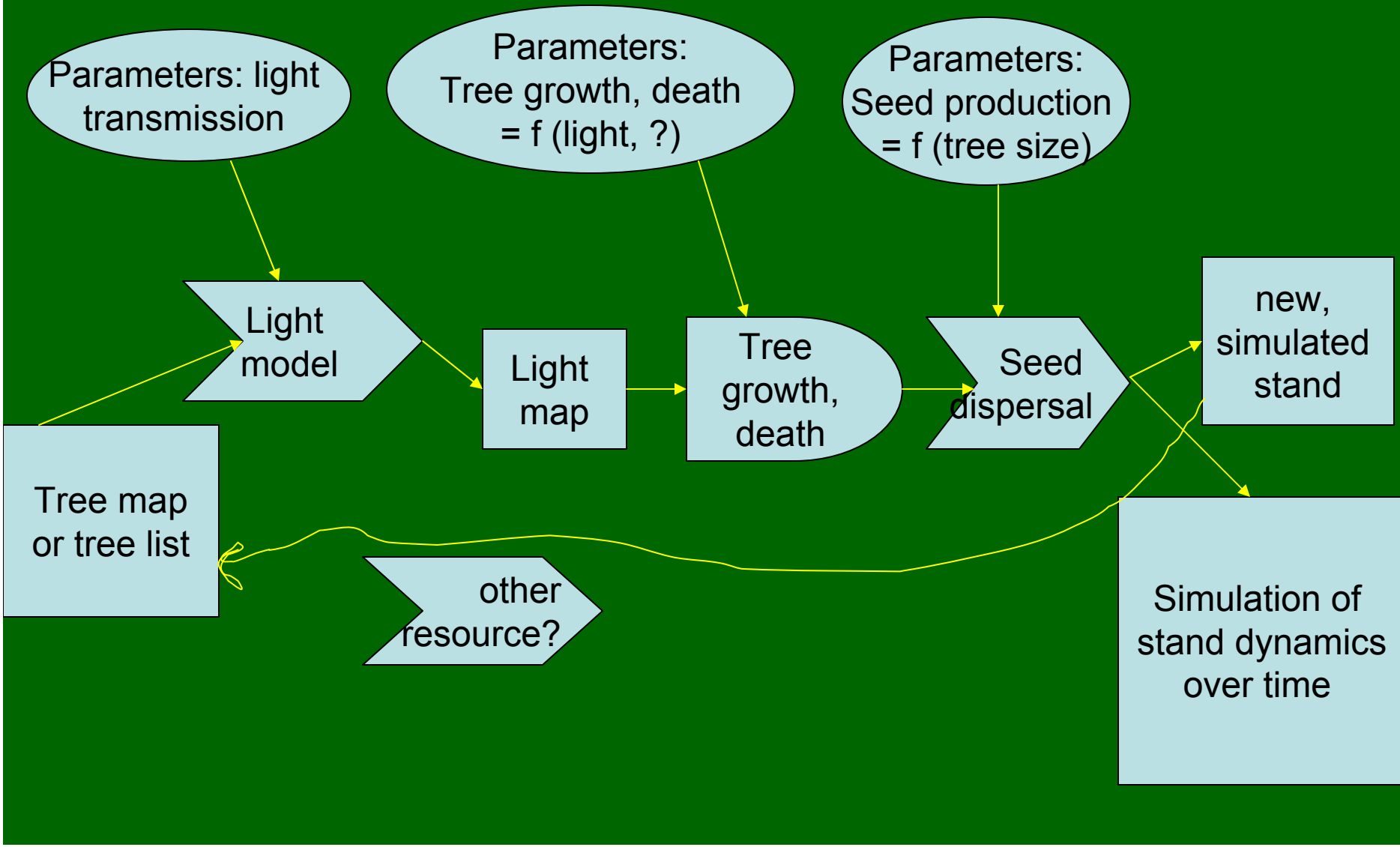
Juvenile trees & light: conclusions

- Different light response in seedling vs sapling
- Seedling height ranking: white fir-ponderosa reversal at 25 +/-15 light units. Most species not sensitive to light as seedlings.
- Saplings: Jeffrey pine strongly sensitive to light. Age important for other species. Water important for the 3 most shade-tolerant species.

Applications

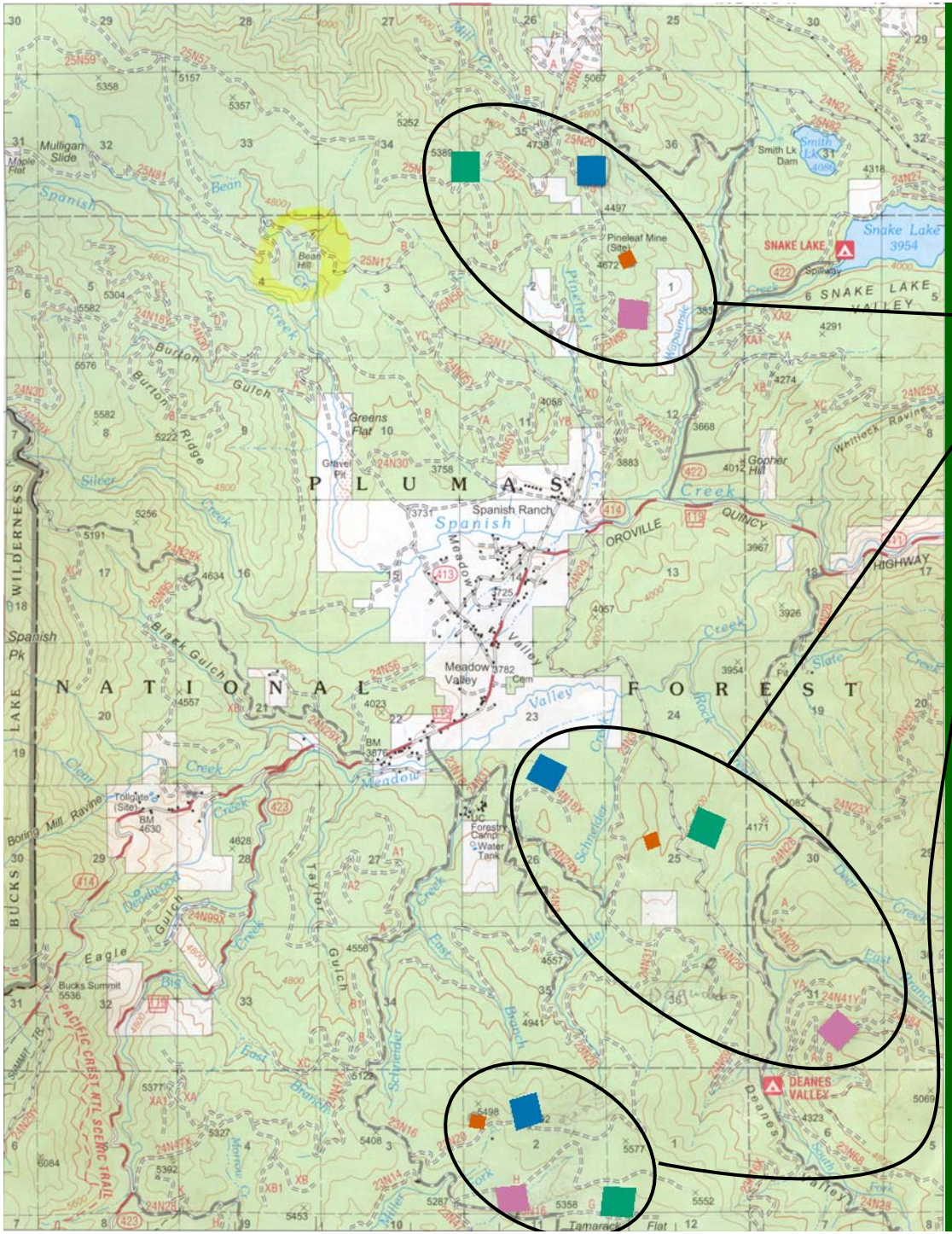
- Interpretation of light after treatments, with commercial system
- Relationship of stand structure & light (from thinning experiment)
- Parameters for forest simulator

Sortie: individual based, distance-dependent forest simulator



Experimental thinning and group selection project:
Relationship of level of canopy thinning to…

- small mammal populations
- potential fire behavior (fuels)
- fire climate (understory wind speed)
- plant community composition
- tree regeneration (light, soil wetness)



Grid Locations

Pineleaf Creek

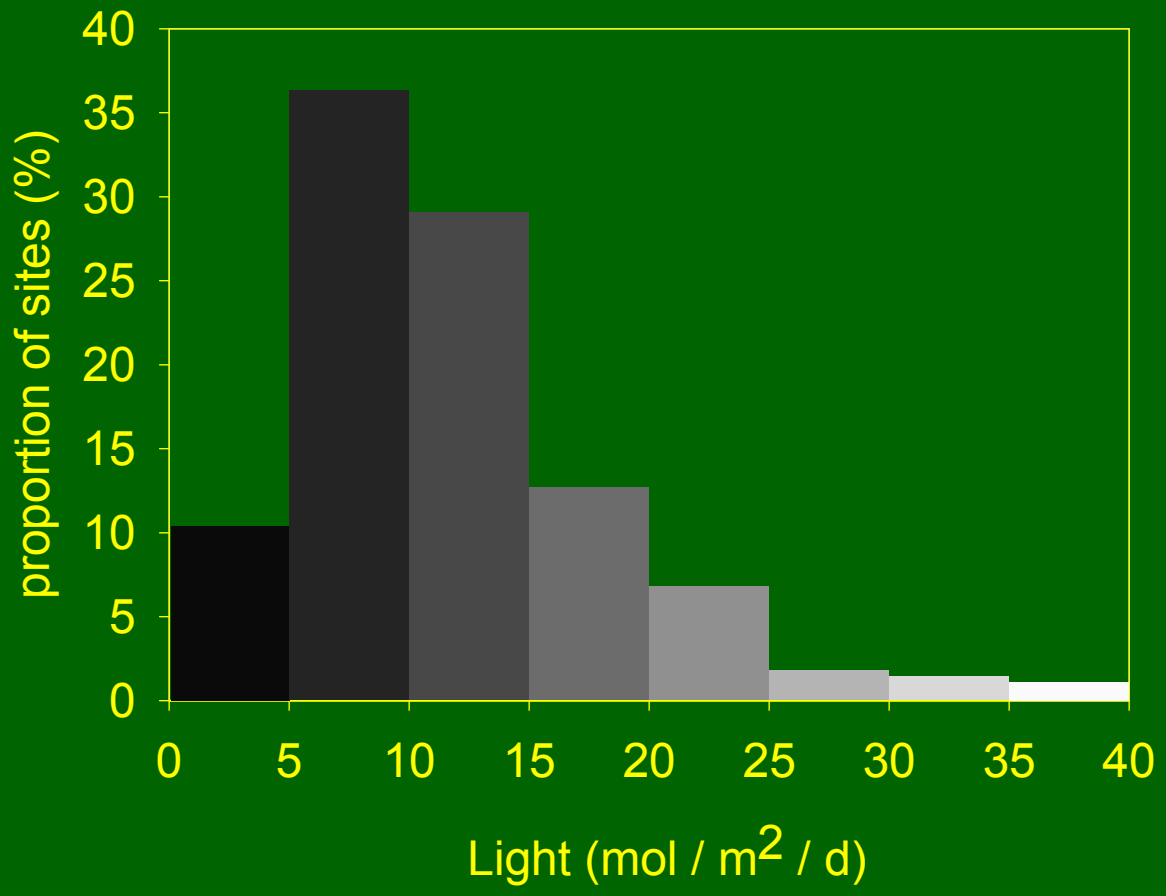
Deanes Valley

Tamarack Flat

Treatments

- Control
- Thin to 50% canopy
- Thin to 30% canopy
- Group Selection

Understory light in unthinned mixed-conifer stands Meadow Valley, Plumas National Forest,



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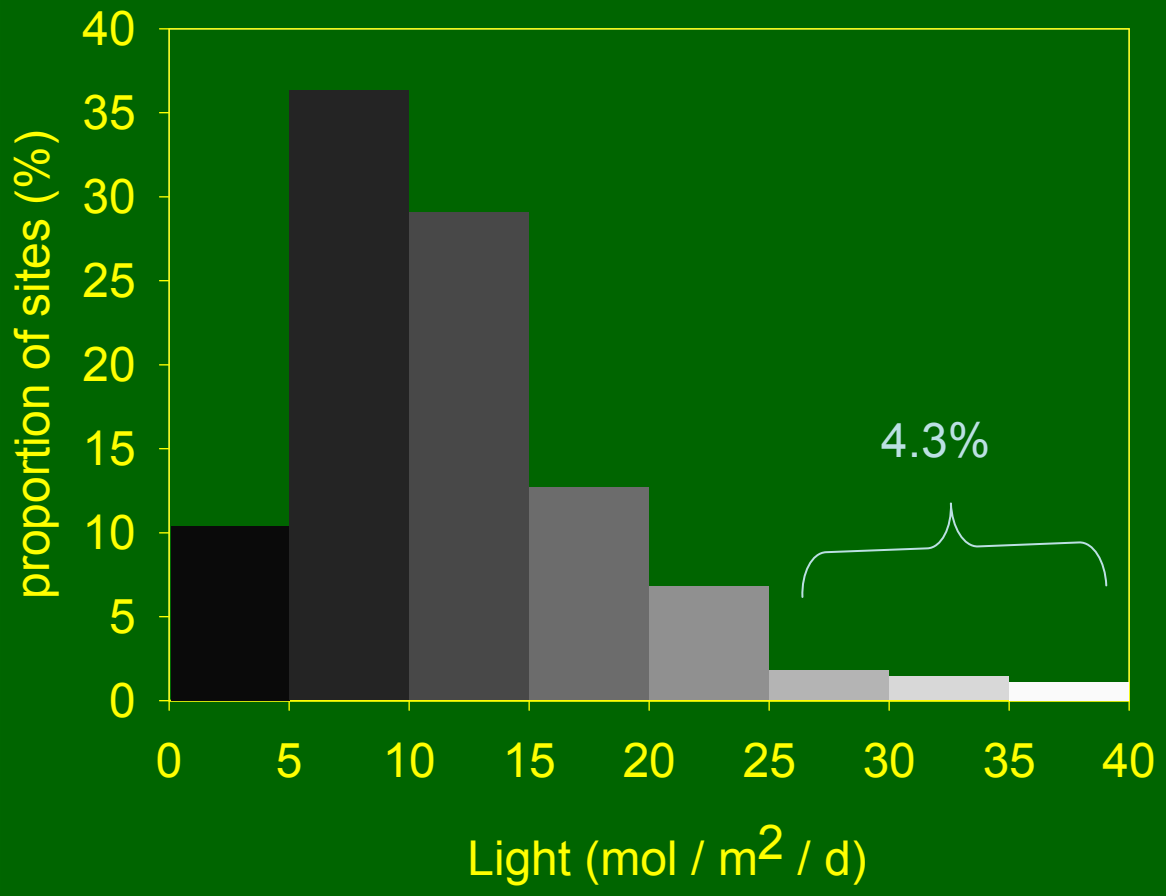
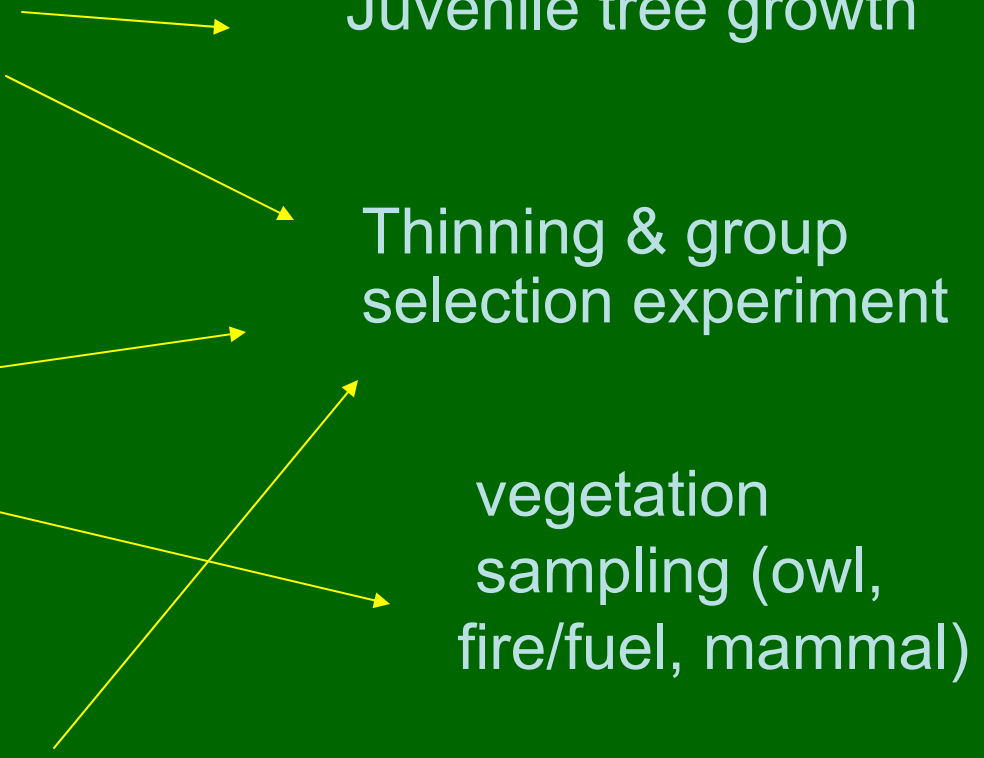


Objectives

Studies

- Tools for future condition
- Help other modules
- group selection



Juvenile tree growth

Thinning & group selection experiment

vegetation sampling (owl, fire/fuel, mammal)

East-side resilience: stand & landscape

Plans

- Immediate: report on juvenile tree & east-side work
- Thinning & Group Selection Experiment
  - 1 yr. light, fire behavior.
  - 2 yr. fire climate, soil water and temperature.
  - Longer. Duration of fuels treatments. Effects on plant communities.

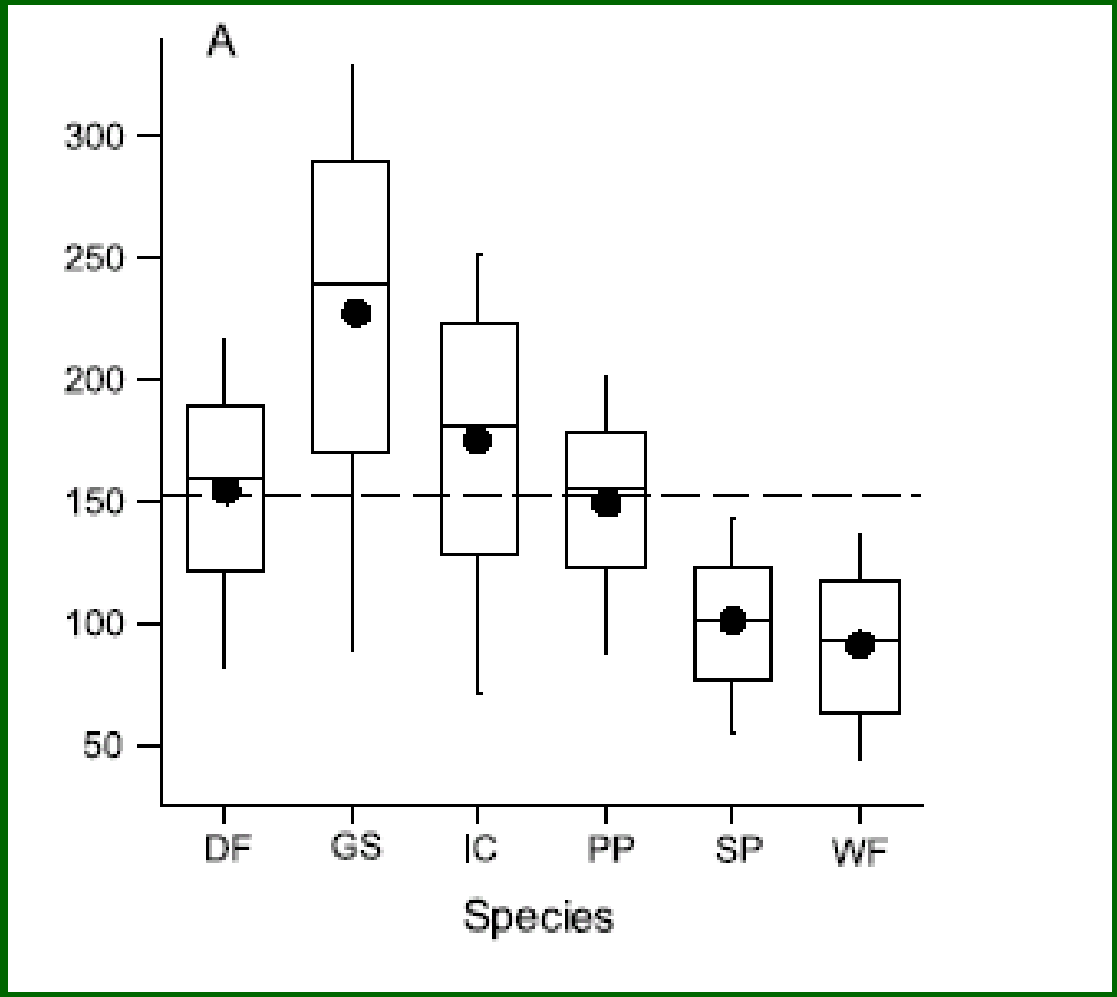
Implications

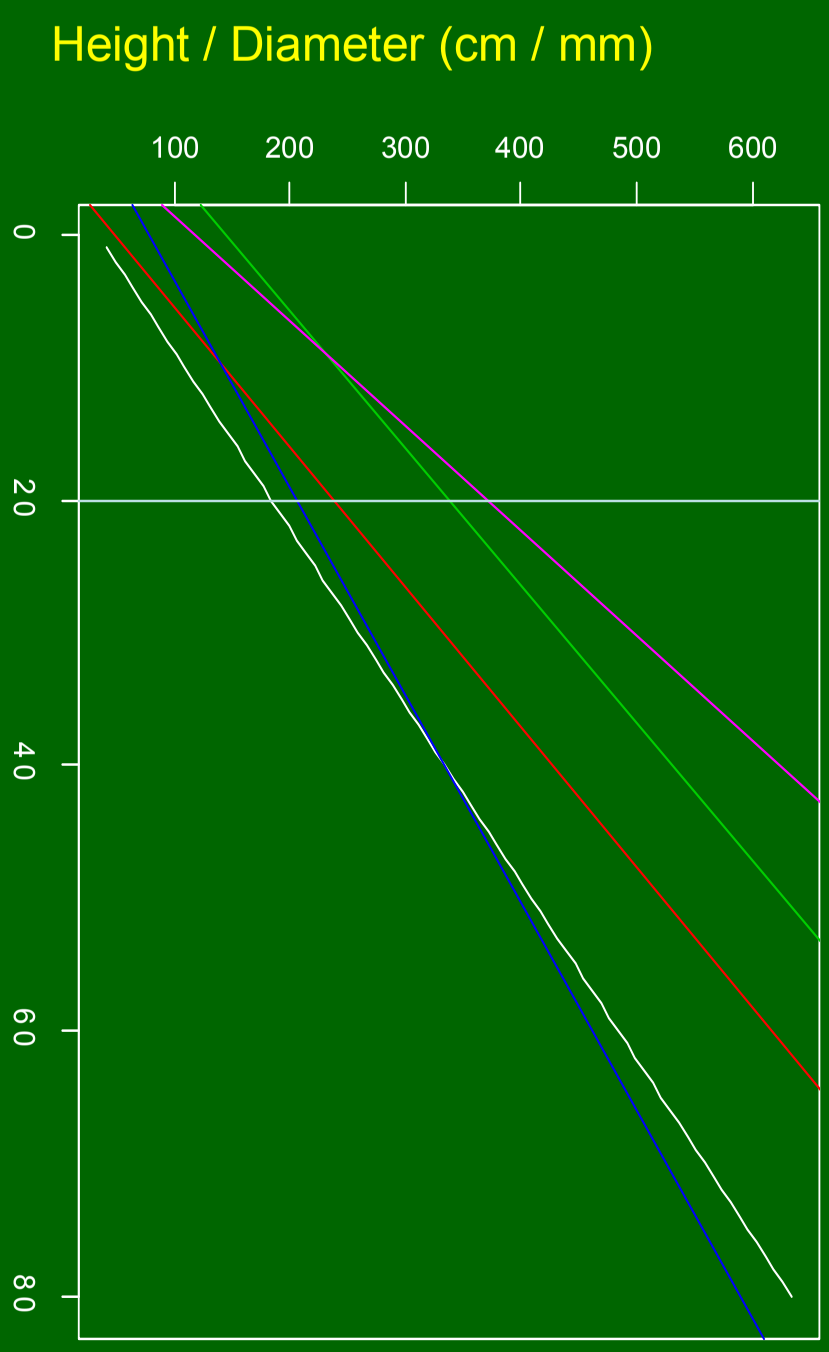
- Need *BIG* gap, or *HEAVILY* thinned stand, to assure height advantage to seedlings of fire-resistant trees
- R_x: thin heavily and / or gappily where there is seed rain from desired trees.
- Beware of established saplings as basis for future stand.

Appreciation

- USFS Region 5 and National Fire Plan
- Emily Ellsmore, Carl Salk, and former research crew members
- Plumas NF staff: Rich Bednarski, Molly Fuller, Angela Parker, Merri Carol Martens, Patti Millet, and many others.
- Maria Garcia, Jim Pena, Quincy Library Group

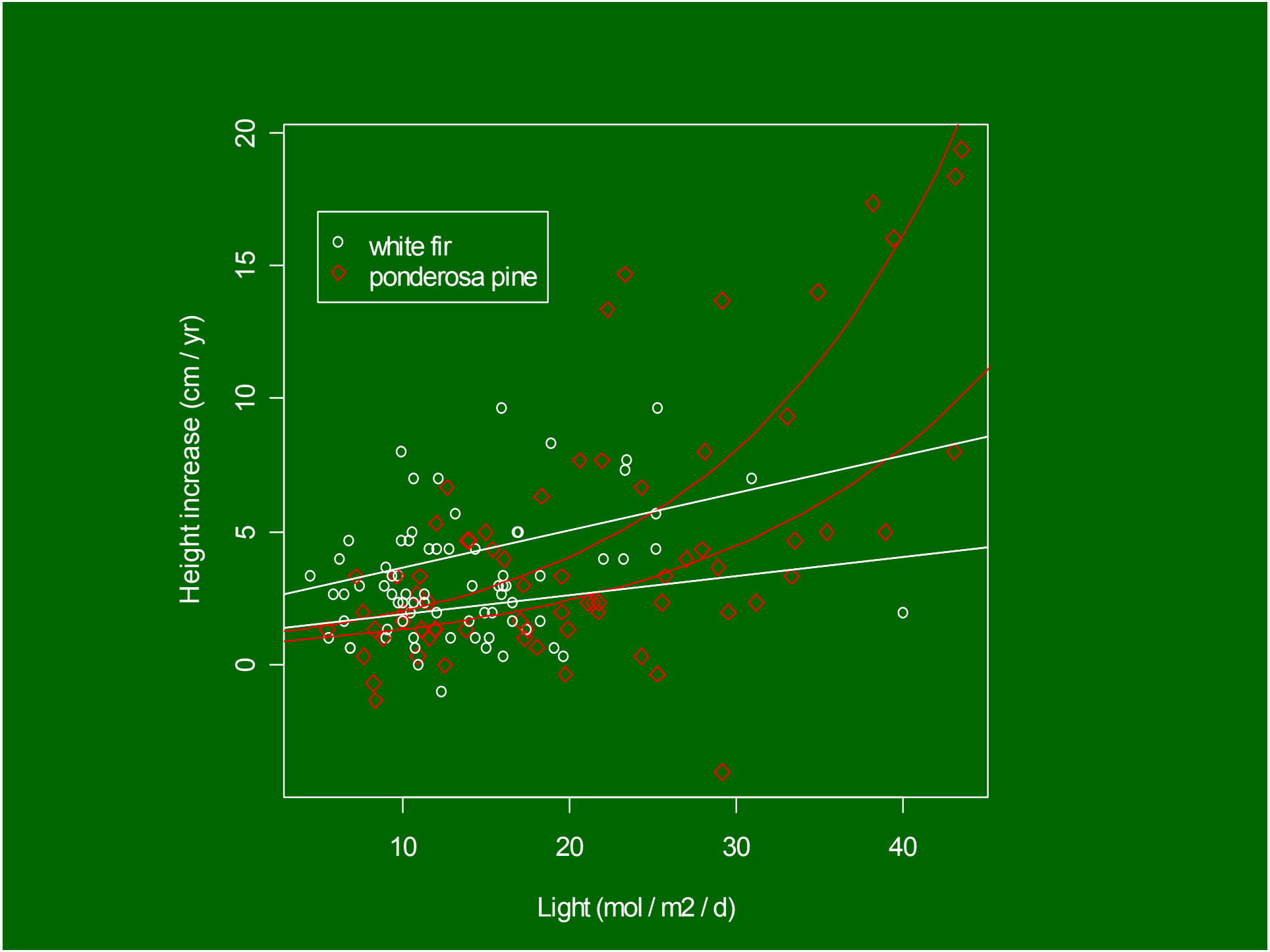
end


A
300
250
200
150
100
50
DF
GS
IC
PP
SP
WF
Species


Height / Diameter (cm / mm)
100
200
300
400
500
600
0
20
40
60
80

Future…

- Thinning & Group Expt. to provide relationship between canopy cover and light…
- Modeling option, Forest Simulators? {Need better growth & mortality factors first}…Or, just need to know Age?


white fir
ponderosa pine
Height increase (cm / yr)
0
5
10
15
20
10
20
30
40
Light (mol / m2 / d)