WITHIN-STAND SITE VARIABILITY IN NORTHERN CONIFERS: INFLUENCE ON SILVICULTURAL OUTCOMES IN MANAGED ACADIAN CONIFER FORESTS

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Introduction: Variability of soils

- Changes in the manifestation of soil forming factors on the landscape lead to variation in soil conditions.

- Forest managers and researchers often ignore site variation across wide areas.

Table 11.--Forest Productivity--Continued

Map symbol and soil name	Potential productivity			Trees to manage
	Common trees	Site index	Volume of wood fiber*	
WkC**:				
Berks	Virginia pine	70	114	Japanese larch,
	Black oak	70	57	Norway spruce,
	Northern red oak	70	57	Virginia pine, eastern white pine, red pine.
WkD**:				
Weikert	Virginia pine	60	86	Virginia pine,
	Northern red oak	64	43	eastern white
	Chestnut oak	50	29	pine, shortleaf pine.
Berks	Virginia pine	70	114	Norway spruce,
	Black oak	70	57	Virginia pine,
	Northern red oak	70	57	eastern white
	Chestnut oak	50	29	pine, red pine.

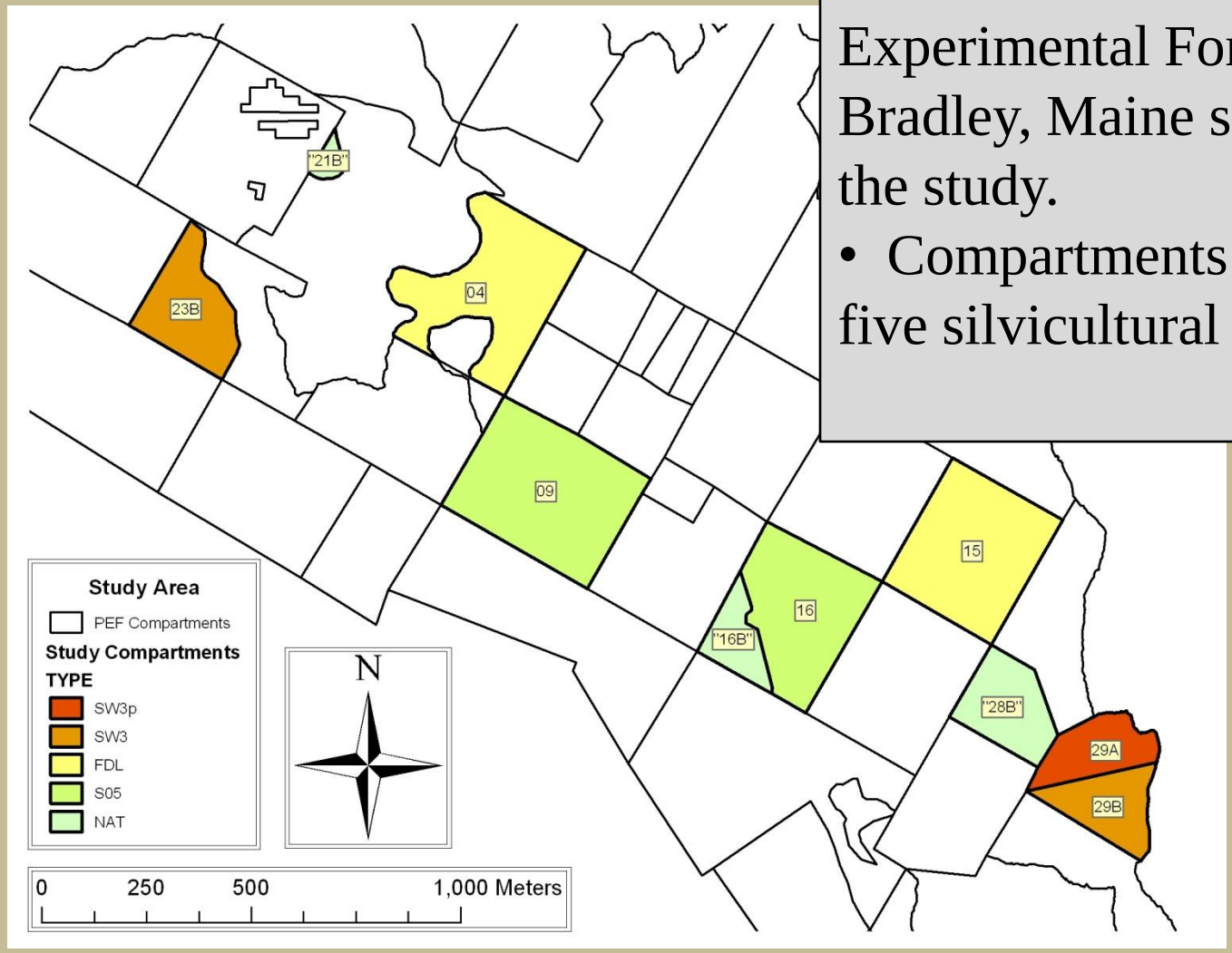
- NRCS soil surveys are limited by resolution of maps.

Introduction: Research questions

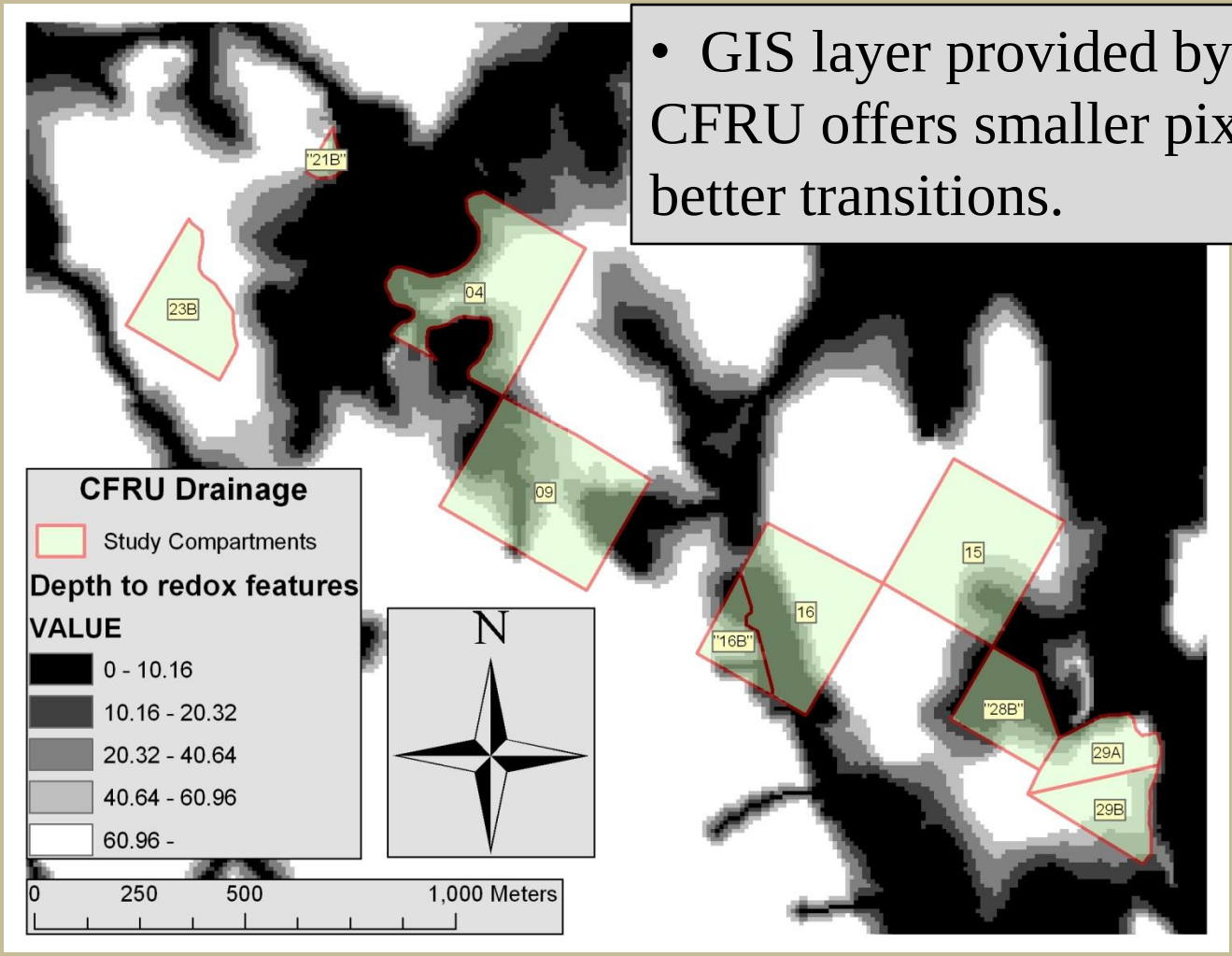
- How do site index (SI) leaf area index (LAI), and growth efficiency (GE) vary with changes in Briggs site class, silvicultural treatment, and species?
- How do stand-level metrics of silvicultural success or failure (such as total stand basal area (BA), % BA by species, and standing volume) respond to changes in Briggs site class and silvicultural treatment?

Methods: Study area

- Ten compartments on the US Forest Service's Penobscot Experimental Forest (PEF) in Bradley, Maine selected for the study.
- Compartments represent five silvicultural treatments.



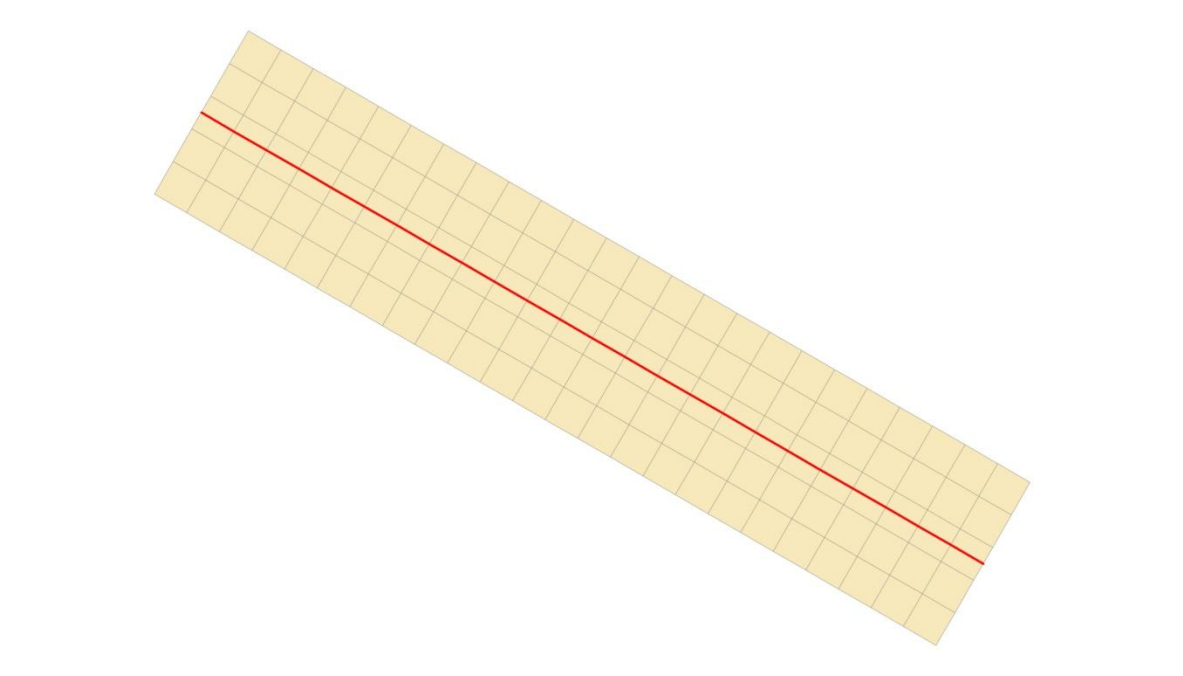
Methods: Predicting drainage classes



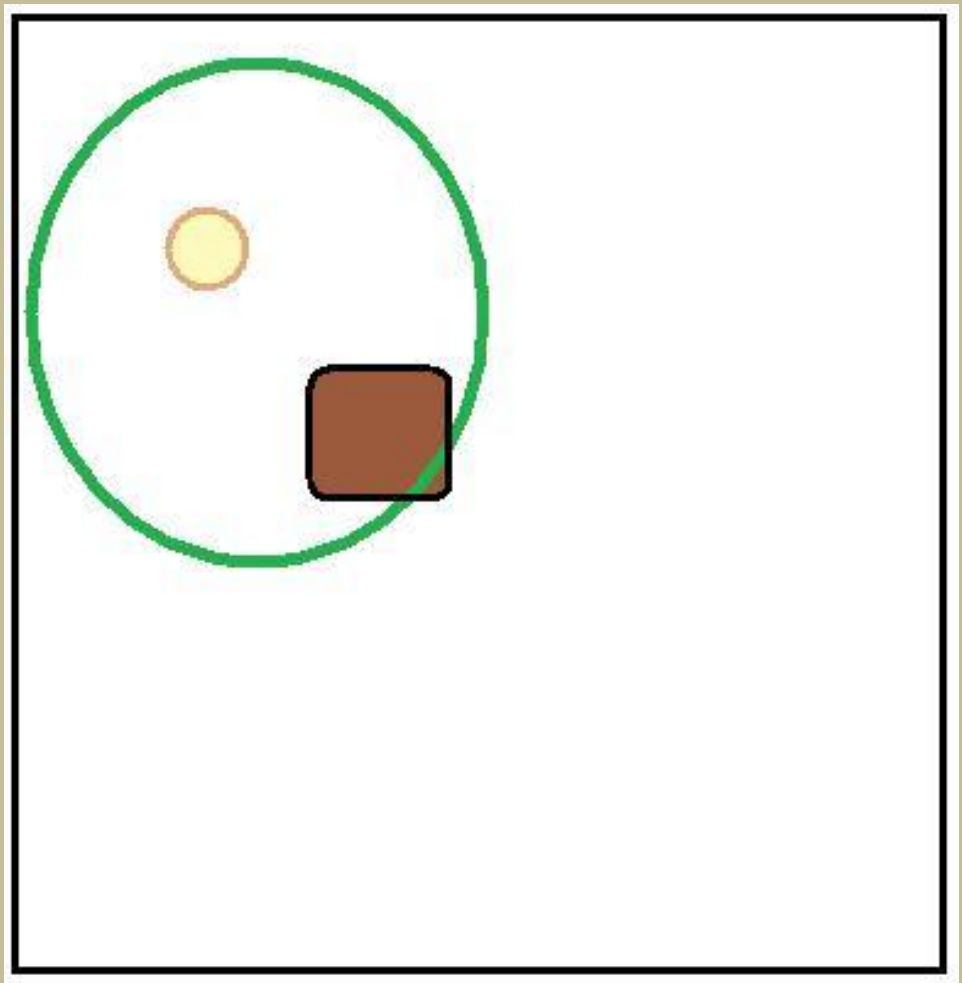
- GIS layer provided by CFRU offers smaller pixels, better transitions.

Methods: Sampling Grids

- Grids established across gradient in soil drainage
- Broken up into 5 m X 5 m cells
- 5 cells wide X ___ cells long

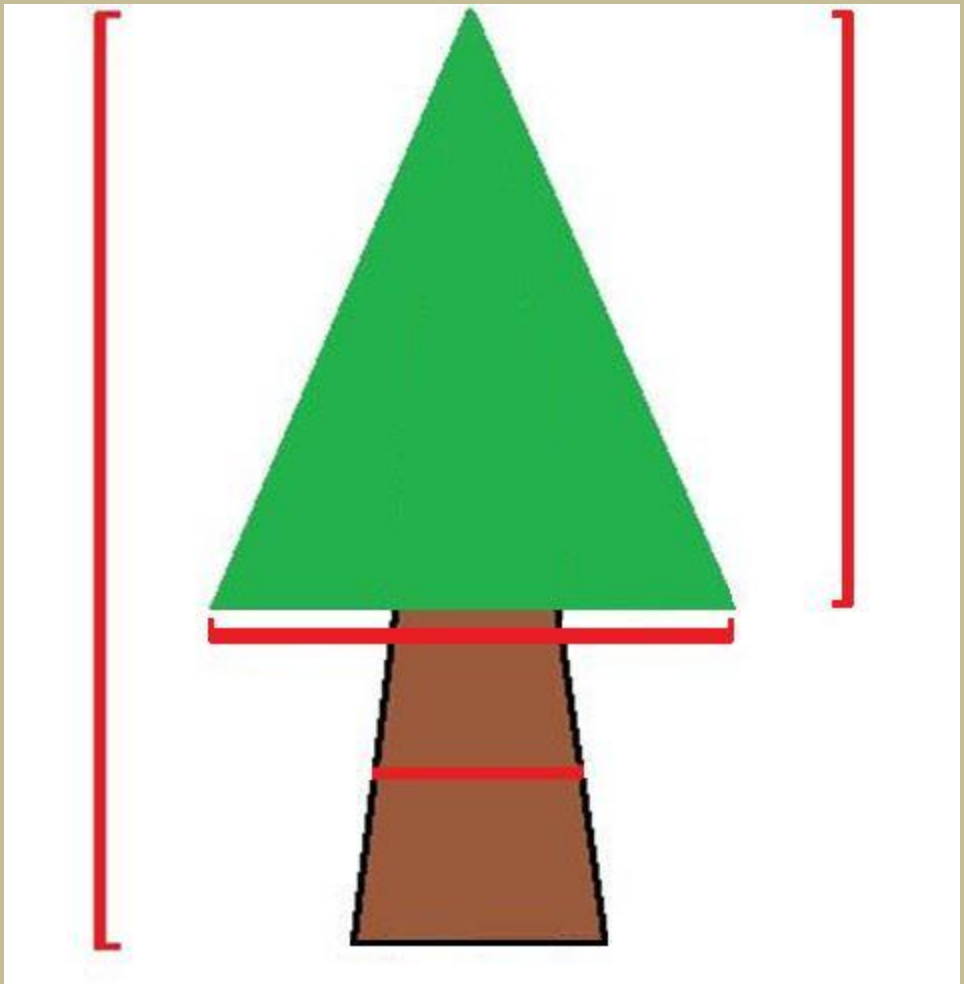


Methods: Soil measurements



- On each cell, flagged the most dominant tree, recorded its species, and assigned to crown class and stratum.
- Beneath crown of cell tree, digging soil pits to identify depth to redox and thickness of O.

Methods: Tree-level measurements



- On a subset of cell trees (free-to-grow conifers) will measure:
  - DBH
  - Total height
  - Length of live crown
  - Crown radius
- Two increment cores will be taken at DBH at 90 .

Methods: Overstory measurements

- On a subset of the study compartments, we will measure the overstory on a “strip-prism” plot, with the centerline of the strip running down the center of the sampling grids.

- Diameter of count trees will be measured at breast height and their species will be recorded.

Methods: Calculations and analysis

- Tree measurements will be used to calculate SI, LAI, and GE for measured trees. Values will be averaged by drainage class, silvicultural treatment, and species. Differences analyzed in ANOVA.

- Overstory measurements will be used to calculate a diameter distribution, BA per ha, % BA by species, and standing volume estimates. Differences between drainage classes and treatments analyzed in ANOVA.

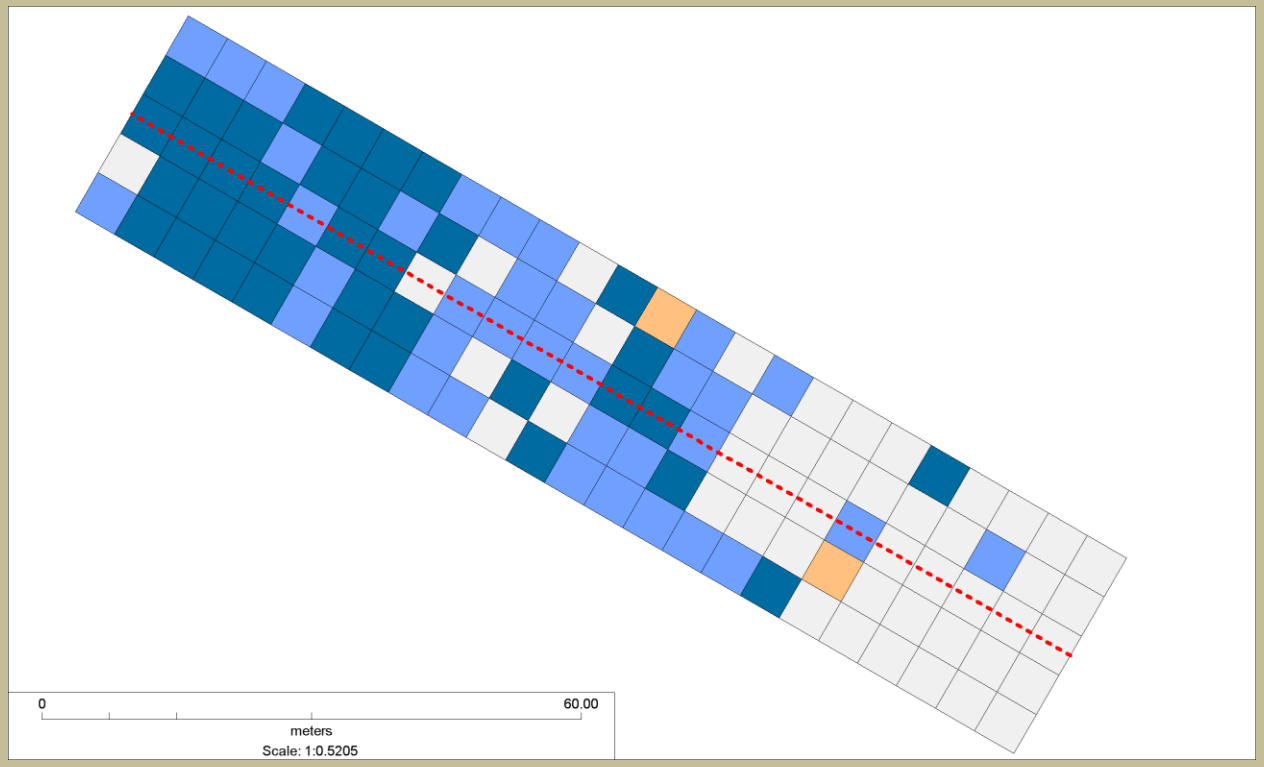
Progress: Cell trees

- Summer 2009:
  - 24 grids established in 10 study compartments.
  - Cell trees established and projected numbers of soil pits and measureable trees identified.

Compartment	Type	Area (ha)	Grids	Soil Pits	Trees
"16B"	NAT	2.2834	1	80	43
"28B"	NAT	4.1822	2	210	97
"21B"	NAT	0.5304	1	80	64
16	S05	8.5668	3	339	147
09	S05	12.247	3	392	151
15	FDL	10.3158	3	394	235
04	FDL	10.1457	4	367	153
23B	SW3	5.0243	2	290	223
29B	SW3	3.5628	2	167	132
29A	SW3p	3.3644	3	220	165

Progress: Field measurements

- Summer/Fall 2010: Soil measurements and tree-level measurements taken in several compartments.



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References

- CFRU 2007. http://www.umaine.edu/cfru/All_Coop/Research/Depth_to_watertable_mapping/Introduction.htm
- USDA Natural Resources Conservation Service. 2001. Soil Survey of Washington County, Maryland.