

## Rationale and Objectives

Studies have shown that non-planted vegetation can be a major competitor for resources in loblolly pine (*Pinus taeda*) plantations. However, studies addressing carbon storage and flux from non-planted species are rare. Information describing carbon cycling in non-target plants may be useful in determining ecosystem carbon budgets and its effect on loblolly pine productivity.

The objective of this study is to determine the effects of stand density, vegetation management intensity and site preparation on non-planted vegetation characteristics in loblolly pine plantations. A description of non-planted vegetation attributes throughout stand development will be produced, including estimates of non-planted biomass, carbon pools, and nitrogen pools at mid-rotation. This data will provide non-planted vegetation information to be used in 3-PG and carbon budget models within the PINEMAP research project and carbon budget models for a sustainable bioenergy project.

## Methods

Data used in this research will come from PINEMAP Tier II sites in Plantation Management Research Cooperative (PMRC) culture density and site preparation studies (Figure 1). The PINEMAP data will provide estimates of non-planted cover, biomass, carbon pools, and nitrogen pools at age 16 for culture density sites and age 28 for site preparation installations. The PMRC data will provide estimates of herbaceous cover and non-planted woody stem counts from age 2-15 for culture density sites and from age 3-25 for site preparation installations.

The effects of stand density, vegetation management intensity, and site preparation on non-planted vegetation attributes will be analyzed using descriptive statistics and ANOVA. An effort to relate the PMRC time series data to the point-in-time PINEMAP biomass data will be made through correlation and regression techniques.



Figure 1. Differences in non-planted vegetation under varying cultural intensity on a PMRC site.

## Results

Table 1. P-values for main effect of culture, density, and their interaction for age 16 stands planted at 1482 and 2964 TPH in the Upper Coastal Plain and Piedmont (n=5).\*

	Cover	Biomass	C concentration	C content	N concentration	N content	C:N
-----P-Values-----							
<b>Total</b>							
Culture	<b>0.020</b>	<b>0.033</b>	0.941	<b>0.013</b>	0.148	<b>0.052</b>	0.195
Density	0.698	0.150	0.830	0.907	0.993	0.224	0.542
Culture*Density	0.894	0.834	0.831	0.421	0.799	0.835	0.540
<b>Herbaceous</b>							
Culture	<b>0.041</b>	<b>0.020</b>	0.904	<b>0.006</b>	0.152	0.243	0.252
Density	0.312	<b>0.029</b>	0.961	0.978	0.986	0.504	0.685
Culture*Density	0.353	0.456	0.607	0.477	0.648	0.899	0.212
<b>Woody</b>							
Culture	<b>0.066</b>	0.177	0.830	0.213	0.249	0.248	0.481
Density	0.690	<b>0.039</b>	0.822	0.277	0.970	<b>0.063</b>	<b>0.035</b>
Culture*Density	0.542	0.225	0.613	0.262	0.837	0.318	0.165

\*Values in bold represent significance at  $\alpha=0.10$

Table 2. Mean values of non-planted vegetation attributes at age 16 for intensive and operational culture in plots planted at 1482 and 2964 TPH in the Upper Coastal Plain and Piedmont (n=5).\*

	Cover (%)	Biomass (Mg/ha)	C concentration (%)	C content (Mg/ha)	N concentration (%)	N content (kg/ha)	C:N
<b>Total</b>							
Intensive	1a	0.009a	45a	0.005a	2.4a	0.3a	16a
Operational	12b	0.353b	45a	0.183b	1.9a	8.2b	24a
<b>Herbaceous</b>							
Intensive	1a	0.008a	44a	0.003a	2.4a	0.3a	16a
Operational	6b	0.176b	44a	0.102b	2.0a	4.4a	23a
<b>Woody</b>							
Intensive	0a	0.001a	48a	0.001a	2.3a	0.1a	23a
Operational	6b	0.177b	46a	0.078a	1.9a	4.6a	26a

\*Means followed by different letters are significantly different at  $\alpha=0.10$

## Conclusions

The results show that cultural intensity had a significant effect on non-planted vegetation cover, biomass, and carbon content for each non-planted vegetation category (Table 1). As expected the more intensive cultural treatment resulted in less non-planted vegetation compared to the operational treatment (Table 2). When comparing planting densities of 1482 and 2964 TPH most non-planted vegetation attributes did not differ significantly, nor where there any significant interactions between culture and density.

The main effects of planting densities of 741, 1482, 2224, 2964, 3705, and 4448 TPH on non-planted vegetation were also tested for significance, however no differences were found. Analysis of the relationship between the one-time non-planted biomass estimates and the time series estimates is in progress and will be completed shortly.

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