Longleaf Mean Annual Increment Curves in Planted Stands in the West Gulf Region

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Background and Introduction

Mean annual increment (MAI) estimates of wood growth in pine and hardwood stands are valuable tools for rotation age determinations and financial decisions. MAI is often expressed in terms of tons/acre/year of wood+bark growth, either to a merchantable top (for hardwoods to an 8 or 10 inch top and for pines to a 3 inch top for pulpwood and to a 6, 8, or 10 inch top for chip-n-saw and sawtimber) or as total tons (to the top of the tree stems). MAI is pine or hardwood species specific and will vary due to soils, land use history, trees per acre, forest management intensity, site, and other factors. Accurate estimations of when (age or age range) maximum MAI is realized is also valuable in decision-making for pine and hardwood species.

Longleaf pine, due in part to its period in the grass stage (no height growth) that may be from 2 to 20 years depending on soils, site, genetics, and management factors, achieves its maximum MAI later than loblolly and slash pine. Studies in the last 30 – 40 years on loblolly and slash pine growth over time tends to reach a maximum MAI at age 15- (slash pine at high planting densities and intensive management) to 25-years (loblolly and slash pine with modest levels of management, moderate planting densities, on low fertility soils). Longleaf's maximum MAI tends to occur earlier on better soils/sites with better management and later on poorer soils/sites and lower levels of management (Figure 1).

Longleaf Plantation wood+bark Growth and MAI Values

Work done by Goelz and Leduc (2001) with long-term data on unthinned longleaf plantations in the Gulf Coastal Plain indicate that wood maximum mean annual increment occurs at age 30-years on the best sites (site index; $SI_{25} > 60$ feet) at 5.5 tons/acre/year, at age 35-years on moderately productive sites (SI_{25}= 50-60 feet) at 4.4 tons/acre/year and on poor sites ($SI_{25}<50$ feet) at age 55 – 60-years at 1.85 tons/ac/year.

The low number or trees per acre (TPA) in the SI<50 feet longleaf plantation plots (326 TPA at age 15-years, 158 TPA at age 25-years and 120 TPA at age 40-years, Table 1) contributed greatly to very low tons/acre wood production and tons/acre/year production rate (Table 1). The SI=50-60 feet and SI>60 feet TPAs were much higher than the low SI (<50 feet) at 510 and 815/acre at age 15-years, 565 and 591 TPA at age 25-years and 363 and 384 TPA at age 40-years, respectively (Table 1). The 510 and 815 TPA at age 15-years for the moderate and high SI sites are much higher than the average surviving TPAs (354/acre) on the most recent Conservation Reserve Program CP36 plantings (1999 – 2006) on former old-field sites in

Georgia summarized by Dickens and others (2017) with an average planting density of 500 TPA, an average basal area of 100 square feet/acre, and an average MAI of 3.9 tons/acre/year through age 15-years.

Summary

These MAI and total wood+bark production curves should be used as rough estimates for longleaf stands planted at lower densities than the moderate or high SI TPA values at age 15-years through age 45-years. As new data becomes available on planted, unthinned former old-field and cut-over longleaf stands in the SE US, we will have more current MAI and wood+bark production curves.

Unthinned longleaf pine plantation mean annual increments (MAIs) by Site Index (base age 25-years) in the Gulf Coastal Plain
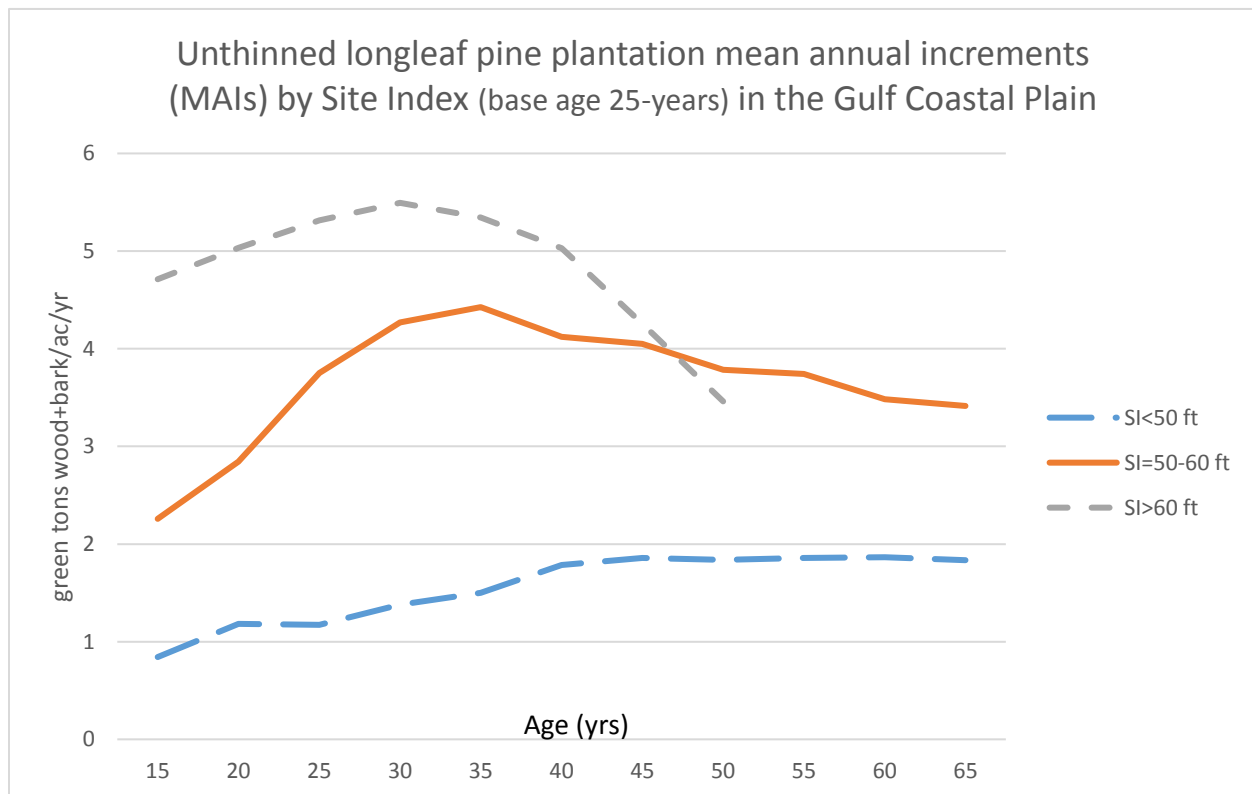
Figure 1. Unthinned longleaf pine plantation wood+bark mean annual increment (MAI) over time by site index base age 25-years from stands in the Gulf Coastal Plain (Goelz and Leduc 2001).

Figure 2. Unthinned longleaf pine plantation wood+bark growth over time by site index base age 25-years from stands in the Gulf Coastal Plain (Goelz and Leduc 2001).

Table 1. Average number of trees per acre

	Site Class		
	Low	Medium	High
Age Class	$SI_{25} < 50$ ft	$SI_{25} = 50\text{-}60$ ft	$SI_{25} > 60$ ft
5		569	786
10		427	722
15	326	510	815
20	248	466	718
25	158	565	591
30	136	530	514
35	124	477	442
40	128	363	384
45	120	320	293
50	89	279	215
55	87	242	
60	86	187	
65	82	169	

Table 2. Basal Area (ft^2) per acre

Age Class	Site Class		
	Low	Medium	High
	SI$_{25}$ < 50 ft	SI$_{25}$ = 50-60 ft	SI$_{25}$ > 60 ft
5		5	14
10		23	40
15	26	59	109
20	39	82	129
25	44	118	150
30	55	140	166
35	62	156	174
40	77	157	178
45	85	164	163
50	88	163	142
55	94	172	
60	100	171	
65	104	177	

Literature Cited:

Geolz, J.C.G. and D.J. Leduc. 2001. Long-term studies on development of longleaf pine plantations. USDA FS. In: Proceedings of the 3rd Longleaf Alliance Regional Conference 2000 October 16-18. Alexandria, LA. Longleaf Alliance Report #5 pp. 116-119.

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Citation:

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