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Fertilizer Response Expectations, Application Levels, and Material Needs for Loblolly, Longleaf, and Slash Pine

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By: E. David Dickens – Forest productivity Professor, David J. Moorhead – Silviculture Professor, Lawrence A. Morris – Forest Soils Professor, and David E. Kissel – Ag Service Lab Director

Numerous southern pine fertilization studies have been performed in the southeastern U.S. since the late 1960's. Loblolly pine fertilization studies have been the most numerous and extensive, followed by slash pine fertilization studies and lastly longleaf fertilization studies. Table 1 summarizes the 8 year fertilizer (NP or NPK) response from these studies using a traditional single application for the three commercially important species.

Table 1. A summary of an 8 year fertilizer response to a single NP or NPK fertilizer application at or after canopy closure

Pine species	Average 8 – year growth response	Low end of response[1]	Upper end of response[1]
	----------Tons per acre per year ----------		
Loblolly	1.60	0.96	2.24
Longleaf	1.00	0.60	1.40
Slash	1.35	0.81	1.89

[1] A 40% plus or minus the mean growth response covers 80% of cited NP fertilization sites based on work at NCSU Forest Nutrition Cooperative for loblolly pine

If a loblolly, slash, or longleaf stand is determined to be responsive using the three diagnostic tools (soil available-P analysis, foliar nutrient analysis, and leaf area index), plus soil series and land use history knowledge, then the landowner should consider (1) the cost of the fertilizer materials plus application fee, (2) the estimated growth response over a 6 to 10-year period to the single fertilizer application, and (3) the anticipated stumpage price for the extra wood grown at the end of the period. Refer to "Rate of return estimates for an 8-year period with a single fertilizer application" publication by Dickens and Moorhead (2010) www.forestproductivity.net for various financial scenarios. Use the application levels shown in Table 2 for nitrogen (N), phosphorus (P), and potassium (K) and the levels of various fertilizer materials shown in Table 3.

Table 2. Recommended fertilizer application rates (elemental – lbs/ac) for loblolly, longleaf, and slash pine

Species	Stand phase/size	Nitrogen (N)	Phosphorus[1] (P)	Potassium[2] (K)	Ca, Mg, S, B, Cu, Mn, Fe[3]
Loblolly	At planting	40 to 50	20 to 40	50 to 80	As needed based on foliar analysis or other diagnostics
	>Canopy closure	125-200			
Slash	At planting	40 to 50			
	>Canopy closure	125-200			
Longleaf	Dbh < 6"	75			
	Dbh>6"	125			

[1]To convert from elemental-P to P_2O_5 multiply by 2.3. To convert from P_2O_5 to elemental-P divide by 2.3.
[2]To convert from elemental-K to K_2O multiply by 1.2. To convert from K_2O to elemental-K divide by 1.2.
[3]Approximate application levels are based on stand needs: 25 to 40 lbs Ca/ac, 25 lbs Mg/ac, 25 to 40 lbs S/ac, 0.5 to 1 lb B/ac, 3 to 5 lbs Cu/ac, 3 to 5 lbs Mn/ac, and 10 to 15 lbs Fe/ac

Table 3. Application level recommendations using common fertilizer materials for loblolly, longleaf, and slash pine stands after canopy closure that have a good probability of response to fertilization

Pine species & age or size	Urea[1] (46-0-0)	Diammonium phosphate[2] (DAP; 18-46-0)	Muriate of potash (0-0-60)
	----------Pounds per acre ----------		
Loblolly < 12 yrs	190 – 235	100 - 200	100 - 150
Loblolly ≥ 12 yrs	355 - 395		
Slash < 12 yrs	190 – 235		
Slash ≥ 12 yrs	340 – 395		
Longleaf < 6" dbh	85 - 125		
Longleaf ≥ 6" dbh	190 - 255		

[1]Use the low Urea application level when used with the high DAP or MAP dose and the converse when a low DAP or MAP dose is used.
[2]Mono-ammonium phosphate (MAP; 11-52-0) may be available and can be used in place of DAP @ 88 – 176 lbs/ac to achieve 20 to 40 lbs elemental-P/acre (46 to 92 lbs P_2O_5/ac) but Urea dosage will need to be increased to achieve N application levels in Table 2.

Warnell School of Forestry and Natural Resources
Athens, Georgia 30602-2152
Telephone 706.542.2686 Fax 706.542.8356