

# NEWS & VIEWS

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## Fertilizing Pine Forests in the Gulf Coastal Plain with Nitrogen and Phosphorus

Historically, commercial pine forests in Louisiana and much of the Midsouth have not received fertilizer applications. High timber prices and recent research showing excellent growth response to fertilizer applications under certain conditions indicate that timber management practices should change to include commercial fertilization.

### At least three conditions must be met before operational fertilization is initiated in a timber tract:

- Trees must be considered as a money-making crop. If the timber stand is solely intended for aesthetic reasons or for hunting, fertilization may not be recommended.
- The soil and/or plant nutrient levels should indicate a need for fertilizer. Shallow rooting caused by rocky or heavy clay subsoils should not be a limitation.
- Good silvicultural practices (planting, weed control, thinning, etc.) should be implemented, especially good weed control.

### Fertilization at Planting

Soil test phosphorus (P) levels are used to consider the need for fertilization at planting. Samples should be collected from 0 to 6 inches at 10 to 15 locations in the forest to represent an area no larger than 40 acres. Research by Tiarks and Haywood with the USDA Southern Forest Experiment Station determined the probability of a response to P at different soil test levels:

Bray P-2 soil test, ppm <sup>1</sup>	Probability of a growth response to P
<4	Good response expected
4 to 7	May respond to fertilization
>7	Response unlikely

<sup>1</sup> A probable growth response would be indicated if soil test P levels are 8 to 10 lb/A by the Mehlich 3 method. One part per million (ppm) is equivalent to 2 lb/A, assuming a 6-inch sampling depth.

*The Bray P-2 levels shown are for colorimetric extractable P measurements. If other extractants or instruments are used, the interpretation may be different, and the laboratory should be consulted for guidance in interpretation.*

In one study, excellent economic returns to nitrogen (N) and P fertilization were measured by Haywood and Tiarks on a soil with colorimetric Bray P-2 of 1 ppm when the fertilizer was applied three months after planting and weed control was good. Pulpwood yields 10 years after planting were greatest with a combination of fertilization at planting coupled with weed control (**Table 1**).

**Table 1. Pine pulpwood net returns to fertilization and weed control 10 years after planting.**

Treatment	Yield, cu. ft./A <sup>1</sup>	Cost	Gross value	Net value
----- \$/A -----				
No fertilizer, no weed control	941	—	235	235
Weed control only	1,611	60	403	343
200-225-0 at planting + weed control	2,701	190	675	485
200-225-0 applied 6 years after planting + weed control	2,171	190	543	353

Pulpwood valued at \$25/cord: 200-225-0 (N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O) valued at \$115.00/A plus application.

<sup>1</sup>One cord approximately equals 80 to 85 cu. ft., depending on log diameter.

In another study, on a similar soil with similar soil test P levels, the timber growth after four years was markedly improved with fertilization and weed control (**Table 2**).

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**Table 2. Pine growth response to fertilization and weed control.**

Treatment	Volume growth, cu ft./A	Increase over the control, %
No fertilizer, no weed control	214	—
No fertilizer, good weed control	330	54
200-200-70, no weed control	354	65
200-200-70 + good weed control	921	330

With fertilization at planting, pulpwood can be harvested earlier, volume can be increased, the time to sawlog harvest can be shortened, and larger sawlogs can be obtained.

### Fertilization after Thinning

Fertilization after thinning, or pulpwood harvest, can also be profitable. If soil samples were not collected at planting, they can be collected and tested for P levels after thinning, using the same interpretations as those used for fertilization at planting. If soil tests at planting called for P fertilization, fertilization after thinning is probably warranted. As an alternative to soil sampling in established forests, 200 needles can be collected at random from at least 15 trees in a representative area. (*Note:* Needle sampling and analyses are preferred for established pine stands and should be used in addition to soil tests for a more accurate assessment of the need for P fertilization). Needles should be collected in the winter from the upper one-third of the canopy of dominant trees. Since shotguns are often used to shoot the branches from the trees in sampling, safety should be exercised (**Table 3**).

**Table 3. Pine needle P sufficiency interpretation for the midsouth Gulf Coastal Plain.**

P Concentration, %	Interpretation
< 0.10	Deficient; response to P highly probable
0.10 to 0.12	Critical range; usually responds to P
> 0.12	Sufficient; response to P not likely

For the best results, fertilizer can be applied after thinning when the next pulpwood, chip and saw, or sawlog harvest is planned in eight years or less. When prescribed burning is used as a weed control tool, fertilizer applications should be delayed at least two months after burning.

### Southern Regional Pine Fertilization Response

The North Carolina State Forest Nutrition Cooperative established 42 research sites across the South in 1984. Recently thinned 10 to 16 year-old pine stands that were moderately stocked (moderate stand density) received different rates of N and P. Results indicated that 200-120-0/A after thinning dramatically increased yields, with most of the response occurring in the first six years

after fertilization. The average 10-year increase over the nonfertilized controls was 500 cu. ft./A or 3086 board ft./A with a gross economic increase of \$1,235/A. Subtracting the fertilizer and application costs (\$1,235/A minus \$100/A) resulted in an average net economic return to fertilization of \$1,135/A.

If a high application cost of \$20.00/A is assumed, the total fertilization investment for 200-120-0 would be about \$100.00/A. If this pine fertilization investment is compared with investing in accounts yielding 5 to 15 percent interest rates, the pine fertilization is clearly a wise investment (**Table 4**).

**Table 4. Ten-year returns to investing \$100.00 at selected interest rates or in pine forest fertilization.**

Annualized rates of return, %			Pine forest fertilization
5	10	15	
\$163	\$259	\$405	\$1,135

Pine forest fertilization figure is the average economic increase from 42 experiments, assuming sawlog timber valued at \$400.00 per 1,000 board feet.

Fertilizing pine forests in much of the South can pay large dividends if stocking levels (stand density) are well managed and good weed control is implemented. Fertilizer should be applied at or shortly after planting if the landowner/manager wishes to increase the pulpwood production and/or shorten the time to the sawlog stage. The use of at least 100 lb/A of 18-46-0 is recommended, at or shortly after planting, for stands established on soils testing very low in extractable P (<4 ppm Bray P-2). If pine straw is to be harvested from the site, fertilization becomes even more critical to maintaining optimum site productivity.

If fertilizer was applied at planting, 100-60-0 would be recommended after the first thinning. An application of 200 to 300 lb of N/A plus 60 lb of P<sub>2</sub>O<sub>5</sub>/A would be recommended following a second thinning. Harvest within 8 to 10 years of fertilization is recommended for best results. If fertilizer was not applied at planting, 100-115-0 would be recommended after the first thinning, followed by an additional 200 to 300 lb of N/A plus 115 lb of P<sub>2</sub>O<sub>5</sub>/A after the second thinning. ■

### Selected References

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