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# Nutrient Management

NM-7
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## NUTRIENT RECOMMENDATIONS FOR COMMERCIAL LOBLOLLY PINE PLANTATIONS IN MARYLAND

**Stages of Growth**

Managing the application of nutrients in commercial Loblolly pine plantations depends upon the growth stage of the plantation. For example, nutrient application at establishment is dictated by soil test levels for phosphorus and potassium whereas nutrient application at mid-rotation thinning depends upon both soil test levels and under some conditions, one or two indicators of tree nutrient status (i.e., Leaf Area Index (LAI) or foliar nutrient levels).

**Nutrient Management During Establishment**

**Nitrogen (N)**

No commercial nitrogen fertilizer is recommended for establishment of Loblolly pine plantations.

**Phosphorus (P) and Potassium (K)**

Application of phosphorus (P) and potassium (K) to areas of Loblolly pine establishment is based on the amount of plant-available P and K already in the soil as expressed by the Fertility Index Value (FIV). See Table 1 on page 2.



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Table 1. Phosphorus (as phosphate, $P_2O_5$) and potassium (as potash, $K_2O$) recommendations for the establishment of Loblolly pine plantations (pounds per acre).

| Soil Test Category | | | | |
|---|---|---|---|---|
| **Rate (lbs./acre)** | **Low (FIV 0-25)** | **Medium (FIV 26-50)** | **Optimum (FIV 51-100)** | **Excessive (FIV >100)** |
| **$P_2O_5$** | 115 | 115 | 55 | 0 |
| **$K_2O$** | 60 | 60 | 30 | 0 |

## Nutrient Management at Mid-Rotation Thinning Using Commercial Fertilizer

Application of nutrients as commercial fertilizer at mid-rotation thinning considers both soil test FIV-P and under some conditions, one or more indicators of tree nutrient status (i.e., LAI or foliar nutrient levels). No potassium is recommended at mid-rotation thinning.

**When soil test FIV-P is low or medium**, follow recommendations in Table 2.

Table 2. N and P recommendation at mid-rotation thinning when soil test FIV-P is low or medium.

| **If soil test FIV-P is…** | **apply…** | **and apply…** |
|---|---|---|
| low | 125 – 250 pounds N per acre | 115 pounds $P_2O_5$ per acre. |
| medium | 125 – 250 pounds N per acre | 55 – 115 pounds $P_2O_5$ per acre. |

**When soil test FIV-P is optimum**, determine LAI and consult Table 3 for recommendation.

For information on determining LAI, contact a consulting forester or the Extension Natural Resource Specialist at the University of Maryland Wye Research and Education Center or consult *Ocular LAI Comparator for Loblolly Pine*. See the "References" section for ordering information.

Table 3. Utilizing LAI to determine N and P recommendation when soil test FIV-P is optimum.

| **If LAI is between…** | **then…** |
|---|---|
| 0.65 and 2.0 | apply 125 – 250 pounds N and 55 pounds $P_2O_5$ per acre. |
| 2.01 and 3.0 (optimum range) | rely on foliar analysis. |
| 3.01 and 4.5 | do not fertilize. |

When soil test FIV-P and LAI are both optimum, rely on foliar analysis.

Collect a representative sample of foliage and obtain a total N and P analysis from an agricultural analytical laboratory and compare the Loblolly pine foliage N and P levels to those reported in Table 4.

Table 4. Interpretive information for N and P concentrations in Loblolly pine foliage.

| Nutrient | Critical Level (%) | Optimum Upper Limit (%) |
|---|---|---|
| **N** | 1.1 – 1.2 | 2.3 |
| **P** | 0.10 – 0.12 | 0.17 |

Consult Table 5 to determine the ultimate N and P recommendations when soil test P and LAI are both optimum.

Table 5. N and P recommendation at mid-rotation thinning when soil test FIV-P and LAI are both optimum.

| **If N…** | **then…** |
|---|---|
| is less than 1.1% in the Loblolly pine foliage | apply 125 – 250 pounds N per acre. |
| is 1.1% or greater in the Loblolly pine foliage | do not apply any N. |
| **If P…** | **then…** |
| is less than 0.10% in the Loblolly pine foliage | apply 55 pounds $P_2O_5$ per acre. |
| is 0.10% or greater in the Loblolly pine foliage | do not apply any P. |

**When soil test FIV-P is excessive**, do not apply any P-bearing nutrient sources. Consult Table 6 for N recommendation.

Table 6. N recommendation at mid-rotation thinning when soil test FIV-P is excessive.

| Step | Action |
|---|---|
| 1 | To determine N recommendation, first determine LAI and follow N recommendation in Table 3.<br>• If LAI is in the optimum range, collect a representative sample of foliage and obtain a total N analysis from an agricultural analytical laboratory. |
| 2 | Compare the Loblolly pine foliage N levels to those reported in Table 4. |
| 3 | Follow N recommendations in Table 5. |

**Organic Waste Applications**

Application rates for organic wastes, such as poultry litter and biosolids, etc., at establishment and at mid-rotation thinning depend upon soil test FIV-P and the plant-available nitrogen (PAN) content of the organic waste (Table 7).

Table 7. Organic waste application rates.

| If FIV-P is… | and growth stage is… | then… |
|---|---|---|
| between 1 and 50 (low and medium) | establishment | apply 60 pounds per acre PAN. |
| between 1 and 50 (low and medium) | mid-rotation thinning | apply 180 pounds per acre PAN. |
| between 51 and 100 (optimum) | establishment | apply 30 pounds per acre PAN. |
| between 51 and 100 (optimum) | mid-rotation thinning | apply 90 pounds per acre PAN. |
| greater than 100 (excessive) | establishment or mid-rotation thinning | do not apply organic waste. |

A representative sample of an organic waste must be collected and analyzed prior to determining the appropriate application rate. See *Sampling Manure for Nutrient Content*, for information on collecting a representative sample.

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**Nutrient Best Management Practices (BMPs) for Loblolly Pine Plantations**

BMPs should be observed and utilized to protect soil and water quality.

**Timing BMPs**

Application of nutrients to Loblolly pine plantations should be limited to either the spring (March 1 – May 15) or fall seasons (August 15 – October 15).

Do not apply nutrients to Loblolly pine plantations from October 15 to February 28.

Nutrient applications to newly established Loblolly pine plantations should be avoided in July and August to avoid foliage burning.

**Site BMPs**

Do not apply any nutrient source near watercourses or Stream Management Zones (SMZs):

- for sites with a slope between 1 – 5%, within 50 feet of a pond, stream or other water body
- for sites with a slope of more than 5%, within 100 feet of a pond, stream or other water body

Do not apply nutrients to a site with standing water at the time of application.

Do not apply nutrients on bedrock outcrops.

Do not apply **any** P-bearing nutrient sources to sites whose soil test FIV-P is greater than 100.

**Nutrient Application Frequency BMPs**

Nutrient applications may occur at mid-rotation or as often as every 5-7 years, if appropriate, based on soil test and foliar analysis or LAI.

**Organic Waste BMPs**

If an organic nutrient source is applied at establishment, it is critical to apply an approved herbicide to control unwanted vegetation.

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**References**

Sampson, D.A., H.L. Allen, E.M. Lunk and D.P. Blevins. 1997. *Ocular LAI comparator for Loblolly pines.* Version 4.1. Department of Forestry and Environmental Resources, North Carolina State University, Raleigh, NC, 27695-8008. ($15)

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