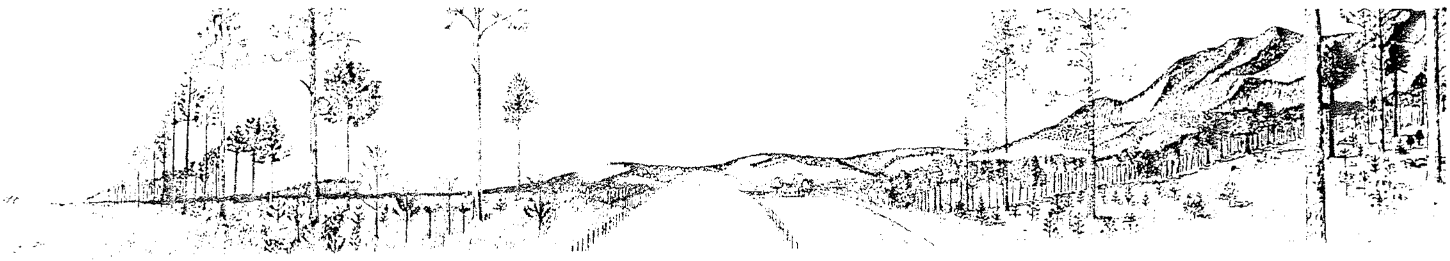

USDA Forest Service Research Note SE-125 December 1969

Estimating Slash Quantity from Standing Loblolly Pine

Abstract. — No significant differences were found between variances of two prediction equations for estimating loblolly pine crown weight from diameter breast height (d.b.h.). One equation was developed from trees on the Georgia Piedmont and the other from trees on the South Carolina Coastal Plain. An equation and table are presented for estimating loblolly pine slash weights from either cruise data or harvested cords per acre.

INTRODUCTION

The economics of today make it imperative that land be kept in continuous production. The short rotations commonly practiced in southern pine management make even a few years' wait between harvest and regeneration costly. If an area is to be regenerated either naturally or by direct-seeding methods, mineral soil must first be exposed. Also, planting or seeding equipment cannot work efficiently in clearcut areas because of the slashings. Moreover, the fire hazard created by logging slash is of concern to forest managers.

Prescribed fire is one means of alleviating problems created by slash accumulation. However, before adequate slash-burning guidelines can be developed, the effects of slash characteristics upon fire behavior must be studied with particular reference to species indigenous to the Southeast. The amount of slash present affects both its continuity and distribution, thereby exerting a strong influence on fire behavior. Olson and Fahnestock (1955) identified fuel quantity as the most important characteristic governing flammability, rate of spread, and magnitude of the slash disposal job in the Northern Rocky Mountains. An efficient, statistically sound means of estimating slash quantity per unit area is obviously needed if laborious field sampling is to be avoided.

Several investigators have shown that conifer crown weights can be predicted from certain standard cruise measurements taken before logging (Kittredge 1944; Baskerville 1965; Brown 1965; Kiil 1965; and Satoo 1965). In the South, Storey et al. (1955) worked with loblolly pine (*Pinus taeda* L.), Wendel (1960) studied pond pine (*P. serotina* Michx.), and Loomis et al. (1966) developed prediction equations for shortleaf pine (*P. echinata* Mill.). Storey and his associates based their prediction equations on nine trees in the Santee Experimental Forest in the South Carolina Coastal Plain.

The purpose of this study was to derive an equation for estimating loblolly pine crown weights from d.b.h. and to compare this data which were taken on the Georgia Piedmont with the equation developed by Storey.

METHODS

Eighteen dominant and codominant trees between 6 and 17 inches d.b.h. were selected for the study. All trees were located on Georgia Kraft Company holdings in Monroe County. Average site index was 90, based on tree height at age 50. Basal area of 90 square feet per acre was determined from a 100-percent cruise.

The slashings were divided into five size classes to facilitate the quantitative weight description of crown components. Four classes were comprised of needles and branchwood less than ½-inch diameter, ½- to 1-inch, 1- to 3-inches, and over 3-inches

Southeastern Forest Experiment Station - Asheville, North Carolina
U. S. Department of Agriculture - Forest Service

diameter. Limbs, the fifth class, were cut flush with the stem up to a 4-inch top, above which the stem was also included. Cones were excluded because their percentage of the total slash weight depends on their abundance and degree of maturity. Crown samples were collected from several of the trees and ovendried at 85° C. to determine the moisture content of individual samples. Moisture content of the different crown components varied too much to assume an average, so all material was divided into the five size classes and ovendried.

RESULTS AND DISCUSSION

The work by Storey, Brown, and Loomis (previously cited) also showed d.b.h., diameter at base of crown, and d.b.h. times crown ratio (ratio of live crown length to total tree height) to be the best predictors of crown weight. Because only d.b.h. normally appears in cruise data, it is the only crown weight predictor discussed in this paper. The prediction equation developed from dry crown weight in pounds (Y), and d.b.h. in inches (X) was of the same form as Storey's (i.e., $\log Y = b \log X - a$). The two regressions were compared with the method outlined by Freese (1967) to find if they could be combined to form a single equation.

For the analysis to be valid, both variances must come from the same statistical population. Bartlett's test of homogeneity of variance was used, and no significant differences were found at the 95-percent probability level. Tests of the two regressions for common slopes and for common intercepts showed no significant differences in either at the 95-percent level. The two equations were thus combined to produce a single one, $\log Y = 2.538 (\log X) - 0.573$ (fig. 1). The regression was tested to find

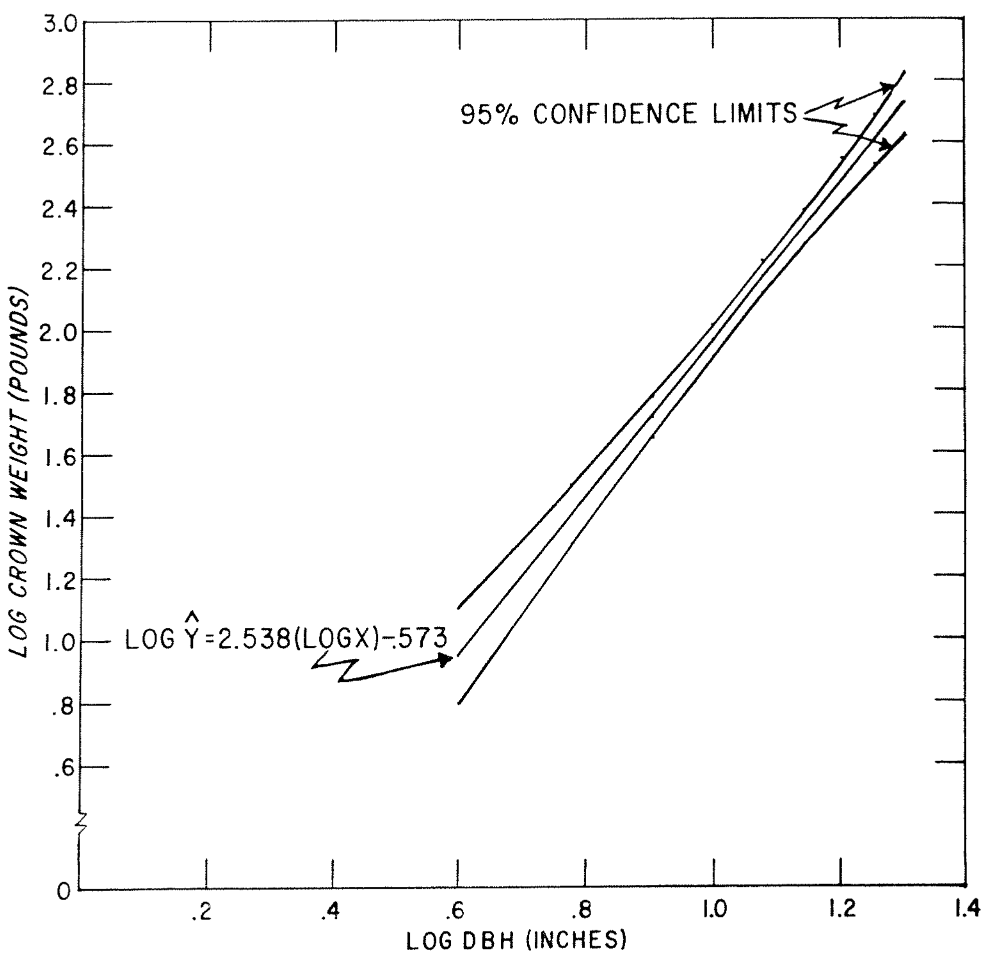

Figure 1. — Combined prediction equation for estimating loblolly pine crown weights from d.b.h.

if the variance of dry crown weight differed at different levels of d.b.h.; no significant differences were found at the 95-percent level. Analysis of variance showed the regression to be highly significant with a correlation coefficient (r) of 0.955. A single regression can thus be used to predict loblolly pine slash weights in both the South Carolina Coastal Plain and the Georgia Piedmont.

This equation was used to predict the dry weight of crowns by d.b.h. classes (see tabulation below) which, in turn, can be used to determine slash weight per acre. Multiplying crown weight for a particular d.b.h. class by the number of trees recorded in that class yields the total slash weight for that class. Adding the totals for each class gives the total slash weight for the area in question. Dividing this value by the number of acres results in the slash weight per acre.

Diameter breast high class (*inches*)	Ovendry crown weight (*lb./tree*)
6	25
7	37
8	52
9	71
10	92
11	118
12	147
13	180
14	217
15	258
16	304
17	355
18	410

In this study, 35 percent (standard deviation 5.3) of the slash weight per acre was composed of needles and branchwood less than ½ inch diameter, which are the fuel constituents most important in fire spread.

Frequently, the small woodlot owner does not know by diameter classes the number of trees cut from his land. However, because he is generally paid on a per-cord or per-unit basis and has a good idea of the acreage involved, a few simple calculations will give him an estimate of the logging residue. The volume harvested per acre can be calculated by dividing total volume by the number of acres in the sale. Units per acre can be converted to cords per acre by multiplying by 1.3. A rough estimate of slash weight in pounds per acre can then be made by simply multiplying the number of cords per acre by 500. The value 500 is a constant that can be used regardless of d.b.h., stocking, or number of trees cut. If any trees were cut for lumber, a conversion factor of 3 cords per thousand board feet (International ¼-inch log rule) can be used to put the volume on a pulpwood basis (McClay 1952).

For example, a landowner figured he had 10 cords of pulpwood harvested per acre plus an additional 2 M bd. ft. (International scale) per acre. To estimate the slash weight per acre, multiply 3 cords by 2 and add the product to 10 for a total of 16 cords per acre. Multiplying 16 by 500 would give him the answer: 8,000 pounds of slash per acre.

It must be remembered that data for this study were based on a minimum top merchantable diameter of 4 inches. If other harvesting standards are used, the estimates must be adjusted accordingly.

SUMMARY

An equation for estimating slash weight of dominant and codominant trees from d.b.h. measurements was developed for standing loblolly pines in the Georgia Piedmont. This formula was compared to one developed for the same species on the South Carolina Coastal Plain. No significant differences were found between the equations so they were combined to produce a single one ($\log Y = 2.538 (\log X) - 0.573$) applicable to both the Piedmont and Coastal Plain.

Average slash weights for 1-inch diameter classes are given to facilitate their use with cruise data. Individual trees may vary markedly from these figures, but results on a weight-per-acre basis should give a reliable estimate of the slash created after either intermediate or final harvest cuttings.

The small woodlot owner who may lack mensurational data on his loblolly pine stand can obtain an estimate of the pounds of slash per acre by multiplying the number of cords harvested per acre by 500.

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Dale D. Wade
Associate Fire Behavior Scientist
Southern Forest Fire Laboratory
Macon, Georgia