SUBSOILING IN A FOREST TREE NURSERY

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Numerous examples have been cited to show that if a tractor travels over the same area for a long period of time, the soil in that area will become compacted. The packing of soil and the formation of dense layers and plow soles by implements and traffic can result in poor growth of plants. To overcome these undesirable soil features in forest tree nurseries, most nurserymen have tried correcting such condition by subsoiling or surface tillage.

Soil in the Auburn Nursery, operated by the Alabama Division of Forestry and located near Auburn, Alabama, has been subsoiled for the past three consecutive years. Feet of the subsoilers were mounted on eighteen inch centers. Effective depth of subsoiling was approximately 16 inches and averaged 3 inches into the subsoil proper. The first year the area was subsoiled twice; the second pass over the field was at right angles to the first. The second and third years the area was covered in a circular method. In all, the area has been subsoiled four times.

To determine the effectiveness of the subsoiling operations, undisturbed soil cores were taken from 40 randomized locations in a 10-acre nursery area and from 10 locations outside the nursery area. The nursery area had been plowed for the past 7 years to a depth of 10 inches. This plowing left a distinct dividing line between the plow horizon and the undisturbed subsoil. A check area outside the nursery had been plowed to a depth of 6 inches and planted in grains and legumes for 10 or more years. The topsoil was removed and a subsoil sample was taken with the Uhland sampler. The core with the undisturbed soil was brought into the laboratory and the bulk density (a measure of compactness) was measured. The higher the bulk density, the more compact the soil.

The average bulk density for the 40 nursery samples was 1.59. The average bulk density for the 10 check samples was 1.62. There was no appreciable difference in bulk density between soils under beds and those under alleys. Samples under beds averaged 1.60, whereas those under alleys averaged 1.59.

Table 1 shows the average bulk density and range in bulk density for the various units within the nursery area. The bulk density of the beds averaged

1. 56 and 1. 64 for compartments I and II, respectively. The bulk density of the alleys averaged 1. 58 and l. 60 for compartments I and II, respectively. Although it would appear that there are differences between compartments, this is not true when the standard deviations are considered.

If the subsoiling operations had been very effective, it would seem that the bulk densities of the 40 samples would be nearly the same. As shown in Table 1, the bulk densities ranged from a low of 1. 35 to a high of 1. 83, whereas that of the check plots ranged from 1.56 to 1.70. This spread in the nursery is too large to be attributed to chance. One explanation for the wide range in bulk density is that some soil samples were taken in the exact location where the subsoiler foot had penetrated while in other instances the samples were taken outside the effective range of the subsoiler foot.

This study suggests that subsoiling as performed in the Auburn Nursery for three consecutive years was not sufficient. For the subsoiling operation to be completely effective, it appears that the methods used in the subsoiling operations should be changed or that subsoiling must be continued for a longer period of time.

Table 1. --Average bulk density and range in bulk density for various units within the nursery area. 1 /

Compartment Number	Bed Bulk Density		Alley Bulk Density	
	Average	Range	Average	Range
I	1.56 ± .11	1.35 - 1.78	1.58 ± .06	1.45 - 1.80
II	1.64 ± .08	1.56 - 1.83	1.60 ± .05	1.49 - 1.64

1/ Ten replications in each unit.