In the region of podzol soils one is impressed with the comparative shallowness of the forest soil profile. Frequently the C₁ layer may be reached within 12 to 14 inches of the surface, with a corresponding thinness of the separate horizons and subhorizons constituting the profile. Furthermore, these horizons may differ so greatly in constitution that they cannot be dealt with except as separate units.

Since this is the case, it is quite necessary that at least the approximate density of each horizon be known. Obviously, the values for field soils are wholly inapplicable to such forest soil profiles. That the upper 6 2/3 or 7 inches of soil over an acre weighs 2,000,000 pounds may be an acceptable assumption for average field soils but it will never apply to shallow podzolizid forest soils. Therefore, studies were carried on during the summer of 1931 with the object of ascertaining the density of volume weight of some of the typical forested soils in New England.

Methods

Of the several methods reported in the literature for studying soil in place, only two were considered feasible for our conditions, namely: (a) the tube or cylinder method recommended by Burger (1), and Craib (2) in which a steel cylinder 10 cm. long and having a capacity of 1000 cc. is driven into the soil and the contents weighed after drying; and (b) the paraffine-immersion method as described by Shaw (5) in which a block of soil is cut out and removed to the laboratory where it is coated with paraffine and its volume determined by displacement in water. The latter procedure was the only one suitable for horizons less than 4” in thickness and it was necessary that the soil be moist and sufficiently coherent to prevent crumbling. Frequently in horizons more than 4” thick, both methods were used.

In addition to the foregoing measurements, the following related properties of the mineral horizons were determined: Moisture equivalent, loss on ignition, organic carbon, clay, silt plus clay, and several size fractions of sands.

Data relative to the amount of duff on the forest floor was obtained by collecting and weighing all of the material on an area of one square foot, using a hollow iron square of that dimension. By measuring its thickness it was then possible to calculate the approximate quantity of duff per acre inch and its volume weight.

Results

The results of these determinations are given in detail in a station bulletin (4). Space permits the presentation of only a portion of the data here.

Amount of Material on Forest Floor

Considering first the organic debris content of the forest floor, Table I, the total amount of F layer ranged from 7000 to 43,000 pounds per acre while the amount per acre inch ranged from 9200 to 32,000 and averaged not quite 20,000 pounds.

The H layer varied from 46,000 to 263,000 pounds total, and 36,000 to 108,000 pounds per acre with an average of 53,000 pounds. Thus the range in F layer is narrower than the amount total, and 36,000 to 108,000 pounds per acre with an average of 53,000 pounds. Thus the range in volume weight of some of the typical forested soils in New England.

Volume Weight of Mineral Horizons

Table II gives the volume weight and related properties of the mineral soil of some typical forest profiles. For a basis of comparison it might be mentioned that a volume weight of 1.324, that in the thicker duff in the spruce hardwoods of the Connecticut duff as it was in the much thicker duff in the spruce region in New Hampshire, indicating that the thickness of this material does not necessarily greater compaction.

In the podzols we observe that the leached layers have a density of a little more than 1.0, and the values for the horizons of accumulation, B₁ and B₂, are less than 1.0. The density then increases with depth. As would be expected, the ortstein samples in the thinner Connecticut forest floor, Table I, the total amount of F layer was approximately 1.5.

Note that the volume weight of the pastures is considerably greater than the corresponding horizons of the forest soil just across the road. The greater volume weight of the latter was clearly discernable in the field, and is due in no small part to the activities of earthworms and other microscopic organisms.

That the foregoing data are in agreement with that has been obtained by others is shown in Table II. Burger (1) and Simpson (6) sampled by arbitrary methods as described by Shaw (5) in which a block of soil is cut out and removed to the laboratory where it is coated with paraffine and its volume determined by displacement in water. The latter procedure was the only one suitable for horizons less than 4” in thickness and it was necessary that the soil be moist and sufficiently coherent to prevent crumbling. Frequently in horizons more than 4” thick, both methods were used.

In addition to the foregoing measurements, the following related properties of the mineral horizons were determined: Moisture equivalent, loss on ignition, organic carbon, clay, silt plus clay, and several size fractions of sands.

Data relative to the amount of duff on the forest floor was obtained by collecting and weighing all of the material on an area of one square foot, using a hollow iron square of that dimension. By measuring its thickness it was then possible to calculate the approximate quantity of duff per acre inch and its volume weight.