The hares damaged white pines by chewing off the distal portions of the terminal and lateral shoots (twigs with foliage). The obliquely cut surface of the branch had a fairly smooth appearance. Shoots of white pine were severed from 1 foot above the ground up to heights of 5 and 6 feet, which were reached by the hares standing on top of the snow. Hardwood tree species which had found their way into the plantation and grew between the rows of white pines were killed outright, having had their outer bark and phloem gnawed down to the xylem along their main stems.

A tally of the white pine trees in subsequent years showed the following: No trees died during the summer of 1959 as a result of hare feeding during the previous winter. In 1960, six severely chewed trees died. Mortality reached a peak in 1961 with 10 trees unable to survive the severe damage caused by the hares 2 years earlier. In 1962 only two trees died and by 1963, 4 years after the feeding, mortality ceased.

Table I shows the relationship between the size of all the trees in the 0.25 acre sample plot and those killed by snowshoe hare feeding. A total of 18 white pines died following the severe hare feeding and none was over 6 feet in height or had a DBH of over 0.50 inches. All 10 trees that were 4.5 feet or less in height were killed. The bulk of the trees in the plot were over 6 feet tall and had DBH's over 0.50 inches, and none of these trees died as a result of the hare feeding damage. It is apparent that had the plantation been younger with the majority of the trees under 6 feet in height, serious mortality would have resulted.

TABLE I
Hare-killed trees separated into height and DBH groups.

Height Group (ft)	Total trees	Hare-killed trees		DBH Group (in.)	Total trees	Hare-killed trees	
		No.	%			No.	%
4.5 and lower	10	10	100.0	No measurement possible	10	10	100.0
4.6–6.0	20	8	40.0	0.01–0.50	23	8	34.8
6.1–8.0	68	0	0.0	0.51–1.00	69	0	0.0
8.1–10.0	298	0	0.0	1.01–2.00	321	0	0.0
Over 10.0	94	0	0.0	Over 2.00	67	0	0.0
Total or Average	490	18	3.7	Total or Average	490	18	3.7

Because of the cyclic nature of the populations of the snowshoe hare, which is caused by the interaction of biological potential and environmental resistance, another peak may be expected in the year 1969. There are several ways in which damage to trees from snowshoe hares may be avoided. Since white pine is more palatable to the snowshoe hare than other tree species, e.g. white spruce, the latter species should be preferentially planted in the years immediately preceding peak hare years. Predators of the snowshoe hare which include carnivorous animals, hawks, and owls should be encouraged. Chemical repellents sprayed on the foliage of trees are effective against hares during the year of application, but new growth which develops subsequent to spraying is fed on by hares. Hares may be excluded from plantations by wire fencing. The above measures would be most beneficial if used to protect trees in plantations which were less than 6 feet in height. S. N. Linzon, Forest Research Laboratory, Maple, Ont.

SOILS

A Soil Sampler for Extraction of Intact Soil Cores From Forest Soils.—The characterization of a soil profile or the evaluation of the effects of treatment on a soil, usually necessitates the taking of undisturbed soil samples. Since forest soils are frequently stony and coarse, it is often difficult to obtain undisturbed samples. Soil samplers described by Richards (U.S. Agricultural Handbook No. 60, 1954) and Steinbrenner (Soil Sci. Soc. Proc. 15, 1950) are used primarily for the extraction of surface cores. The sampler described here, successfully removed intact soil cores to a pre-determined depth from two inter-mountain podsol soils described by Kelley and Spilsbury (Report No. 3, British Columbia Soil Survey, 1949) now described as degraded acid brown wooded (Rept. Sixth Meeting Natl. Soil Surv., Can. Dept. Agr. 1965) with a profile type: *L-H, Ae, Bfh, (Bf), C.* The cores were sufficiently free from contamination for chemical and physical analyses.

The complete sampler consists of an exterior extractor and an interior liner. The exterior portion is made up of a cutting head, a sectioned shaft, and a T-shaped vented top. The cutting head has a hardened cutting edge, a machined shoulder on which the core liner rests, and ½″ of machine thread. The inside diameter (I.D.) of the cutting head is slightly smaller than that of the liner to prevent sticking and compacting of the soil core. Shaft sections are made from 3-inch I.D. seamless steel tubing with ½″ of machine thread so sections may be coupled to any desired length. It has proven convenient to machine shaft sections to the length of liner. To protect the threaded portions of the sections as the sampler is driven into the soil, slightly less than one-half (3/16″) of the tube wall is utilized by the thread; the remaining portion is machine-faced to meet evenly and tightly with the adjoining section. The sampler top has ½″ of machine thread to join it to the upper end of the shaft, an air-escape vent, and a 12″ T-handle. Rounding the sampler top helps to maintain the sampler in a vertical position as it is driven into the soil.

Cylindrical liners are fitted inside the extractor shaft. Fifteen-ounce, lacquered preserving cans, with both end flanges rolled, are suitable liners. Sampling to a desired depth is accomplished by joining an appropriate number of cans with tape. The rolled end-flanges help to maintain the cylindrical shape of the liner and reinforces the end that rests on the shoulder of the cutting head.

The assembled unit may be driven into the soil with a heavy sledge hammer. On tightly compacted soils, particularly in the "C" horizons, placing a hardwood block upon the extractor top reduces vibrations as the unit is driven into the soil. Small rock fragments and stones are either pushed aside by the curved surface of the cutting head or imbedded in the soil core. Obstructions too large to enter the extractor or to be pushed aside, may sometimes be overcome by rotating the unit as it is driven into the soil. Roots are easily cut if the head is kept sharp and hard.

Extracting cores from dry sandy soils, excessively wet clayey soils and soils with considerable surface litter require special care. Moistening dry sandy soils facilitates obtaining cores. Compaction of the surface litter within the core sampler may be avoided by pre-cutting the litter layer with a cutting tool equal in diameter to that of the extractor cutting head. To prevent contamination of the core and to minimize the loss of surface soil, the lid of the top liner section should not be removed, but it must be vented. Because the outside diameter of the cutting head is greater than that of the shaft the danger of the soil sticking to the sides of the extractor shaft is reduced. After the sampler has been driven into the soil to the desired depth, it is rotated to break the core evenly from the soil mass.

After removal of the sampler from the soil, the screw top is removed and the liners pushed through the shaft sections with a plunger-type tool. Removal of the tape that joins the liners together permits separation of the core into sections. The cores may be sealed within the liners and stored in a cold room to minimize chemical and physical change.

The soil sampler is made of readily available and inexpensive materials. The total cost of the entire unit including case hardening of the cutting head and sufficient shaft sections to extract cores 2 feet in length is about $65.00. The cost of liners and splicing tape for a 2-foot core is about 25 cents. Plans for this soil sampler may be obtained from the author. —J. Baker, Forest Research Laboratory, Victoria, B.C.