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NEW VOLUMETRIC SAMPLER INCREASES SPEED AND ACCURACY OF PEAT SURVEYS

by

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CATEGORY: Sampling methods

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INTRODUCTION

Of Ontario's 42.1 million ha of productive forest land, about 20% is peatland (Ketcheson and Jeglum 1972). In Ontario, an estimated 281 km^2 of peatlands dominated by black spruce (*Picea mariana* [Mill.] B.S.P.) are cut each year, yielding about 20% of all roundwood harvested in Ontario (Haavisto 1980).

To characterize peatland sites, volumetric samples of surface organic layers are needed for baseline studies. To meet this need, we developed a sampling tool (Fig. 1) that quickly extracts a relatively undisturbed volume of peat. This sample can be used to determine moisture and nutrient contents on a percent-volume basis, providing information on the nutrient availability to roots distributed within a unit volume of peat substrate. This is an advantage over sampling approaches that express nutrient contents on the basis of percent dry weight, which reveals nothing about nutrients per unit volume. Furthermore, the new sampler is useful for studies of root exploitation of the growing medium and comparisons of soil characteristics with tree productivity.

DESCRIPTION

The improved sampler is a modified version of a volumetric peat sampler designed by Heikurainen (1955) and used in

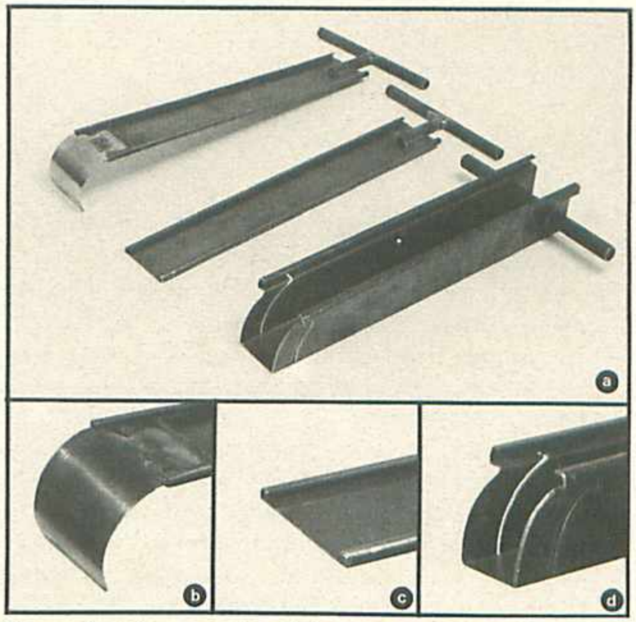

Figure 1. Photographs of the peat sampler showing (a) cutting blades and sampler, and sharpened tips of (b) spring-steel cutting blade, (c) straight cutting blade, and (d) the sampler box.

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Finland for the study and sampling of fine roots. This sampler was well suited for surface peat surveys, but presented problems in cutting the bottom of the sample. (One method was to dig alongside the sampler and use a knife to cut off the peat column at its base, a time- and energy-consuming process.) The new design effectively resolves this problem.

The sampler is a rectangular metal box with one side open (Fig. 1, 2). The edges of the open side act as guides for blades or contains medium to large roots, either of which might deflect the blade.

OPERATION

In operation, the sampler is positioned vertically, and a serrated knife is used to cut vertical slits in the peat directly below the bottom edges of the sampler to depths of about 5 cm. These cuts make a groove for the sides of the sampler to

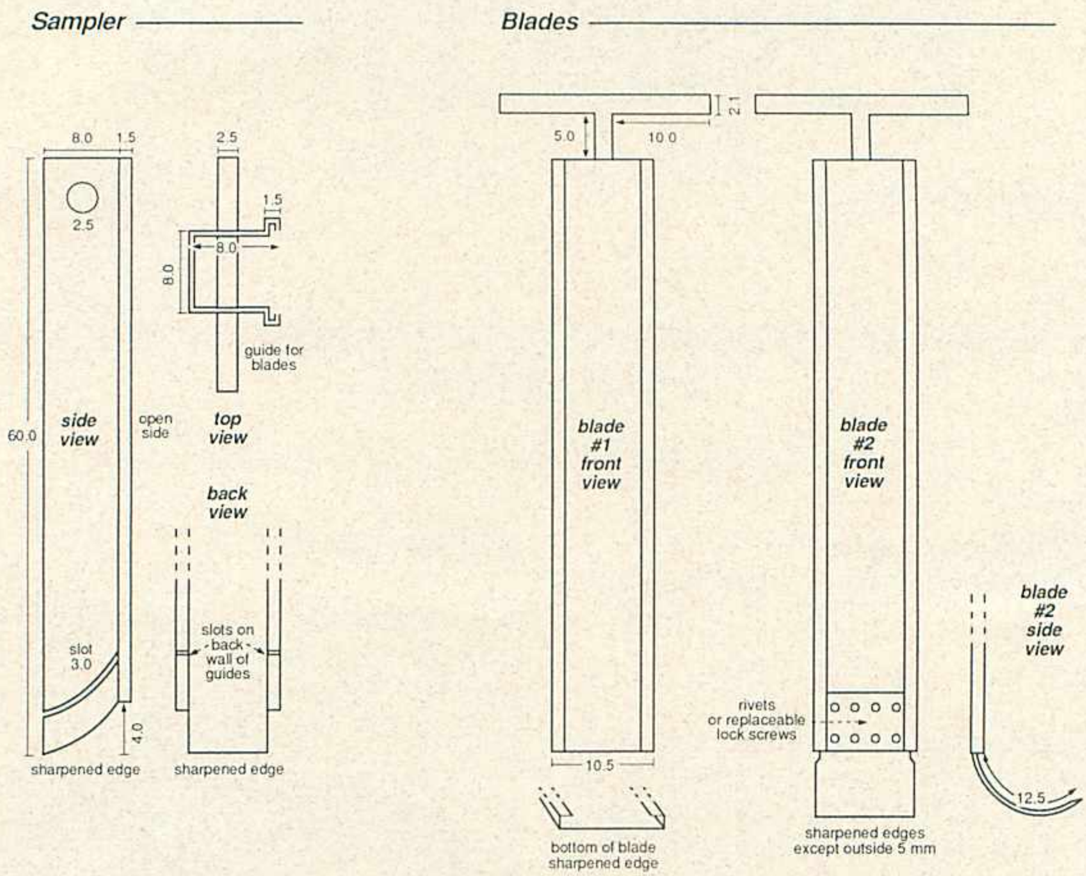

Figure 2. Schematic diagram of the sampler, with dimensions in centimetres.

that are used to cut the fourth side and the bottom of the peat column. The inside dimensions of the sampler are 8 x 8 cm, and the sampler is 60 cm long. These dimensions were chosen to obtain a 50-cm column and to allow subsampling in 10-cm depth increments for physical and chemical tests. The sampler can be lengthened to permit deeper sampling.

Two blades are used to cut and extract the peat column. The first is a straight blade that cuts the fourth side of the sample; the second is a similar blade, but with a section of curved spring steel attached to its end to undercut the sample (Fig. 1, 2). Slots along the open side of the sampler serve as guides, and permit the spring steel of the second blade to undercut the peat column at the bottom of the sampler. The bottom edges of the slots may be bent inwards by 5 to 10° to catch the curved blade as it descends and force it to slide into a curved groove in the sampler body. This feature ensures that the curved blade engages properly when peat is woody

enter, and reduce compaction of the upper, less-dense strata of peat. Sometimes roots close to the surface must be cut with heavy-duty scissors or pruning shears.

The sampler is then shoved sharply into the peat, and pushed down until the bottom edge of the handle is flush with the surface of the peat (Fig. 3a). The surface may be considered either the top of the living moss or the peat surface beneath the living portion of the moss, depending on the purpose of the sampling.

After first cutting a 5-cm vertical slit in the peat along the open side of the sampler, the straight cutting blade is inserted into the guides on the box and pushed down to cut the fourth side of the square column of peat (Fig. 3b). After a vertical slit has been cut, surface peat inside the box can also be gently pulled away from the cutting blade to prevent it from being dragged downward during insertion. This process is particularly necessary with soft, fluffy peats.

The straight cutting blade is then extracted, and the second, curved cutting blade inserted (Fig. 3c). This blade follows the guides until it reaches slots at the bottom of the guides. At this point, the tension in the spring steel causes it to curve into the slots and undercut the peat column.

The sampler is then extracted from the ground while the second cutting blade holds the peat column in the sampler (Fig. 3d). The handle that extends across the top of the sampler is a hollow tube, and a small metal rod or pipe can be inserted through the handle to allow two people to pull out the sampler more easily.

The sampler is laid flat, and the second blade is withdrawn. At this point, the upper part of the peat column is typically compressed to some degree. A knife should be used to adjust the compressed layers upwards until they touch the lower edge of the handle (i.e., the surface reference). The column can then be marked into desired layers that can be cut with a knife (and/or scissors for small twigs and roots). Before the subsamples are extracted, the column can be described in terms of the dominant moss at the surface, peat composition, color, von Post humification, etc.

DESIGN AND OPERATING CONSIDERATIONS

When the ground is frozen, the spring-steel blade may fracture as a result of metal fatigue after repeated sampling. Aluminum has been found to work well under these conditions, although it becomes dulled and bent after much use. Eight screws permit the spring steel or aluminum blades to be interchanged or replaced easily in the field.

When sampling shallow peats, the curved cutting blade may jam or break if it meets underlying mineral soil. If the peat depth is less than the depth to which the sampler can penetrate, the curved cutting blade should not be used. However, the sampler body and straight cutting blade are durable enough to be used on shallow peat sites. The cutting edges on the sampler and cutting blades should be sharpened frequently with a file to ensure easy operation.

If a longer sampling unit were used, extraction would be made easier if a small tube were welded to the outside of the sampler to provide air and break the suction during sample extraction.

PRODUCTIVITY

The sampler has been used in a field survey in which a team of two people sampled peats in permanent growth plots. In each plot, 10 columns of peat were extracted. Each column was divided into four subsamples that were fully described, bagged and labeled. The distance between sampling sites was about 2 m. Early in the survey, as the operating technique was being developed, only one plot was sampled in an 8-hr day. As the technique improved, two plots could often be completed, including half an hour to travel between plots.

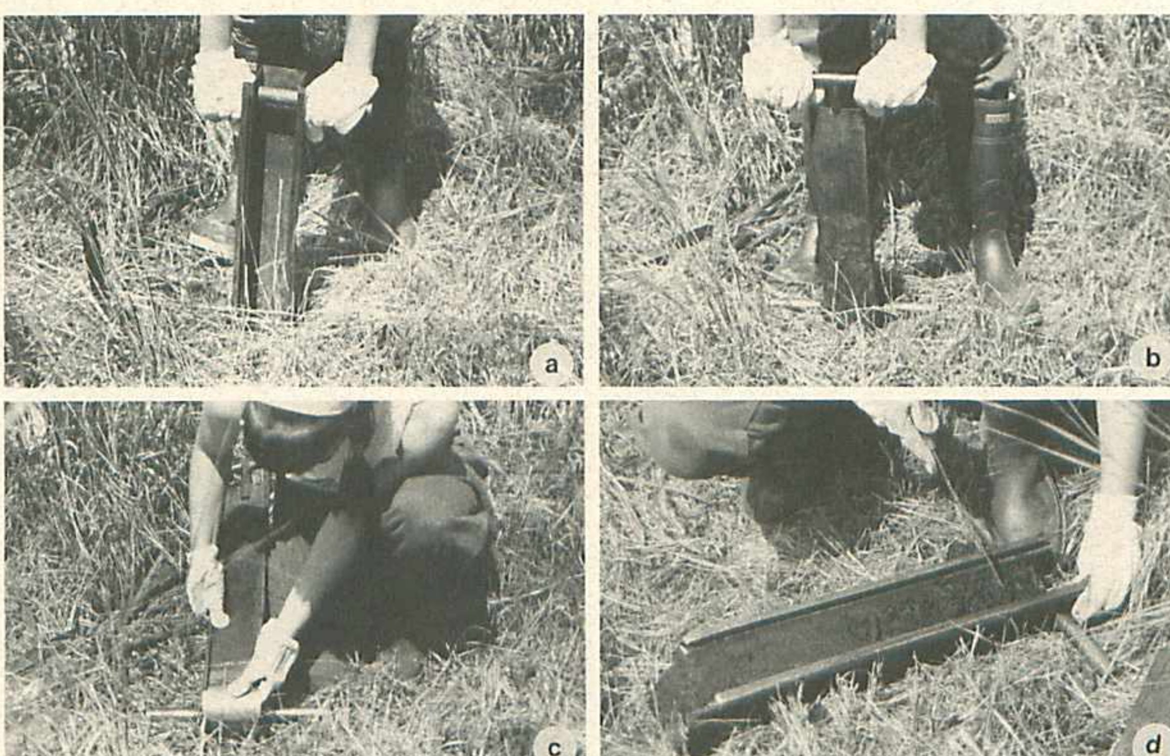

Figure 3. (a) The sampler is pushed down until its handle is flush with surface of organic matter; (b) and (c) staight and spring-steel cutting blades are inserted; (d) the peat sample is extracted .

When sampling only for water content and bulk density, with no profile characterizations, up to 40 columns per day could be obtained. Sampling was slowed where peat was loose and fluffy or where woody material or roots were abundant. Sampling was faster in compacted peats without many roots.

CONCLUSION

The peat sampler provides samples of bulk density and water content that are comparable to those obtained by other peat sampling methods. Furthermore, the sampler allows easy subsampling of the peat column, detailed peat-profile descriptions and a rapid and efficient sampling method for extensive peat surveys.

Readers of this technical note may construct their own sampler using information contained herein without any special permission. The senior author may be contacted to provide assistance at the address given below.

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