

Field transport of the neutron soil-moisture meter in steep terrain

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MEASURING soil moisture by the neutron scattering technique requires heavy equipment. A commercially available neutron probe and portable scaler together weigh 13 to 18 kilograms. Older models weigh up to 23 kilograms.

To overcome the weight problem, various wheeled vehicles have been developed to enable one person to transport and operate the equipment (1, 2). However, such wheeled vehicles cannot be used in many areas because of steep slopes and dense brush.

Such is the case in a hydrology study in Oregon's western Cascade Mountains. Only trail access exists to 35 neutron probe access tubes installed in a 10.2-hectare watershed.

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Slopes are 60 to 110 percent, and the vine maple and rhododendron understory is dense. Carrying heavy equipment by hand is tiring, slow, and hazardous.

For these reasons a Kelty¹ recreational packframe was adapted to carry the equipment. The packframe is equipped with two brackets made from 1/8-inch sheet aluminum (Figure 1) that accommodate a model 200B scaler and a model S6A probe/shield of a Troxler¹ depth gage.

The top bracket consists of two plates, each 20 centimeters long with two 90-degree bends so the outer-most parts of the plates are 50 centimeters apart when bolted to the packframe. To maximize packframe strength, existing holes in the packframe were used to fasten the brackets to the frame.

After its legs were removed, the scaler was attached to the bracket with the large hand-tightened bolts that normally fasten the legs and handle of the scaler to the scaler housing (Figure 2).

¹Use of company names does not imply endorsement by the School of Forestry, Oregon State University.

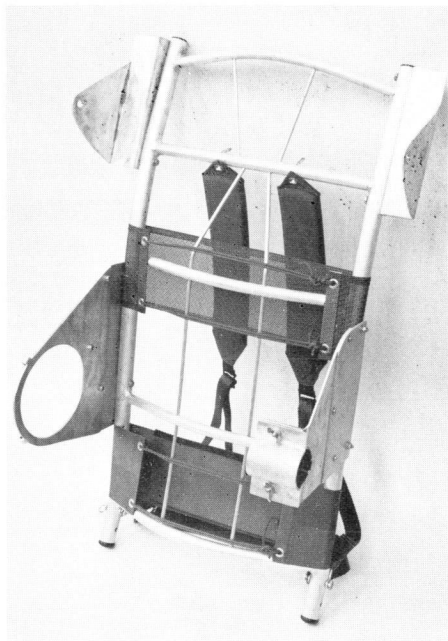


Figure 1. Recreation packframe with aluminum brackets for mounting portable scaler and probe.

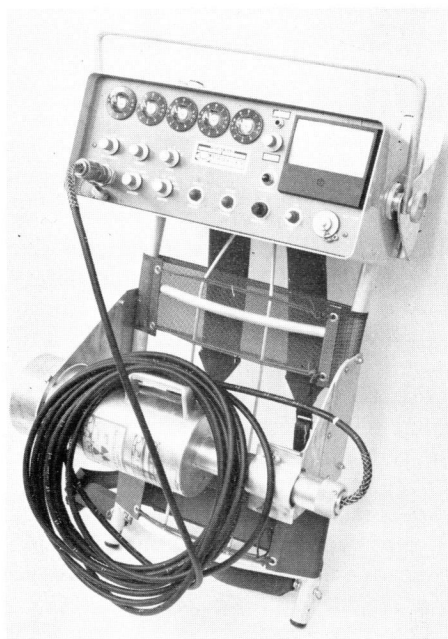


Figure 2. Scaler and probe in transporting position.

The lower bracket, which holds the probe/shield, also consists of two parts. One part has a 12.5-centimeter diameter hole into which the large diameter end of the shield fits. The other part is a two-piece, rubber-lined clamp that fits around the top end of the shield and firmly secures the shield to the packframe. The probe cable is simply coiled and hung from the packframe.

This transportation method presents no radiological health hazard. The probe/shield mounting bracket keeps the shield 10 centimeters from the operator's middle back. With such an arrangement the operator may carry the instrument up to 20 hours a week without exceeding exposure limits. Mounting a piece of paraffin 5 centimeters thick between the packframe and shield would allow a weekly carrying time of 40 hours.

In any case, construction details must allow for proper protection against radiation exposure during the time required for whatever soil moisture sampling scheme is used. To monitor exposure, each operator

should wear a film badge adjacent to the shield.

The packframe weighs 2 kilograms. Total weight to be transported is less than 23 kilograms. Although the load is heavy, the packframe is comfortable and allows free use of both hands. With the packframe one person can make routine soil moisture measurements. Cost of material and labor, including the packframe, was less than \$50.

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