

cies. The two soils responded similarly to the addition of nutrients. Nitrogen, potassium, and micronutrients resulted in no increase in the yield of shoots, roots, or shoots plus roots. The addition of phosphorus, however, resulted in about a 100% increase in root yield and 60% increase in shoot yield.

The effect of 20 years of protection from grazing varied between soils. Soils from the Headquarters Park area were equally productive inside and outside the enclosure. Productivity at Libby Flat, as measured in this study, was lower under protection.

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### An Improved Vegetation Sampling Quadrat

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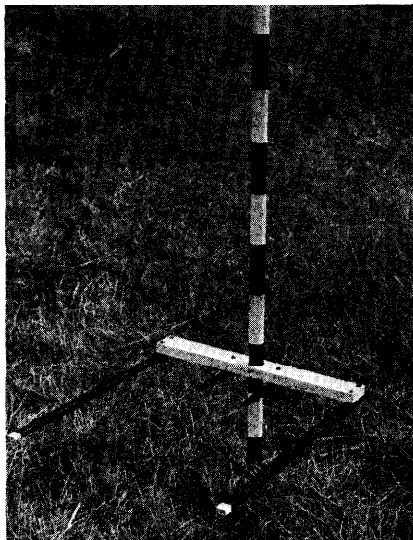


Fig. 1. Quadrat frame assembled on staff. The staff is marked in decimeters. The large quadrat is 0.2 m<sup>2</sup> in area, the smaller is 1.0 dm<sup>2</sup>.

Measurements of rangeland vegetation requiring a larger number of small plots can be made faster and more easily if an open-end quadrat frame mounted on a short staff (Fig. 1) is used in place of the usual closed frame or plot outlined by chaining pins. An open-end frame can be positioned with minimal disturbance and rearrangement of herbaceous vegetation, and can also be placed under shrubs and around small trees. The ends of the arms provide two points for ocular alignment, so it is not difficult to determine whether a plant is within the quadrat when it occurs at the open end of the frame. A straight-edge may be placed across the open end if greater precision is desired, but usually this is not necessary.

The frame can be moved up or down on the staff to fit the vegetation being sampled. A height of 2.5 dm works well on most rangelands. For carrying convenience, the frame can be removed from the staff and the arms folded to prevent breakage (Fig. 2).

The staff allows the operator to move the frame without having to bend over and pick it up. This decreases sampling time and reduces fatigue. If marked in suitable intervals, the staff can also be used to show scale in photographs.

The frame can be adapted for nested plots (Fig. 1), and used as a "complementary quadrat" in frequency sampling with plot size adjusted to species abundance. Frequencies of the most abundant species are recorded with the small quadrat while less abundant species are sampled with the larger quadrat (Hyder et al. 1965). Or the smaller interior quadrat can include a given percentage of the area of the larger (e.g., 5%), and be used as an aid in estimating foliage cover.

Quadrat size and shape may be varied. Square frames up to 6 dm on a side are balanced by a 1.5-dm spike on the staff. Larger frames will require a longer spike to prevent tipping. With rectangular plots, the sliding crosspiece should have the greater dimension.

Materials for constructing a frame and staff can be purchased for less than \$2.00.

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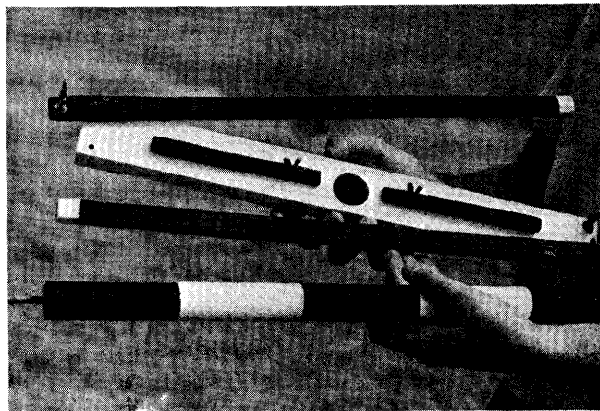


Fig. 2. Frame folded for transport.