A quadrat frame for backcountry vegetation sampling

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Abstract

A lightweight quadrat frame for backcountry vegetation sampling is described. The frames are constructed of aluminum and disassemble for easy packing. The cost per frame is about $15.

Key Words: vegetation sampling, backpacking

Range managers, plant ecologists, and wildlife managers among others regularly use quadrat frames as a tool to help estimate vegetation biomass, density, frequency, and basal and foliar cover. Quadrats are "square areas" (McNaughton and Wolf 1973) of any selected size used for detailed study of vegetation. Quadrats vary in size and shape, are usually square, but can be a rectangle, circle, or point (Greig-Smith 1957). The appropriate size and shape depend upon the objectives and requirements of the job and characteristics of the vegetation to be sampled (Cook and Stubbendieck 1986).

Tapes, folding rulers, sticks, and even strips of paper have been used for marking quadrats. Commonly, quadrats are marked by rigid frames made of steel strap or rod, bent to desired dimensions with the ends welded together. Steel bar, angle or channel stock is often used to reduce chances of a frame being bent out of shape. This results in a rugged but bulky and heavy piece of equipment.

To obtain standing crop samples in backcountry meadows in Sequoia National Park, California (Ratliff 1980), quadrat frames made up of 2.54 cm by 3.2 mm (1 by 1/8 in) steel strap were used. We quickly found them difficult to pack and carry; protecting the pack backs and other equipment from the frames posed additional problems. We also found that the weight of several such frames—at 550 g (1.2 lb) each—was more than we cared to bear. As this

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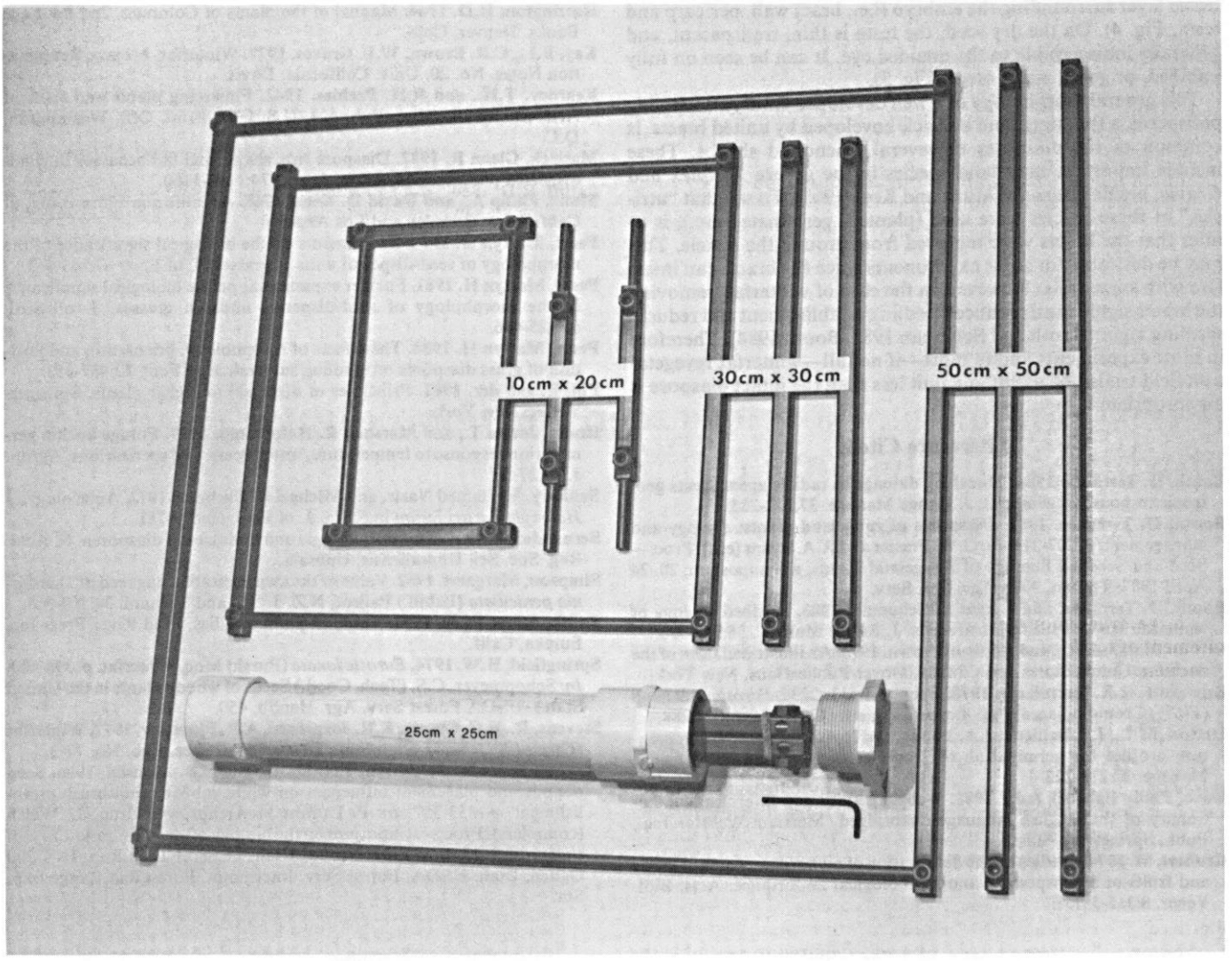

Fig. 1. *Three quadrat frame sizes (assembled and unassembled) and frames with case and Allen wrench.*

demonstrates, strong, and lightweight equipment is essential to those who must backpack to the work site.

To meet these requirements we devised a quadrat frame that was light in weight and easily disassembled for packing (Fig. 1). We first built and tested a 30 by 30-cm (1 ft²) prototype frame of steel. It cost about $4 for materials and 2 hours of labor. No special equipment other than a drill press and a welding outfit was needed. The assembled frame was strong and worked well in the field. The disassembled frame met our backpacking requirement of ease in packing but its weight, 600 g (1.3 lb) was a problem.

To reduce weight we had five 30 by 30-cm (1 ft²) aluminum frames made by a local machine shop. Each quadrat assembly weighed only 210 g (7.4 oz), including an Allen wrench needed for frame assembly and disassembly.

The frames were made from round bar and drawn square tubing of 6061-T6 aluminum alloy. That particular alloy was selected because it can be welded easily, is readily available, and resists corrosion. Frames of this material have served successfully since 1973.

In 1983, we had 16 new frames made in a variety of quadrat sizes at a cost of approximately $15 each. Though not necessary, we spent an additional $5 per provided frame to have them anodized. This optional process provides corrosion protection, a clean surface to handle, and a bright color that was easily seen in vegetation.

Two sides of the frames were made from 8.0 mm (5/16 in) diameter round bar stock and cut 25.4 mm (1 in) longer than the quadrat length (L). The other 2 sides of the frames were made from 12.7-mm (1/2 in) square tubing with rounded corners and a wall thickness of 1.6 mm (1/16 in). The tubing was cut 31.8 mm (1-1/4 in) longer than the quadrat width (W).

Holes were drilled at each end of the tubing separated by a centered distance of L + 8.0 mm (5/16 in). At each end, two, 8.7 mm (11/32 in) diameter holes were drilled through opposing sides of the tubing to accept the round bar. A single, 4.8 mm (3/16 in) diameter hole was drilled directly over the opposing holes for the set screw. A 4.8 mm (3/16 in), fine-threaded nut (UNF-3/16) was welded in place over each set-screw hole to hold the 4.8 × 6.4 mm (3/16 × 1/4 in), Allen-head set screw. Holes must be located and drilled with precision for best results. The optional anodizing was applied to the completed parts.

With the bars inserted through the holes in the tubes and their ends made flush with the outside edges of the tubing, a quadrat with inside dimensions L by W is formed. When the set screws are tightened on the bars, the frame becomes rigid. Various bar and tube lengths can be combined to make quadrats (squares or rectangles) of desired dimensions.

For storage or transportation, the frame is taken apart, the round bars are slid inside the square tubes, and the set screws are

tightened. The quadrat can then be stored in an area 2.54 by 3.18 cm (1 by 1-1/4 in) by the length of the longest dimension of the frame. We use 3.8 cm (1-1/2 in) polyvinylchloride (PVC) pipe and end caps to make cases for carrying and protecting the frames and backpacks. Heavy cloth bags with draw strings would also serve well, require less space, and be lighter. A frame of reasonable size could also be wrapped in an item of clothing and carried safely in the backpack.

Caution must be taken not to bur the aluminum bar by over-tightening the set screws. Other than that, we have encountered no problems with the frames. They are excellent tools and can be made at any good machine shop at reasonable cost.

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