A Grid Method for Obtaining Loop Readings on Small Plots

GERALD S. STRICKLER

Range Conservationist, Pacific Northwest Forest and Range Experiment Station, Forest Service, U. S. Department of Agriculture, Portland, Oregon

The adaption of loop-transect techniques[1] to small plots is useful in relating loop measurements to trends in range vegetation sampled by other methods. For this purpose, Driscoll (1958) described a method of obtaining loop measurements of ground cover on small, permanent, circular plots. The method, however, samples a restricted area of the plot, and loop positions are difficult to duplicate in repeat measurements. This note describes the design and use of equipment to obtain similar measurements, but with loop positions gridding the plot and with greater accuracy in duplicating positions during remeasurement.

The method described herein obtains a grid of 50 loop readings each on a series of 24-square-foot circular plots alined along a 100-foot transect. The equipment was primarily designed to sample ground cover on very stony soils commonly only 4 inches deep, two factors which prohibited the use of numerous stake-type reference points. With equipment and technique modifications, the method can be adapted to many vegetation types, to other intensities and methods of measurement (such as the point method of analysis), and to plots of different size, shape, and distribution.

Equipment

Essential equipment includes a ¾-inch loop equipped with a two-way leveling bubble, a T-shaped frame used as a jig for guiding placement of the loop, and a 100-foot steel measuring tape for reference in controlling frame positions within each plot (Figure 1).

The main parts of the frame are cut from 1x2x1-inch channel aluminum. The length of the cross member, shown at right angles to the tape, is 6 feet. This length is governed by plot diameter. The axial member, parallel to the tape, and the three adjustable legs are each approximately 2 feet long.

The axial member is bolted at right angles to the cross member, with one of its edges intersecting the center of the cross member. In Figure 1, the left edge of the axial member, as viewed by the operator, is the centered edge. The axial member also extends one-fourth inch beyond the back edge of the cross member, as shown in Figure 2. The reasons for this offset and extension of the axial member are brought out in the method of use.

A flat aluminum bar is bolted to the underside of the cross member, with three-eighths inch of the bar protruding beyond the front edge of the cross member to form a lip along the entire span. Eight notches, spaced at the predetermined loop-grid interval of 0.7 foot, are cut on the

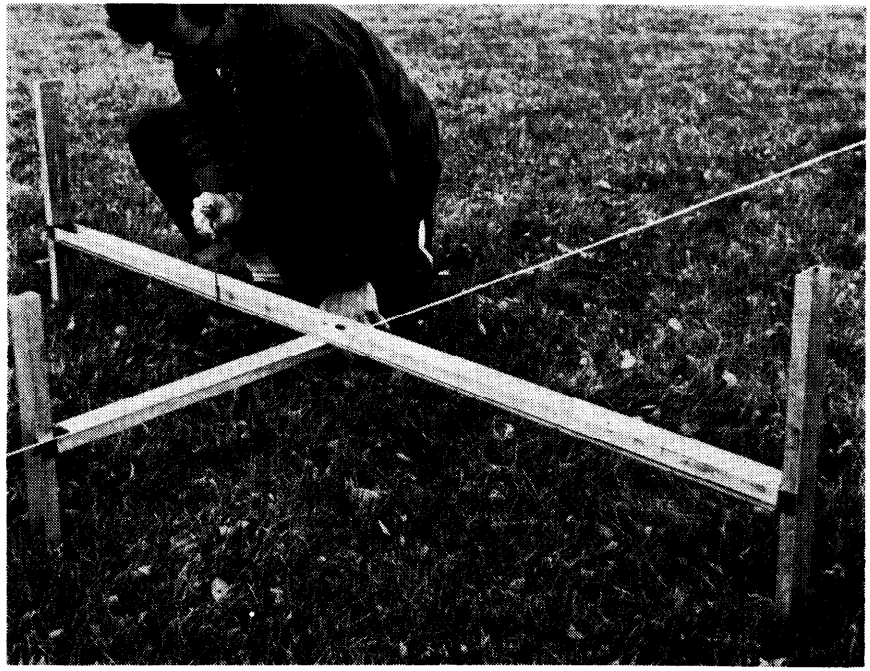

FIGURE 1. The T-frame in normal position relative to the 100-foot measuring tape with a loop-position measurement being recorded. The tape bisects the cross member and lies flush to the axial member of the T-frame.

[1] *Parker, Kenneth W. A method for measuring trend in range condition on national forest ranges. 26 pp., illus. (Unpublished administrative report, U. S. Forest Service, Washington, D. C.) 1951.*

[2] *Parker, p. 7b (See footnote 1.)*

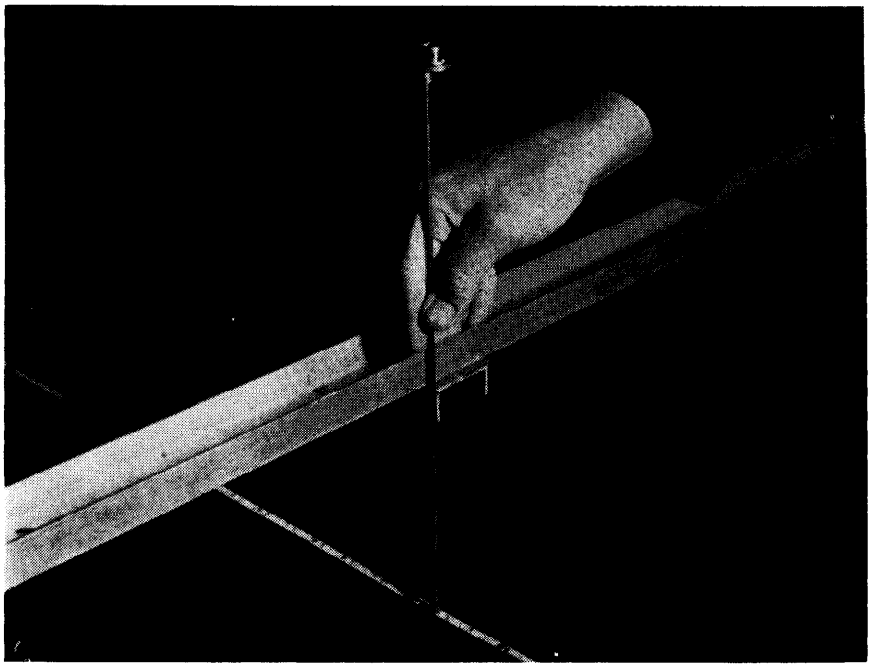

FIGURE 2. Using the 3/4-inch loop to plumb the frame over the tape mark of a frame position when the tape lies below the adjustable height of the frame.

protruding lip to receive the shank of the loop. The notches are numbered from one to eight, beginning from the left end of the cross member.

Leg holders, bolted to the frame, are made from 1x1-inch angle iron and are so fabricated as to serve as sleeves for the legs. A bolt, centered and brazed to each leg holder, is inserted through a slot cut in the wide face of each leg, and the leg is secured with a wing nut. The slots allow vertical movement of each leg to level and position the frame next to the tape. Leveling the frame results in better frame stability on irregular ground surfaces. During measurements, leg positions are recorded from graduations marked on each leg, enabling the same positions in remeasurements.

Method of Use

The 100-foot tape is stretched in the desired position and anchored firmly, and permanent reference points are established at the zero and 100-foot marks. Permanent reference points are necessary because all subsequent frame and loop positions are keyed to tape placement. Etched marks on large buried boulders or convenient rock outcroppings are excellent as permanent reference points, especially on shallow soils. On deep soils, deeply driven 1-inch angle iron stakes are satisfactory only if not disturbed (by grazing livestock or by recreationists, for example, who may use them as tent pegs).

With the tape in place, the circular plots are located along the tape so that their centers coincide with designated tape marks. These tape marks are recorded as permanent plot centers. Along the segment of tape crossing each plot, eight frame positions are spaced at 0.7-foot intervals, the same interval as the notches on the cross-member bar. These eight frame positions are read from the tape and recorded as

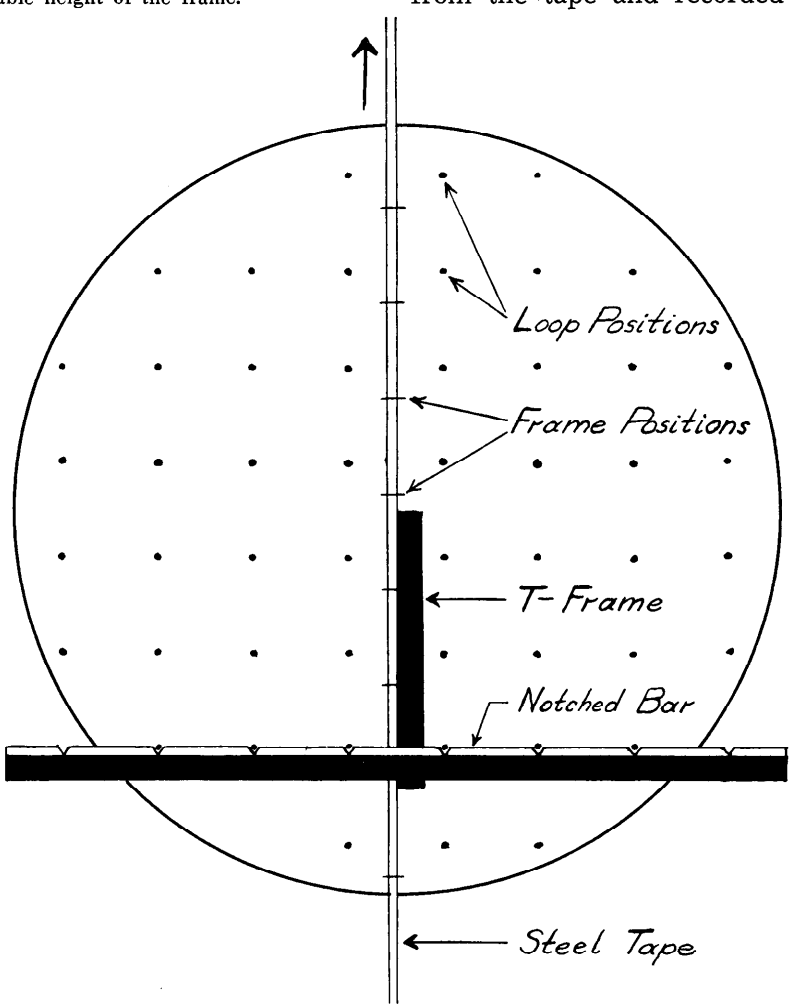

FIGURE 3. Schematic diagram showing relation of plot, measuring tape, T-frame, and the 50 loop positions. The frame is shown alined at the second position.

permanent tape points.

The frame is placed over the tape near the first frame position, with the centered edge of the axial member next to the tape. Next, the frame is leveled and set to tape height by adjusting the legs. Then, holding the centered edge of the axial member flush with the tape, the back edge of the cross member is matched with the tape mark of the first frame position. With the frame thus alined, the loop shank is placed and plumbed in the desired notches, and ground cover within the loop is recorded. Frame alinement and recording of ground cover is repeated at each frame position, resulting in a grid of 50 loop readings on the plot (Figure 3). Although the 0.7-foot grid interval makes possible 52 loop positions per plot, only 50 are recorded. This facilitates analysis and transformation of data to percentiles. When the frame is alined on the first and eighth frame position of a plot, one loop position is omitted. In Figure 3, the third loop position has been omitted.

The recording form used for each plot is similar to that used in loop transect work[2] except that 8 instead of 10 rows and columns of recording blocks are used. The eight rows of blocks correspond to the eight frame positions on the plot. Also, each row has only the numbered blocks that correspond to the numbered loop positions read at that frame position. For example: the first row has blocks 4, 5, and 6 only; the second row, blocks 2 to 7; and the third row, blocks 1 to 8. This method of recording assures the operator of recording ground cover only at those loop positions desired at each frame position.

The height of the two reference points controls tape height; therefore, the tape occasionally lies below the minimum adjustable frame height. When this occurs, the tape side of the forward leg (at the end of the axial member) is positioned flush with the tape, and the frame is then alined along the tape line by using the loop shank as a plumb line. The tape mark designating a frame position is matched to the loop shank held plumb from the junction of the extended axial member and the back edge of the cross member (Figure 2).

Discussion

This equipment and method can yield any desired number of loop or similar measurements of ground cover in an areal distribution with accurate and easily maintained position control. When carefully used it also enables good accuracy in duplicating loop positions during remeasurements. Trials on eight grassland plots resulted in a plot average of 93.2 percent duplication of loop recordings with a standard error of 3.2 percent. More than three-fourths of the discrepancies noted in the remeasurement resulted from displacement of rock, litter, and moss by the operator during initial measurement.

The method is not well suited for sampling herbaceous vegetation in heavy timber nor among tall shrubs because of the rigidity and size of the frame. However, it has been used successfully since 1957 in open timber stands, in sparse cover of low shrubs, and in grasslands to supplement plot measurements obtained by other means and to relate these measurements to loop measurements.

LITERATURE CITED

DRISCOLL, RICHARD S. 1958. A loop method for measuring groundcover characteristics on permanent plots. Jour. Range Mangt. 11:94, illus.