A Permanent Plot for Measurement of Vegetation Change[1]

K. E. SEVERSON
AND F. R. GARTNER

Assistant Professor, Department of Wildlife Management, South Dakota State University, Brookings; and Associate Professor, Department of Range Science, Colorado State University, Fort Collins.

Range and wildlife managers have been dissatisfied generally with techniques for marking permanent plots for future analysis. The authors, faced with the need to measure vegetation change in a low shrub-grassland complex in Wyoming's Red Desert, designed a sampling frame which can be installed rapidly at permanently marked sampling points. The device was used on key areas of pronghorn antelope winter ranges by employing a cluster sampling technique.

The intent of the design was to enable (1) rapid positioning of the sampling unit, (2) rapid location and placement of a permanent pivot stake, (3) rapid location and placement of a second reference stake, and (4) rapid and accurate relocation of the sampling frame at future dates.

Fig. 1 illustrates both the design and the positions of the permanent marker stakes. A length of steel rod (⅜ × 48 in.) was bent at one end to form a collar with an inside diameter of one inch. The collar was formed to fit tightly, but smoothly, around a piece of one inch pipe, 18 inches in length. These pieces of pipe were driven about one ft into the ground. The six inches protruding above the ground surface served as the pivot stake and receptacle for the collar of the sampling frame.

The sampling frame was also made of steel rod. For our purposes we chose a rectangular frame (1 × 2 ft). It was welded to the rod at the end opposite the collar.

The following procedure was used to locate permanently each sampling frame (side view, Fig. 1). First, a piece of one inch pipe was driven vertically into the ground, using care to prevent damage to the top of the pipe. Secondly, the collar was placed over the section of pipe protruding above the ground surface. Next, the sampling frame was positioned. Finally, a piece of concrete reinforcing rod (⅜ × 12 in.) was driven into the ground directly beneath the point where the "arm" of the sampling apparatus bisected the sampling frame. This rod served as the second reference stake to enable exact relocation of the frame.

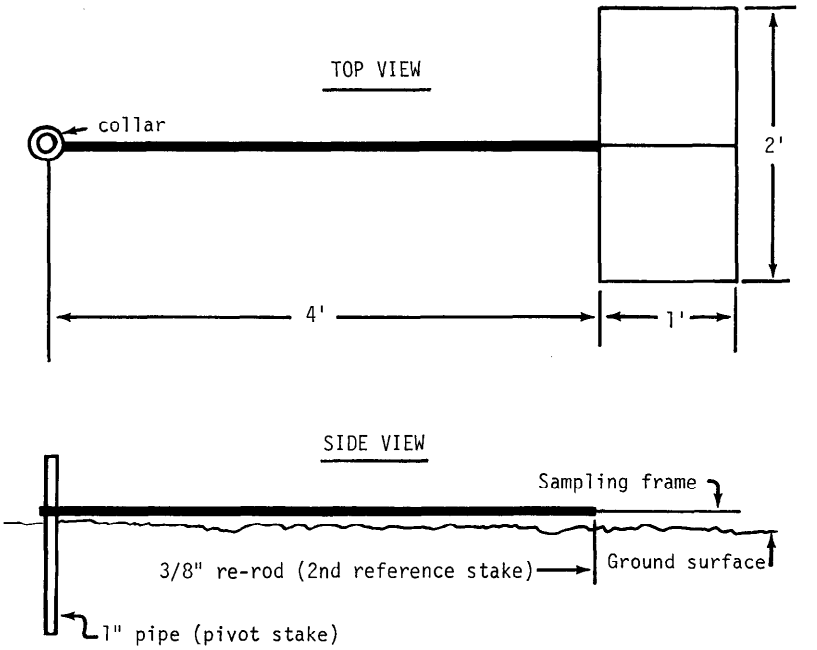

FIG. 1. Design of the sampling frame.

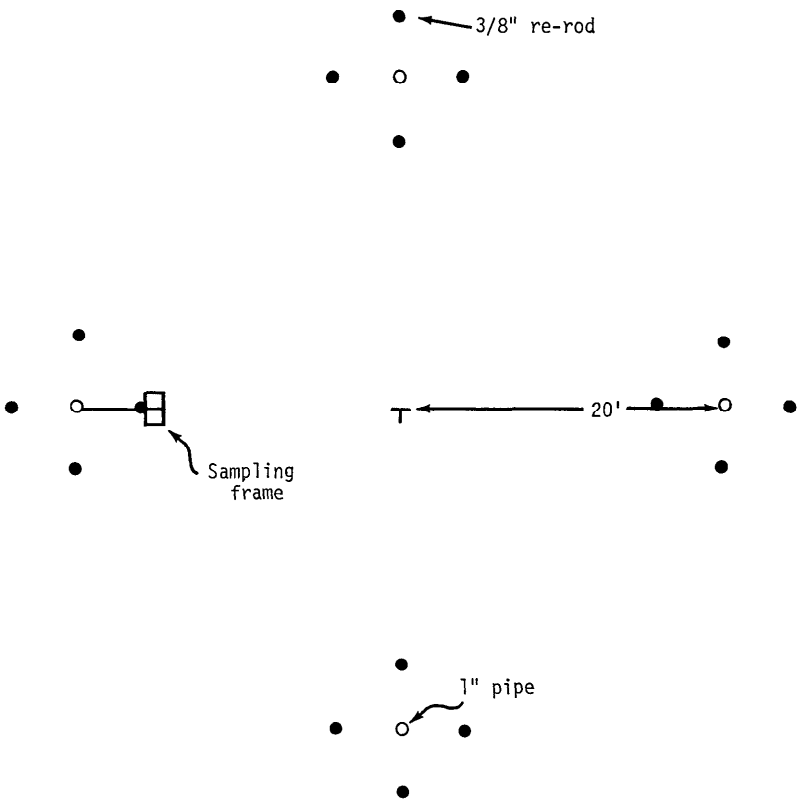

FIG. 2. The cluster sampling design.

[1]The technique reported herein was developed while the senior author was employed by the Technical Services Division of the Wyoming Game and Fish Department.

For the cluster design (Fig. 2), a six-ft steel fencepost was driven into the ground as a reference marker for the center of the cluster. Four 18-inch pieces of pipe were driven into the ground 20 ft from the marker post at 90° intervals around an imaginary circle. This provided for exclusion of measures within a circle with a radius of 15 ft (area = approx. 707 ft^2) around the fencepost. A larger area could be excluded, but this amount was deemed adequate for our purposes. Four reinforcing rods were then positioned at 90° intervals four ft distant from each pipe (the secondary reference stakes).

In this study, 30 clusters with a total of 120 plots and 480 subplots were used. However, the number of clusters, number and location of plots, and the number, location and size of the subplots should be suited to the attributes of the vegetation studied and the measurements desired. Likewise, the lengths of marker pipe and re-rod may have to be longer for stability in some soils. This method of plot location would be difficult to use in rocky soils or on steep slopes where soil movement is evident, but should be suitable for most other soil conditions. In areas with frost heaving, care should be taken to make the pipe and marker rod long enough to reach below the level of soil movement or into the upper portion of the parent material. Sheep and antelope did not disturb the marker stakes, although this might be a problem on cattle ranges. On ranges where vehicular traffic occurs, some means of marking the pipe locations may be necessary to avoid tire damage. Threading the top of the pipe and fitting with a cap may be desirable.

The technique has been completely satisfactory for the conditions encountered.