able utilization technique can be employed.

This procedure can only be used effectively where there is a seasonal separation of use by game and livestock. This condition is satisfied on many ranges in our areas which deer occupy during winter and early spring and which are used by livestock in late spring or fall.

Because browse plants are of especial concern under the conditions described, the usual "basket" or "cage" in use elsewhere is inadequate. The low basket normally in use, although satisfactory in reseeded areas or wherever the stature of plants is low, is not sufficiently tall to cover plants of interest to us which may grow to several feet in height. These and other considerations led to the type of cage shown in Figure 1. This is a simple cylinder, 4.55 feet in diameter, open at the top, made of heavy gauge wire cut to the desired size and placed around the plot to be protected. The wire is cut on the ground at the time of installation, hence transportation difficulties are minimized since the original roll is compact. Upon installation the free ends of the wire are secured by means of number two hog rings. Tent stakes driven alongside the baskets provide adequate means of anchoring the wire in most situations.

Several types of wire were tried. All were of the same 2 x 4 inch rectangular size (2″ horizontal, 4″ high). Two gauges of wire were used, number 11 and number 9, and welded and nonwelded types were used. The most satisfactory in our opinion is the welded wire, 11 gauge and 4 feet high. This height is satisfactory for all shrubs of moderate height. Where taller shrubs must be enclosed, five foot wire has been used, although we have yet to see evidence of animals reaching into the four foot cages to browse. Wire of this gauge and construction forms more rigid cages than does the unwelded wire in the same gauge. It is, moreover, lighter in weight. One disadvantage to the welded wire is that 11 gauge wire is not every where available for purchase.

Wire of the kinds tried is available in 100 foot rolls and each roll can be made to provide seven baskets (14.3 ft. in circumference). This encloses an area adequate to encompass most shrubs encountered on winter ranges in our area. It will also accommodate a plot of 9.6 square feet, either round or square, which is a convenient size if weight estimates are to be the basis for forage inventory. Other sizes could be used.

At the outset we felt some concern regarding the possibility of the baskets being displaced by rubbing. To date, cattle have not caused any disturbance of the baskets. A few instances of deer running into them have been noted. Elk have been seen rubbing on baskets placed near their feeding grounds.

A METHOD FOR RANDOM LOCATION OF SAMPLE UNITS IN RANGE INVESTIGATIONS[1]

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Plots, transects, or tagged plants often must be located randomly to allow greatest statistical interpretation in range investigations. One of the most common means of randomizing the position of range sample units is by gridding out an area into squares or rectangles with a large number of possible locations. Developing such a grid on an area involves considerable time and expense, especially if the study units need to be relocated. For this reason, it was considered desirable to devise a technique wherein a minimum number of marker stakes would need to be set in order to permanently locate study units.

A system of radius vectors was used successfully during the 1958 field season to locate sample units in range investigations. Clusters of sample unit locations were randomly determined on aerial photographs for herbage production and basal area studies. The centers of these clusters were marked on the aerial photographs and the point then located as nearly as possible in the field. A 7-foot steel fencepost was driven approximately 3 feet into the ground at the determined cluster centers. These cluster marker posts were each assigned a number and were painted with yellow stripes to aid in relocation.

An area with a 20-foot radius around the post was expected to receive excessive use due to livestock concentration and was not included in the sampling area. The area between the inner circle of 20 feet and an outer circle with a radius of 120 feet was designated at the area in which sample units could be located. This "doughnut shaped" area was subdivided into ten equal parts by concentric circles of appropriate varying radii by the following method:

The area of the individual subdivisions (A_i) is found by

Let r_m = maximum radius
r_o = minimum radius
r_i = radius of one of the ten subidivisions
r_{i-1} = radius of the next smaller subdivision

The area of the entire sampling unit (A_t) is found by

$$A_t = pi(r_m^2 - r_o^2)$$

The area of the individual sub-

[1]*Acknowledgement is extended to Dr. F. S. McFeely of the Statistical Laboratory for his aid in this work.*

divisions (A_i) is found by

$$A_i = \frac{pi\,(r_m^2 - r_o^2)}{10}$$

The radius of the individual concentric circles is found by taking

$$10\,(r_i^2 - r_{i-1}^2) = r_m^2 - r_o^2$$

or more simply

$$r_i = \sqrt{\frac{r_m^2 - r_o^2}{10} + r_{i-1}^2}$$

The radii were determined in this example by starting with $r_{i-1} = 20$ feet. The derived r_i then became the r_{i-1} for the next larger radius determination.

Each of these concentric circles was then divided into ten equal area parts by straight lines passing through the center of the circles at 36° intervals, thus delineating 100 sub-units of equal area. The intersections of the circumferences of the concentric circles with the radial lines designates a sampling point. Each sampling point then represented one point of an infinite number of points in each of 100 equal areas. Each of the 100 sampling points had an equal chance of being selected as a sample unit location.

The sample points were determined by selection of two numbers from a random numbers table. The first random number determined the direction from the cluster marker stake and the second number determined the distance from the same stake. A sample unit was located in the field by setting a compass on a tripod over the cluster marker stake and first locating the specified direction with the compass; and secondly, the specified distance from the marker stake was determined by the use of a steel tape.

Directions and distances to locate study unit points within a distance from 20 to 120 feet from the marker stake are shown in the following table. A lightweight chain 20 feet long connects the marker post and the zero end of the measuring tape. The sampling points closest to the center marker post are 42.4 feet from the marker post and the farthest sampling points are 120 feet away.

Random number	Direction from marker (degrees)	Distance from marker (ft. on tape)
0	0	22.4
1	36	36.6
2	72	47.8
3	108	57.5
4	144	66.1
5	180	73.8
6	216	81.0
7	252	87.7
8	288	94.0
9	324	100.0

This system allows for random location of study units and provides for rapid relocation of permanent plots, permanent line transects, and permanently tagged individual plants for range studies with only one marker post.

OCULAR POINT FRAME

An ocular point frame has been used satisfactorily in sampling bitterbrush *(Purshia tridentata)* and sagebrush *(Artemisia tridentata)* communities in central Oregon. This frame was developed by Dr. W. W. Chilcote and students for use by Oregon State College ecology classes. It consists of two sets of cross hairs forming a square with 25 points at approximately three-inch spacing. The two sets are attached to the frame with the points vertically aligned. The frame is supported at convenient heights with metal legs.

This unit was found to be particularly well adapted for securing an objective measure of cover in sparse vegetation. On the ranges studied, temporary 100-foot square plots served as sampling units for obtaining plant composition data. Twenty-five points were recorded at each setting of the frame. Sufficient mechanically spaced settings