Two Modifications to the Vegetation Photographic Charting Method

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Highlight

Two modifications to the vegetation photographic charting method are suggested: The use of Polaroid film to identify species and density in the field and the use of stereoscopic pairs to facilitate detailed analysis of vegetation and site characteristics in the laboratory.

Vegetation charting has long been used as a means of providing information about plant composition and the extent to which the ground surface is covered by plants. Several charting methods have been developed; but, in general, all of them have two principal disadvantages. These are (a) variation in the personal factor, and (b) accuracy in relation to the time expended in the field measurements. As a consequence, a high degree of accuracy in a short time can usually be obtained only by skilled workers.

Photography has been used in ecological studies since the early years of the present century. Oblique photographs of square quadrats were recommended by Clements (1905) to obtain vegetational data and also to obtain a permanent record of vegetation changes. Cooper (1924) developed an apparatus to take vertical photographs of one m² quadrats of dune vegetation. The principal limitation that he found was that vegetation must be relatively uniform in height and not very tall. Cooper's data, however, were suitable for statistical analysis. J. F. V. Phillips (West, 1937) developed a charting technique that involved drawing from a glass plate which replaced the focusing screen of a camera. This method was improved later by Rowland and Hector (1934), who recommended it under circumstances that required photographing the charted vegetation. Booth (1934) developed another charting method based on the same principle although by direct observation without a camera.

Charting from vertical photographs is proposed here as a method that increases accuracy by decreasing personal error and permits faster operations; however, there are some difficulties such as overlapping of plant overstories and species identification. Stoddart and Smith (1955) observed that "identification from photographs of similar appearing plants is impossible except with detailed field notes".

Two innovations in the photographic recording of ground cover are presented here in an attempt to solve, at least partially, some of these previously indicated difficulties.

A 4 x 5-inch Crown-Graphic camera with a special back for Polaroid film was mounted on a metal tripod on which two legs had been opened by using 6-inch wood bars (Fig. 1). The camera lens was 70 inches above the central point of a m² quadrat. Polaroid positive/negative 55-type film (20-seconds developing process) was used.

Several square meter quadrats were located in the desert grassland of southern Arizona. A vertical photograph was taken of each quadrat, with the equipment described. The Polaroid system made it possible to obtain immediately positive prints on which the following operations were carried out: a).—Each plant that appeared on the photograph was labeled with its name or number. b).—Plant basal area boundaries were delineated using black carbon ink in a 00 Radiograph pen (Fig. 2). c).—The area covered by each plant was calculated with a transparent dot grid in which the number of dots had been previously determined by the formula described by Avery (1962). The entire procedure from adjusting the camera on the plot until basal area calculation required an average time of about 30 min/quadrat.

For two of the quadrats, the plant basal area was previously determined by three different pairs of operators using a chartograph apparatus similar to the type reported by Pearse, Pechanec, and Pickford (1935). The time required was about two to three hr/quadrat. These quadrats were also recorded by the vertical photographic method. A comparison between total plant basal area obtained with each method showed a difference of less than 5%.

Overlapping of plant overstories is frequent when two or more plants of different heights and habits are present. In an attempt to obtain photographs of the same area from dif-
different points of view to eliminate in part the overlapping, the following modification of the technique was employed. Two photographs were taken at each plot. The “camera stations” were about 8 inches apart with the imaginary line between them passing by the vertical projection of the central point about 70 inches above the ground surface.

The plants were then identified on a positive print and the area boundaries recorded as described above. With this pair of photographs, a stereogram can be made which permits calculation of plant basal area, litter and rock cover by using a pocket stereoscope in the field or a mirror stereoscope in the laboratory (Fig. 3).

The principal advantages of adding to accepted techniques the two modifications of (1) Polaroid film and (2) Stereoscopy are: (a).—The quality of the photograph is immediately known. (b).—All the species are easily identified. (c).—Only one person is required. (d).—There is a minimum of personal error. (e).—The operation is more rapid than with a chartograph and similar results are obtained. (f).—By using stereo vision, there is depth perception which makes it possible to observe plants that overlap in a single vertical photograph. (g).—The immediate knowledge (in the field) of the percent basal area occupied by a species is useful and saves time.

The main disadvantages in applying the two suggested innovations are: (a).—Higher cost because the film used is more expensive than non-Polaroid film. (b).—Stereogram construction requires two photographs per plot. (c).—Image displacement from the central point is a source of error (could be decreased by using calculated dot grids to compensate for the area differences caused by displacement). (d).—This method is suitable only for low-growing vegetation. (e).—Not suitable for other vegetation, especially rhizomatous species or dense vegetation.

Fig. 2. Vertical photograph of a quadrat with the basal boundaries of the curly mesquite (Hilaria belangeri) grass plants.

Fig. 3. Stereogram made with two vertical photographs taken in blue grama (Bouteloua gracilis) desert grassland.
The two modifications proposed in this paper were used on a small number of plots. It is possible that charting a large number of plots in different vegetation by different operators might introduce additional advantages or disadvantages or might emphasize some of those mentioned above.

LITERATURE CITED


Highlight

Where large pinyon and juniper trees were killed 4 to 6 years earlier by bulldozing, cliffrose browse yield was 3.5 lb/acre greater than on untreated sites. Most of the gain represented growth on cliffrose plants established before treatment.

Cliffrose (Cowania mexicana var. stansburiana (Torr.) Jepson) is a conspicuous shrub of the pinyon-juniper woodland (Pinus edulis Engelm. and Juniperus spp.) in the Grand Canyon region of Arizona. It was among the 5 most abundant items in contents of several sample series totalling more than 130 deer stomachs examined from winter ranges of the North Kaibab Plateau (Arrington, 1950; Rasmussen, 1941; Wright, 1950). Decisions to regulate hunting pressure in northern Arizona are based partly on periodic estimates of linear amounts of cliffrose twigs removed by mule deer (Odocoileus hemionus Pursh).

Woodland control by killing of pinyon and juniper trees may tend to increase or decrease cliffrose browse, depending on destructive-ness of tree control methods to cliffrose populations. This note compares some characteristics of cliffrose stands on untreated pinyon-juniper sites with those where the tree control method and natural abundance of cliffrose were expected to favor maximum production of cliffrose browse.

Procedure

Observations were made on winter deer range on the west side of the North Kaibab. Cliffrose stems were counted in 1961 on 1000 circular plots of 0.01 acre each (diameter 23.6 ft) arranged in a series of 20 rectangular grids each containing 50 plots and encompassing 4 acres. Grids were systematically spaced on the ridges where cliffrose stands occurred. There were 10 grids on untreated pinyon-juniper areas and 10 where cliffrose roots after aerial crown destruction was not seen on the North Kaibab nor among stands examined elsewhere in Arizona. Some plants had bud calluses on stems at the soil surface similar to those described for bitterbrush (Purshia tridentata).

Table 1. North Kaibab cliffrose stands and browse yields.

<table>
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<th>Height Class</th>
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<th>Standing Pinyon-Juniper Sites</th>
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<tr>
<td></td>
<td>lb/acre</td>
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<td>Total</td>
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Cliffrose Browse Yield on Bulldozed Pinyon-Juniper Areas in Northern Arizona

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