A Field Stereophotographic Technique for Range Vegetation Analysis[1]

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Highlight

Color negative film used in a camera with a lens providing a good depth of field at short focal distances has produced stereo color prints that permit accurate identification and measurement of range vegetation with a pocket stereoscope. This system can overcome many of the problems of inventorying a range.

The many and varied range inventory techniques are the results of a continuing search for better inventory procedures. Major considerations in inventory techniques continue to be time allotted, information desired, accuracy required and qualifications of personnel. The time involved in all of the acceptable procedures severely restricts the size of the samples; the smallness of the samples creates too great a sampling error.

The greatest weakness, however, of these processes lies in the difference between results achieved by different field technicians when they attempt to duplicate a sample. This variation prohibits the accurate recognition of small trends over a period of time even when the best trained men collect the sample information, it makes the results from any one sample suspect.

Most previous attempts to use close-up photography in understory vegetational analysis have proven rather fruitless. Winkworth, Perry and Rossettii (1962) made vertical photographs from a stepladder to facilitate examination of plant cover. Although they did find that the photographs gave an excellent projectional representation of the vegetation, they also concluded that it was impossible to measure areas planimetrically without simplifying the plant outlines quite arbitrarily. Grelen (1959) similarly concluded that vertical photographs have not been successful in measuring basal area because of the confusion with crown cover.

In 1956 the U. S. Forest Service adapted the "Three-Step Method" for documentation of range condition and trend. The relevant step three consisted of two key photographs; a general view of the transect and a close-up of a 3×3 foot square plot, taken obliquely from the same point as the general photograph (Parker and Harris, 1959). These photographs were suitable for showing general changes in understory condition, but they offered limited application in interpreting small changes. As such, they can supplement ground surveys, but have not been used to quantify the vegetation.

Wimbush, Barrow and Costin (1967) worked on color stereo-photography in 1966 to measure range vegetation. They took color transparencies with a 35 mm camera, forming a continuous strip 30×3 feet with 15 pairs of photographs. Using these stereophotographs required a rather sophisticated stereoscope. They reported success in measuring vegetative trends, but stated that the method is not suitable for multilayered vegetation, except to determine species composition of the dominant and perhaps the subdominant strata.

Claveran (1966) reported the use of Polaroid stereoscopic pairs in charting Arizona range plants. Use of the Polaroid positive/negative AA-type film allowed immediate field check of the photograph quality and field charting on the photographs. He noted that the method is suitable only for low vegetation and especially unsuitable for rhizomatous or dense vegetation. Remeiun (1967) discusses requirements for obtaining high quality stereophotographs.

The authors worked with a sample plot, one meter on a side, subdivided into 25 squares, each 20 centimeters on a side (Fig. 1). The frame delineating the plot was designed to fold in the center and the bars creating the subdivisions were removable. The subdivision bars are laced into position after the frame has been positioned as close to the ground as possible. If the plots are to be used for periodic remeasurement, each corner can be marked with a peg driven flush with the ground.

The camera was a Hasselblad 500C, with a 55 mm, 75 degree lens. It was

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FIG. 1. Frame delineating the sample area.

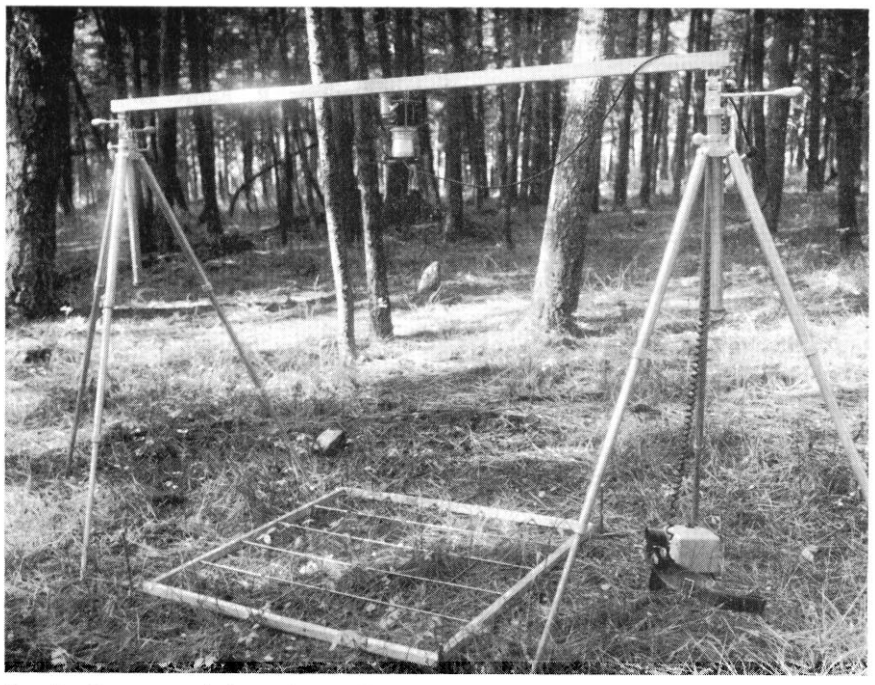

FIG. 2. Camera and frame in position recording a sample.

suspended five feet above the mean ground level over the center of the plot from an aluminum angle bar supported between two tripods (Fig. 2). The camera was off-set 18 centimeters for the second exposure. A second pair of stereo pictures was then taken with the camera positioned over the downhill side of the plot frame. These oblique pictures were added after the original tests to help in locating and identifying the smaller plants that might be hidden under other vegetation when photographed from directly above.

When the sun created shadows on the plot, the sample unit was shaded with a black plastic sheet. Exposures were made with artificial light provided by a full ring-strobe (44000 ECPS) camera aperture of F-16, and a shutter speed of 1/60 of a second, providing a focal depth of three feet. The film was Kodak Ektacolor, type S with an ASA rating of 80.

The major disadvantage of this procedure was with tall grasses on a windy day. The exposure resulting from the strobe light will stop this action, but the displacement of the subject for the second picture results in a confusing image for the observer; for instance when some of the subjects coincide others are out of position. This effect could be eliminated with two cameras taking simultaneous exposures.

To check the observer's accuracy in locating and identifying vegetation on the stereophotographs, every species that appeared in each of the 20 centimeter square subdivisions of the sample was identified in the field. Several weeks later the photographs were used to identify the species appearing in each of these subsample units and the results then compared to the field tally. This procedure was applied to 15 different sample units under conditions ranging from a timber stand of medium density to open range land. All field information and photographic interpretation was carried out by one observer who was familiar with the vegetation. The results from this work indicated that over 95 percent of the plants could be located accurately within the grid system and that 95 percent accuracy of species identification was possible. Small annual forbs appeared to cause the most trouble in both location and identification.

Stereophotographs of range vegetation can help to determine species frequency and density, as well as the area of vertical projection of the aboveground parts onto the ground foliage cover. The photographs may be less valuable for interpreting basal area, however, the oblique photographs does allow measurement of one dimension of the basal spread of a plant. They also should permit very accurate determination of vegetative trends by comparing photographic samples taken years apart. Rephotographing plots for trend analysis, however, must be done at the same stage of plant development that existed for the earlier recordings.

The photographic sampling technique permits a technician with relatively little training to do the field work and leave the identification and analysis to individuals possessing this skill for the winter. This permits the critical phase of the inventory to be made during a continuous work session, thereby eliminating variations usually inherent in the work of different individuals, or one individual's work over a long period of time.

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