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ON A PHOTOGRAPHIC METHOD OF RECORDING DEVELOPMENTAL PHASES OF VEGETATION

By E. P. FARROW

One of the first things usually done when commencing an ecological study of a particular area is to make maps and charts showing the distribution of the various types of vegetation on the area. This process of mapping is extremely valuable in many respects. For instance, it prevents one's attention from running along too definite and fixed grooves at the start, and it is often the means of bringing many interesting problems to light owing to the close observation of the vegetation of extensive areas which it necessitates. These preliminary maps can usually be done on a fairly small scale, however, and—owing to the great expenditure of time which extensive and careful large-scale mapping requires—it is advisable to reduce as much as possible those areas which are to be mapped on a large scale. The positions of those areas which it is desired, for special reasons, to chart on a large scale can usually be marked and fixed by means of strong stakes¹, and can then be indicated on the small-scale maps, or their angular positions in relation to fixed points may be picked up on the actual area by means of optical instruments. Another of the chief reasons of mapping is often the desire to obtain data relating to the stability or otherwise of the vegetation (by means of subsequent recharting and comparison of the new charts with the old ones). Results obtained in this way are often very interesting, and

¹ The stakes may be readily transported by being strapped to the frame of a bicycle—this is often an easier method than carrying the stakes oneself.

it is often found that the vegetation is far more mobile than was at first suspected; in fact the condition of the vegetation at any time is merely a developmental phase in a long series of changing conditions.

The time taken by careful mapping has been found to be especially great when the worker is single-handed, largely owing to the necessity under these conditions of continually moving from one end of the tape or chain to the other end when it is required to be moved. On this account the writer's attention has been directed towards finding some method of still further reducing the time and labour required in obtaining accurate large-scale records of the vegetation without sacrificing results. It was necessary that exactly similar records of the condition of the vegetation at some future date should be obtainable, in order to see what had happened to the vegetation in the meantime.

It was thought that some solution of this problem of rapidly recording vegetation on a large scale might possibly be found in photography, and it appeared upon further consideration that if a definite photographic method of recording vegetation was to be used, the first and most fundamental thing to do would be to fix accurately in space the best positions of the respective view-points for the photographic records, and that the next important thing would be to have fixed points within the fields of view so that the positions of other points in these fields could be correlated with the positions of these fixed points.

The method finally adopted has been to select the most suitable view-point in each special case by using the focussing screen¹. The point on the ground vertically below the lens is then marked, the camera and stand are temporarily removed, a stout stake is driven firmly into the ground at this point, and the camera and stand replaced in the same position as before with the centre of the lens vertically above the driven stake and with the lens pointing in the direction required with the view-point which has been found most suitable for the particular case.

The most natural, and often the ecologically most useful, effect in the resulting photograph is obtained when the camera lens has a position and a direction which would correspond with a normal position and direction which a human eye would occupy in viewing the object being photographed. Cross lines have previously been carefully ruled across the centre of the focussing screen, and another stake is then carefully driven in the ground in the field of view so that the centre of the top is exactly focussed upon the cross lines on the focussing screen. It may often be useful to place a metre rule in the field of view in front of the stake. The photograph is then taken, and, as a similar photograph may be required later on for observing what changes have occurred in the vegetation, it is advisable to use an exposure-meter so that the second negative shall be of the same density as the first one. After the photograph has been taken, the exact distance of the lens above the stake must be measured and recorded. It is well to write up

¹ For focussing vegetation in a wind, a square neckscarf of close texture with one edge fixed tightly under the coat collar and so arranged that the opposite edge can be pulled over the head and camera, has been found very convenient, as, being fixed at one edge, it does not blow about so badly and is more convenient to use than a loose focussing cloth.

particulars of each exposure (make of plate, etc.) on a separate card and thus make a card-index containing all the particulars about the various photographic records. As the position of the lens has been ascertained relatively to the top of the stake and recorded, and as there is a fixed point in the centre of the field of view, photographic records can be taken in exactly the same way at any time in the future as long as the stakes last; and any changes and relative movements in the vegetation can be seen by a comparison of the photographs. In frequented districts where stakes might be liable to removal, the positions of the fixed points can be indicated by removing small triangular pieces of turf down to a sufficiently stable stratum, a small portable tripod signal with a white disc being erected on the turfed spot in the field of view to show the position of the fixed point within that field.

When the photographs are taken it is important that the fixed point on the stake in the field of view should be exactly focussed—preferably by the focussing scale or by a differential method—on the fixed point on the focussing screen (if necessary a small diaphragm must be used to bring the other portions into focus), so that the lens is used at constant focus in the same case and the subsequent pictures are all on exactly the same scale. It is as well to use the rising and cross fronts of the camera in the normal positions, as these are the conditions most easily reproduced. For taking these photographic records, it is a great advantage to have a very firm and reliable stand, and on this account a strong wooden stand is better for the purpose than one of the less rigid metal tripods. When the subsequent records are to be taken from exactly the same height above the stake as the previous photographs, one may feel that vertical rackwork motion for accurately adjusting the height of the camera would be convenient. A substitute for such an arrangement may however be found by using one of those tripods¹ which are fitted with sliding adjustable lower legs. The best way of comparing two records is to view the two prints through separate ruled glass screens with central points over the fixed points in the fields of view.

In ordinary mapping it is often difficult to decide exactly where to take the boundary between two merging associations, and in these cases when one came to map the area again after several years, in order to see if any changes had occurred in the distribution of the vegetation, one's standard as to where to take the boundaries would be very likely to have varied somewhat and the two records might not be strictly comparable. Photographic recording of the vegetation is, however, an impersonal process which avoids this danger of personal equations and descriptive standards which may vary with time.

Another advantage of the photographic method over ordinary charting is that the photographic records convey data relating to three dimensions—the vertical distribution of the vegetation is recorded in addition to its horizontal distribution. It is difficult to do this at all satisfactorily on charts—many contour lines become confusing and do not give the complete comparable impressions.

¹ Such as the "Jaynay." The sliding lower legs can be graduated in equal small divisions to facilitate the adjustment of the height of the tripod.

When using photographic records in the study of competition, it is important that the records which are being compared should be taken at similar times of the year and preferably with no sun. It is also advisable to do actual counting of the plants in addition to noting the general appearance, and to use a rather dense orthochromatic screen with ortho plates in order to differentiate the various shades of green.

A useful quality of these photographic records taken from fixed points in definite directions lies in the fact that they can be mounted on flexible strips and exactly superimposed in the proper order, the mounting strips being fastened together at one end in a sort of book so that when the other ends of the mounting strips are allowed to flick by the thumb, a kinematographic representation of the details of the changing vegetation is produced. By this means data relating to the details of the changes might be obtained, which probably would not well be obtained in any other way. It is thought that this kinematographic arrangement may be useful in the future for studying the exact details of such processes as e.g. the degeneration of *Calluna* heath to grass-heath.

While these orientated photographic records convey much valuable information which could not be conveniently and clearly indicated on ordinary charts, it must on the other hand be remembered that charts may convey information which it would be difficult to gather from photographs, and on this account these two methods of recording vegetation may be largely complementary.

The photographic method of recording vegetation here outlined possesses the following advantages over ordinary charting. Photographic records can be obtained with much greater rapidity; they are three-dimensional; they are impersonal; they can often be used for the purpose of general illustrations; and they can be mounted and arranged so as to give kinematographic representations of the details of the changes in the vegetation.