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Aerial Photographs in the Forest

Self-help manuals and instructor-trainee field exercises show foresters how to use photos in every-day work.

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INTRODUCTION

IF I WERE A CHIEF FORESTER, I would not be satisfied perfectly until each forester in my organization going into the woods carried aerial photographs with him. I would be well satisfied if he had photographs of an area he was visiting in his vehicle parked on the road. I would even be happy if he scanned the photographs of the area in which he is to work before he leaves the office each morning. I am not a chief forester, but I do crusade for foresters using aerial photographs in the forest at every opportunity. If they don't, they miss a golden opportunity to reduce their physical burden and to increase their fund of area management knowledge.

Aerial photographs are an excellent tool of the field forester. However, like any other forestry tool, they should be used continually for maximum effectiveness. The forester who uses aerial photographs continually finds new uses for them constantly. The basic problem is to get a field man interested initially in aerial photograph use. Technical literature is part of the solution; an ample supply has been produced, but not all foresters use aerial photographs in the field.

Field training in aerial photograph use can be obtained in two ways: training manuals, and instructor-trainee sessions. Field foresters need easy-to-read, clearly illustrated instructions on field photograph use if training is to be self-help in nature. They need clear, patient instruction if the work is to be done on an instructor-trainee basis. This paper provides examples of both types of instructional methods for better field use of aerial photographs by foresters.

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TRAINING MANUAL TECHNIQUES

As an outgrowth of a research project which culminated in a self-training manual for using aerial photographs on the Texas National Forests (Baker, 1964), additional research is currently devoted to preparation of a pocket-size field manual on aerial photograph use in forestry. Several examples of material to be included in the manual are discussed below.

Traveling cross-country. Looking at photographs helps the forester select the points he wishes to visit in the field and travel between those points in the most efficient manner. For instance, inspecting a proposed timber sale area is much easier if one knows beforehand the shortest and least cumbersome route for a representative field sample of conditions in the area. The forester must receive adequate training before he attempts to travel cross-country with aerial photographs. This



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can be provided best by an experienced photo user accompanying him after he has read the techniques in a photo training manual.

Locating photo image of occupied ground positions. Two principal reasons for locating an exact ground position on the face of an aerial photograph are: to reference the point for later reoccupation, and to use this point as a reference in locating yet another point. Both require a degree of patience and the ability to learn location by association with recognizable objects. The user of aerial photographs often can locate some particular identifying feature in open land, but in dense forest he must study the photograph carefully

years before because the reference points had been described inadequately. Such poorly referenced points as "shortleaf pine at road edge" or "11-inch shortleaf on east side of woods road" present definite relocation problems. A description of an annotated point such as "corner, a red painted pipe with a marked cap, 15 feet to right of center line dirt road, at corner of two tangents S 76° W and S 20° W, 9.5 chains from borrow pit, approximately 1.5 miles easterly from Red Hills Lookout Tower," is entirely adequate for relocation purposes. Proper instructions for locating points would minimize future search time.

ABSTRACT: Several worthwhile forestry field uses of aerial photographs are: traveling cross-country; following bearings and distances to field plots; locating photographic image of occupied ground locations; visualizing recent harvesting changes on out-dated photographs; and using back of photograph as a source document. The author's recent experience includes enlarging industrial district foresters' use of company photographs. Foresters are encouraged to use aerial photographs in the field and to develop personal procedures for their continued better use.

to reference the point in question to a subtle change in images such as tree size, species tone, stand texture, or slope of land. Written instruction and photographic examples can improve this art.

Following bearings and distance to field plots. Modern methods of forest inventory often employ widely spaced permanent plots which are visited for remeasurement at specific intervals several years apart. It is more efficient to locate a field plot on aerial photographs and indicate its bearing and distance from a more clearly defined point on the photograph, usually a road or an opening. By transferring both plot location and reference point location from older photographs to the latest coverage available at reinventory, a ready index is provided for locating these plots. Temporary plots are often used to aid in prescribing future management activity. If one knows the total number of plots needed on a particular tract, he may locate them on an aerial photograph in the more easily reached locations (still minimizing locational bias) because the different timber stands to be sampled are indicated clearly on the photograph.

The author and student assistants have experienced considerable difficulty attempting to re-occupy field points previously located on aerial photographs only seven

Visualizing recent harvesting changes on out-dated photographs. How does the field man see changes which have occurred in an area since aerial photographs were taken? Written training instructions can help. Clear-cutting is obvious on the ground, but the boundaries should be located on the photograph. For accurate photographic location, cutting boundaries can be referenced to roads, survey lines or natural boundaries between stands. Once the boundary of the area is delineated and annotated, the field man mentally can reference cutover tracts to those of similar condition when the aerial photographs were taken. By knowing what type of cutting was done, or what conditions exist in the residual stand, the field forester can look at the photographic image of the area in the light of changed stand conditions. If aerial photographs are used during pre-cutting prescription, predicted cutting boundaries can be delineated and only need be checked after cutting takes place.

Using back of photograph as a source document. The back of an aerial photograph is a natural field note page for describing objects the field forester sees. By pin-pricking an image through the photograph and describing it on the back, the forester references the point permanently for his or another's subsequent work. Points such as property corners,

superior trees, desirable road locations, permanent or temporary inventory plots, washed-out bridges, erosion areas, steep slopes, rockslides and dangerous hazard areas can be referenced on the back of aerial photographs. When relocating points in the field, having the point referenced on an aerial photograph may save much field time. The back of the photograph may be used to record such timber stand information as species composition, size class, density, timber soundness, need for cutting, timber volume or value, and site index. As timber stand maps should be made only when needed, stand information gathered while doing other forestry tasks and posted to the back of a photograph may prove invaluable in any project requiring partial stand information. This type of information is helpful in northern climates where office work may be relegated to winter months when ground locations cannot be inspected. Training manuals should stress that records posted to the back of an aerial photograph must be understandable to other photo users.

INSTRUCTOR-TRAINEE TECHNIQUES

Instruction in field uses of aerial photographs on an instructor-trainee basis is an alternative to self-help manuals. Short courses and training sessions can be conducted where lecture-demonstrations are handled by an instructor, and trainees then perform specific exercises with the photographs. Two such courses for foresters are Hahn's slide-tape training sessions on basic photo interpretation (c1963) and Moessner's *Basic Techniques in Forest Photo Interpretation* (1960). The author has reviewed Hahn's course and attended a 5-day course employing Moessner's techniques presented for U. S. Forest Service personnel in the South. The courses stress office uses of aerial photographs, however.

Procedures discussed in this portion of the paper refer to the author's recent experience in conducting a field-photo-use training session for district foresters of a Texas-based pulp-paper company. An evaluation is made of the response to several instructional techniques and field exercises.

Photo-use training sessions were conducted a total of four days at the company's clubhouse located on its forest property. The area used for training included natural bottomland hardwood and pine sites and also an experimental pine and hardwood plantation area. Part of the course included the following topics: detailed study of aerial coverage of the area, field determination of photograph scale, locating objects on the

aerial photographs and correlation with ground view, a walking trip through a forest area, plantation area determination, following a course through the woods, transferring property lines, plotting permanent sample locations, timber stand delineation with field check, photographic location of dramatic site preparation areas, and stereoscopy without a stereoscope.

The company had October 1965 panchromatic photographs at a scale of 500 varas* to the inch. Coverage of its entire ownership was secured, with district foresters having custody of the portion they managed. The course was arranged because the company's staff foresters believed that district personnel were not using the photographs to maximum potential. The express purpose of the four training sessions was to put the aerial photographs in the foresters' hands in the field.

An unproductive experience in the field with a pocket stereoscope and photos was the key to obtaining maximum interest on the part of the company's district foresters during the training sessions. The foresters became exasperated trying to balance both photos and stereoscope in their hands, on an automobile hood, or on the ground while the author had no difficulty seeing stereoscopically without a stereoscope. The district foresters wanted to learn the same trick. They were shown the "stereo stare" necessary for this type of stereoscopic viewing and within twenty minutes all present were seeing stereoscopically sans stereoscope. After this, the trainees showed more interest in using aerial photographs in the field.

During the course the company's foresters slowly changed from an attitude of "Why bother with these things?" to an attitude of "Why haven't I been using them?" At the last session it was obvious that an intense interest in using aerial photographs had been built up and that their value in labor-saving techniques and improved accuracy clearly had been demonstrated.

The author's "textbook" solution to stand mapping and classification was checked by two-man crew visits during the training sessions. Several discrepancies were found and corrected when the crews looked at disputed stands and discussed what the author had overlooked or oversimplified. It seems to be very desirable for the "textbook" solution to timber stand classification to include

* 1 vara = 33.33 inches.

some errors which the training-session participants can correct.

A continuing problem in industrial forestry is accurate location of property boundaries so that timber and land trespass difficulties are minimized. Usually, property lines have been posted onto earlier photographic coverage and only need be transferred to every set of new photographs as soon as received. Transfer of property lines should be made by the forester who uses them in the field—the man who has stood at the property corner and who knows where it is. He can thus update previous errors or revisit a corner whose location is in doubt. In the training sessions the deed descriptions of a small tract were given to the participants, from field observation one corner was located on the photograph, and the other three corners were plotted by scaling the proper distances and bearings. Then photo location of each of the last three corners was checked in the field.

The industrial forestry client in the training sessions manages extensive acreage of plantation and searches for understocked stands to cut and replant. All the small low-valued timber on many clear-cut areas is "chopped" prior to replanting. The company's district foresters were asked to map the boundary of a particular area "chopped" after the photographs were taken. Each participant then worked backwards to determine if he could have foreseen beforehand where he would have delineated the boundaries of the area. As a result of this training, company foresters will now employ aerial photographs more fully in deciding which areas should receive this type of treatment and in estimating acreage and attendant cost.

Several small experimental pine plantations containing either of two species were pointed out on the aerial photographs, mental correlations of size, tone and texture being made by the participants, who then estimated species composition on other small plantations nearby. Species composition was estimated consistently only when spacing and age were similar. This exercise indicated that the field man should be aware of both positive and negative results of aerial photographic interpretation. What he can't see on an aerial photograph may be as important as what he can see.

CONCLUSION

Field use of aerial photographs by foresters is both an art and a science, and as such,

should be a personal experience. The techniques of photographic interpretation are practiced differently by different people; procedures applied successfully by one man may be undesirable to another. Constant practice with aerial photographs in the field leads to constant improvement in efficiency of use. Organizations should periodically conduct review sessions on field uses of aerial photographs; successful procedures should be shared with others. It is possible to look at aerial photographs under a stereoscope without really concentrating on images. Deep concentration is required to extract the last ounce of information from an aerial photograph. For example, a forester can trace woods roads overtopped by tree crowns by "looking through" the trees to see patches of roadway underneath, and by connecting the patches can delineate the road. This degree of concentration cannot be taught, but must be obtained through an honest desire to use aerial photographs fully. When the photograph user has progressed to this point, he can be classed as a photographic interpreter.

It is the author's considered opinion that a suitable amount has been published for foresters to use aerial photographs indoors where work conditions are optimum. Field uses of aerial photographs need equal time. Once the field man has mastered the technique of "reading" single prints or seeing stereoscopically without a stereoscope, he will find the aerial photograph an indispensable part of his tool kit. However, he cannot extract the maximum benefit from aerial photographs unless he is trained in their proper field use. A self-help manual is good, but instructor-trainee field exercises are even better. Enlightened organizations should employ both techniques to improve their foresters' efficiency.

LITERATURE CITED

- Baker, Robert D. 1964. *A self-training manual in aerial photograph use for the Texas National Forests*. Nacogdoches, Texas. Accompanying text are 77 folders of photographs, maps and overlays.
- HAHN, Albert G. c1963. *Basic photo interpretation: planchmeasurements on aerial photos*. U. S. Forest Service. Division of Timber Management. Washington, D. C. 77 p., photographs.
- Moessner, Karl E. 1960. *Training handbook: basic techniques in forest photo interpretation*. U. S. Forest Service. Intermountain Forest and Range Experiment Station. Ogden, Utah. 73 p., photographs.