and for other species. Although much work remains to be done the value of such work is definitely indicated, and if results continue to be encouraging, it won't be long before we will be using stereo work to replace a portion of the foot work required for timber inventory.

APPLICATION OF COLOR PHOTOGRAPHY*

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THE word "application" in the title of our panel discussion does not exactly pertain to the use of color photography by Region One of the Forest Service. To date, we have taken color photos with the idea of finding out how they could be applied. I shall attempt to present a few of the facts we have determined, relative to the use of color photography.

A comparison of the initial costs of different types of film is one of the first things which may be of interest. Using the 75′×9″ roll of film as a standard, color film is about five times more expensive than black and white or infra-red film. In round figures, the color film roll costs $125.00, the black and white $25.00 and the infra-red $30.00.

Developing color film requires about three times more time than is needed for processing black and white or infra-red; accordingly the development cost for labor is trebled. One man can process a roll of either of the latter types in about two hours, while six hours are required for processing color film. For making prints, the cost differential is even greater. Although Region One does not have equipment available for making color prints, we have had a number of 7″×9″ color prints made; the cost of each was about $8.00. Prints from infra-red or black and white negatives cost approximately 50 cents each.

Prior to our first attempt at taking color verticals or obliques on aerial film, available information and advice indicated that our chances of successful results were practically nil, particularly with only an 8¼-inch focal length camera. In fact we had about decided to postpone experimenting for a few years, when in the summer of 1946 we were asked to try some color shots of mountain-pine yellow pine killed by beetles. Using our Fairchild K-3-B camera (7″×9″ with 8¼″ focal-length lens), a number of high and low angle obliques were taken from an altitude of about 2,000 feet, and the negatives were processed in our own laboratory. The resulting transparencies were exceptionally good; definition and color was clear and strong; and the affected trees could be distinguished as far as three miles away. Those who had first-hand interest in the test were very favorably impressed. That same fall we borrowed a U. S. Army K-22, 9″×9″ camera with 12″ focal-length lens and made an additional test. Although conditions were not too favorable, the results were entirely satisfactory.

In the spring of 1947, we were called upon to take aerial color photos of "Tussock Moth" damaged timber on the St. Joe National Forest in north-central Idaho. As infestation was heavy and spreading rapidly, it was necessary to use an effective means of "selling" the need for controlling the moth. Vertical color shots from 10,000 feet were taken with our 8¼-inch lens, 7″×9″ Fairchild camera, as well as low and high angle obliques. The results, while not as good as our first or second attempts, were very effective. In the vertical photos, practically every tree that had been damaged could be detected, and the

* Paper read at Annual Meeting of Columbia River Section of the Society, Portland, Oregon, December 7, 1949.

obliques clearly showed the widespread areas affected. The color transparencies in this case were largely responsible for proving the need for immediate and all-out efforts to control the "Tussock Moth." The results were that the interested agencies and bureaus cooperated on a large-scale, intensive program that completely eradicated the moth, and saved timber potentially worth millions of dollars.

In the summer of 1948, we took one roll of color film on an area where fumes from a smelter were damaging timbered areas, and in the summer of 1949 we took a roll for resource studies on the Coeur d'Alene National Forest. The color transparencies in both cases were excellent, but we do not yet know the results of the studies made from them.

An attempt at taking color verticals early in the spring of 1949, on a snow survey for the Army Engineers, gave very poor transparencies due to extreme contrast between snow and timber. In the late summer of 1949, we took some oblique color photos of blister-rust damage on the St. Joe National Forest, obtaining fine color detail, despite heavy haze and some smoke.

The results of color photography in Region One have been far better than we anticipated. While the full value has not been determined, the effectiveness for certain phases of our work is readily apparent and we expect to continue using it for special jobs. Through its use to date, we have arrived at a few general conclusions, which I briefly summarize:

1. Color film is not "tricky" to use but strict adherence to specified techniques is imperative; proper exposure and filtering are perhaps most critical as the latitude of color film is not as great as that of other films. Filters have to be prepared in the laboratory, and the combination of filters to be used varies with the expected haze and the altitude at which the work is to be done.
2. For the present, color prints are probably too expensive for use except in very special instances. Lacking these, the use of the transparencies has certain disadvantages.
3. Our experience, although not backed by conclusive proof, indicates that over a period of several years, color in the transparencies fades to an appreciable, though not a nullifying, extent.
4. For certain problems, color film is invaluable, as it clearly indicates to both the layman and the expert, changes or types that otherwise would not be detectable.
5. It is our belief that while aerial color photography for Forest Service and other work has many uses that have not as yet been determined, black and white film will be used for the bulk of our photo work in the immediate future.

NEWS NOTE

ACCURACY OF STAND HEIGHT MEASUREMENTS MADE ON AIR PHOTOS

Tree-height measurements made on good air photos vary, on the average, less than 6 feet from Abney level field readings, according to a report of the Central States Forest Experiment Station of the U. S. Forest Service.

A study covering nearly 100 stands in southern Indiana compares parallax wedge readings made on 1:20,000 photos with field measurements of the same stands. In addition, it shows that new 9-×9-inch summer-flown photos are superior to 3-year-old 9-×9-inch winter-flown photos, and to 9-year-old 7-×9-inch summer-flown photos.

The results of this study are reported in Station Note No. 59 of the Central States Forest Experiment Station, 111 Old Federal Building, Columbus 15, Ohio.