BI-MONTHLY

RESEARCH NOTES

A selection of notes on current research conducted by the Canadian Forestry Service, Department of Fisheries and Forestry

ENTOMOLOGY

Aerial Photography (35-mm): Aid to Forest Pest Surveys.—Aerial observations and ground surveys have been used for the past 20 years to detect and appraise forest insect and disease problems in British Columbia. Color photography, a desirable adjunct to these methods, provides a permanent record suitable for detailed study and specific comparison with subsequent photography. The discouraging physical problems in obtaining timely color photographs with standard aerial photographic techniques include the need for expensive cameras, skilled camera man, specialized aircraft, films and processing, and critical weather.

Klein (J. Forest. 68: 475-478, 1970) and Zsilinszky (Photogrammetria 25: 27-38, 1969/1970) reported that standard 35-mm color aerial photography could be used inexpensively and conveniently in insect-damage surveys. A variation of this method was tried in August and September 1970, during regular pest detection flights in British Columbia by the Forest Insect and Disease Survey. Two 35-mm Asahi Pentax Spotmatic single lens reflex cameras with 1:1.4/50 lenses were mounted on a bar to facilitate the simultaneous operation of both for film comparisons. The cameras were handheld and photographs were taken through or out of the window or through the cargo hatch of a Cessna 185, Cessna 206, Cessna 337 Super Skymaster and deHavilland Beaver, all aircraft commonly used in British Columbia for pest detection and appraisal mapping flights. Films used were Kodachrome-X (color positive film), Ektachrome Infrared Aero type 8443 with "Hoya G" filter (false-color positive film) and Kodacolor-X (color negative film). Photographs were vertical and oblique; those with overlap could be viewed in stereo. Exposures were 1/500 second except when low light levels demanded 1/250 second. Photographs were taken at flying heights that gave scales ranging from about 1:5,000 to 1:50,000.

Insect infestations were photographed near Prince George and Kamloops (spruce beetle, *Dendroctonus rufipennis* (Kirby); Douglas-fir beetle, *D. pseudotsugae* Hopk., and mountain pine beetle, *D. ponderosae* Hopk.), and near Vancouver and Nanaimo (balsam woolly aphid, *Adelges piceae* (Ratz.); spruce budworm, *Choristoneura occidentalis* Free.; black-headed budworm, *Acleris variana* (Fern.), and western hemlock looper, *Lambdina fiscellaria lugubrosa* (Hulst)).

Insect infestations are recognized from the air by three damage symptoms; in the first four insects mentioned, symptoms were dead or dying trees with foliage varving from yellow-green to red and brown, and then thinning as foliage gradually dropped from the trees. Budworm and looper defoliation give infested trees a brownish or reddish tint caused by dead or dying needles that remain for a time in webbing laid down by the feeding caterpillars.

The aircraft used were generally satisfactory for this type of survey, although some had windows that could not be opened conveniently for easy photography. Photographs taken through closed, clear windows were slightly inferior to those taken through open windows, but even tinted windows did not eliminate recordable color tone differences.

Choice of films depended upon the primary use of the photographs and the urgency with which they were needed for viewing. The positive transparency films were useful because they could be projected, and offered sharp reproduction for detailed viewing. When prints were desired, they could be made more quickly from the negative films, and were usually of better quality than when made from slides. Good positive transparencies from negative film takes several weeks longer than for positive film, if normal commercial processing facilities must be used, an important consideration in pest assessment photography where time is usually significant.

Although exposure meters are not designed for Ektachrome Infrared Aero film, good exposures usually resulted, under a variety of lighting conditions, using the meters set at an A.S.A. rating of 100; there was a tendency sometimes to overexpose slightly at settings based on this rating.

The mortality caused by bark beetles and balsam woolly aphid was more pronounced on small-scale, false-color film obliques than on normal-color films. In the former, the affected trees were a distinct blue against the red of healthy ones, while in the latter, the leafless grey stems were often masked by the green-appearing foliage of their healthy neighbors. False-color film was no better than normal-color film for identifying or delineating defoliation caused by the budworms or looper.

Useful mosaics were made from 27 oblique normal-color prints of a 12,000-acre spruce budworm infestation in the Lillooet River Valley near Pemberton, and from 11 prints of an 850-acre black-headed budworm infestation at Green Mountain near Nanaimo. Edge-scale distortion made it possible to assemble only rough mosaics, but the infestations were easily discernible.

The survey at Pemberton can be given as an example of the costs involved in this photographic technique. A normal survey reconnaissance flight was made over the infestation, during which the usual sketch-mapping was accomplished. Immediately afterwards, one observer, who had previously noted the areas of most significant interest, directed the aircraft's return and took photographs. This involved about 30 minutes or $40 of additional aircraft time. This, plus the cost of two rolls of film, including processing and making 3- x 5-inch prints (about $20) added approximately ½¢ per acre to infestation appraisal costs. Similar costs were involved in taking photographs of the black-headed budworm infestation.

The 35-mm format was a disadvantage when interpreting the film; a slightly larger format (2 inch or 70 mm) would be more convenient and provide better quality and larger photographs. Advancing the film by hand was difficult, especially when two cameras were involved; stereo reproduction and continuous strip photography could be facilitated by an electric film advance system.

These trials indicate that useful photographs can be obtained simply and cheaply during forest pest aerial surveys in British Columbia with standard 35-mm equipment. Such photographs could (a) assist in determining intensity of damage, (b) serve as a permanent record for future study, and (c) supplement observations and sketch maps in describing damage or infested areas accurately. A pictorial record of damage would help the forester select salvage cutting boundaries and delineate areas for aerial chemical control treatments. It would also aid pest surveys by helping sampling crews pick representative locations, both for current and future examinations.—J. W. E. Harris, Forest Research Laboratory, Victoria, B.C.