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AN ERTS-1 PROJECT
INVESTIGATION OF THE DETECTION & MONITORING OF
FOREST INSECT INFESTATIONS IN THE SIERRA NEVADA
MOUNTAINS OF CALIFORNIA

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16. Abstract Work has proceeded on the planned schedule. Our first ERTS-1 Color IR transparencies were received on December 15, 1972, and our first U-2 RC-10 Color IR on December 3. Considerable difficulty was experienced in enlarging and printing ERTS-1 imagery resulting in more than a month's delay in obtaining a usable enlarged color print. Since we have had less than two weeks to interpret these photos, our conclusions on insect infestation detectability must be considered tentative, but we believe we can detect areas of heavy tree mortality and heavy defoliation, Many other features of the physical environment are readily detectable. Underflight U-2 - RC-10 imagery continues to be extremely useful.					
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Figure 2. Technical Report Standard Title Page

Introduction

This is our progress report for the period of December, 1972 and January, 1973 for the investigation of the Detection and Monitoring of Forest Insect Infestation in the Sierra Nevada Mountains of California.

We received our first ERTS-1 Color IR transparencies on December 15 and our first U-2 RC-10 Color on December 3.

Our efforts during the reporting period have been devoted exclusively to office duties since winter weather conditions in our mountain area prevented any on-the-ground imagery verification.

Dr. Ralph C. Hall, Principal Investigator, has met and conferred with members of his team of investigators and his Scientific Monitor on numerous occasions for planning and executing the project.

ERTS-1 Imagery

Due to the fact that the ERTS-1 Color transparencies were not received until December 15 and had to be prepared for interpretation we are able to report only preliminary conclusions on this project.

ERTS-1 IMAGERY ENHANCEMENT

We have experienced real difficulty in enlarging our original ERTS-1 prints for interpretation purposes. Our first try was a commercial color printing firm who caused delays by (1) losing the first batch in the holiday mail, and (2) in the ultimate batch, one enlargement was printed backwards and its stereo mate printed from the wrong frame. Our second attempt from another company was reasonably successful, but the copies were not received until January 18. We are now trying another approach in cooperation with the professional photographer from the Pacific Southwest Forest and Range Experiment

Station who is taking 35 mm Kodachrome slides of portions of the Color transparencies and subsequently projecting these on a beaded screen. We have only been working with these for a few days, but initially we believe that we can now detect images not discernable from the enlarged prints. The big advantage is that we can have imagery available in a matter of two to three days.

ERTS-1 Imagery Interpretation

We have worked with three types of imagery including (1) a false color infrared simulation by photographing the screen of I²S adco1 viewer, (2) the ERTS-1 Color IR 9 x 9 transparencies and (3) images obtained through the use of the 35 mm slides. From the standpoint of interpretation quality, these would rate as follows: the best, no. 3; intermediate, no. 2; and poorest, no. 1.

For our primary objective, from these preliminary examinations we now believe that we can identify and roughly map areas of heavy tree mortality caused by the mountain pine beetle and heavy defoliation from the needleminer. We are having some problems in color tone differences due to aspect: that is the same true color may vary depending whether it occurs on the north or southern slope.

For our secondary objective, we are reasonably sure that we can do the following: differentiate and map timbered and non-timbered areas; determine timber stand density in at least two categories, identify and map major stream courses, that we can detect lakes, mountain meadows, massive rock outcrops and domes, riparian vegetation, grazing land, old burned areas and glaciers.

We are basing these assumptions on underflight photos taken by us at scales of 1/5,000 and 1/18,500 and U-2 RC-10 NASA support,

plus limited ground truth collected on random sample plots measured and evaluated in late September and early October.

Because of snow conditions we have not been able to take our ERTS-1 photos in the field for positive check and this must wait until June, 1973.

We have found the black & white 9 x 9 positive and negative images of little value by themselves, in the bands of 4, 5, 6, and 7 for detecting insect infestation.

NASA Underflight Support

We have found the NASA underflight support extremely useful in our project, particularly the RC-10 Color IR imagery. We have been impressed with its possibility for enlargement with little loss in detail. We have experimented with enlarging the RC-10 to the same scale as our 1/18,500 and find it compares very favorably. As an example, had we realized its potential we could have eliminated our contract underflight and saved about \$7,000 on this one phase of the project.

We have had one minor problem with our RC-10 photos in the matter of exposure where they tend to be a bit dark. We appreciate the problem is a balanced exposure where the same flight may cover great extremes from very light desert, to intermediate agriculture, to extremely dark mountain forests.

We feel that the U-2 - RC-10 Color IR imagery, by itself will prove to be an extremely useful tool in detecting forest insect outbreak in considerable detail over vast forested areas and would expect the A-1 or A-3 imagery to be even better, but have not had an opportunity as yet to evaluate these two although these are on our spring flight schedule.

Future Work

Our activities for the next two-month period will be devoted to further analysis of our ERTS-1 transparencies with special emphasis on further enhancement through the use of 35 mm color slide techniques and attempts to identify differences in degree of damage both in tree mortality and degree of defoliation.

Significant Results

In the area of our primary objectives; the detection of insect infestations, we still must limit our conclusions as tentative, but very promising, through the use of ERTS-1 imagery alone.

In the field of features other than insect infestation, we can be more positive; for example, we are sure that we can detect the following: timber vs. non-timber; timber density in broad categories; lakes, major stream courses, rock outcrops and domes; riparian vegetation, cultivated field, pasture land and glaciers.

Respectfully submitted,

NATURAL RESOURCES MANAGEMENT CORP.



Ralph C. Hall
Principal Investigator

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