DETECTION AND MONITORING OF VEGETATION DAMAGE ASSOCIATED WITH HIGHWAYS AND HIGHWAY FACILITIES

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16. Abstract

Preliminary visual analysis of recently received color composites has been initiated. Tentative conclusions based on a very limited study are favorably for attaining objectives as outlined in the original proposal.

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PREFACE

a. Objectives - To detect vegetation stress associated with highway facilities with special reference to damage attributable to de-icing chemicals and/or alteration of the ground water regime.

b. Scope - To employ standard visual airphoto interpretation techniques and limited color additive enhancement procedures to identify, map and monitor areas of vegetation stress. To determine the smallest areas discernible on different types of imagery and small scale photography.

c. Conclusions - Three color composites, which were ordered from NASA in Novèmber 1972, have been partially analyzed visually. Four color composites of the same scenes made by the General Electric Co. Photo Lab were received several days ago and have been superficially examined. A number of areas less than three acres in extent of known vegetation stress have been definitely identified, using visual procedures. Sites where trees are dead are more difficult to detect. At least in this preliminary stage of visual analysis of the recently received color composites, it appears that partially damaged coniferous forest sites are the easiest to identify. A more thorough study and field check will be completed within the next few months.

Introduction - This report contains a brief description of the findings of a cursory analysis of several color composites received during the past week. No field checks or chemical analysis of soil and plant materials taken from vegetation stress sites identified in the ERTS imagery have been made.

Work Performed - Following are a few brief observations and tentative conclusions based on the very limited study of the color composites available at this writing.

A. Comparison of NASA and General Electric color composites made from Bands 4, 5 and 7 of scenes 1040 - 14543 and 1040 - 14540 taken 1 September 1972.

1. The resolution and general sharpness of the 9 x 9 transparencies made by NASA are considerably better than that of the GE products.

2. The areas of known vegetation stress are very difficult to detect on the NASA product because of the low contrast between the image of stressed sites and that of adjacent healthy forests.

3. The product made by General Electric is generally very fuzzy and the registration is considerably inferior to that made by NASA. However, the very high contrast (a bright green hue) of the partially damaged coniferous sites is readily discernible in the GE product.

B. Preliminary study of green and blue-green color patterns observed in Bands 4, 5, 7 and Band 4, 5, 6 color composites. These particular colors on simulated CIR are all important for detecting vegetation stress.

1. The most striking color patterns occurring in the 1:1,000,000 transparencies are the high contrast green spots in a general background of magenta or pinkish gray. Spots 10 acres in extent are easily seen with little or no magnification of the 9" x 9" transparencies. By using a

567 3M Overhead Projector, a Kodak 35 mm Projector or a B & L Zoom Stereoscope, a number of green spots less than three acres in extent were readily identified.

2. Significance of green spots. A half-day field trip to check a number of readily accessible areas in the immediate vicinity of the writer's office revealed the green spots were:

a. A 30' - 40' tamarack stand known to be damaged by de-icing chemicals (based on previous chemical analysis which revealed toxic levels of sodium and chlorine in both tissue and soil samples).

b. A portion of a treeless heath bog which, to a casual observer was apparently healthy. This site will be analyzed chemically to determine the degree of pollution by de-icing chemicals.

c. An abandoned highway salt storage area. This salt saturated gravel pad less than one acre in extent was faintly discernible.

d. The wet floor of an abandoned gravel pit about 150 feet wide and 400 feet long.

e. A sedge meadow, apparently healthy and probably not polluted by de-icing salts. This area will be examined by a competant plant physiologist.

f. The center of the Bangor business district. The brilliant green hue represented an area having no trees. Adjacent areas having a few scattered elms and maples had a duller green hue with a slight bluish tint.

g. A nearly dead red maple stand bordering a lake. The stress was caused by raising of the water level of the lake by damming.

The above observations are, admittedly, very superficial and are intended only as information for the reviewers of this report. An attempt will be made to differentiate between the various shades of green-blue hues, using visual methods, to determine the reliability of color patterns

alone for the purpose of identifying definitely each of the seven features described above. Sample microdensitometer analysis or enhancement procedures may be applied after a standard visuable analysis has been accomplished.

C. U-2 Underflights

1. A few usable frames were obtained during an aborted U-2 underflight made on 27 January 1973.

2. Over 500 linear miles of nearly cloud-free U-2 coverage was obtained on 31 January 1973.

3. On 24 March 1973 a 50-mile wide band covering the Coastal Zone was obtained. According to the pilot, 70 % of this coverage should be cloud free. The products have not been received at this writing.

4. Because of inclement weather no coverage was obtained during a scheduled mission in the latter part of May.

5. An additional underflight is scheduled for the period between 30 May and 7 June.

Planned for the Next Period -

1. All available color composites will be analyzed visually.

2. Interpretations will be field checked.

3. Arrangements are being made to analyze the data at the General Electric Company facility at Valley Forge, Pennsylvania, in the latter part of June.

4. Both ERTS-1 imagery and Underflight photography will be analyzed using Spectral Data instrumentation available at the University of Vermont.

5. During the latter part of the summer it is hoped to use I^2S equipment at GSFC.

6. Prepare thematic maps of several test areas showing the location of vegetation stress sites attributed to highways and highway facilities.

7. Prepare a paper on findings related to this study.