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ERE P B I M O N T H L Y P R O G R E S S R E P O R T - N U M B E R 1 7

Period: March 16, 1975 - May 15, 1975

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INVENTORY OF FOREST AND RANGELAND RESOURCES, INCLUDING FOREST STRESS

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Coinvestigators: Frederick P. Weber  
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INVENTORY OF FOREST AND RANGELAND RESOURCES, INCLUDING FOREST STRESS

EREP Bimonthly Progress Report

Report No. 17

Period: March 16, 1975 to May 15, 1975

Principal Investigator: Robert C. Aldrich

Coinvestigators: Frederick P. Weber  
Richard S. Driscoll

A. Overall Status

1. Manitou, Colorado-range inventory site (161313)

We are in the process of completing the initial draft of our final report on applications of EREP photographic products for rangeland surveys. Since rangeland, or other natural resources surveys or inventories, requires data to determine the aerial extent of plant community systems, this has been a major thrust of our work: to determine at what level in a plant community hierarchy EREP photographic products can be used for plant community classification. In addition, we have been concerned with changes in cultural features of a mountainous landscape as they would affect resource management alternatives and how those changes can be interpreted from the EREP data. These objectives have been accomplished and information about them will be included in our final report. Also included will be preliminary information on how very large-scale aerial photographs can be used to quantify certain plant community characteristics, the plant communities defined from the EREP photographic products.

2. Augusta, Georgia-forest inventory site (177512)

a. Photo interpretation of forest and other land use:

Two 10,000-meter grid ground truth maps have been photographed with a precision copy camera. Prints and film overlays made from the negatives will be used to assess the accuracy of computer maps produced by microdensitometry and computer-assisted classification.

Training aids that describe various forest and related land use are being made. Each land use is described by four photographs: (1) a color ground photograph, (2) a 1:120,000-scale copy of RB-57 Mission 274 (April 1973) CIR transparency, (3) a 1:380,000-scale copy of

SL-4 S190B (Nov. 30, 1973) HR color transparency, and (4) a 1:380,000-scale copy of SL-3 S190A (Sept. 12, 1973) simulated CIR transparency (Bands 0.6 to 0.7 $\mu$  and 0.7 to 0.8 $\mu$ ) combined on our I<sup>2</sup>S additive color viewer. A common format is being designed for the 16 training aids.

All photographic products to be used in the photo interpretation test were completed during the period.

A photo interpretation test using S190A and S190B products for two dates (September 12 and November 30, 1973) has been completed. Forest type, physiographic site, crown closure, stand origin, and disturbances have been recorded for 206 Forest Survey permanent sample plots, and the data has been punched for analysis. Land-use classification has been recorded for 3,296 points on 206 (16-point) clusters and punched for analysis.

b. Sampling designs for forest stratification and forest area estimates:

A four-class ground truth map of McDuffie County has been digitized, and editing of the resultant magnetic tapes is nearly complete. The unexpected departure of the project's computer programmer caused a considerable slowdown in making the data ready for analysis.

A scanning densitometer has been used to sample an S190B photograph from SL-4 using the same matrix of points and covering the same land area as the digitized map discussed above. A preliminary gray-scale map of part of the area has been printed out to assure that the quality of the taped data is satisfactory. The area is being stratified into forest and nonforest components and the stratification accuracy checked against the digitized map.

c. Microdensitometer classification and mapping of forest and non-forest land use:

All the major data processing procedures for classifying digitized film density of S190B data have been developed and debugged. Sixteen scan matrices and four microdensitometer apertures (4 filters each) can now be merged and combined both within and between apertures allowing a variety of analytical techniques to be applied. Gray-scale maps of the data have been produced and the study area boundaries accurately located. Color coded, digitized type maps are in the process of being produced on an EAI plotter. However, some problems have arisen with the new software package for the plotter and some hardware adjustments are necessary.



Type maps being produced use a supervised, nearest neighbor technique to determine the best combination of the four channels (each aperture) to use in separating land-use types of interest.

d. Reflectance measurements for correction of Skylab photographic data:

The B&W infrared photos (S190A Stations 1 and 2) of the Whiskeytown, California, site were scanned with the microdensitometer (MDM) early in the reporting period. With the same optical and electronic settings, a step tablet sample of the 2420 copy film provided by JSC Photographic Technology Division was scanned to allow conversion of microdensity to diffuse density.

The computer programs which convert photodensity to film plane exposure were checked and corrected during this reporting period. The analysis and data flow proceed, generally, in three parallel paths. The first step in one path is to generate a histogram of the scan runs of the test site and establish the range of density values which must be calibrated. In the second path a separate tape containing the JSC step-tablet scans is analyzed by a program called RNSTAB, which finds a second-order equation to convert the microdensity in digital counts to NASA diffuse density. In the third path, described in our Jan. 21, 1975, Progress Report No. 15, a third-order polynomial is derived which relates diffuse density to relative exposure using the duplicate density tables in the JSC sensitometry package. From this equation a look-up table is generated for use with a specific EREP duplicate roll.

Finally, the look-up table, the coefficients of the density conversion equations from RNSTAB, and the site-scan tape are put into a program named XCAL which derives and prints out a relative exposure value for each microdensity value. We also have another program, DENCAL, which combines the functions of RNSTAB and XCAL, utilizing the look-up table and both MDM input tapes in one computer run. DENCAL writes an exposure tape, as well as a printout, but does not have the flexibility of selecting different combinations of scanning runs from the MDM tapes as do RNSTAB and XCAL.

The site MDM scans for camera stations 1 and 2 have been converted and four to six areas from each reflectance data set have been identified with areas from the corresponding relative exposure data set. There is a highly linear correlation between reflectance and exposure at the film plane and, therefore, between reflectance and satellite radiance. To date the path radiance and transmittance figures have not been computed.

We recomputed the camera station 6 data using mean values of converted exposure for the various image blocks. We had previously done a preliminary computation using converted values of the mean microdensity for the image blocks and came out with a correlation coefficient of 0.978. The newer, more proper method resulted in a better correlation of 0.984, but a path radiance value only 1.12% higher.

3. Black Hills, South Dakota-forest stress site (191312)

There is no status report for this reporting period. The investigation status will, by contract agreement and by agreement with the coinvestigator, be included in the final report due August 31, 1975.

B. Recommendations Concerning Decisions to Ensure Attainment of Experiment's Scientific Objectives

1. Manitou, Colorado-range inventory site (161313)

None at present.

2. Augusta, Georgia-forest inventory site (177512)

In late March, our Computer Programmer/Mathematician, with very short notice, resigned her position with the Forest Service. We have been trying to refill this position through Civil Service Commission channels for over 2 months without success. Because of the importance of computer classification to attain our scientific objectives, and the need for programming of data analyses, we have fallen behind in meeting our intermediate work goals. Work is continuing at a much slower pace, and we may have to ask for an extension of our final reporting date if these circumstances continue.

3. Black Hills, South Dakota-forest stress site (191312)

None at present.

C. Expected Accomplishments

1. Manitou, Colorado-range inventory site (161313)

This is our final bimonthly report. We will submit our final report on or about August 31, 1975.

2. Augusta, Georgia-forest inventory site (177512)

This is our final bimonthly report. We are in the process of analyzing results and completing evaluations. However, because of personnel problems described under "Recommendations Concerning Decisions to Ensure Attainment of Experiment's Scientific Objectives," our August 31 deadline for the final report may have to be extended.

3. Black Hills, South Dakota-forest stress site (191312)

This is our final bimonthly report. Since we have not received bimonthly reports from the coinvestigator for the last two reporting periods, it is impossible to state what expected accomplishments will be reported in the final report. Since the coinvestigator for this portion of the Forest Service investigation is bound by agreement to complete this work, we expect all portions of the stress investigation to be completed.

D. Significant Results, Practical Applications, and Operational Problems

1. Manitou, Colorado-range inventory site (161313)

None this report period.

2. Augusta, Georgia-forest inventory site (177512)

None this report period.

3. Black Hills, South Dakota-forest stress site (191312)

None this report period.

E. Travel Plans - May 16 to August 15, 1975

1. Manitou, Colorado-range inventory site (161313)

If the need arises, Driscoll will go to Berkeley, CA, to assist Aldrich in the collation of the final report.

2. Augusta, Georgia-forest inventory site (177512)

None planned.

3. Black Hills, South Dakota-forest stress site (191312)

None planned.