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6th QTR Report

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Period: June 7, 1976, to September 6, 1976

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EXTENSIVE INVENTORY OF FOREST RESOURCES BY MULTISTAGE SAMPLING

GSFC Identification Number 2306A

Contract Number S-54053A

Report date - September 22, 1976

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2306 A

Extensive Inventory of Forest Resources by Multistage Sampling

GSFC Identification Number 2306A

Principal Investigator: Robert C. Aldrich

Coinvestigators: Robert W. Dana
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STATEMENT OF PROBLEMS:

1. We have not received at this writing, the LANDSAT Catalog listing the imagery for April 20, 1976. If we are to perform any of the planned processing of this data within the allotted contract time, we must receive the catalog very soon.

2. Delays caused by the transfer of the Principal Investigator, Coinvestigators and supporting personnel from Berkeley, California, to Fort Collins have seriously disrupted the continuity of this research effort. Darkroom facilities are not yet fully operational, a link-up with the Lawrence Berkely Laboratory CDC 7600 computer is not yet operational and our remote sensing laboratory space is still under construction. We estimate that a four-month extension of the contract will be necessary to complete the defined work.

ACCOMPLISHMENTS:

Photo Interpretation, Mapping, and Photogrammetry:

1. Water resource inventory data are being processed in preparation for selecting ground samples. LANDSAT grid cell classifications and U-2 photographic subsample data for stream length and areas of water bodies are being summarized for analysis.

2. Large area 16-point cluster samples have been interpreted for five of nine counties using LANDSAT data enhanced and reproduced photographically by UC Berkeley from CCT's. These images produced by the Imaging Gang Optical Recorder (IGOR) do not separate water area from land area with reliability. A photographic density slice for water, made from an October LANDSAT image (band 7) produced by EROS, was used together with the IGOR image on a Zoom Transfer Scope (ZTS). Cluster points were interpreted and classified into four land use categories -- Level I: forest, nonforest, water; Level II: pine, hardwood.

3. Using a 1:250,000 scale sample cluster overlay precisely constructed with a coordinatograph, all permanent Forest Service 16-point ground sample clusters were located on the May LANDSAT image and interpreted as described above. These same clusters were then located on U-2 CIR photos (1:120,000) taken in May 1975 and land use was interpreted into detailed Level I and Level II classes. A double systematic sample with random starts will be selected from the LANDSAT grid cell clusters and interpreted on the U-2 photographs. Adjusted land use proportions, proportions for pine and hardwood, and the proportions for census and noncensus water will be computed by regression techniques.

Computer Analysis, Mapping, and Photogrammetry:

1. Problems and delays in establishing a link-up with the Lawrence Berkeley Laboratory (LBL) computer facility prevented our continuing the computer aided classification work before this time. The problems have apparently been resolved and we should be able to resume these activities soon.

2. Photo images for the October 1975 LANDSAT scene were made for us from the CCT's at the University of California (Berkeley) Remote Sensing Laboratory. The images produced on the U.C. optical imaging device (IGOR) from band 7, look superior to the May imagery for water inventory.

3. The unsupervised classification routines we had expected to try at Colorado State University's Earth Resources Department, are not yet operational. Thus, we will continue our spectra clustering work using empirical distributions derived from radiance value histograms for each channel. The frequency distribution for each channel is divided into intervals based on inspection of printer grey maps and known ground truth. Vectors are formed for each coordination of channel intervals and each vector is assigned a printer character. Printer maps of these spectral classes are compared with ground truth for aggregation or disaggregation into classes defined by the objectives of the inventory. If satisfactory results are not obtained, a readjustment of radiance intervals for one or more channels can be made. Resulting statistics from this quasi-unsupervised classification will be input to a linear discriminant analysis using maximum likelihood and Gaussian assumptions. Final classification products will be output from this supervised processing. Included will be a complete pixel by pixel in place classification for a portion of our test site. Also, area statistics will be generated for the entire nine county area using a sampling procedure.

Data Standardization and Quantification

1. The calibration data for the radiometric instruments used at the Virginia test site in April have been processed. We first smoothed the calibration data from our irradiance standard, which were given at 50-100 nonometer (nm) intervals, by modeling to black body distributions multiplied by a tungsten emmissivity distribution. The black body temperature range was 3000K-3050K, the wavelength range was 300-1200 nm, and the interval was 10 nm. Since lamp calibration uncertainties are commonly given as percentages, we applied a logarithmic treatment to the lamp data. This allowed conversion of the standard error of the least square fit to a percentage value.

These computations resulted in a selection of the 3030K black body distribution with a standard error of 1.7 percent. Considering original NBS uncertainties and transfer and current setting uncertainties, the mean uncertainty given by the supplier was 1.4 percent. Although the error of the smoothed data appear slightly higher, we now have it interpolated to much finer wavelength intervals with a logical physical model.

2. Our instruments were calibrated with a quartz-halogen lamp similar to that used to calibrate the LANDSAT MSS. The LANDSAT spectral response curves were used to compute the broadband irradiance and radiance values received by our instruments. Our filter-detector sets should be adequately matched to the MSS response to minimize spectral matching errors.

3. The digital tapes from our April 1976 flight are being unpacked and the data massaged for comparison to LANDSAT data. Due to malfunctions of the data acquisition system, some records are shorter than expected. We are currently forced to truncate the last 5 percent of our records to achieve uniform record lengths. We are working on programing to correct this problem and therefore extract as much data as possible.

Aircraft and Ground Data Acquisition:

There was no data acquisition during the reporting period.

SIGNIFICANT RESULTS:

There are no significant results to be reported at this time.

PUBLICATIONS:

None.

RECOMMENDATIONS:

There are no recommendations to be made at this time.