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# SPECTRAL MEASUREMENT OF WATERSHED COEFFICIENTS IN THE SOUTHERN GREAT PLAINS

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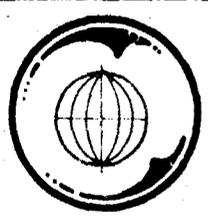
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January 1976  
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August 1975 - November 1975

Prepared for:  
Goddard Space Flight Center  
Greenbelt, Maryland 20771

Contract No. NAS5-22534

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**TEXAS A&M UNIVERSITY  
REMOTE SENSING CENTER  
COLLEGE STATION, TEXAS**



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## 1.0 BACKGROUND & SUMMARY

### 1.1 Background

This investigation is directed toward testing and modifying a technique developed in a previous study (contract #5-70251-AG TASK #5) where a linear combination of Landsat data was related to watershed runoff coefficients. The relationship was developed and tested in a region of central Oklahoma where extensive rainfall and runoff data were available for research watersheds.

In this study the technique will be tested in two regions, one in central and east central Texas having more dense vegetation than Oklahoma, and the other in arid regions of Arizona and New Mexico where vegetation is less dense. In each region twenty watersheds will be selected on a basis of the most adequate records of rainfall and runoff. The technique will be tested in each region by developing a relationship between spectral response and runoff coefficients based on ten watersheds and then testing the prediction capability of the relationship on the remaining watersheds in that region.

It is expected that by testing the technique in regions having more dense and more sparse vegetation on the watershed surfaces, an estimate can be made of the

area where the technique is applicable. At the same time, the influence of the quality of rainfall and runoff data used to calibrate the prediction scheme should indicate whether the technique can be useful to practicing hydrologists.

## 1.2 Summary

Work in this reporting period (August 1975- November 1975) has been directed toward collection of rainfall and runoff data for representative watersheds in central and east central Texas. A cursory examination of all available rainfall and runoff data for watersheds in the east half of Texas has been completed and twenty-seven watersheds with the most complete records have been selected for study. Extensive data have been collected and compiled for each of the selected watersheds. Runoff coefficients were calculated for eleven watersheds, and data on the remaining sixteen watersheds have been reduced to a form suitable for calculation of runoff coefficients. All Texas test watersheds have been mapped and a computer program was developed to reproduce the maps at scales required for overlay on the Landsat images. A study of rainfall records in four regions of Texas was also completed to provide an index of dry time periods to indicate which Landsat scenes would be most suitable for analysis.

## 2.0 ACCOMPLISHMENTS AND PROBLEM AREAS

### 2.1 Accomplishments

All effort during this reporting period has been directed towards selection of watersheds in Texas with adequate records to warrant their use at test areas for the Landsat-2 study. Twenty-seven watersheds were selected after a cursory study of existing records (Figure 1). The period of record on selected watersheds is generally 1962-1974. Eleven watersheds were highly instrumented for a cooperative study conducted by The U.S. Geologic Survey (USGS), the Soil Conservation Service (SCS), and the Texas Water Development Board beginning in 1951. These watersheds were highly instrumented for rainfall data. The rainfall records are of high quality, however, the runoff records are altered somewhat by the effect of SCS detention structures.

Computation of runoff coefficients (SCS curve numbers) has been completed on the first eleven watersheds. Both rainfall and runoff data for this group of watersheds had been compiled in annual reports by the USGS for the cooperative study, were readily available for input to the computer programs used to compute runoff coefficients.

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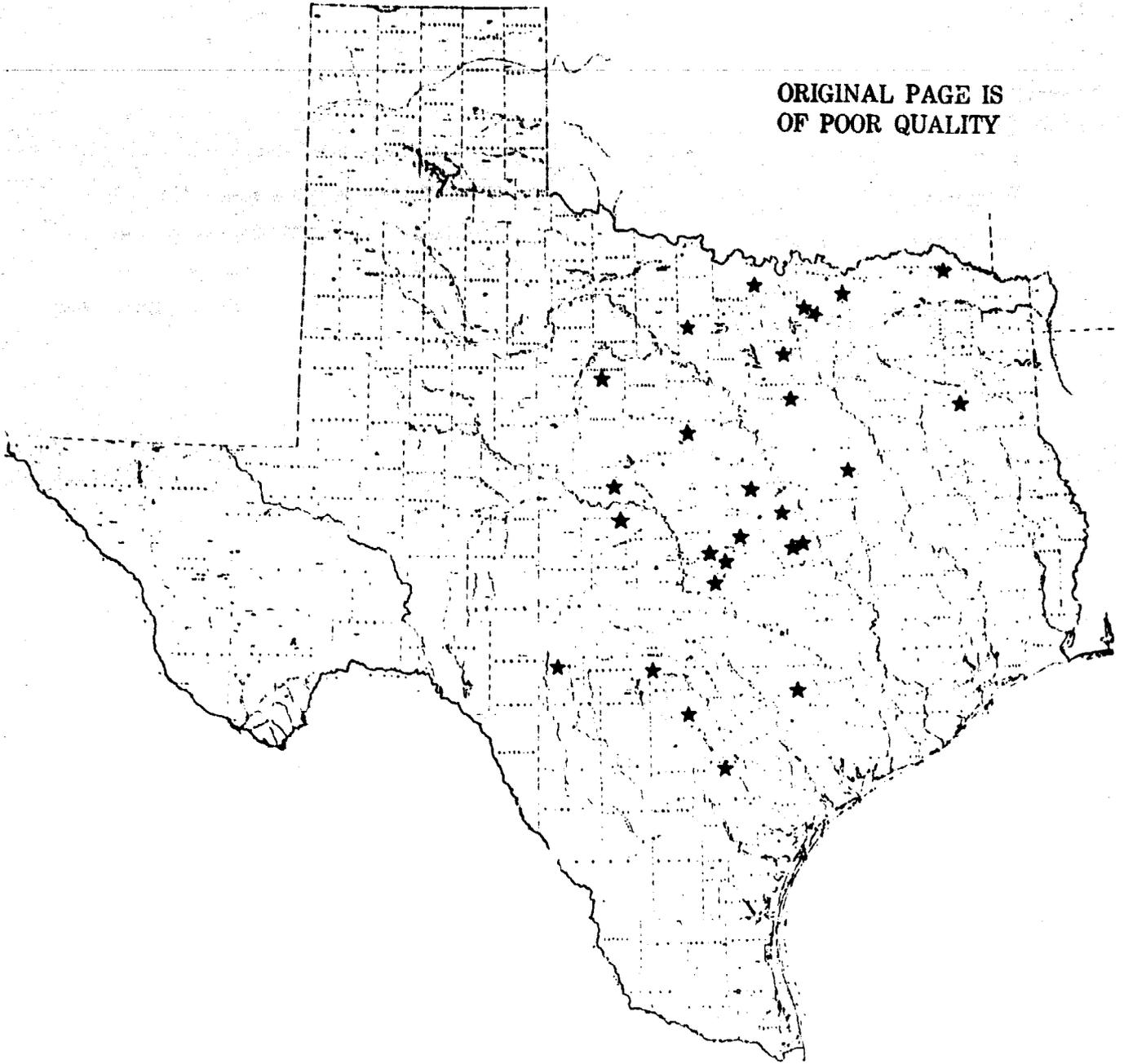


Figure 1. Location of watersheds with adequate records for use as Texas test sites.

The remaining sixteen watersheds selected all have relatively good runoff data and fair rainfall data. Final selection of the sixteen watersheds was based on the proximity of weather bureau rain gauges. An effort was made to select only watersheds with two or more rain gauges located either within the drainage area or close to the boundaries.

Rainfall data for the remaining watersheds were acquired from monthly summaries of daily rainfall in Texas. Runoff data for the same watersheds were collected from annual USGS surface water records for Texas. These data required extensive tabulation and keypunching time to reduce the data to Thiessen weighted rainfall and daily runoff in inches ultimately used to calculate runoff coefficients. Data at the end of the reporting period are in useable form.

USGS topographic maps (7 1/2 minute quads) were used to outline boundaries of all watersheds selected for this study. Longitude and latitude of points along the boundary of each watershed have been recorded on computer cards. A computer mapping program has been written to accept the longitude and latitude as input and produce maps of the watershed to any desired scale for overlays on Landsat data.

Regional groups of rain gauges were also selected representing north central and south central Texas and daily rainfall from each group of gauges was compiled for the period September 1972 through October 1975. These data have been used to calculate a thirty-day decayed antecedent precipitation index (API) to determine dry periods in each region. The dry periods will be compared to the available cloud-free Landsat scenes in order to request a minimum of CCT's.

## 2.2 Problem Areas

None

## 2.3 Recommendation

None

## 2.4 Accomplishments Expected During the Next Quarter

Major effort in the next quarter will be directed toward the collection and processing of watershed data for the test watersheds in Arizona and New Mexico. Landsat data will be ordered for the Texas study area and preliminary programs for selection of CCT data pertaining to individual watersheds will be developed.

## 3.0 SIGNIFICANT RESULTS AND PRESENTATIONS

### 3.1 Significant Results

None

**3.2 Presentations**

**None**

**4.0 FUNDS EXPENDED AND LANDSAT DATA STATUS**

**4.1 First Quarter Expenditures**

**4.2 Data Expenditures**

TABLE 4-1. First Quarter Expenditures

	Total Budget	Expenditures This Quarter	Balance
TAMU Contract	54,222.00	7,653.65	46,568.35
TAMU Matching Funds	6,197.00	1,032.00	5,165.00
NASA Data Accounts	4,300.00	190.00	4,110.00

TABLE 4-2. Data Expenditures

	Value of Data Allowed	Value of Data Ordered	Value of Data Received
ASCS LANDSAT			
Imagery (20780)	1,100.00	190.00	190.00
EROS CCT			
Data	3,200.00	-0-	-0-