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Earth Resources Evaluation for  
New Mexico by LANDSAT-2  
(Follow-on Investigation #23370)

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### I. Objectives:

The objective of the study is to utilize LANDSAT data as well as supplementary photos and maps in conjunction with field investigation to provide information that will be useful in evaluating, developing and managing the natural resources of New Mexico. Emphasis will be placed on mineral resources, geologic structure, and landform surveys and on land-use survey and mapping.

### II. Accomplishments:

During this reporting period, work has progressed in two areas: hydrologic surveying and land-use mapping. A land-use map of the state of New Mexico has been initiated and should be completed during the next reporting period. Categories used on the map were derived from a combination of the draft version of U.S.G.S. Circular 671, the Rocky Mountain Federation of States preliminary

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land-use classification, and land-use classifications under consideration by the Land Use Advisory Council to the New Mexico Legislature.

The classification categories (Table 1) are detectable on LANDSAT images, but in some instances collateral information must be used. This includes checking of high- and low-altitude aircraft imagery as well as ground truth. Other levels can be broken down from this classification system and the system can be used for other than remote sensing interpretation.

A main criticism of the classification in Table 1 concerns the underground extraction category. It was included so that gas and oil fields which can be discriminated on LANDSAT images as a network of dots could be mapped. However, other underground mining areas with no distinctive surface pattern would be difficult to recognize.

The land-use map of New Mexico will be published at a scale of 1:1,000,000 and may be used in conjunction with the LANDSAT mosaic of the state. Interpretation of color composites of the state is in progress. Most composites were obtained from the Goddard Space Flight Center and missing images from the EROS Data Center. Unfortunately, the color balance on those images from Goddard and EROS differs markedly. Differences in high mountain vegetation is not as easily distinguished on EROS color composites and this may present a problem.

LANDSAT imagery is also being used in an adjunct project by Mike E. White entitled "Volumetric Measurements and Seasonal Variation of Selected New Mexico Lakes." The object of this study is to monitor surface water resources using band 7 multi-spectral scanner imagery from the LANDSAT-1 satellite. Four seasonal maps of New Mexico taken in 1973 will indicate variations of surface water throughout the state. These maps will also serve as a base against which future seasonal maps can be compared and changes detected.

The capacity of the seasonal maps to be used for volumetric lake monitoring is also being investigated. Monthly coverage by LANDSAT-1 imagery for six major New Mexico lakes will be used to measure surface area changes. Images of the lakes will be enlarged to different scales in order to ascertain which is most accurate. Each lake has a different hypsographic and morphometric characteristic and has a detailed capacity table, against which to check measurements.

TABLE 1

LAND USE CLASSIFICATION

<u>Level I</u>	<u>Level II</u>
Urban/Built Up	Residential Commercial-Industrial Institutional (Including the Military) Transportation Recreation
Agriculture	Cropland-Pasture (Irrigated) Cropland-Pasture (Non-Irrigated)
Grass/Shrub	Grass Predominant Shrub Predominant
Forest	Deciduous Evergreen Mixed
Water	Streams Lakes-Reservoirs
Barren Lands	Bare Soils Bare Rock Salt Flats Snow Fields (Year Round)
Extraction	Surface Underground
Miscellaneous	Wetlands

### III. Significant Results:

An associated project generated as a result of the LANDSAT study is in progress. The project is concerned with developing a cost-effective technique of measuring and monitoring surface area fluctuations in lake size in southeastern New Mexico over a two-year period. The lakes are shallow, and therefore a small volume increase results in a noticeable increase in surface area on the LANDSAT imagery. Before temporal LANDSAT images were examined, hydrologists working in the area had assumed that there was little fluctuation in lake size. Lake sizes are now being quantitatively measured on an I<sup>2</sup>S Digicoll Viewer.

The topography of the area is known, and therefore lake volumes can be calculated from surface area measurements. Water from potash mining operations is being pumped into some of these lakes and the input volume is documented. Using water input and surface contour as well as direct lake level measurements as ground truth as well as the LANDSAT images, calculations may be possible regarding how much additional industrial water can be added to these lakes without the occurrence of saline seepage into the major river system.

#### LANDSAT and Aircraft Images

A total of 13 scenes have been received since the initiation of the contract providing good to excellent coverage of almost 20% of the state of New Mexico. Those scenes received have their center points located to the south of those taken by LANDSAT-1. Therefore, areas on the periphery of LANDSAT-1 images occur in a more favorable position on LANDSAT-2 images. The study has progressed in the previous 3 months using both LANDSAT-1 and -2 scenes.

An aircraft underflight of the region around Socorro, New Mexico was requested and approved. The flight area includes the city of Socorro and the Magdalena Mountains and will be used in conjunction with the LANDSAT material for land-use determination and the investigation of mineral resources.

We have been notified by the Aircraft Project Manager, D. W. Whittle, that the test site (297-Rio Grande River Watershed) has been flown. To date, no microfilm strip of the photography has been received.

In the process of working on the land-use map of New Mexico, it was found that the latitude and longitude tick marks on the images were totally unreliable. The tick marks did not coincide with latitude and longitude on state maps of

New Mexico. In addition, if 2 scenes from different dates were overlaid and topographic features matched, latitude and longitude marks did not coincide. After this experience, tick marks were ignored and topographic features on images and maps matched when transferring land-use features.

Reports written by other LANDSAT investigators have been studied. In many cases when an image or portion of an image was included in a report, no image identification number was given. Therefore, there was no way to order a duplicate image without contacting one of the investigators. It is recommended that, when images are used in progress and final reports, the image identification numbers be included to facilitate image ordering by interested parties.

Data Use

<u>Value of Data Allowed</u>		<u>Value of Data Received</u>	
<u>LANDSAT</u>	<u>AIRCRAFT</u>	<u>LANDSAT</u>	<u>AIRCRAFT</u>
\$1,900	\$605	\$100	\$0

Publications

No papers have been published or talks given in this reporting period.