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DELINEATION OF MAJOR SOIL ASSOCIATIONS USING ERTS-1 IMAGERY

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ABSTRACT

The delineation of a major soil association in the loess region of Obion County has been accomplished using ERTS-1 imagery. Channel 7 provides the clearest differentiation. The separation of other smaller soil associations in an intensive row crop agricultural area is somewhat more difficult. Soil differentiation has been accomplished visually as well as electronically using a scanning microdensitometer. Lower altitude aircraft imagery permits a more refined soil association identification and where imagery is of sufficient scale, even individual soils may be identified.

INTRODUCTION

The reflectance characteristics of soils are conditioned by many factors. The soil color and soil moisture content are two factors that greatly influence soil reflectance. The medium textured soils of the southeast generally have a reddish or yellowish hue. The reflectance from these soils generally reaches a minimum at a moisture content of 16 to 18 percent by weight (about 2 bars tension). As the moisture content increases or decreases, the soil reflectance increases. Maximum soil reflectance is obtained at a moisture level near or slightly below field capacity (1/3 bar tension).

If soils are to be delineated through the use of aircraft or ERTS imagery, the best conditions are when the soil is void of vegetation and preferably in a freshly tilled state. This condition is generally found only in areas of intensive row crop agriculture or areas where all vegetation is removed from the land each year as in sections of developing countries with extremes in yearly rainfall distribution.

Another means for soil identification is where the soil is covered with a vegetative cover characteristic to a particular soil association or soil group. This characteristic occurs in many forested areas but may also be found in other types of vegetative cover. In such cases the soil associations are delineated through the reflectance characteristics of a reasonably uniform type of vegetation possessing the same boundaries as the soil associations. The identification of vegetation types through reflectance characteristics is quite widely known and used.

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Original photography may be purchased from
EROS Data Center
10th and Dakota Avenue
Sioux Falls, SD 57198

METHODS OF IMAGERY ANALYSIS

Channel 7 ERTS-1 imagery in 9¼ inch transparencies was used in these studies. After visual analysis, selected areas are analyzed through the use of a high speed digital scanning microdensitometer and an IBM 360/65 computer with the appropriate software developed for this type of analysis. A 25 micrometer raster was used for scanning.

RESULTS AND DISCUSSION

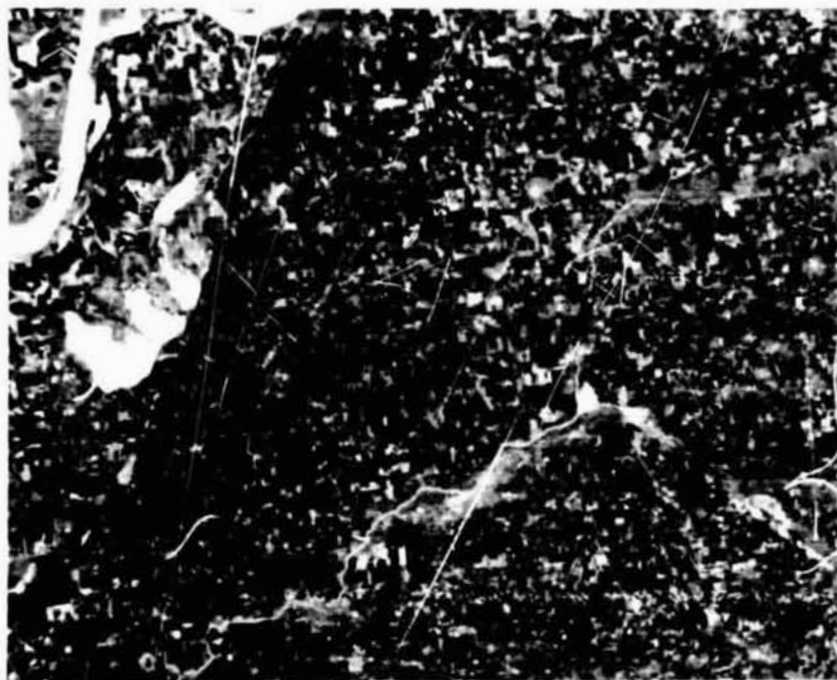
The example reported herein is a case of soil association delineation through the reflective characteristics of a fairly uniform cover of vegetation. In this particular case the Memphis soil association may be identified in Obion County using ERTS imagery. This Memphis soil association occurs in the western edge of the loess that covers most of West Tennessee. . . . known as the "bluffs" and occurs at the break between the loess . . . the delta soils of the Mississippi floodplain.

Figure 1 shows a photograph . . . Channel 7, ERTS-1 imagery of 1, October, 1972 and a soil association map of Obion County. The orientation features in the photograph are Reelfoot Lake and the Mississippi River in northwest corner and the Obion River that crosses the county from northeast to the southwest. The map and picture scale is 1 inch equals about 8.5 miles.

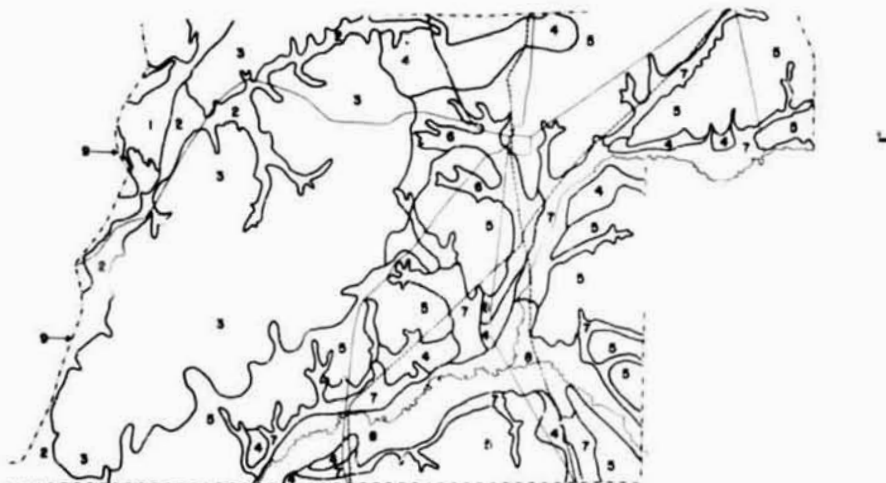
The Memphis soil association is the large block (No. 3) in the western portion of the county. A small block of the Memphis association is found in the northwest portion of the county and extends across the state line into Kentucky. The area has a fairly uniform vegetative cover of pasture grasses and this characteristic permits its delineation through ERTS-1 imagery. Small cultivation and wooded areas are found throughout the area but most of these are not of sufficient size to be detected. The areas east of the large Memphis block is one of intensive row crop agriculture.

The computer printout of the large block of the Memphis association is too large to be adequately shown in one photograph. Figure 2 shows a small portion of the computer printout that separates Reelfoot Lake, the Adler-Convent-Palaya, and the Memphis soil associations. Figure 3 shows the computer printout of the Obion River and the adjacent Waverly-Swamp association.

These findings demonstrate the feasibility of delineating major soils through vegetative cover characteristics common to the soils in question. Channel 7 provides the most information for studies of this type.



From ERTS-1, Obion County, Tennessee, 1, October, 1972



Obion County soil associations: 1. Bowdre-Sharkey, 2. Adler-Convent-Falaya, 3. Memphis, 4. Routon-Calloway-Center, 5. Grenada-Loring-Center, 6. Fountain-Dekoven, 7. Falaya-Waverly-Collins, 8. Waverly-Falaya-Swamp, 9. Iberia-Sharkey.

Figure 1. ERTS-1 imagery and soil association map of Obion County, Tennessee showing delineation of the Memphis soil association.



Figure 3. Computer printout from ERTS-1 imagery evaluation showing the Obion River and the adjacent Waverly-Swamp area.