UNIVERSITY OF TENNESSEE AGRICULTURAL REMOTE SENSING
MARCH 2, 1973

CR-130729

(a) PROJECT TITLE: Utilization of ERTS data to detect plant diseases and nutrient deficiencies, soil types and moisture levels.

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(b) GSFC ID UN650 MMC #139

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(c) No great problems were encountered. The digital scanning microdensitometer was out of operation most of January and this delayed electronic evaluation of imagery.

(d) 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.

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. It is known as the "bluffs" and occurs at the break between the loess soils and the delta soils of the Mississippi floodplain.

(e) Significant findings are shown on the attached Figures. Figure 1 shows a photograph from 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-Falaya, 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.

(f) A paper entitled "Delineation of major soil associations using ERTS-1 imagery" is to be presented at the March 5-9 symposium on results from ERTS-1 sponsored by GSFC.

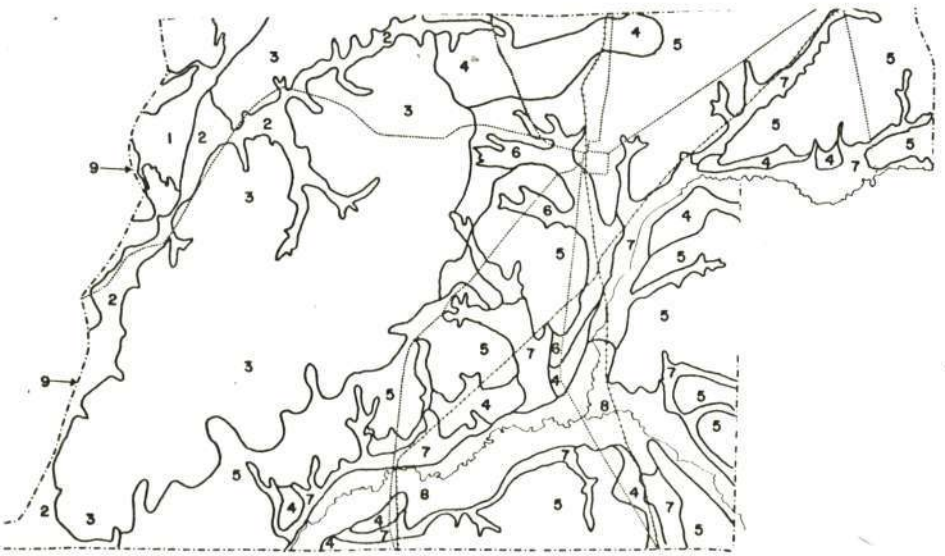
(g) We hope that NASA aircraft support to ERTS investigators is not removed. We find the group very cooperative and the information useful.

(h) No changes in order forms have been made.

(i) None.

(j) None.

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.

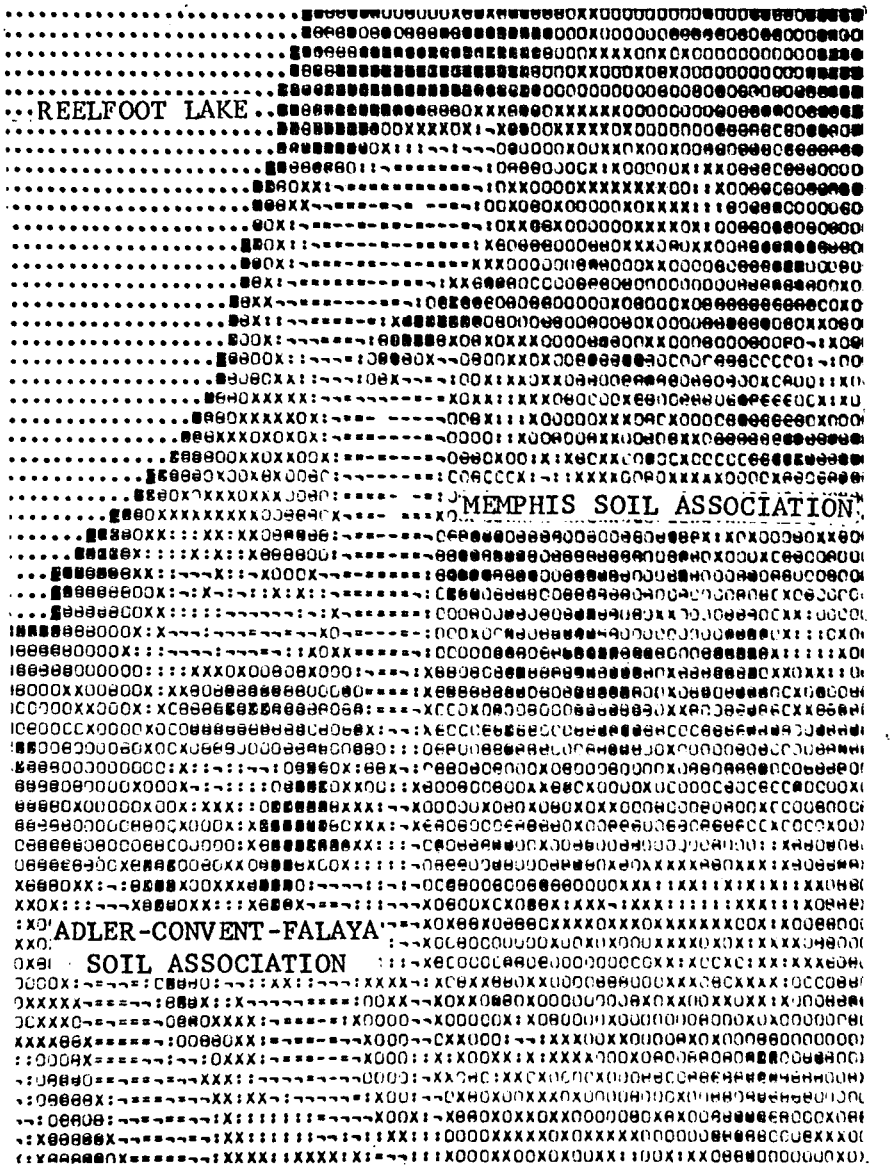


Figure 2. Computer printout from ERTS-1 imagery evaluation separating Reelfoot Lake, the Adler-Convent-Falaya, and the Memphis soil associations.

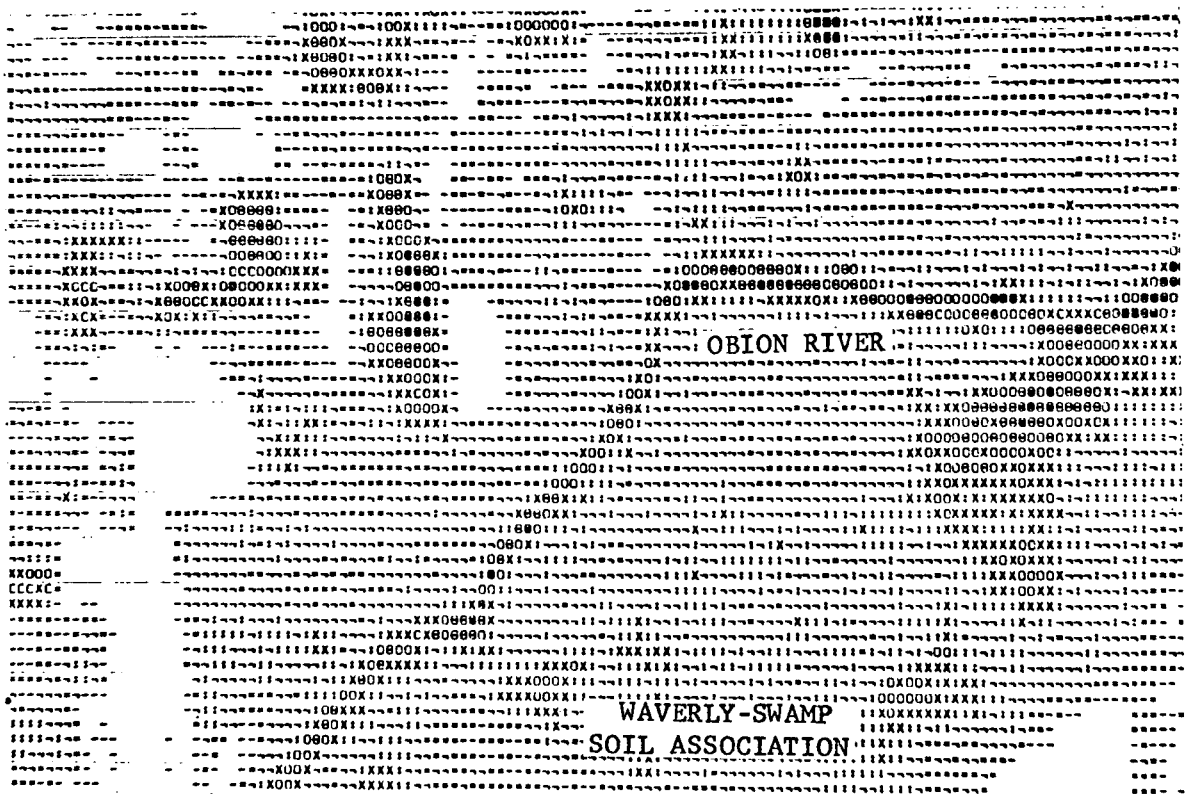


Figure 3. Computer printout from ERTS-1 imagery evaluation showing the Obion River and the adjacent Waverly-Swamp area.