(TMX-72174)

EREP QUARTERLY PROGRESS REPORT

1 AUGUST to 31 OCTOBER 1974

PLANNING APPLICATIONS IN EAST CENTRAL FLORIDA

EXPERIMENT PROPOSAL NO. 385

CONTRACT NO. CC-30281A

BREVARD COUNTY PLANNING DEPARTMENT

2575 North Courtenay Parkway

Merritt Island, Florida 32952

COMPUTER PROGRAMS

A maximum likelihood classification capability has now been developed and put into operation. The flow scheme for this program was developed by Fernando Esparza, in consultation with G. L. Thomas, and the programming was done by James J. Millard. Due to differences in data format, two versions have been prepared, one for EREP MSS data and the other for ERTS MSS data. The logic is the same in the two versions, the difference lying in the data handling methods.

Three programs have been written:

(1) Classification Program.

The principal feature of this program is the maximum likelihood classification procedure, which is based on the mathematical method outlined by Swain.[1] Since this method is rather costly in terms of computer time, two other alternatives were added to provide perhaps less exact results at reduced computer time. They are: (a) classification according to the class which has its centroid the least Euclidean distance from the point being classified, and (b) choosing the three nearest classes by the above distance measurement and then using the maximum likelihood method to make the classification from among those three classes. For purposes of discussion, we shall refer to these three options as MAXLIK, MINDIST, and MAX/MIN, respectively.

After any one of the above analysis methods is concluded for each data sample, the appropriate class character is assigned for mapping purposes. Concurrently, a character count for each class determined is maintained for tabulation and use during analysis of the requested rectangular area under investigation. Up to eight classes may be requested to describe any area.

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[1] Philip N. Swain. Pattern Recognition: A Basis for Remote Sensing Data Analysis.
LARS Information Note 111572 (9/10/73)

(2) Matrix Tape File Generation Program

This program computes the necessary parameters needed for the maximum likelihood technique from training data samples of various land-use classes as observed in the four MSS bands. The parameters include the covariance matrix for each class and the respective matrix determinant and centroid values of each band for each class established. The parameters then are recorded on a magnetic tape for use in the other programs described. Different files have been created for various areas under investigation as well as for each data set used due to differing radiance values caused by differing atmospheric conditions and sun angles.

(3) Character Counting Program

This program yields the character count and fraction of the total for each class with the added capability of examining any polygonal-shaped area, a feature not feasible in the Maximum Likelihood program. The logic within the Maximum Likelihood program is applicable, except for omission of mapping output.

It is appropriate at this point to acknowledge the contributions of Jay Millard. In addition to doing the bulk of the computer programming, as indicated by the title page, he also has handled the input parameters for the various computer runs as requested by the co-investigator, and has made numerous innovations to the programs and participated in the interpretation of results.

LAKELAND

A MAX/MIN classification map has been prepared to test the above programs for uncorrected S192 data for Lakeland. The results indicate that useful land-use maps can be prepared from the uncorrected data provided the noise

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errors are overlooked (probably most effectively by making a tracing on an overlay to show the significant pattern, ignoring single-character errors). In this particular case it is believed that a revision and modification of the training set will improve the results. This will be done by conferring with the collaborating Lakeland city planner, James Delcamp.

ORANGE COUNTY

A generalized land-use map of Orange County has been prepared from S-190A photography using the Variscan projection and tracing method described in an earlier progress report.[2] This map, shown as Figure 1, was reviewed by Orange County Planners, resulting in a couple of changes. A planimeter has been used to measure the areas associated with the several classes, with the results shown in Table 1 (1,···, 14). Also shown in that table are comparable figures currently being used by the Orange County Planners (a,···,h). Comparison of the figures is difficult because of the relatively small scale of the EREP map and because of differences in definitions of classes. Where some sort of a comparison could be made, it is shown in the table. An uncertainty of the order of 5% was found in the planimeter figures. While the EREP determination of water area is, in principle, quite accurate, the figure quoted here is low because the cutoff point for drawing (and, thus measuring) lakes was around 20 acres. Citrus often is difficult to distinguish from urban features either by visual interpretation or digital methods (because of the reflectivity of the soil seen between the trees), but its location permits a fairly accurate delineation. The forest determination should be accurate;

[2] EREP Quarterly Progress Report, 31 July 1974

ORANGE COUNTY

GENERALIZED LAND-USE

Prepared from EREP, SL-2, SL-4 SI90A
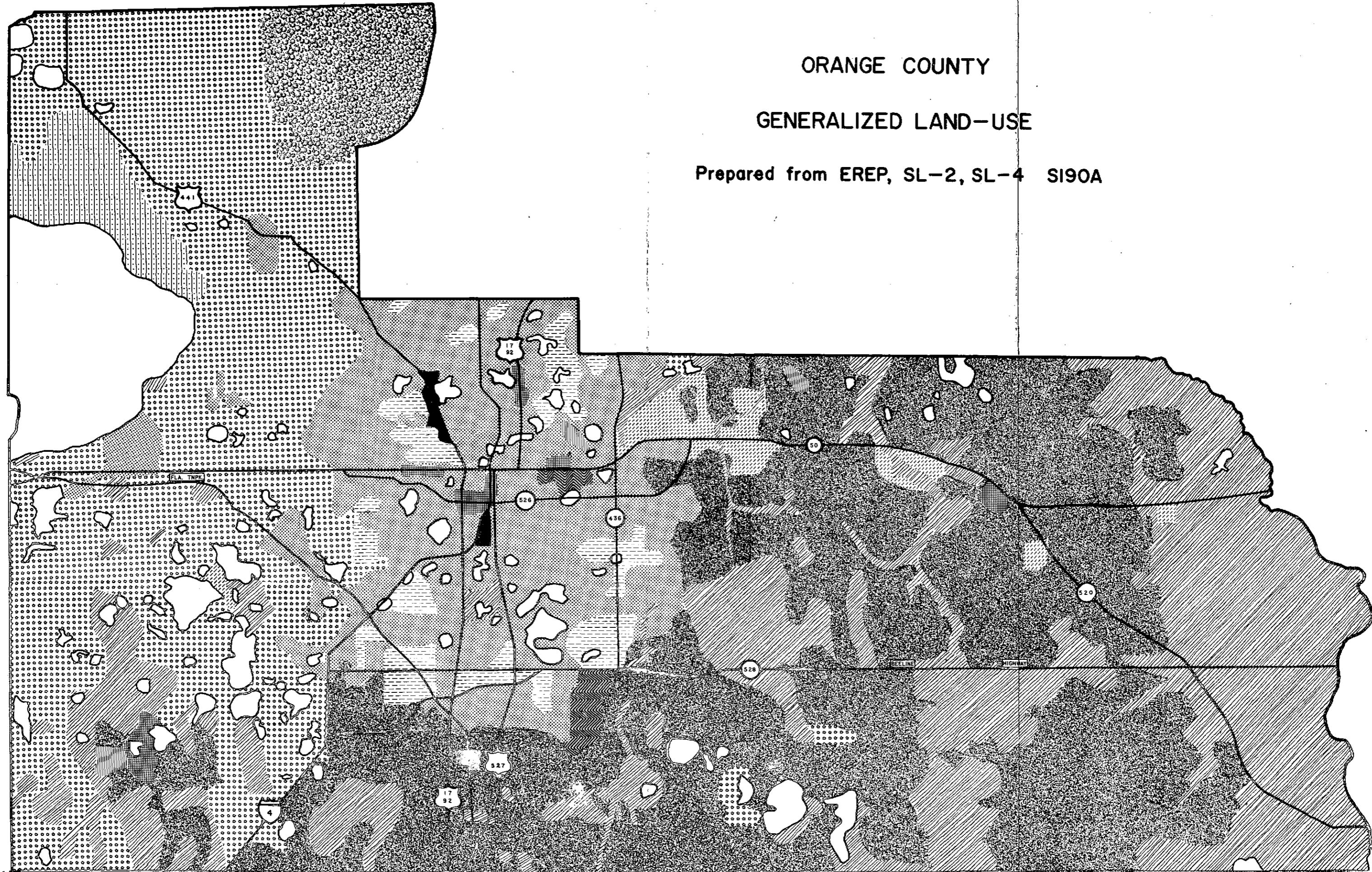
LAND-USE CATEGORIES:

Level 1

01. Urban and built-up land

02. Agricultural land ----
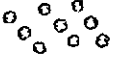
03. Rangeland

04. Forest Land. --------

05. Water

06. Nonforested Wetland

07. Barren Land

## Mixed Categories

Open and Citrus Groves

Groves and Lakes

Lakes, Groves & Vegetated Wetlands

Level 2

01. Residential -----------------
    a. Rural residential --------
    b. Mobile-home parks --------
02. Commercial and services------
03. Industrial -----------------
04. Extraction.
    a. Phosphate mines ----------
    b. Reclaimed phosphate mines
05. Transportation---------------
07. Strip
09. Open -----------------------
10. Institutional & recreational__

01. Cropland and pasture
    a. Muck farms (vegetables)---
02. Groves
    a. Primarily citrus ---------

01. Grass -----------------------

01. Deciduous
02. Evergreen (pine)
03. Mixed

01. Streams and waterways
02. Lakes ----------------------
03. Other (Gulf of Mexico)

01. Vegetated ------------------
02. Bare

03. Sand other than beaches -----

TABLE 1

ORANGE COUNTY LAND USE

		EREP MAP		COUNTY PLANNERS		
		AREA (ACRES)	PERCENT OF TOTAL	AREA (ACRES)	PERCENT OF TOTAL	PERCENT DIFFERENCE
1.	Water	45,090	7	58,990	10	-24
2.	Citrus	120,680	20			
3.	Forest	16,970	3			
4.	Vegetable Farming	12,080	2			
5.	Urban	77,240	13			
6.	Vegetated Wetlands	122,640	20			
7.	Industrial	1,450	>1	2,590		-44
8.	Open Urban	15,520	3			
9.	Commercial	3,580	1	6,280	1	-43
10.	Recreational	580	>1			
11.	Institutional	680	>1			
12.	Rural Residential	7,290	1			
13.	Transportation	1,730	>1			
14.	Other Agricultural	181,940	30			
a.	Residential			44,550	7	
b.	Commercial			6,280	1	
c.	Industrial			2,590	>1	
d.	Recreation			4,870	1	
e.	Cultural/Institutional			9,790	2	
f.	Undeveloped			397,450	65	
g.	Flood Plain			85,350		
h.	Water			58,990	10	
Urban:(5+7+9+11+12+13), (a+b+c+e)		91,970	15	63,210	10	+45
Undeveloped: (2+3+4+8+14), f		347,190	57	397,450	65	-13
Total		609,870		609,870		

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in this county, the major forest area is delineated clearly. The vegetable farming area is a "muck farming" region bordering Lake Apopka on the north and is well defined. The vegetated wetlands figure from the EREP map is larger than the flood plain figure used by the county planners because of differences in interpretations of the two terms. Also, although the wetlands area is seen clearly on EREP photography, the boundary between it and agricultural use is rather arbitrary. The open urban category refers to apparently undeveloped sectors within the boundaries of urban Orlando. The EREP industrial and commercial figures apply to only sectors sufficiently large to be identified; smaller industrial and commercial sectors are included in the general urban category (which represents the urban area exclusive of other urban figures listed in this table). Hence, the EREP industrial and commercial figures are low. Similarly, most recreational features are not separately identified on the EREP map; the recreational area quoted here represents a couple of golf courses at Disney World; The same general statement can be made regarding institutional features; the institutional figure quoted here represents Florida Technological University. In both of the above cases, the feature observed is outside the urban area and, hence, can be identified. Similarly, the transportation figure represents the two major airports. Other agricultural includes all undeveloped land not otherwise designated. As mentioned above, the border between wetlands and agricultural use is somewhat arbitrary.