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PROGRESS REPORT

Evaluation of Satellite Imagery as an Information Service for Investigating  
Land Use and Natural Resources (Skylab). NASA Contract NAS 9-13364

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This report covers the period of  
November 1-31, 1973

E74-10402)	EVALUATION OF SATELLITE	74-19010
	IMAGERY AS AN INFORMATION SERVICE FOR	
	INVESTIGATING LAND USE AND NATURAL	
	RESOURCES (SKYLAB) Progress Report,	Unclas
(Cornell Univ.)	11 p HC \$4.00 CSCL 05B	63/13 00402

GENERAL COMMENTS

The Resource Information Laboratory in late October and early November, 1973, forwarded some 160 questionnaires to Regional Planning Boards, County Planning Boards, County Cooperative Extension Agents, and private planning consultants throughout the State of New York. The overall return was approximately 31.9% (51 responses).<sup>1</sup>

The Regional Planning Boards, County Planning Boards, and private planning consultants gave an approximate 61% return (29 out of 48). However, only 28 were calculated as one return was left blank and stated that they were not qualified to answer the questionnaire. Generally, the response from the group was quite high for most questions.

The response from the County Agents was rather poor. There were a total of 112 questionnaires circulated to County Cooperative Extension agents throughout the state and only 22 were answered (19.6%). Part of the poor returns can be attributed to the type of questions asked e. g., regional planning matters. Several responses stated that they were not qualified to answer the type of questions asked, and one specifically said that this type of information was not relevant to county agricultural agents' role in planning. (This reply was not calculated in the tables.) Nevertheless, the present situation indicates that there is a tremendous need to illustrate and educate county agents on the potential of satellite data, if it is to serve a useful purpose at the county level.

This report is a brief review of the returns. The paper will take the following format: list of the question, main responses to the question, and the significance of the replies.

Question I:

Do you conduct regional studies? If so, what is a typical area covered (approximately to the nearest square mile)?

<sup>1</sup>Two more responses have been received from County Planning Boards since the initial calculations were made. However, they have not been included in this paper. These returns would raise overall returns to 33% (53 out of 160) and Regional Planning Boards, etc., to 64.5% (31 out of 48).

Response:

Table 1

Average = 4,210 square miles

Number of answers = 31

No responses = 18

There was a tremendous extreme in the areas of study. The smallest area of coverage was 10 to 15 square miles to the largest area of 14,067 square miles.

Question 2

What is the size of the smallest data unit that you would use (i. e., for vegetation, it may be 10 acres; or for waterbodies, 1 acre, etc.)?

Response:

This question was asked in order to obtain an approximate idea of the data unit size presently required by land planners.

Table 2: Size in Acres	Percentage		Number of Users
	#1	#2	
0 to 2.0	48.9	58.5	24
2.1 to 5.0	12.3	14.7	6
5.1 to 10.0	12.3	14.7	6
10.1 to 25.0	--	--	
25.1 to 65.0	8.1	9.7	4
65.1	2.0	2.4	1
	* 100.0%		41

NOTE: #1 - % of total received

#2 - % out of those actually answering the question

\* - these questions allowed the user to respond to more than one category

\*\* - not all the answers are given in this report

Number of answers - 41

No responses - 8

The present ERTS information at 1:62,500 has an approximate resolution of 45 acres. However, the Skylab imagery is believed to have a greater resolution and the user needs are more likely to be met. There were only a few responses (5) that indicated an interest in using less definitive imagery (e. g., 25 acres

+ data size) as a guide to indicate seasonal and general land use trends. Moreover, the thinking of almost all planners and county agents was that land assessment and planning should be conducted with information as specific as 1 to 10 acres.

### Question 3

In what form do you want the initial data ( e. g., computer tapes, acetate overlays, on topography maps similar to USGS, etc.)?

#### Response:

This question was asked for several reasons including what format is most acceptable to present planning techniques, would output from the satellite be compatible with these techniques, and are there any categories not presently used that could be supplied by satellite data. The major correlation was the use of acetate overlays with USGS-type maps.

Table 3

Form of data	Percentage		Number of Users
	#1	#2	
Topographic maps with acetate overlays	55.1	57.4	27
Acetate overlays without USGS	22.4	23.4	11
Computer tapes	18.4	19.1	9
Topographic maps	14.3	14.9	7
Number of answers = 47	**	**	*

No response = 2

### Question 4

What is your area of concentration (e. g., regional recreation planning, water quality analysis, etc.)?

#### Response:

The question was asked to see what cross section of experts were answering the form. It also was asked to clarify whether the given areas of concentration could be obtained from remote sensing techniques. Factors such as social, economic, and political concerns are obviously important in planning. However, for the most part are difficult, if not impossible to obtain from satellite imagery. There was a strong correlation for a general category that was called County and Regional land use planning (44 out of 48). This category included environmental inventory, planning, and land uses in general.

Table 4

	Percentage		Number of Users
	#1	#2	
Area of concentration			
County and regional land use planning	89.8	91.7	44
Water quality and utility planning	16.3	16.7	8
Education	6.1	6.3	3
Transportation <sup>2</sup>	6.1	6.3	3
Number of answers = 48	**	**	**

## Question 5

Do you use consultants and/or regional maps of other disciplines in your analysis? If so, what disciplines?

## Response:

The intent of this question was to ascertain what types of consultants and maps are used by the people interviewed. Some 38 out of 48 responses (79.2%) said that they used consultants in their operations. There was a considerable variety of data maps (23 different types). The main categories mentioned included soils 16 out of 48 (33.3%), geology 10 out of 48 (20.8%), and transportation maps 9 out of 48 (18.8%).

Table 5

	Percentage		Number of Users
	#1	#2	
Consultants and/or type of regional maps			
Do you use regional consultants (yes)	77.5	79.2	38
Do you use regional consultants (no)	20.4	20.8	10
Soils maps	* 32.7	100.0 33.3	48 16
Geology maps	20.4	20.8	10
Transportation maps	18.4	18.8	9
	**	**	**

<sup>2</sup> It is assumed many, if not all, the Regional Land Use planning responses dealt with transportation needs. However, the answers that specified transportation mentioned it as a special consideration apart from county and regional land use planning.

## Question 6

Do you use any of the following natural resource data? If not, please state the data that you use.

topography slope  
 topography orientation  
 vegetation type  
 vegetation edges (ecotone)  
 water (if so, state type, e. g., ponds)  
 wildlife type  
 wildlife quality  
 wildlife habitat  
 unique resources  
 geology (surface)  
 geology (sub-surface)  
 soils  
 other

## Response:

The main purpose of this question was to obtain an idea of what natural resource data is presently being used in the planning fields. With this information it would be possible to guide future data retrieval. Generally, the answers for this question had a strong correlation. Table 6 indicates that the following categories were used extensively: soils 46 out of 47 (97.8%), topographic slopes 45 out of 47 (95.7%), water, ponds, lakes, and streams 39 out of 47 (83.0%), vegetation type 35 out of 47 (74.5%), geology (surface) 34 out of 47 (72.3%), unique resources 33 out of 47 (70.2%), and topographic orientation 32 out of 47 (68.0%).

Table 6

Natural Resource Data	Percentage		Number of Users
	#1	#2	
Soils	94.0	97.8	46
Topographic slopes	91.8	95.7	45
Water, ponds, lakes, and streams	79.6	83.0	39
Vegetation type	71.4	74.5	35
Geology (surface)	69.4	72.3	34
Unique resources	67.3	70.2	33
Topographic orientation	65.3	68.0	32
Geology (subsurface)	59.2	61.7	29
Wildlife habitat	51.0	52.2	25
Number of answers = 47	**	**	**

No response = 2

## Question 7

What existing cultural conditions are most important to your needs.

Present ownership

Distance from present development

Present use

Possible future use

Existing legislation and financing

Project demand

Cost of land

Present property taxation

Other

## Response:

This question was designed to determine what cultural data is either presently being used or is required by land planners. Several categories in the list would be impossible to obtain from either conventional remote sensing methods (aerial photographs, etc.) or satellite imagery, and they include present land ownership, project demand, and existing legislation and financing. However, other categories may be obtainable from satellite imagery, and they include present use and distance from present development. There were no questions in the questionnaire that asked for weighting. The answers to this question, however, had some weighted replies. Eight of the nine gave first preference to present use (the last choices did not correlate).

Table 7

Existing cultural conditions	Percentage		Number of Users
	#1	#2	
Present use	91.8	93.8	45
Possible future use	79.6	81.3	39
Present ownership	63.3	64.6	31
Cost of land	57.1	58.3	28
Distance from present development	53.1	54.2	26
Existing legislation and financing	51.0	52.1	25

Project demand	49.0	50.0	24
Present property tax	46.9	47.9	23
Sewage and water	10.2	10.4	5
Number of answers = 48	**	**	**

No response = 1

#### Question 8

Generally, there are several elements considered important as guides for the spatial allocation of activities. The factors include type of activity, surrounding uses, distance from other activities and settlements, availability and diversity. Are there other factors that you consider important?

Response:

This question was designed to see what guides planners used for locating activities on the land. There was no attempt to delineate every factor affecting location. For example, people's values and choices were not mentioned but they would play a major role in any planning. Due to the general nature of this question there was a tremendous variation in the answers. It was impossible to draw trends from the responses. There were three categories that received more than four responses.

Table 8

Categories	Percentage		Number of Users
	#1	#2	
Demand, need, feasibility	35.7	47.6	10
Transportation/accessibility	18.4	32.1	9
Natural factors/environmental constraints	18.4	32.1	9
Population density/migration	8.2	14.3	4
Number of answers = 28	**	**	**

No response = 21

#### Question 9

What natural resource data not presently obtainable would you like to see more available?

Response:

The intent of this question was to obtain ideas for possible new data types. There were twenty-six responses that varied from the need to know forest stands to historic settlements.

Table 9

Category	Percentage		Number of Users
	#1	#2	
Floodplains (5, 10, 20, and 50 year levels)	10.2	19.2	5
Seasonal coverage	10.2	19.2	5
Forest (nature stands, heights, type, boundaries, etc.)	8.2	15.4	4
Ground water data (movement quantity, quality, etc.)	8.2	15.4	4
Historic settlement	6.1	11.5	3
Wildlife habitat	6.1	11.5	3
Publication on what information is presently available	6.1	11.5	3
Number of answers = 26	**	**	**

No response = 23

#### Question 10

Any others comments?

Response:

The last question responses varied from enthusiastic, "practical application of this new wealth of information is unlimited", to skepticism: "I am a bit skeptical of your product, frankly. Nonetheless, I hope you are successful in influencing the pattern of development for the better." There were only two comments that showed obvious skepticism and sixteen that gave positive responses.

Table 10

Response	Percentage		Number of Users
	#1	#2	
Keep us informed	16.3	42.1	8
Education on the matter needed	6.1	15.8	3
Data must be more detailed	6.1	15.8	3
Need to coordinate information with other agencies	4.0	10.5	2

When is it available	4.0	10.5	2
Skeptical/like to see documentation on the value of satellite data	4.0	10.5	2
Number of answers = 19	**	**	**
No response = 30			

#### SIGNIFICANCE OF THE SURVEY

The survey, although being limited in sample size (restricted strictly to New York State), gave some guides for future research with satellite data and the need for better communications with the users. Many responders asked to be kept informed and only a few voiced skepticism about the planning potential of Skylab data. However, thirty-six (36 out of 41 for 77.9%) answers stated that they used data units of 10 acres or less. Moreover, at this time the resolution of present ERTS information at 1:62,500 is approximately 45 acres. This problem is one that can be resolved through education on the Skylab's potential. For example, the phenological qualities did not appear to be fully understood (5 responses). It is the feeling of the Resource Information Laboratory that generalized data taken at regular intervals<sup>3</sup> can be used to augment present more detailed information.

The survey indicated that the present information being used by land planners can, to some extent, be supplied by satellite imagery. The natural factors that were most widely used included soils, topographic slope, water ponds, lakes, and streams, vegetation type, geology (surface), unique resources, and topographic orientation (approximately in that order of importance).

The most outstanding natural data required by planners but not presently available included floodplains (5, 10, 20, and 50 year levels), forest (mature stands, heights, type boundaries, etc.), and ground water information.

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<sup>3</sup>ERTS Evaluation for Land Use Inventory, Type II Report, December 13, 1972, to June 13, 1972, Contract # NAS 5-21886, Department of Natural Resources, Cornell University, Appendix B, page 8 figures show 52.1% required update of one year or less; this is more frequent than what is presently available.

A second questionnaire was sent out to about 100 people in state and federal wildlife management programs at the districts or regional level. Its aim is to determine the data used, and additional requirements desired, for wildlife habitat evaluation. About 20% of the questionnaires have been returned to date. Most indicate a need for very detailed natural information such as forest species, agricultural crop type, and prey species. A more detailed analysis of responses from this questionnaire is being postponed until more responses are received.

No other activities have been started on this project since the data has not yet been received from Skylab.

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