PLAN FOR THE UNIFORM MAPPING OF EARTH RESOURCES AND ENVIRONMENTAL COMPLEXES FROM SKYLAB IMAGERY

EREP INVESTIGATION #510

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Principal Investigator
Charles E. Poulton
Earth Satellite Corporation

Technical Monitor: Mr. Ryborn Kirby
Lyndon B. Johnson Space Center

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OVERALL STATUS

Natural Vegetation Analog Study

Testing of Skylab II S190A imagery by human interpreters was conducted on the Colorado Plateau test site. The 426 sample sites of sixteen analog types were located on a 1:500,000 color infrared print of the Colorado Plateau (color infrared S190A imagery). The following intraregional analog types were used in the study. All of the types except numbers 7 (Cultural Shrub Steppe), 9 (Oak Woodland), and 12 (Spruce-fir/Aspen Forest) also represent interregional analogs that have been documented by ground truth, large-scale EarthSat-obtained imagery, and B-57 support imagery in the Sierra-Lahontan test site as well as the Colorado Plateau test site.

	Vegetation Analog	Legend Symbol	Number of Sample Plots
(1)	Greasewood (Sarcobatus) Communities	324.6	24
(2)	Saltbush (Atriplex) Communities	324.7	33
(3)	Semidesert Annual (Atriplex, Bromus) Communities	312.3	27
(4)	Shrub Steppe (Artemisia) Communities	325.5	32
(5)	Pinyon-juniper (Pinus edulis-Juniperus) Communities with 10-40% cover	341.3	24
(6)	Pinyon-juniper Communities with 40-70% cover	341.3	30
(7)	Cultural Shrub Steppe (Artemisia) Vegetation	425.5	32

	Vegetation Analog	Legend Symbol	Number of Sample Plots
(8)	Riparian Cottonwood-Willow (*Populus-Salix*) Communities	342.6	30
(9)	Oak Woodland (*Quercus*) Communities	342.7	27
(10)	Pine Forest (*Pinus ponderosa*) Communities	341.6	46
(11)	Aspen (*Populus tremuloides*) Forest Communities	342.8	32
(12)	Aspen/Spruce-fir Forest (*Populus tremuloides/Picea-Abies*) Communities	343.7	19
(13)	Sedge (*Carex*) Meadow Communities	315.4	25
(14)	Clouds	910	15
(15)	Lakes and Reservoirs	210	15
(16)	Snow	280	15

A dichotomous narrative key was prepared for use by the interpreters to train them in identification of each analog type. Photographic key examples included sample analog sites on an adjacent Skylab S190A frame, large-scale color imagery and ground photographs (color and color infrared).

Preliminary analysis of the data shows the ability of human interpreters to identify and differentiate intraregional vegetational-environmental analogs in early summer. Since a dichotomous key was used by the interpreters to make decisions in a binary fashion, their success in correctly interpreting analogs can be related to various levels of generalization in terms of the legend system.

Table I is a tabulation of these results.

Table I

INTRAREGIONAL ANALOG INTERPRETATION TEST RESULTS.

SKYLAB S190A COLOR INFRARED IMAGERY
(6 June 1973, Scale 1:500,000)

Legend Class	Percent Correctly Identified	Total Number of Plots Seen by Interpreter
A. 200: Water	100	30
B. 210: Ponds, lakes, reservoirs	100	15
BB. 280: Snow and ice	100	15
AA. 300 & 400: Natural and Cultural Vegetation	100	381
C. 310: Herbaceous types	77.6	58
D. 312.3	66.7	36
DD. 315.4	95.5	22
CC. 320, 420, & 340: Non-Herbaceous Types	97.8	323
E. 320, 420: Shrub-scrub Types	79.7	133
F. 324: Halophytic Types	66.7	72
G. 324.6	50.0	26
GG. 324.7	56.5	46
FF. 325, 425: Shrub Steppe Types	77.1	61
H. 325.5	50.0	34
HH. 425.5	92.6	27
EE. 340: Forest and Woodland Types	94.7	190
I. 341: Coniferous Forests	76.0	100
J. 341.6	77.4	53
JJ. 341.3	63.8	47
K. 341.3 with 10-40% cover	28.0	25
KK. 341.3 with 40-70% cover	63.6	22
II. 342,343: Broadleaf and Mixed Broadleaf/Coniferous Forests	93.3	90
L. 342.6	92.6	27

Table I (cont'd.)

	Percent Correctly Identified	Total Number of Plots Seen by Interpreter
LL. Non-riparian Forests	88.7	53
M. Aspen Dominant Forests	78.6	42
N. 342.8	68.2	22
NN. 343.7	41.7	20
MM. 342.7	66.7	21
AAA. 900: Obscured Land	100	15

At primary legend levels (X00.0) all analog types were recognized without error. At the secondary level (XX0.0) interpretation success was variable (77.6-97.8%) depending upon analog types. At tertiary (XXX.0) and quaternary (XXX.X) levels interpretation success varied from 28.0% (341.3, pinyon-juniper woodlands with cover of 10-40%) to 99.5% (315.4, Carex meadows).

The following analog types are very successfully interpreted (> 90% success) even at detailed (quaternary) legend levels on the S190A color infrared imagery: Carex meadows, 315.4--95.5%; reseeded cultural shrub steppe vegetation, 425.5--92.6%; and riparian cottonwood and willow forests, 342.6--92.6%. Many of the analogs are interpreted with moderate success (60-90%) at this same detailed level. These types include: ponderosa pine forests, 341.6--77.4%; oak brushlands, 342.7--66.7%; pinyon-juniper forests with 40-70% cover, 341.3--63.6%; shrub-steppe types, 325 and 425--77.1%; halophytic shrub types, 324--66.7%; and semidesert annual vegetation, 312.3--66.7%.

A number of analog types are poorly (< 60% success) interpreted on the imagery of early June. These include greasewood (Sarcobatus) types, 324.6--50.0%; saltbush (Atriplex) types, 324.7--56.5%; big sagebrush (Artemisia tridentata) types, 325.5--50.0%; and pinyon-juniper woodlands with 10-40% cover--28.0%. In each case these are vegetation-environmental analogs occurring in

semidesert environments where cover values rarely exceed 40% over very large areas. Exceptions exist where drainage, favorable weather conditions and/or permanently flowing water allows dense vegetation growth. This is the case for analog types 312.3 (66.7% correct) and 342.8 (92.6% correct). Since individual plants or clones are not resolved on either the S190A or S190B systems, interpreters must utilize color, topographic position, and other associated evidence to identify these analog types where plant cover is low. These types of information were not provided to the interpreters for this investigation. It is anticipated that when keys incorporating this information for analyses of Skylab III products are used significantly higher rates of success will be realized.

A section of the Colorado Plateau test site was mapped using S190A color infrared imagery enlarged to a scale of 1:250,000. Individual clones of aspen approximately 100 acres in size are easily distinguishable where they contrast with surrounding features. The following vegetation types and complexes were mapped on the San Juan National Forest in southwestern Colorado: (a) pinyon-juniper forests, (b) cultural shrublands, (c) pinyon-juniper/oakbrush complex, (d) oakbrush shrublands, (e) riparian cottonwood-willow forest, (f) ponderosa pine forest-oakbrush complex, (6) ponderosa pine forest-aspen-grass meadow complex, (i) aspen forest-grass meadow complex, (j) forb meadows, (k) aspen-spruce/fir forest complex, and (1) spruce/fir forest. The accuracy of this mapping will be determined using RB-57 support imagery and EarthSat-flown large-scale support imagery.

Rice Analog Studies

Skylab III (SL3) screening film has been received. Coverage of the Louisiana Coastal Plain is still lacking, as the SL3 ground track (EREP pass 52) was too far to the east. The area of coverage includes insignificant acreages of rice and as a result emphasis will continue to be placed on the California rice growing area. The screening film indicates good coverage of three of four possible study sites in the California region on 28 May 1973 and 3 July 1973.

Due to the shift of emphasis much of the effort in the past reporting period has been to increase the amount of farmer cooperators ground data in the California area. Additional farmers have been contacted through county agents and personnel at the University of California at Davis. To date response to our requests for the ground data has been slow but hopefully further correspondence is all that is necessary.

Techniques are being developed to utilize a new piece of equipment for determining acreage of rice and changes in acreage from date to date. The ability of this machine (Interpretation System Incorporated VP8 image analyzer) to density slice and integrate areas has led to methods designed to reduce rice signatures to isodensity form. Once in this form the acreages can be quickly determined using the machine. Validity testing is now being performed on the methods used in reducing the rice signatures to isodensity categories. Upon receipt of SL3 color products, multidate analyses can be completed. To date rice identification, acreage determination, and single date condition are all that is presently being performed.

TRAVEL PLANS

No travel is planned to either natural vegetation study area or the agricultural test site.

PERSONNEL

No changes in personnel have occurred since the last reporting period.

PROBLEMS

No significant problems are evident since the last reporting period.

PLANS FOR NEXT REPORTING PERIOD

An analysis of accuracy will be conducted on vegetation mapping already completed on the Colorado Plateau.

Photo interpretation testing will be conducted on Skylab III imagery on an interregional basis once this imagery is available to us.

Multispectral analyses of both the black-and-white photographic products and S192 data will be performed to document the signature characteristics of several vegetation-environmental complexes both intra- and interregionally. An electronic image analyzer will be used to conduct these analyses.

Contingent on farmer response to our requests for ground data, identification of rice fields and mapping will be the primary objective of the next reporting period. Emphasis is being placed on the ground

data due to the necessity of establishing proper training examples for the rice interpretation procedures. Rice identification and mapping will combine human photo interpretation and machine-aided interpretation techniques.