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

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OVERALL STATUS

Natural Vegetation Analog Study

Large scale color and color infrared imagery was obtained in September on both test sites (Colorado Plateau and Sierra-Lahontan). This imagery monitors a critical phenological stage of development for deciduous plants as well as coniferous forest types.

A ground truth study was completed in early September on the Sierra-Lahontan test site. Over 100 additional analog sites were documented. Detailed vegetation maps were obtained from cooperating personnel in Reno, Nevada (Forest Supervisor, Toiyabe National Forest) and Carson City, Nevada (U.S.D.A., Nevada River Basin Survey).

Skylab II S190A imagery of the Colorado Plateau test site is being processed to produce color and color infrared prints at a scale of ca. 1:500,000. The color prints will be analyzed and compared directly with color prints from the S190B system that are already available. From quick-look evaluations of the various film types exposed with the S190A system, it appears that the color infrared film will give the most definitive results in identifying vegetational-environmental complexes.

The color of several vegetation types as imaged on Skylab II S190B color prints (scale ca. 1:500,000) has been documented. Table I shows the color characteristics of several vegetation types using the Inter-Society

Color Council and National Bureau of Standards (ISCC-NBS) centroid color system. This psychological color measuring system has been selected due to the wide availability of calibrated color chips, ease of hue, saturation and intensity determination and, therefore, its practical applicability for use by land managers not equipped to handle more sophisticated techniques.

TABLE I  
Color Values of Colorado Plateau Vegetation Types from  
Skylab II S190B Imagery taken June 5, 1973

<u>Vegetation Type</u>	<u>Legend Symbol</u>	<u>Color Value</u>
(1) Salt Desert Vegetation-- Saltbush communities ( <u>Atriplex confertifolia</u> )	324.7	9. pink White
(2) Shrub Steppe Vegetation-- Big Sagebrush communities ( <u>Artemisia tridentata</u> )	325.5	8. gray Pink 10. pink Gray 32. gray yellow Pink
(3) Pinyon-juniper Woodlands, Cover 10-40% ( <u>Pinus edulis--</u> <u>Juniperus osteosperma</u> )	341.3	42. light red Brown 45. light grey red Brown 57. light Brown 60. light gray Brown
(4) Pinyon-juniper Woodlands, Cover 40-70% ( <u>Pinus edulis--</u> <u>Juniperus osteosperma</u> )	341.3	228. gray Purple 234. deep purple Gray
(5) Ponderosa pine forests ( <u>Pinus ponderosa</u> )	341.6	215. gray Violet
(6) Oakbrush/Mountainbrush Vegetation ( <u>Quercus gambellii/</u> <u>Symphoricarpos, Amelanchier</u> )	327.4	228. gray Purple 234. deep purple Gray
(7) Aspen forests ( <u>Populus tremuloides</u> )	342.8	228. gray Purple 234. deep purple Gray

Alpine vegetation, sub-alpine meadow, spruce-fir forests, some low elevation aspen forests, and Douglas-fir/white fir forests are mostly covered with snow at this season of the year. Montane and alpine riparian vegetation (Salix/Alnus types) is also under snow cover.

Salt desert vegetation, shrub steppe vegetation, sparse pinyon-juniper woodlands, and ponderosa pine forests are well differentiated at this floristic level. Dense pinyon-juniper vegetation, oakbrush and mountain-brush communities and aspen stands are difficult to differentiate even at this broad floristic level on color characteristics alone. Dense pinyon-juniper merges at its upper elevational limits with oakbrush/mountainbrush communities since these same species become a part of the understory beneath pinyon-juniper. Oakbrush and aspen forests are not distinct at this season but will perhaps exhibit distinct images in later seasonal development.

Photographic renditions of S192 data for bands 2, 7, and 11 were enlarged to approximate the scale of the original S190B transparencies. This data along with the S190B color prints were used to select a 5-second data segment that would enable maximum evaluation of several vegetational-environmental analogs. This will give us the opportunity to study the specific multispectral signatures of detailed vegetational analogs and to compare similar types intraregionally.

#### Louisiana Coastal Plain Test Site

Due to the availability of additional RB57 underflight coverage, a late season large scale and field data acquisition mission was completed. The mission occurred at an opportune time for observing yield limiting factors, especially severe lodging. At the time of the data acquisition approximately 50-60% of the first rice crop had been harvested. However, of the remaining crop, approximately 70-80% had been severely lodged due to the heavy rains and winds encountered in early September. The lodging occurred in fields whose conditions ranged from green headed to fully mature. These differing times of occurrence will have a highly variable effect on yield. If lodging occurs while water is still on the field (as in the

green headed stage) the rice plant will cease seed production and begin to tiller in order to rise above the water. Furthermore, the rice beans that have developed will be subject to molds and fungi and will not develop fully. As maturity advances and water is drained from the fields, yield reduction due to lodging decreases. In a mature field where lodging has occurred the combines can pick up the rice but yield is reduced by a maximum of 8-10%. These conditions of severe lodging have been well documented on large scale aerial photography and ground photos and we are awaiting cooperators data sheets to begin correlation and quantification of the resultant yield limiting factors and the respective yields.

As yet no Skylab and small scale aircraft support photography of the Louisiana Coastal Plain Test Site has been received at the EarthSat office. However, work is proceeding as planned using the EarthSat gathered large scale photography and ground data. Multiple-date photography is being compiled in order to follow development of the crop and its respective yield limiting factors throughout the season. Data from cooperating farmers is beginning to be received and is being correlated with the respective photographs. This procedure will define and locate examples of the various yield limiting factors and will allow preliminary analysis of their general influence on yield. These preliminary examples will be used in instructing interpreters who will then interpret imagery of the entire test site.

#### California Northern Great Valley Test Site

Two additional image acquisition missions have been completed since the last reporting dates. The completed mission schedule can be seen in Appendix I. The first crop season is almost over in California and cooperators information is beginning to be sent to the EarthSat offices.

Field sequencing and factor identification are proceeding on the large scale aerial photography as is being done for the Louisiana Test Site.

Skylab II S190A imagery of the Northern Great Valley Test Site has arrived at the EarthSat offices. Photography from two aircraft support missions has also been received. Both the Skylab and underflight imagery is of excellent quality. The Skylab coverage includes 3 of a possible 4 sub-sampling units, the underflight photography covers all 4. The Skylab coverage is being used to determine our primary sampling unit. This unit will include a major portion of the Northern Great Valley agricultural area. This primary sampling unit will be the basis for two preliminary analyses: (1) determination and tabulation of agricultural versus non-agricultural lands, and (2) identification and measurement of rice crop acreages. Inherent in the second analysis is the identification and evaluation of the effect on rice acreage determination by the various rice analogs. Within the boundaries for the primary sampling unit are located sub-sample units. These units have been subjected to larger scale aerial photograph acquisition and ground data collection throughout the season. These sub-sample units have been established to provide the more detailed information needed for yield prediction and problem identification.

#### TRAVEL PLANS

No travel is planned to either natural vegetation study area.

#### PERSONNEL

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

## PROBLEMS

The only problems encountered have been an absence of Skylab imagery and small scale aircraft support imagery of the Louisiana Coastal Plain Test Site.

## PLANS FOR NEXT REPORTING PERIOD

Intraregional analysis of natural vegetational-environmental complexes will continue on the S190A and S190B products of the Colorado Plateau Test Site. Detailed vegetation communities will be identified on the imagery and analyzed as to color characteristics. This data will allow comparisons of seasonal effects on image characteristics once Skylab III imagery is received and analyzed. We look forward to receipt of the color reconstituted 5-second data strips and eventually working with digital S192 data.

The primary task for the next reporting period in the rice study areas will be to continue compilation of cooperators ground data with the acquired aerial and space photography. Measurements will be made to determine total agricultural land and rice cropland. Finally, the sub-sample units will be altered in size in order to facilitate statistical analysis and projection of the data over the primary sample unit.

APPENDIX I

Large Scale Imagery Obtained to Date for All Test Areas

<u>DATE OF COVERAGE</u>	<u>AREA OF COVERAGE</u>	<u>FILM TYPES AND SIZES OBTAINED</u>
3/31/73	Louisiana Coastal Plain	35mm, 70mm color and color IR
5/7/73	No. Great Valley	35mm and 70mm color and color IR
6/3/73	Louisiana Coastal Plain	35mm, 70mm, 9"x9" color and color IR
6/5/73	Colorado Plateau	35mm, 70mm, 9"x9" color and color IR
6/14/73	No. Great Valley	35mm, 70mm, 9"x9" color and color IR
6/15/73	Tahoe-Lahontan	35mm, 70mm, 9"x9" color and color IR
6/29/73	Louisiana Coastal Plain	35mm, 70mm, 9"x9" color and color IR
7/10/73	No. Great Valley	35mm, 70mm, 9"x9" color and color IR
7/11/73	Tahoe-Lahontan	35mm, 70mm, 9"x9" color and color IR
7/12/73	Colorado Plateau	35mm, 70mm, 9"x9" color and color IR
7/28/73	Louisiana Coastal Plain	35mm, 70mm, 9"x9" color and color IR
8/8/73	Tahoe-Lahontan	35mm, 70mm, 9"x9" color and color IR
8/9/73	Colorado Plateau	35mm, 70mm, 9"x9" color and color IR
8/10/73	Louisiana Coastal Plain	35mm, 70mm, 9"x9" color and color IR
8/28/73	No. Great Valley	35mm, 70mm, 9"x9" color and color IR
9/14/73	No. Great Valley	35mm, 70mm, 9"x9" color and color IR
9/15/73	Tahoe-Lahontan	35mm, 70mm, 9"x9" color and color IR
9/19/73	Louisiana Coastal Plain	35mm, 70mm, 9"x9" color and color IR
9/22/73	Colorado Plateau	35mm, 70mm, 9"x9" color and color IR