PN-AAC-412
ISN 60115

AGRICULTURAL DEVELOPMENT SUPPORT II
HAITI

University of Arkansas,
Fayetteville

FINAL REPORT

LAND COVER/USE MAPPING

REGION DU SUD
HAITI

Comprehensive Resource Inventory
and Evaluation System (CRIES) Project,
Department of Resource Development,
Michigan State University

In Cooperation With

USAID ADSII/MARNDR

March 1987

REPORT # 29

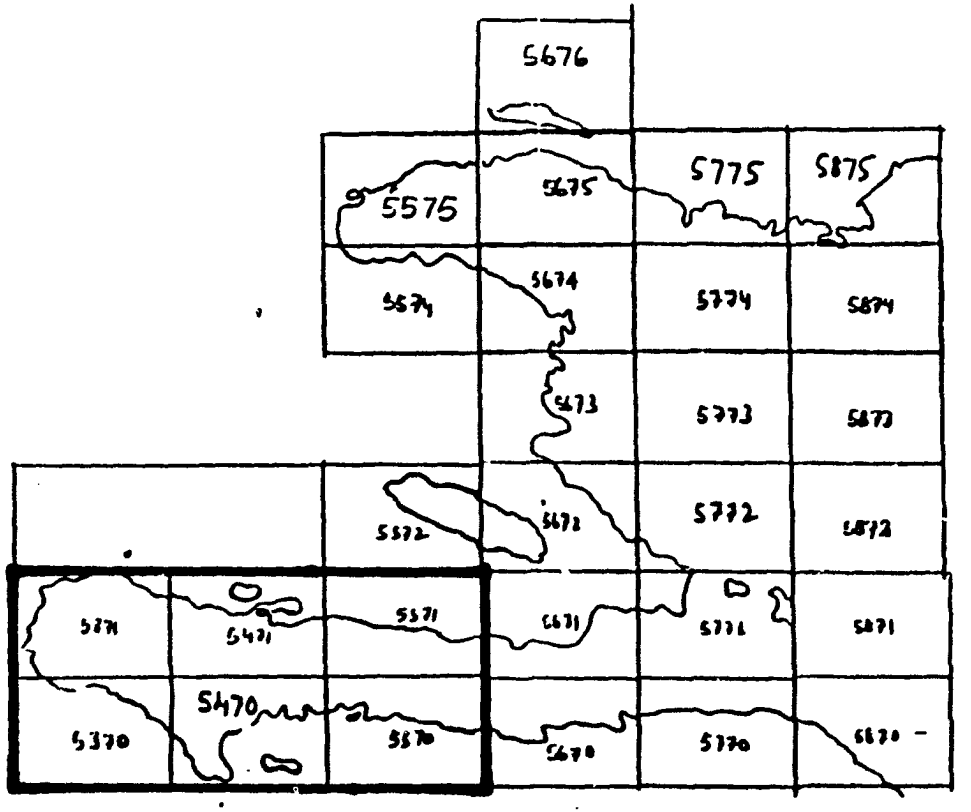

Fig. 1 Location of Topographic Map Sheets for Haiti

ABSTRACT

A land use/land cover interpretation was carried out for the Region du Sud of Haiti. Interpretations were derived from both Landsat Thematic Mapper (TM) and Multi spectral Scanner (MSS) imagery, as well as 1:40,000 scale aerial photographs for areas of cloud cover. Ground truthing of interpretations was carried out from both the ground and low flying light aircraft. The interpretation were referenced to six 1:100,000 topographic sheets (5370, 5371, 5470, 5471, 5570, 5571) situated in the study area. Land use/cover interpretation were then transferred to stable mylar base and digitized to the CRIES GIS.

ACKNOWLEDGMENT

The project was carried out under auspices of the USAID ADSII/MARNDR project. Staff of the ADS II and CRIES project collaborated on this effort, while other MARNDR personnel participated on occasions. The support of USAID and MARNDR is gratefully acknowledged.

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I. OVERVIEW OF ACCOMPLISHMENTS

The land use/cover interpretation for the Region du Sud of Haiti has been a coordinated effort between Michigan State University's CRIES Project and and Haiti's Ministere de l'Agriculture des Ressources Naturelles et du Developpement Rural (MARNDR). Events leading up to the completion of the assignment include:

1. Training for Haitian personnel at MSU in visual interpretation of Landsat imagery as well as diazo processing of analog satellite data.

2. Actual interpretation of satellite and aerial photography data by both MARNDR and CRIES personnel at MSU and in Haiti.

3. On-site ground truthing of interpreted data by means of low altitude aerial and ground surveys.

4. Compilation of satellite interpretation and ground-truthing data into a final stable mylar base.

5. Drafting of black line paper hard copy renditions as well as reproduction of a stable mylar base.

6. Transfer of analog hardcopy interpretations into a digital format through use of CRIES GIS.

II. LISTING OF FILE ATTRIBUTE VALUES

CODING ASSIGNMENT FOR ATTRIBUTES IN DIGITAL FILE ( )

LEGENDE

CARTE DES CULTURE et DE
LA VEGETATION NATURELLE

ZONE DE PLAINES ET VALLEES

111 Cultures Spécialisées

1111 Riz (1)
1112 Cane a Sucre (2)
1113 Banane (3)
1114 Cocotier (4)
1115 Vetiver (5)
1116 Café (6)

112 Cultures Vivrières Intensives

1121 Arboriculture Dominante (Agro-Forestier) (7)
1122 Culture des Plantes Dominante (8)

121 Monoculture Extensive

1211 Sisal (9)

122 Agriculture Mixte Extensive

1221 Cultures Vivières Mixes (10)
1222 Savanes Arbustives - Très Claires (11)
1223 Savanes Arbustives - Claires (12)
1224 Savanes Arbustives - Denses (13)

131 Fôret Décidues

1311 Denses (14)
1312 Clairs (15)
1313 Très Clairs (16)

132 Fôret de Coniferes

1321 Denses (17)
1322 Clairs (18)
1323 Très Clairs (19)

6

ZONES MONTAGNEUSES

211 Cultures Spécialisées

2111 Riz (20)
2112 Canne A Sucre (21)
2113 Banane (22)
2114 Cocotier (23)
2115 Vetiver (24)
2116 Café (25)

212 Cultures Vivrières Intensives

2121 Arboriculture Dominante (Agro-Forestier) (26)
2122 Culture des Plantes Dominante (27)

221 Monoculture Extensive

2211 Sisal (28)

222 Agriculture Vivrières Mixte Extensive

2221 Cultures Vivrières Mixes (29)
2222 Savanes Arbustives - Très Claires (30)
2223 Savanes Arbustives - Claires (31)
2224 Savanes Arbustives - Denses (32)

231 Fôret Décidues

2311 Denses (33)
2312 Clairs (34)
2313 Très Clairs (35)

232 Fôret de Coniferes

2321 Denses (36)
2322 Clairs (37)
2323 Très Clairs (38)

ZONES URBANISEES

311 Centre National ou Régional (39)
312 Centre Rural (40)

ZONES NON AGRICOLE

411 Marais

4111 Mangrove Cotière (41)
4112 Marais Interieur (42)

412 Mines à Ciel Ouvert

4121 Pierre à chaux (43)
4122 Autres (44)

413 Zones Stériles

4131 Roche et Sable (45)
4132 Zone d' Erosion (46)

III. FINALIZED CLASSIFICATION SCHEME

LAND COVER/USE CLASSIFICATION SCHEME FOR HAITI USING LANDSAT TM/MSS DATA - ADSII/CRIES.

The land cover/use categories, defined below, will be used to establish regional and area-specific base line data reflecting current land use information derived from Landsat. The satellite data comprise high (TM) and low (MSS) resolution data, available as of mid 1986. The base line data, reflecting current land use, should be used in conjunction with potential land use, reflecting land use alternatives and their estimated socio-economic benefits on an aggregate and location-specific basis. This last estimate can be derived by the CRIES-AIS-YIELD model coupled with enterprise analysis for representative farming systems identified.

The selected interpretation resolution (type size) is 9 hectares. This represents the smallest unit of cartographic delineation on the final map scale of 1 : 100.000 (or 3 x 3 mm.). To minimize mapping units, two major resource domains are identified: The Flat Land Resource Domain, in which most intensive agriculture production takes place, and the Mountain Resource Domain which is characterized by extensive, rain-fed agriculture of a primarily, subsistence nature. The Flat Land Resource Domain represents the alluvial coastal plains, the floodplains, their adjacent uplands, coastal and highland plateaux with slopes of less than 8 percent. The Mountain Resource Domain encompasses the foothills and mountains, with slopes of 8 percent or more.

The current land use patterns of the Mountain Domain represent the

severe impacts of erosion on soil profiles and their associated water holding capacity. In many cases soil profiles have become so shallow that rain-fed agriculture is not longer possible. This is characterized by the presence of many abandoned fields, the so-called "rack bois" and the visibility of parent material. These lands are primarily included under the shrub and grass savannah categories.

LAND COVER/USE CLASSIFICATION SCHEME FOR HAITI

CODE	TITLE	DESCRIPTION
1	FLAT LAND RESOURCE DOMAIN	LAND USE ASSOCIATED WITH LOW-LAND PLAINS AND ELEVATED PLATEAUX
11	Intensive, Predominant Cash Crop, Flat-Land Agriculture.	Areas with more than 50% of the land area incrops. Delineations represent areas equal or greater than 9 hectares.
111	Intensive, Flat land, Monocultures.	Large & medium scaleagri-culturewith dominatingmono-cultures of contiguous areas greater than or equal to 18 hectares.
1111	Rice	Rice dominant crop including most field conditions associated with its production.
1112	Sugarcane	Sugarcanedominantcrop including most field conditions associated with its production.
1113	Banana	Banana dominant crop including most field conditions associated with its production.
1114	Coconut	Coconut dominant crop including most field conditions associated with its production.
1115	Vetiver	Vetiver dominant crop including most field conditions associated with its production.
1116	Coffee	Coffee dominant crop including most field conditions associated with its production, including shade trees.
112	Intensive, Mixed Flat Land Agriculture.	Mixed small and medium-scale farming systems. Delineation represent areasequal or greater than 9 hectares.

1121 Dominated by Tree Crops	Mixed, small and medium-scale agriculture. Agro-forestry (cash and food crops under shade). Field cultivation with dominant shade trees (fruit trees, fuel wood species, etc.)
1122 Dominated by Non-Tree Crops	Mixed small and medium-scale agriculture with numerous cash and some food crops.
12 Extensive, Predominant Cash Crop, Flat Land Agriculture.	Areas with less than 50% of land area incrops. Delineation represent areas equal or greater than 9 hectares.
121 Extensive, Flat Land Monocultures	Large and medium scale cropping with an area equal to or greater than 9 hectares.Dispersed in nature.
1211 Sisal	Sisal is the dominating crop. All field conditions are associated with sisal production.
122 Extensive, Mixed Flat Land Agriculture	Small and medium-scale fields occupying less than 50% of the land area. Delineations equal to or greater than 9 hectares.
1221 Extensive, Mixed Cropland	Mixed crops with limited grazing. Crops include scattered fields of corn, sorghum, sisal, vetiver, beans, tubers, bananas, coconut, and some fruit trees.
1222 Open Grass Savannah	Unimproved Grassland with sparse (<40%) shrub cover. Grazing use of the more recently abandoned fields.
1223 Sparse Shrub Savannah	Grassland with sparse (40-70%) shrub cover. Limited grazing in abandoned fields.
1224 Shrub Savannah	Grassland with dense (>70%) shrub cover.Very limited grazing in abandoned fields.
13 Forest in the Plains and Plateaux	Forest cover with associated crown closure percentages

131 Deciduous Forest	Broad leaf forest lands with land areas equal to or greater than 9 hectares.
1311 Dense Deciduous	Broad leaf Forest cover >70%
1312 Open Deciduous	Broad leaf Forest cover 40-70%
1313 Sparse Deciduous	Broad leaf Forest cover <40%
132 Coniferous Forest	Evergreen soft wood forest with a land area equal to or greater than 9 hectares.
1321 Dense Coniferous	Coniferous Forest cover >70%
1322 Open Coniferous	Coniferous Forest cover 40-70%
1323 Sparse Coniferous	Coniferous Forest cover <40%
2 MOUNTAIN RESOURCE DOMAIN	**RESOURCE USES ASSOCIATED WITH FOOTHILLS AND MOUNTAINS**
21 Intensive Agriculture in the Mountains.	Agriculture associated with mountain environments. Areas with more than 50% of the land area in crops. Delineations represent areas equal or greater than 9 hectares.
211 Intensive, Mountain Monocultures	Large & medium scale agriculture with contiguous land areas equal to or greater than 16 hectares.
2111 Rice	Rice dominant crop including most field conditions associated with its production.
2112 Sugarcane	Sugarcanedominantcrop including most field conditions associated with its production.
2113 Banana	Banana dominant crop including most field conditions associated with its production.
2114 Coconut	Coconut dominant crop including most field conditions associated with its production.

2115 Vetiver	Vetiver dominant crop including most field conditions associated with its production.
2116 Coffee	Coffee dominant crop including most field conditions associated with its production, including shade trees.
212 Intensive, Mixed Mountain Agriculture	Mixed small to medium scale farming systems occupying more than 50% of land area. Delineations represent areas equal to or greater than 9 hectares. Limited marketing orientation.
2121 Agro-forestry	Mixed, small and medium-scale agriculture with dominant tree crops (scattered fruit trees, fuel wood, construction wood, mangos, etc).
2122 Mixed Agriculture	Small and medium-scale agriculture with scattered corn, beans, potatoes, other tuber crops, etc.
22 Extensive Mountain Agriculture	Agricultural land occupies less than 50% of the area delineated. With theexceptionof monocultures, primarily subsistence in nature.
221 Extensive Mountain Monocultures	Large and medium scale farming systems dominated by monocultures. Delineations represent areas equal to or greater than 18 hectares.
2211 Sisal	Sisal is the dominating crop. All field conditions are associated with sisal production.
222 Extensive, Mixed Mountain Agriculture	Small and medium-scale fields that occupy less than 50% of land area delineated.
2221 Extensive, Mix Cropland	Mixed crops with corn, sisal, vetiver, banana, coconut, beans, potatoes, other tubers.
2222 Open Grass Savannah	Unimproved Grassland with sparse (<40%) shrub cover. Grazing use of the more recently abandoned

	fields.
2223 Sparse Shrub Savannah	Grassland with sparse (40-70%) shrub cover. Limited grazing in abandoned fields.
2224 Shrub Savannah	Grassland with dense (>70%) shrub cover. Very limited grazing in abandoned fields.
23 Forest in the Foothills and Mountains	Forest cover with associated crown closure percentages
231 Deciduous Forest	Broad leaf forest lands with land areas equal to or greater than 9 hectares.
2311 Dense Deciduous	Broad leaf Forest cover >70%
2312 Open Deciduous	Broad leaf Forest cover 40-70%
2313 Sparse Deciduous	Broad leaf Forest cover <40%
232 Coniferous Forest	Evergreen soft wood forest with a land area equal to or greater than 9 hectares.
2321 Dense Coniferous	Coniferous Forest cover >70%
2322 Open Coniferous	Coniferous Forest cover 40-70%
2323 Sparse Coniferous	Coniferous Forest cover <40%
31 Urban	Urban Land Use with a total land area equal to or greater than 9 hectares.
311 National and Regional Urban Centers	Urban Centers with a total land area of more than 18 hectares.
312 Rural Urban Centers	Small communities and associated subsistence farming with a total land area between 9 and 16 hectares.
41 Non agricultural	No significant agriculture present.
411 Wetlands	Areas dominated almost equally by vegetation and water with a land area equal to or greater than 9 hectares.

4111	Coastal	Wetlands in the tidal zone. Mangrove swamps
4112	Inland	Fresh water swamps
412	Surface mining	Areas with evidence of surface extraction of 9 hectares or greater.
4121	Limestone	Active or abandoned limestone quarries.
4122	Other	Other surface mining including bauxite.
413	Barren land	Exposed or denuded areas of of 9 hectares or greater.
4131	Barren sand and rock	Areas without vegetation cover, including eroded areas.
4132	Eroded areas	Areas with locational evidence of advancing and severe surface erosion.

APPENDIX A: LISTING OF FILES HEADERS

File name: 5370LU.ras

Description:
CARTE 5370-COTEAUX LANDUSE/COVER

Number of columns: 438 Upper left column value: 80

Number of rows: 193 Upper left row value: 1958

Map grid x-coordinate: 561900.0

Map grid y-coordinate: 2027300.0

Grid cell size x_direction: 100.0

Grid cell size y_direction: 100.0

Maximum attribute value: 255

Geographic referencing system: UTM

File name: 5371LU.ras

Description:
CARTE 5371-JERAMIE LANDUSE/COVER

Number of columns: 516 Upper left column value: 1

Number of rows: 378 Upper left row value: 1581

Map grid x-coordinate: 554000.0

Map grid y-coordinate: 2065000.0

Grid cell size x direction: 100.0

Grid cell size y direction: 100.0

Maximum attribute value: 255

Geographic referencing system: UTM

File name: 5470LU.ras

Description:
CARTE 5470-LES CAYES LANDUSE/COVER

Number of columns: 532 Upper left column value: 517

Number of rows: 355 Upper left row value: 1955

Map grid x-coordinate: 605600.0

Map grid y-coordinate: 2027600.0

Grid cell size x direction: 100.0

Grid cell size y direction: 100.0

Maximum attribute value: 255

Geographic referencing system: UTM

File name: 5471LU.ras

Description:
CARTE 5471-BARADARE LANDUSE/COVER

Number of columns: 530 Upper left column value: 516

Number of rows: 347 Upper left row value: 1611

Map grid x-coordinate: 605496.0625

Map grid y-coordinate: 2062000.0

Grid cell size x_direction: 100.0

Grid cell size y_direction: 100.0

Maximum attribute value: 255

Geographic referencing system: UTM

File name: 5570LU.ras

Description:
CARTE 5570-AQUIN LANDUSE/COVER

Number of columns: 530 Upper left column value: 1046

Number of rows: 180 Upper left row value: 1950

Map grid x-coordinate: 658504.0625

Map grid y-coordinate: 2028100.0

Grid cell size x_direction: 100.0

Grid cell size y_direction: 100.0

Maximum attribute value: 255

Geographic referencing system: UTM

File name: 5571LU.ras

Description:
CARTE 5571-ANSE-A-VEAU LANDUSE/COVER

Number of columns: 530 Upper left column value: 1044

Number of rows: 224 Upper left row value: 1731

Map grid x-coordinate: 658300.0

Map grid y-coordinate: 2050000.0

Grid cell size x direction: 100.0

Grid cell size y direction: 100.0

Maximum attribute value: 255

Geographic referencing system: UTM

APPENDIX B: HISTOGRAM OF FILES

Prepared by: CRIES-GIS / Michigan State University

File name: 5370LU.ras

Raster file description:

CARTE 5370-COTEAUX LANDUSE/COVER

Attribute Value	Number of Grid cells	Number of hectares	Percentage of non zero grid cell
0	54811	54811.00	0.00
1	10	10.00	0.04
7	1409	1409.00	4.75
8	1718	1718.00	5.79
10	793	793.00	2.67
11	317	317.00	1.07
13	257	257.00	0.87
18	60	60.00	0.21
26	2222	2222.00	7.48
27	55	55.00	0.19
29	9468	9468.00	31.86
30	2663	2663.00	8.96
31	6570	6570.00	22.11
33	483	483.00	1.63
34	3218	3218.00	10.83
35	60	60.00	0.21
40	118	118.00	0.40
41	82	82.00	0.28
45	220	220.00	0.75

Total number of non zero grid cells: 29723
Total number of grid cells: 84534

Prepared by: CRIES-GIS / Michigan State University

File name: 5371LU.ras

Raster file description:

CARTE 5371-JERAMIE LANDUSE/COVER

Attribute Value	Number of Grid cells	Number of hectares	Percentage of non zero grid cells
0	34580	34580.00	0.00
1	111	111.00	0.07
7	5059	5059.00	3.16
8	4963	4963.00	3.10
10	894	894.00	0.56
12	361	361.00	0.23
26	24819	24819.00	15.47
27	28794	28794.00	17.95
29	30714	30714.00	19.15
30	6064	6064.00	3.78
31	17974	17974.00	11.21
32	929	929.00	0.58
33	1362	1362.00	0.85
34	17028	17028.00	10.62
35	14597	14597.00	9.10
36	280	280.00	0.18
37	6083	6083.00	3.80
39	109	109.00	0.07
40	110	110.00	0.07
41	175	175.00	0.11
45	42	42.00	0.03

Total number of non zero grid cells: 160468
Total number of grid cells: 193048

Prepared by: CRIES-GIS / Michigan State University

File name: 5470LU.ras

Raster file description:

CARTE 5470-LES CAYES LANDUSE/COVER

Attribute Value	Number of Grid cells	Number of hectares	Percentage of non zero grid cell
0	83873	83873.00	0.00
1	2804	2804.00	2.68
2	10481	10481.00	9.99
7	8219	8219.00	7.83
8	11896	11896.00	11.34
10	2709	2709.00	2.59
11	443	443.00	0.43
12	553	553.00	0.53
26	12558	12558.00	11.97
27	23004	23004.00	21.92
29	15613	15613.00	14.88
30	8091	8091.00	7.71
31	2808	2808.00	2.68
33	681	681.00	0.65
37	216	216.00	0.21
39	179	179.00	0.18
40	38	38.00	0.04
41	2979	2979.00	2.84
42	70	70.00	0.07
45	1645	1645.00	1.57

Total number of non zero grid cells: 104987
Total number of grid cells: 188860

Prepared by: CRIES-GIS / Michigan State University

File name: 5471LU.ras

Raster file description:

CARTE 5471-BARADARE LANDUSE/COVER

Attribute Value	Number of Grid cells	Number of hectares	Percentage of non zero grid cell .
0	48755	48755.00	0.00
1	584	584.00	0.44
2	40	40.00	0.03
7	3623	3623.00	2.69
8	5300	5300.00	3.93
10	1995	1995.00	1.48
11	64	64.00	0.05
12	358	358.00	0.27
13	8205	8205.00	6.08
26	27024	27024.00	20.00
27	17919	17919.00	13.26
29	29463	29463.00	21.80
30	1795	1795.00	1.33
31	10287	10287.00	7.62
32	14062	14062.00	10.41
34	10187	10187.00	7.54
35	723	723.00	0.54
36	44	44.00	0.04
37	1420	1420.00	1.06
40	58	58.00	0.05
41	1934	1934.00	1.44
45	70	70.00	0.06

Total number of non zero grid cells: 135155
Total number of grid cells: 183910

Prepared by: CRIES-GIS / Michigan State University

File name: 5570LU.ras

Raster file description:

CARTE 5570-AQUIN LANDUSE/COVER

Attribute Value	Number of Grid cells	Number of hectares	Percentage of non zero grid cells
0	33809	33809.00	0.00
1	173	173.00	0.29
4	27	27.00	0.05
7	2737	2737.00	4.45
8	10744	10744.00	17.45
10	1372	1372.00	2.23
12	6836	6836.00	11.10
13	949	949.00	1.55
26	3211	3211.00	5.22
27	7972	7972.00	12.95
29	5929	5929.00	9.63
30	613	613.00	1.00
31	11695	11695.00	18.99
32	8111	8111.00	13.17
40	78	78.00	0.13
41	667	667.00	1.09
45	477	477.00	0.78

Total number of non zero grid cells: 61591
Total number of grid cells: 95400

Prepared by: CRIES-GIS / Michigan State University

File name: 5571LU.ras

Raster file description:

CARTE 5571-ANSE-A-VEAU LANDUSE/COVER

Attribute Value	Number of Grid cells	Number of hectares	Percentage of non zero grid cells
0	35791	35791.00	0.00
1	340	340.00	0.41
7	6585	6585.00	7.95
8	16715	16715.00	20.16
10	2180	2180.00	2.63
12	1426	1426.00	1.72
26	8849	8849.00	10.68
27	8559	8559.00	10.33
29	21718	21718.00	26.19
30	4535	4535.00	5.47
31	8592	8592.00	10.37
32	2656	2656.00	3.21
39	30	30.00	0.04
40	17	17.00	0.03
41	279	279.00	0.34
43	382	382.00	0.47
45	66	66.00	0.08

Total number of non zero grid cells: 82929
Total number of grid cells: 118720

APPENDIX C: CHARACTER MAPS

(SCALE 1 : 300,000)

Prepared by: CRIES-GIS / Michigan State University
Tuesday January 01, 1980 Time 01:23

File name: 5370LU.ras

```
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      8890112345567889012234556789901233456678900123345677890 01
      0863197520864197530864297531864208531974208631975208 64197

1958                              UUSSSSSSSSSSSYYYSUXXXXUUXXXSWWSSS  1958
1972     UUUUUUUUUUUUUUUUUUUUS8UUSSS8SSSSSPPSXXXTSSUXXXXXXPPSWWW  1972
1985       OOOUSSSSUUSSSSUU      7888SPPTPPPPUUSP7PPPPPSUSSPPXS  1985
1999        AOAAAOOOCOHi            77TTTTTTTSSSSSSUPSUPPSUUUUUX  1999
2013                                        TSUUSSSSSSSSPSXXXXXSSSS  2013
2027                                         d7UU7UUUU888XXXXXXXXXS  2027
2040                                              USSiTUSSXXUUUXSSS  2040
2054                                                   TUSSSSSSUUSSP 2054
2068                                                    UT7T7SSS7UTS 2068
2081                                                       TTSSS7SPS 2081
2095                                                        88TTTTSS 2095
2109                                                            88TTT 2109
2123                                                               77 2123
2136                                                                0 2136
2150                                                                  2150

      0001111111111111222222222222223333333333333444444444444444555
      8890112345567889012234556789901233456678900123345677890 01
      0863197520864197530864297531864208531974208631975208 64197
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CARTE 5370-COTEAUX LANDUSE/COVER

Mapping Directive	Print Symbol	Frequency
0		571
7	7	12
8	8	14
10	O	9
11	A	4
13	C	1
18	H	1
26	P	24
29	S	89
30	T	24
31	U	60
33	W	5
34	X	35
35	Y	3
40	d	1
45	i	2

Prepared by: CRIES-GIS / Michigan State University
Tuesday January 01, 1980 Time 01:12

File name: 5371LU.ras

```
0000000000000111111111111122222222222222333333333333344444444444444555
0012334567789001233456778900123345677890012334567789001233456778900 1
1964297520863196429752085319642975208531864297520853186419752085318 6

1581                                    8                                1581
1594                              UUd8UUUUUU88UU8                        1594
1607                     TT TTT UUUUU8U88UUUUUUUUUUUTS                   1607
1620                P  PPPTTTTT8TTSUSSUSUUUUUUUUUUUUUUTTTSc              1620
1633              88PTPPPPSSS888TPSPPPSSXXUUUUUUSSSUTUTTT777             1633
1646           88888PPPPTPPPSSSSXXXSXSXSXXXXXXSSSSSSTTQQ87QQQ87          1646
1659           BBPPPPTTTPPSSXXXXXXSSXXXXXXSSSSSSSS8UUUU8QUUUU7UUU788     1659
1672            17PPPPPPXXXQXXXXSXXXXTTTTTSSS888888UUUQQQUQ77PPUUUUUU700V 1672
1685            ePTPTPSXXXQQXXXXTTTTSSSSSSSS88PQQSSSSSQQQQ7PPPUUUUUU7VVVV 1685
1698            PPPPSTPTTTQPQXQTQPTSPPPPS7PPQQPQQQQQQQQQQQ7QUUUUUUUQQQQPS 1698
1711           d7PQPTPPTPPQQQQQQQ7777P7777QQQQQQQQQQQQQQQQPQQQUQQQQQQQQQQ 1711
1724          7PP7XXXXXXTQQQP7777777777PPPQQQQQQQQQQQQQQQPPQQQQQQQPPPPPOS 1724
1737         P7PPQ7QXXSQQQQ7777PPPPP7PPSSSSXXXQQQQQQQQQQQPQQQQQPPPP0000SS 1737
1750         PPPQQQQQQQSPPPPPPQQQPPPXXXXXXXSSQSSQQQQQQQPPPPQQQQSPSOSSPSSS 1750
1763        e777PQQPPPSSSSQQQXQQQPPPXXXYYYSSYYYYYYQQQQQPPPPPPPSSSPSSPPSSQ 1763
1776       BPPPPQQQPQQPPQQQXXXXSXSSYYYYYYYYYYYYYYYYPPPPPPQQQQSSSPSPPPPQQQ 1776
1789       QQ888PPPPPPPPQXXXXXSSSPPSSYYYTTYTYYTTYYYPSQQQQQQQSSSSSSPPPPPSS 1789
1802       877QPPSSSSXPPPSSXXXSXUUPUSSSSYYYYSTTSSSSSSQQPQQQSSSSPSPPPPPQQP 1802
1815      QQQPPPPSSSPPXXXXXXQQQQYUUUUaaaaSSSSSSSSSSSSQQQQQQQPSSPPPPPPPQQP 1815
1828      8PPPPYYPPPYYQQQQQQXXXYYYUaaaaaaSSSSSSSSSSSSSQQQQQQQQQQPPPPPQQPP 1828
1841     Q7Q7YYYYYYYYYQQQQQQXXXXXXYYYSSaSSSSSSSSSSSSSWWWWQQQQQQQPPPYYYYQP 1841
1854    7PPPSPYYYYYYSSSSQQQSSXXXXYYYSSSaaaSSSSSSXXXXXXXWWWYYYYYYYYYYYYQQ 1854
1867    SSSS8YYYYYYYYYYYYYYYSSSSYYYSSSSSXXXXXXXXXXXXXQQQQQQQQQQQQQQQQQQS 1867
1880       i8YYYYYYYYPYXXXXXYYYYSSSSPPPPXXXXXXXXaaaaaXaaaaaaQQQQQSSSSSSSSS 1880
1893        8YYYYYYYYPPPXXSXXXXSSSSSSPPXXXXXXXWaaaaaSSSSSSaaaSSSSSSYYYYYZY 1893
1906        YUYYYYYYYYYPPXXSXXXaaSaaSPPXXXUUXWWWWWUUUSSSSaSSSSSSSSSSZZZSSS 1906
1919        PUXYYYYYXXXXXXXXXaaaUUUXXXXXUUXXUWWUUUUUUUSPPaPPPSSaaaaaaaSSSS 1919
1932        UUXXUXXXXaaaaUUUUUUUUUUUUUUUUUUUSUUSSSUUUUPPPPPPPPUUPPSUSUUaaaa 1932
1945         7UUUUUUUUUQUQUUQUQQQUUUUUUUUTUSSSSSSSSaUSPPUUUUUUYYUXXVVUUSSU 1945
1958              Q7QQQ77Q7UUUUUUUUTTTTU                                  1958

0000000000000111111111111122222222222222333333333333344444444444444555
0012334567789001233456778900123345677890012334567789001233456778900 1
1964297520863196429752085319642975208531864297520853186419752085318 6
```

CARTE 5371-JERAMIE LANDUSE/COVER

Mapping Directive	Print Symbol	Frequency
0		449
1	1	1
7	7	56
8	8	42
10	0	8
12	B	3
26	P	244
27	Q	284
29	S	289
30	T	60
31	U	187
32	V	7
33	W	15
34	X	181
35	Y	146
36	Z	4
37	a	58
39	c	1
40	d	2
41	e	2
45	i	1

Prepared by: CRIES-GIS / Michigan State University
Tuesday January 01, 1980 Time 00:40

File name: 5470LU.ras

```
0000000000000000000000000000000000000000000000000000000000000000000001111111
5555555555566666666666667777777777777888888888888899999999999990000000
1234456778900123445677890012344567789001234456778900123445677890112344
7520853196429752086319642975208631964297530863196429753086319642075308

1955                                                    QQQSSSQSSSSSSQQSQ   1955
1968 SSWQQSSSSPSSSSSSPQiQQQQQQQQQQQPQQQQQQQQQQQQQQQQU888PPQQQQPPSSSPPPPQQQS   1968
1981 SWSWWaQQS7i7SS77SQiQQ1Q8Q8QQQQQ2QQQ2QQQQQQQQQ8888UUUUPSSSPPAAQQPPPQQQ   1981
1994 SSWQQQQaQQSQQQ7Q77i88888888QQQ22Q2Q2QQQQQQQ8QQ22QUQ7USSPSSSSSAAAAAQQP   1994
2007 QSSWQQQQQQPPPQQi7778888888882222222QQQQQ2QQQQ22QP7UUUQUUUSUUUUPPP7PQ   2007
2021 SSSQQQPQQQQPi88887888888888282222Q2QQQQQQ2QQQ222Q8UUUQ77S77SSQQQQ77PP   2021
2034 SSSSSPPP7Q7PPS88888888i888882222Q2QQ22SQQ8QUee1eQ8QQUQQ111QQQQd1118QQ   2034
2047  SSPPSSSSQ7QQPPS788888888ii822Q88QQ2QTSTTQQeeeQUQQQ7UQ ePQQ     e1S88   2047
2060  PPSSPSSPPPPSSi78788888888822i222QQ2QTTTT777eeQQ eQ   PSSQQQ    SSeSS   2060
2073  PPPQQPPPSSQPSSS78888888882222222QQQQQQTTQ   U PPQU  PSSS QQQ           2073
2086  SPSSPPQPP88SSS178888888888222222222QQQQQQ     eee   See   Q    i ii    2086
2099  SPSSSSSQQPP71S77887782228282222221112ee                                2099
2112  TTTTTTSSPPQQQS7778872222221221212cce                                   2112
2125  TTTTTTTTPTPPQS777777222221122211                                       2125
2139  007STTSTPPPPPPQ78771222221122                                          2139
2152    SSSSSSSPTPTPQ7i771722221                                             2152
2165     00SPPPPTPPTPP7i771222                                               2165
2178      007STTTTTPPPTT7777                                                 2178
2191         0SPTTTTPPPTP77                                                  2191
2204         00TTTTTTTTTTP7                                                  2204
2217          00TTTTTTPPTQTT                    SSSe         ee              2217
2230            0TTPTTSPTPQQTTTO                 7S77S    eeeeee             2230
2243             00PSSSTPPQQQ77Q                  SSSSSSSSSSSeSPe            2243
2257             00BSSSTSSPTSSQ77                  SSSeeSSSSSSePP            2257
2270              0BB88TTTSTPPQ7Q78                                          2270
2283               BB88B000TSTT77T                                           2283
2296                0000000008T888                                           2296
2309                                                                         2309

0000000000000000000000000000000000000000000000000000000000000000000001111111
5555555555566666666666667777777777777888888888888899999999999990000000
1234456778900123445677890012344567789001234456778900123445677890112344
7520853196429752086319642975208631964297530863196429753086319642075308
```

CARTE 5470-LES CAYES LANDUSE/COVER

Mapping Directive	Print Symbol	Frequency
0		923
1	1	27
2	2	104
7	7	77
8	8	119
10	O	30
11	A	7
12	B	6
26	P	112
27	Q	227
29	S	159
30	T	82
31	U	26
33	W	6
37	a	2
39	c	2
40	d	1
41	e	34
45	i	16

Prepared by: CRIES-GIS / Michigan State University
Tuesday January 01, 1980 Time 01:37

File name: 5471LU.ras

```
     000000000000000000000000000000000000000000000000000000000000000000000000000111111
     555555555556666666666666677777777777777888888888888889999999999999999000000
     123345677890012334566789001233456678900123345667899012334567899012334
     641974207530863196429752085318641974207530863196429752085318641974207 5

1611                                                                                16
1624                                    CCCCOOC                                     16
1638                                 CCC8CCCCCOCCCC                                 16
1651                                CCCC8CCOCOOCCCC                                 16
1664 OOVVVV                           eCBBBBCCCCC                                   16
1678 VVVSVVVCCe1e                         eeee                 CCCCCCCCC           16
1691 QQQPPPVVVVCC e                                eCCCCCCCCCCCCCCCCCCC             16
1704 SSSSVSVVVVVV7VVVVVVVVVVV                 eeeCCC   eCCeCCCCCCCC                   17
1717 SSSSVVVVVVVVVVVVVVVVVVVVVVVV              VVCC                                   17
1731 SPPPPPPSPPPSSSVVPPPPPPPVVVVVV VVVVVVVVVVVVVUUUU                                 17
1744 SXXXXXXPPOPSUUVVPPPPPPVPVPPVPVVVVVVVVVVVVVUUUUU O                    e1B        17
1757 SSXXXXXXXXXPPPUUUPVUUUVVUUPPPPPPVPPS777XXVUUUU                 Ve8888777       17
1771 QQPQPPPPPPXXXXXPPPXXXXXXXPPXXXPPXXXSSXUSPPUU77e XSeVVVVeVV2VVVVVVVVVV          17
1784 SSSPPSSPPPPXXXXXXXXXPPXXPXXXPXXSPSSSSPPUUUS7XUXXSSQQVVVPVVVVVVV7VVVVV          17
1797 PSSSSSSSSSSPPPPPPPPPXXPPPSSSPUPPUUUUXXXXXXXXXS77771QQQQPPQVVQQVVVVVV           17
1811 SQQSSSSQSSSSSSSSOOOPUOPPPPUUXXPXXXXXXXXXPP7PPS77PPPPPPPQQQSSSSSSVVVQQQ         18
1824 SQQQPPSSSSSSSSSSSPPPXXXXSSSSSSSSXPPPPPPSPPPS77PPPPPPPPQQQQQPQQQQQQQSS          18
1837 QQQQQQQPPSSSSSSSPPXXXUUUUXXXXXXPXXXPPPSS77S7PPPPPSSQQQPP777QQPSSSSSPS          18
1851 QPPQQQQQPPPPSSYYYQUXXXXXXXXSSSSSSSSSPPSSSTTTPPPPPP8887778877SSSSSOOOO          18
1864 SSSSPSSSSSSSSSQQQQQUUUYYYUUYSUUUUUSUSSSSTTTTPSSSPPPPQPPPPP8SSSSQQQOOO         18
1877  SSSSSSSSSSSSSSSSSSSSSUSSSSUUUPPPPPUUTTTTPTPPSSPPPPQQQPPPSSSSSQQQQQQQ         18
1890  SSSSSSSSSSSSSSSPQSSSSSSSSSUUPPUUSSUUUUUUUPPPPPPQQQQQQQQPQPPPPSSSQQQQQ         18
1904  SSSSSSSQSSSSSSSSSSSSUSSSUUUPUQUUPUUQQQPPUPQQQQQQ8QQQQSSPQPPPPPQQQPQQQ         19
1917  SaaaSSSQSSSSSSSSPPPPPPQPSSQQQQ7UUQUSPSQPPPQQ88888888888Q888QSSSPPQQQSSSS      19
1930  aaaaaaSSSSSSSTTTPPPPPPPPQQQPP887SSSSU77UUU88888888888QQQPPSSSPPQQSSSSSP       19
1944  UUJaaaUUUSTTTTTPPPQQPPPPPPPP88118788888Q88888UU8QQQQQQQQQQQQQSSSSSSPSS        19
1957  SSSaaUQUSSSSSPPPP                                                             19

     000000000000000000000000000000000000000000000000000000000000000000000000000111111
     555555555556666666666666677777777777777888888888888889999999999999999000000
     123345677890012334566789001233456678900123345667899012334567899012334
     641974207530863196429752085318641974207530863196429752085318641974207 5
```

CARTE 5471-BARADARE LANDUSE/COVER

Mapping Directive	Print Symbol	Frequency
0		573
1	1	5
2	2	1
7	7	36
8	8	49
10	0	21
12	B	5
13	C	81
26	P	259
27	Q	154
29	S	301
30	T	20
31	U	98
32	V	145
34	X	102
35	Y	7
37	a	14
41	e	19

Prepared by: CRIES-GIS / Michigan State University
Tuesday January 01, 1980 Time 01:58

File name: 5570LU.ras

```
     1111111111111111111111111111111111111111111111111111111111111111111111111111111111111111
     0000000111111111111112222222222222333333333333333444444444444445555555555
     4566789001233456678990123345667899012334566789901223456678990122345667
     6419742075308631964297520853186419742075308631964297520853186419742075

1950                                                                QQQUUU          19
1964 QQSQQQQSSPUPPPPPSSSSS7S888888888888Q88QQQQQQSSSSPPPUQ8VV8VVQQ                19
1978 QQQPPPPPPPPPPPQQQQ8778888888888QQQ88888883888QQ77SSPPPPVVVVVVV                19
1991 QPPPQPSSSSSSSTT88UU888d8788888QQUVV8888888888QQQQ78QQQQQQSSSVVVV             19
2005 PPPQSSSPPQQS7T88888888888888888QUUUUUUUVVVV88VUVVVV7V777QQSSQQQ              20
2019 PQQSSQQQQQQ8788 ii87888888U88888UUUUUUUVVVVUUUVVVVV777VVQQQQSQQ8             20
2033 QQ8QQQQ   778eee  eieUU78BBBUUUUUVVVVVUVVVUOUVUVVVVVQQVVVVSVSSSS8             20
2046    e                 CCCCCC8BUUUUUUUUBUUUUUUOUVVVVUVVVVVVVVVVUSUSS8            20
2060                     iCVVVVCCUBBBBBBBBBBBBBBUUUOUUUUUUUUUUUUUUUUUUUUU8         20
2074              TTe   VVCCVVC        BBBBBBBBBBBBOOBBBBBUUUUUUUUUUUUUUUUU        20
2088                                                  OOBBBBBBUBBUUUUUUUUUUU7       20
2101                                                      OOBBBBBBBBBBBBBBBBO       21
2115                                                                 OBBOOO         21
2129                                                                                21

     1111111111111111111111111111111111111111111111111111111111111111111111111111111111111111
     0000000111111111111112222222222222333333333333333444444444444445555555555
     4566789001233456678990123345667899012334566789901223456678990122345667
     6419742075308631964297520853186419742075308631964297520853186419742075
```

CARTE 5570-AQUIN LANDUSE/COVER

41

Prepared by: CRIES-GIS / Michigan State University
Tuesday January 01, 1980 Time 02:06

File name: 5571LU.ras

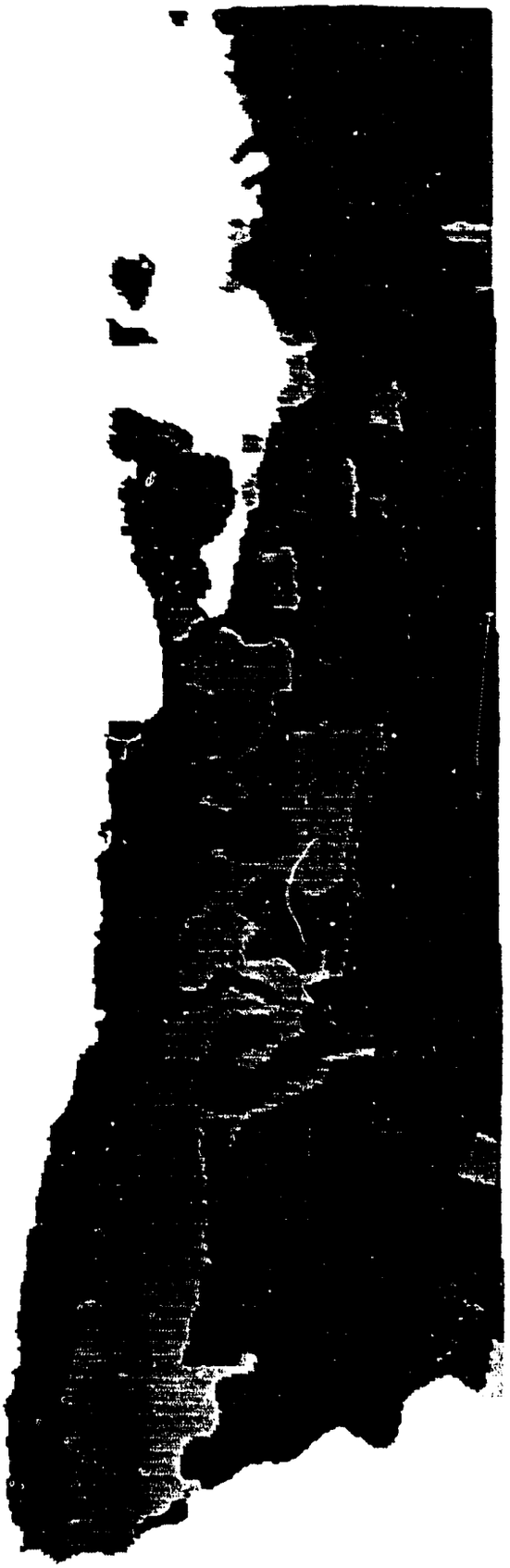
```
     1111111111111111111111111111111111111111111111111111111111111111111111111111
     0000000011111111111112222222222222333333333333344444444444444555555555555
     4556789901223455678990122345567889012234556788901223455678890112345567
     4297520853186419742075308631964297520853186419742075308631964297520853

 1731                                                                          1731
 1744 BBBB BB8BB                                                               1744
 1757 8888888888B8B88BBBB                                                      1757
 1770 V888V8U88UUUUUUU88888e88B                                                1770
 1783  VVQQVU8UUUUSSSSSUUS7U888818                B88888                       1783
 1797  VPSSSVVUSSUUUU707S70UPPPP88888U7SS778787UU7VBBB88ee                    1797
 1810  QQPSSSSSSSSSSS000000U888878UUSSSSSSSS7TSTTUV8VVVVV8ee        TT        1810
 1823  SSSOSSSSSSSSS8888888888888SSSSSSSSSSSSSSSSPQVVVTVVUTTi  TTTTUU         1823
 1836  000000SSSPSSSPPPPPPP7777PPSSSSPPPPPPPPPPPPSPPPPTUUUUUUUUTT8UUU         1836
 1849  00000SSSPPPPPPPPPPPP7PTTPPPTTTTSSSSSSSSSTQTTTTTTTQQUTTTTU88888         1849
 1862  77SSSSSSSSSPPSSPPSPP77PTPPPPPPTTSSSSSSSQQQQQQQQQQQQTTTT888U78          1862
 1875  QQQ77SSTTTSS8SSSS77SSSSSSSSSSSPPPTTTTTTTQQQgQQgQQQQSS8887U78           1875
 1888  QQ88888787877788SSSSSSSSSSSSSSSSSSSPPPPPPPPQQQQQQQSSSS1888UU            1888
 1902  QQQQ8888888888888SSQQQQQQ777777SSS77S77777QQQSSS888888888SSSSSS        1902
 1915  QQQQQ77878778877 8Q8888PPP7777777778788888888PP888888787SUUUUSUU       1915
 1928  SQQQQQUUUUUUUUU88888SSSPPSQQQQQS88888788888888U8QQUU8777 8UUUSU       1928
 1941  SSSSUUUUUUUUSSSSSSSSSSSSSQQQSSSS8SSSSSSSSPPP8888QQUQQQQQ7UUUU         1941
 1954                                                                          1954

     1111111111111111111111111111111111111111111111111111111111111111111111111111
     0000000011111111111112222222222222333333333333344444444444444555555555555
     4556789901223455678990122345567889012234556788901223455678890112345567
     4297520853186419742075308631964297520853186419742075308631964297520853
```

CARTE 5571-ANSE-A-VEAU LANDUSE/COVER

Mapping Directive	Print Symbol	Frequency
0		413
7	7	21
8	8	101
10	O	14
12	B	61
13	C	12
26	P	34
27	Q	76
29	S	42
30	T	5
31	U	110
32	V	79
40	d	1
41	e	7
45	i	4

Mapping Directive	Print Symbol	Frequency
0		457
1	1	2
7	7	68
8	8	166
10	O	20
12	B	19
26	P	83
27	Q	82
29	S	201
30	T	50
31	U	84
32	V	20
41	e	5
43	g	2
45	i	1

APPENDIX D: EXAMPLE COLOR OUTPUT