

LAND COVER ACCURACY ASSESSMENT FOR SOUTHERN GUAM

Yuming Wen
Shahram Khosrowpanah
Leroy F. Heitz



WERI

WATER AND ENVIRONMENTAL RESEARCH INSTITUTE
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by

**Yuming Wen
Shahram Khosrowpanah
Leroy Heitz**

Water and Environmental Research Institute of the Western Pacific
University of Guam, UOG Station, Mangilao, Guam 96913

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ABSTRACT

Land cover change (LCC) has been a hot topic for decades. LCC is caused by not only human disturbances but also natural forces. Considering the advantages of the remote sensing data such as satellite imagery and aerial photos which can be applied to monitor some hard-to-reach locations, they can be used to extract land cover information in the hilly southern Guam. Therefore it is dispensable to find some remote sensing data available to Guam to derive land cover information, and to determine land cover change in space and time if temporal data are available. Thanks to the long term service of Landsat satellites since 1972, Landsat imagery has been utilized for resource management, environmental monitoring, coastal management, extraction of land cover and land cover change, just name a few here.

A previous research was focused on detection of land cover change in watersheds in southern Guam (Wen et. al. 2009). Two landsat images were used to determine watershed land cover changes. These images were Landsat Multi-Spectral System (MSS) image of November 14, 1973, and Landsat Thematic Mapper (TM) image of March 15, 2001. Supervised classification was used to derive land cover information from these satellite images. It is important to understand that when a classification process is done, it's essential to conduct an accuracy assessment to compare the classification to ground truth or other data. However, during the previous study, land cover classification accuracy has not been assessed yet. Therefore, the main purpose of this study aims to conduct land cover classification accuracy assessment. Historical GIS data, and higher resolution satellite images with acquisition dates close to those of the Landsat images are used as reference data for land cover accuracy assessment. The assessment indicates that both land cover results for 1973 and 2001 are satisfactory; however, land cover classification accuracy is affected by image resolution and data quality.

INTRODUCTION

Land cover change (LCC) has been a subject of concern for decades around the world. Examples of LCC are the land clearances for housing, change of native forest into farming land, badlands, changes in wetlands, road construction and many more. These changes could amplify the soil erosion, which is the main source of non-point pollution for streams and estuarine areas. Although many of the changes have been recorded qualitatively through the use of comparative photography and historical reports, little quantitative information has been available at watershed scale (Kepner et.al 2002 and 1999).

The state of the art geo-technologies such as remote sensing, GIS and GPS can provide the basis for developing landscape composition and pattern indicators as sensitive measures of environmental change, and thus may provide an effective and economical method for evaluating watershed condition related to disturbance from human and natural stresses (Kepner et. al. 2002 and 1999). Multi-temporal Landsat imagery can be applied to extract land cover information for different dates, and therefore may be utilized to detect LCC (Jensen, 2005 and 2000; Sidkar et. al. 2004; Wen, 2005). These technologies have been utilized to extract land cover information for the Guam watersheds, and further to determine land cover changes (Wen et. al. 2009). When land cover has been derived from satellite imagery or aerial photos, it is necessary to conduct accuracy assessment on the derived land cover (Wickham et. al. 2004). *Spatial and temporal modeling of changes in wetlands and badlands in Southern Guam watersheds* was identified as one of the highest priority research needs for Guam at the Research Advisory Council Meeting of September 26, 2006. In response to the need, and based on the previous project focusing on watershed land cover changes (Wen et. al. 2009), it is critical to assess land cover information derived from satellite images. Improvement of classification accuracy or reclassification of the satellite images may be necessary if accuracy of classification is low. Land cover accuracy assessment can be used to evaluate the quality assurance or control of land cover derived from satellite imagery. Land cover and LCC information may help researchers, land managers, local, state or federal government agencies and other interested parties for better watershed protection, management and planning, they are also important information to water quality analysis, soil erosion prediction, land use planning, environmental monitoring and modeling.

The main purpose of this project aimed to evaluate the classification accuracy of land cover from a previous project (Wen et. al. 2009). Historical GIS data, aerial photos and higher resolution satellite imagery from IKONOS and QuickBird were applied as reference data for accuracy assessment. Details about study area, methodology and results are discussed in the following chapters.

RELATED RESEARCH

Watershed land cover change detection in Guam, a project funded by the Department of Interior via the Water Resources Research Institute Program of the U.S. Geological Survey, was focused on derivation of land cover information from watersheds in southern Guam, and determination of overall watershed land cover change, and land cover change in each watershed. GIS and remote sensing were integrated to classify land cover information for the watersheds in southern Guam (Wen, Khosrowpanah and Heitz, 2009).

The development of a spatial diffusion (SDIF) model for simulation of urban land cover change, was part of a NASA funded project "Multiple Innovative Models in Land Cover Change Study". In this project, biophysical and socio-economic factors were incorporated to simulate and predict urban land cover change. Driving forces such as urban centers, transport networks and population, and barriers for urban development such as wetlands and hydrographic features such as rivers and lakes were used in the model (Wen, 2005). ArcGIS from ESRI provided many spatial and modeling functions for the spatial diffusion model. Remote sensing techniques were used to provide updated datasets, and classified them suitable for use in the model.

Developing A Digital Watershed Atlas for Guam was funded by US geological Survey (USGS) through Water Institute Program, and NOAA through Guam Bureau of Statistics and Plans. The project focused on developing a digital watershed atlas including physical characteristics such as soil types, vegetation information, rivers and topography, and outreach activities such as web publishing of the digital atlas results, and providing a public education effort through workshops and by working with the local media outlets (TV and radio) to ensure that the public was aware of the availability of the watershed atlas resources (Khosrowpanah, Wen, and Heitz, in press).

A project currently funded by the Bureau of Statistics and Plans through Guam Coastal Management Program Grant (NOAA) was designed to develop assessment strategies for Non-Point sources of Pollution for a Southern Guam Watershed. The objectives of this project were to gather physical and environmental data on the Ugum Watershed. The project also developed a GIS watershed management database for Ugum Watershed that identifies the spatial distribution and extent of such items as: soil types; land slopes; land cover information; extend of undeveloped roads; land use areas including conservation and preserve areas; low density housing areas; urban areas; managed recreational areas such as golf courses, and areas impacted by agricultural operations; dams, wells and hydrological features; lengths and locations of streams, bank erosion and shoreline erosion; and areas impacted by off-road activities. Tools available in ESRI's ArcMap and Arc Hydro were used to identify areas that have the highest potential to contribute pollution to the streams (Khosrowpanah and Jocson, 2005).

METHODOLOGY

Description of study area

Guam, a tropical island in the western Pacific, is located at latitude 13°28' N. and longitude 144°45' E. It is 3,800 miles from Honolulu, Hawaii, 2,500 miles (4,000 kilometers) from Beijing, China, 1,600 miles from Manila, the Philippines, and 1,560 miles from Tokyo, Japan (Figure 1). It is about 30 miles long with a width of 8.5 miles at the northern tip, a minimum width of about 4 miles at the middle, and a maximum width of 11.5 miles in the south. Approximately 171,000 residents live in the 19 municipalities on Guam, which has a total area of about 209 square miles. The shoreline length is 116.5 miles, coral reef length is 80 miles, and area of parklands is 25,333.3 acres (Guam Bureau of Statistics and Plans, 2005). About 40,000 active military personnel and dependents are expected on Guam by 2014 because of military build-up activities (ICF International, 2009).

There are no surface rivers in the northern Guam, since the northern plateau is mostly composed of limestone, and when rain comes down, water penetrates into the limestone and goes down to the underground. The rivers are located in the dissected volcanic uplands of central and southern Guam, and generally the rivers in the east are longer than those in the west. This hydrographical characteristic is determined by the physiographical features on Guam (Figure 2), and topographical features. The study area is focused on the southern Guam, which is composed of 14 watersheds (Wen et. al. 2009) (Figure 3).

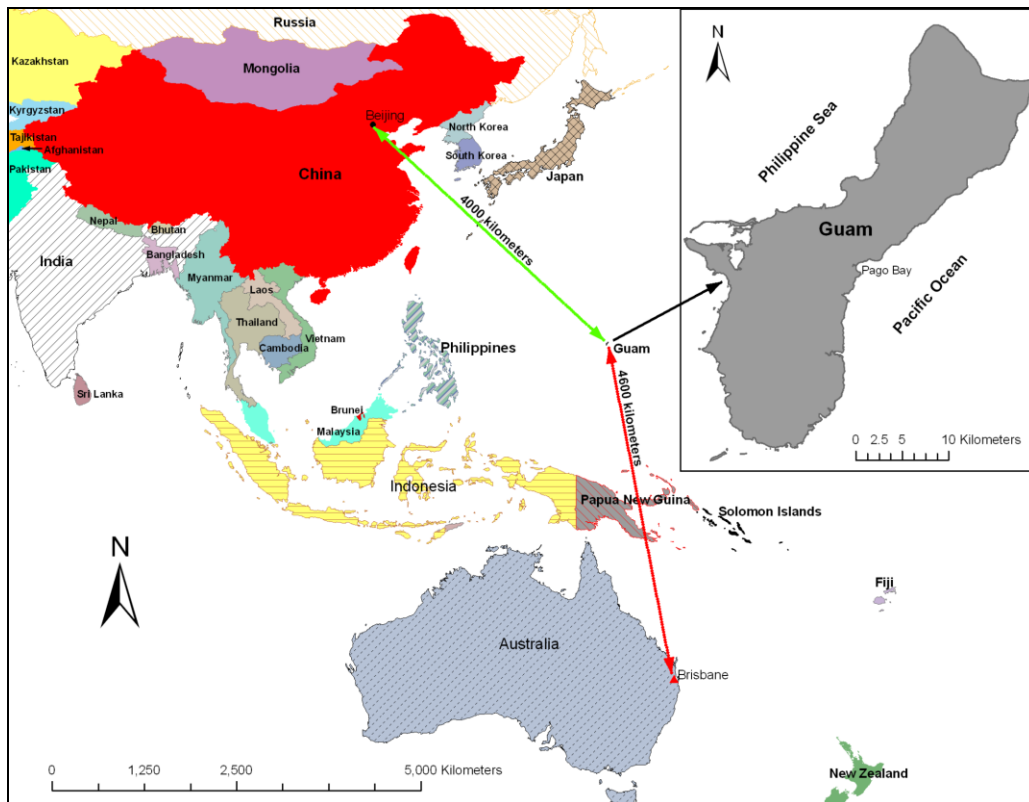


Figure 1. Location of Guam

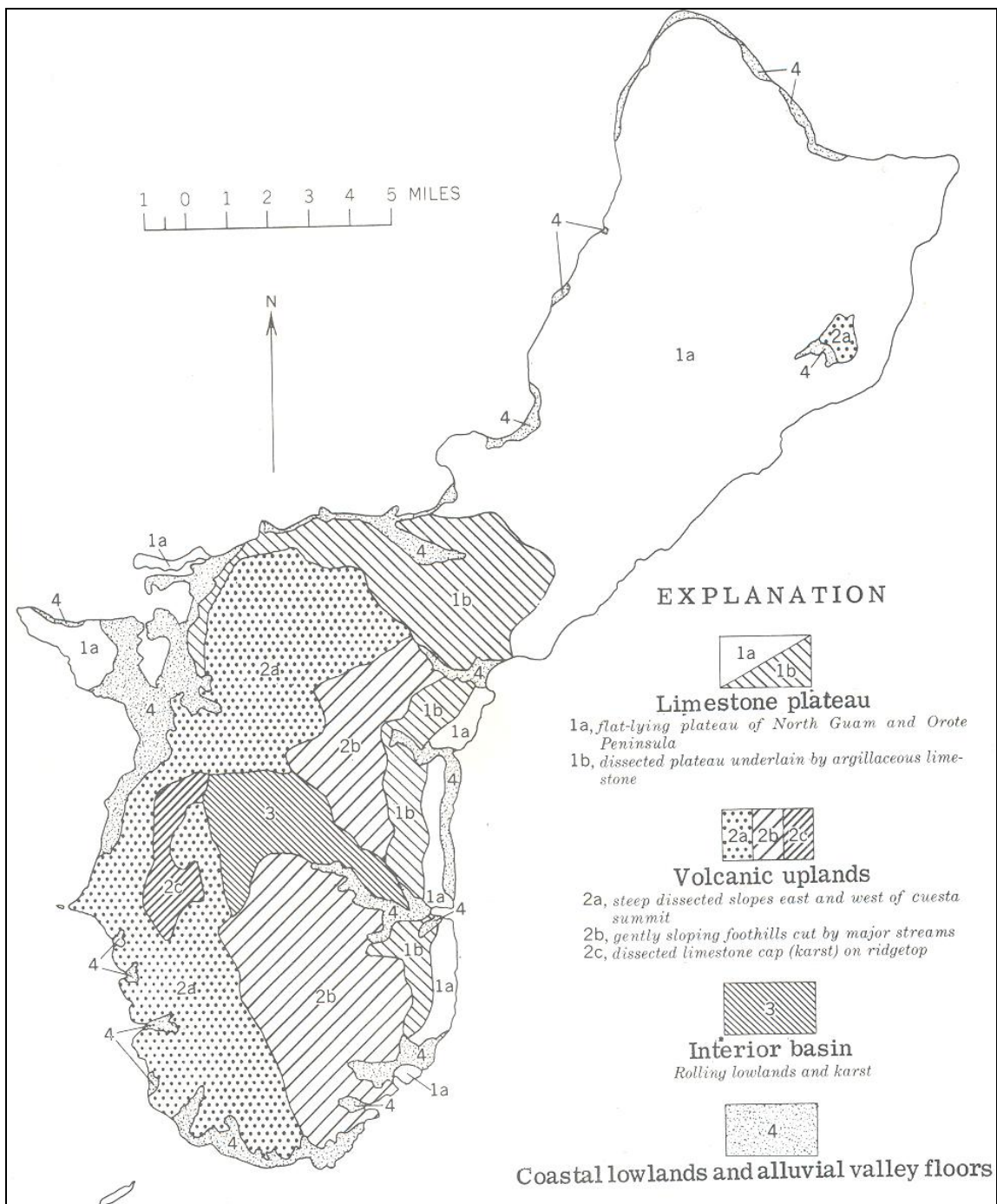


Figure 2. Physiographic divisions of Guam (Tracey et. al, 1964)

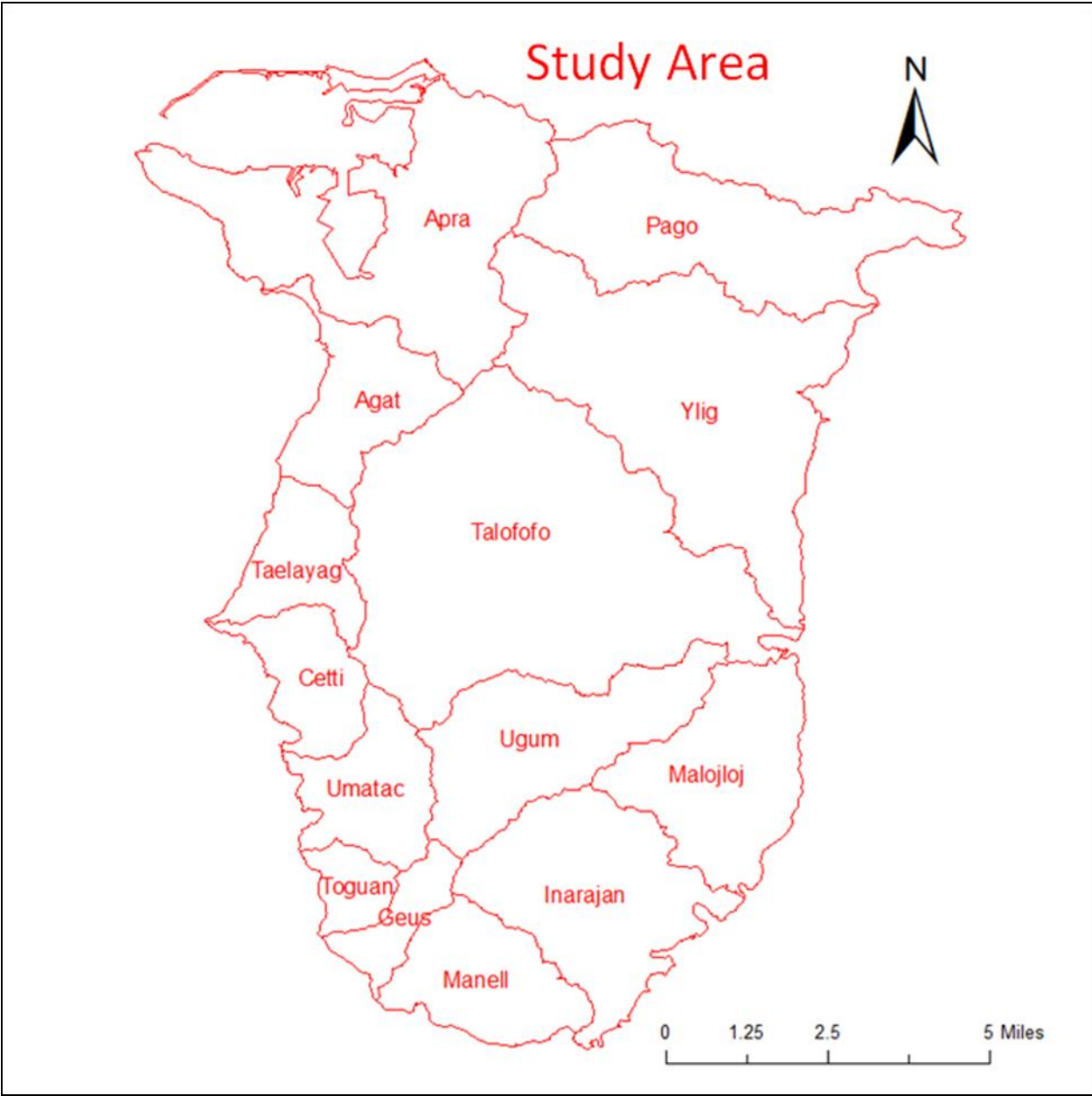


Figure 3. Watersheds in the southern Guam

Data sources

Land cover data of 1973 and 2001 are available for land cover classification accuracy assessment (Figures 4 and 5, from Wen et. al. 2009). The subset georeferenced Landsat MSS image of November 14, 1973 and the subset Landsat TM image of March 15, 2001 (Figure 6) are used as reference data. Historical data such as USGS DLG of 1975 and aerial photos of 1975, and USGS DRG data of 1978 are available as reference data for 1973 land cover classification accuracy assessment; while IKONOS image with acquisition dates of November 30, 2000 and February 23, 2001 and QuickBird image of 2006 are utilized for 2001 land cover classification accuracy assessment.

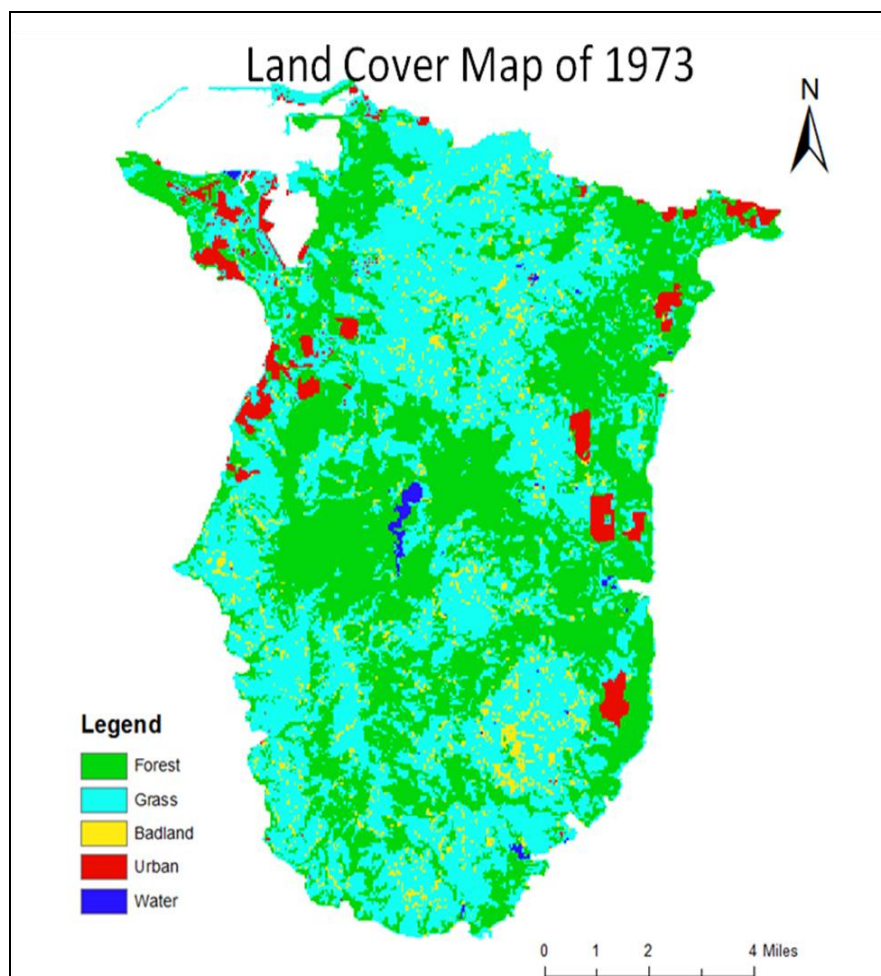


Figure 4. Land cover derived from Landsat MSS image of November 14, 1973

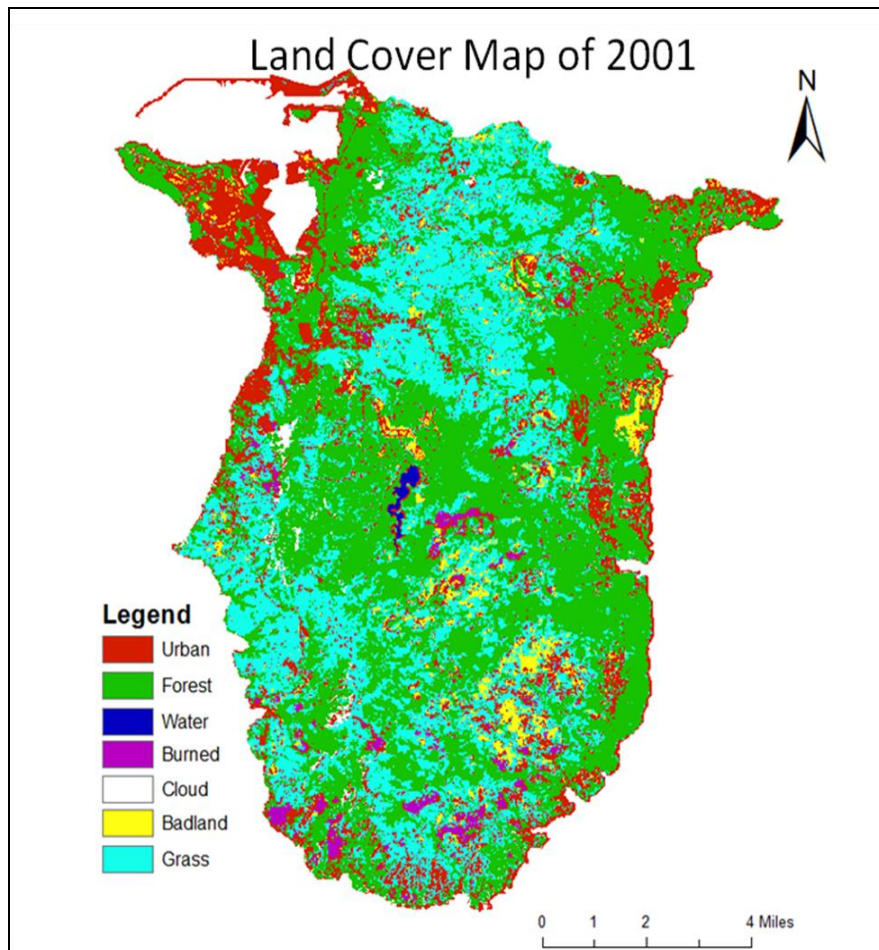


Figure 5. Land cover derived from Landsat TM image of March 15, 2001

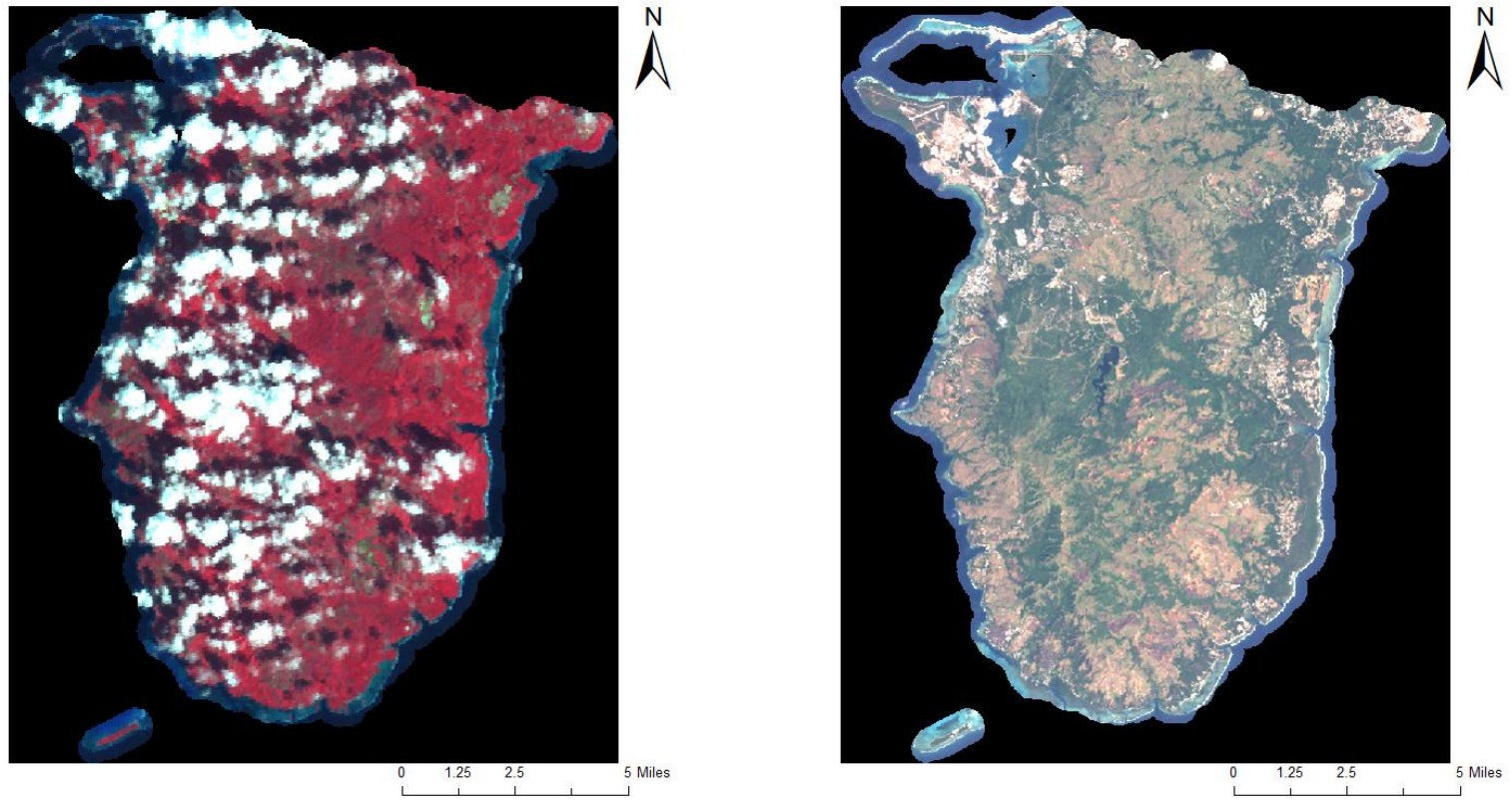


Figure 6. Subset Landsat images (Left: subset Landsat MSS image of 1973; Right: subset Landsat TM image of 2001)

Methods

Just as stated in Wen et. al. 2009, supervised classification was used to classify land cover information from Landsat MSS image of November 14, 1973 and Landsat TM image of March 15, 2001. A signature file was needed for each satellite image. A signature is a set of data that defines a training sample or cluster. A signature corresponds to a class in a classification process (Leica Geosystems Geospatial Imaging, LLC, 2005). In order to use a signature file for classification, the signature must be good enough for use. The error matrix table for the signature file used to classify the Landsat TM image of 2001 is shown in Table 1. The information from the table indicates that a very small portion of trainings for each class are classified by mistake as other class categories. Thus it can be used for classification. Otherwise, a new signature file should be created, until the signature file meets the user's requirement. The same consideration is applied to create a signature file for classification of Landsat MSS image. The only difference is that clouds and shadows will be removed from Landsat MSS image before a signature file is created.

Reference Data				
Classified Data	Urban	Forest	Water	Burned
Urban	91.11	1.36	0.00	1.09
Forest	0.00	98.30	0.00	0.00
Water	0.00	0.00	100.00	0.00
Burned	0.00	0.00	0.00	98.18
Cloud	0.00	0.00	0.00	0.00
Barren	8.46	0.00	0.00	0.00
Grassland	0.43	0.34	0.00	0.73
Column Total	461	294	232	275

Reference Data (Cont.)				
Classified Data	Cloud	Barren	Grassland	Row Total
Urban	0.00	0.63	0.47	432
Forest	0.00	0.00	0.93	295
Water	0.00	0.00	0.00	232
Burned	0.00	0.00	0.00	270
Cloud	100.00	0.00	0.00	76
Barren	0.00	98.73	0.16	351
Grassland	0.00	0.63	98.44	640
Column Total	76	315	643	2296

Table 1. Error matrix table from signature file used for classification of Landsat TM image

When classification process is completed, accuracy assessment follows so as to make sure the classification is accurate enough for use. Accuracy assessment is a term for comparing the classification to geographical data which are assumed to be true, in order to determine the accuracy of the classification process. Since it is impossible to ground truth all pixels of a classified image, a set of randomly selected pixels, whose true values should be known, will be used. ERDAS IMAGINE Accuracy Assessment tool is used to conduct an accuracy assessment in this study. ERDAS IMAGINE uses a square window to select the reference pixels. The size of the window can be defined by users. Three different types of distribution are offered for selecting the random pixels, i.e., random—no rules are used, stratified random—the number of points is stratified to the distribution of thematic layer classes, and equalized random—each class has an equal number of random points (Leica Geosystems Geospatial Imaging, LLC, 2005). The reference pixels are selected randomly without rules for this study. ERDAS IMAGINE Accuracy Assessment tool is used to conduct watershed land cover classification accuracy assessment for southern Guam.

RESULTS AND DISCUSSION

Figure 7 shows part of the Accuracy Assessment CellArray used to conduct classification accuracy assessment for land cover of 1973 derived from Landsat MSS image of 1973. The class value of Point ID# 1 from the classified image class value is 1, while the reference data value is also 1. That means that the land cover on this point is classified correctly. However, the class value of Point ID# 20 (= 2) is not equal to the corresponding reference data value which is equal to 1. That means the classification for this point is wrong. After all randomly selected pixels are compared with the corresponding reference data, an error report can be generated by using ERDAS IMAGINE Accuracy Assessment tool. The classification accuracy assessment report for land cover of 1973 is listed in Table 2. The overall accuracy of 1973 watershed land cover is 82.74%, and the overall Kappa statistics is 0.7658. The Kappa statistics is used to express how many errors a classification process can avoid compared with those generated by a completely random classification. The land cover classification for Landsat MSS image can avoid about 76.6% of the errors that a completely random classification generates. Considering the relatively low spatial resolution and few bands available from Landsat MSS, the land cover classification result is very satisfactory. There are five general classes for the land cover of watersheds in the southern Guam, i.e., forest, grassland, barren land, urban area and water (Figure 5).

The image quality of Landsat TM data of March 15, 2001 is pretty high. Only small areas are covered by clouds. The supervised classification with parametric rule of maximum likelihood was applied to extract land cover information. IKONOS imagery with acquisition dates of November 30, 2000 and February 23, 2001, and QuickBird image of 2006 are applied as reference data for land cover accuracy assessment. There are seven general classes, i.e., forest, grassland, barren land, urban area, burned area, water and cloud (Figure 6). The overall accuracy is 90.42%, and the overall Kappa statistics is 0.8802 (Table 3). That means the classification can avoid about 88% of the errors that a completely random classification generates.

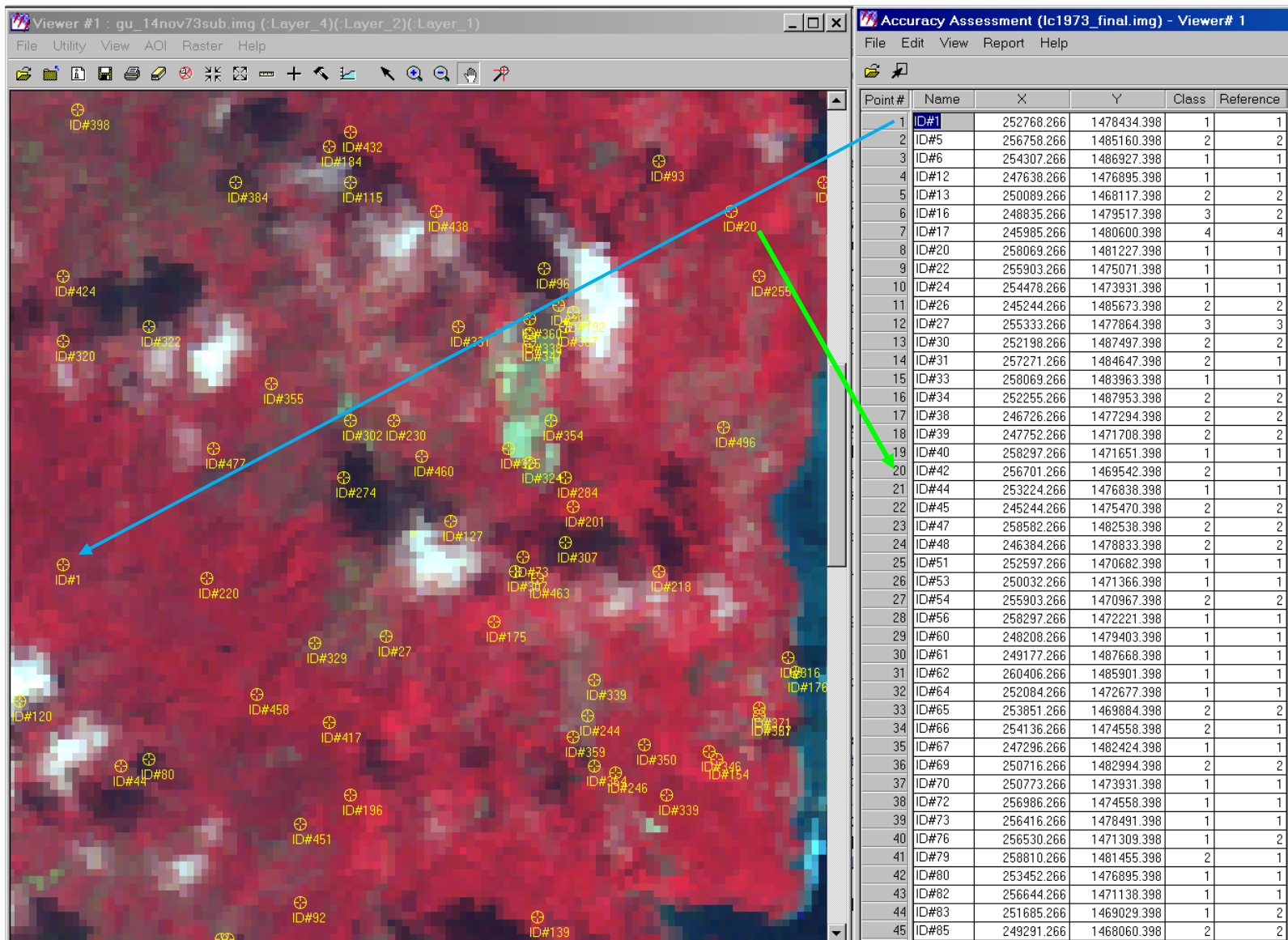


Figure 7. Accuracy Assessment CellArray used to assess the accuracy of land cover derived from Landsat MSS image of 1973

CLASS NAME	REFERENCE TOTALS	CLASSIFIED TOTALS	NUMBER CORRECT	PRODUCERS ACCURACY	USERS ACCURACY
FOREST	151	134	119	78.81%	88.81%
GRASSLAND	118	118	88	74.58%	74.58%
BARREN	43	58	41	95.35%	70.69%
URBAN	61	61	57	93.44%	93.44%
WATER	21	23	21	100.00%	91.30%
TOTALS	394	394	326		

OVERALL CLASSIFICATION ACCURACY = 82.74%

OVERALL KAPPA STATISTICS = 0.7658

CONDITIONAL KAPPA FOR EACH CATEGORY.

CLASS NAME	KAPPA
FOREST	0.8185
GRASSLAND	0.6371
BARREN	0.6710
URBAN	0.9224
WATER	0.9081

Table 2. Classification accuracy assessment report for land cover of 1973

CLASS NAME	REFERENCE TOTALS	CLASSIFIED TOTALS	NUMBER CORRECT	PRODUCERS ACCURACY	USERS ACCURACY
URBAN	44	60	42	95.45%	70.00%
FOREST	114	114	110	96.49%	96.49%
WATER	31	31	31	100.00%	100.00%
BURNED	31	31	31	100.00%	100.00%
CLOUD	10	12	10	100.00%	83.33%
BARREN	43	33	28	65.12%	84.85%
GRASSLAND	61	53	50	81.97%	94.34%
TOTALS	334	334	302		

OVERALL CLASSIFICATION ACCURACY = 90.42%

OVERALL KAPPA STATISTICS = 0.8802

CONDITIONAL KAPPA FOR EACH CATEGORY.

CLASS NAME	KAPPA
URBAN	0.6545
FOREST	0.9467
WATER	1.0000
BURNED	1.0000
CLOUD	0.8282
BARREN	0.8261
GRASSLAND	0.9307

Table 3. Classification accuracy assessment report for land cover of 2001

CONCLUSIONS AND RECOMMENDATIONS

When land cover information is derived from satellite images, it is important to perform land cover classification accuracy assessment to make sure whether the classification is good enough for use. In order to conduct classification accuracy assessment, we need to find quality reference data to be used for comparison with the values of the corresponding random points from the classified image. The multi-spectral Landsat images can be utilized to extract land cover information, and meanwhile they can also be used as reference data if the quality is good enough. In this study, the Landsat MSS image is covered by a lot of clouds and shadows in addition to its coarse spatial resolution. Therefore, it is definitely not working if there are not other data available as reference data. Fortunately, DLG data and DRG data from USGS, aerial photos of 1975 are available.

The data quality of Landsat TM of 2001 is excellent except for a few clouds found in the study area. However, the class types of some points from the TM image are difficult to be identified if it is used as reference data. That's why higher resolution IKONOS imagery with acquisition dates of November 30, 2000 and February 23, 2001 is obtained as reference data for accuracy assessment of land cover of 2001. Since there are some clouds and shadows in the IKONOS image, QuickBird of 2006 is used to assist the accuracy assessment process for the classified image of 2001.

The overall accuracy of 1973 watershed land cover is 82.74%, and the overall Kappa statistics is 0.7658. The overall accuracy is 90.42%, and the overall Kappa statistics is 0.8802. Considering the bad quality of Landsat MSS image, the classification accuracy is satisfactory. By comparison of the accuracy assessment results for land cover of 1973 and 2001, the following conclusions can be made.

- The classification accuracy of 1973 Land cover is lower than that of 2001 land cover.
- Most of misclassifications for 1973 land cover are forest and grassland, grassland and badland.
- Most of misclassifications for 2001 land cover are forest and grassland, built-up area and badland.
- Land cover classification accuracy is affected by the quality and resolution of source data.

The classification accuracy assessment is crucial to quality control and quality assurance of land cover in watersheds of southern Guam. High quality land cover information can be used for erosion modeling, water resource management, watershed planning, and environmental modeling. The methods and technologies used in this study and the watershed land cover change project (Wen, Khosrowpanah and Heitz, 2009) can be used to assess land cover data in other tropical islands in the western Pacific region such as the Commonwealth of the Northern Mariana Islands (CNMI), and the Federated States of Micronesia (FSM).

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APPENDICES

1. Accuracy Assessment CellArray for land cover of 1973

ROW	NAME	X	Y	CLASS	REFERENCE
1	ID#1	252768.266	1478434.398	1	1
2	ID#5	256758.266	1485160.398	2	2
3	ID#6	254307.266	1486927.398	1	1
4	ID#12	247638.266	1476895.398	1	1
5	ID#13	250089.266	1468117.398	2	2
6	ID#16	248835.266	1479517.398	3	2
7	ID#17	245985.266	1480600.398	4	4
8	ID#20	258069.266	1481227.398	1	1
9	ID#22	255903.266	1475071.398	1	1
10	ID#24	254478.266	1473931.398	1	1
11	ID#26	245244.266	1485673.398	2	2
12	ID#27	255333.266	1477864.398	3	3
13	ID#30	252198.266	1487497.398	2	2
14	ID#31	257271.266	1484647.398	2	1
15	ID#33	258069.266	1483963.398	1	1
16	ID#34	252255.266	1487953.398	2	2
17	ID#38	246726.266	1477294.398	2	2
18	ID#39	247752.266	1471708.398	2	2
19	ID#40	258297.266	1471651.398	1	1
20	ID#42	256701.266	1469542.398	2	1
21	ID#44	253224.266	1476838.398	1	1
22	ID#45	245244.266	1475470.398	2	2
23	ID#47	258582.266	1482538.398	2	2
24	ID#48	246384.266	1478833.398	2	2
25	ID#51	252597.266	1470682.398	1	1
26	ID#53	250032.266	1471366.398	1	1
27	ID#54	255903.266	1470967.398	2	2
28	ID#56	258297.266	1472221.398	1	1
29	ID#60	248208.266	1479403.398	1	1
30	ID#61	249177.266	1487668.398	1	1
31	ID#62	260406.266	1485901.398	1	1
32	ID#64	252084.266	1472677.398	1	1
33	ID#65	253851.266	1469884.398	2	2
34	ID#66	254136.266	1474558.398	2	1
35	ID#67	247296.266	1482424.398	1	1
36	ID#69	250716.266	1482994.398	2	2
37	ID#70	250773.266	1473931.398	1	1
38	ID#72	256986.266	1474558.398	1	1
39	ID#73	256416.266	1478491.398	1	1
40	ID#76	256530.266	1471309.398	1	2
41	ID#79	258810.266	1481455.398	2	1
42	ID#80	253452.266	1476895.398	1	1
43	ID#82	256644.266	1471138.398	1	1
44	ID#83	251685.266	1469029.398	1	2
45	ID#85	249291.266	1468060.398	2	2
46	ID#89	256074.266	1474216.398	1	1
47	ID#91	257898.266	1473703.398	1	1

Accuracy Assessment CellArray for land cover of 1973 (Cont.)

ROW	NAME	X	Y	CLASS	REFERENCE
48	ID#92	254649.266	1475755.398	1	1
49	ID#93	257499.266	1481626.398	1	1
50	ID#95	256758.266	1472620.398	1	1
51	ID#96	256587.266	1480771.398	1	1
52	ID#100	254535.266	1470397.398	3	3
53	ID#101	247638.266	1476040.398	1	1
54	ID#102	249063.266	1471024.398	2	2
55	ID#104	244959.266	1476952.398	2	3
56	ID#106	245472.266	1484419.398	2	2
57	ID#110	250659.266	1484932.398	2	2
58	ID#111	255561.266	1484077.398	2	1
59	ID#115	255048.266	1481455.398	1	1
60	ID#116	250203.266	1469485.398	2	2
61	ID#118	249348.266	1481455.398	1	1
62	ID#119	248550.266	1481854.398	1	2
63	ID#120	252426.266	1477351.398	1	1
64	ID#121	249234.266	1476439.398	1	1
65	ID#124	256815.266	1486585.398	2	1
66	ID#127	255846.266	1478776.398	2	2
67	ID#128	250545.266	1486243.398	2	2
68	ID#131	250659.266	1480714.398	1	1
69	ID#133	250488.266	1474843.398	1	1
70	ID#135	256017.266	1485445.398	1	1
71	ID#136	245814.266	1475185.398	3	2
72	ID#139	256530.266	1475641.398	1	1
73	ID#140	249177.266	1488637.398	1	1
74	ID#142	249804.266	1469257.398	1	1
75	ID#145	245700.266	1487098.398	1	1
76	ID#146	247866.266	1487041.398	1	1
77	ID#148	253452.266	1469656.398	1	2
78	ID#149	256302.266	1472905.398	1	1
79	ID#151	259665.266	1483621.398	2	2
80	ID#153	252027.266	1483906.398	2	2
81	ID#154	257955.266	1476895.398	4	1
82	ID#155	247638.266	1476952.398	1	1
83	ID#158	244617.266	1485787.398	2	1
84	ID#159	251286.266	1488751.398	1	2
85	ID#160	258297.266	1483906.398	1	1
86	ID#162	249975.266	1469485.398	1	2
87	ID#167	253167.266	1485445.398	1	2
88	ID#170	246270.266	1475242.398	2	2
89	ID#171	248493.266	1467319.398	2	2
90	ID#173	253053.266	1468459.398	2	2
91	ID#174	249120.266	1487440.398	1	1
92	ID#175	256188.266	1477978.398	2	2
93	ID#176	258582.266	1477579.398	2	2
94	ID#179	248949.266	1470283.398	1	1

Accuracy Assessment CellArray for land cover of 1973 (Cont.)

ROW	NAME	X	Y	CLASS	REFERENCE
95	ID#181	255561.266	1474843.398	2	2
96	ID#182	261261.266	1486243.398	4	4
97	ID#183	249234.266	1470112.398	1	1
98	ID#184	254877.266	1481740.398	2	1
99	ID#185	250260.266	1475185.398	1	1
100	ID#186	250716.266	1488580.398	2	2
101	ID#187	259095.266	1481968.398	1	1
102	ID#188	249063.266	1484476.398	1	1
103	ID#189	245871.266	1486984.398	1	2
104	ID#190	251913.266	1487611.398	2	2
105	ID#192	256815.266	1480429.398	1	1
106	ID#193	251172.266	1477807.398	5	5
107	ID#196	255048.266	1476610.398	1	1
108	ID#198	254307.266	1466749.398	2	1
109	ID#199	253908.266	1485730.398	1	2
110	ID#200	253737.266	1466521.398	2	2
111	ID#201	256815.266	1478890.398	1	1
112	ID#202	256359.266	1469086.398	2	1
113	ID#204	249747.266	1472791.398	1	2
114	ID#205	249519.266	1486813.398	1	1
115	ID#207	251172.266	1466350.398	2	2
116	ID#210	252027.266	1465951.398	2	2
117	ID#213	249063.266	1481284.398	1	1
118	ID#214	247524.266	1482823.398	1	1
119	ID#218	257499.266	1478377.398	1	2
120	ID#220	253908.266	1478320.398	1	1
121	ID#222	245928.266	1474615.398	1	1
122	ID#223	248208.266	1477693.398	1	1
123	ID#224	249804.266	1480144.398	1	1
124	ID#225	253167.266	1468288.398	2	2
125	ID#227	247866.266	1472563.398	2	2
126	ID#230	255390.266	1479574.398	2	2
127	ID#232	251001.266	1479346.398	2	2
128	ID#233	253110.266	1466578.398	2	2
129	ID#234	248208.266	1470739.398	1	1
130	ID#236	255276.266	1482709.398	2	1
131	ID#237	255846.266	1484020.398	2	2
132	ID#241	251856.266	1476781.398	1	1
133	ID#242	250545.266	1468174.398	1	1
134	ID#243	247923.266	1467376.398	1	2
135	ID#244	256929.266	1477237.398	4	4
136	ID#245	246783.266	1475527.398	1	1
137	ID#246	257157.266	1476781.398	4	1
138	ID#248	250203.266	1480714.398	1	1
139	ID#249	246498.266	1470568.398	2	2
140	ID#253	251058.266	1469314.398	1	1
141	ID#254	251343.266	1473133.398	1	1

Accuracy Assessment CellArray for land cover of 1973 (Cont.)

ROW	NAME	X	Y	CLASS	REFERENCE
142	ID#255	258297.266	1480714.398	2	1
143	ID#256	255333.266	1470169.398	2	2
144	ID#257	248037.266	1488580.398	1	1
145	ID#258	249519.266	1476097.398	1	1
146	ID#259	246498.266	1486414.398	2	2
147	ID#260	250716.266	1476781.398	1	1
148	ID#261	257385.266	1483393.398	1	1
149	ID#264	246270.266	1473418.398	1	1
150	ID#265	256701.266	1480486.398	4	4
151	ID#266	257841.266	1473760.398	2	2
152	ID#267	243705.266	1486870.398	1	1
153	ID#268	250488.266	1470511.398	1	1
154	ID#273	254991.266	1483792.398	2	1
155	ID#274	253623.266	1470511.398	2	2
156	ID#275	254934.266	1471081.398	2	2
157	ID#276	251058.266	1470112.398	2	1
158	ID#277	250830.266	1473076.398	2	2
159	ID#278	253680.266	1473019.398	2	2
160	ID#282	249747.266	1472449.398	1	1
161	ID#284	259209.266	1483792.398	4	4
162	ID#286	254706.266	1468174.398	3	1
163	ID#288	247125.266	1484305.398	2	4
164	ID#290	253851.266	1483108.398	2	2
165	ID#295	256986.266	1471252.398	2	1
166	ID#298	245358.266	1484362.398	2	4
167	ID#299	251970.266	1479061.398	1	1
168	ID#302	252255.266	1485502.398	2	2
169	ID#303	256644.266	1475356.398	2	2
170	ID#307	256359.266	1478377.398	2	1
171	ID#309	250659.266	1476610.398	1	1
172	ID#310	254649.266	1474273.398	1	1
173	ID#311	253737.266	1468459.398	2	2
174	ID#312	254478.266	1474672.398	1	1
175	ID#315	257214.266	1474501.398	1	1
176	ID#316	258525.266	1477693.398	1	1
177	ID#320	252768.266	1480201.398	2	2
178	ID#321	258297.266	1477237.398	4	4
179	ID#322	253452.266	1480315.398	2	3
180	ID#323	256986.266	1485730.398	2	2
181	ID#324	255048.266	1485844.398	2	2
182	ID#328	249006.266	1466692.398	2	4
183	ID#329	254763.266	1477807.398	2	2
184	ID#330	251457.266	1471651.398	1	1
185	ID#331	255903.266	1480315.398	2	2
186	ID#333	248094.266	1480144.398	1	1
187	ID#334	253851.266	1474045.398	1	1
188	ID#336	251742.266	1469656.398	2	1

Accuracy Assessment CellArray for land cover of 1973 (Cont.)

ROW	NAME	X	Y	CLASS	REFERENCE
189	ID#337	248778.266	1485445.398	2	2
190	ID#338	251343.266	1470169.398	1	1
191	ID#339	257556.266	1476610.398	1	1
192	ID#340	249063.266	1481455.398	2	1
193	ID#342	248949.266	1470910.398	2	2
194	ID#343	259380.266	1485673.398	1	1
195	ID#344	252027.266	1467490.398	1	1
196	ID#345	254706.266	1470967.398	2	2
197	ID#348	248037.266	1479232.398	3	2
198	ID#350	252255.266	1468117.398	2	1
199	ID#354	253566.266	1474273.398	2	2
200	ID#355	254421.266	1479859.398	2	1
201	ID#358	250602.266	1480201.398	1	1
202	ID#360	251400.266	1480600.398	1	1
203	ID#363	250602.266	1480771.398	1	1
204	ID#367	249177.266	1475755.398	1	1
205	ID#370	256416.266	1471024.398	2	2
206	ID#371	251457.266	1470112.398	2	2
207	ID#372	253509.266	1483507.398	2	2
208	ID#373	249405.266	1487611.398	2	1
209	ID#375	259722.266	1484932.398	1	1
210	ID#376	247353.266	1478320.398	1	1
211	ID#384	254136.266	1481455.398	3	3
212	ID#385	251343.266	1480201.398	1	1
213	ID#386	251343.266	1484020.398	2	2
214	ID#388	250830.266	1482025.398	2	2
215	ID#392	257499.266	1485616.398	2	2
216	ID#396	255504.266	1468744.398	2	2
217	ID#397	255105.266	1474786.398	2	2
218	ID#398	252882.266	1482025.398	1	2
219	ID#399	247125.266	1476553.398	1	1
220	ID#401	252597.266	1482253.398	1	1
221	ID#402	250260.266	1469086.398	2	2
222	ID#403	259380.266	1485160.398	1	1
223	ID#409	253110.266	1485559.398	1	1
224	ID#412	249291.266	1482025.398	2	2
225	ID#413	248550.266	1487155.398	3	3
226	ID#415	250146.266	1470340.398	2	2
227	ID#416	246384.266	1478206.398	2	2
228	ID#417	254877.266	1477180.398	1	1
229	ID#424	252768.266	1480714.398	2	1
230	ID#425	257784.266	1485730.398	1	1
231	ID#426	248436.266	1479004.398	2	1
232	ID#430	258240.266	1485901.398	1	1
233	ID#431	249690.266	1466806.398	2	1
234	ID#432	255048.266	1481854.398	1	1
235	ID#433	250488.266	1472848.398	1	1

Accuracy Assessment CellArray for land cover of 1973 (Cont.)

ROW	NAME	X	Y	CLASS	REFERENCE
236	ID#434	252426.266	1474615.398	2	2
237	ID#437	250317.266	1488352.398	1	1
238	ID#438	255732.266	1481227.398	1	1
239	ID#439	247467.266	1483165.398	2	2
240	ID#442	246384.266	1478662.398	2	2
241	ID#443	255789.266	1469314.398	1	2
242	ID#445	251400.266	1475185.398	1	1
243	ID#446	257043.266	1483735.398	1	1
244	ID#451	254649.266	1476382.398	1	1
245	ID#452	251115.266	1482709.398	2	2
246	ID#453	250317.266	1479346.398	2	1
247	ID#454	257043.266	1485046.398	2	2
248	ID#456	251400.266	1481626.398	2	2
249	ID#458	254307.266	1477408.398	1	1
250	ID#459	248550.266	1481341.398	1	1
251	ID#460	255618.266	1479289.398	2	2
252	ID#463	256530.266	1478320.398	2	2
253	ID#464	250830.266	1485673.398	2	2
254	ID#465	245358.266	1486243.398	4	4
255	ID#466	249063.266	1480885.398	1	1
256	ID#467	248721.266	1482994.398	1	1
257	ID#469	257670.266	1472392.398	4	4
258	ID#470	252369.266	1466065.398	2	2
259	ID#474	249120.266	1470112.398	1	2
260	ID#475	254820.266	1472620.398	2	2
261	ID#477	253965.266	1479346.398	1	1
262	ID#481	256701.266	1482709.398	1	1
263	ID#483	246042.266	1485502.398	1	1
264	ID#489	244788.266	1476154.398	2	2
265	ID#491	245415.266	1484989.398	4	4
266	ID#493	250203.266	1476325.398	1	1
267	ID#494	253167.266	1472734.398	1	1
268	ID#495	254421.266	1486357.398	2	2
269	ID#496	258012.266	1479517.398	2	2
270	ID#497	250773.266	1476781.398	1	1
271	ID#498	248550.266	1468573.398	2	2
272	ID#500	245415.266	1485445.398	2	2
273	ID#273	254364.266	1469770.398	3	3
274	ID#274	254991.266	1479118.398	3	3
275	ID#275	254136.266	1487440.398	3	2
276	ID#276	254421.266	1474729.398	3	3
277	ID#277	254535.266	1470511.398	3	2
278	ID#278	253167.266	1486414.398	3	3
279	ID#279	251856.266	1469029.398	3	2
280	ID#280	254079.266	1469884.398	3	3
281	ID#281	250545.266	1474216.398	3	2
282	ID#282	254364.266	1469827.398	3	3

Accuracy Assessment CellArray for land cover of 1973 (Cont.)

ROW	NAME	X	Y	CLASS	REFERENCE
283	ID#283	254421.266	1471024.398	3	3
284	ID#284	256758.266	1479118.398	3	4
285	ID#285	254934.266	1473532.398	3	3
286	ID#286	252084.266	1483621.398	3	3
287	ID#287	254592.266	1469884.398	3	3
288	ID#288	254193.266	1470112.398	3	3
289	ID#289	252084.266	1468174.398	3	3
290	ID#290	254478.266	1471480.398	3	3
291	ID#291	251514.266	1478947.398	3	3
292	ID#292	256530.266	1472278.398	3	3
293	ID#293	254934.266	1472107.398	3	3
294	ID#294	254364.266	1482766.398	3	2
295	ID#295	254364.266	1469884.398	3	3
296	ID#296	253566.266	1472221.398	3	3
297	ID#297	256530.266	1471537.398	3	2
298	ID#298	254250.266	1471138.398	3	3
299	ID#299	252882.266	1471081.398	3	2
300	ID#300	254079.266	1475470.398	3	3
301	ID#301	251001.266	1488694.398	3	2
302	ID#302	255048.266	1479574.398	3	3
303	ID#303	249291.266	1481797.398	3	2
304	ID#304	252198.266	1468003.398	3	3
305	ID#305	255504.266	1470739.398	3	3
306	ID#306	254649.266	1470340.398	3	3
307	ID#307	256758.266	1478605.398	3	2
308	ID#308	245073.266	1476211.398	3	3
309	ID#309	245472.266	1476154.398	3	3
310	ID#310	245871.266	1475869.398	3	3
311	ID#311	254307.266	1471138.398	3	3
312	ID#312	251001.266	1482310.398	3	2
313	ID#313	255105.266	1471822.398	3	3
314	ID#314	254535.266	1470511.398	3	3
315	ID#315	248094.266	1472620.398	3	3
316	ID#316	254535.266	1472392.398	3	2
317	ID#317	245472.266	1476154.398	3	3
318	ID#318	251286.266	1466692.398	3	3
319	ID#319	251685.266	1483393.398	3	3
320	ID#320	254022.266	1475470.398	3	3
321	ID#321	254136.266	1471081.398	3	3
322	ID#322	254250.266	1471081.398	3	3
323	ID#323	259437.266	1486243.398	4	4
324	ID#324	256473.266	1479232.398	4	4
325	ID#325	256302.266	1479346.398	4	4
326	ID#326	258867.266	1483336.398	4	4
327	ID#327	262059.266	1486015.398	4	4
328	ID#328	247980.266	1485217.398	4	4
329	ID#329	245472.266	1484305.398	4	4

Accuracy Assessment CellArray for land cover of 1973 (Cont.)

ROW	NAME	X	Y	CLASS	REFERENCE
330	ID#330	249519.266	1489606.398	4	4
331	ID#331	246726.266	1480315.398	4	4
332	ID#332	257556.266	1471537.398	4	4
333	ID#333	257727.266	1472221.398	4	4
334	ID#334	248094.266	1481170.398	4	4
335	ID#335	248094.266	1482196.398	4	4
336	ID#336	262059.266	1486072.398	4	4
337	ID#337	259722.266	1486072.398	4	4
338	ID#338	256473.266	1480258.398	4	4
339	ID#339	256986.266	1477522.398	4	4
340	ID#340	245700.266	1484305.398	4	4
341	ID#341	245586.266	1479061.398	4	4
342	ID#342	261888.266	1486357.398	4	4
343	ID#343	258810.266	1483336.398	4	4
344	ID#344	257784.266	1472620.398	4	4
345	ID#345	244503.266	1486642.398	4	4
346	ID#346	257898.266	1476952.398	4	4
347	ID#347	256473.266	1480201.398	4	4
348	ID#348	247353.266	1481626.398	4	4
349	ID#349	245700.266	1478947.398	4	4
350	ID#350	257385.266	1477009.398	4	1
351	ID#351	248037.266	1482139.398	4	4
352	ID#352	249462.266	1482823.398	4	4
353	ID#353	257670.266	1472848.398	4	4
354	ID#354	256644.266	1479574.398	4	4
355	ID#355	246954.266	1486813.398	4	4
356	ID#356	259950.266	1486072.398	4	4
357	ID#357	258297.266	1477237.398	4	4
358	ID#358	245301.266	1486357.398	4	4
359	ID#359	256815.266	1477066.398	4	4
360	ID#360	256473.266	1480372.398	4	4
361	ID#361	245814.266	1484476.398	4	4
362	ID#362	248037.266	1481797.398	4	4
363	ID#363	262287.266	1486129.398	4	4
364	ID#364	256986.266	1476838.398	4	4
365	ID#365	258240.266	1486414.398	4	4
366	ID#366	245871.266	1486186.398	4	4
367	ID#367	256758.266	1480315.398	4	4
368	ID#368	248436.266	1481056.398	4	4
369	ID#369	258753.266	1483507.398	4	4
370	ID#370	261660.266	1486414.398	4	4
371	ID#371	258297.266	1477294.398	4	1
372	ID#372	262116.266	1485844.398	4	4
373	ID#373	251457.266	1478035.398	5	5
374	ID#374	250773.266	1476496.398	5	5
375	ID#375	251058.266	1478092.398	5	5
376	ID#376	251229.266	1478320.398	5	5

Accuracy Assessment CellArray for land cover of 1973 (Cont.)

ROW	NAME	X	Y	CLASS	REFERENCE
377	ID#378	251172.266	1478035.398	5	5
378	ID#379	251514.266	1478263.398	5	5
379	ID#380	251115.266	1478092.398	5	5
380	ID#382	251001.266	1478035.398	5	5
381	ID#383	250887.266	1477294.398	5	5
382	ID#388	251001.266	1477921.398	5	5
383	ID#390	250773.266	1477123.398	5	5
384	ID#391	251172.266	1477636.398	5	5
385	ID#393	250773.266	1477636.398	5	5
386	ID#397	250830.266	1477750.398	5	5
387	ID#398	251514.266	1478092.398	5	5
388	ID#399	250773.266	1477294.398	5	5
389	ID#401	256416.266	1483906.398	5	1
390	ID#403	250944.266	1477807.398	5	5
391	ID#405	251001.266	1477807.398	5	5
392	ID#406	255105.266	1484305.398	5	1
393	ID#409	251514.266	1478206.398	5	5
394	ID#411	251058.266	1478206.398	5	5

2. Accuracy Assessment CellArray for land cover of 2001

ROW	NAME	X	Y	CLASS	REFERENCE
1	ID#1	244474.766	1476523.667	2	2
2	ID#2	249519.266	1473246.167	11	11
3	ID#3	254706.266	1466976.167	2	2
4	ID#4	250345.766	1469113.667	11	2
5	ID#8	257157.266	1472020.667	1	1
6	ID#10	262173.266	1485672.167	2	2
7	ID#12	256330.766	1470111.167	2	2
8	ID#13	246811.766	1474386.167	11	11
9	ID#14	257926.766	1470738.167	2	2
10	ID#15	255019.766	1482394.667	11	11
11	ID#16	249604.766	1479915.167	2	2
12	ID#18	254877.266	1481739.167	2	2
13	ID#19	250231.766	1483591.667	2	2
14	ID#22	245016.266	1484988.167	1	1
15	ID#23	258325.766	1474101.167	2	2
16	ID#25	255190.766	1477806.167	1	1
17	ID#27	250801.766	1475041.667	2	2
18	ID#30	245301.266	1476352.667	2	2
19	ID#31	250830.266	1466263.667	11	11
20	ID#37	257755.766	1476580.667	2	2
21	ID#39	256416.266	1480570.667	2	2
22	ID#40	244674.266	1485273.167	2	2
23	ID#42	255760.766	1478632.667	11	11
24	ID#44	248550.266	1475953.667	2	2
25	ID#46	258040.766	1472305.667	2	2
26	ID#47	250174.766	1471365.167	11	11
27	ID#48	247809.266	1479231.167	11	11
28	ID#49	252084.266	1467204.167	2	11
29	ID#51	255162.266	1486356.167	2	2
30	ID#53	253338.266	1471878.167	2	2
31	ID#56	252454.766	1485301.667	11	11
32	ID#57	250431.266	1468857.167	2	2
33	ID#58	254991.266	1486242.167	2	2
34	ID#60	247980.266	1477008.167	2	2
35	ID#62	249604.766	1480029.167	2	2
36	ID#63	254079.266	1466377.667	2	2
37	ID#64	254164.766	1467774.167	11	10
38	ID#65	249177.266	1467688.667	11	11
39	ID#66	251941.766	1474072.667	2	11
40	ID#67	248208.266	1467688.667	2	11
41	ID#70	251001.266	1473103.667	11	11
42	ID#74	254563.766	1468771.667	1	1
43	ID#75	248008.766	1471593.167	2	2
44	ID#76	249718.766	1470196.667	2	2
45	ID#78	251086.766	1466548.667	1	10
46	ID#79	251400.266	1477977.167	3	3
47	ID#81	247153.766	1478262.167	1	10

Accuracy Assessment CellArray for land cover of 2001 (Cont.)

ROW	NAME	X	Y	CLASS	REFERENCE
48	ID#85	250773.266	1478547.167	2	2
49	ID#87	246042.266	1476979.667	1	10
50	ID#89	252796.766	1483107.167	11	11
51	ID#90	250374.266	1482907.667	1	1
52	ID#97	251143.766	1484902.667	1	10
53	ID#99	249519.266	1487239.667	2	2
54	ID#101	257328.266	1472106.167	1	1
55	ID#103	249889.766	1487952.167	2	2
56	ID#104	255133.766	1469997.167	11	11
57	ID#107	249861.266	1486612.667	2	2
58	ID#108	255988.766	1478746.667	11	11
59	ID#109	253366.766	1471450.667	11	11
60	ID#110	251884.766	1477521.167	2	2
61	ID#111	250146.266	1473673.667	11	11
62	ID#112	253395.266	1472419.667	2	2
63	ID#118	254136.266	1471764.167	11	11
64	ID#119	259864.766	1483449.167	2	2
65	ID#120	246127.766	1479915.167	2	2
66	ID#121	249576.266	1478803.667	11	11
67	ID#122	248407.766	1484332.667	2	2
68	ID#123	261517.766	1486071.167	1	1
69	ID#124	249690.266	1473217.667	11	11
70	ID#125	255304.766	1475155.667	11	11
71	ID#126	256159.766	1484503.667	2	2
72	ID#128	258696.266	1482366.167	1	1
73	ID#129	250003.766	1473445.667	2	2
74	ID#133	248379.266	1476267.167	2	2
75	ID#134	249975.266	1476894.167	2	2
76	ID#138	255960.266	1486983.167	2	2
77	ID#139	251029.766	1470538.667	11	11
78	ID#140	248806.766	1481055.167	2	2
79	ID#145	254250.266	1473531.167	2	2
80	ID#146	256672.766	1475497.667	2	2
81	ID#147	244360.766	1487040.167	1	1
82	ID#149	251685.266	1466577.167	11	11
83	ID#150	251742.266	1475412.167	2	2
84	ID#151	248293.766	1489348.667	1	1
85	ID#153	246726.266	1480684.667	1	1
86	ID#155	256387.766	1479430.667	1	1
87	ID#156	256900.766	1483249.667	2	2
88	ID#158	258895.766	1482423.167	10	10
89	ID#159	247951.766	1479145.667	11	11
90	ID#160	259579.766	1483420.667	1	1
91	ID#162	249063.266	1472419.667	2	2
92	ID#164	244560.266	1486954.667	1	1
93	ID#165	252939.266	1481824.667	2	2
94	ID#166	256501.766	1481995.667	2	2

Accuracy Assessment CellArray for land cover of 2001 (Cont.)

ROW	NAME	X	Y	CLASS	REFERENCE
95	ID#167	251571.266	1470396.167	10	10
96	ID#174	258211.766	1476637.667	1	1
97	ID#175	256900.766	1476637.667	2	2
98	ID#177	247039.766	1472932.667	11	11
99	ID#178	252084.266	1473474.167	11	11
100	ID#179	245899.766	1478205.167	11	11
101	ID#181	255703.766	1476865.667	2	2
102	ID#182	249120.266	1480770.167	1	1
103	ID#183	250630.766	1471792.667	2	2
104	ID#185	253509.266	1465950.167	2	2
105	ID#188	247552.766	1471393.667	11	11
106	ID#191	250089.266	1470481.667	2	2
107	ID#192	254649.266	1476694.667	2	2
108	ID#193	247011.266	1483620.167	11	11
109	ID#198	250602.266	1476466.667	2	2
110	ID#199	248493.266	1485330.167	2	2
111	ID#200	250060.766	1487125.667	2	2
112	ID#201	253822.766	1477606.667	2	2
113	ID#202	256558.766	1478319.167	1	1
114	ID#203	249604.766	1466064.167	2	2
115	ID#204	252711.266	1470681.167	2	2
116	ID#205	258439.766	1476523.667	2	2
117	ID#207	248521.766	1482252.167	1	1
118	ID#210	256815.266	1482337.667	2	2
119	ID#213	248578.766	1484902.667	2	2
120	ID#215	242821.766	1486897.667	2	2
121	ID#216	253224.266	1482622.667	11	11
122	ID#217	254592.266	1486441.667	2	2
123	ID#220	250345.766	1466776.667	1	10
124	ID#222	252825.266	1483392.167	11	11
125	ID#223	254364.266	1466520.167	1	1
126	ID#226	253167.266	1475497.667	11	11
127	ID#231	254364.266	1484475.167	10	10
128	ID#232	253936.766	1481511.167	11	11
129	ID#238	255219.266	1478404.667	1	1
130	ID#239	251086.766	1484218.667	11	11
131	ID#242	249405.266	1468087.667	2	2
132	ID#244	254706.266	1478889.167	11	11
133	ID#245	252768.266	1476979.667	5	5
134	ID#246	247723.766	1471108.667	2	2
135	ID#248	249690.266	1475925.167	2	2
136	ID#249	248293.766	1470624.167	2	2
137	ID#251	255475.766	1472362.667	1	11
138	ID#253	257499.266	1485928.667	2	2
139	ID#255	250488.266	1480485.167	11	11
140	ID#257	250659.266	1467660.167	11	11
141	ID#258	257698.766	1478974.667	2	2

Accuracy Assessment CellArray for land cover of 2001 (Cont.)

ROW	NAME	X	Y	CLASS	REFERENCE
142	ID#260	246754.766	1470937.667	2	2
143	ID#263	244959.266	1486783.667	1	1
144	ID#264	253936.766	1477236.167	2	2
145	ID#266	247581.266	1488778.667	2	2
146	ID#268	251770.766	1487667.167	11	11
147	ID#269	250801.766	1470282.167	2	2
148	ID#271	253737.266	1482679.667	11	11
149	ID#273	253908.266	1483449.167	2	2
150	ID#274	249975.266	1471507.667	2	2
151	ID#279	252825.266	1472134.667	2	2
152	ID#281	253822.766	1469968.667	11	11
153	ID#283	257698.766	1483591.667	2	2
154	ID#285	257442.266	1483050.167	2	2
155	ID#286	253338.266	1475868.167	11	11
156	ID#287	255789.266	1476010.667	2	2
157	ID#290	255789.266	1479601.667	1	1
158	ID#292	249946.766	1489263.167	1	1
159	ID#298	246156.266	1478376.167	1	11
160	ID#299	253680.266	1482651.167	11	11
161	ID#301	256131.266	1475668.667	2	2
162	ID#302	257242.766	1483734.167	2	2
163	ID#304	254905.766	1471108.667	1	11
164	ID#306	257727.266	1482879.167	2	2
165	ID#309	260634.266	1485928.667	2	2
166	ID#311	250231.766	1480884.167	2	2
167	ID#314	255162.266	1481083.667	2	2
168	ID#315	250231.766	1481140.667	11	11
169	ID#316	250602.266	1472448.167	2	2
170	ID#318	247438.766	1487154.167	1	1
171	ID#319	253309.766	1466947.667	1	10
172	ID#323	253509.266	1479630.167	11	11
173	ID#325	259608.266	1482337.667	1	10
174	ID#327	257670.266	1481226.167	2	2
175	ID#328	246954.266	1478091.167	11	11
176	ID#331	249120.266	1480257.167	2	2
177	ID#333	249262.766	1485672.167	2	2
178	ID#334	249034.766	1475839.667	2	2
179	ID#335	254592.266	1473474.167	11	10
180	ID#336	253224.266	1481739.167	11	11
181	ID#337	249547.766	1475782.667	2	2
182	ID#339	246355.766	1486242.167	1	1
183	ID#342	253879.766	1475868.167	11	11
184	ID#343	258525.266	1476409.667	2	2
185	ID#345	252654.266	1475526.167	11	11
186	ID#348	255874.766	1471365.167	2	2
187	ID#351	253024.766	1465693.667	7	2
188	ID#352	261745.766	1485472.667	2	2

Accuracy Assessment CellArray for land cover of 2001 (Cont.)

ROW	NAME	X	Y	CLASS	REFERENCE
189	ID#353	261204.266	1485643.667	2	2
190	ID#354	244332.266	1486128.167	1	2
191	ID#356	248436.266	1477749.167	2	2
192	ID#357	252882.266	1482537.167	11	11
193	ID#360	248749.766	1486954.667	2	2
194	ID#361	253480.766	1472961.167	11	11
195	ID#363	248407.766	1470681.167	2	2
196	ID#364	250402.766	1468372.667	11	11
197	ID#365	252625.766	1481881.667	2	2
198	ID#369	253509.266	1470652.667	11	11
199	ID#370	257157.266	1469142.167	2	2
200	ID#374	252141.266	1473132.167	2	11
201	ID#376	257100.266	1478604.167	1	1
202	ID#377	256188.266	1486213.667	2	2
203	ID#382	250174.766	1479801.167	2	2
204	ID#383	251970.266	1485814.667	2	2
205	ID#384	259237.766	1483648.667	1	1
206	ID#385	247153.766	1482964.667	2	2
207	ID#388	252397.766	1470082.667	2	2
208	ID#392	257584.766	1478917.667	2	2
209	ID#394	252882.266	1472448.167	2	2
210	ID#396	258040.766	1483620.167	1	1
211	ID#397	254421.266	1468885.667	1	2
212	ID#399	258468.266	1485985.667	2	2
213	ID#400	247552.766	1477521.167	2	2
214	ID#214	251457.266	1478404.667	3	3
215	ID#215	250915.766	1477008.167	3	3
216	ID#216	251086.766	1477977.167	3	3
217	ID#217	251314.766	1478433.167	3	3
218	ID#218	250716.266	1477321.667	3	3
219	ID#219	251001.266	1477891.667	3	3
220	ID#220	251172.266	1478119.667	3	3
221	ID#221	250972.766	1477635.167	3	3
222	ID#222	251001.266	1478148.167	3	3
223	ID#223	250858.766	1476865.667	3	3
224	ID#224	250887.266	1476580.667	3	3
225	ID#225	251058.266	1477977.167	3	3
226	ID#226	251143.766	1478062.667	3	3
227	ID#227	251172.266	1478347.667	3	3
228	ID#228	251058.266	1478034.167	3	3
229	ID#229	251143.766	1478034.167	3	3
230	ID#230	251001.266	1477521.167	3	3
231	ID#231	250944.266	1478005.667	3	3
232	ID#232	250830.266	1477435.667	3	3
233	ID#233	251058.266	1477663.667	3	3
234	ID#234	250944.266	1476409.667	3	3
235	ID#235	250944.266	1477749.167	3	3

Accuracy Assessment CellArray for land cover of 2001 (Cont.)

ROW	NAME	X	Y	CLASS	REFERENCE
236	ID#236	250944.266	1477920.167	3	3
237	ID#237	250887.266	1477749.167	3	3
238	ID#238	250858.766	1476865.667	3	3
239	ID#239	251029.766	1477834.667	3	3
240	ID#240	251400.266	1478319.167	3	3
241	ID#241	250801.766	1477207.667	3	3
242	ID#242	251200.766	1478319.167	3	3
243	ID#243	251086.766	1478091.167	3	3
244	ID#244	251827.766	1468600.667	5	5
245	ID#245	247068.266	1468201.667	5	5
246	ID#246	252597.266	1476979.667	5	5
247	ID#247	248379.266	1468657.667	5	5
248	ID#248	247239.266	1468173.167	5	5
249	ID#249	246982.766	1468429.667	5	5
250	ID#250	255817.766	1470139.667	5	5
251	ID#251	251286.266	1468543.667	5	5
252	ID#252	255988.766	1483335.167	5	5
253	ID#253	248778.266	1467688.667	5	5
254	ID#254	254620.766	1475896.667	5	5
255	ID#255	247068.266	1478233.667	5	5
256	ID#256	254050.766	1468629.167	5	5
257	ID#257	250516.766	1467289.667	5	5
258	ID#258	251314.766	1465950.167	5	5
259	ID#259	250231.766	1470424.667	5	5
260	ID#260	246469.766	1479145.667	5	5
261	ID#261	254421.266	1479117.167	5	5
262	ID#262	251998.766	1476210.167	5	5
263	ID#263	253053.266	1468230.167	5	5
264	ID#264	252255.266	1467831.167	5	5
265	ID#265	251314.766	1468315.667	5	5
266	ID#266	251001.266	1467432.167	5	5
267	ID#267	251058.266	1468629.167	5	5
268	ID#268	249804.266	1482280.667	5	5
269	ID#269	254478.266	1469170.667	5	5
270	ID#270	246954.266	1468116.167	5	5
271	ID#271	252625.766	1468315.667	5	5
272	ID#272	254905.766	1471479.167	5	5
273	ID#273	251941.766	1468885.667	5	5
274	ID#278	250317.266	1487011.667	7	7
275	ID#279	247609.766	1483848.167	7	7
276	ID#280	247381.766	1479117.167	7	7
277	ID#285	247609.766	1479544.667	7	7
278	ID#287	249291.266	1481397.167	7	10
279	ID#289	247552.766	1479516.167	7	7
280	ID#294	247296.266	1475583.167	7	7
281	ID#295	247182.266	1478917.667	7	7
282	ID#300	247609.766	1483905.167	7	7
283	ID#301	247296.266	1478946.167	7	7
284	ID#302	247324.766	1479145.667	7	7
285	ID#304	251257.766	1478832.167	10	10

Accuracy Assessment CellArray for land cover of 2001 (Cont.)

ROW	NAME	X	Y	CLASS	REFERENCE
286	ID#305	256416.266	1478005.667	10	10
287	ID#306	258867.266	1480684.667	10	10
288	ID#307	252882.266	1474414.667	10	10
289	ID#308	260748.266	1486726.667	10	1
290	ID#309	251314.766	1483021.667	10	10
291	ID#310	245215.766	1476039.167	10	10
292	ID#311	255247.766	1472989.667	10	10
293	ID#312	254677.766	1473246.167	10	10
294	ID#313	254278.766	1472818.667	10	10
295	ID#314	257812.766	1480570.667	10	10
296	ID#315	258154.766	1479259.667	10	10
297	ID#316	254022.266	1488408.167	10	1
298	ID#317	254848.766	1471336.667	10	10
299	ID#318	251799.266	1474699.667	10	10
300	ID#319	252910.766	1474471.667	10	10
301	ID#320	254962.766	1473360.167	10	10
302	ID#321	251799.266	1471251.167	10	10
303	ID#322	255162.266	1470966.167	10	10
304	ID#323	255190.766	1478347.667	10	11
305	ID#324	258297.266	1479630.167	10	10
306	ID#325	254706.266	1484190.167	10	11
307	ID#326	255504.266	1473160.667	10	10
308	ID#327	254763.266	1483762.667	10	11
309	ID#328	255190.766	1470681.167	10	10
310	ID#329	254820.266	1471308.167	10	10
311	ID#330	254278.766	1469797.667	10	10
312	ID#331	258411.266	1479544.667	10	10
313	ID#332	258183.266	1479117.167	10	10
314	ID#333	254905.766	1472533.667	10	10
315	ID#334	256330.766	1469455.667	1	1
316	ID#335	247039.766	1484161.667	1	1
317	ID#336	257670.266	1472761.667	1	1
318	ID#337	245358.266	1485900.167	1	1
319	ID#338	250915.766	1466577.167	1	10
320	ID#339	245842.766	1484389.667	1	1
321	ID#340	246726.266	1475155.667	1	11
322	ID#341	249547.766	1484161.667	1	1
323	ID#342	250345.766	1466719.667	1	10
324	ID#343	246897.266	1471393.667	1	1
325	ID#344	245814.266	1485729.167	1	1
326	ID#345	255390.266	1472790.167	1	10
327	ID#346	247809.266	1483734.167	1	1
328	ID#347	248407.766	1482052.667	1	1
329	ID#348	248749.766	1489690.667	1	1
330	ID#349	246070.766	1484389.667	1	1
331	ID#350	252141.266	1466548.667	1	10
332	ID#351	258724.766	1479573.167	1	10
333	ID#352	250231.766	1482850.667	1	1
334	ID#353	246241.766	1485757.667	1	1