

# Monitoring Annual Land Use/Land Cover Change in the Tucson Metropolitan Area with Google Earth Engine (1986–2020)

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**Data Availability Statement:** The yearly LULC classification results, the GEE scripts and other ancillary data supporting this study are open-access; See Dubertret, F., Le Tourneau, F.M., Villarreal, M.L., and L.M. Norman. 2022. Annual (1986–2020) land-use/land cover maps of the Tucson metropolitan area, Arizona: U.S. Geological Survey data release, <https://doi.org/10.5066/P9XC5Y36> (accessed on 14 April 2022).

Table S1. Training/validation datasets composition.

Classes	Training polygons		Validation polygons	
	Number (total area)	Sample points	Number (total area)	Sample points
11. Water	9 (16.1 ha)	210	14 (39.3 ha)	277
21. Developed. Roads	31 (40.9 ha)	277	30 (39.8 ha)	277
22. Urban. Low Density	127 (82.6 ha)	277	152 (85.8 ha)	277
23. Urban. Med. Density	80 (365.8 ha)	277	91 (429.9 ha)	277
24. Urban. High Density	81 (123.2 ha)	277	78 (145.8 ha)	277
31. Barren. Washes	65 (30.0 ha)	277	70 (31.0 ha)	277
32. Barren. Mines	25 (1 092.3 ha)	277	33 (1 367.7 ha)	277
41. Deciduous Forest	55 (47.0 ha)	277	48 (38.4 ha)	277
42. Evergreen Forest	63 (122.8 ha)	277	53 (93.6 ha)	277
43. Rocky Outcrops	51 (281.9 ha)	277	51 (463.4 ha)	277
52. Shrubs	18 (255.3 ha)	277	13 (165.7 ha)	277
53. Shrubs. Dark	136 (1 897.4 ha)	277	125 (1 378.0 ha)	277
54. Shrubs. Bright	45 (397.5 ha)	277	40 (316.4 ha)	277
71. Grassland	58 (192.3 ha)	277	56 (96.2 ha)	277
81. Pasture and Parks	39 (344.5 ha)	277	38 (271.6 ha)	277
82. Cultivated Crops	30 (17.6 ha)	232	30 (19.1 ha)	251
83. Nut-Tree Plantations	8 (128.9 ha)	277	6 (75.3 ha)	277
91. Riparian Forest	34 (36.2 ha)	277	40 (49.5 ha)	277
<b>TOTAL</b>	<b>955 (5 472.5 ha)</b>	<b>4874</b>	<b>968 (5 106.7 ha)</b>	<b>4960</b>

**Table S2.** Confusion matrix of yearly land cover validations. UA= user's accuracies; PA=producer's accuracies; OA = Overall accuracies; Kappa = Kappa coefficients. Note: 2012 was not treated due to a lack of good quality data because of Landsat 7 issues and the delayed launch of Landsat 8 from July 2011 to February 2013.

1986		OA = 86.7%								Kappa = 0.854					
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00
21. Developed. Roads	0	273	0	0	0	0	4	0	0	0	0	0	0	0	0.99
22. Urban. Low Density	0	0	231	8	0	2	0	8	0	28	0	0	0	0	0.83
23. Urban. Med. Density	0	0	20	213	7	0	7	1	0	29	0	0	0	0	0.77
24. Urban. High Density	5	0	10	11	198	2	39	0	0	10	0	2	0	0	0.71
31. Barren. Washes	0	0	0	0	0	233	0	25	0	2	0	0	0	17	0.84
32. Barren. Mines	1	0	0	0	0	5	211	1	1	58	0	0	0	0	0.76
41. Deciduous Forest	0	0	0	0	0	6	0	227	0	4	22	3	1	14	0.82
42. Evergreen Forest	0	0	0	0	0	2	0	23	528	1	0	0	0	0	0.95
52. Shrubs	0	0	0	0	0	4	2	12	7	785	20	0	1	0	0.94
71. Grassland	0	0	0	0	0	0	0	23	0	15	232	0	7	0	0.84
81. Pasture and Parks	2	0	1	0	0	2	45	0	0	20	0	181	0	0	0.72
82. Cultivated Crops	0	0	0	0	0	3	0	8	8	26	0	10	497	2	0.90
91. Riparian Forest	0	0	0	0	0	8	0	45	2	2	0	0	2	218	0.79
UA		0.97	1.00	0.88	0.92	0.97	0.87	0.69	0.61	0.97	0.80	0.85	0.92	0.98	0.87

1987		OA = 89.2%								Kappa = 0.881					
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00
21. Developed. Roads	0	274	0	0	0	0	3	0	0	0	0	0	0	0	0.99
22. Urban. Low Density	0	0	237	6	0	2	0	8	0	24	0	0	0	0	0.86
23. Urban. Med. Density	0	0	20	214	6	0	7	1	0	29	0	0	0	0	0.77
24. Urban. High Density	5	0	8	10	204	2	37	0	0	9	0	2	0	0	0.74
31. Barren. Washes	0	0	0	0	0	238	0	22	0	2	1	0	0	14	0.86
32. Barren. Mines	1	0	0	0	0	2	218	1	1	54	0	0	0	0	0.79
41. Deciduous Forest	0	0	0	0	0	6	0	242	0	3	12	3	1	10	0.87
42. Evergreen Forest	0	0	0	0	0	2	0	14	537	1	0	0	0	0	0.97
52. Shrubs	0	0	0	0	0	3	1	10	4	807	6	0	0	0	0.97
71. Grassland	0	0	0	0	0	0	0	19	0	10	243	0	5	0	0.88
81. Pasture and Parks	2	0	1	0	0	2	44	0	0	21	0	181	0	0	0.72
82. Cultivated Crops	0	0	0	0	0	0	0	2	1	7	0	10	534	0	0.96
91. Riparian Forest	0	0	0	0	0	6	0	45	0	2	0	0	4	220	0.79
UA		0.97	1.00	0.89	0.93	0.97	0.90	0.70	0.66	0.99	0.83	0.93	0.92	0.98	0.90

1988		OA = 89.7%								Kappa = 0.887					
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00
21. Developed. Roads	0	274	0	0	0	0	3	0	0	0	0	0	0	0	0.99
22. Urban. Low Density	0	0	236	7	0	2	0	8	0	24	0	0	0	0	0.85
23. Urban. Med. Density	0	0	19	215	6	0	11	1	0	25	0	0	0	0	0.78
24. Urban. High Density	5	0	8	11	206	0	36	0	0	9	0	2	0	0	0.74
31. Barren. Washes	0	0	0	0	0	239	0	21	0	2	1	0	0	14	0.86
32. Barren. Mines	1	0	0	0	0	2	222	0	1	50	0	0	0	1	0.80
41. Deciduous Forest	0	0	0	0	0	6	0	255	0	3	5	2	1	5	0.92
42. Evergreen Forest	0	0	0	0	0	1	0	13	539	1	0	0	0	0	0.97
52. Shrubs	0	0	0	0	0	2	1	9	3	811	5	0	0	0	0.98

71. Grassland	0	0	0	0	0	0	0	18	0	9	243	1	6	0	0.88
81. Pasture and Parks	2	0	1	0	0	2	44	0	0	21	0	181	0	0	0.72
82. Cultivated Crops	0	0	0	0	0	0	0	1	1	6	0	10	536	0	0.97
91. Riparian Forest	0	0	0	0	0	5	0	47	0	2	0	0	6	217	0.78
UA	0.97	1.00	0.89	0.92	0.97	0.92	0.70	0.68	0.99	0.84	0.96	0.92	0.98	0.92	

1989		OA = 90.9%								Kappa = 0.900					
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00
21. Developed. Roads	0	274	0	0	0	0	3	0	0	0	0	0	0	0	0.99
22. Urban. Low Density	0	0	239	7	0	1	0	7	0	23	0	0	0	0	0.86
23. Urban. Med. Density	0	0	24	212	5	0	10	1	0	25	0	0	0	0	0.77
24. Urban. High Density	5	0	4	9	219	0	36	0	0	3	0	1	0	0	0.79
31. Barren. Washes	0	0	0	0	0	239	0	20	0	3	1	0	0	14	0.86
32. Barren. Mines	0	0	0	0	0	1	226	0	1	48	0	0	0	1	0.82
41. Deciduous Forest	0	0	0	0	0	6	0	258	0	3	4	1	1	4	0.93
42. Evergreen Forest	0	0	0	0	0	1	0	9	543	1	0	0	0	0	0.98
52. Shrubs	0	0	1	0	0	0	3	8	3	812	4	0	0	0	0.98
71. Grassland	0	0	0	0	0	0	0	20	0	9	245	1	2	0	0.88
81. Pasture and Parks	2	0	1	0	0	2	32	0	0	21	0	193	0	0	0.77
82. Cultivated Crops	0	0	0	0	0	0	0	4	0	1	0	11	538	0	0.97
91. Riparian Forest	0	0	0	0	0	2	0	34	0	1	0	0	3	237	0.86
UA	0.98	1.00	0.89	0.93	0.98	0.95	0.73	0.71	0.99	0.85	0.96	0.93	0.99	0.93	

1990		OA = 91.5%								Kappa = 0.907					
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00
21. Developed. Roads	0	274	0	0	0	0	3	0	0	0	0	0	0	0	0.99
22. Urban. Low Density	0	0	247	5	0	1	0	4	0	20	0	0	0	0	0.89
23. Urban. Med. Density	0	0	28	209	5	0	9	1	0	25	0	0	0	0	0.75
24. Urban. High Density	5	0	6	8	220	0	36	0	0	1	0	1	0	0	0.79
31. Barren. Washes	0	0	0	0	0	241	0	16	0	4	0	0	0	16	0.87
32. Barren. Mines	0	0	0	0	0	1	226	0	1	48	0	0	0	1	0.82
41. Deciduous Forest	0	0	0	0	0	6	0	257	0	5	6	0	1	2	0.93
42. Evergreen Forest	0	0	0	0	0	1	0	8	544	1	0	0	0	0	0.98
52. Shrubs	0	0	1	0	0	0	4	9	3	809	5	0	0	0	0.97
71. Grassland	0	0	0	0	0	0	0	19	0	9	246	1	2	0	0.89
81. Pasture and Parks	2	0	1	0	0	2	10	0	0	21	0	215	0	0	0.86
82. Cultivated Crops	0	0	0	0	0	0	0	7	0	4	0	6	537	0	0.97
91. Riparian Forest	0	0	0	0	0	1	0	32	0	1	0	0	3	240	0.87
UA	0.98	1.00	0.87	0.94	0.98	0.95	0.78	0.73	0.99	0.85	0.96	0.96	0.99	0.93	

1991		OA = 91.8%								Kappa = 0.911					
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00
21. Developed. Roads	0	274	0	0	0	0	3	0	0	0	0	0	0	0	0.99
22. Urban. Low Density	0	0	245	9	0	1	0	4	0	18	0	0	0	0	0.88
23. Urban. Med. Density	0	0	25	213	7	0	6	1	0	25	0	0	0	0	0.77
24. Urban. High Density	5	0	5	8	222	0	34	0	0	2	0	1	0	0	0.80
31. Barren. Washes	0	0	0	0	0	237	0	15	0	4	0	0	0	21	0.86
32. Barren. Mines	0	0	0	0	0	1	226	0	1	48	0	0	0	1	0.82

41. Deciduous Forest	0	0	0	0	0	6	0	257	0	5	6	0	1	2	0.93
42. Evergreen Forest	0	0	0	0	0	1	0	7	545	1	0	0	0	0	0.98
52. Shrubs	0	0	1	0	0	0	1	12	3	808	6	0	0	0	0.97
71. Grassland	0	0	0	0	0	0	0	22	0	13	239	1	2	0	0.86
81. Pasture and Parks	2	0	1	0	0	2	9	0	0	22	0	215	0	0	0.86
82. Cultivated Crops	0	0	0	0	0	0	0	7	0	4	0	5	538	0	0.97
91. Riparian Forest	0	0	0	0	0	0	0	14	0	1	0	0	0	262	0.95
UA	0.98	1.00	0.88	0.93	0.97	0.96	0.81	0.76	0.99	0.85	0.95	0.97	0.99	0.92	

1992	OA = 92.0%							Kappa = 0.912							
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00
21. Developed. Roads	0	274	0	0	0	0	3	0	0	0	0	0	0	0	0.99
22. Urban. Low Density	0	0	245	9	0	1	2	4	0	16	0	0	0	0	0.88
23. Urban. Med. Density	0	0	21	218	8	0	4	1	0	25	0	0	0	0	0.79
24. Urban. High Density	5	1	4	10	220	0	34	0	0	2	0	1	0	0	0.79
31. Barren. Washes	0	0	0	0	0	236	0	17	1	4	0	0	0	19	0.85
32. Barren. Mines	0	0	0	0	0	0	229	0	1	46	0	0	0	1	0.83
41. Deciduous Forest	0	0	0	0	0	6	0	262	0	2	3	0	1	3	0.95
42. Evergreen Forest	0	0	0	0	0	1	0	7	545	1	0	0	0	0	0.98
52. Shrubs	0	0	1	0	0	0	1	14	3	804	8	0	0	0	0.97
71. Grassland	0	0	0	0	0	0	0	22	0	19	234	1	1	0	0.84
81. Pasture and Parks	2	0	1	0	0	2	9	0	0	21	0	216	0	0	0.86
82. Cultivated Crops	0	0	0	0	0	0	0	6	0	1	0	5	542	0	0.98
91. Riparian Forest	0	0	0	0	0	0	0	13	1	0	0	0	0	263	0.95
UA	0.98	1.00	0.90	0.92	0.96	0.96	0.81	0.76	0.99	0.85	0.96	0.97	1.00	0.92	

1993	OA = 92.5%							Kappa = 0.917							
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00
21. Developed. Roads	0	274	0	0	0	0	3	0	0	0	0	0	0	0	0.99
22. Urban. Low Density	0	0	248	6	0	1	2	4	0	16	0	0	0	0	0.90
23. Urban. Med. Density	0	0	18	222	9	0	3	1	0	24	0	0	0	0	0.80
24. Urban. High Density	5	1	5	10	220	0	33	0	0	2	0	1	0	0	0.79
31. Barren. Washes	0	0	0	0	0	247	0	16	1	4	1	0	0	8	0.89
32. Barren. Mines	0	0	0	0	0	0	231	0	0	45	0	0	0	1	0.83
41. Deciduous Forest	0	0	0	0	0	5	0	263	0	2	3	0	1	3	0.95
42. Evergreen Forest	0	0	0	0	0	1	0	5	546	2	0	0	0	0	0.99
52. Shrubs	0	0	1	0	0	0	1	13	4	804	8	0	0	0	0.97
71. Grassland	0	0	0	0	0	0	0	13	0	17	246	0	1	0	0.89
81. Pasture and Parks	2	0	1	0	0	2	9	0	0	21	0	216	0	0	0.86
82. Cultivated Crops	0	0	0	0	0	0	0	5	0	1	0	5	543	0	0.98
91. Riparian Forest	0	0	0	0	0	3	0	16	6	0	0	0	0	252	0.91
UA	0.98	1.00	0.91	0.93	0.96	0.95	0.82	0.78	0.98	0.86	0.95	0.97	1.00	0.95	

1994	OA = 92.7%							Kappa = 0.920							
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00
21. Developed. Roads	0	274	0	0	0	0	3	0	0	0	0	0	0	0	0.99
22. Urban. Low Density	0	0	249	5	0	1	2	4	0	16	0	0	0	0	0.90
23. Urban. Med. Density	0	0	19	227	5	0	3	1	0	22	0	0	0	0	0.82



24. Urban. High Density	5	1	4	10	221	0	33	0	0	2	0	1	0	0	0.80
31. Barren. Washes	0	0	0	0	0	248	0	16	0	4	1	0	0	8	0.90
32. Barren. Mines	0	0	0	0	0	0	231	0	0	45	0	0	0	1	0.83
41. Deciduous Forest	0	0	0	0	0	5	0	252	0	2	14	0	1	3	0.91
42. Evergreen Forest	0	0	0	0	0	1	0	7	544	2	0	0	0	0	0.98
52. Shrubs	0	0	1	0	0	0	1	12	3	812	2	0	0	0	0.98
71. Grassland	0	0	0	0	0	0	0	11	0	12	253	0	1	0	0.91
81. Pasture and Parks	2	0	1	0	0	2	9	0	0	22	0	215	0	0	0.86
82. Cultivated Crops	0	0	0	0	0	0	0	5	0	0	0	0	549	0	0.99
91. Riparian Forest	0	0	0	0	0	5	0	15	5	0	0	0	2	250	0.90
UA	0.98	1.00	0.91	0.94	0.98	0.95	0.82	0.78	0.99	0.86	0.94	1.00	0.99	0.95	

1995	OA = 92.6%								Kappa = 0.918						
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00
21. Developed. Roads	0	274	0	0	0	0	3	0	0	0	0	0	0	0	0.99
22. Urban. Low Density	0	0	246	8	0	1	2	3	0	16	0	0	0	1	0.89
23. Urban. Med. Density	0	0	22	227	3	0	5	1	0	19	0	0	0	0	0.82
24. Urban. High Density	5	1	4	10	221	0	34	0	0	1	0	1	0	0	0.80
31. Barren. Washes	0	0	0	0	0	248	0	18	0	4	1	0	0	6	0.90
32. Barren. Mines	0	0	0	0	0	0	230	0	0	46	0	0	0	1	0.83
41. Deciduous Forest	0	0	0	0	0	7	0	250	0	2	14	0	1	3	0.90
42. Evergreen Forest	0	0	0	0	0	1	0	13	538	2	0	0	0	0	0.97
52. Shrubs	0	0	1	0	0	0	0	6	3	819	2	0	0	0	0.99
71. Grassland	0	0	0	0	0	0	0	13	0	10	254	0	0	0	0.92
81. Pasture and Parks	2	0	1	0	0	2	9	0	0	22	0	215	0	0	0.86
82. Cultivated Crops	0	0	0	0	0	0	0	7	0	0	0	0	547	0	0.99
91. Riparian Forest	0	0	0	0	0	5	0	17	5	0	0	0	3	247	0.89
	UA 0.98	1.00	0.90	0.93	0.99	0.94	0.81	0.76	0.99	0.87	0.94	1.00	0.99	0.96	

1996	OA = 92.8%									Kappa = 0.921					
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00
21. Developed. Roads	0	274	0	0	0	0	3	0	0	0	0	0	0	0	0.99
22. Urban. Low Density	0	0	243	11	0	1	3	3	0	15	0	0	0	1	0.88
23. Urban. Med. Density	0	0	21	232	1	0	4	0	0	19	0	0	0	0	0.84
24. Urban. High Density	5	0	4	9	223	0	34	0	0	1	0	1	0	0	0.81
31. Barren. Washes	0	0	0	0	0	245	0	20	0	5	1	0	0	6	0.88
32. Barren. Mines	0	0	0	0	0	0	227	0	0	49	0	0	0	1	0.82
41. Deciduous Forest	0	0	0	0	0	7	0	254	1	1	11	0	1	2	0.92
42. Evergreen Forest	0	0	0	0	0	1	0	14	537	2	0	0	0	0	0.97
52. Shrubs	0	0	1	0	0	0	1	5	2	817	5	0	0	0	0.98
71. Grassland	0	0	0	0	0	0	0	11	0	7	257	2	0	0	0.93
81. Pasture and Parks	2	0	1	0	0	2	3	0	0	27	0	216	0	0	0.86
82. Cultivated Crops	0	0	0	0	0	0	0	8	0	0	0	0	546	0	0.99
91. Riparian Forest	0	0	0	0	0	0	0	16	3	0	0	0	1	257	0.93
	UA 0.98	1.00	0.90	0.92	1.00	0.96	0.83	0.77	0.99	0.87	0.94	0.99	1.00	0.96	

[illegible]

21. Developed. Roads	0	274	0	0	0	0	3	0	0	0	0	0	0	0	0.99
22. Urban. Low Density	0	0	242	12	0	1	3	3	0	15	0	0	0	1	0.87
23. Urban. Med. Density	0	0	21	232	3	0	4	0	0	17	0	0	0	0	0.84
24. Urban. High Density	5	0	4	10	223	0	32	0	0	2	0	1	0	0	0.81
31. Barren. Washes	0	0	0	0	0	236	0	32	0	6	2	0	0	1	0.85
32. Barren. Mines	0	0	0	0	0	0	226	0	0	51	0	0	0	0	0.82
41. Deciduous Forest	0	0	0	0	0	7	0	252	1	0	11	0	4	2	0.91
42. Evergreen Forest	0	0	0	0	0	1	0	14	537	2	0	0	0	0	0.97
52. Shrubs	0	0	1	0	0	0	1	5	2	816	6	0	0	0	0.98
71. Grassland	0	0	0	0	0	0	0	11	0	14	250	2	0	0	0.90
81. Pasture and Parks	2	0	1	0	0	2	3	0	0	27	0	216	0	0	0.86
82. Cultivated Crops	0	0	0	0	0	1	0	10	0	0	0	0	543	0	0.98
91. Riparian Forest	0	0	0	0	0	0	0	10	3	0	0	0	0	264	0.95
UA	0.98	1.00	0.90	0.91	0.99	0.95	0.83	0.75	0.99	0.86	0.93	0.99	0.99	0.99	

1998	OA = 92.8%							Kappa = 0.921							
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00
21. Developed. Roads	0	274	0	0	0	0	3	0	0	0	0	0	0	0	0.99
22. Urban. Low Density	0	0	243	12	0	1	2	3	0	15	0	0	0	1	0.88
23. Urban. Med. Density	0	0	21	228	12	0	3	0	0	13	0	0	0	0	0.82
24. Urban. High Density	5	0	3	9	225	0	32	0	0	2	0	1	0	0	0.81
31. Barren. Washes	0	0	0	0	0	238	0	30	0	5	3	0	0	1	0.86
32. Barren. Mines	0	0	0	0	0	0	226	0	0	51	0	0	0	0	0.82
41. Deciduous Forest	0	0	0	0	0	1	0	251	1	5	11	0	4	4	0.91
42. Evergreen Forest	0	0	0	0	0	1	0	13	539	1	0	0	0	0	0.97
52. Shrubs	0	0	1	0	0	0	1	4	2	821	2	0	0	0	0.99
71. Grassland	0	0	0	0	0	0	0	12	0	10	255	0	0	0	0.92
81. Pasture and Parks	2	0	1	0	0	2	7	0	0	23	0	216	0	0	0.86
82. Cultivated Crops	0	0	0	0	0	1	0	8	0	0	0	0	545	0	0.98
91. Riparian Forest	0	0	0	0	0	0	0	11	0	0	0	0	0	266	0.96
UA	0.98	1.00	0.90	0.92	0.95	0.98	0.82	0.76	0.99	0.87	0.94	1.00	0.99	0.98	

1999	OA = 92.9%							Kappa = 0.922							
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00
21. Developed. Roads	0	274	0	0	0	0	3	0	0	0	0	0	0	0	0.99
22. Urban. Low Density	0	0	245	10	0	1	2	3	0	15	0	0	0	1	0.88
23. Urban. Med. Density	0	0	21	229	15	0	3	0	0	9	0	0	0	0	0.83
24. Urban. High Density	5	0	4	8	225	0	32	0	0	2	0	1	0	0	0.81
31. Barren. Washes	0	0	0	0	0	244	0	23	0	8	2	0	0	0	0.88
32. Barren. Mines	0	0	0	0	0	0	225	0	0	52	0	0	0	0	0.81
41. Deciduous Forest	0	0	0	0	0	1	0	260	1	6	4	0	1	4	0.94
42. Evergreen Forest	0	0	0	0	0	1	0	15	537	1	0	0	0	0	0.97
52. Shrubs	0	0	1	0	0	0	1	4	2	821	2	0	0	0	0.99
71. Grassland	0	0	0	0	0	0	0	12	0	9	256	0	0	0	0.92
81. Pasture and Parks	2	0	1	0	0	2	10	0	0	20	0	216	0	0	0.86
82. Cultivated Crops	0	0	0	0	0	2	0	8	0	0	0	0	544	0	0.98
91. Riparian Forest	0	0	0	0	0	2	0	17	0	0	0	0	0	258	0.93
UA	0.98	1.00	0.90	0.93	0.94	0.96	0.82	0.76	0.99	0.87	0.97	1.00	1.00	0.98	

2000	OA = 93.0%									Kappa = 0.923					
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00
21. Developed. Roads	0	274	0	0	0	0	3	0	0	0	0	0	0	0	0.99
22. Urban. Low Density	0	0	248	7	0	1	2	3	0	15	0	0	0	1	0.90
23. Urban. Med. Density	0	0	23	232	10	0	4	0	0	8	0	0	0	0	0.84
24. Urban. High Density	5	0	4	8	226	0	32	0	0	2	0	0	0	0	0.82
31. Barren. Washes	0	0	0	0	0	240	0	26	0	9	2	0	0	0	0.87
32. Barren. Mines	0	0	0	0	0	0	228	0	1	48	0	0	0	0	0.82
41. Deciduous Forest	0	0	0	0	0	1	0	261	1	6	2	0	1	5	0.94
42. Evergreen Forest	0	0	0	0	0	1	0	15	536	1	0	0	0	1	0.97
52. Shrubs	0	0	1	0	0	0	0	4	0	823	3	0	0	0	0.99
71. Grassland	0	0	0	0	0	1	0	11	0	13	252	0	0	0	0.91
81. Pasture and Parks	2	0	1	0	0	2	10	0	0	19	0	217	0	0	0.86
82. Cultivated Crops	0	0	0	0	0	2	0	8	0	0	0	0	544	0	0.98
91. Riparian Forest	0	0	0	0	0	2	0	17	0	0	0	0	0	258	0.93
UA	0.98	1.00	0.90	0.94	0.96	0.96	0.82	0.76	1.00	0.87	0.97	1.00	1.00	0.97	

2001	OA = 93.2%									Kappa = 0.925					
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00
21. Developed. Roads	0	274	0	0	0	0	3	0	0	0	0	0	0	0	0.99
22. Urban. Low Density	0	0	247	8	0	1	2	3	0	15	0	0	0	1	0.89
23. Urban. Med. Density	0	0	23	235	9	0	3	0	0	7	0	0	0	0	0.85
24. Urban. High Density	5	0	3	8	227	0	31	0	0	3	0	0	0	0	0.82
31. Barren. Washes	0	0	0	0	0	245	0	21	0	9	2	0	0	0	0.88
32. Barren. Mines	0	0	0	0	0	0	226	0	1	50	0	0	0	0	0.82
41. Deciduous Forest	0	0	0	0	0	1	0	262	1	5	2	0	1	5	0.95
42. Evergreen Forest	0	0	0	0	0	1	0	12	538	2	0	0	0	1	0.97
52. Shrubs	0	0	1	0	0	0	0	5	0	824	1	0	0	0	0.99
71. Grassland	0	0	0	0	0	1	0	11	0	15	250	0	0	0	0.90
81. Pasture and Parks	2	0	1	0	0	2	10	0	0	19	0	217	0	0	0.86
82. Cultivated Crops	0	0	0	0	0	2	0	7	0	3	0	0	542	0	0.98
91. Riparian Forest	0	0	0	0	0	2	0	14	0	0	0	0	0	261	0.94
UA	0.98	1.00	0.90	0.94	0.96	0.96	0.82	0.78	1.00	0.87	0.98	1.00	1.00	0.97	

2002	OA = 93.6%									Kappa = 0.929					
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00
21. Developed. Roads	0	274	0	0	0	0	3	0	0	0	0	0	0	0	0.99
22. Urban. Low Density	0	0	246	9	0	1	2	3	0	15	0	0	0	1	0.89
23. Urban. Med. Density	0	0	27	238	5	0	2	0	0	5	0	0	0	0	0.86
24. Urban. High Density	6	0	2	9	227	0	30	0	0	3	0	0	0	0	0.82
31. Barren. Washes	0	0	0	0	0	244	0	21	0	10	2	0	0	0	0.88
32. Barren. Mines	0	0	0	0	0	0	226	0	1	50	0	0	0	0	0.82
41. Deciduous Forest	0	0	0	0	0	1	0	263	1	5	1	0	2	4	0.95
42. Evergreen Forest	0	0	0	0	0	1	0	12	540	1	0	0	0	0	0.97
52. Shrubs	0	0	1	0	0	0	0	4	0	826	0	0	0	0	0.99
71. Grassland	0	0	0	0	0	1	0	10	0	16	250	0	0	0	0.90
81. Pasture and Parks	2	0	1	0	0	0	0	0	0	20	0	228	0	0	0.91
82. Cultivated Crops	0	0	0	0	0	2	0	8	1	3	0	0	540	0	0.97

91. Riparian Forest	0	0	0	0	0	0	0	13	0	0	0	0	0	264	0.95
UA	0.97	1.00	0.89	0.93	0.98	0.98	0.86	0.79	0.99	0.87	0.99	1.00	1.00	0.98	

2003		OA = 93.5%								Kappa = 0.929					
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00
21. Developed. Roads	0	274	0	0	0	0	3	0	0	0	0	0	0	0	0.99
22. Urban. Low Density	0	0	248	7	0	1	2	3	0	15	0	0	0	1	0.90
23. Urban. Med. Density	0	0	25	245	1	0	1	0	0	5	0	0	0	0	0.88
24. Urban. High Density	6	0	3	9	226	0	32	0	0	1	0	0	0	0	0.82
31. Barren. Washes	0	0	0	0	0	243	0	24	0	8	1	1	0	0	0.88
32. Barren. Mines	0	0	0	0	0	0	222	0	1	54	0	0	0	0	0.80
41. Deciduous Forest	0	0	0	0	0	1	0	264	1	5	0	0	2	4	0.95
42. Evergreen Forest	0	0	0	0	0	1	0	13	539	1	0	0	0	0	0.97
52. Shrubs	0	0	2	0	0	0	0	4	0	819	6	0	0	0	0.99
71. Grassland	0	0	0	0	0	1	0	10	0	17	249	0	0	0	0.90
81. Pasture and Parks	2	0	1	0	0	0	1	0	0	19	0	228	0	0	0.91
82. Cultivated Crops	0	0	0	0	0	2	0	7	1	0	0	0	543	1	0.98
91. Riparian Forest	0	0	0	0	0	0	0	13	0	0	0	0	0	264	0.95
UA	0.97	1.00	0.89	0.94	1.00	0.98	0.85	0.78	0.99	0.87	0.97	1.00	1.00	0.98	

2004		OA = 93.6%								Kappa = 0.930					
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00
21. Developed. Roads	0	274	0	0	0	0	3	0	0	0	0	0	0	0	0.99
22. Urban. Low Density	0	0	248	7	0	1	2	2	0	16	0	0	0	1	0.90
23. Urban. Med. Density	0	0	24	246	1	0	1	0	0	5	0	0	0	0	0.89
24. Urban. High Density	5	0	1	9	229	0	33	0	0	0	0	0	0	0	0.83
31. Barren. Washes	0	0	0	0	0	238	0	28	0	8	1	1	0	1	0.86
32. Barren. Mines	0	0	0	0	0	0	222	0	1	54	0	0	0	0	0.80
41. Deciduous Forest	0	0	0	0	0	1	0	269	1	3	0	0	0	3	0.97
42. Evergreen Forest	0	0	0	0	0	1	0	12	540	1	0	0	0	0	0.97
52. Shrubs	0	0	2	0	0	1	0	4	1	816	7	0	0	0	0.98
71. Grassland	0	0	0	0	0	1	0	9	0	13	254	0	0	0	0.92
81. Pasture and Parks	2	0	1	0	0	0	1	0	0	18	0	229	0	0	0.91
82. Cultivated Crops	0	0	0	0	0	2	0	7	1	0	0	0	542	2	0.98
91. Riparian Forest	0	0	0	0	0	0	0	14	0	0	0	0	1	262	0.95
UA	0.98	1.00	0.90	0.94	1.00	0.97	0.85	0.78	0.99	0.87	0.97	1.00	1.00	0.97	

2005		OA = 94.4%								Kappa = 0.938					
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00
21. Developed. Roads	0	274	0	0	0	0	3	0	0	0	0	0	0	0	0.99
22. Urban. Low Density	0	0	249	6	0	2	2	2	0	15	0	0	0	1	0.90
23. Urban. Med. Density	0	0	22	247	4	0	2	0	0	2	0	0	0	0	0.89
24. Urban. High Density	4	0	1	6	235	0	31	0	0	0	0	0	0	0	0.85
31. Barren. Washes	0	0	0	0	0	242	0	20	0	7	7	0	0	1	0.87
32. Barren. Mines	0	0	0	0	0	0	225	0	0	52	0	0	0	0	0.81
41. Deciduous Forest	0	0	0	0	0	1	0	269	1	3	1	0	0	2	0.97
42. Evergreen Forest	0	0	0	0	0	1	0	12	541	0	0	0	0	0	0.98
52. Shrubs	0	0	2	0	0	1	2	4	2	819	1	0	0	0	0.99

71. Grassland	0	0	0	0	0	1	0	5	0	9	262	0	0	0	0.95
81. Pasture and Parks	2	0	1	0	0	0	1	0	0	10	0	237	0	0	0.94
82. Cultivated Crops	0	0	0	0	0	2	0	5	1	0	0	0	545	1	0.98
91. Riparian Forest	0	0	0	0	0	0	0	14	0	0	0	0	1	262	0.95
UA	0.98	1.00	0.91	0.95	0.98	0.97	0.85	0.81	0.99	0.89	0.97	1.00	1.00	0.98	

2006		OA = 94.6%								Kappa = 0.941						
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA	
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	
21. Developed. Roads	0	274	0	0	0	0	3	0	0	0	0	0	0	0	0.99	
22. Urban. Low Density	0	0	248	8	0	2	2	2	0	14	0	0	0	1	0.90	
23. Urban. Med. Density	0	0	19	250	4	0	3	0	0	1	0	0	0	0	0.90	
24. Urban. High Density	4	0	2	5	235	0	31	0	0	0	0	0	0	0	0.85	
31. Barren. Washes	0	0	0	0	0	247	0	15	0	7	7	0	0	1	0.89	
32. Barren. Mines	0	0	0	0	0	0	229	0	0	48	0	0	0	0	0.83	
41. Deciduous Forest	0	0	0	0	0	1	0	268	0	5	1	0	0	2	0.97	
42. Evergreen Forest	0	0	0	0	0	1	0	12	539	2	0	0	0	0	0.97	
52. Shrubs	0	0	2	0	0	0	5	5	2	814	3	0	0	0	0.98	
71. Grassland	0	0	0	0	0	1	0	5	0	1	270	0	0	0	0.97	
81. Pasture and Parks	2	0	1	0	0	0	1	0	0	9	0	238	0	0	0.95	
82. Cultivated Crops	0	0	0	0	0	2	0	4	1	0	0	1	545	1	0.98	
91. Riparian Forest	0	0	0	0	0	0	0	14	0	0	0	0	0	263	0.95	
UA	0.98	1.00	0.91	0.95	0.98	0.97	0.84	0.82	0.99	0.90	0.96	1.00	1.00	0.98		

2007		OA = 94.7%								Kappa = 0.942						
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA	
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	
21. Developed. Roads	0	274	0	0	0	0	3	0	0	0	0	0	0	0	0.99	
22. Urban. Low Density	0	0	246	10	0	1	2	2	0	15	0	0	0	1	0.89	
23. Urban. Med. Density	0	0	18	252	4	0	2	0	0	1	0	0	0	0	0.91	
24. Urban. High Density	3	0	1	5	236	0	32	0	0	0	0	0	0	0	0.85	
31. Barren. Washes	0	0	0	0	0	247	0	15	0	7	7	0	0	1	0.89	
32. Barren. Mines	0	0	0	0	0	0	231	0	0	46	0	0	0	0	0.83	
41. Deciduous Forest	0	0	0	0	0	1	0	264	0	7	1	0	1	3	0.95	
42. Evergreen Forest	0	0	0	0	0	1	0	10	541	2	0	0	0	0	0.98	
52. Shrubs	0	0	2	0	0	0	4	5	2	815	3	0	0	0	0.98	
71. Grassland	0	0	0	0	0	1	0	4	0	1	271	0	0	0	0.98	
81. Pasture and Parks	2	0	1	0	0	0	2	0	0	8	0	238	0	0	0.95	
82. Cultivated Crops	0	0	0	0	0	2	0	4	1	0	0	2	544	1	0.98	
91. Riparian Forest	0	0	0	0	0	0	0	13	0	0	0	0	0	264	0.95	
UA	0.98	1.00	0.92	0.94	0.98	0.98	0.84	0.83	0.99	0.90	0.96	0.99	1.00	0.98		

2008		OA = 94.7%								Kappa = 0.942						
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA	
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	
21. Developed. Roads	0	274	0	0	0	0	3	0	0	0	0	0	0	0	0.99	
22. Urban. Low Density	0	0	248	9	0	1	2	2	0	14	0	0	0	1	0.90	
23. Urban. Med. Density	0	0	15	259	2	0	0	0	0	1	0	0	0	0	0.94	
24. Urban. High Density	3	0	1	5	236	0	32	0	0	0	0	0	0	0	0.85	
31. Barren. Washes	0	0	0	0	0	247	0	15	0	7	7	0	0	1	0.89	
32. Barren. Mines	0	0	0	0	0	0	230	0	0	47	0	0	0	0	0.83	

41. Deciduous Forest	0	0	0	0	0	1	0	264	0	8	1	0	1	2	0.95
42. Evergreen Forest	0	0	0	0	0	1	0	8	539	6	0	0	0	0	0.97
52. Shrubs	0	0	2	0	0	2	3	5	2	815	2	0	0	0	0.98
71. Grassland	0	0	0	0	0	1	0	6	0	3	267	0	0	0	0.96
81. Pasture and Parks	2	0	1	0	0	0	1	0	0	9	0	238	0	0	0.95
82. Cultivated Crops	0	0	0	0	0	1	0	5	2	0	0	2	543	1	0.98
91. Riparian Forest	0	0	0	0	0	0	0	13	0	0	0	0	0	264	0.95
	UA	0.98	1.00	0.93	0.95	0.99	0.97	0.85	0.83	0.99	0.90	0.96	0.99	1.00	0.98

2009	OA = 94.9%								Kappa = 0.944						
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00
21. Developed. Roads	0	274	0	0	0	0	3	0	0	0	0	0	0	0	0.99
22. Urban. Low Density	0	0	248	9	0	1	2	2	0	14	0	0	0	1	0.90
23. Urban. Med. Density	0	0	16	259	1	0	0	0	0	1	0	0	0	0	0.94
24. Urban. High Density	3	0	1	6	235	0	32	0	0	0	0	0	0	0	0.85
31. Barren. Washes	0	0	0	0	0	245	0	22	0	6	3	0	0	1	0.88
32. Barren. Mines	0	0	0	0	0	0	237	0	0	40	0	0	0	0	0.86
41. Deciduous Forest	0	0	0	0	0	1	0	268	0	5	1	0	1	1	0.97
42. Evergreen Forest	0	0	0	0	0	1	0	8	540	5	0	0	0	0	0.97
52. Shrubs	0	0	2	0	0	2	3	6	2	812	4	0	0	0	0.98
71. Grassland	0	0	0	0	0	1	0	6	0	3	267	0	0	0	0.96
81. Pasture and Parks	2	0	1	0	0	0	1	0	0	9	0	238	0	0	0.95
82. Cultivated Crops	0	0	0	0	0	1	0	5	2	0	0	2	543	1	0.98
91. Riparian Forest	0	0	0	0	0	0	0	11	0	0	0	0	1	265	0.96
	UA 0.98	1.00	0.93	0.95	1.00	0.97	0.85	0.82	0.99	0.91	0.97	0.99	1.00	0.99	

2010	OA = 95.4%									Kappa = 0.950					
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00
21. Developed. Roads	0	274	0	0	0	0	3	0	0	0	0	0	0	0	0.99
22. Urban. Low Density	0	0	253	5	0	1	2	2	0	13	0	0	0	1	0.91
23. Urban. Med. Density	0	0	18	259	0	0	0	0	0	0	0	0	0	0	0.94
24. Urban. High Density	3	0	1	6	235	0	32	0	0	0	0	0	0	0	0.85
31. Barren. Washes	0	0	0	0	0	250	0	19	0	6	0	0	0	2	0.90
32. Barren. Mines	0	0	0	0	0	0	247	0	0	30	0	0	0	0	0.89
41. Deciduous Forest	0	0	0	0	0	1	0	270	0	4	0	0	1	1	0.97
42. Evergreen Forest	0	0	0	0	0	1	0	11	538	4	0	0	0	0	0.97
52. Shrubs	0	0	2	0	0	1	4	6	1	813	4	0	0	0	0.98
71. Grassland	0	0	0	0	0	1	0	7	0	2	267	0	0	0	0.96
81. Pasture and Parks	1	0	1	0	0	0	1	0	0	7	0	241	0	0	0.96
82. Cultivated Crops	0	0	0	0	0	1	0	5	0	0	0	1	547	0	0.99
91. Riparian Forest	0	0	0	0	0	0	0	12	0	0	0	0	1	264	0.95
	UA 0.99	1.00	0.92	0.96	1.00	0.98	0.85	0.81	1.00	0.92	0.99	1.00	1.00	0.99	

[illegible]

24. Urban. High Density	1	0	2	5	243	0	26	0	0	0	0	0	0	0	0.88
31. Barren. Washes	0	0	0	0	0	258	0	11	0	6	0	0	0	2	0.93
32. Barren. Mines	0	0	0	0	1	0	249	0	0	27	0	0	0	0	0.90
41. Deciduous Forest	0	0	0	0	0	1	0	269	0	6	0	0	0	1	0.97
42. Evergreen Forest	0	0	0	0	0	1	0	11	540	2	0	0	0	0	0.97
52. Shrubs	0	0	2	0	0	0	4	7	0	818	0	0	0	0	0.98
71. Grassland	0	0	0	0	0	1	0	9	0	2	265	0	0	0	0.96
81. Pasture and Parks	1	0	1	0	0	0	0	0	0	0	0	249	0	0	0.99
82. Cultivated Crops	0	0	0	0	0	0	0	6	0	0	0	1	547	0	0.99
91. Riparian Forest	0	0	0	0	0	0	0	11	0	0	0	0	0	266	0.96
UA	0.99	1.00	0.91	0.97	1.00	0.98	0.88	0.83	1.00	0.94	1.00	1.00	1.00	1.00	0.99

2013	OA = 95.8%								Kappa = 0.954						
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00
21. Developed. Roads	0	274	0	0	0	0	3	0	0	0	0	0	0	0	0.99
22. Urban. Low Density	0	0	254	4	0	1	2	2	0	13	0	0	0	1	0.92
23. Urban. Med. Density	0	0	18	257	2	0	0	0	0	0	0	0	0	0	0.93
24. Urban. High Density	1	0	1	5	244	0	26	0	0	0	0	0	0	0	0.88
31. Barren. Washes	0	0	0	0	0	261	0	9	0	5	0	0	0	2	0.94
32. Barren. Mines	0	0	1	0	1	0	243	0	0	32	0	0	0	0	0.88
41. Deciduous Forest	0	0	0	0	0	9	0	259	0	6	0	0	0	3	0.94
42. Evergreen Forest	0	0	0	0	0	1	0	6	545	2	0	0	0	0	0.98
52. Shrubs	0	0	2	0	0	1	2	7	1	818	0	0	0	0	0.98
71. Grassland	0	0	0	0	0	1	0	10	0	2	264	0	0	0	0.95
81. Pasture and Parks	1	0	1	0	1	0	0	0	0	0	0	248	0	0	0.99
82. Cultivated Crops	0	0	0	0	0	0	0	5	0	0	0	5	544	0	0.98
91. Riparian Forest	0	0	0	0	0	0	0	10	0	0	0	0	0	267	0.96
	UA	0.99	1.00	0.92	0.97	0.98	0.95	0.88	0.84	1.00	0.93	1.00	0.98	1.00	0.98

2014	OA = 96.1%									Kappa = 0.958					
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00
21. Developed. Roads	0	274	0	0	0	0	3	0	0	0	0	0	0	0	0.99
22. Urban. Low Density	0	0	255	4	0	2	2	2	0	11	0	0	0	1	0.92
23. Urban. Med. Density	0	0	20	255	2	0	0	0	0	0	0	0	0	0	0.92
24. Urban. High Density	1	0	1	6	247	0	22	0	0	0	0	0	0	0	0.89
31. Barren. Washes	0	0	0	0	0	265	0	6	0	4	0	0	0	2	0.96
32. Barren. Mines	0	0	1	0	1	0	241	0	0	34	0	0	0	0	0.87
41. Deciduous Forest	0	0	0	0	0	9	0	260	0	5	0	0	0	3	0.94
42. Evergreen Forest	0	0	0	0	0	1	0	6	545	2	0	0	0	0	0.98
52. Shrubs	0	0	2	0	0	1	0	4	1	823	0	0	0	0	0.99
71. Grassland	0	0	0	0	0	1	0	10	0	0	266	0	0	0	0.96
81. Pasture and Parks	1	0	1	0	1	0	0	0	0	0	0	248	0	0	0.99
82. Cultivated Crops	0	0	0	0	0	0	0	5	0	0	0	5	544	0	0.98
91. Riparian Forest	0	0	0	0	0	0	0	7	0	0	0	0	0	270	0.97
	UA 0.99	1.00	0.91	0.96	0.98	0.95	0.90	0.87	1.00	0.94	1.00	0.98	1.00	0.98	

[illegible]

21. Developed. Roads	0	274	0	0	0	0	3	0	0	0	0	0	0	0	0.99
22. Urban. Low Density	0	0	254	6	0	3	2	2	0	10	0	0	0	0	0.92
23. Urban. Med. Density	0	0	19	255	3	0	0	0	0	0	0	0	0	0	0.92
24. Urban. High Density	5	0	2	9	247	0	14	0	0	0	0	0	0	0	0.89
31. Barren. Washes	0	0	0	0	0	268	0	5	0	4	0	0	0	0	0.97
32. Barren. Mines	0	0	1	0	1	0	246	0	0	29	0	0	0	0	0.89
41. Deciduous Forest	0	0	0	0	0	4	0	263	0	5	0	0	3	2	0.95
42. Evergreen Forest	0	0	0	0	0	1	0	9	542	2	0	0	0	0	0.98
52. Shrubs	0	0	2	0	0	0	0	1	1	827	0	0	0	0	1.00
71. Grassland	0	0	0	0	0	1	0	14	0	3	259	0	0	0	0.94
81. Pasture and Parks	1	0	1	0	1	0	0	0	0	0	0	248	0	0	0.99
82. Cultivated Crops	0	0	0	0	0	0	0	4	0	0	0	5	545	0	0.98
91. Riparian Forest	0	0	0	0	0	0	0	6	0	0	0	0	0	271	0.98
UA	0.98	1.00	0.91	0.94	0.98	0.97	0.93	0.87	1.00	0.94	1.00	0.98	0.99	0.99	

2016		OA = 96.3%								Kappa = 0.959						
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA	
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	
21. Developed. Roads	0	277	0	0	0	0	0	0	0	0	0	0	0	0	1.00	
22. Urban. Low Density	0	0	255	5	1	3	2	2	0	9	0	0	0	0	0.92	
23. Urban. Med. Density	0	0	22	253	2	0	0	0	0	0	0	0	0	0	0.91	
24. Urban. High Density	10	0	2	9	248	0	8	0	0	0	0	0	0	0	0.90	
31. Barren. Washes	0	0	0	0	0	271	0	3	0	3	0	0	0	0	0.98	
32. Barren. Mines	0	0	1	0	1	0	245	0	0	30	0	0	0	0	0.88	
41. Deciduous Forest	0	0	0	0	0	4	0	266	0	3	0	0	3	1	0.96	
42. Evergreen Forest	0	0	0	0	0	1	0	9	543	1	0	0	0	0	0.98	
52. Shrubs	0	0	4	0	0	1	0	2	1	823	0	0	0	0	0.99	
71. Grassland	0	0	0	0	0	1	0	12	0	5	259	0	0	0	0.94	
81. Pasture and Parks	0	0	1	0	1	0	0	0	0	0	0	249	0	0	0.99	
82. Cultivated Crops	0	0	0	0	0	0	0	4	0	0	0	7	543	0	0.98	
91. Riparian Forest	0	0	0	0	0	0	0	6	0	0	0	0	3	268	0.97	
UA	0.97	1.00	0.89	0.95	0.98	0.96	0.96	0.88	1.00	0.94	1.00	0.97	0.99	1.00		

2017		OA = 96.3%								Kappa = 0.959						
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA	
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	
21. Developed. Roads	0	277	0	0	0	0	0	0	0	0	0	0	0	0	1.00	
22. Urban. Low Density	0	0	255	5	1	3	2	3	0	8	0	0	0	0	0.92	
23. Urban. Med. Density	0	0	28	248	1	0	0	0	0	0	0	0	0	0	0.90	
24. Urban. High Density	9	0	3	9	253	0	3	0	0	0	0	0	0	0	0.91	
31. Barren. Washes	0	0	0	0	0	270	0	4	0	3	0	0	0	0	0.97	
32. Barren. Mines	0	0	1	0	1	1	245	0	0	29	0	0	0	0	0.88	
41. Deciduous Forest	0	0	1	0	0	2	0	272	0	1	0	0	0	1	0.98	
42. Evergreen Forest	0	0	0	0	0	1	0	9	543	1	0	0	0	0	0.98	
52. Shrubs	0	0	4	0	0	1	0	2	1	823	0	0	0	0	0.99	
71. Grassland	0	0	0	0	0	1	0	11	0	7	258	0	0	0	0.93	
81. Pasture and Parks	0	0	1	0	1	0	0	0	0	0	0	249	0	0	0.99	
82. Cultivated Crops	0	0	0	0	0	0	0	4	0	0	0	6	544	0	0.98	
91. Riparian Forest	0	0	0	0	0	0	0	7	0	0	0	0	3	267	0.96	
UA	0.97	1.00	0.87	0.95	0.98	0.97	0.98	0.87	1.00	0.94	1.00	0.98	0.99	1.00		



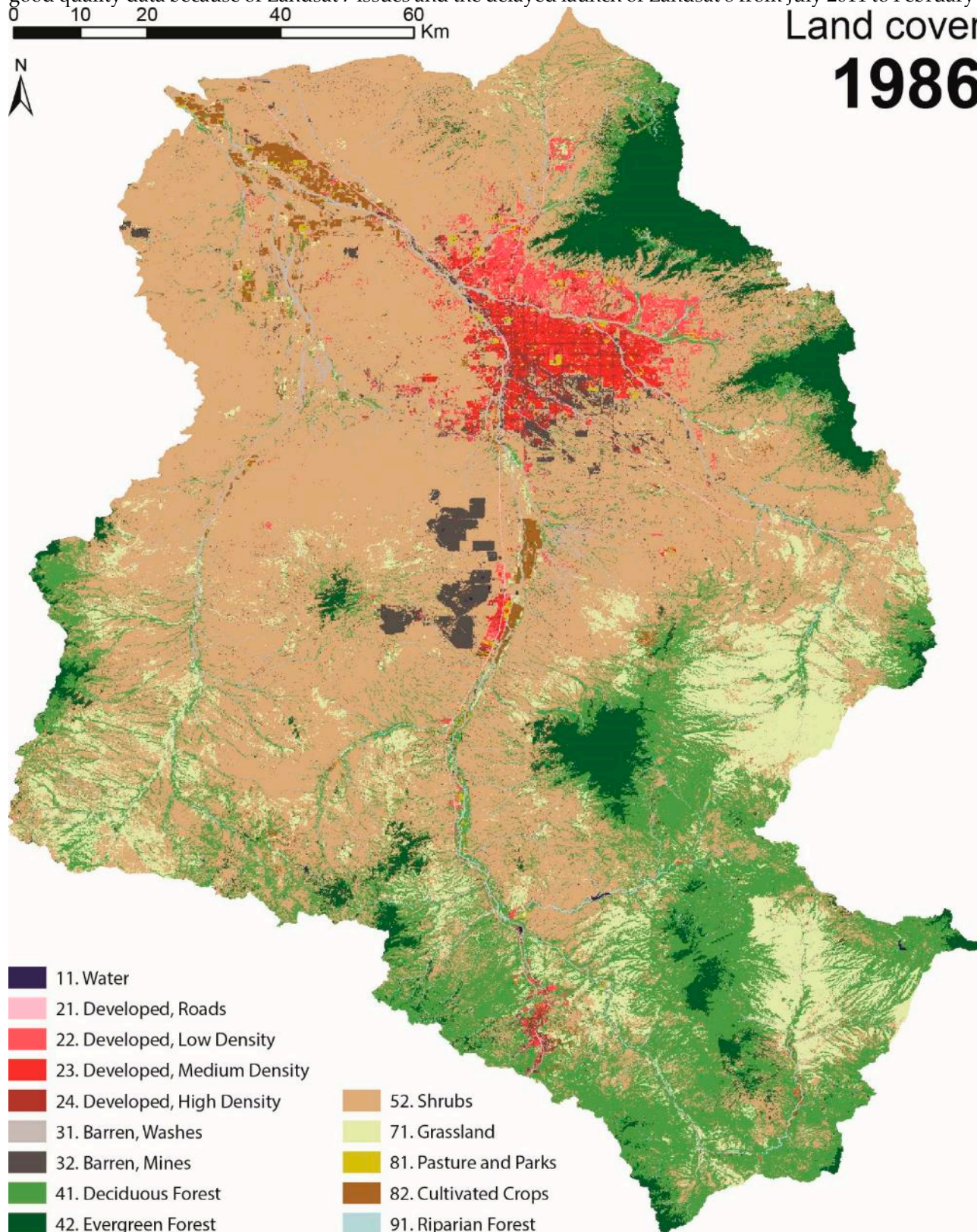
2018	OA = 96.3%									Kappa = 0.960					
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00
21. Developed. Roads	0	277	0	0	0	0	0	0	0	0	0	0	0	0	1.00
22. Urban. Low Density	0	0	256	5	0	3	2	3	0	8	0	0	0	0	0.92
23. Urban. Med. Density	0	0	28	247	2	0	0	0	0	0	0	0	0	0	0.89
24. Urban. High Density	1	0	4	9	260	0	3	0	0	0	0	0	0	0	0.94
31. Barren. Washes	0	0	0	0	0	269	0	5	0	3	0	0	0	0	0.97
32. Barren. Mines	1	0	1	0	1	1	244	0	0	29	0	0	0	0	0.88
41. Deciduous Forest	0	0	1	0	0	3	0	271	0	2	0	0	0	0	0.98
42. Evergreen Forest	0	0	0	0	0	1	0	9	542	2	0	0	0	0	0.98
52. Shrubs	0	0	4	0	0	1	0	3	0	823	0	0	0	0	0.99
71. Grassland	0	0	0	0	0	1	0	11	0	8	257	0	0	0	0.93
81. Pasture and Parks	0	0	2	0	1	0	0	0	0	0	0	248	0	0	0.99
82. Cultivated Crops	0	0	0	0	0	0	0	4	0	0	0	8	542	0	0.98
91. Riparian Forest	0	0	0	0	0	0	0	10	0	0	0	0	1	266	0.96
UA	0.99	1.00	0.86	0.95	0.98	0.96	0.98	0.86	1.00	0.94	1.00	0.97	1.00	1.00	

2019	OA = 96.4%									Kappa = 0.960					
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00
21. Developed. Roads	0	277	0	0	0	0	0	0	0	0	0	0	0	0	1.00
22. Urban. Low Density	0	0	258	4	0	3	2	2	0	8	0	0	0	0	0.93
23. Urban. Med. Density	0	0	21	253	3	0	0	0	0	0	0	0	0	0	0.91
24. Urban. High Density	0	0	4	6	264	0	2	0	0	1	0	0	0	0	0.95
31. Barren. Washes	0	0	2	0	0	267	0	5	0	3	0	0	0	0	0.96
32. Barren. Mines	1	0	1	0	1	1	241	0	0	32	0	0	0	0	0.87
41. Deciduous Forest	0	0	1	0	0	3	0	271	0	2	0	0	0	0	0.98
42. Evergreen Forest	0	0	0	0	0	2	0	7	543	2	0	0	0	0	0.98
52. Shrubs	0	0	4	0	0	1	0	2	0	821	3	0	0	0	0.99
71. Grassland	0	0	0	0	0	1	0	13	0	8	255	0	0	0	0.92
81. Pasture and Parks	1	0	2	0	1	0	0	0	0	0	0	247	0	0	0.98
82. Cultivated Crops	0	0	0	0	0	0	0	6	0	0	0	8	540	0	0.97
91. Riparian Forest	0	0	0	0	0	0	0	9	0	0	0	0	0	268	0.97
UA	0.99	1.00	0.88	0.96	0.98	0.96	0.98	0.86	1.00	0.94	0.99	0.97	1.00	1.00	

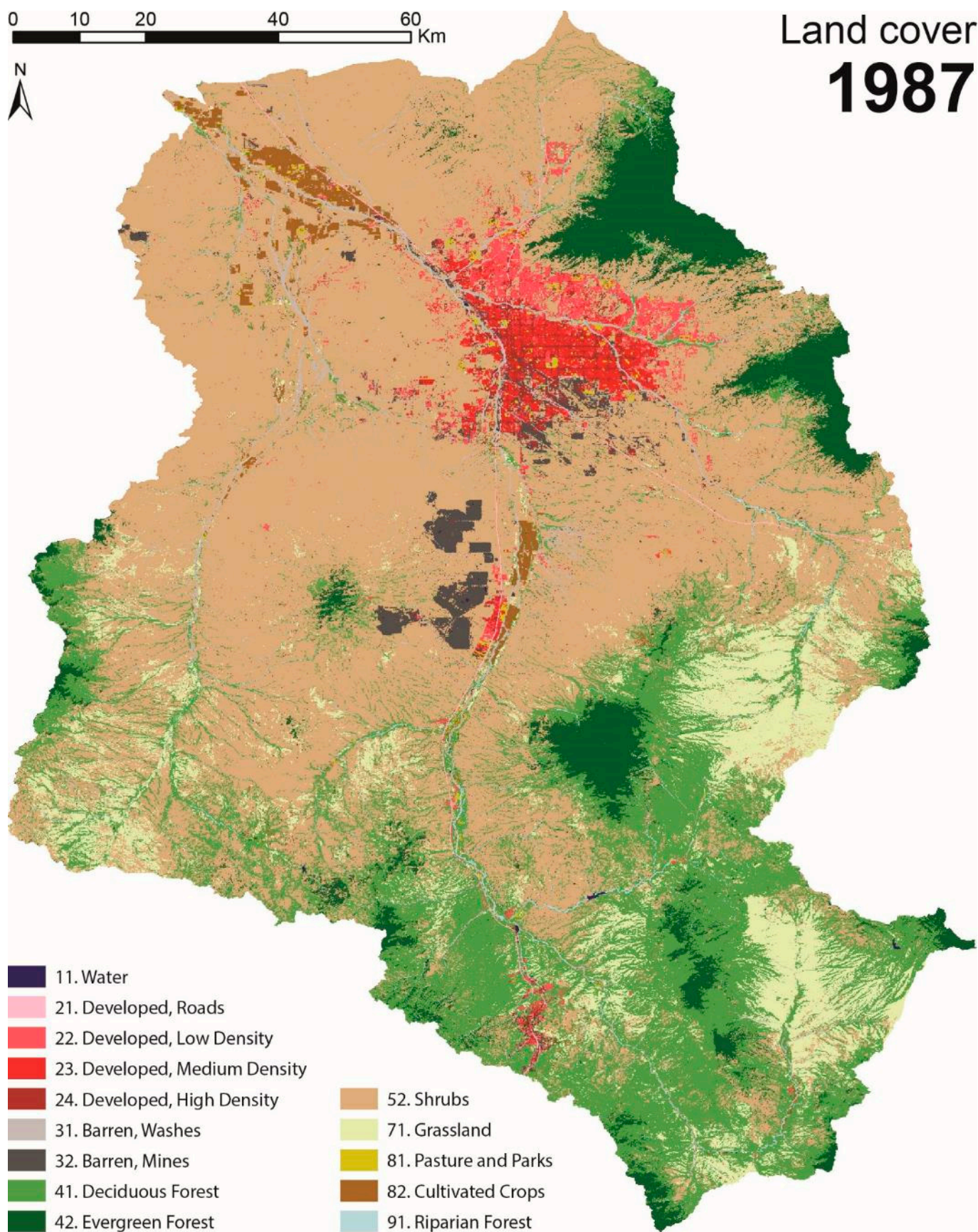
2020	OA = 96.3%									Kappa = 0.959					
Classes	11	21	22	23	24	31	32	41	42	52	71	81	82	91	PA
11. Water	277	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00
21. Developed. Roads	0	277	0	0	0	0	0	0	0	0	0	0	0	0	1.00
22. Urban. Low Density	0	0	261	3	0	3	2	2	0	6	0	0	0	0	0.94
23. Urban. Med. Density	0	0	20	253	4	0	0	0	0	0	0	0	0	0	0.91
24. Urban. High Density	0	0	4	7	263	0	2	0	0	1	0	0	0	0	0.95
31. Barren. Washes	0	3	2	0	0	261	0	8	0	3	0	0	0	0	0.94
32. Barren. Mines	0	0	3	0	1	0	243	0	0	30	0	0	0	0	0.88
41. Deciduous Forest	0	0	1	0	0	2	0	272	0	2	0	0	0	0	0.98
42. Evergreen Forest	0	0	0	0	0	2	0	7	543	2	0	0	0	0	0.98
52. Shrubs	0	0	6	0	0	1	0	2	0	819	3	0	0	0	0.99
71. Grassland	0	0	0	0	0	1	0	15	0	10	251	0	0	0	0.91
81. Pasture and Parks	1	0	2	0	1	0	0	0	0	0	0	247	0	0	0.98
82. Cultivated Crops	0	0	0	0	0	0	0	6	0	0	0	3	545	0	0.98

91. Riparian Forest	0	0	0	0	0	0	0	11	0	0	0	0	0	266	0.96
UA	1.00	0.99	0.87	0.96	0.98	0.97	0.98	0.84	1.00	0.94	0.99	0.99	1.00	1.00	

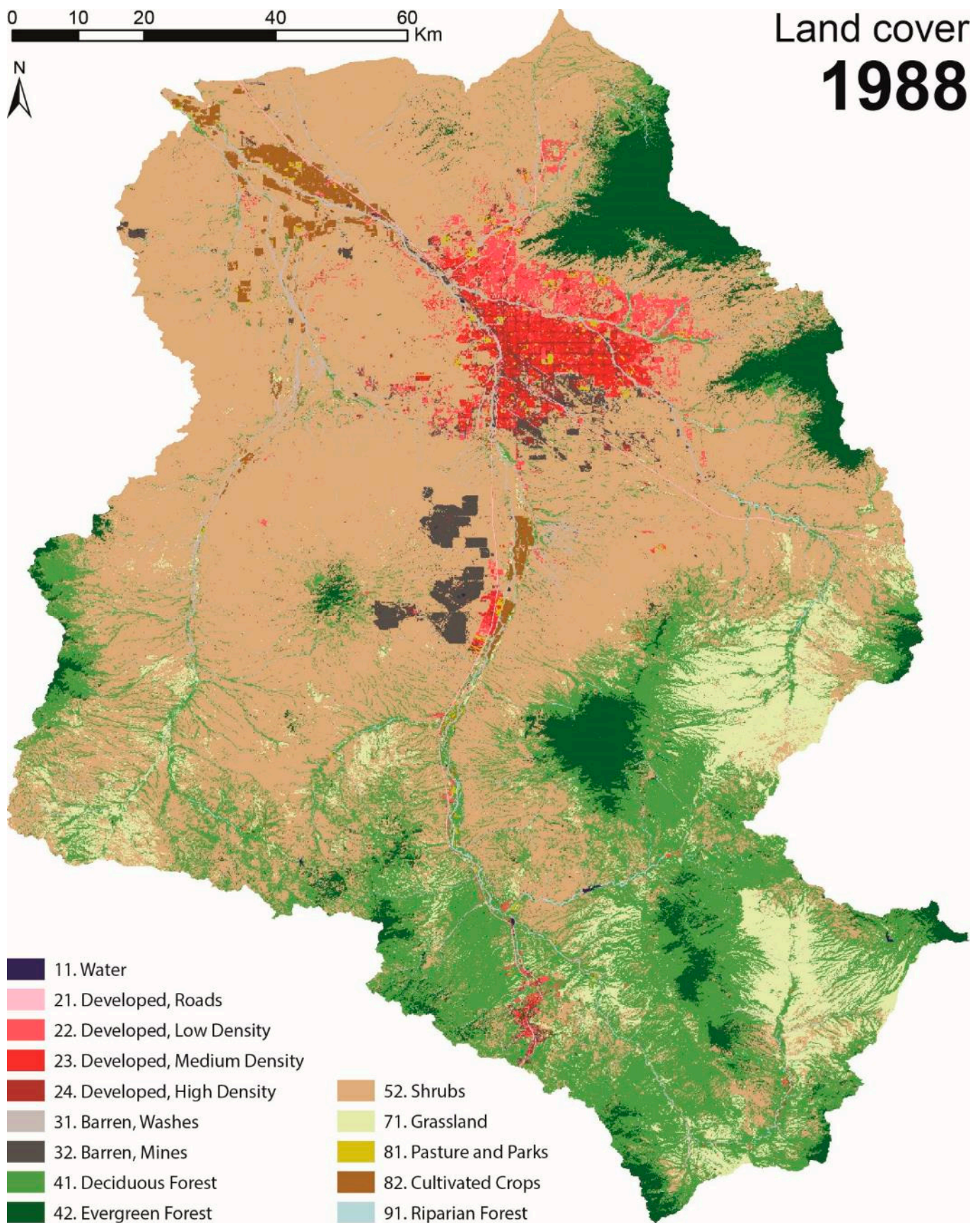
**Figure S1.** Maps of yearly land cover classifications results (1986–2020). Note: 2012 was not treated due to a lack of good quality data because of Landsat 7 issues and the delayed launch of Landsat 8 from July 2011 to February 2013.



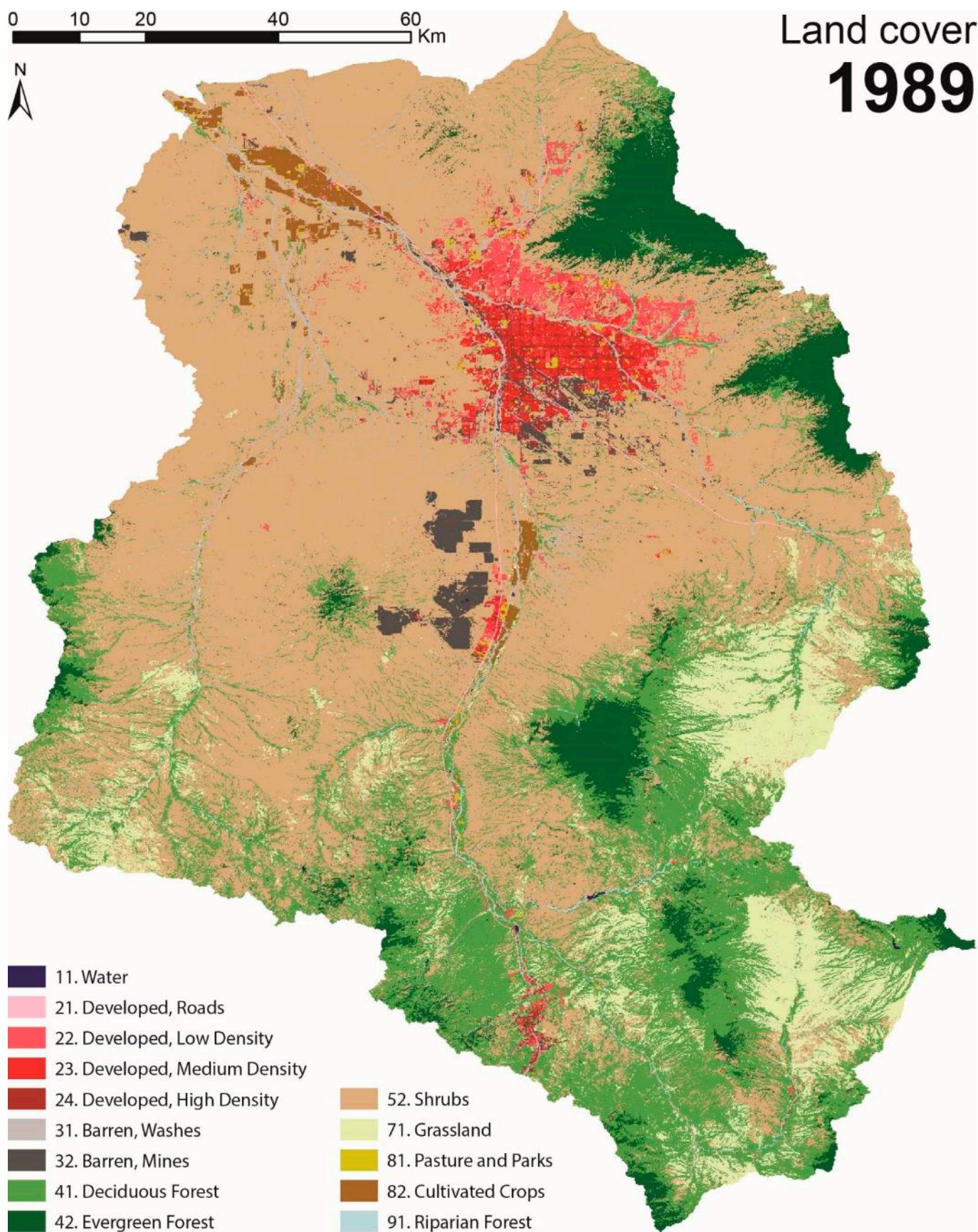




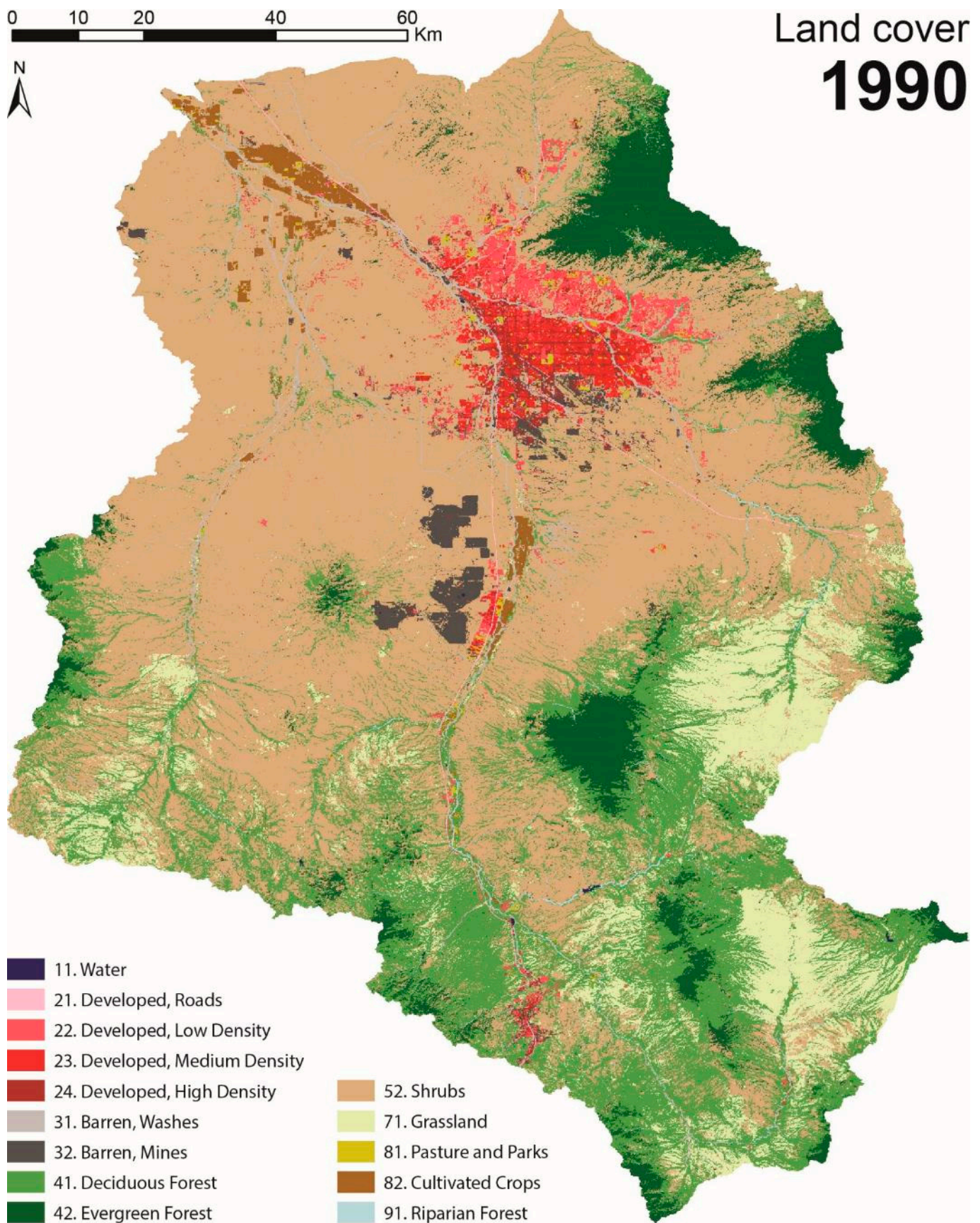




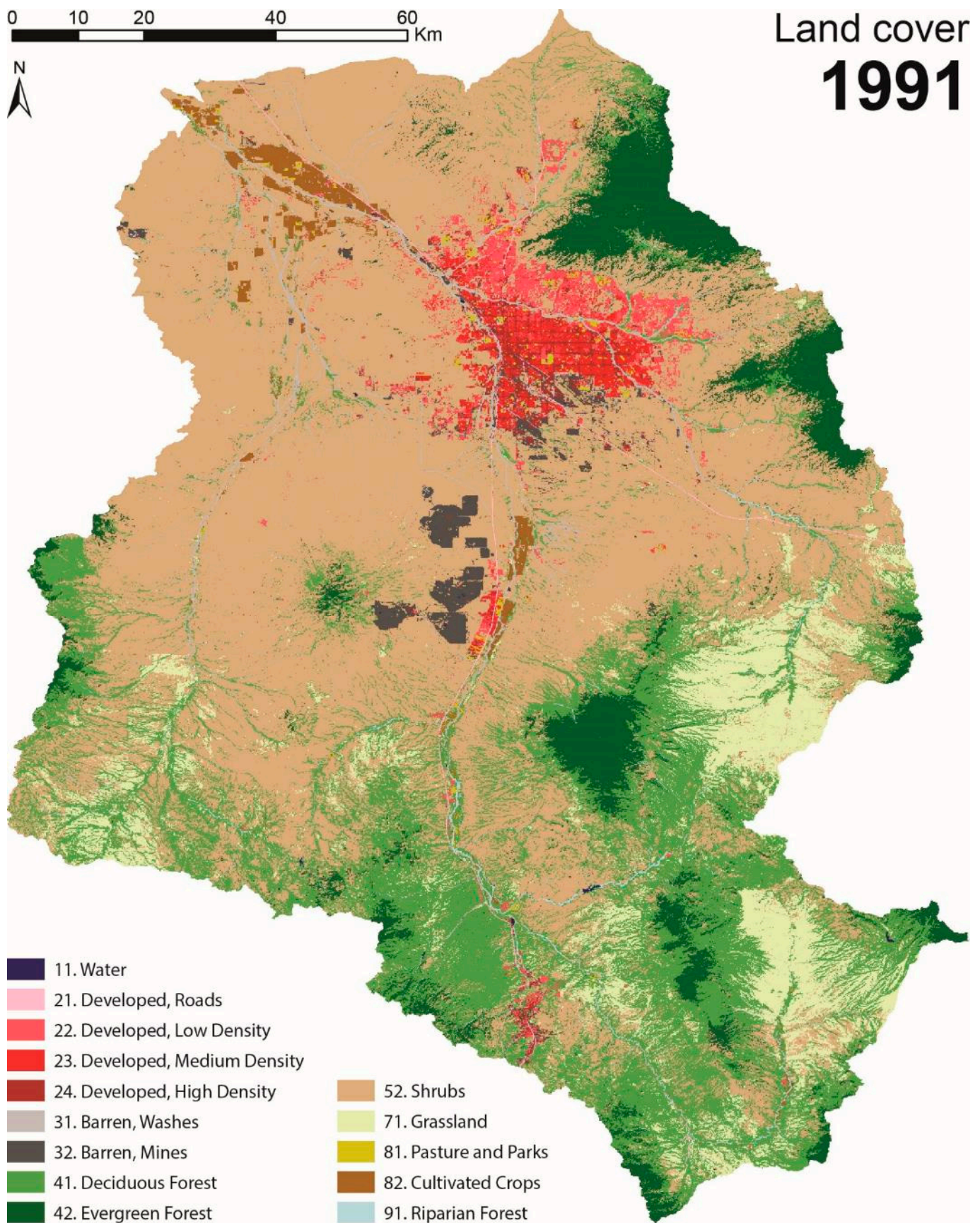




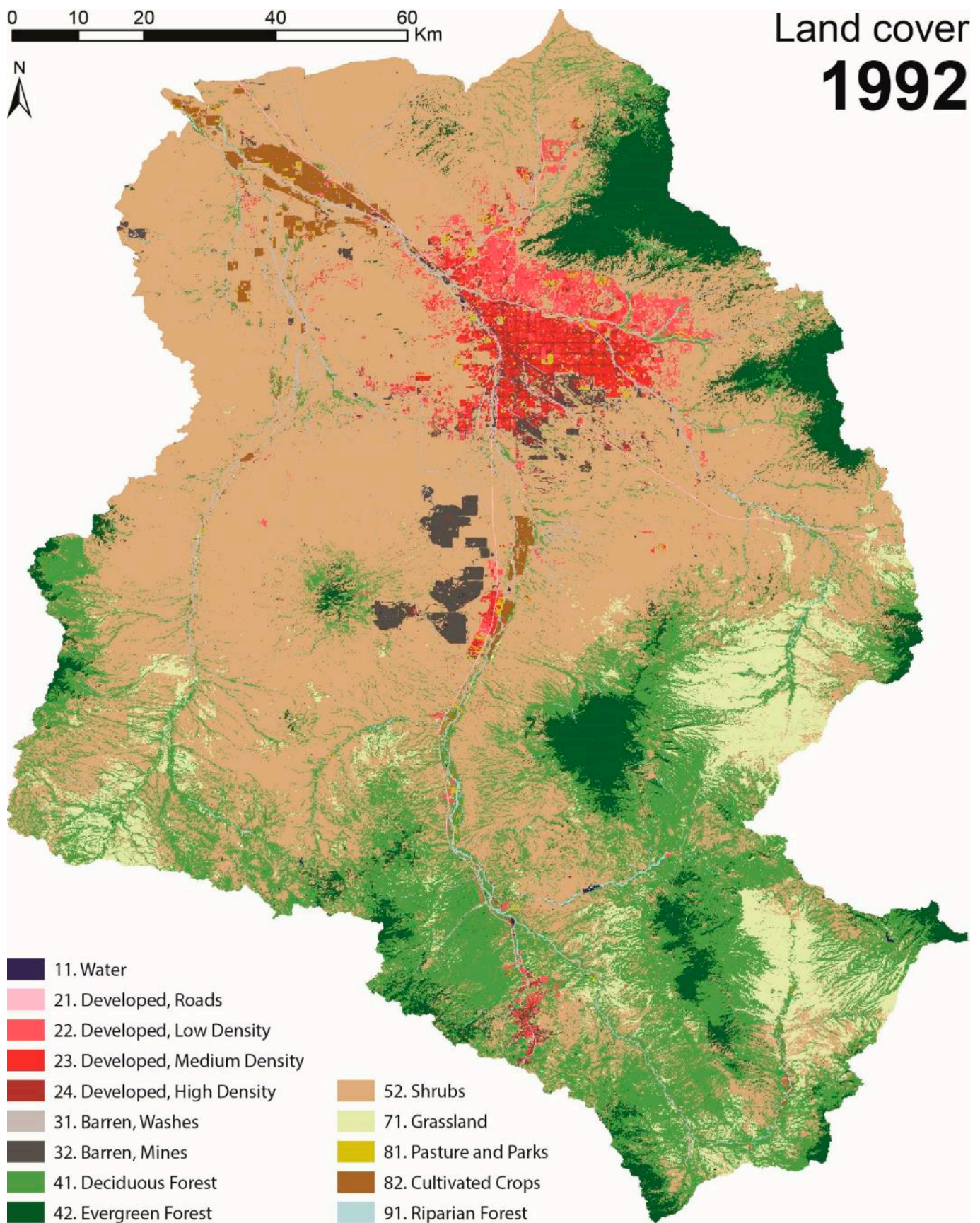




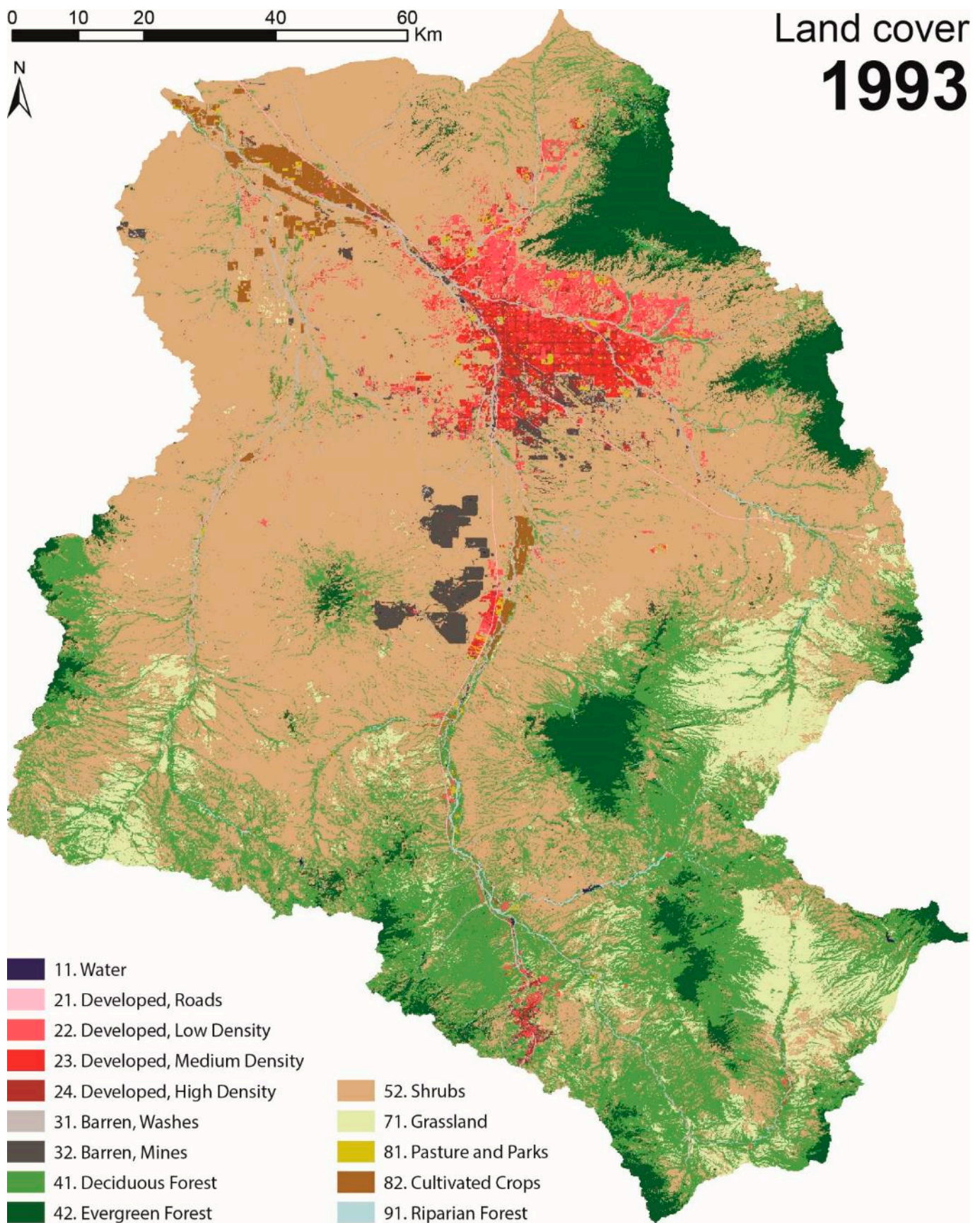




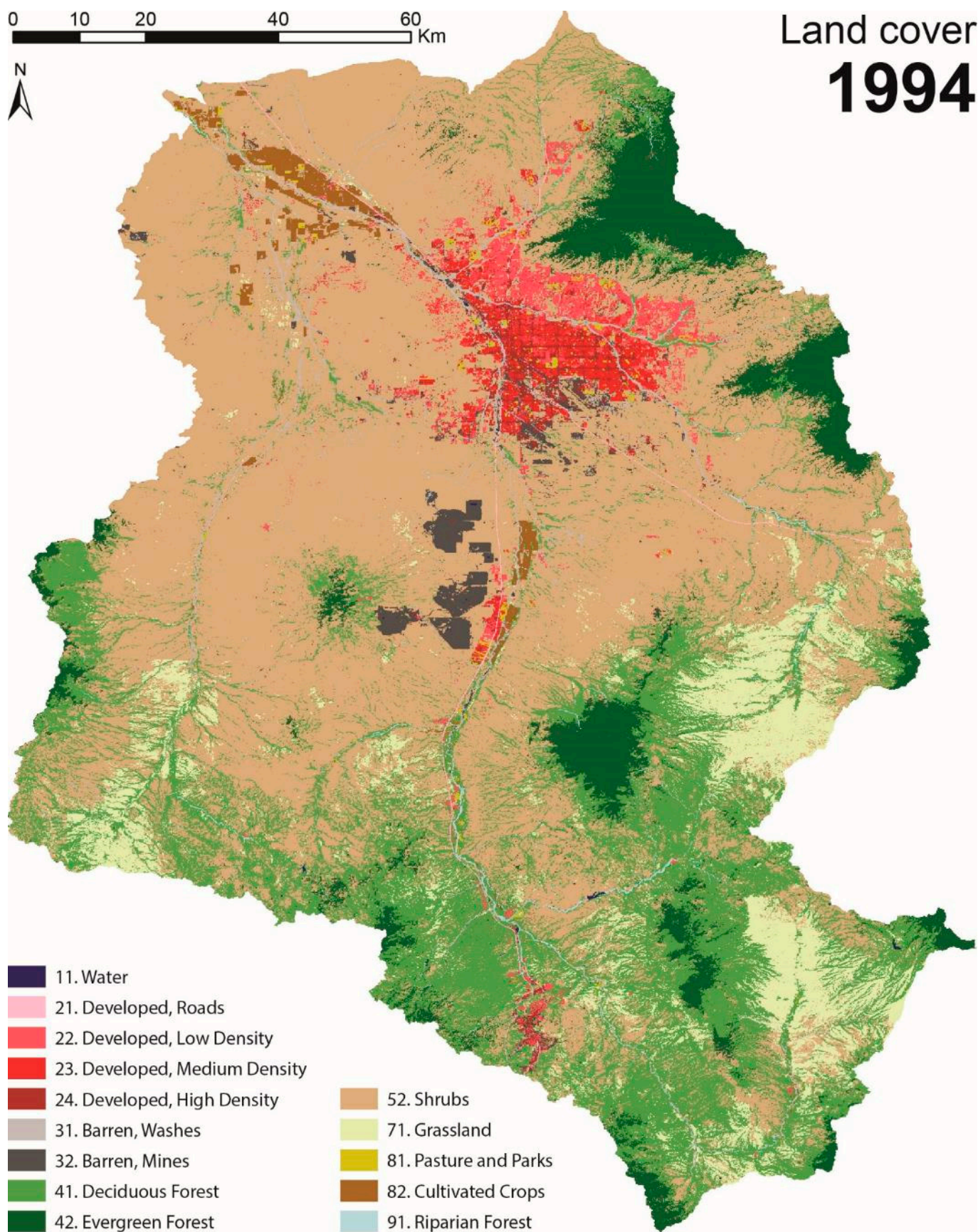




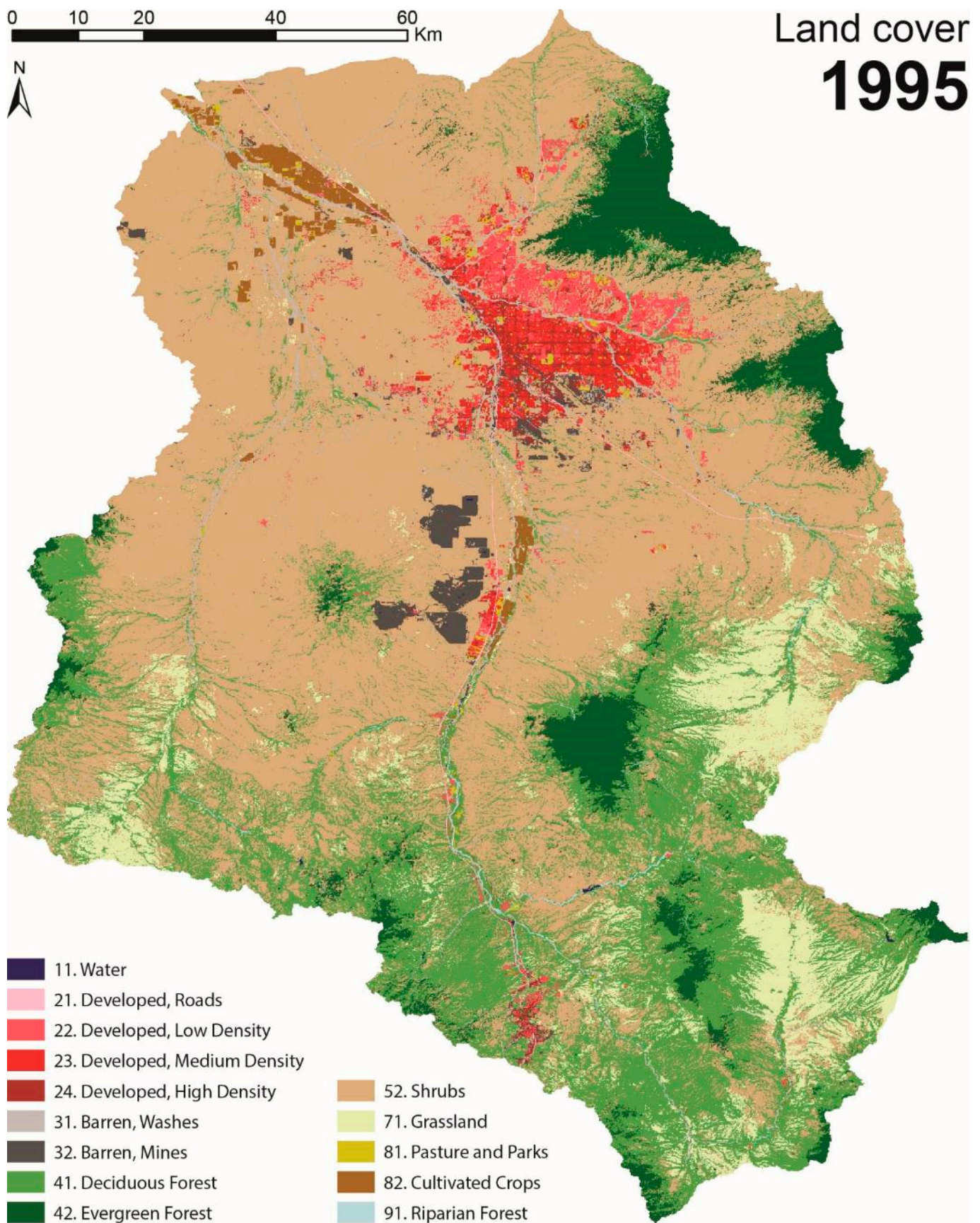




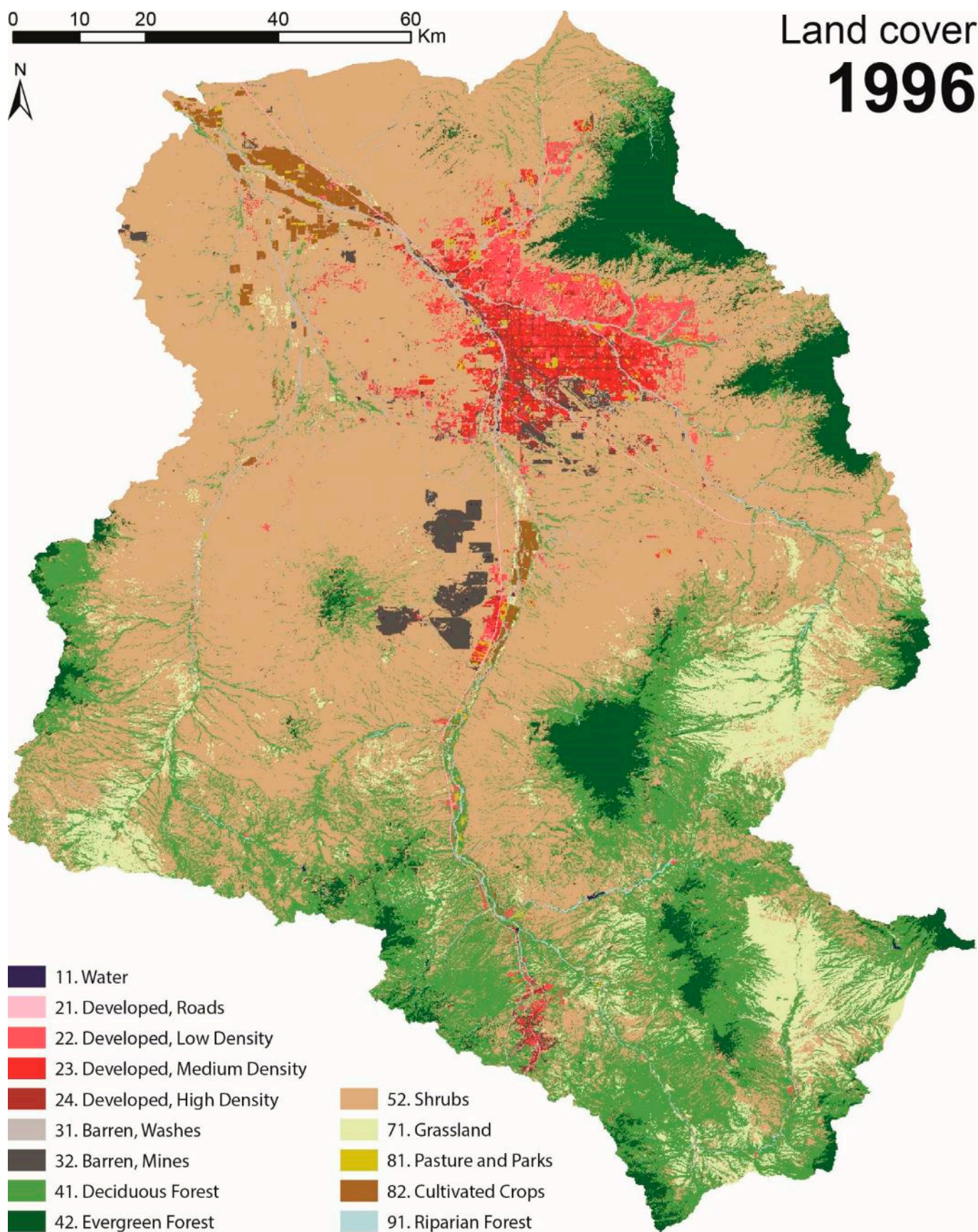




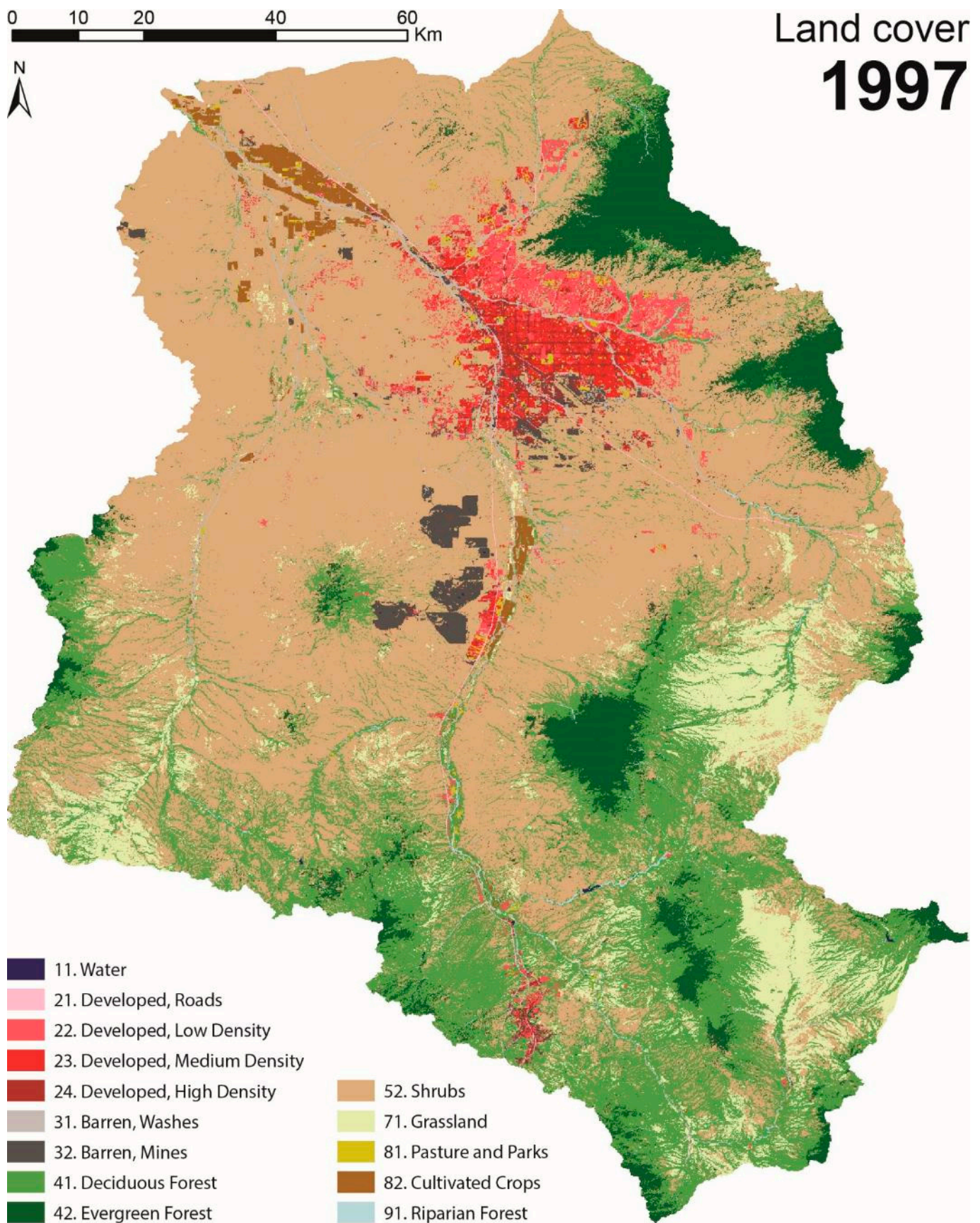




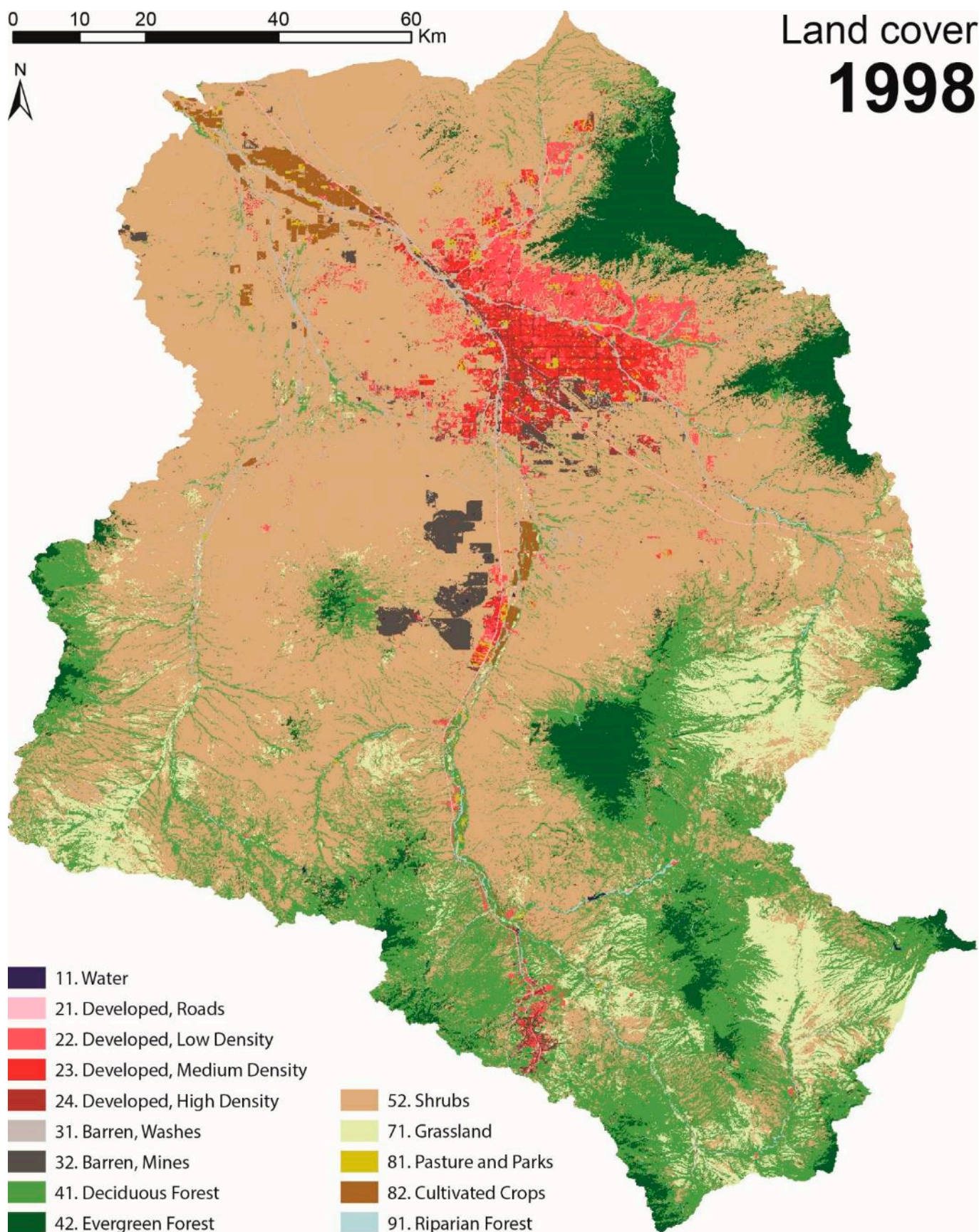




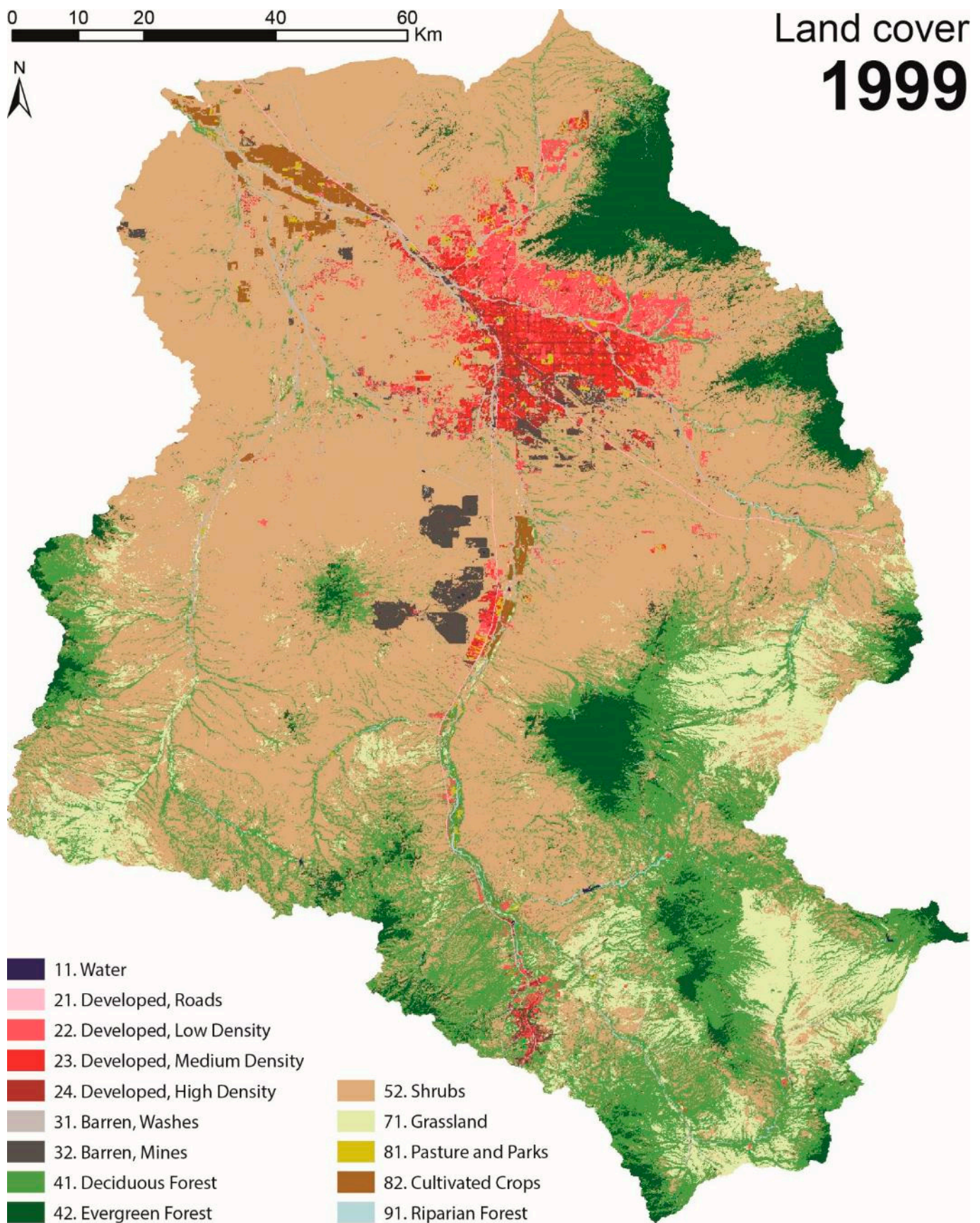




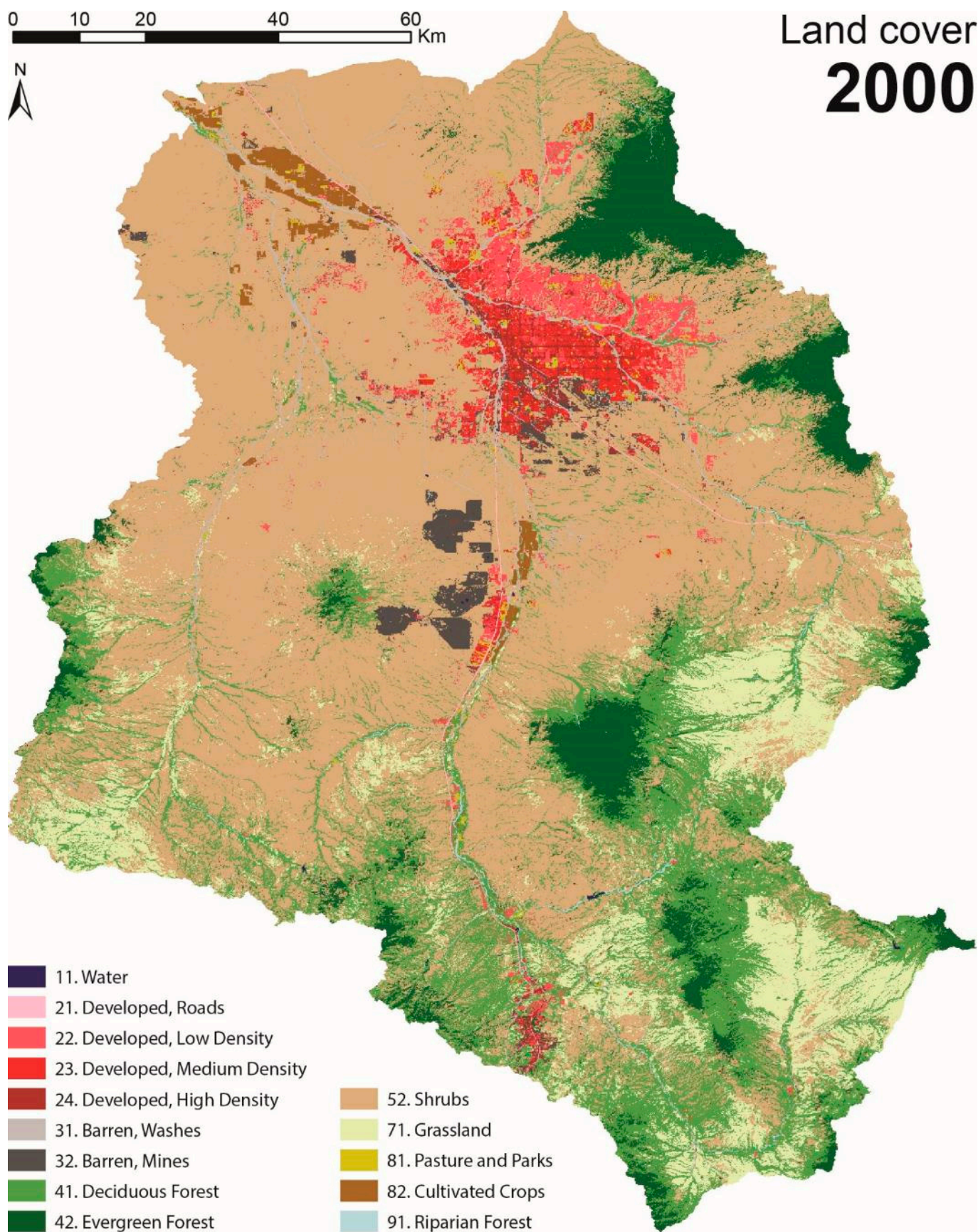




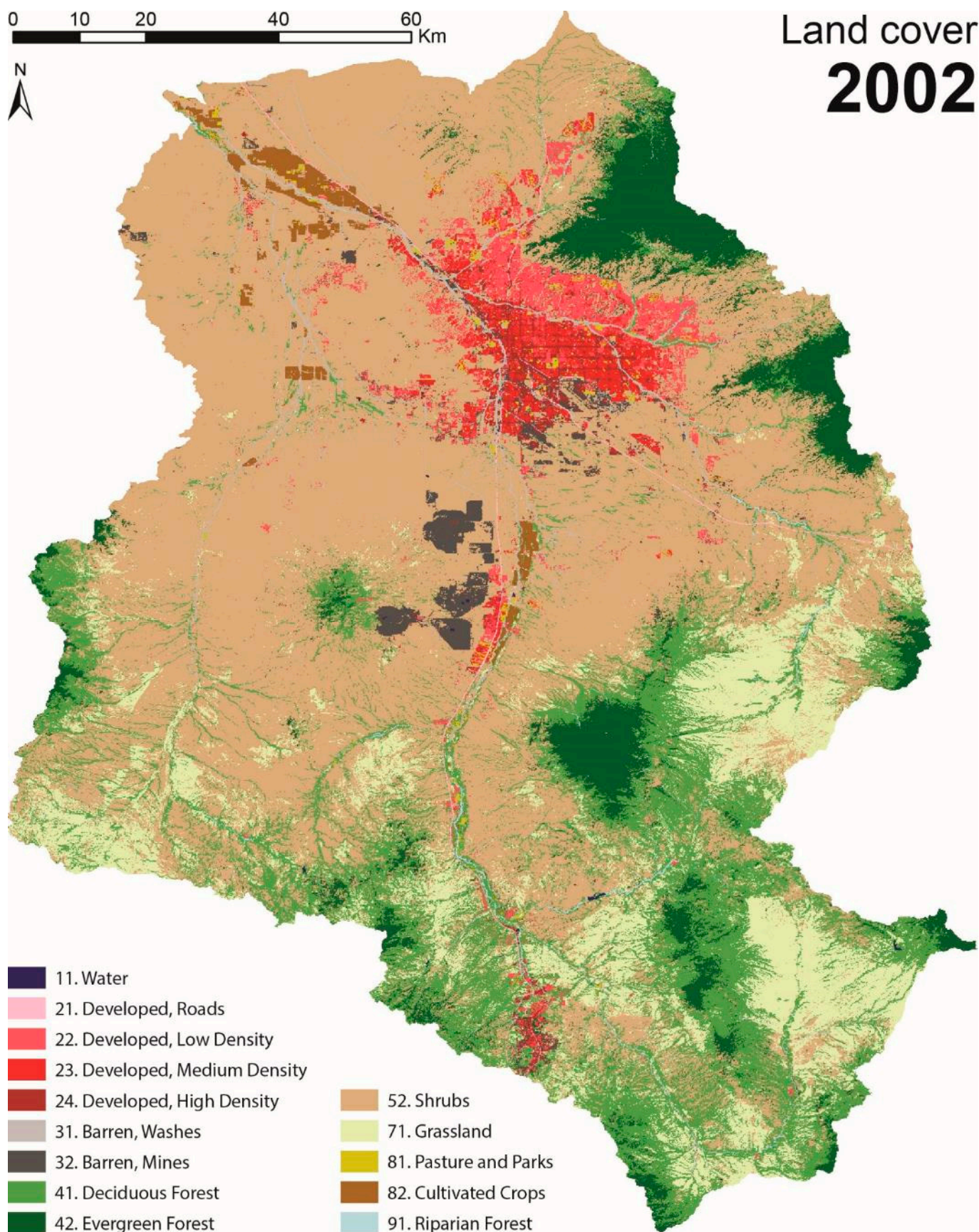














0 10 20 40 60 Km



# Land cover 2002

