

## **Introducing fuzzy set theory to evaluate risk of misclassification of land cover maps to land mapping applications: testing on coastal watersheds**

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## Supplementary Tables

**Table S.1**

Error matrix for cross-validation of the Mamanguape estuary region sub-sample.

		Reference data							Nr. Classified points
		agriculture	aquaculture	mangrove	restinga	urban	water	rainforest	
Rapideye	agriculture	626	0	21	2	2	2	24	677
	aquaculture	8	38	0	3	0	1	0	50
	mangrove	17	0	241	0	0	1	0	259
	restinga	7	1	2	41	1	0	0	52
	urban	10	0	0	6	34	0	0	50
	water	8	1	3	0	0	38	0	50
	rainforest	12	0	0	0	0	0	122	134
	Nr. «Ground Truth» points	688	40	267	52	37	42	146	1272

**Table S.2**

Error matrix for cross-validation of the Paraiba estuary region sub-sample.

		Reference data							Nr. Classified points
		agriculture	aquaculture	mangrove	restinga	urban	water	rainforest	
Rapideye	agriculture	383	0	10	0	4	2	4	403
	aquaculture	0	46	3	0	0	1	0	50
	mangrove	41	0	218	0	3	7	0	269
	restinga	4	0	0	46	0	0	0	50
	urban	34	0	19	6	291	2	0	352
	water	1	1	0	0	0	97	0	99
	rainforest	1	0	0	0	0	0	49	50
	Nr. «Ground Truth» points	464	47	250	52	298	109	53	1273

**Table S.3**

Area (ha) occupied by each land cover class per draining basin and per Protected Area in the Mamanguape estuary region (pixel size 20x20m)

		Land cover							Total
		Agriculture	Aquaculture	Urban	Mangrove	Restinga	Rainforest	Waterbody	
Draining basins	1	763.84	123.68	113.2	1417.48	614.4	0	444.24	3476.84
	2	2045.28	20.4	68.8	878.16	47.48	72.72	48.28	3181.12
	3	765.08	0	34.24	647.6	0	0	108.12	1555.04
	4	3047	24.84	0	675.2	0	0	0.84	3747.88
	5	839.48	0	66.04	1006	0	38.72	134.96	2085.2
	6	2705.04	0	0	583	0	0	3.72	3291.76
	7	2305.76	0	141.56	0	0	1702.72	0	4150.04
	8	896.48	0	134.72	0	0	271.28	5.2	1307.68
PA	APA	2856.08	143.16	485.44	4654.64	661.88	65.48	703.6	9570.28
	ARIE	593.36	82.56	9.24	4404.88	147.52	0	565.92	5803.48
	RB Guaribas	72.28	0	1.6	0	0	296.32	0	370.2

PA - Protected Areas; APA – Environmental Protection Area; ARIE- Mangroves Area of Relevant Ecological Interest; RB – Biological Reserve

**Table S.4**

Area (ha) occupied by each land cover class per draining basin and per Protected Area in the Paraíba estuary region (pixel size 20x20m)

		Land cover							Total
		Agriculture	Aquaculture	Urban	Mangrove	Restinga	Rainforest	Waterbody	
Draining basins	1	0	0	307.72	74.28	354.64	0	1056.04	1792.68
	2	1651.88	0	9.32	693.44	0	187.88	45.32	2587.84
	3	15.92	10.36	212.2	169.92	0	0	63.92	472.32
	4	0	0	1064.12	53.48	86.96	0	33.44	1238
	5	3649.44	0	0	638.24	0	993.32	19.68	5300.68
	6	224.12	39.12	33.08	593.96	378.52	0	407.84	1676.64
	7	0	0	265.16	321.64	73.24	0	458.2	1118.24
	8	4317	230.24	129.44	1942.24	0	344	277.92	7240.84
	9	0	0	1194.44	0	77.4	0	0	1271.84
	10	0	53.96	0	716.8	0	0	469.28	1240.04
	11	0	140.56	4208.16	1489.72	0	0	52.52	5890.96
	12	1386.24	0	857.28	746.36	0	0	138.76	3128.64
	13	1494.64	0	2838.76	1070.64	0	0	109.28	5513.32
PA	FN Cabedelo	0	0	1.44	103	0	0	11.76	116.2

PA - Protected Areas; FN - National Forest

**Table S.5**

Mapped and estimated area, in number of pixels, per estuarine region and land category.

Land Categories	Mapped	Estimated	95% CI	Difference	
spatial units (pixels)					
<b>Mamanguape Estuarine Region</b>					
agriculture	350623	350784	9606	161	Underestimated
aquaculture	5410	5095	1510	-315	Overestimated
mangrove	134209	138190	6539	3981	Underestimated
restinga	26883	24573	3688	-2310	Overestimated
urban	16804	12980	2811	-3824	Overestimated
water	23297	19368	3301	-3929	Overestimated
rainforest	69148	75385	5929	6237	Underestimated
<b>Paraíba Estuarine Region</b>					
agriculture	318481	365451	14539	46970	Underestimated
aquaculture	11856	11698	1793	-158	Overestimated
mangrove	212768	196048	12922	-16720	Overestimated
restinga	24269	27066	4192	2797	Underestimated
urban	277992	235351	11741	-42641	Overestimated
water	78305	85657	5566	7352	Underestimated
rainforest	38130	40529	3429	2399	Underestimated