

Figure S1. Subset of the 10 most important features for level 1 OBIA random forest classifier for land masking in the (a) 2009 Quickbird-02 image of lake Saint-Pierre and the (b) 2019 Worldview-03 image of the lake Saint-François. The prefixes are the zonal statistics followed by “x”, and the suffixes are the band on which it was calculated : Coastal (C), Blue (B), Green (G), Yellow (Y), Red (R), Red Edge (RE), Near Infrared 1 & 2 (N1 and N2), the vegetation indexes (NDVI, EVI, NDAVI, WAVI) and the textural indexes (NH1-8 and BH1-8)

Table S1. Confusion matrix for the level 1 OBIA land masking model of the 2009 Quickbird-02 image of the lake Saint-Pierre. FP, mFP, FN and mFN and n respectively mean false positive, meaningful false positive, false negative, meaningful false negative and the number of objects per class in the training set. Meaningful errors are calculated using only the red cells, where confusion will impact the land masking performance.

		Observed												
Predicted	Classes	l_ag	l_boats	l_forest	l_shadow	l_wetlands	o_foam	v_em	v_sub	w_bg_deep	w_brown	w_dark	FP	mFP
	l_ag	30.58	0.00	0.14	0.00	0.22	0.00	0.00	0.00	0.00	0.00	0.00	1.15%	0.00%
	l_boats	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00%	0.00%
	l_forest	0.00	0.00	6.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00%	0.00%
	l_shadow	0.00	0.00	0.00	4.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00%	0.00%
	l_wetlands	0.04	0.00	0.00	0.00	26.73	0.00	0.00	0.00	0.00	0.00	0.00	0.14%	0.00%
	o_foam	0.00	0.00	0.00	0.00	0.00	2.91	0.00	0.00	0.02	0.00	0.00	0.84%	0.84%
	v_em	0.00	0.16	0.00	0.00	0.00	0.00	8.43	0.14	0.00	0.17	0.12	6.54%	1.77%
	v_sub	0.00	0.00	0.00	0.00	0.00	0.01	0.06	9.40	0.32	0.00	0.05	4.49%	0.12%
	w_bg_deep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	1.39	0.16	0.00	14.39%	0.00%
	w_brown	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.07	7.80	0.06	1.85%	0.00%
	w_dark	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00%	0.00%
FN		0.12%	81.25%	1.96%	0.00%	0.82%	0.42%	0.87%	2.17%	23.13%	4.08%	100.00%		
mFN		0.00%	81.25%	0.00%	0.00%	0.00%	0.42%	0.00%	0.00%	1.36%	0.00%	0.00%		
n		332	3	80	45	297	32	97	106	22	90	3		

Table S2. Confusion matrix for the level 1 OBIA land masking model of the 2019 Worview-03 image of lake Saint-François. FP, mFP, FN and mFN and n respectively mean false positive, meaningful false positive, false negative, meaningful false negative and the number of objects per class in the training set. Meaningful errors are calculated using only the red cells, where confusion will impact the land masking performance.

Predicted	Observed													FP	mFP		
	Classes	l_ag	l_anthro	l_boats	l_forest	l_sand	l_shadow	l_wet	o_boatwave	v_em	v_floating	w_deep	w_shallow				
	l_ag	23.74	0.03	0.00	0.00	0.00	0.00	0.31	0.00	0.00	0.00	0.00	0.00			1.39%	0.00%
	l_anthro	0.02	11.25	0.09	0.00	0.29	0.13	0.00	0.00	0.00	0.00	0.00	0.00			4.52%	0.00%
	l_boats	0.00	0.03	0.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			8.51%	0.00%
	l_forest	0.00	0.00	0.00	21.36	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00			0.52%	0.00%
	l_sand	0.00	0.03	0.00	0.00	1.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00			1.63%	0.00%
	l_shadow	0.00	0.03	0.00	0.16	0.00	2.57	0.00	0.00	0.00	0.00	0.00	0.00			6.85%	0.00%
	l_wet	0.20	0.00	0.00	0.00	0.00	0.01	11.96	0.00	0.00	0.00	0.00	0.00			1.70%	0.00%
	o_boatwave	0.00	0.00	0.12	0.00	0.00	0.00	0.00	4.05	0.00	0.00	0.00	0.00			2.89%	0.00%
	v_em	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.25	0.02	0.00	0.01			0.19%	0.00%
	v_floating	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.92	0.00	0.00			0.00%	0.00%
	w_deep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.00			0.00%	0.00%
	w_shallow	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.08	3.09			4.00%	1.60%
	FN	0.90%	0.98%	36.76%	0.76%	15.81%	8.84%	2.52%	1.26%	0.00%	0.35%	32.14%	0.28%				
mFN	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.26%	0.00%	0.00%	0.00%	0.00%					
N	314	151	8	277	26	38	165	54	174	65	3	41					

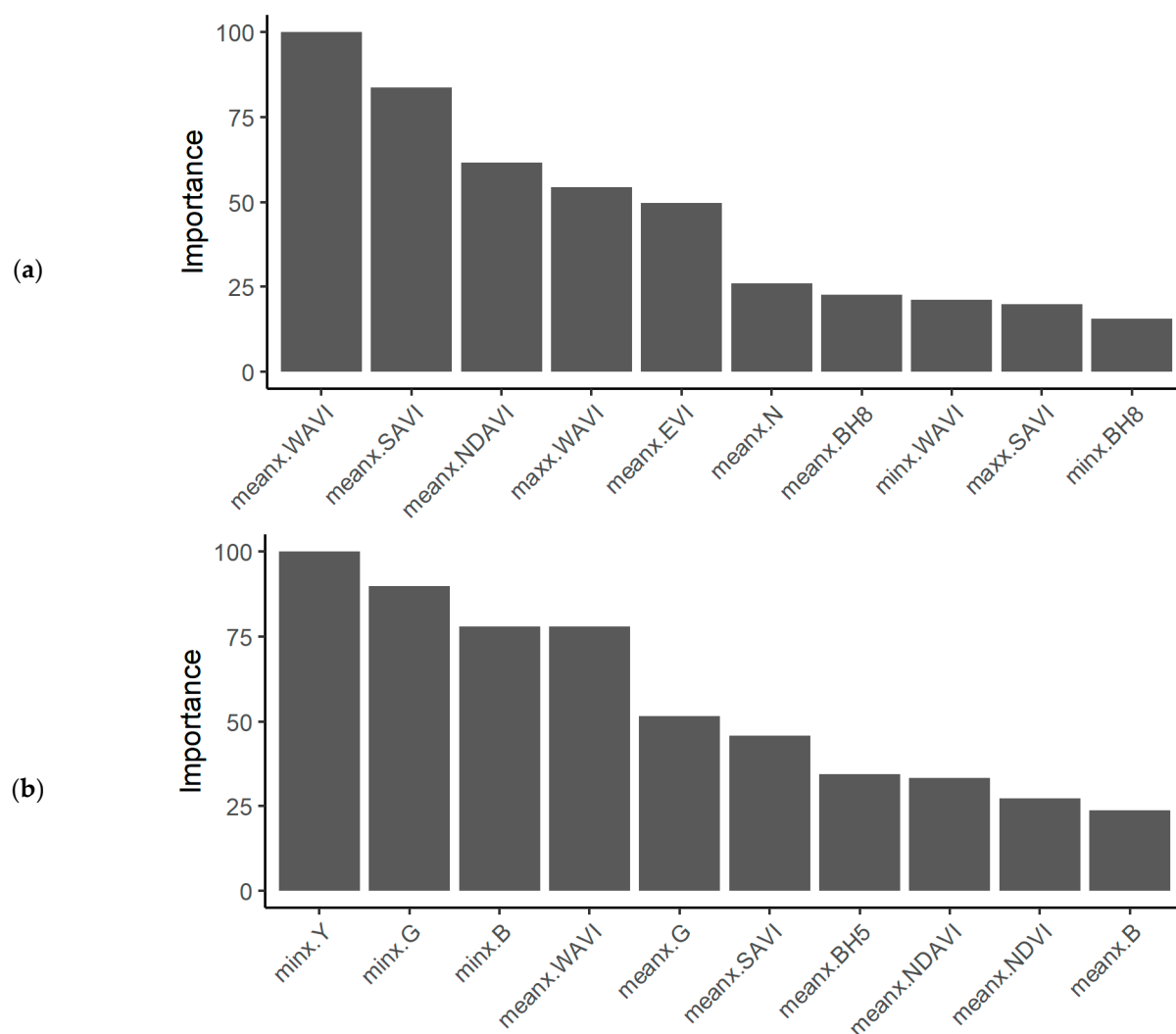


Figure S2. Subset of the 10 most important features for level 2 OBIA random forest classifier for SAV cover mapping in the **(a)** 2009 Quickbird-02 image of lake Saint-Pierre and the **(b)** 2019 Worldview-03 image of the lake Saint-François. The prefixes are the zonal statistics followed by “x”, and the suffixes are the band on which it was calculated: Coastal (C), Blue (B), Green (G), Yellow (Y), Red (R), Red Edge (RE), Near Infrared 1 & 2 (N1 and N2), the vegetation indexes (NDVI, EVI, NDAVI, WAVI) and the textural indexes (NH1-8 and BH1-8)

Table S3. Confusion matrix for the final level 2 OBIA SAV cover mapping model of the 2009 Quickbird-02 image of the lake Saint-Pierre. FP, mFP, FN and mFN and n respectively mean false positive, meaningful false positive, false negative, meaningful false negative and the number of objects per class in the training set. Meaningful errors are calculated using only the red cells, where confusion will impact the SAV cover mapping performance.

Predicted	Classes	v_em	v_p_em	v_sub_high	v_sub_low	w_bg	w_brown	w_dark	w_p_dark	w_shallow	FP	mFP
	v_em	3.51	0.06	0.39	0.00	0.00	0.00	0.00	0.00	0.12	14.25%	3.20%
	v_p_em	0.07	3.94	0.07	0.00	0.00	0.00	0.00	0.00	0.01	3.65%	0.40%
	v_sub_high	0.91	0.11	9.89	0.21	0.00	0.18	0.43	0.14	0.08	17.19%	6.88%
	v_sub_low	0.00	0.00	0.23	5.81	0.29	0.03	0.03	0.00	0.00	9.07%	5.54%
	w_bg	0.00	0.00	0.00	1.65	36.39	0.17	0.00	0.00	0.00	4.76%	4.32%
	w_brown	0.00	0.00	0.10	0.12	0.03	24.67	0.38	0.00	0.28	3.57%	0.85%
	w_dark	0.00	0.00	0.36	0.08	0.00	0.28	3.32	0.03	0.06	19.54%	10.62%
	w_p_dark	0.00	0.00	0.07	0.00	0.00	0.00	0.04	2.33	0.00	4.44%	2.93%
	w_shallow	0.17	0.00	0.03	0.00	0.00	0.06	0.00	0.00	2.87	8.12%	6.28%
FN		24.62%	4.23%	11.17%	26.11%	0.87%	2.82%	21.07%	7.01%	16.08%		
mFN		3.56%	0.10%	5.03%	23.46%	0.78%	0.84%	11.09%	5.79%	6.22%		
N		252	220	585	416	1957	1346	218	132	181		

Table S4. Confusion matrix for the final level 2 OBIA SAV cover mapping model of the 2019 Worlview-03 image of the lake Saint-François. FP, mFP, FN and mFN and n respectively mean false positive, meaningful false positive, false negative, meaningful false negative and the number of objects per class in the training set. n values in parentheses mean these classes were randomly resampled down to a lower number of objects for balancing purposes. Meaningful errors are calculated using only the red cells, where confusion will impact the SAV cover mapping performance.

		Observed							
Predicted	Classes	o_boatwave	v_floating	v_sub_high	v_sub_low	w_deep	w_shallow	FP	mFP
	o_boatwave	3.96	0.00	0.00	0.01	0.04	0.01	1.52%	0.30%
	v_floating	0.00	0.76	0.00	0.00	0.02	0.00	3.82%	0.36%
	v_sub_high	0.00	0.03	3.53	0.01	0.00	0.02	1.56%	1.22%
	v_sub_low	0.01	0.02	0.01	16.50	0.10	0.90	5.93%	5.88%
	w_deep	0.09	0.07	0.00	0.56	54.74	0.15	1.54%	1.00%
	w_shallow	0.01	0.00	0.02	1.04	0.01	17.39	5.87%	5.73%
FN	2.63%	13.89%	0.96%	8.92%	0.32%	5.83%			
mFN	0.13%	5.82%	0.71%	8.86%	0.18%	4.97%			
n	1022	202	828	4198 (2000)	12667 (2000)	4291 (2000)			