Table S1. Complete AGB model evaluations including tuned hyperparameters.

Train/eval structure	Feature set	Algorithm	Parameters	Parameter values	Train R^2	Train RMSE	Test R^2	Test RMSE
nested CV: outer random 10-fold, inner random 5-fold	Spectral bands + indices	SVR	C, gamma	1931, 0.07	0.87	465	0.72	679
		RF	max_depth, min_samples_leaf, min_samples_split, n_estimators	90, 1, 2, 100	1.00	73	0.71	683
		PCA	n_components	13	0.68	717	0.63	769
		PLSR	n_components	11	0.68	716	0.64	760
		XGB	learning_rate, max_depth, min_child_weight, n_estimators	0.05, 3, 10, 800	1.00	58	0.69	704
		LASSO	mean alpha	2.3	0.68	715	0.65	759
nested CV: outer LOGO by plot, inner 5-fold group by plot	Spectral bands + indices	SVR	C, gamma	10000, 0.07	0.90	405	0.73	656
		RF	max_depth, min_samples_leaf, min_samples_split, n_estimators	30, 1, 2, 400	1.00	56	0.69	710
		PCA	n_components	13	0.68	718	0.63	776
		PLSR	n_components	9	0.68	717	0.63	774
		XGB	learning_rate, max_depth, min_child_weight, n_estimators	0.2, 3, 1, 100	0.99	92	0.66	746
		LASSO	mean alpha	2.6	0.68	718	0.64	769
nested CV: outer LOGO by date, inner 5-fold group by date	Spectral bands + indices	SVR	C, gamma	10000, 0.003	0.68	723	0.45	941
		RF	max_depth, min_samples_leaf, min_samples_split, n_estimators	90, 2, 5, 100	0.99	109	0.48	916
		PCA	n_components	13	0.67	727	0.60	800
		PLSR	n_components	8	0.68	724	0.59	811
		XGB	learning_rate, max_depth, min_child_weight, n_estimators	0.05, 3, 1, 100	0.98	188	0.49	914
		LASSO	mean alpha	2.4	0.68	716	0.58	825

		SVR	C, gamma	1931, 0.07	0.75	680	0.25	937
holdout set: Train BRU 3-fold CV by plot, Test NFREC	Spectral bands	RF	max_depth, min_samples_leaf, min_samples_split, n_estimators	30, 1, 2, 200	1.00	0	0.05	1050
		PCA	n_components	7	0.63	820	0.28	915
		PLSR	n_components	6	0.65	799	0.31	900
		XGB	learning_rate, max_depth, min_child_weight, n_estimators	0.05, 3, 10, 100	0.89	449	0.02	1069
		LASSO	mean alpha	1.5	0.66	791	0.27	923

Table S2. Complete %N model evaluations including tuned hyperparameters.

Train/eval structure	Feature set	Algorithm	Parameters	Parameter values	Train R^2	Train RMSE	Test R^2	Test RMSE
nested CV: NFREC only - outer random 5-fold, inner random 3-fold	Spectral bands + indices	SVR	C, gamma	14, 0.014	0.80	0.25	0.65	0.34
		RF	max_depth, min_samples_leaf, min_samples_split, n_estimators	30, 1, 2, 100	0.99	0.05	0.57	0.37
		PCA	n_components	10	0.74	0.29	0.66	0.33
		PLSR	n_components	12	0.75	0.29	0.64	0.34
		XGB	learning_rate, max_depth, min_child_weight, n_estimators	0.05, 6, 10, 100	0.97	0.1	0.50	0.40
		LASSO	mean alpha	0.001	0.75	0.29	0.65	0.34
		SVR	C, gamma	72, 0.014	0.82	0.24	0.70	0.31

nested CV scheme	Bands	Model	Hyperparameters	Values				
nested CV: NFREC only - outer LOGO by plot, inner 3-fold group by plot	Spectral bands + indices	RF	max_depth, min_samples_leaf, min_samples_split, n_estimators	30, 1, 2, 200	1.00	0.04	0.55	0.38
		PCA	n_components	11	0.74	0.29	0.65	0.34
		PLSR	n_components	9	0.75	0.29	0.66	0.33
		XGB	learning_rate, max_depth, min_child_weight, n_estimators	0.05, 6, 1, 800	1.00	0.01	0.52	0.40
		LASSO	mean alpha	0.0005	0.75	0.29	0.66	0.33
nested CV: NFREC only - outer LOGO by date, inner 3-fold group by date	Spectral bands	SVR	C, gamma	10000, 0.0001	0.72	0.30	0.55	0.38
		RF	max_depth, min_samples_leaf, min_samples_split, n_estimators	70, 1, 2, 100	0.99	0.05	0.20	0.51
		PCA	n_components	8	0.69	0.31	0.53	0.39
		PLSR	n_components	7	0.72	0.30	0.55	0.38
		XGB	learning_rate, max_depth, min_child_weight, n_estimators	0.05, 3, 1, 400	0.97	0.10	0.25	0.49
		LASSO	mean alpha	0.001	0.72	0.30	0.60	0.36
nested CV: NFREC only - outer LOGO by year, inner 3-fold group by plot	Spectral bands	SVR	C, gamma	373, 0.003	0.78	0.27	0.27	0.49
		RF	max_depth, min_samples_leaf, min_samples_split, n_estimators	30, 1, 2, 200	0.99	0.04	-0.41	0.68
		PCA	n_components	6	0.75	0.29	0.28	0.48

		PLSR	n_components	5	0.74	0.29	0.21	0.51
		XGB	learning_rate, max_depth, min_child_weight, n_estimators	0.05, 3, 1, 100	0.95	0.13	-0.41	0.68
		LASSO	mean alpha	0.0013	0.74	0.29	0.36	0.46

Table S3. Parameter ranges for all algorithms

Algorithm	Parameters	Ranges
SVR	C	0.1, 0.51794747, 2.6826958, 13.89495494, 71.9685673, 372.75937203, 1930.69772888, 10000
	gamma	0.0001, 0.00051795, 0.0026827, 0.01389495, 0.07196857, 0.37275937, 1.93069773, 10
RF	max_depth	30, 70, 90
	min_samples_leaf	1, 2
	min_samples_split	2, 5
	n_estimators	100, 200, 400, 800
PCA	n_components	Length of features (10 or 20 if indices included)
PLSR	n_components	Length of features (10 or 20 if indices included)
XGB	learning_rate	0.05, 0.1, 0.2
	max_depth	3, 6, 9
	min_child_weight	1, 10, 100
	n_estimators	100, 400, 800
LASSO	alpha	100-n sequence determined by LassoCV function in scikit-learn library