Supplementary Material

Tables S1 to S4

Table S1: Pearson correlation coefficient r (*p*-value < 0.001) between pairs of five forest attributes within the reference set of GLAS surrogate forest inventory (FI) plots (n = 3600). Numbers in bold characters are for r values > 0.95.

	Stand height	Crown closure	Stand volume	Total volume	AGB
Stand height	1.00				
Crown closure	0.75	1.00			
Stand volume	**0.97**	0.63	1.00		
Total volume	**0.98**	0.66	1.00	1.00	
AGB	**0.98**	0.69	**0.98**	**0.98**	1.00

Table S2: Descriptive statistics for ''observed'' values of five forest attributes using both all reference/validation samples (ALL) and partitioned by three forest cover types (Conifer, Broadleaf, Mixedwood) for: a) a reference dataset from GLAS surrogate forest inventory (FI) plots and b) two validation sets: National Forest Inventory (NFI) plots and boreal transect airborne laser scanning (BT-ALS) LiDAR plots. Empty cells are due to missing validation sets for crown closure.

		a) Reference set					**b) Validation sets**									
		GLAS					**NFI[a]**					**BT-ALS**				
Attribute	**Forest type**	**n**	**Min**	**Max**	**Mean**	**SD[b]**	**n**	**Min**	**Max**	**Mean**	**SD**	**n**	**Min**	**Max**	**Mean**	**SD**
Stand height (m)	ALL	3,600	3.6	34.1	9.7	5.9	31	5.0	31.5	14.8	7.0	1,080,866	2.5	35.0	11.6	6.1
	Conifer	2,459	3.6	33.6	8.8	4.8	19	6.5	29.7	12.9	6.6	831,619	2.5	34.8	10.0	5.0
	Mixedwood	528	3.7	34.1	13.5	7.4	*7*	*12.0*	*31.5*	*19.7*	*7.0*	146,738	2.6	34.9	16.5	6.7
	Broadleaf	219	3.7	34.0	15.7	8.3	*5*	*5.0*	*20.4*	*14.9*	*6.1*	102,509	2.6	35.0	17.4	6.1
Crown closure (%)	ALL	3,600	11.7	77.0	39.9	10.7										
	Conifer	2,459	14.9	74.1	39.1	9.6										
	Mixedwood	528	18.1	67.6	42.5	10.8										
	Broadleaf	219	21.2	77.0	55.1	11.2										
Stand volume ($m^3 \cdot ha^{-1}$)	ALL	3,600	6.3	404.1	50.8	65.0	31	1.1	361.0	93.0	99.3	1,080,866	3.3	422.2	66.5	66.3
	Conifer	2,459	6.3	393.1	40.9	49.2	19	1.1	255.9	63.9	80.6	831,619	3.3	418.8	49.7	50.8
	Mixedwood	528	6.9	404.1	89.7	89.1	*7*	*31.5*	*361.0*	*169.4*	*125.7*	146,738	3.5	421.4	118.9	81.2
	Broadleaf	219	6.9	400.5	116.9	101.4	*5*	*4.0*	*166.2*	*96.9*	*81.8*	102,509	3.5	422.2	127.8	76.7
Total volume ($m^3 \cdot ha^{-1}$)	ALL	3,600	16.7	530.1	82.4	87.1	31	5.9	545.3	135.8	141.4	1,080,866	7.9	602.1	108.6	97.5
	Conifer	2,459	16.7	517.3	69.3	66.9	19	5.9	328.5	96.4	108.8	831,619	7.9	597.7	83.7	75.7
	Mixedwood	528	17.8	530.1	135.6	117.1	*7*	*43.4*	*545.3*	*252.2*	*190.4*	146,738	8.2	601.1	186.3	117.3
	Broadleaf	219	17.8	525.8	171.4	132.8	*5*	*6.6*	*224.7*	*122.3*	*104.9*	102,509	8.4	602.1	199.9	110.1
AGB ($t \cdot ha^{-1}$)	ALL	3,600	1.2	352.1	54.2	51.6	30	4.5	300.1	85.4	77.0	1,080,734	7.9	326.4	72.1	55.1
	Conifer	2,459	15.1	286.5	49.2	38.6	18	7.6	195.8	64.4	59.6	831,499	7.9	324.4	57.9	43.5
	Mixedwood	528	15.9	292.6	87.2	64.8	*7*	*26.7*	*300.1*	*147.7*	*100.8*	146,726	8.2	325.9	116.3	64.3
	Broadleaf	219	15.9	290.6	107.0	73.1	*5*	*4.5*	*127.5*	*74.0*	*61.2*	102,509	8.3	326.4	124.3	59.8

[a] samples with numbers in grey italic font not used for validation due to small sample size

[b] standard deviation

Table S3: Linear regression (predicted ~ observed) goodness of fit (Adj. R^2) along with slope, intercept, root mean square error (RMSE) (p-value < 0.001) for four attributes across broad forest types (rows) and across two Satellite Vegetation Inventory (SVI) map versions (SVI: final maps; SVI_L: Landsat-based map) and previously published (PUB) Landsat-based maps (columns) based on two independent validation sets: a) National Forest Inventory (NFI) plots and b) boreal transect airborne laser scanning (BT-ALS) LiDAR plots. Empty cells are due to missing published maps for total and stand volume. See Table S2 for the descriptive statistics of the two validation sets.

a) NFI			**Adj. R^2**			**Slope**			**Intercept**			**RMSE**		
Attribute	**Forest Type**	**n**	**SVI**	**SVI_L**	**PUB**	**SVI**	**SVI_L**	**PUB**	**SVI**	**SVI_L**	**PUB**	**SVI**	**SVI_L**	**PUB**
Stand height (m)	All	31	0.48	0.34	0.32	0.89	0.86	1.25	2.6	3.5	1.1	5.03	5.66	5.75
	Conifer	19	0.58	0.36	0.55	0.91	0.87	1.50	1.5	2.5	-2.2	4.32	5.32	4.45
Stand volume ($m^3 \cdot ha^{-1}$)	All	31	0.40	0.31		1.07	1.10		-3.2	1.5		76.59	82.39	
	Conifer	19	0.66	0.44		1.11	1.13		-20.7	-16.2		47.14	60.29	
Total volume ($m^3 \cdot ha^{-1}$)	All	31	0.41	0.29		1.14	1.13		-19.7	-8.1		108.71	118.95	
	Conifer	19	0.70	0.44		1.13	1.11		-37.7	-27.3		60.09	81.69	
Aboveground biomass ($t \cdot ha^{-1}$)	All	30	0.45	0.35	0.43	1.09	1.10	2.14	-9.0	-4.2	-47.1	57.02	62.13	58.40
	Conifer	18	0.74	0.48	0.28	1.05	1.04	1.50	-14.1	-8.7	-15.5	30.60	43.03	50.55

b) BT-ALS			**Adj. R^2**			**Slope**			**Intercept**			**RMSE**		
Attribute	**Forest Type**	**n**	**SVI**	**SVI_L**	**PUB**	**SVI**	**SVI_L**	**PUB**	**SVI**	**SVI_L**	**PUB**	**SVI**	**SVI_L**	**PUB**
Stand height (m)	All	1,080,866	0.55	0.40	0.38	0.85	0.78	1.01	1.8	2.8	1.2	4.06	4.68	4.78
	Conifer	831,619	0.51	0.35	0.32	0.78	0.68	0.94	2.1	3.1	1.3	3.47	3.98	4.08
	Mixedwood	146,738	0.38	0.23	0.14	0.77	0.65	0.66	4.2	6.8	7.5	5.26	5.83	6.17
	Broadleaf	102,509	0.26	0.14	0.11	0.61	0.46	0.50	7.4	10.4	10.3	5.22	5.64	5.74
Stand volume ($m^3 \cdot ha^{-1}$)	All	1,080,866	0.50	0.35		0.81	0.75		11.8	18.3		46.96	53.44	
	Conifer	831,619	0.47	0.31		0.74	0.64		10.8	16.4		37.11	42.36	
	Mixedwood	146,738	0.32	0.18		0.74	0.61		34.6	54.9		67.20	73.37	
	Broadleaf	102,509	0.23	0.12		0.60	0.46		55.5	78.8		67.36	72.09	
Total volume ($m^3 \cdot ha^{-1}$)	All	1,080,866	0.51	0.36		0.90	0.83		13.5	24.2		68.18	77.87	
	Conifer	831,619	0.48	0.32		0.82	0.71		13.3	23.1		54.64	62.52	
	Mixedwood	146,738	0.33	0.19		0.82	0.68		47.5	79.9		96.11	105.25	
	Broadleaf	102,509	0.24	0.12		0.67	0.51		82.1	119.4		96.22	103.17	
Aboveground biomass ($t \cdot ha^{-1}$)	All	1,080,734	0.53	0.38	0.54	0.89	0.81	2.08	10.5	17.4	-44.7	37.60	43.35	37.33
	Conifer	831,499	0.50	0.33	0.54	0.81	0.70	1.79	11.3	17.8	-35.8	30.86	35.49	29.49
	Mixedwood	146,726	0.35	0.21	0.42	0.82	0.68	2.06	28.7	48.9	-24.9	51.74	57.06	49.01
	Broadleaf	102,509	0.26	0.13	0.30	0.67	0.50	1.84	48.8	74.6	-2.6	51.56	55.84	50.12

Map versions

SVI	SVI final map version (PALSAR + Landsat + environmental features)
SVI_L	SVI Landsat-based map version (Landsat + environmental features)
PUB	Published Landsat-based maps of Mahoney et al. (2018) for stand height and of Wang et al. (2021) for AGB

Table S4: Pixel-wise percent mean error (ME%) and percent root mean square error (RMSE%) for four attributes across broad forest types (rows) and across two Satellite Vegetation Inventory (SVI) map versions (SVI: final maps; SVI_L: Landsat-based map) and previously published (PUB) Landsat-based maps (columns) based on two independent validation sets: a) National Forest Inventory (NFI) plots and b) boreal transect airborne laser scanning BT-ALS cells. Empty cells are due to missing Landsat-based published maps for total and stand volume See Table S2 for the descriptive statistics of the two validation sets.

a) NFI				**ME%**			**RMSE%**	
Attribute	Forest Type	N	SVI	SVI_L	PUB	SVI	SVI_L	PUB
Stand height (m)	All	31	-6.9	-10.7	-26.2	33.9	38.9	46.2
	Conifer	19	-3.2	-7.0	-21.7	32.1	39.9	41.2
Stand volume ($m^3 \cdot ha^{-1}$)	All	31	-3.5	-10.7		79.8	86.5	
	Conifer	19	19.6	11.0		73.2	90.5	
Total volume ($m^3 \cdot ha^{-1}$)	All	31	0.7	-5.8		77.9	85.2	
	Conifer	19	23.0	15.3		64.2	81.9	
Aboveground biomass ($t \cdot ha^{-1}$)	All	30	1.6	-4.7	-27.7	64.7	70.6	78.2
	Conifer	18	16.3	9.5	-17.2	47.8	63.8	77.9

b) BT-ALS				**ME%**			**RMSE%**	
Attribute	Forest Type	N	SVI	SVI_L	PUB	SVI	SVI_L	PUB
Stand height (m)	All	1,080,866	-0.6	-2.8	-10.8	35.8	41.7	42.7
	Conifer	831,619	1.4	1.2	-6.9	36.3	42.2	41.5
	Mixedwood	146,738	-3.6	-9.0	-18.2	33.0	38.1	42.4
	Broadleaf	102,509	-6.0	-13.4	-19.3	32.7	38.3	39.9
Stand volume ($m^3 \cdot ha^{-1}$)	All	1,080,866	1.0	-3.2		72.4	82.8	
	Conifer	831,619	5.3	5.0		78.6	91.1	
	Mixedwood	146,738	-3.6	-12.0		58.3	65.6	
	Broadleaf	102,509	-6.3	-17.2		56.3	63.6	
Total volume ($m^3 \cdot ha^{-1}$)	All	1,080,866	-2.8	-6.2		63.2	72.8	
	Conifer	831,619	2.2	2.0		66.7	77.6	
	Mixedwood	146,738	-8.9	-16.1		53.0	60.2	
	Broadleaf	102,509	-11.5	-21.0		51.3	58.7	
Aboveground biomass ($t \cdot ha^{-1}$)	All	1,080,734	-3.7	-6.9	-22.2	52.8	61.5	63.4
	Conifer	831,499	-0.4	-0.8	-9.6	54.8	64.1	57.3
	Mixedwood	146,726	-8.3	-14.9	-41.0	45.8	52.6	61.6
	Broadleaf	102,509	-10.0	-19.3	-44.6	44.3	52.0	61.3

Map versions	
SVI	SVI final map version (PALSAR + Landsat + environmental features)
SVI_L	SVI Landsat-based map version (Landsat + environmental features)
PUB	Published Landsat-based maps of Mahoney et al. (2018) for stand height and of Wang et al. (2021) for AC

Supplementary Material

Figures S1 to S2

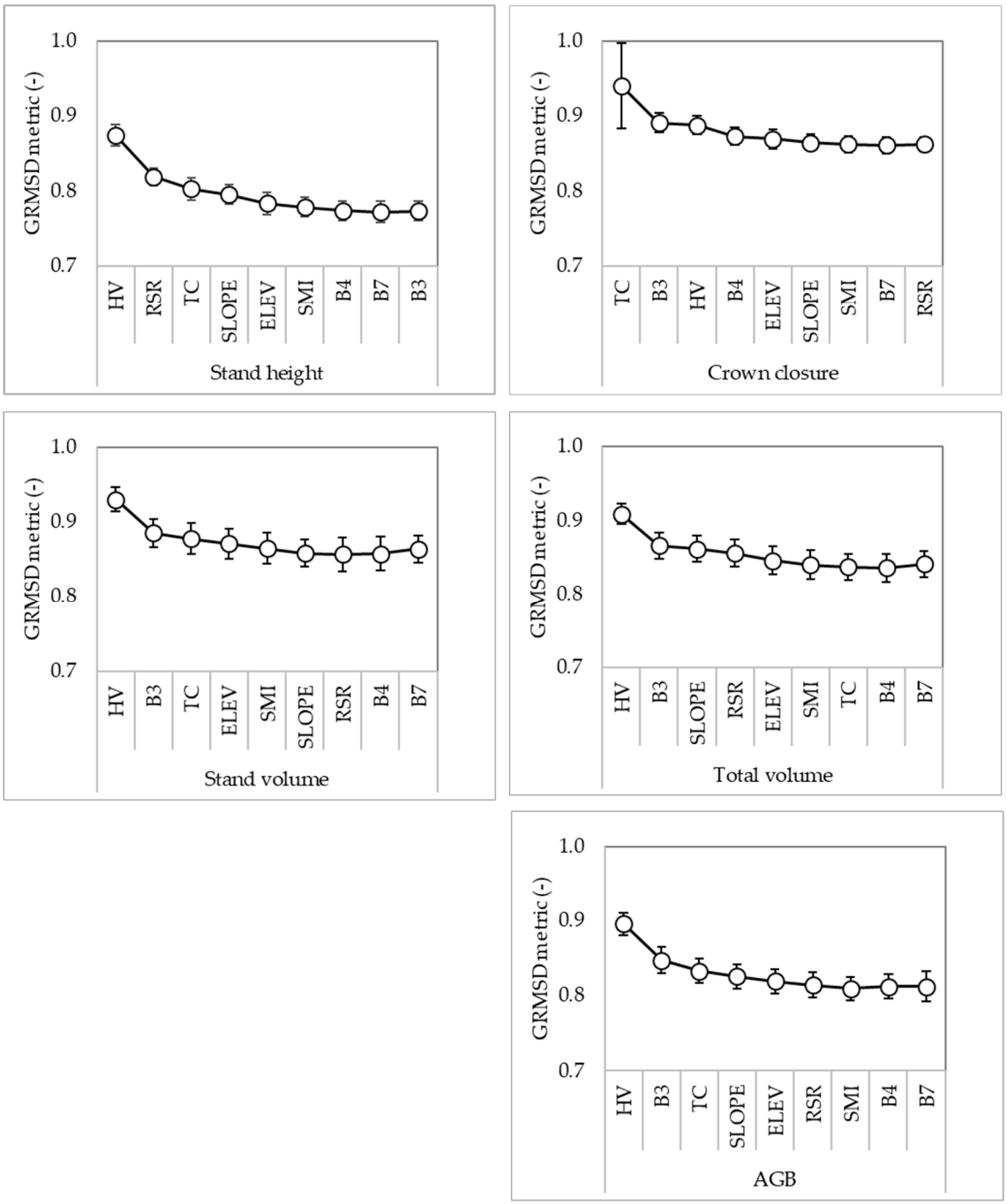
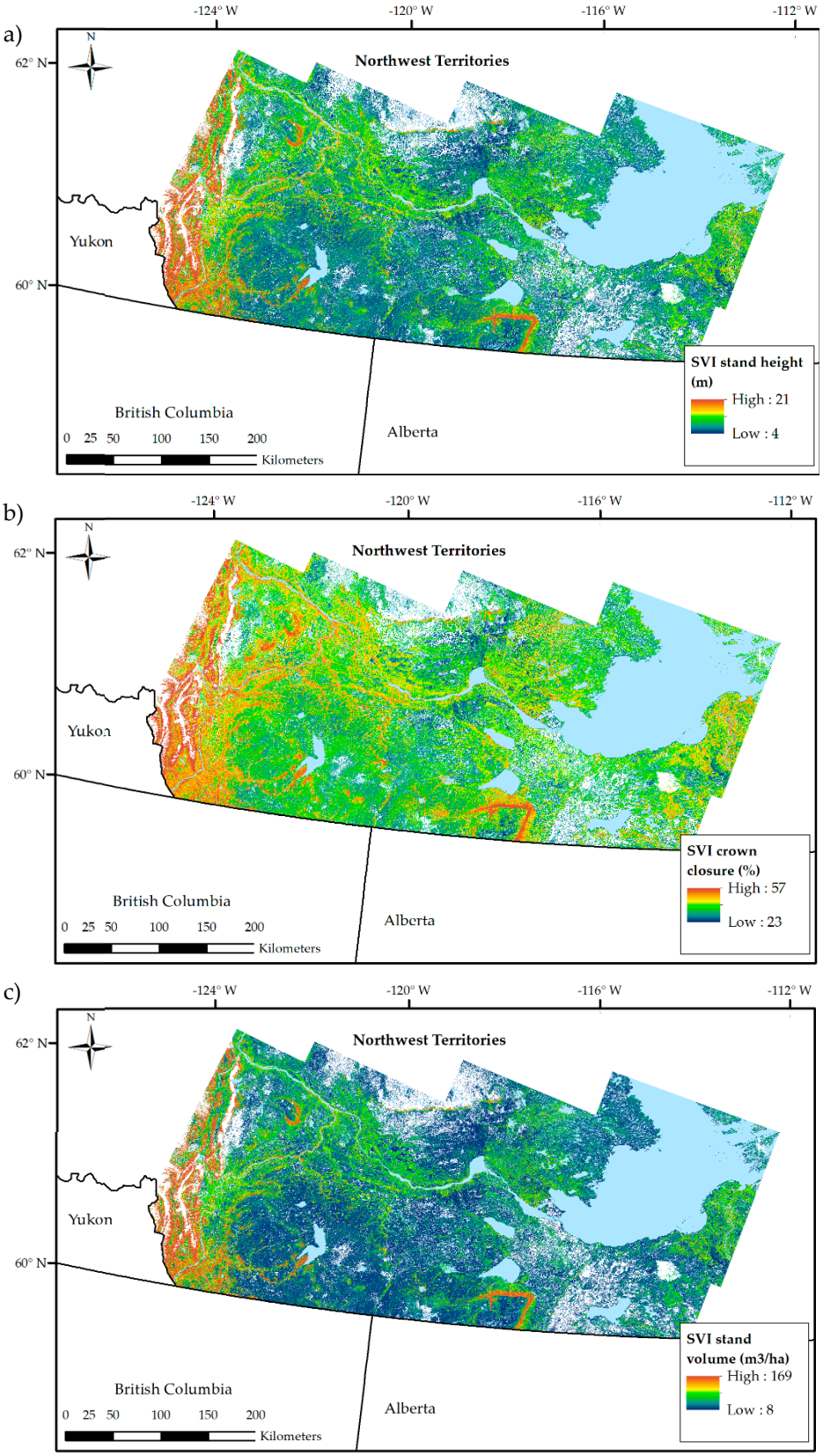


Figure S1: Univariate global root mean square difference (GRMSD) metric (the circle represents the mean, and the vertical bar length is ± 1 standard deviation) as function of forward iterative selection of best features among the final selection of nine features for stand height, crown closure, stand volume, total volume and above ground biomass (AGB). See Table 1 for more information regarding definition of the feature variables.


a)
-124° W
-120° W
-116° W
-112° W
62° N
60° N
N
Northwest Territories
Yukon
British Columbia
Alberta
0 25 50 100 150 200
Kilometers
SVI stand height (m)
High : 21
Low : 4
b)
-124° W
-120° W
-116° W
-112° W
62° N
60° N
N
Northwest Territories
Yukon
British Columbia
Alberta
0 25 50 100 150 200
Kilometers
SVI crown closure (%)
High : 57
Low : 23
c)
-124° W
-120° W
-116° W
-112° W
62° N
60° N
N
Northwest Territories
Yukon
British Columbia
Alberta
0 25 50 100 150 200
Kilometers
SVI stand volume (m3/ha)
High : 169
Low : 8

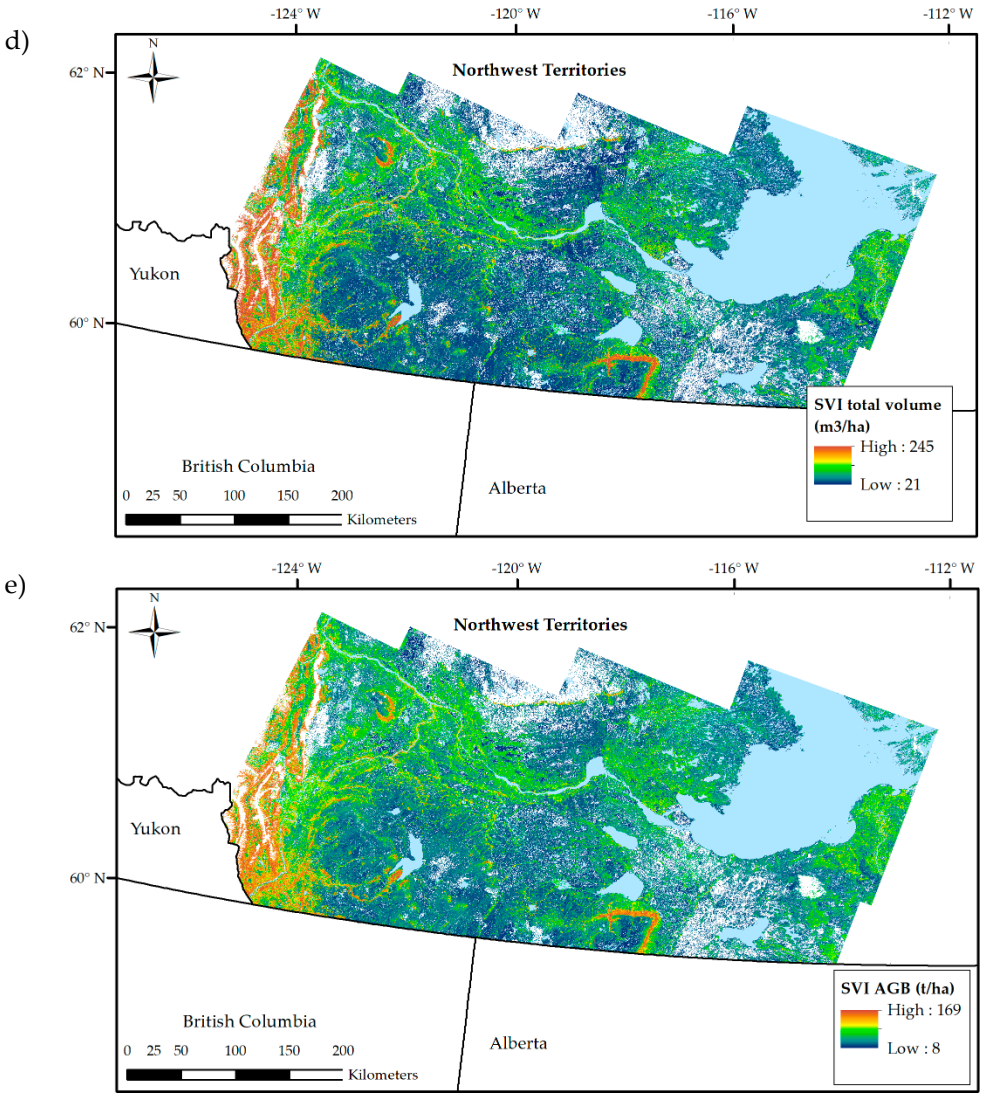


Figure S2: Satellite Vegetation Inventory (SVI) raster maps from *k*-NN predictions of a) stand height, b) crown closure, c) stand volume, d) total volume and e) aboveground biomass (AGB) for the Phase 1 area. White pixels are non-forested lands whereas light blue pixels are water bodies. Low and high attribute values are the 5% and 95% percentile, respectively.