Supplementary Materials: Automated Detection of Forest Gaps in Spruce Dominated Stands Using Canopy Height Models Derived from Stereo Aerial Imagery. *Remote Sensing* 2016, *8*, Article No.

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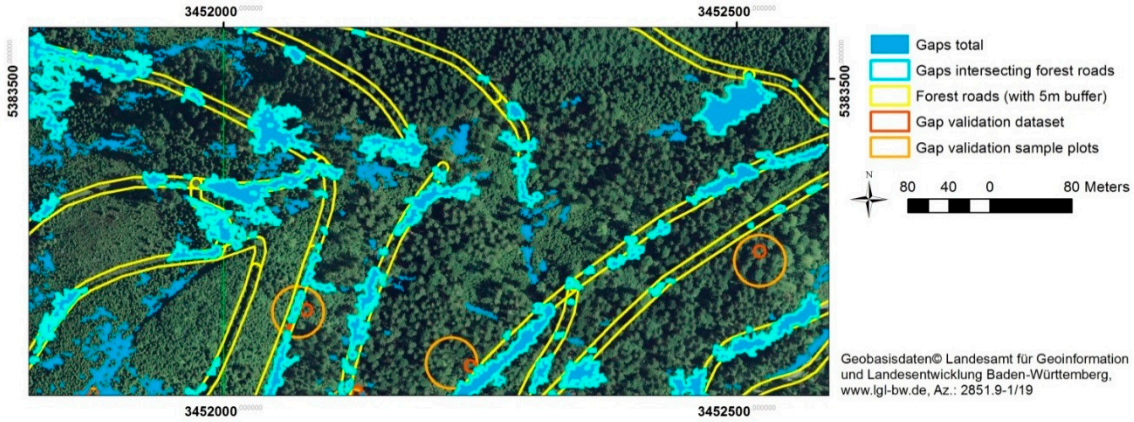

Figure S1. Example for the verification of gaps mapped in 2012 on and next to forest roads (gaps intersecting 5 m buffer of the road centerline selected by location).

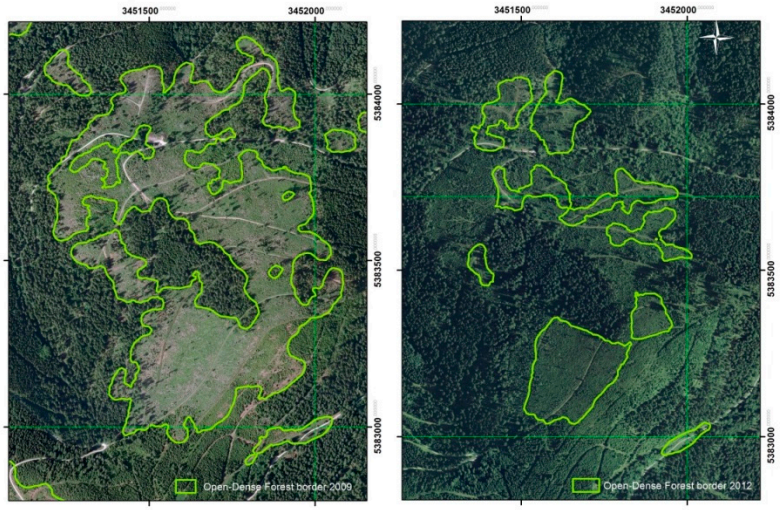

Figure S2. Example of the results of delimiting open forest (delineated in light green) within a dense forest matrix in 2009 (**right**) and 2012 (**left**).

Table S3. Confusion Matrix for evaluating the automated determination of open forest (OF) and dense forest (DF) with the results of visual classification.

	Visual Reference					
	2009			**2012**		
Automated Mapping	**OF**	**DF**	**Total**	**OF**	**DF**	**Total**
OF	37	3	40	40	0	40
DF	3	37	40	6	34	40
Total	40	40	80	46	34	80

Table S4. Descriptive statistics for low (LF < 8 m) and high (HF ≥ 8 m) forest stands mapped in 2009 and 2012.

	2009		**2012**	
Statistics	**LF**	**HF**	**LF**	**HF**
N	82	18	70	22
Minimum size (m²)	3020	3046	3126	3874
Maximum size (m²)	659,404	6,177,173	834,811	7,383,150
Mean size (m²)	21,340	424,257	30,180	355,155
Median size (m²)	6147	8957	5534	11,478
Interquartile 25%	4237	3981	4283	5272
Interquartile 75%	12,384	60,830	17,422	27,214
SD (m²)	74,429	1,417,558	10,5212	1,533,808
Sum area (m²)	1,749,919	7,636,625	2,112,599	7,813,413

Table S5. Descriptive statistics of gap mapping results per year (including gaps persisting in both years) and forest type (low (LF) and high (HF) forest and in total).

	2009			**2012**			**Persisting Gaps 2009–2012**		
Statistics	**LF**	**HF**	**Total**	**LF**	**HF**	**Total**	**LF**	**HF**	**Total**
N	2401	2174	4575	3088	1579	4667	1330	652	2765
Density (N/ha)	13.7	2.8	4.9	14.6	2.0	4.7	6.3	0.8	13.1
Min size (m²)	10	10	10	10	10	10	1	1	1
Max size (m²)	19,091	2105	19,091	12,556	2495	12,556	4129	1437	4129
Mean size (m²)	188	113	152	151	98	133	130	66	101
Median size (m²)	29	36	32	26	27	27	57	62	65
Interquartile 25%	16	17	16	15	15	15	18	22	20
Interquartile 75%	81	99	89	73	80	75	365	230	329
SD (m²)	699	221	530	545	215	461	367	137	283
Total area (m²)	450,722	246,026	696,748	465,853	155,418	621,271	173,296	43,169	279,593
Coverage (m²/ha)	2576	322	742	2205	199	626	820	55	1323

Table S6. Shadow occurrence statistics (yes = shadow, in division to "partial" and "full" shadow coverage) in areas of visually identified and not automatically mapped gaps in 2009 and 2012.

Year	**2009**				**2012**			
Shadow Occurrence	**No**	**Shadow**			**No**	**Shadow**		
		Yes	***Partial***	***Full***		**Yes**	***Partial***	***Full***
No of visually and not automatically identified gaps	**4**	**27**	*20*	*7*	**19**	**38**	*27*	*17*
% of visually and not automatically identified gaps	**13**	**87**	*21*	*74*	**30**	**70**	*27*	*43*

Table S7. Statistics of "No-data" raster cells located within the evaluation plots for gap validation in 2009 and 2012.

Year	2009	2012
"No-data" cells (no.)/% of total cells in evaluation plots	4107 (12.2%)	3015 (8.8%)
N of "no-data" cell groups (region group with 8 neighbors)	916	918
Max. no. of no cells in a group	77	74
Mean group size (N of no value cells)	4.5	4.5
Other raster cells	29,484	31,146
Total cells in the gap evaluation plots	33,591	34,161

Table S8. Types of gaps (in regard to their location within a forest stand (0), on a storm throw (1), on a road (2), next to open forest (3), on a skidding trail (4) and next to a road or a skidding trail(5)) identified during the visual validation in 2009 and 2012.

	2009		2012	
Gap Type	**No**	**%**	**No**	**%**
Gap within a forest stand (0)	107	54	114	50
Gap on a storm throw (1)	1	0	13	6
Gap on a road (2)	40	20	54	23
Gap next to an open forest (3)	11	6	1	0
Gap on a skidding trail (4)	20	10	31	13
Gap next to road or skidding trail (5)	18	9	17	7
Gaps on or next to road or skidding trail (2,4,5)	*78*	*39*	*102*	*43*
Total	197	99	230	99

Table S9. Statistics for gaps mapped on or next to forest roads (all gaps intersecting the 5 m buffer from the forest road line).

		Gaps		Gap area (m²)				
Year	**Forest Height Class**	**N**	***% of All Gaps in Class***	**Sum**	***% of Total Class Area***	**Mean**	**Range**	**SD**
2009	LF	663	*28*	362,328	*80*	87.6	0-6314	286
	HF	806	*37*	164,628	*67*	44.5	0-1114	88
2012	LF	760	*25*	343,053	*74*	72.3	0-3108	211
	HF	547	*35*	120,369	*77*	40.2	0-1020	88

Table S10. Basic statistics of gaps mapped not on or next to roads (solely within forest stands) in low (LF) and high (HF) forest height classes in 2009 and 2012.

		Gaps		Gap Area (m²)		
Year	**Forest Height Class**	**N**	***Gap Density (N/ha)***	**Sum**	***Gap Area per ha (m²/ha)***	**Mean**
2009	LF	1738	*9.9*	88,650	*80*	51
	HF	1368	*1.8*	80,274	*67*	59
2012	LF	2328	*11.0*	122,846	*74*	53
	HF	1032	*1.3*	35,130	*77*	34