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SUPPLEMENTARY MATERIAL

For the Article:

Does degradation from selective logging and illegal activities differently impact forest resources? A case study in Ghana

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Supplementary material description:

The following supplementary material contains eight tables and four figures. In the main text they are referred to as "Tab./Fig. S##".

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Table S1 - Recent plots information. ANP = Ankasa National Park; DFR = Dadieso Forest Reserve; BRR = Bia Resource Reserve; BNP = Bia National Park.

PLOT NAME	PLOT SIZE (M^2)	NUMBER OF PLOTS	YEAR	AREA	MIN. DBH (PLOTS #, AREA PER PLOT)
ANP	10000	3	2011	3.00 ha	10 cm
ANP	500	34	2012	1.70 ha	10 cm
DFR	1600	20	2012-13	3.2 ha (20 cm) 1.84 ha (10 cm)	20 cm (20 plots, 1600 m^2) 10 cm (46 subplots, 400 m^2)
BRR	500	3	2012-13	0.15 ha	10 cm
BRR	400	10	2012-13	0.40 ha	10 cm
BRR	1600	8	2012-13	1.28 ha (20 cm) 0.32 ha (10 cm)	20 cm (8 plots, 1600 m^2) 10 cm (8 subplots, 400 m^2)
BNP	500	2	2012-13	0.10 ha	10 cm
BNP	400	5	2012-13	0.20 ha	10 cm
BNP	1600	11	2012-13	1.76 ha (20 cm) 0.80 ha (10 cm)	20 cm (11 plots,1600, m^2) 10 cm (20 subplots, 400 m^2)

Table S2 - Total area sampled and number of trees in recent data. DBH = diameter at breast height. ANP = Ankasa National Park; DFR = Dadieso Forest Reserve; BRR = Bia Resource Reserve; BNP = Bia National Park.

PLOT NAME	Sampled area for DBH>20 cm (ha)	N. of trees DBH>20 cm	Sampled area for 10<DBH<20 cm (ha)	N. of trees 10<DBH<20 cm
ANP	4.70	899	4.70	1356
DFR	3.20	345	1.84	221
BRR	1.83	235	0.87	207
BNP	2.06	340	1.10	204

Table S3 - Total area sampled and number of trees used for richness and diversity analysis; data are from subplots of 500 m^2 for Ankasa, and 400 m^2 for the other areas. ANP = Ankasa National Park; DFR = Dadieso Forest Reserve; BRR = Bia Resource Reserve; BNP = Bia National Park.

PLOT NAME	Sampled area for DBH>20 cm (ha)	N. of trees for DBH>20 cm	Sampled area for DBH>10 cm (ha)	N. of trees for DBH>10 cm
ANP	1.70	357	1.70	841
DFR	3.20	345	1.84	402
BRR	1.68	253	0.72	290
BNP	1.96	352	1.00	335

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Table S4 - Nonmetric Multidimensional Scaling (NMS) ordination of data in eight subcategories. ANP = Ankasa National Park; DFR = Dadieso Forest Reserve; BRR = Bia Resource Reserve; BNP = Bia National Park.

Initial Class (vegnum)	Description
1	Wet Evergreen forest, swampier ANP plots.
2	Wet Evergreen forest, ANP plots, intermediate between 1 and 3.
3	Wet Evergreen forest, ANP plots, well-drained areas in the upper parts of landscape
4	Moist Evergreen forest, 6 DFR swampier plots.
5	Moist Evergreen forest, 4 DFR plots, intermediate between class 4 and 6, 1 plot from BRR.
6	Damper Moist Semideciduous, borderline ME/MS forest, 7 plots from BRR and 8 from DFR.
7	Moist Semideciduous forest (intermediate between 6 and 8), 13 BRR plots, slightly wetter and more disturbed than class 8, 2 plots from DFR.
8	Moist Semideciduous forest (drier end of the spectrum), including all plots from BNP

Table S5 - Statistics of mean tree height, diameter at breast height (DBH), and wood density parameters per DBH class, 2012-13 data. ANP = Ankasa National Park; DFR = Dadieso Forest Reserve; BRR = Bia Resource Reserve; BNP = Bia National Park. St.Dev = standard deviation; Min. = minimum; Max.= maximum.

PLOT NAME	10-20 cm DBH class				> 20 cm DBH class			
	Mean	St. Dev.	Min.	Max.	Mean	St. Dev.	Min.	Max.
				Height in meters				
ANP	13.95	3.77	4.10	25.80	22.35	6.30	4.00	42.60
DFR	9.57	3.12	2.70	24.80	17.28	6.28	5.00	34.80
BRR	9.74	3.24	2.50	22.60	16.00	6.80	3.00	39.00
BNP	9.66	3.50	4.00	22.00	18.62	7.57	3.80	49.00
				Diameter in cm				
ANP	13.59	2.62	10.00	19.90	38.49	18.06	20.00	150.00
DFR	14.48	2.84	10.00	19.70	36.60	21.49	20.00	130.00
BRR	13.52	2.67	10.00	19.90	36.89	22.68	20.00	137.50
BNP	13.76	2.77	10.00	19.80	44.72	28.30	20.00	190.00
				Wood Density in 10^3 kg/m^3				
ANP	0.67	0.13	0.10	0.98	0.67	0.12	0.31	0.97
DFR	0.61	0.14	0.21	0.99	0.59	0.16	0.21	0.99
BRR	0.60	0.14	0.28	0.84	0.56	0.14	0.21	0.88
BNP	0.58	0.13	0.10	0.98	0.55	0.14	0.21	0.99

Table S6 - Basal area and above ground biomass (AGB) values, 2012-13 data. ANP = Ankasa National Park; DFR = Dadieso Forest Reserve; BRR = Bia Resource Reserve; BNP = Bia National Park.

PLOT	**Basal Area (m^2 ha^{-1}) per Ha**		
NAME	*10-20 cm DBH*	*>20 cm DBH*	*Total*
ANP	4.34	27.15	31.49
DFR	2.05	15.24	17.29
BRR	3.54	18.89	22.43
BNP	2.86	36.26	39.12
	AGB (Mg ha^{-1}) per Ha		
	10-20 cm DBH	*>20 cm DBH*	*Total*
ANP	27.83	307.62	335.45
DFR	8.37	129.29	137.66
BRR	14.19	146.44	160.63
BNP	11.06	292.32	303.38

Table S7 - Percentage of guilds per diameter at breast height (DBH) class, recent data. ANP = Ankasa National Park; DFR = Dadieso Forest Reserve; BRR = Bia Resource Reserve; BNP = Bia National Park. NPLD = Non Pioneer Light Demanding.

	10-20 cm DBH			
	%Pioneer	%NPLD	%Shade-bearer	%Swamp
ANP	2.46	16.01	79.45	2.08
DFR	6.91	30.41	60.83	1.84
BRR	12.87	27.32	57.73	2.06
BNP	10.20	38.27	51.53	0.00
	> 20 cm DBH			
	%Pioneer	%NPLD	%Shade-bearer	%Swamp
ANP	2.50	31.70	62.38	3.40
DFR	14.24	33.72	51.16	0.87
BRR	17.6	40.77	38.20	3.43
BNP	17.46	46.45	36.09	0.00

Table S8 - Historical basal area and guilds data for DFR and BRR. DFR = Dadieso Forest Reserve; BRR = Bia Resource Reserve; NPLD = Non Pioneer Light Demanding.

	BA m^2/ha (10-30 cm DBH) (>30 cm DBH)	**% Pioneer**	**% NPLD**	**% Shade-bearer**	**% Swamp**
DFR	(10-30) 5.74	5.00	18.00	74.00	0.10
1991	(>30)10.22	12.92	43.33	39.38	4.33
BRR	(10-30) 7.48	17.61	43.29	38.65	0.44
1987	(>30) 16.34	20.22	52.81	26.31	0.64

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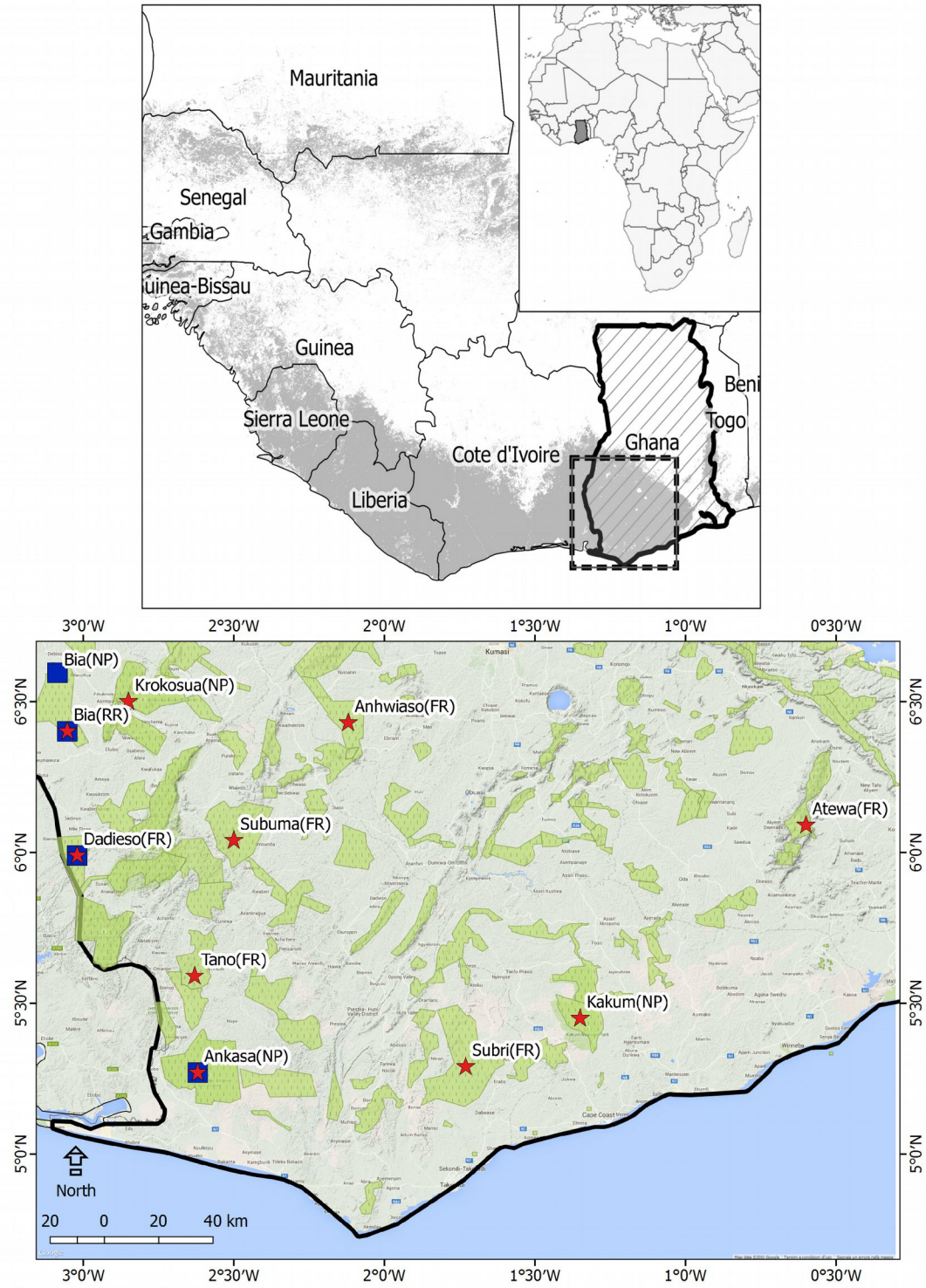

Figure S1 - The study areas. Includes sites with field data (four blue squares), and sites where remote sensing data (ten red stars) were used.

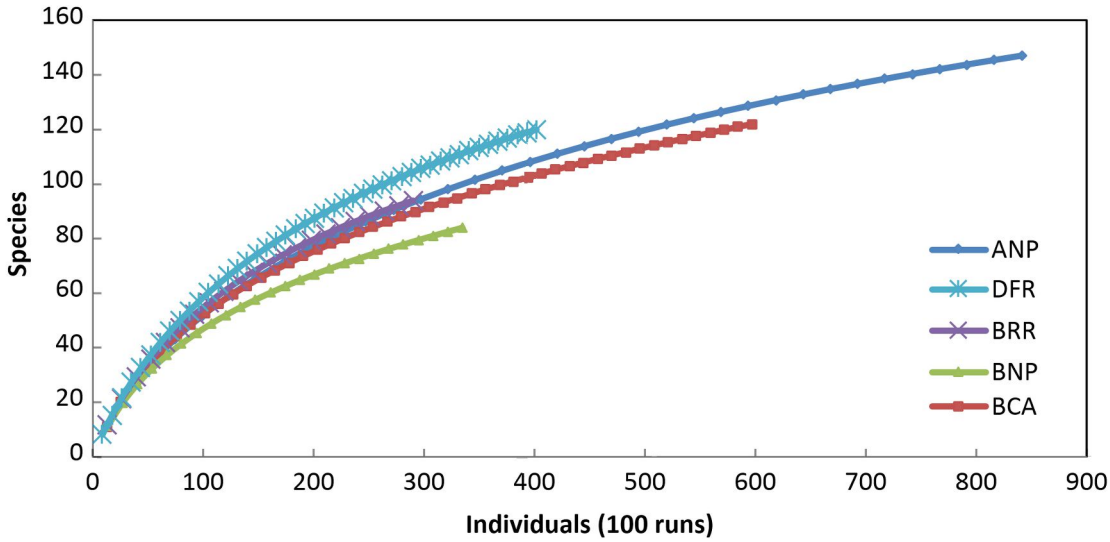

Figure S2 - Coleman rarefaction curve. ANP = Ankasa National Park; DFR = Dadieso Forest Reserve; BRR = Bia Resource Reserve; BNP = Bia National Park.

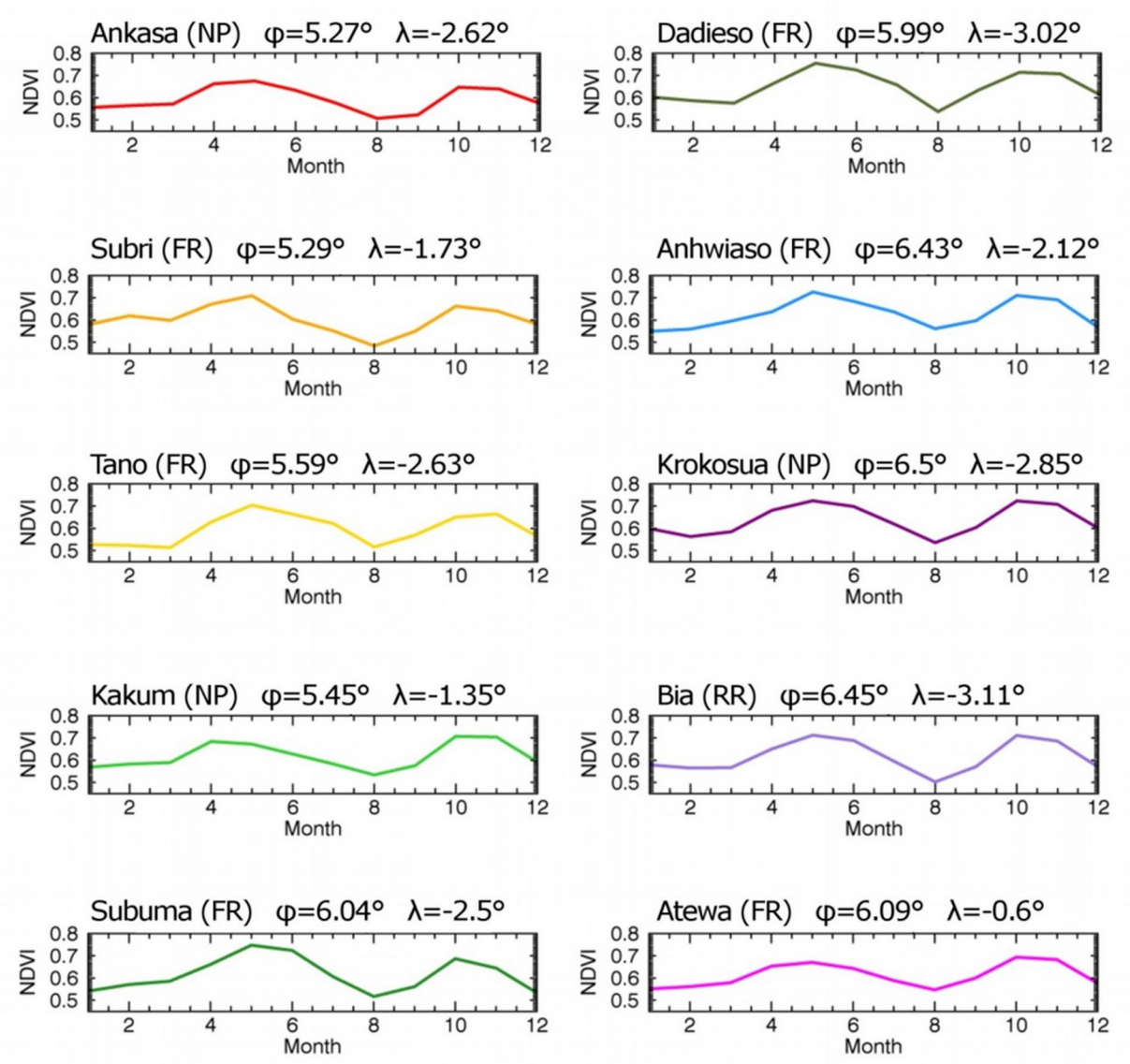

Figure S3 - 30-year averaged monthly NDVI values in 10 forested areas in Ghana. FR = Forest Reserve; NP = National Park; RR = Resource Reserve. φ = latitude; λ = longitude. NDVI = Normalized Difference Vegetation Index.

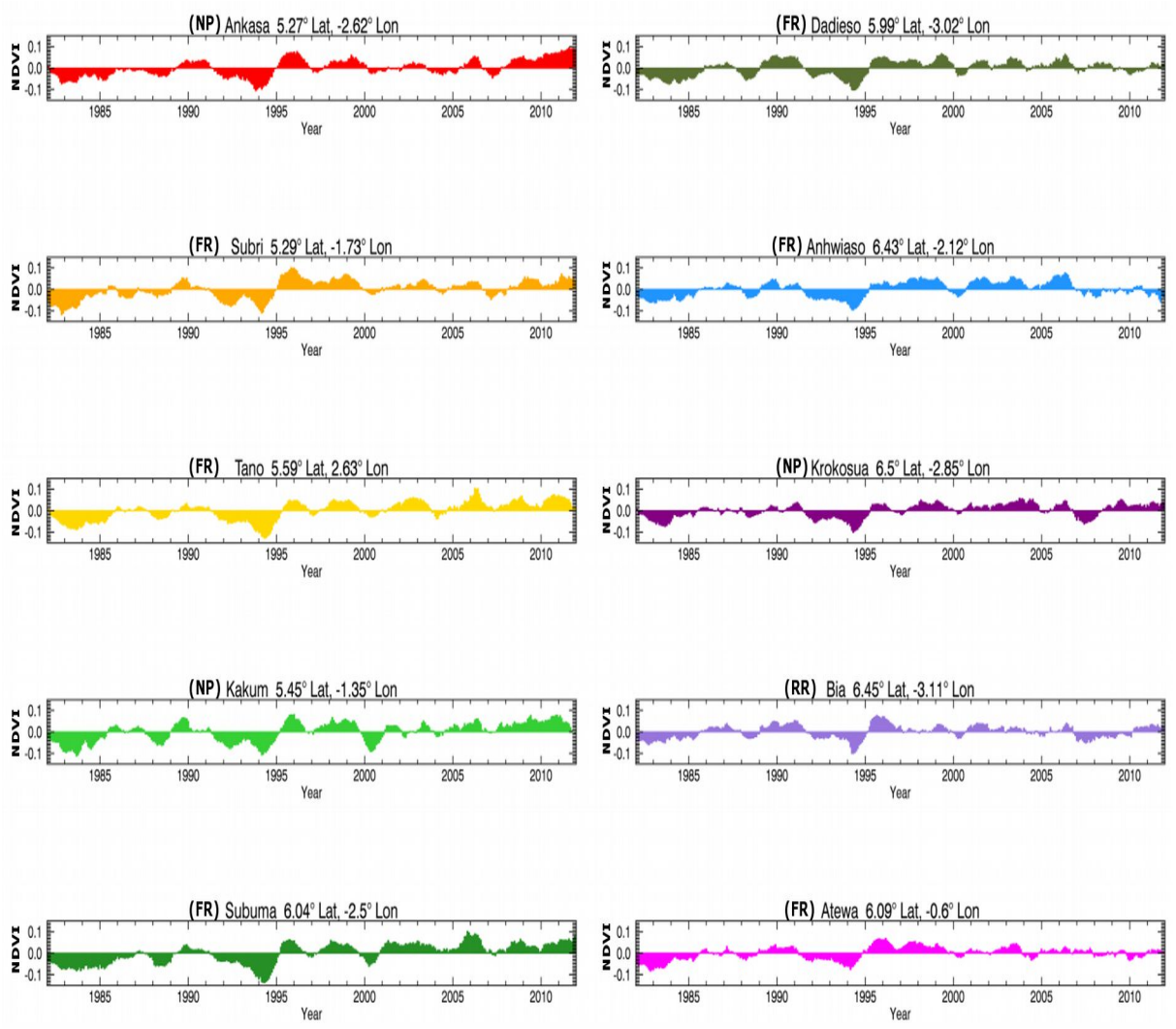

Figure S4 - Anomalies in 30-year NDVI time series for ten forests in Ghana. Sites are ordered according to increasing distance (from top left to bottom right) from the wet evergreen ecological center. FR = Forest Reserve; NP = National Park; RR = Resource Reserve; NDVI = Normalized Difference Vegetation Index.