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Article

Supplementary data

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Supplementary figures

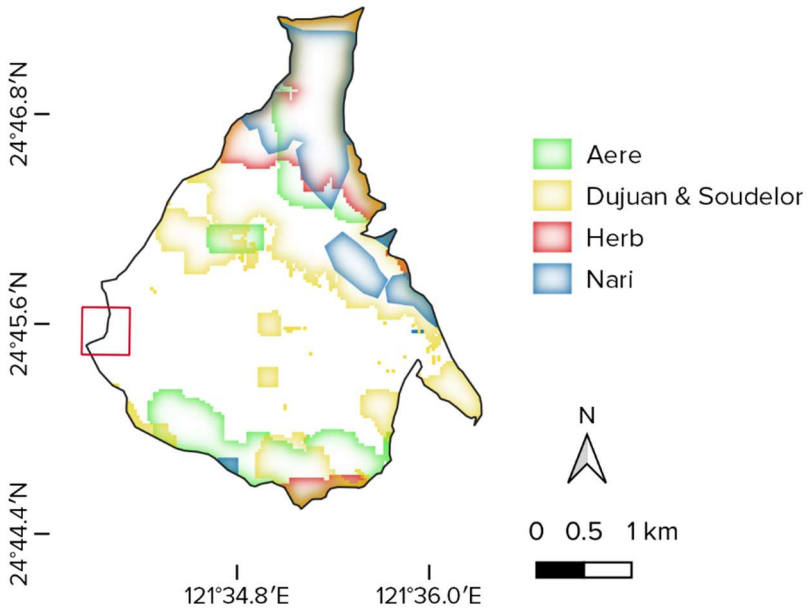

Figure S1. Cloud coverage in satellite imagery in the Fushan Experimental Forest (FEF, black) and Fushan Forest Dynamics Plot (FFDP, red) for 5 typhoon disturbances. Note that for Typhoons Dujuan and Soudelor, cloud cover was summed across imagery for both disturbance events.

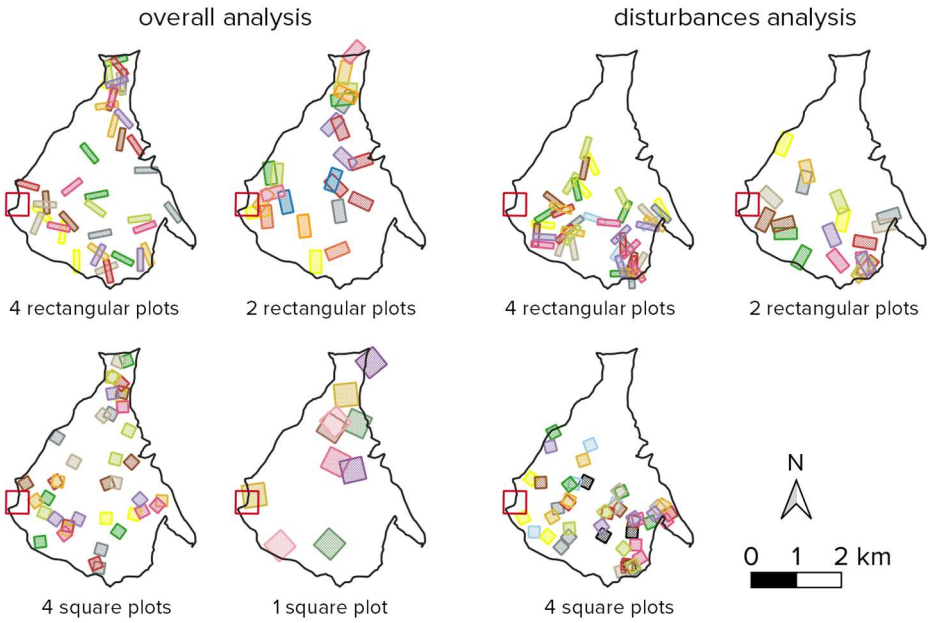

Figure S2. Location of forest dynamics plots created following four alternative strategies for the overall (left) and disturbance (right) analysis. Subplots belonging to a same plot have the same color (i.e., not for 1 square strategy). FFDP in red, FEF in black.

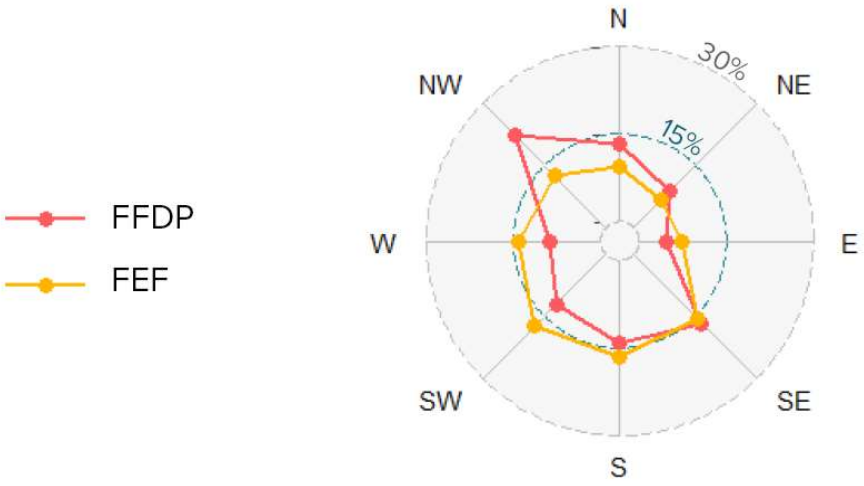

Figure S3: Percentage of slope aspects in the FEF and the FFDP. Points show the percentage of slopes that face that compass direction for each area analyzed (e.g., 10% and 14% of slopes face North in the FEF and FFDP, respectively).

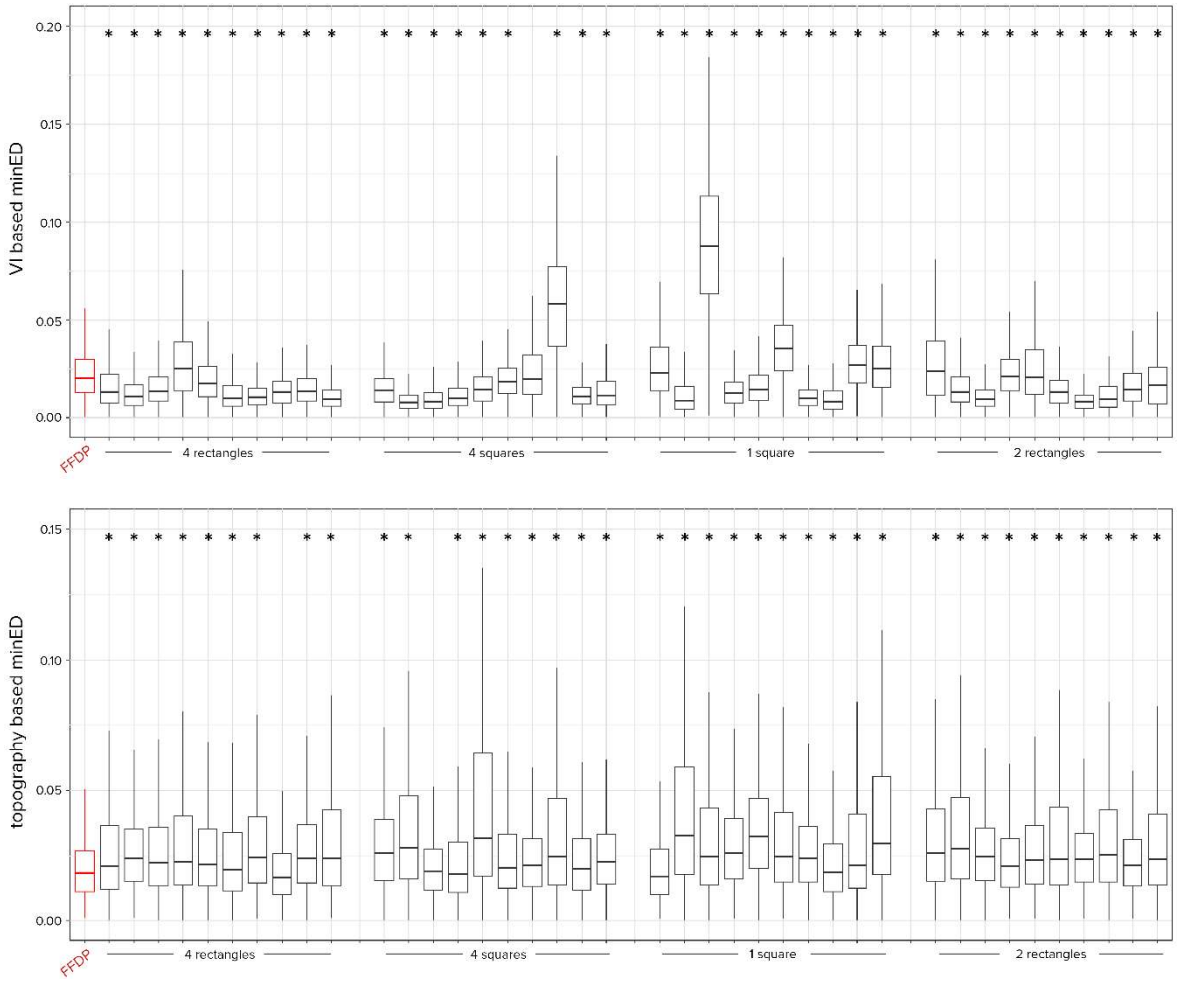

Figure S4: Minimum Euclidian distances (minED) measured between the FEF and the FFDP for the four alternative plot designs. Two types of minED were calculated: based on vegetation indices (VI, top panel), and based on topographical variables (bottom panel). Significant differences between the minED calculated for the FFDP and the alternative plots shown with an asterix (*, see Table S5).

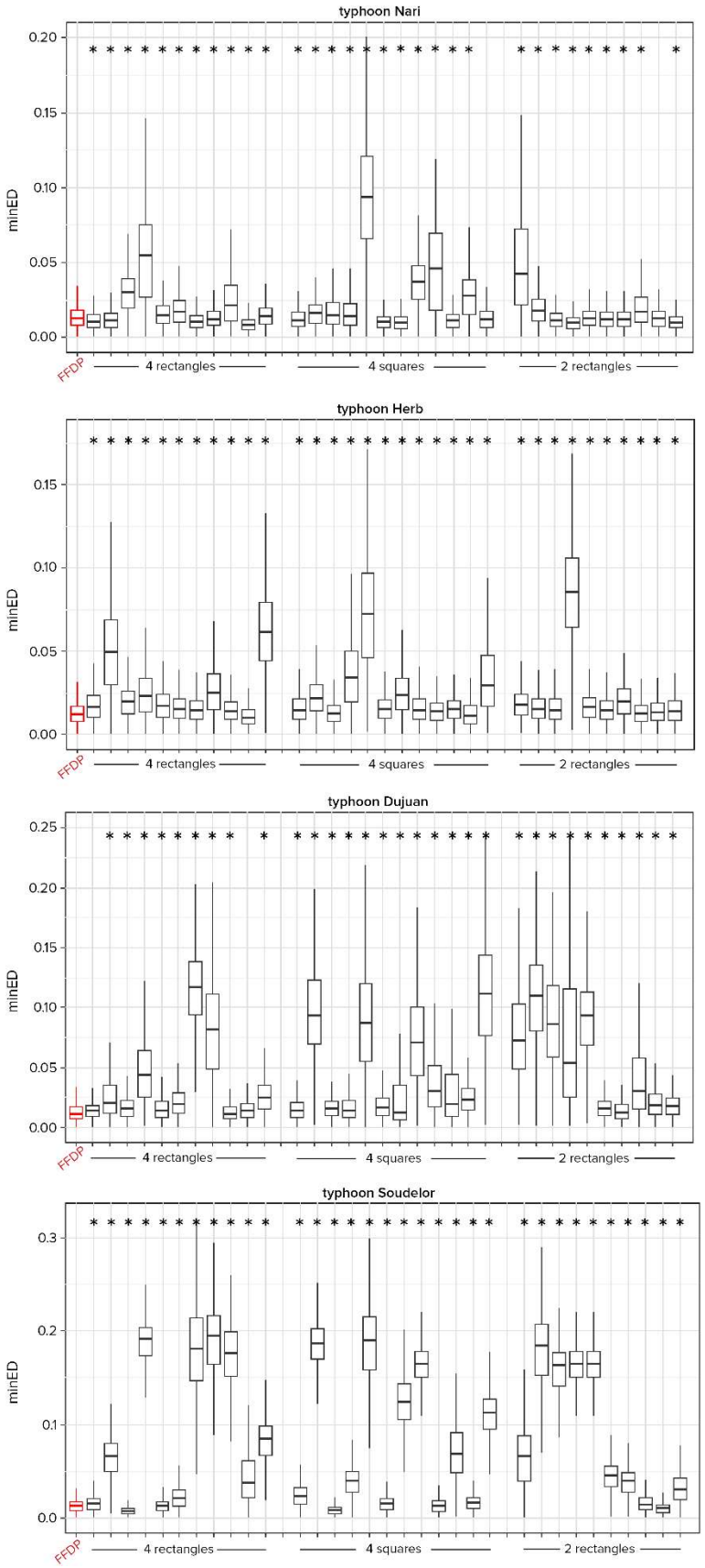

Figure S5: minED for changes of vegetation indices (ΔVIs) associated with four typhoons (Typhoon Aere not included in the analysis) between the FFDP and the three alternative plot design strategies within the FEF. Significant difference between the FFDP and alternative plots are shown with an asterix (*) based on the 95% Cis shown in Table S7.

Supplementary tables

Table S1. Overall analysis Spearman's ρ (and p value) for correlation between vegetation indices (NDVI and NDII) and topographical variables (elevation, slope steepness, and Topographic Position Index, TPI) for the FFDP (black) and the FEF (blue).

	NDII	NDVI	elevation	slope	TPI
NDII	-	0.56 (0)	-0.32 (0)	0.04 (0)	0.06 (0)
NDVI	0.67 (0)	-	-0.56 (0)	-0.02 (0.24)	0 (1)
elevation	-0.21 (0.03)	-0.34 (0)	-	0.14 (0)	0.21 (0)
slope	-0.13 (1)	0.05 (1)	0.17 (0.09)	-	0.01 (1)
TPI	0.01 (1)	0.03 (1)	0.52 (0)	0.13 (0.64)	-

Table S2: Mean (SD) ΔVIs (pre-disturbance - post disturbance) for the five studied typhoons in the FFDP and FEF. 95% CI based on bootstrapped comparisons on means as $mean_{reserve} - mean_{plot}$ (5000 iterations).

Typhoon	Area analyzed	NDVI		NDII	
		mean(SD)	95% CI	mean(SD)	95% CI
Aere	FFDP	-0.03 (0.04)	0.01;0.02	-0.01 (0.02)	0.001;0.013
	FEF	-0.01 (0.03)		-0.001 (0.03)	
Dujuan	FFDP	0.03 (0.05)	-0.097;0.008	-0.04 (0.04)	0.004;0.021
	FEF	0.03 (0.06)		-0.02 (0.06)	
Herb	FFDP	-0.02 (0.02)	-0.019;-0.003	0.02 (0.03)	-0.014;-0.001
	FEF	-0.03 (0.06)		0.01 (0.05)	
Nari	FFDP	-0.02 (0.03)	-0.027;-0.009	-0.03 (0.02)	-0.009;0.001
	FEF	-0.08 (0.14)		-0.04 (0.06)	
Soudelor	FFDP	0.01 (0.02)	-0.022;-0.0125	0.01 (0.01)	-0.019;-0.012
	FEF	-0.01 (0.04)		-0.01 (0.03)	

Table S3. Coefficient of variation (CV) of four variables before (t_0) and after disturbance (t_1). 95% confidence interval (CI) based on bootstrapped comparison of means between the FFDP and the FEF as mean CV_{FEF} – mean CV_{FFDP} (5000 iterations).

Typhoon	Area analyzed	NDVI				NDII			
		CVt_0	CVt_1	ratio	95% CI	CVt_0	CVt_1	ratio	95% CI
Aere	FFDP	1.355	4.948	0.27	0.18;1.14	4.213	5.310	0.79	-0.21;0.40
	FEF	3.170	3.461	0.92		7.906	8.965	0.88	
Dujuan	FFDP	0.902	4.743	0.19	0.20;0.77	2.849	10.496	0.27	0.06;0.33
	FEF	4.984	7.274	0.69		8.673	18.414	0.47	
Herb	FFDP	1.950	2.465	0.79	-0.29;0.30	5.324	5.009	1.06	-0.30;0.31
	FEF	5.388	6.772	0.80		10.917	10.249	1.07	
Nari	FFDP	1.471	3.994	0.37	-0.14;0.19	3.051	6.680	0.46	0.002;0.46
	FEF	3.616	9.115	0.40		8.491	12.298	0.69	
Soudelor	FFDP	2.764	0.9018	3.06	-3.43;-1.46	2.738	2.849	0.96	-0.60;-0.20
	FEF	2.809	5.000	0.56		4.953	8.714	0.57	

Table S4. Percentage of cells included in each damage sum class (0 to 5 disturbances) based on two thresholds and the two Vegetation Indices (VIs), NDVI and NDII for the Fushan Forest Dynamics Plot (FFDP) and the Fushan Experimental Forest (FEF). Rounded up values.

	ΔVI < 0 (%)				**ΔVI < mean-0.5∗SD (%)**			
	NDVI		**NDII**		**NDVI**		**NDII**	
sum	FFDP	FEF	FFDP	FEF	FFDP	FEF	FFDP	FEF
0	0	1	0	0	34	32	78	64
1	4	8	5	7	30	18	13	16
2	23	19	24	24	4	6	4	3
3	38	30	45	35	21	19	3	8
4	34	38	21	26	9	16	2	7
5	1	4	5	8	2	9	0	2

Table S5. The 95% confidence intervals (CIs) from bootstrapped comparisons on means between alternative plots and the FEF in the overall analysis for vegetation indices (NDVI, NDII), topographical variables (slope steepness, and Topographic Position Index, TPI) as $mean_{FEF} - mean_{alternative\ plot}$ (5000 iterations). The 95% CIs from the comparison of means Minimum Euclidian distances (minED) based on vegetation indices (VI) or topographical variables (slope and TPI) between alternative plot designs and the FFDP as $mean_{alternative\ plot} - mean_{FFDP}$ (5000 iterations). 95% CIs including 0 in green, negative intervals in bold.

	NDVI	**NDII**	**slope**	**TPI**	**minED**	
					VI	**topography**
2 rectangular plots	0.007;0.021	**-0.013;-0.001**	-1.431;1.753	**-1.156;-0.060**	0.004;0.005	0.021;0.023
	0.006;0.017	0.004;0.012	**-5.476;-2.408**	-0.173;1.020	**-0.007;-0.006**	0.013;0.015
	0.011; 0.021	0.003;0.012	1.475;4.428	-1.038;0.131	**-0.012;-0.012**	0.005;0.006
	-0.027;-0.019	**-0.012;-0.003**	-2.472;0.381	0.140;1.167	**-0.001;-0.0003**	0.003;0.004
	0.014;0.023	-0.001;0.007	**-3.177;-0.310**	-0.606;0.687	0.002;0.003	0.009;0.010
	0.011;0.021	-0.002;0.007	**-6.633;-3.745**	0.008;1.226	**-0.009;-0.008**	0.015;0.016
	-0.002;0.007	0.0001;0.009	2.153;5.411	0.018;1.133	**-0.014;-0.014**	0.004;0.005
	0.009;0.020	-0.003;0.008	-1.546;1.392	-0.228;0.864	**-0.011;-0.010**	0.021;0.023
	0.001;0.010	0.003;0.012	2.626;5.965	-0.105;1.111	**-0.007;-0.006**	0.003;0.003
	0.027;0.043	0.013;0.025	-5.784;-2.863	0.211;1.453	**-0.004;-0.004**	0.003;0.003
4 square plots	-0.003;0.007	0.002;0.010	-2.268;0.921	-0.164;1.144	**-0.009;-0.008**	0.008;0.009
	0.014;0.026	0.004;0.013	**-5.159;-2.169**	-0.142;1.162	**-0.014;-0.013**	0.014;0.015
	-0.013;-0.002	**-0.010;-0.0004**	0.3216;3.595	**-1.394;-0.274**	**-0.013;-0.012**	-0.0001;0.0007
	-0.009;0.002	**-0.016;-0.006**	**-3.656;-0.574**	-0.892;0.265	**-0.012;-0.011**	0.004;0.005
	-0.009;0.001	-0.008;0.0004	**-4.089;-0.864**	-0.842;0.278	**-0.008;-0.007**	0.024;0.026
	0.015;0.025	-0.0003;0.008	-1.280;1.655	**-1.239;-0.185**	**-0.004;-0.003**	0.004;0.005
	0.006;0.015	0.005;0.014	-0.357;2.970	-0.143;0.998	-0.0004;0.0004	0.002;0.003
	-0.003;0.007	0.004;0.013	-2.338;0.505	**-1.254;-0.123**	0.034;0.035	0.014;0.015
	-0.012;-0.001	-0.009;0.0002	-1.163;1.790	-0.568;0.464	**-0.012;-0.011**	0.003;0.004
	-0.013;-0.002	**-0.011;-0.002**	-2.295;1.090	0.367;1.533	**-0.010;-0.009**	0.003;0.004
4 rectangular plots	0.004;0.015	0.014;0.023	**-3.848;-0.999**	-0.315;0.840	**-0.007;-0.006**	0.007;0.008
	-0.001;0.011	0.011;0.022	4.043;7.179	-0.414;0.719	**-0.009;-0.009**	0.005;0.010
	-0.008;0.003	**-0.011;-0.002**	-2.539;0.478	0.365;1.584	**-0.008;-0.007**	0.011;0.012
	0.005;0.016	0.013;0.022	-1.408;1.668	-0.873;0.299	0.004;0.005	0.011;0.012
	0.005;0.016	0.002;0.011	**-6.300;-3.166**	**-1.363;-0.093**	**-0.001;-0.0003**	0.007;0.008
	-0.013;-0.003	**-0.011;-0.002**	**-4.575;-1.607**	-0.749;0.408	**-0.011;-0.010**	0.004;0.005
	-0.001;0.009	-0.007;0.002	**-3.617;-0.505**	-0.970;0.149	**-0.012;-0.011**	0.014;0.016
	0.002;0.013	0.003;0.015	-3.398;0.212	-0.920;0.353	**-0.009;-0.008**	-0.0008;0.0001
	0.015;0.023	0.013;0.023	-0.242;2.851	-0.625;0.509	**-0.006;-0.005**	0.011;0.012

	-0.013;-0.002	-0.007;0.002	**-4.954;-1.957**	-0.984;0.226	**-0.012;-0.011**	0.011;0.012
	-0.023;-0.014	**-0.033;-0.026**	3.649;6.608	-0.635;0.417	0.004;0.005	0.002;0.003
	-0.008; 0.005	0.023;0.035	4.416;7.623	0.049;1.053	**-0.012;-0.011**	0.025;0.026
	0.026;0.035	0.008;0.016	-1.720;1.011	**-1.170;-0.008**	0.063;0.065	0.010;0.011
1 large	-0.004;0.005	-0.004;0.004	-2.884;0.171	-0.516;0.807	**-0.010;-0.009**	0.010;0.011
square plot	0.004;0.013	-0.005;0.004	**-4.332;-1.178**	0.074;1.358	**-0.007;-0.006**	0.013;0.014
	0.025;0.033	0.005;0.013	-0.598;2.049	**-1.255;-0.143**	0.012;0.013	0.012;0.013
	0.027;0.036	0.012;0.021	**-3.859;-1.247**	0.121;1.247	**-0.013;-0.012**	0.009;0.011
	0.033;0.042	0.021;0.030	**-6.472;-3.724**	-0.291;0.952	**-0.012;-0.011**	0.004;0.005
	-0.025;-0.016	**-0.011;-0.002**	**-4.215;-1.424**	-0.690;0.407	0.005;0.005	0.011;0.012
	0.056;0.066	0.0489;0.059	**-3.684;-0.631**	**-1.556;-0.398**	0.005;0.005	0.011;0.012
current plot	**-0.028;-0.020**	**-0.038;-0.031**	6.935;9.757	-0.447;0.645	-	-

Table S6. 95% confidence intervals (CI) from bootstrapped comparisons on mean ΔVIs between the alternative plot designs and the FEF for typhoon Nari, as $mean_{plot} - mean_{reserve}$ (5000 iterations). 95% CIs including 0 in green, negative intervals in bold.

	ΔNDVI	**ΔNDII**
2 rectangular plots	**-0.013;-0.010**	**-0.009;-0.007**
	-0.013;-0.009	**-0.004;-0.002**
	-0.027;-0.023	**-0.010;-0.008**
	0.008;0.011	0.001;0.003
	-0.018;-0.015	**-0.007;-0.005**
	0.008;0.012	0.003;0.005
	0.016;0.019	0.005;0.007
	0.044;0.047	0.010;0.012
	-0.006;-0.002	**-0.009;-0.007**
	0.032;0.035	0.007;0.008
4 square plots	0.031;0.034	0.002;0.004
	0.007;0.010	0.001;0.002
	-0.008;-0.005	**-0.002;-0.0003**
	0.014;0.018	0.004;0.006
	-0.019;-0.014	**-0.007;-0.005**
	0.005;0.009	0.003;0.005
	-0.032;-0.029	**-0.014;-0.012**
	0.012;0.015	0.004;0.006
	0.047;0.050	0.015;0.017
	-0.022;-0.019	**-0.009;-0.007**
	0.040;0.043	0.011;0.013
	0.003;0.006	**-0.004;-0.002**
4transects	0.006;0.009	-0.0003;0.003
	0.040;0.043	0.012;0.014
	-0.007;-0.003	0.002;0.004
	0.021;0.024	0.010;0.012
	0.011;0.015	0.002;0.004
	0.010;0.013	-0.001;0.001
	0.023;0.026	0.005;0.006
	0.007;0.010	0.001;0.003
	0.021;0.024	0.006;0.008
	0.021;0.025	0.009;0.011
	0.006;0.009	-0.001;0.001

Table S7. 95% confidence intervals (CI) of bootstrapped comparison on means of FFDP (i.e., current plot) and alternative plots for minimum Euclidian distances (minED) based on ΔVI (NDVI and NDII), as $minED_{alternative} - minED_{FFDP}$ for the four typhoons and three alternative plot strategies. 95% CIs including 0 in green, negative intervals in bold.

	Dujuan	Herb	Nari	Soudelor
2transects	0.063;0.065	0.006;0.007	0.035;0.036	0.049;0.050
	0.091;0.093	0.004;0.005	0.005;0.006	0.164;0.166
	0.072;0.074	0.003;0.003	**-0.002;-0.002**	0.142;0.144
	0.057;0.060	0.073;0.074	**-0.003;-0.003**	0.149;0.151
	0.075;0.077	0.004;0.005	**-0.0006;-0.0001**	0.149;0.150
	0.002;0.003	0.003;0.004	**-0.0012;-0.0007**	0.033;0.034
	0.0003;0.001	0.007;0.008	**-0.0012;-0.0007**	0.025;0.026
	0.023;0.024	0.002;0.003	0.006;0.006	0.004;0.004
	0.010;0.011	0.001;0.002	-0.0004;0.0002	**-0.002;-0.001**
	0.004;0.005	0.003;0.004	**-0.003;-0.003**	0.019;0.020
4squares	0.001;0.002	0.004;0.004	**-0.001;-0.001**	0.012;0.013
	0.081;0.083	0.010;0.011	0.002;0.003	0.172;0.173
	0.002;0.003	0.0008;0.001	0.003;0.004	**-0.004;-0.003**
	0.004;0.006	0.023;0.024	0.002;0.003	0.027;0.028
	0.072;0.0740	0.058;0.059	0.079;0.081	0.171;0.173
	0.005;0.007	0.003;0.004	**-0.003;-0.002**	0.003;0.004
	0.011;0.012	0.012;0.013	**-0.003;-0.003**	0.113;0.114
	0.057;0.059	0.003;0.004	0.024;0.024	0.149;0.151
	0.022;0.023	0.004;0.004	0.031;0.032	0.001;0.001
	0.017;0.018	0.002;0.003	**-0.002;-0.002**	0.058;0.059
	0.011;0.012	0.001;0.002	0.014;0.015	0.004;0.004
	0.095;0.097	0.020;0.020	-0.0003;0.0003	0.096;0.097
4transects	-0.00004;0.0009	0.004;0.005	**-0.002;-0.002**	0.003;0.004
	0.013;0.014	0.038;0.040	**-0.0013;-0.0008**	0.051;0.052
	0.005;0.006	0.007;0.007	0.016;0.017	**-0.005;-0.004**
	0.032;0.034	0.012;0.012	0.039;0.040	0.171;0.173
	0.003;0.004	0.005;0.005	0.002;0.002	0.001;0.001
	0.008;0.009	0.004;0.005	0.006;0.007	0.010;0.011
	0.100;0.102	0.002;0.003	**-0.002;-0.002**	0.166;0.169
	0.066;0.068	0.014;0.014	**-0.0006;-0.0001**	0.175;0.177
	0.002;0.003	0.002;0.003	0.012;0.012	0.158;0.160
	-0.0002;0.001	**-0.001;-0.0004**	**-0.003;-0.002**	0.030;0.031
	0.012;0.014	0.049;0.050	0.0002;0.0007	0.069;0.070

Table S8: Wilcoxon tests p values (with Bonferroni adjustment) for the comparison of mean minimum Euclidian distances between each plot designs for all typhoons (except Typhoon Aere), and the overall vegetation analysis. The mean minED of each plot design is calculated based on the replicates minED values.

Designs comparison	Dujuan	Herb	Nari	Soudelor	Overall
4 square – 4 rectangle	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
4 square – 2 rectangle	< 0.001	< 0.001	< 0.001	< 0.001	1
4 rectangle – 2 rectangle	< 0.001	< 0.001	< 0.001	0.004	< 0.001
1 square – 4 rectangle	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
1 square – 4 square	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

1 square – 2 rectangle	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

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