Supplementary materials for

Forest structure and composition are critical to hurricane-induced mortality

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This PDF file includes:

Figures S1 to S4

Tables S1 to S5

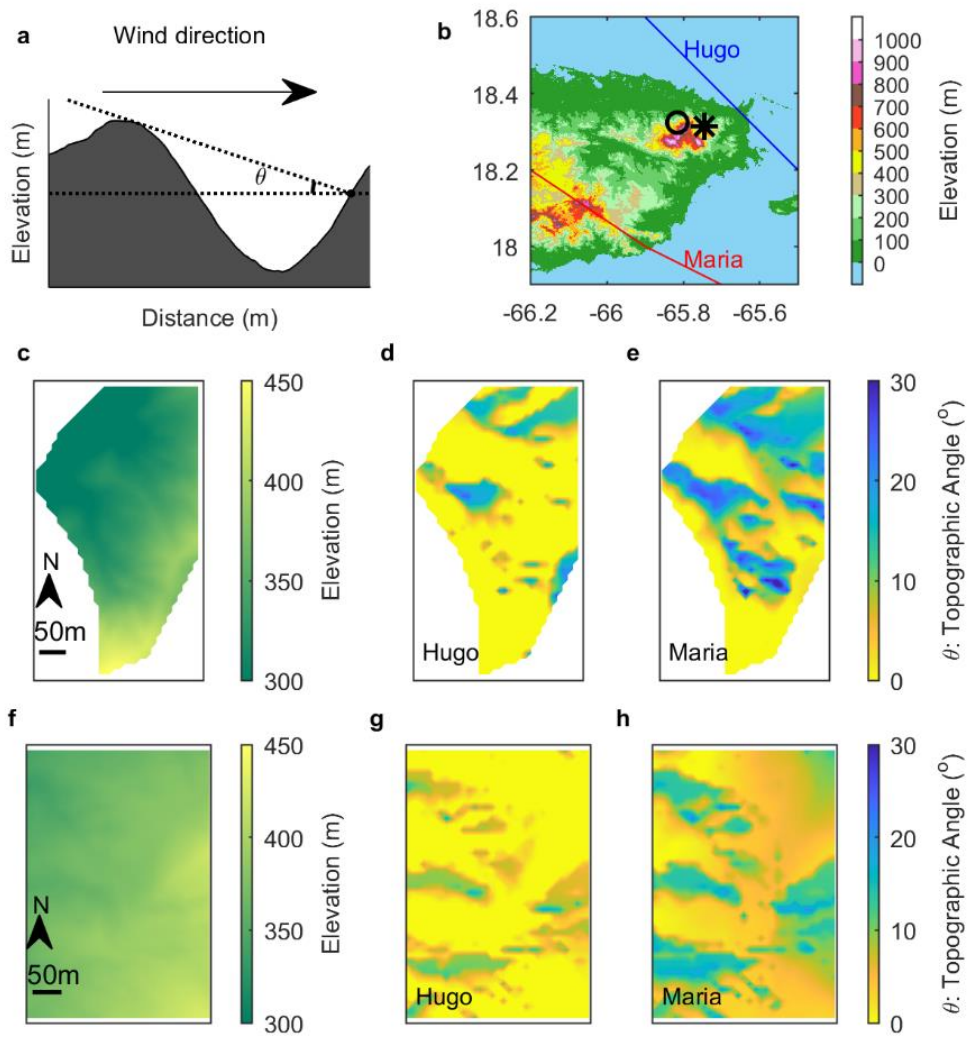

Figure S1. Topographic angle maps of two study sites from two hurricanes. Method of calculating topographic angle (θ) of a given point (**a**), location of the Bisley Experimental Watersheds (BEW) (black star) and the Luquillo Forest Dynamics Plot (LFDP) (black circle) relative to the tracks of hurricanes Hugo and María (colored lines) (**b**), elevation map of the BEW (**c**) and the map of the topographic angle of BEW regarding hurricane Hugo (**d**) and hurricane María (**e**). (**f**–**h**) are the same as (**c**–**e**), except for the LFDP. The topographic angle reveals the likelihood of exposure of a given point to wind disturbances, and smaller angle indicates higher likelihood of being exposed to the wind. The maps in (**d**,**e**,**g**,**h**) show the minimum topographical angle (maximum exposure) of the pixel among the times when the hurricanes were within 500 km of the site.

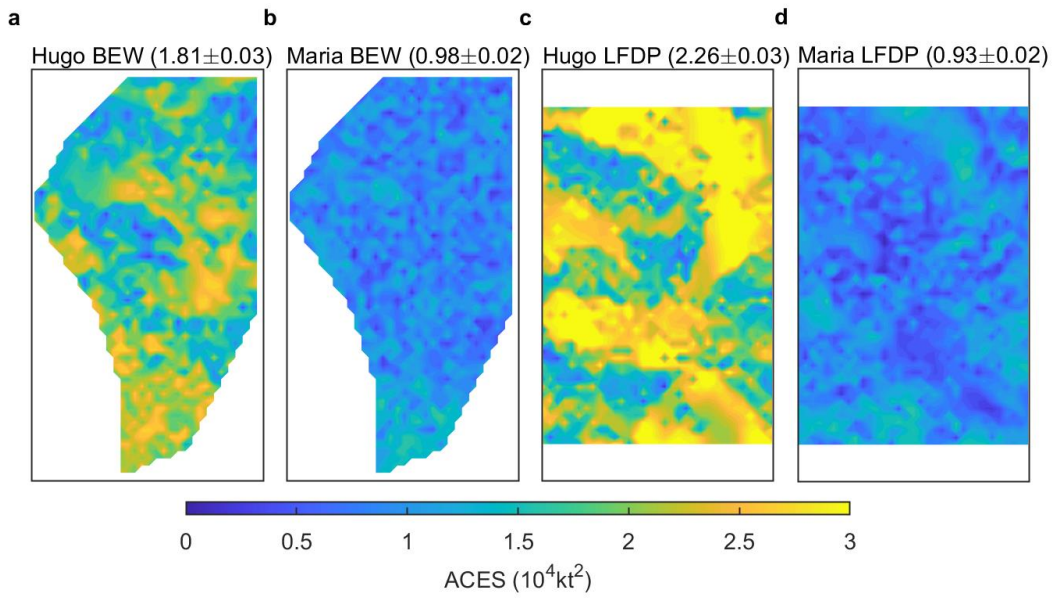

Figure S2. Same as Figure S1**d, e, g, h**, but for the accumulated cyclone energy at site (ACES). The domain mean and 95% confidence interval for each site during each hurricane are given in parentheses.

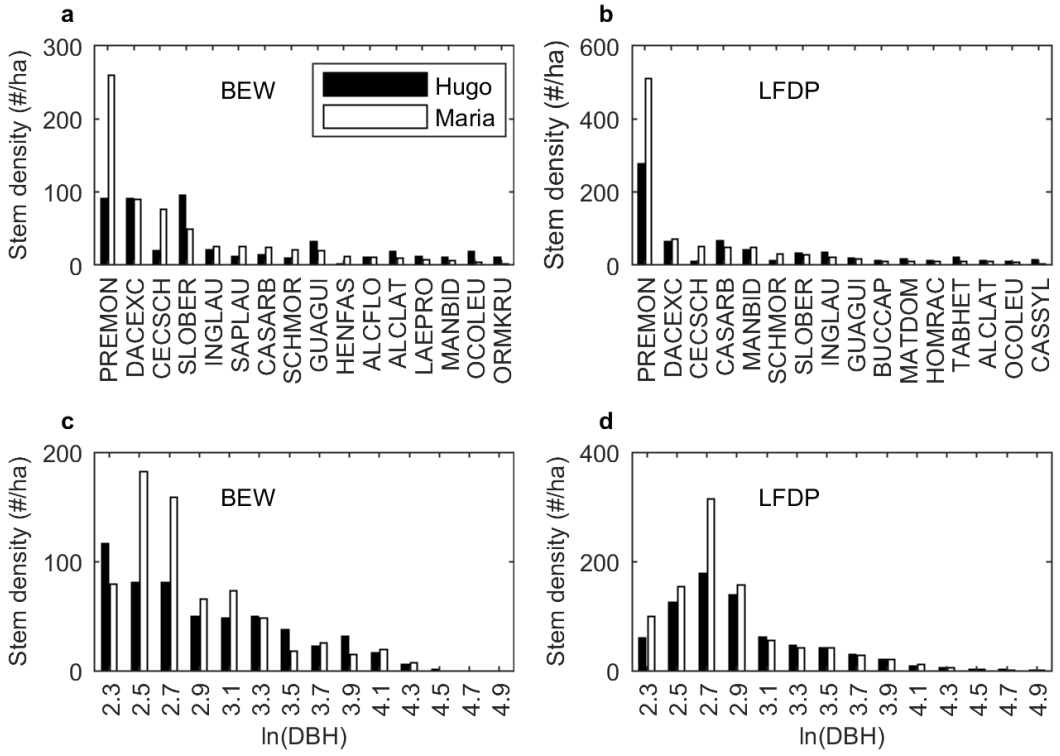

Figure S3. Species composition and size structure of the two sites (BEW and LFDP) during the two hurricane events (María and Hugo). (**a**) and (**c**) show the stem density of each species (**a**) and each DBH size (**c**) with DBH ≥ 10 cm and density ≥ 10 #/ha at BEW at the times of hurricane Hugo and hurricane María. (**b**,**d**) are the same as (**a**,**c**), but for LFDP. The DBH in x-axis in (**c**,**d**) are on a logarithmic scale. The data for LFDP in (**b**,**d**) are from Table S1 and Figure S1, respectively, in Uriarte et al. [4], which is under creative commons license (https://creativecommons.org/licenses/by/4.0/, last accessed 25 January 2022). The two distributions in each panel are significantly different (P<0.0001) using χ^2 test.

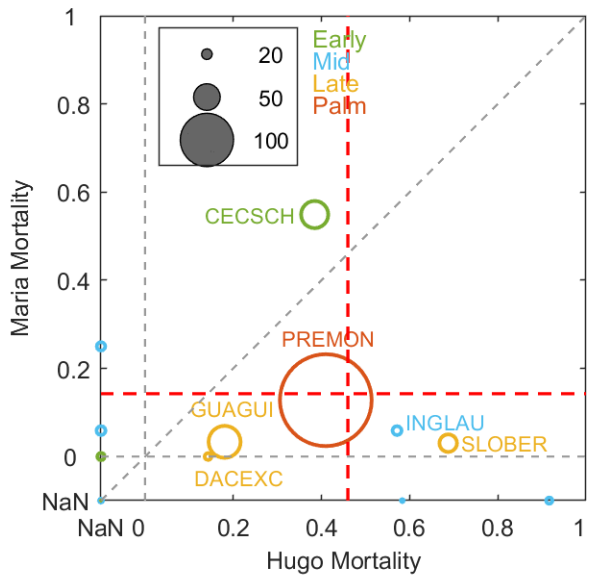

Figure S4. Same as Figure 2, but for stems with DBH ≥ 10 cm.

Table S1. Code, Genus and species, Family, and Plant Function Type (PFT) of each species, listed in the order of descending abundance for each PFT before hurricane María. The scientific name of species follows the Integrated Taxonomic Information System (https://www.itis.gov/, last accessed 25 January 2022).

Code	Genus and species	Family	PFT
PREMON	*Prestoea montana*	Arecaceae	Palm
CECSCH	*Cecropia schreberiana*	Moraceae	Early
SCHMOR	*Schefflera morototoni*	Araliaceae	Early
MICTET	*Miconia tetrandra*	Melastomataceae	Early
PSYBER	*Psychotria berteriana*	Rubiaceae	Early
MICPRA	*Miconia prasina*	Melastomataceae	Early
PSYBRA	*Psychotria brachiata*	Rubiaceae	Early
DENARB	*Dendropanax arboreus*	Araliaceae	Early
CLIHIR	*Clidemia hirta*	Melastomataceae	Early
MICRAC	*Miconia racemosa*	Melastomataceae	Early
PALCRO	*Palicourea croceoides*	Rubiaceae	Early
UREBAC	*Urera baccifera*	Urticaceae	Early
CASARB	*Casearia arborea*	Flacourtiaceae	Mid
INGLAU	*Inga laurina*	Fabaceae	Mid
OCOLEU	*Ocotea leucoxylon*	Lauraceae	Mid
SAPLAU	*Sapium laurocerasus*	Euphorbiaceae	Mid
CORBOR	*Cordia borinquensis*	Boraginaceae	Mid
HENFAS	*Henriettea fascicularis*	Melastomataceae	Mid
ALCFLO	*Alchorneopsis floribunda*	Euphorbiaceae	Mid
ALCLAT	*Alchornea latifolia*	Euphorbiaceae	Mid
LAEPRO	*Laetia procera*	Flacourtiaceae	Mid
MYRDEF	*Myrcia deflexa*	Myrtaceae	Mid
ANIBRA	*Aniba bracteata*	Lauraceae	Mid
STEOBT	*Stenostomum obtusifolium*	Rubiaceae	Mid
ANDINE	*Andira inermis*	Fabaceae	Mid
INGVER	*Inga vera*	Fabaceae	Mid
MYRSPL	*Myrcia splendens*	Myrtaceae	Mid
SYZJAM	*Syzygium jambos*	Myrtaceae	Mid
MELHER	*Meliosma herbertii*	Sabiaceae	Mid
QUATUR	*Quararibea turbinata*	Bombacaceae	Mid
DRYGLA	*Drypetes glauca*	Euphorbiaceae	Mid
ORMKRU	*Ormosia krugii*	Fabaceae	Mid
CORSUL	*Cordia sulcata*	Boraginaceae	Mid
HOMRAC	*Homalium racemosum*	Flacourtiaceae	Mid
BYRSPI	*Byrsonima spicata*	Malpighiaceae	Mid
TABHET	*Tabebuia heterophylla*	Bignoniaceae	Mid

OCOSPA	*Ocotea spathulata*	Lauraceae	Mid
HENSQU	*Henriettea squamulosum*	Melastomataceae	Mid
SLOBER	*Sloanea berteriana*	Elaeocarpaceae	Late
DACEXC	*Dacryodes excelsa*	Burseraceae	Late
CYAPOR	*Cyathea portoricensis*	Cyatheaceae	Late
GUAGUI	*Guarea guidonia*	Meliaceae	Late
MANBID	*Manilkara bidentata*	Sapotaceae	Late
CYAARB	*Cyathea arborea*	Cyatheaceae	Late
GUAGLA	*Guarea glabra*	Meliaceae	Late
EUGEGE	*Eugenia eggersii*	Myrtaceae	Late
BUCCAP	*Buchenavia tetraphylla*	Combretaceae	Late
SWIMAC	*Swietenia macrophylla*	Meliaceae	Late
TETBAL	*Tetragastris balsamifera*	Burseraceae	Late
HIRRUG	*Hirtella rugosa*	Chrysobalanaceae	Late
EUGSTA	*Eugenia stahlii*	Myrtaceae	Late
ILEOBC	*Ilex obcordata*	Aquifoliaceae	Late
MAGSPL	*Magnolia splendens*	Magnoliaceae	Late
KHANYA	*Khaya anthotheca*	Meliaceae	Late
TRIPAL	*Trichilia pallida*	Meliaceae	Late
CASGUI	*Cassipourea guianensis*	Rhizophoraceae	Late
LAPPOR	*Laplacea portoricensis*	Theaceae	Late

Table S2. Mortality of each species from hurricanes Hugo and María. The list is in the descending order of the abundance of each species before hurricane María.

Species Code	# of stems before Hugo	# of stems dead after Hugo	Mortality from Hugo	# of stems before María	# of stems dead after María	Mortality from María
PREMON	65	27	41.5%	184	23	12.5%
SLOBER	260	164	63.1%	159	7	4.4%
DACEXC	109	36	33.0%	102	3	2.9%
CYAPOR	39	28	71.8%	57	3	5.3%
CECSCH	17	8	47.1%	54	28	51.9%
CASARB	31	11	35.5%	31	6	19.4%
INGLAU	41	21	51.2%	29	1	3.5%
OCOLEU	52	42	80.8%	28	3	10.7%
SAPLAU	8	6	75.0%	23	1	4.4%
SCHMOR	8	7	87.5%	18	1	5.6%
CORBOR	17	5	29.4%	17	0	0.0%
GUAGUI	26	7	26.9%	15	0	0.0%
HENFAS	4	0	0.0%	15	3	20.0%
PSYBER	48	45	93.8%	13	2	15.4%
MICTET	8	5	62.5%	13	4	30.8%
MANBID	14	6	42.9%	10	0	0.0%
ALCFLO	9	4	44.4%	8	0	0.0%
ALCLAT	14	9	64.3%	7	0	0.0%
LAEPRO	8	2	25.0%	7	0	0.0%
MYRDEF	8	8	100.0%	7	0	0.0%
ANIBRA	3	2	66.7%	6	1	16.7%
STEOBT	2	0	0.0%	6	0	0.0%
CYAARB	1	1	100.0%	6	2	33.3%
GUAGLA	25	16	64.0%	5	0	0.0%
ANDINE	3	1	33.3%	5	0	0.0%
MELHER	17	12	70.6%	4	0	0.0%
INGVER	7	5	71.4%	4	1	25.0%
EUGEGE	5	2	40.0%	4	0	0.0%
MYRSPL	3	0	0.0%	4	0	0.0%
MICPRA	2	1	50.0%	4	0	0.0%
SYZJAM	2	1	50.0%	4	0	0.0%
BUCCAP	5	1	20.0%	3	0	0.0%
SWIMAC	3	0	0.0%	3	0	0.0%
QUATUR	0	0		3	0	0.0%
ORMKRU	7	5	71.4%	2	0	0.0%
DRYGLA	3	2	66.7%	2	0	0.0%

HIRRUG	2	0	0.0%	2	1	50.0%
TETBAL	2	2	100.0%	2	0	0.0%
EUGSTA	0	0		2	0	0.0%
PSYBRA	0	0		2	0	0.0%
DENARB	3	0	0.0%	1	0	0.0%
ILEOBC	2	0	0.0%	1	0	0.0%
BYRSPI	1	0	0.0%	1	0	0.0%
HOMRAC	1	0	0.0%	1	0	0.0%
CLIHIR	0	0		1	0	0.0%
CORSUL	0	0		1	0	0.0%
UREBAC	12	12	100.0%	0	0	
UNKNOWN	8	8	100.0%	0	0	
PALCRO	7	7	100.0%	0	0	
HENSQU	6	3	50.0%	0	0	
OCOSPA	5	0	0.0%	0	0	
MICRAC	4	4	100.0%	0	0	
TABHET	3	2	66.7%	0	0	
KHANYA	2	2	100.0%	0	0	
CASGUI	1	1	100.0%	0	0	
LAPPOR	1	1	100.0%	0	0	
MAGSPL	1	1	100.0%	0	0	
TRIPAL	1	0	0.0%	0	0	

Table S3. Damage information of each species from hurricane María. The list is in the descending order of the abundance of each species before hurricane María.

Species Code	# of stems Dead	# of stems with Damage III	# of stems with Damage II	# of stems with Damage I	# of stems Intact	Total # of stems
PREMON	23	10	3	99	49	184
SLOBER	7	23	23	49	57	159
DACEXC	3	2	12	60	25	102
CYAPOR	3	3	0	0	51	57
CECSCH	28	10	6	7	3	54
CASARB	6	3	1	15	6	31
INGLAU	1	6	2	14	6	29
OCOLEU	3	6	4	9	6	28
SAPLAU	1	9	8	4	1	23
SCHMOR	1	4	3	4	6	18
CORBOR	0	2	2	1	12	17
GUAGUI	0	1	7	6	1	15
HENFAS	3	3	7	2	0	15
MICTET	4	1	2	4	2	13
PSYBER	2	2	5	2	2	13
MANBID	0	0	0	5	5	10
ALCFLO	0	4	2	2	0	8
ALCLAT	0	4	1	1	1	7
LAEPRO	0	2	3	0	2	7
MYRDEF	0	2	0	3	2	7
ANIBRA	1	2	0	2	1	6
CYAARB	2	1	0	0	3	6
STEOBT	0	0	1	3	2	6
ANDINE	0	0	1	4	0	5
GUAGLA	0	1	0	0	4	5
EUGEGE	0	0	1	0	3	4
INGVER	1	0	2	1	0	4
MELHER	0	0	3	0	1	4
MICPRA	0	2	0	2	0	4
MYRSPL	0	0	1	1	2	4
SYZJAM	0	1	1	2	0	4
BUCCAP	0	0	1	2	0	3
QUATUR	0	0	2	1	0	3
SWIMAC	0	2	1	0	0	3
DRYGLA	0	0	0	1	1	2
EUGSTA	0	0	0	0	2	2
HIRRUG	1	0	0	1	0	2
ORMKRU	0	2	0	0	0	2

PSYBRA	0	0	0	2	0	2
TETBAL	0	0	0	0	2	2
BYRSPI	0	0	0	0	1	1
CLIHIR	0	0	0	0	1	1
CORSUL	0	1	0	0	0	1
DENARB	0	0	0	1	0	1
HOMRAC	0	0	0	1	0	1
ILEOBC	0	0	0	1	0	1

Table S4. Damage information of each DBH class from hurricane María.

DBH class	# of stems Dead	# of stems with Damage III	# of stems with Damage II	# of stems with Damage I	# of stems Intact	Total # of stems
2.5 – 5 cm	1	14	23	38	91	167
5 – 10 cm	14	28	23	68	95	228
10 – 20 cm	35	30	22	146	63	296
≥ 20 cm	20	30	30	60	11	151
Not measured	20	7	7	0	0	34

Table S5. Damage information of each crown dominance category from hurricane María.

Crown dominance	# of stems Dead	# of stems with Damage III	# of stems with Damage II	# of stems with Damage I	# of stems Intact	Total # of stems
Dominant	0	1	6	23	6	36
Co-Dominant	0	3	14	88	27	132
Intermediate	4	12	27	107	87	237
Suppressed	5	78	50	94	128	355
Not measured	81	15	8	0	12	116