

Supplementary Material

Wildfire response of GPS-tracked Bonelli's eagles in eastern Spain

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Supplementary Material

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Table S1: Summary information of 10 territorial Bonelli's eagles tracked by GPS/GSM telemetry in eastern Spain. Short-term period (Jun 01st – Aug 31st) and Long-term period 2015 – 2017. The untagging date of individuals that died are indicated with ^A and the individuals that its GPS stopped working are indicated with ^B.

Individual	Code	Sex	Territory	Distance to wildfire (km)	Tagging date	Untagging date	Analysis
Abel	M_ALF	M	Alfondeguilla	4.5	19/05/2015	16/09/2016 ^A	Short-term Long-term
Adan	M_ALF	M	Alfondeguilla	4.5	17/01/2017	-	Long-term
Aura	F_ALF	F	Alfondeguilla	4.5	19/05/2015	-	Short-term Long-term
Carbo	M_TAL	M	Tales	0	28/10/2015	-	Short-term Long-term
Carla	F_TAL	F	Tales	0 0	28/10/2015 12/12/2016	20/04/2016 ^B 2/012/2018 ^B	Long-term
Dino	M_SON	M	Soneja	8.6	29/10/2015	21/03/2018 ^A	Short-term Long-term
Dora	F_SON	F	Soneja	8.6	29/10/2015	21/03/2018 ^A	Short-term Long-term
Faig	M_AYO	M	Ayódar	6.8	08/06/2016	-	Short-term Long-term
Flora	F_AYO	F	Ayódar	6.8	08/06/2016	14/12/2016 ^A	Short-term Long-term
Fauna	F_AYO	F	Ayódar	6.8	17/05/2017	-	Long-term

Table S2: Summary additional information of 10 territorial Bonelli's eagles' locations, tracked by GPS/GSM telemetry in eastern Spain during the Short-term period (01 Jun – Aug 31) and Long-term period (2015 – 2017).

Individual	Individual code	No. of GPS locations in Short-term analysis			Total locations	No. of GPS locations in Long-term analysis				Total locations
		Before	During	After		1	2	3	4	
Abel	M_ALF	9,852	1,491	5,332	16,675	63,077	6,875	-	-	182,589
Adan	M_ALF	9,574	1,492	5,303	16,369	-	-	53,294	59,343	139,898
Aura	F_ALF	-	-	-	-	44,428	16,876	34,510	44,084	138,378
Carbo	M_TAL	9,918	1,499	5,364	16,781	33,441	14,954	45,558	44,425	138,378
Carla	F_TAL	-	-	-	-	14,754	1,683	50,949	37,563	104,949
Dino	M_SON	10,172	1,508	5,391	17,071	31,878	23,428	57,282	10,484	123,072
Dora	F_SON	10,173	1,509	5,398	17,08	42,779	24,210	57,299	10,449	134,737
Faig	M_AYO	8,060	1,439	5,344	14,843	8,059	23,835	55,002	54,426	141,322
Flora	F_AYO	7,932	1,473	5,064	14,469	7,932	18,701	-	-	100,506
Fauna	F_AYO	-	-	-	-	-	-	37,897	35,976	100,506

Short-term differences in home range

Table S3: Means, Standard Deviation (SD), Kruskal-Wallis and Wilcoxon results of the daily K95%, K50%, TDD and SLM of 7 individuals for the 3 short-term periods. Significant variables are highlighted in bold.

Variable		Mean \pm SD			χ^2	df	Wilcoxon test pair samples p-value			p-value
		Before	During	After			Before-During	Before-After	During-After	
M_ALF	K95% (km ²)	34.43 \pm 14.39	53.05 \pm 13.49	37.37 \pm 17.04	9.342	2	0.006	0.352	0.039	0.009
	K50% (km ²)	8.62 \pm 4.33	13.86 \pm 6.01	9.59 \pm 4.73	5.932	2	0.054	0.436	0.084	0.052
	TDD (km)	78.88 \pm 21.63	87.57 \pm 17.98	55.09 \pm 21.47	22.379	2	0.289	0.000	0.000	0.000
	SLM (m)	432.28 \pm 113.97	470.36 \pm 97.32	297.62 \pm 110.92	23.798	2	0.419	0.000	0.000	0.000
F_ALF	K95% (km ²)	36.67 \pm 23.02	53.88 \pm 11.27	34.99 \pm 18.64	10.124	2	0.004	0.935	0.007	0.006
	K50% (km ²)	8.62 \pm 4.88	14.33 \pm 4.86	8.62 \pm 5.02	8.255	2	0.011	0.950	0.020	0.016
	TDD (km)	74.68 \pm 22.83	79.33 \pm 22.99	50.82 \pm 18.53	21.411	2	0.607	0.000	0.003	0.000
	SLM (m)	421.71 \pm 116.77	425.08 \pm 120.94	274.68 \pm 94.88	26.998	2	0.975	0.000	0.003	0.000
M_TAL	K95% (km ²)	47.6 \pm 27.5	76.6 \pm 24.56	47.86 \pm 24.58	8.182	2	0.013	0.943	0.013	0.017
	K50% (km ²)	10.02 \pm 5.84	15.47 \pm 8.43	10.89 \pm 6.97	3.51	2	0.190	0.710	0.190	0.173
	TDD (km)	80.69 \pm 32.83	100.37 \pm 26.53	83.84 \pm 35.63	3.292	2	0.200	0.750	0.240	0.193
	SLM (m)	438.65 \pm 171.76	535.47 \pm 141.81	452.97 \pm 190.3	3.027	2	0.230	0.840	0.250	0.220
M_SON	K95% (km ²)	24.2 \pm 11.44	38.83 \pm 12.71	34.8 \pm 14.47	15.034	2	0.007	0.005	0.373	0.001
	K50% (km ²)	4.73 \pm 3.12	9.85 \pm 4.32	8.43 \pm 4.18	21.938	2	0.002	0.000	0.435	0.000
	TDD (km)	61.85 \pm 17.33	53.69 \pm 13.59	46.48 \pm 16.75	15.154	2	0.137	0.001	0.133	0.001
	SLM (m)	328.47 \pm 92.33	287.1 \pm 72.45	249.78 \pm 87.47	14.518	2	0.207	0.001	0.207	0.001
F_SON	K95% (km ²)	22.41 \pm 12.99	39.95 \pm 11.32	32.52 \pm 16.23	14.407	2	0.006	0.010	0.118	0.001
	K50% (km ²)	4.33 \pm 3.35	9.51 \pm 3.96	7.61 \pm 4.34	20.365	2	0.001	0.001	0.266	0.000
	TDD (km)	55.56 \pm 18.99	57.32 \pm 15.2	43.15 \pm 18.79	9.792	2	0.793	0.011	0.043	0.007
	SLM (m)	294.86 \pm 100.58	304.17 \pm 81.38	231.46 \pm 98.63	9.173	2	0.777	0.014	0.053	0.010
M_AYO	K95% (km ²)	29.58 \pm 15.31	30.06 \pm 11.99	23.91 \pm 14.5	2.763	2	0.880	0.310	0.310	0.251
	K50% (km ²)	8.23 \pm 4.79	8.96 \pm 3.11	6.59 \pm 4.31	3.829	2	0.500	0.210	0.200	0.147
	TDD (km)	47.55 \pm 19.45	47.28 \pm 14.98	40.43 \pm 15.03	2.856	2	0.950	0.300	0.560	0.240
	SLM (m)	273.58 \pm 103.24	261.19 \pm 76.56	219.37 \pm 80.1	5.049	2	0.879	0.086	0.332	0.080
F_AYO	K95% (km ²)	32.39 \pm 18.24	30.48 \pm 12.8	25.98 \pm 14.48	1.391	2	0.880	0.710	0.880	0.499
	K50% (km ²)	8.64 \pm 5.39	8.93 \pm 3.31	6.95 \pm 4.28	1.577	2	0.650	0.500	0.500	0.455
	TDD (km)	51.79 \pm 21.4	50.58 \pm 13.39	49.37 \pm 17.84	0.217	2	0.920	0.920	0.920	0.897
	SLM (m)	303.56 \pm 112.17	276.01 \pm 78.92	290.49 \pm 99.47	0.577	2	0.870	0.870	0.870	0.749

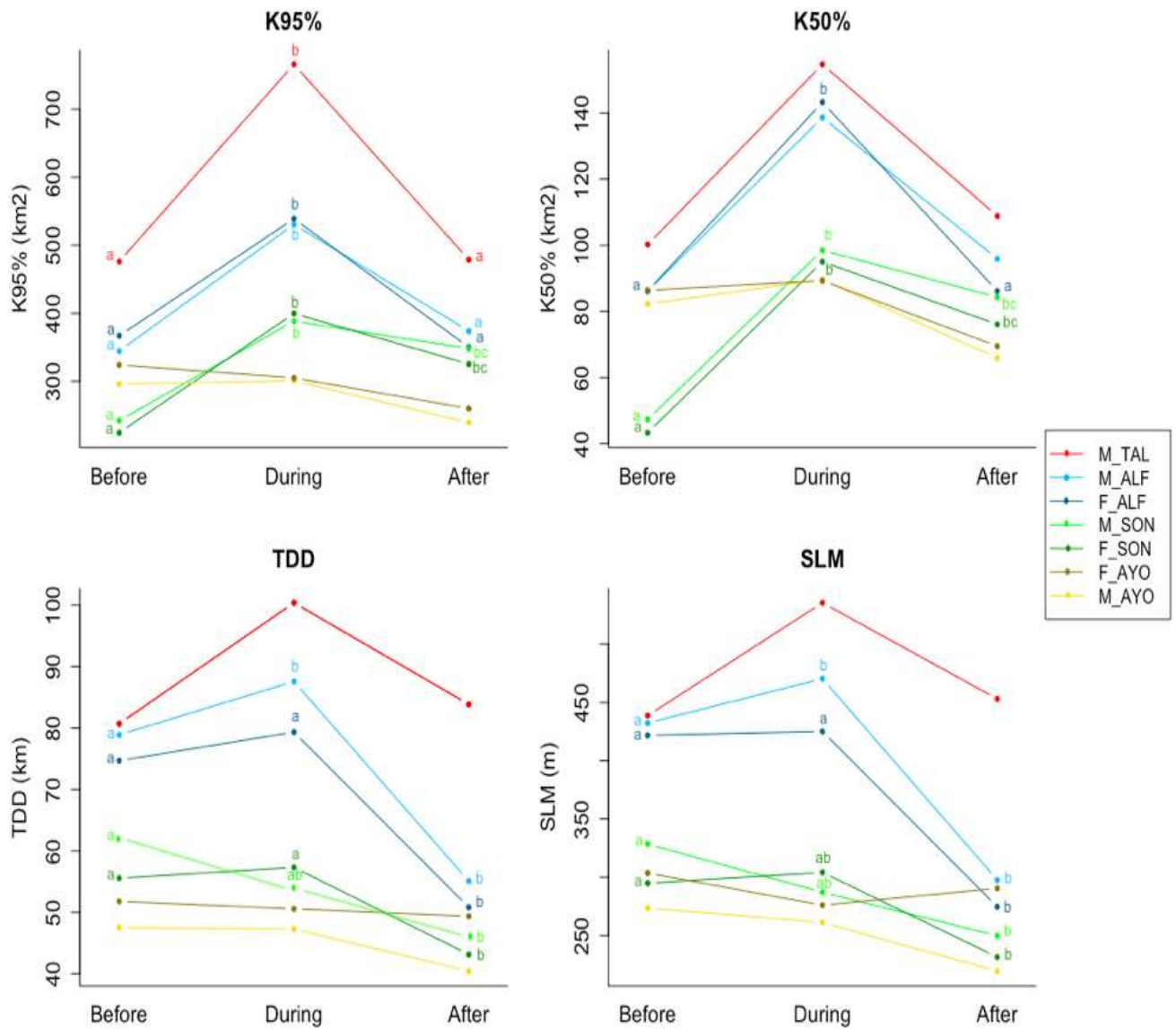


Figure S2: Short-term differences in the spatial parameters before, during, and after the wildfire of seven Bonelli's eagles (three pairs and the male directly affected by the fire (M_TAL)). Abbreviations: K95% = 95% kernel; K50% = 50% kernel; TDD = total daily distance; SLM = step length mean. The significance between periods (before, during, after) is shown with letters; lines with no letters refers to non-significant changes among the three periods.

K95% and K50% maps territories of the 7 Bonelli's eagles

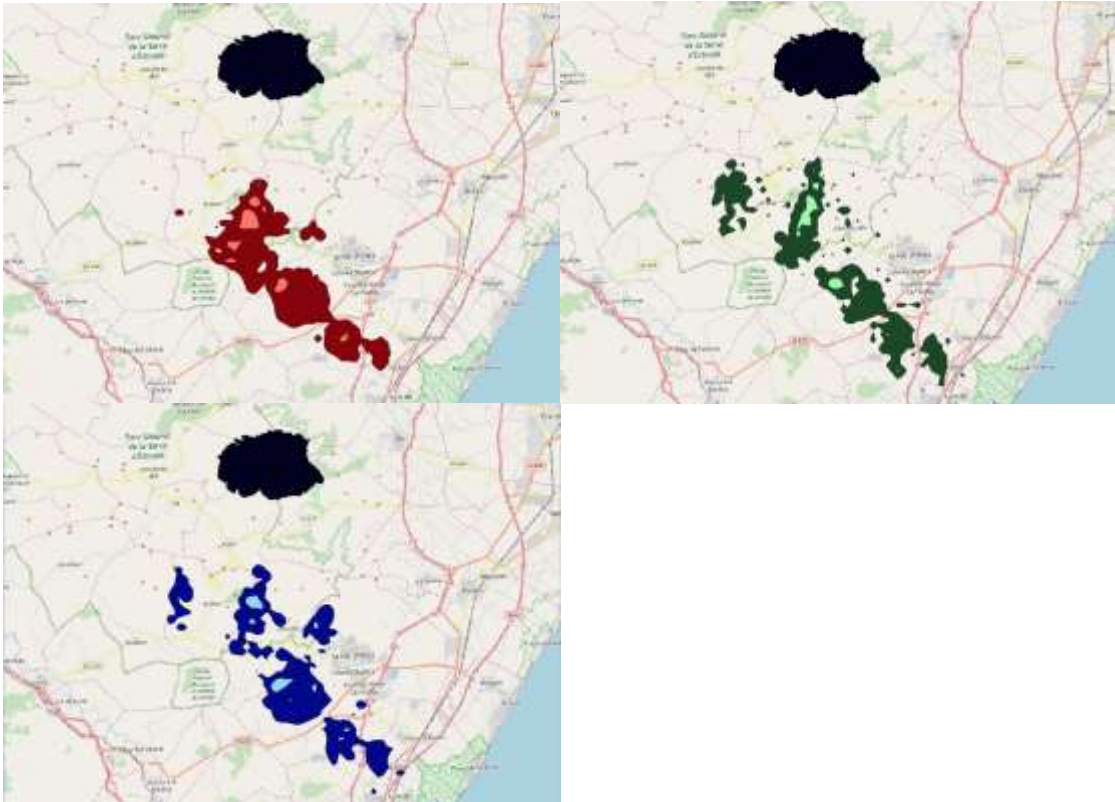


Figure S3: K50% and K95% of M_ALF before the wildfire (red; 01/06/16 - 24/07/16), during the wildfire (Green; 25/07/16 - 01/08/16) and after the wildfire (blue; 02/08/16 - 31/08/16).

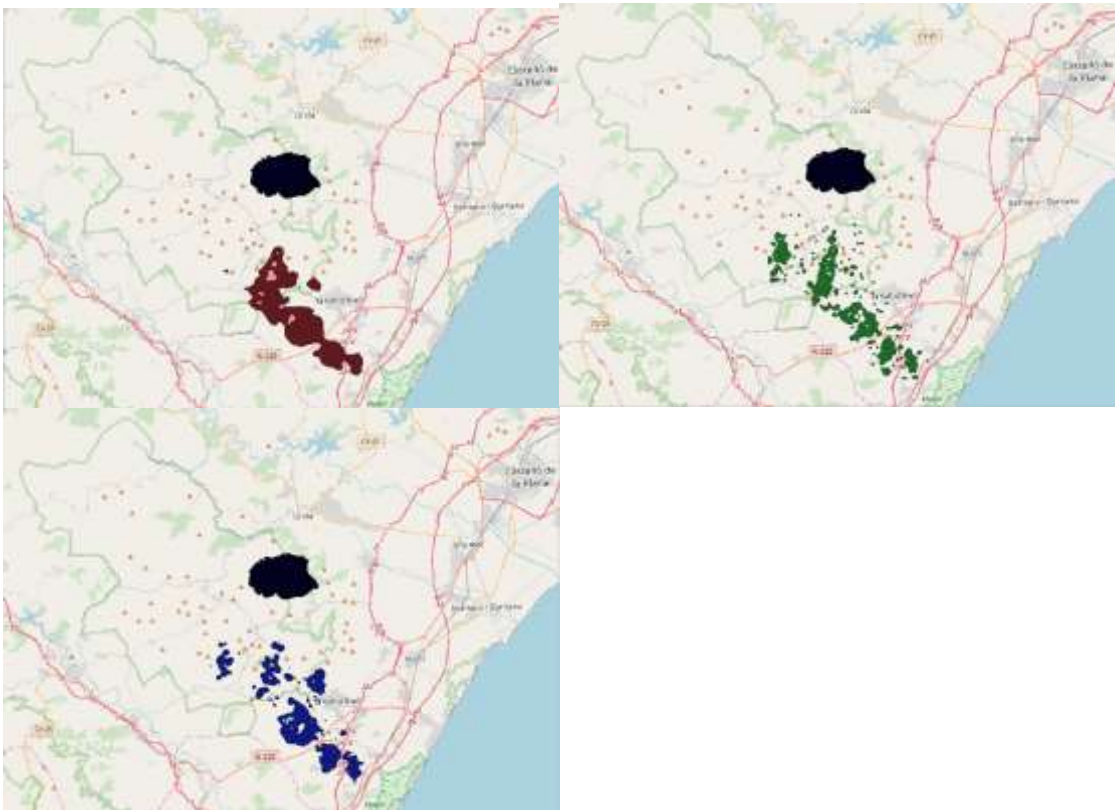


Figure S4: K50% and K95% of F_ALF before the wildfire (red; 01/06/16 - 24/07/16), during the wildfire (Green; 25/07/16 - 01/08/16) and after the wildfire (blue; 02/08/16 - 31/08/16).

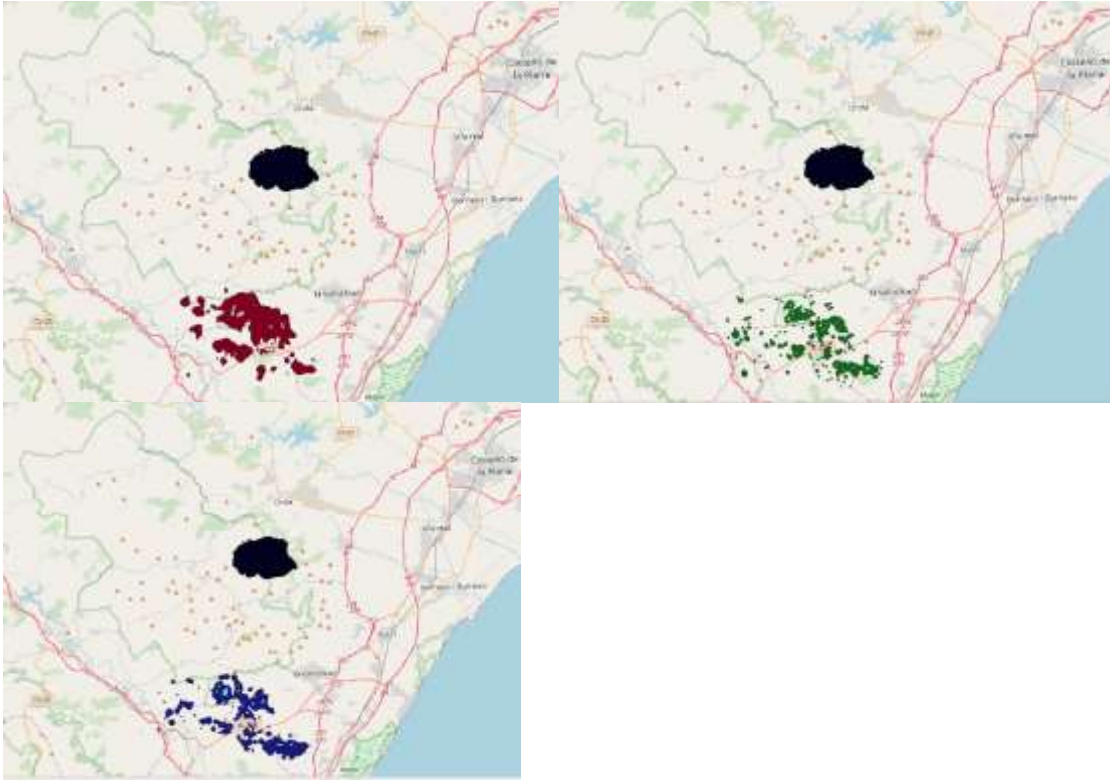


Figure S5: K50% and K95% of M_SON before the wildfire (red; 01/06/16 - 24/07/16), during the wildfire (Green; 25/07/16 - 01/08/16) and after the wildfire (blue; 02/08/16 - 31/08/16).

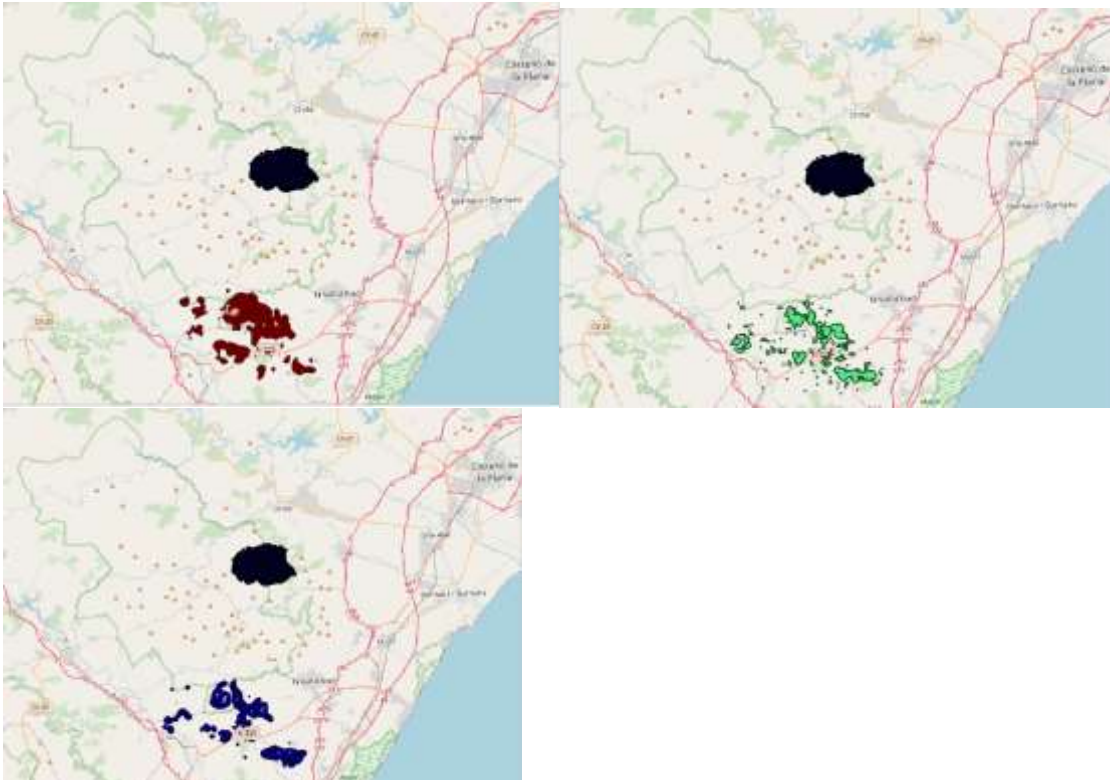


Figure S6: K50% and K95% of F_SON before the wildfire (red; 01/06/16 - 24/07/16), during the wildfire (Green; 25/07/16 - 01/08/16) and after the wildfire (blue; 02/08/16 - 31/08/16).

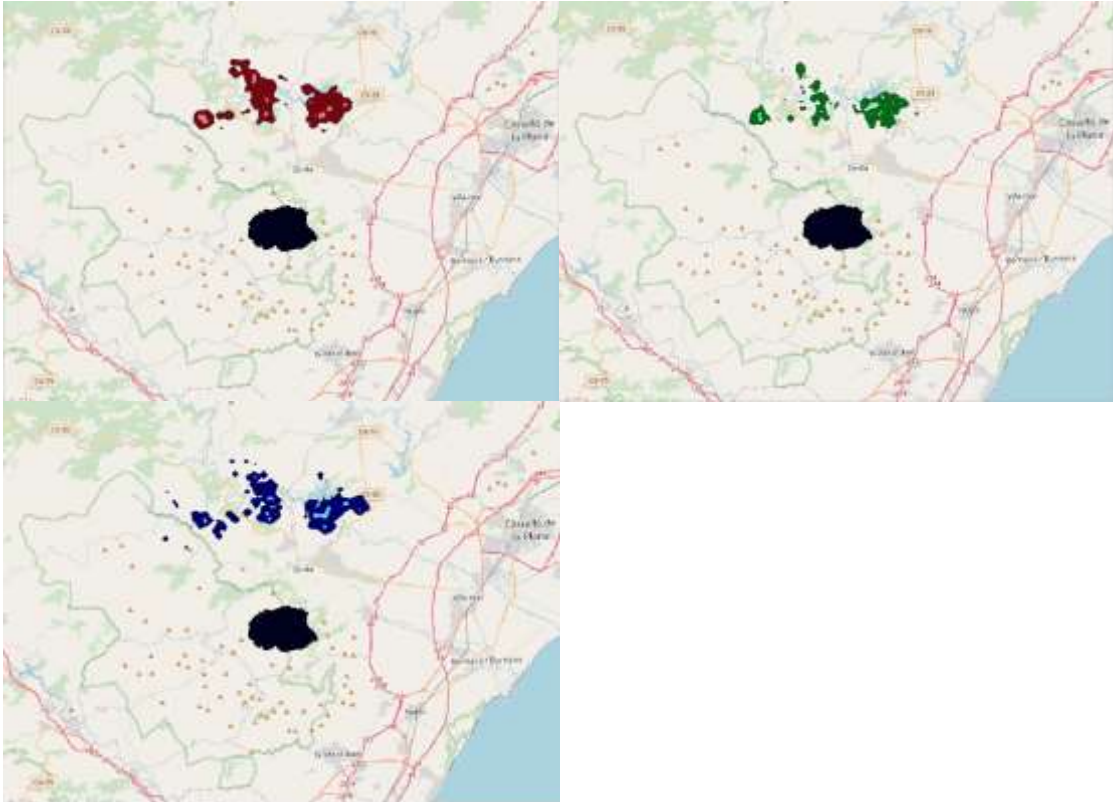


Figure S7: K50% and K95% of M_AYO before the wildfire (red; 01/06/16 - 24/07/16), during the wildfire (Green; 25/07/16 - 01/08/16) and after the wildfire (blue; 02/08/16 - 31/08/16).

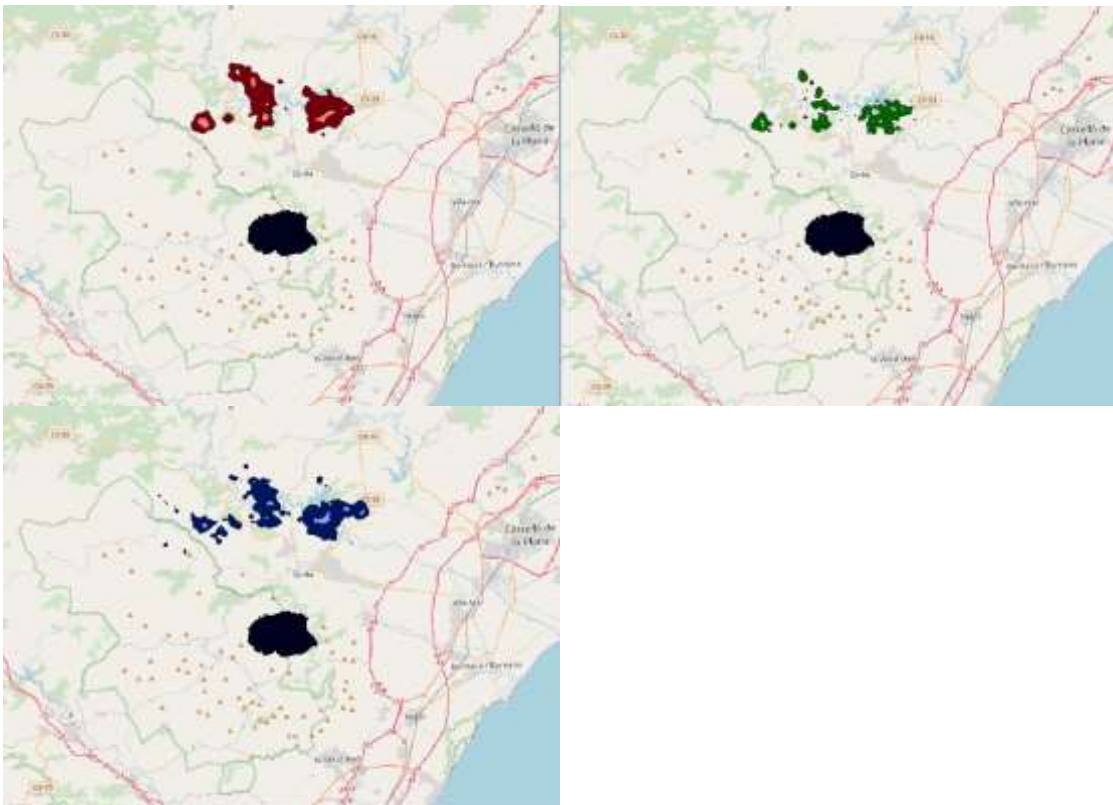


Figure S8: K50% and K95% of F_AYO before the wildfire (red; 01/06/16 - 24/07/16), during the wildfire (Green; 25/07/16 - 01/08/16) and after the wildfire (blue; 02/08/16 - 31/08/16).

Long-term differences in the home range

Table S4: Statistical results of the Kruskal-Wallis analysis between the four periods selected for the 4 variables. In addition, the statistical results of the Wilcox test in pairs are shown. Significant results are shown in bold with a value of $p < 0.05$. 1: 2015-2016 period before the wildfire; 2: 2016 period after the wildfire; 3: 2017 period; 4: 2018 period.

Individual	Variable	χ^2	df	Wilcoxon test pair samples p-Value						p-Value
				1:2	1:3	1:4	2:3	2:4	3:4	
M_ALF	K50%	247.86	3	0.000	0.000	0.000	0.000	0.360	0.000	0.000
	K95%	244.16	3	0.000	0.000	0.000	0.000	0.160	0.000	0.000
	TDD	123.3	3	0.004	0.049	0.000	0.089	0.086	0.000	0.000
	SLM	87371	3	0.654	0.337	0.000	0.337	0.003	0.000	0.000
H_ALF	K50%	124.54	3	0.000	0.604	0.000	0.001	0.000	0.000	0.000
	K95%	154.23	3	0.004	0.883	0.000	0.004	0.000	0.000	0.000
	TDD	94338	3	0.570	0.160	0.000	0.140	0.000	0.000	0.000
	SLM	55878	3	0.027	0.280	0.000	0.189	0.007	0.000	0.000
M_TAL	K50%	20151	3	0.113	0.007	0.864	0.001	0.071	0.007	0.000
	K95%	17387	3	0.039	0.039	0.572	0.001	0.022	0.053	0.001
	TDD	43579	3	0.000	0.003	0.506	0.000	0.000	0.006	0.000
	SLM	16739	3	0.712	0.003	0.770	0.152	0.642	0.001	0.001
H_TAL	K50%	30722	3	0.031	0.000	0.001	0.538	0.289	0.065	0.000
	K95%	28309	3	0.037	0.000	0.000	0.615	0.497	0.347	0.000
	TDD	40623	3	0.860	0.000	0.000	0.026	0.016	0.159	0.000
	SLM	23571	3	0.759	0.412	0.000	0.926	0.412	0.000	0.000
M_SON	K50%	117.95	3	0.002	0.000	0.000	0.006	0.000	0.000	0.000
	K95%	96404	3	0.730	0.000	0.000	0.000	0.000	0.000	0.000
	TDD	112.09	3	0.000	0.364	0.000	0.000	0.000	0.000	0.000
	SLM	120.08	3	0.000	0.140	0.000	0.000	0.000	0.000	0.000
H_SON	K50%	176.06	3	0.000	0.000	0.000	0.038	0.000	0.000	0.000
	K95%	133.7	3	0.000	0.000	0.000	0.960	0.000	0.000	0.000
	TDD	62334	3	0.002	0.012	0.000	0.000	0.000	0.000	0.000
	SLM	100.1	3	0.141	0.002	0.000	0.000	0.000	0.000	0.000
M_AYO	K50%	32505	3	0.005	0.502	0.885	0.000	0.000	0.100	0.000
	K95%	43231	3	0.010	0.208	0.250	0.000	0.000	0.684	0.000
	TDD	42442	3	0.003	0.590	0.431	0.000	0.000	0.431	0.000
	SLM	53041	3	0.118	0.015	0.096	0.000	0.000	0.313	0.000
H_AYO	K50%	24.86	3	0.025	0.231	0.847	0.000	0.006	0.025	0.000
	K95%	27953	3	0.020	0.166	0.472	0.000	0.000	0.206	0.000
	TDD	14441	3	0.016	0.990	0.990	0.002	0.005	0.990	0.002
	SLM	119.58	3	0.297	0.002	0.000	0.004	0.000	0.000	0.000

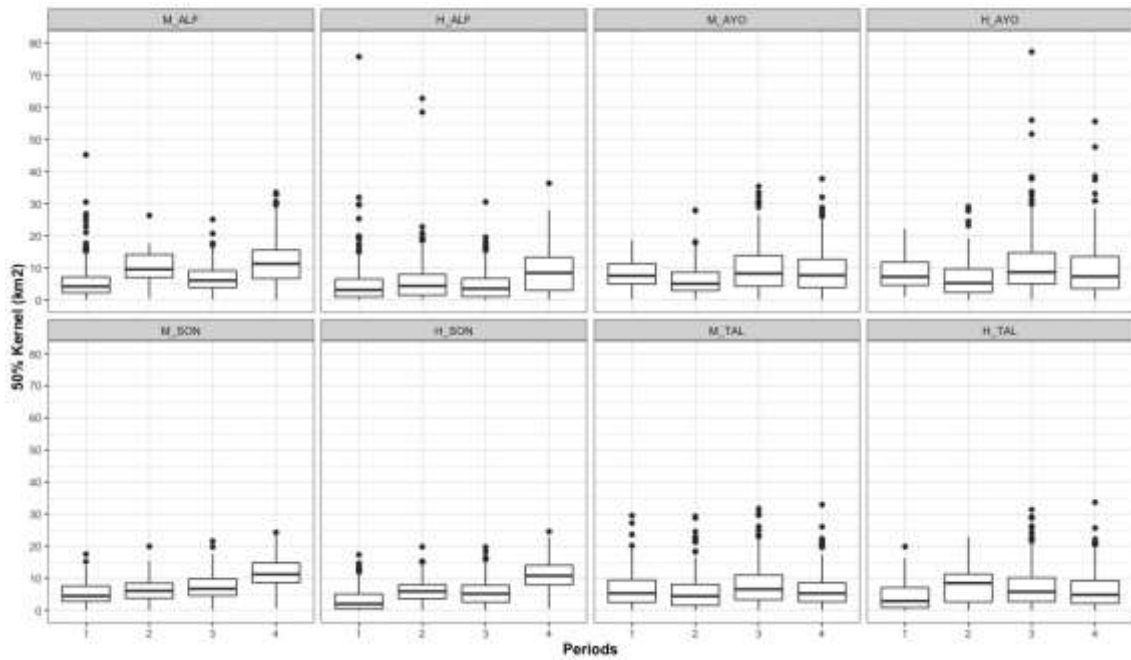


Figure S9: Boxplot showing the differences of K50% (km²), of the 7 Bonelli's eagles in the 4 different periods (1: 2015-2016 period before the wildfire; 2: 2016 period after the wildfire; 3: 2017 period; 4: 2018 period).

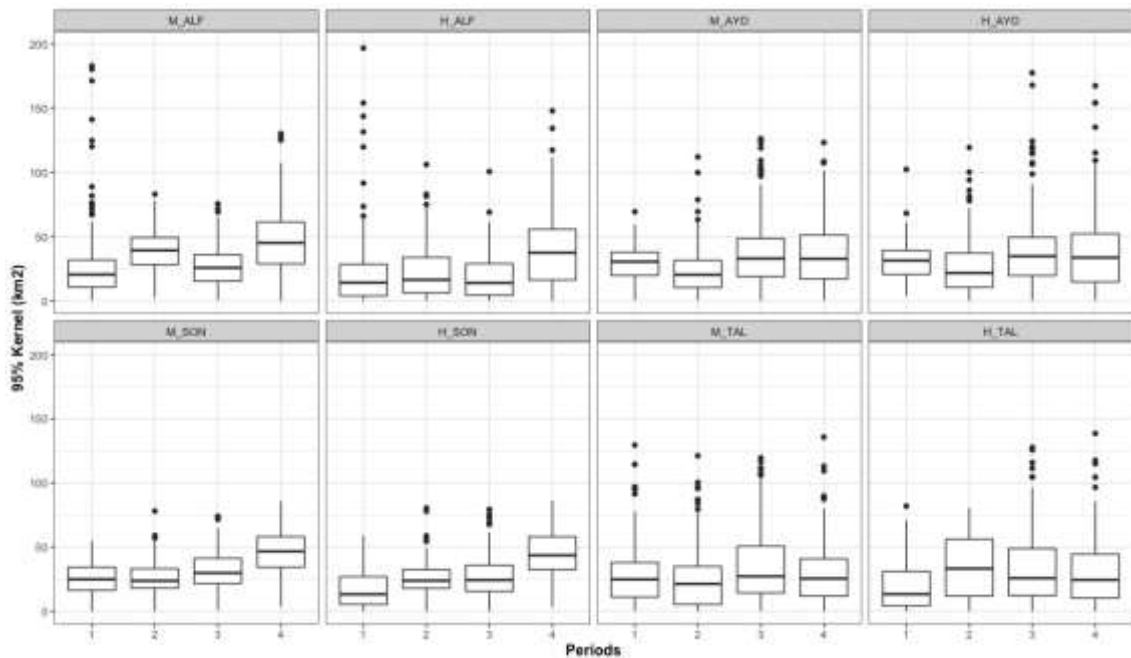


Figure S10: Boxplot showing the differences of K95% (km²), of the 7 Bonelli's eagles in the 4 different periods (1: 2015-2016 period before the wildfire; 2: 2016 period after the wildfire; 3: 2017 period; 4: 2018 period).

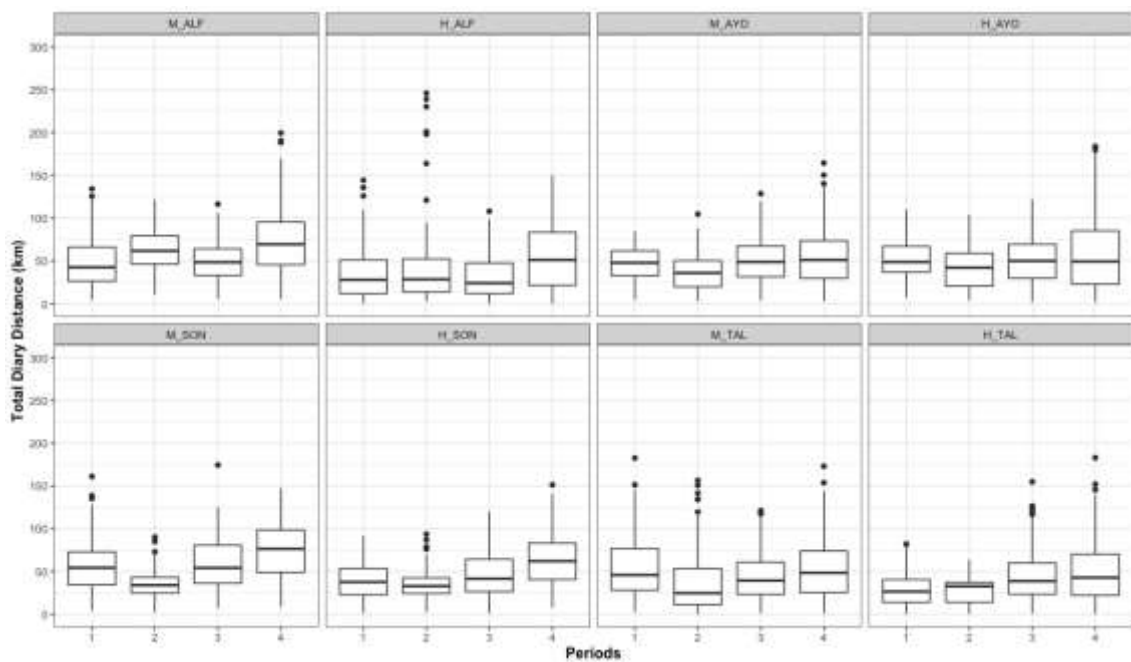


Figure S11: Boxplot showing the differences of TDD (km), of the 7 Bonelli's eagles in the 4 different periods (1: 2015-2016 period before the wildfire; 2: 2016 period after the wildfire; 3: 2017 period; 4: 2018 period).

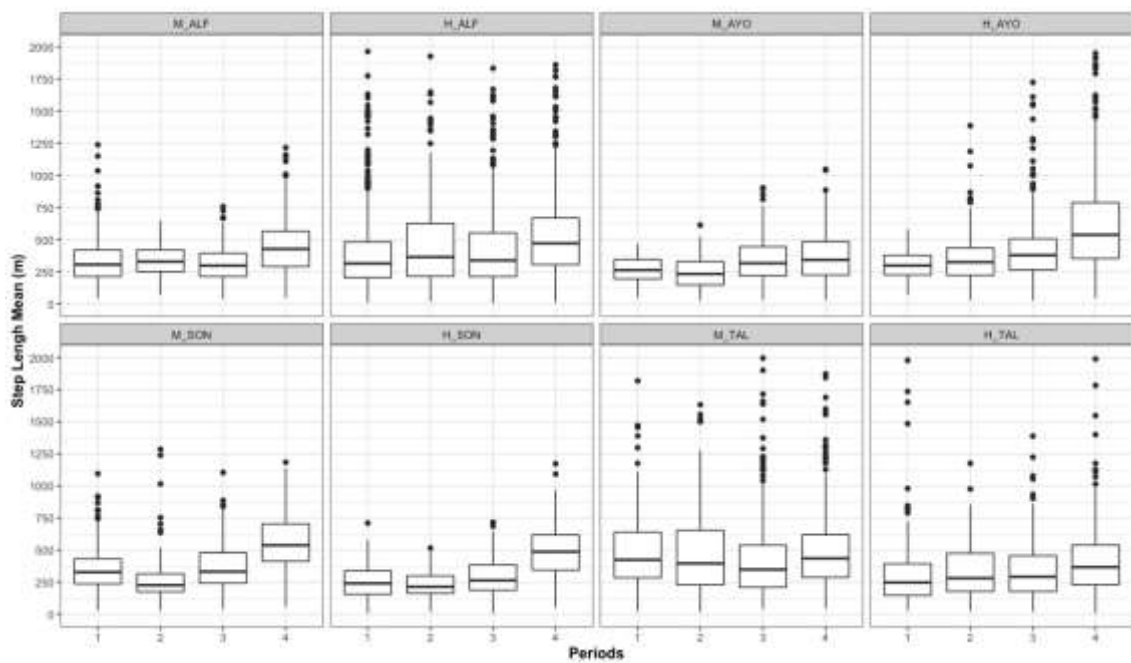


Figure S12: Boxplot showing the differences of SLM (m) of the 7 Bonelli's eagles in the 4 different periods (1: 2015-2016 period before the wildfire; 2: 2016 period after the wildfire; 3: 2017 period; 4: 2018 period).

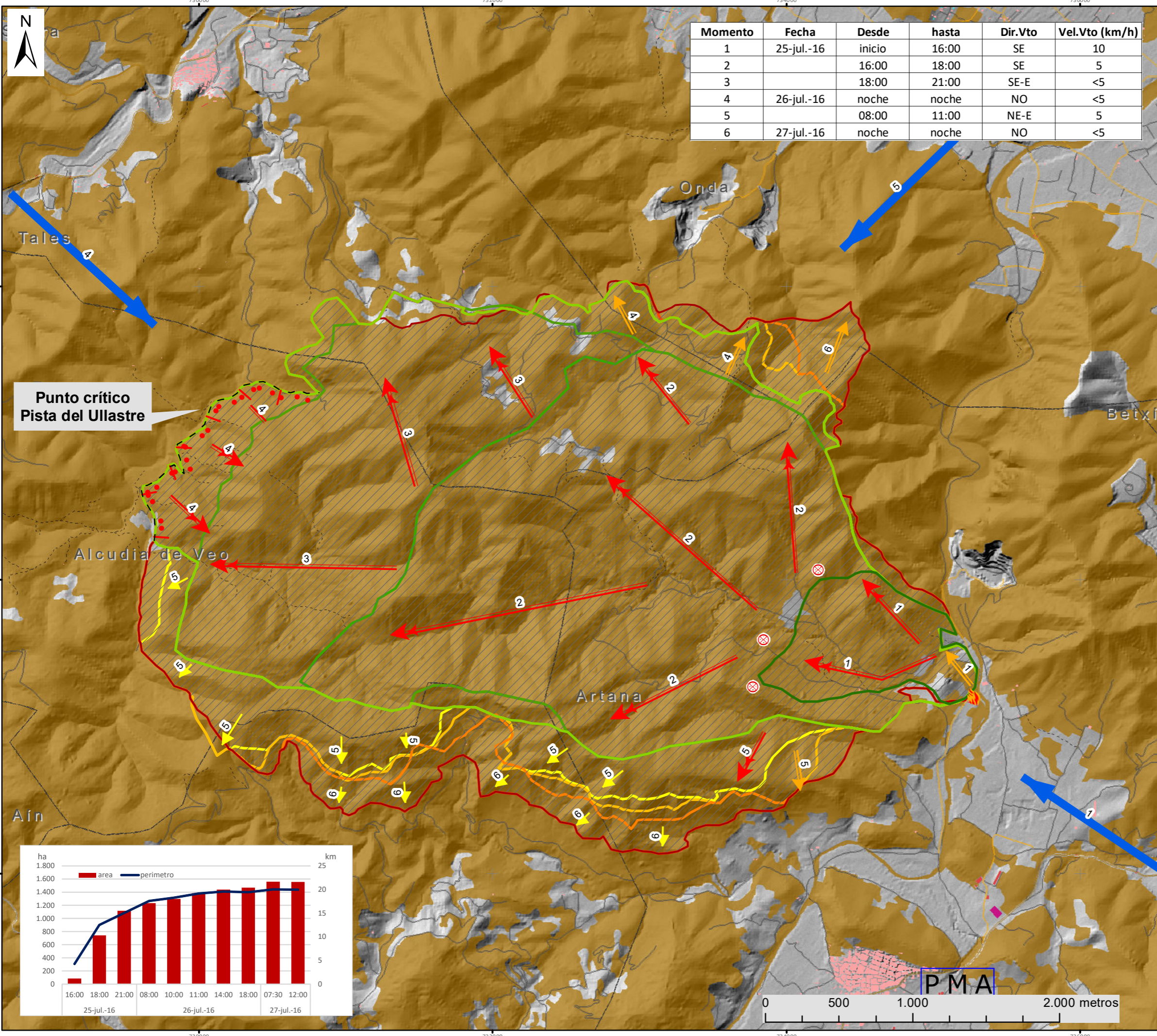
INCENDIO: ARTANA


Fecha inicio:	25/07/2016	Hora inicio:	14:49
Fecha control:	01/08/2016	Hora control:	15:00
Superficie FORESTAL:	1.534,50 ha	Superficie no forestal:	21,37 ha


FICHA 3: EVOLUCIÓN DEL FUEGO


MAPA 1


Momento	Fecha	Desde	hasta	Dir.Vto	Vel.Vto (km/h)
1	25-jul.-16	inicio	16:00	SE	10
2		16:00	18:00	SE	5
3		18:00	21:00	SE-E	<5
4	26-jul.-16	noche	noche	NO	<5
5		08:00	11:00	NE-E	5
6	27-jul.-16	noche	noche	NO	<5





Origen 


Saltos de fuego 

Contrafuego 











Carrera principal 

Carrera secundaria 

Carrera retroceso 

Viento dominante 

Evolucion del incendio

-  25/07/2016, 16:00
-  25/07/2016, 18:00
-  25/07/2016, 21:00
-  26/07/2016, 08:00
-  26/07/2016, 10:00
-  26/07/2016, 11:00
-  26/07/2016, 14:00
-  26/07/2016, 18:00
-  27/07/2016, 07:30
-  27/07/2016, 12:00

NOTA: las isócronas tienen carácter aproximado en su ubicación como a la hora a la que hacen referencia

