Wind Driving Longer Uncontrolled Larger Fire Duration in the Western United States

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----- Supplementary Material -----

Table S1. Regression coefficients of MLR models of different ecoregions in the western US for the two fire seasons. ** indicates statistical significance at the p-values shown.

	R^2	Intercept	Maximum wind speed within the fire duration	Mean wind speed within the fire duration	Standard deviation of the daily wind speed ± 7 days	Elevation	Mean wind speed (seasonal)	Mean VPD (seasonal)	Mean temperature (seasonal)
JJA models									
Eco 3 – Cold deserts	0.84	10.44	8.75**	-5.65*					
Eco 4 – Warm deserts	0.71	9.65	8.63**	-6.96**					
Eco 5 – Mediterranean California	0.76	10.94	13.29**	5.73**					
Eco 6 – Western Sierra Madre	0.63	9.34	6.70**	-4.07**	-3.14**	0.60			
Eco 8 – Upper Gila Mountains	0.63	28.98	16.09**	-10.27**	-4.41**	1.99**			
Eco 40 – Western Cordillera	0.74	41.58	14.52**	-8.59**					
Eco 48 – Western-Central Semi-Arid Prairies	0.36	6.28	5.07**	-2.80*	-3.01**				
Eco 49 – South-Central Semi-Arid Prairies	0.51	5.17	11.10*	-7.69*					
SON models									
Eco 3 – Cold deserts	0.57	6.17	3.76**	-1.61*		0.602			1.74**
Eco 5 – Mediterranean California	0.77	9.36	6.73**	-5.31**		1.99**		2.54**	
Eco 40 – Western Cordillera	0.70	22.43	13.03**	-7.96**			3.11*		
Eco 48 – Western-Central Semi-Arid Prairies	0.54	4.32			-4.91**	1.98**	3.91**		

Table S2. The regression fits for the original model and the sensitivity experiments

	Intercept	Maximum wind speed during fires	Mean wind speed during fires	Mean LAI (seasonal, ig)	Mean temperature (seasonal)	Mean slope	Mean elevation	Mean burned area
JJA								
Ori: Model (R^2=0.90, AdjR^2=0.89)								
Exp1: Model (R^2=0.77, AdjR^2=0.75) – Remove Max wind and add mean burned area								
Coefficient	21.11		0.09	7.39				4.45
p-value	P<<0.05**		0.93	P<<0.05**				P<<0.05**
Exp2: Model (R^2=0.92, AdjR^2=0.91) – Include Max wind and mean burned area								

Coefficient	21.11	6.68	-1.98	3.07				1.78
p-value	P<<0.05**	P<<0.05**	P<<0.05**	0.0016**				0.02*
SON								
Ori: Model (R^2=0.83, AdjR^2=0.79)								
Exp1: Model (R^2=0.56, AdjR^2=0.46) – Remove Max wind and add mean burned area								
Coefficient	12.55		2.11		2.52	2.20	2.28	1.83
p-value	P<<0.05**		0.08		0.03*	0.06	0.05	0.11
Exp2: Model (R^2=0.85, AdjR^2=0.80) – Include Max wind and mean burned area								
Coefficient	12.55	5.80	-0.24		0.86	1.17	0.75	1.02
p-value	P<<0.05**	P<<0.05**	0.75		0.24	0.10	0.30	0.14

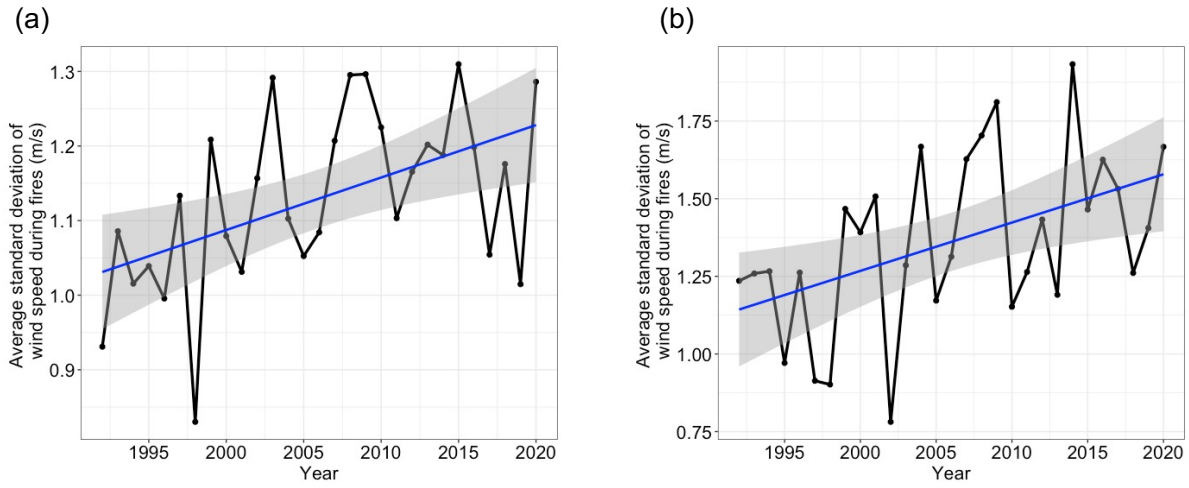

Fig S1. Increasing trends in average standard deviation of daily wind speed during large fires for 1992-2020 over the western US (<103° W) for (a) June-July-August (JJA) and (b) September-October-November (SON). The shaded area shows the 90% confidence intervals of the regression trend. The trends are 0.007 m/s yr^{-1} (p<<0.05) and 0.016 m/s yr^{-1} (p<<0.05) for JJA and SON, respectively.

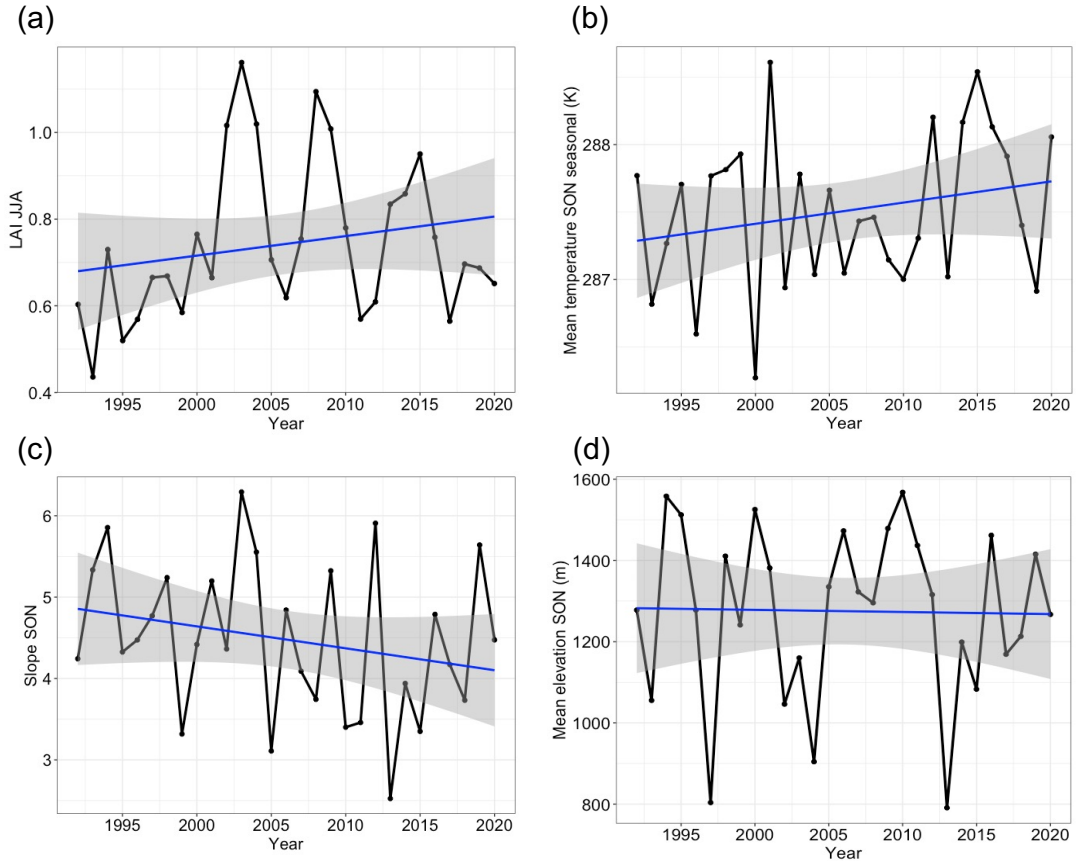

Fig S2. Observed average (a) seasonal mean LAI in JJA, (b) seasonal mean temperature in SON, (c) mean slope in SON, and (d) mean elevation in SON during large fires for 1992-2020 over the western US (<103° W). The shaded area shows the 90% confidence intervals of the regression trend.

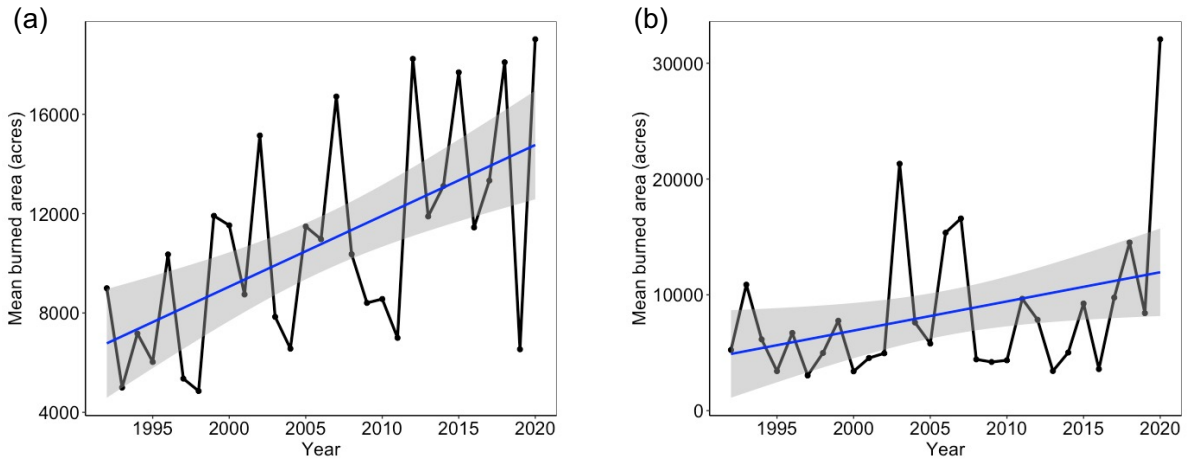

Fig S3. Time series of mean burned area over the western US (<103°W) during 1992-2020 for (a) JJA and (b) SON.

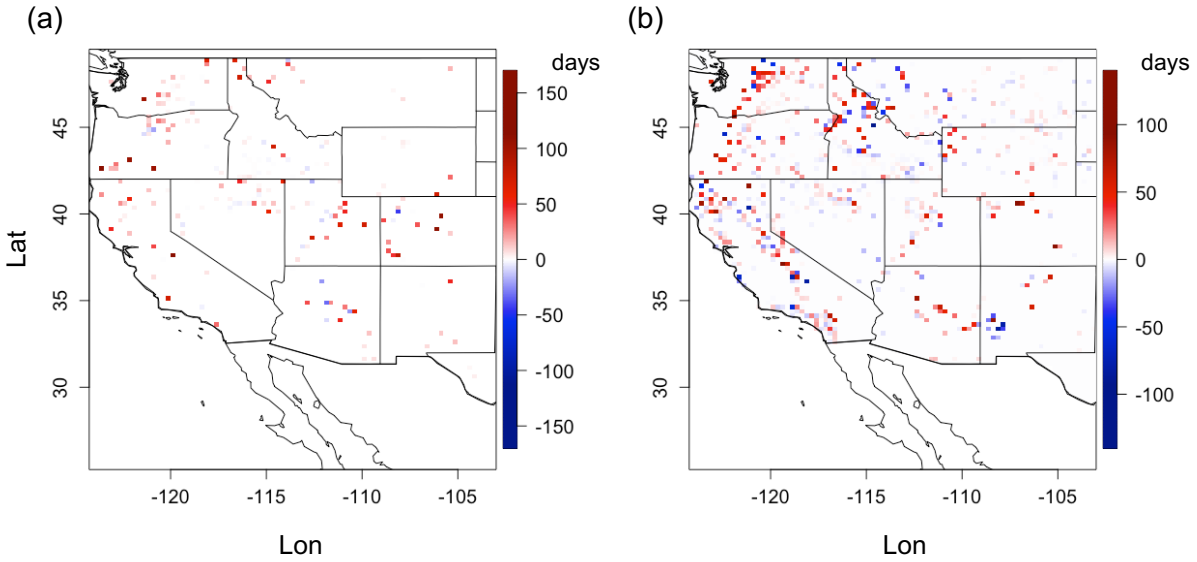

Fig S4. Spatial distribution of the differences in large fire durations between 2007-2020 and 1992-2006 for (a) JJA and (b) SON.

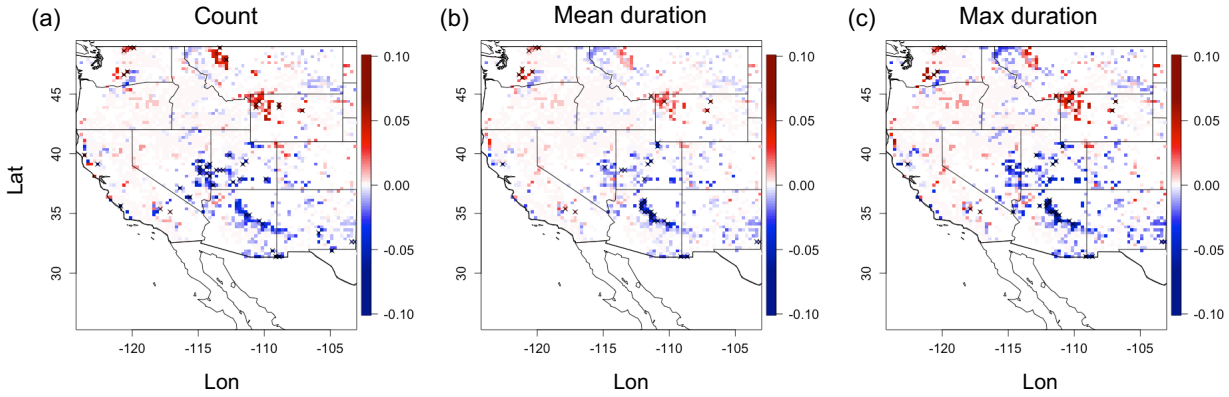

Fig S5. Observed trends in (a) count, (b) mean duration, and (c) maximum duration of strong wind events during JJA for 1992-2020 over the western US (<103°W). Trends that are statistically significant above 95% confidence level are marked with black crosses.

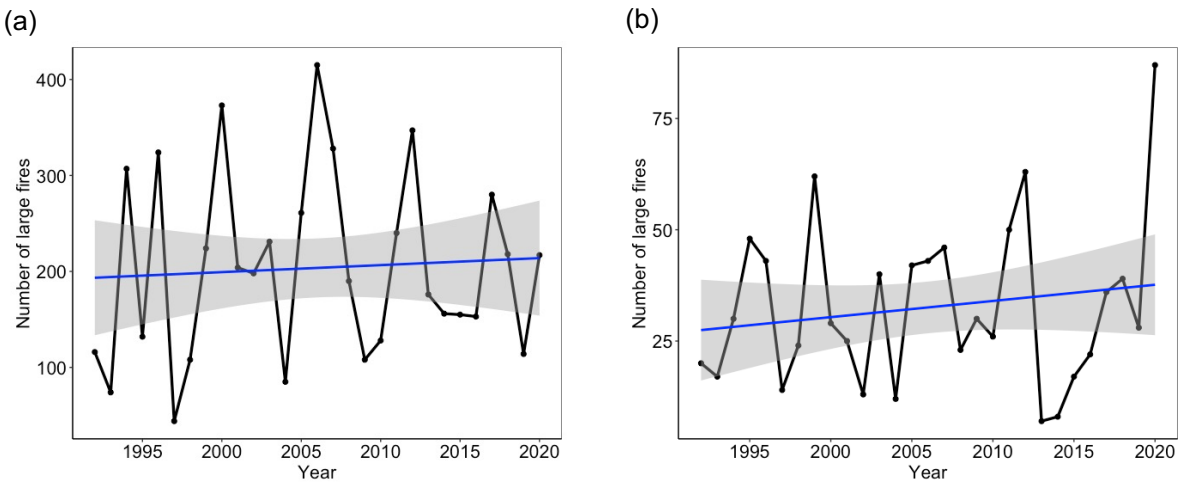

Fig S6. Time series of number of large fires used in the analysis during 1992-2020 for (a) JJA and (b) SON.