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Hurricane Disturbance Leads to Elevated Wildfire Activity in the Gulf Coast Region U.S.A.

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Abstract

Building on long-standing hypotheses of a hurricane-fire interaction, this study assesses empirical evidence for hurricane-driven increases in wildfire activity along the Gulf Coast of the United States. It has been proposed that wildfire risk is elevated post-hurricane due to increased fuel accumulation and alterations to forest microclimates associated with treefall (e.g., increased radiation, temperature, aridity). While isolated studies have identified evidence supporting this relationship using premodern proxy data, an analysis using modern empirical data is lacking. This study addresses this gap by using spatial analysis of contemporary hurricane and wildfire data to evaluate changes in wildfire activity following hurricane landfall events. Eighteen hurricanes that made landfall between 1992 and 2020 (Category 2 to 5) were analyzed alongside wildfire data surrounding their path of destruction from the five years before and after each storm. On average, in the five years after hurricanes, increases were seen in the size of wildfires (40%), number of wildfires (62%), and total area burned (147%). Temporal variation was also apparent, with most wildfire activity occurring within 2-3 years following hurricanes, though this varies by region along the coastline. Of the three regions studied, the Florida Peninsula experienced the largest increase in wildfire activity. These results support the hypothesis of a hurricane-fire interaction and demonstrate that hurricanes continue to influence Gulf Coast fire regimes in the modern era, despite widespread fire suppression and prescribed burning efforts.

Key words: Hurricanes, Wildfires, Fire management, Climate change, Gulf of Mexico

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1 Introduction

Hurricanes and wildfires are among the most important and frequent natural disturbances along the U.S. Gulf of Mexico coastline (Gang et al., 2020; Liu et al., 2008; Myers & van Lear, 1998; Pope et al., 2023; Senkbeil et al., 2020). The Atlantic basin – which includes the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico – experiences an average of 14 named storms, 7 hurricanes, and 3 major hurricanes (Category 3-5 on the Saffir-Simpson scale) each year (National Hurricane Center [NHC], n.d.). In the northern Gulf of Mexico specifically, over 250 hurricanes have impacted the region since 1851, roughly one-third of which were major hurricanes (Gang et al., 2020). Recent decades have seen an increasing proportion of major hurricanes, a trend projected to continue with human-induced climate change (Gang et al., 2020; Ibanez et al., 2022; Pope et al., 2023). In addition to this shift towards more intense storms, wind speeds are expected to intensify and the recurrence interval between extreme events is projected to shorten (Senkbeil et al., 2020), underscoring the importance of understanding how hurricane activity influences this region and its disturbance regimes.

Fire plays an equally important role in the forests of the southeastern U.S., particularly within the fire-prone and fire-adapted pine savannas and pine-dominated forests that dominate the landscape (Donovan et al., 2023; Ibanez et al., 2022; Liu et al., 2008; Myers & van Lear, 1998; O'Brien et al., 2008). Wildfires are a common occurrence in the coastal zone due to the high number of thunderstorm days – and consequently, lightning strikes – as well as pronounced wet and dry seasonal precipitation fluctuations (Liu et al., 2008), though humans can also inadvertently ignite fires that become uncontrollable (Bowman et al., 2020). In addition, widespread fire suppression and other management techniques, such as prescribed burning and forest thinning, have altered fire regimes and natural ecosystem processes along the Gulf Coast (Bowman et al., 2020; Ibanez et al., 2022; Liu et al., 2008; O'Brien et al., 2008). Despite increased investment in fire management, the total area burned by wildfires has risen since the 1980s and is projected to continue increasing with climate change, alongside rising wildfire frequency and longer fire seasons (Bowman et al., 2020; Donovan et al., 2023). Although fire remains an essential component of southern coastal and inland ecosystems, increasingly intense fires can negatively impact ecosystem services and overwhelm emergency management systems (Bowman et al., 2020; Costa-Saura et al., 2025; O'Brien et al., 2008).

The impacts of hurricanes and wildfires on forest ecosystems have been well studied individually (Donovan et al., 2023; Ibanez et al., 2022; O'Brien et al., 2008; Pope et al., 2023), but research examining their interactions remains limited (Liu et al., 2008; Myers & van Lear, 1998). Compound disturbances like these have been less studied than individual hazards, yet understanding the connections between hurricanes and wildfires is vital for evaluating their ecosystem effects and how an initial disturbance can increase the likelihood or intensity of a subsequent one (Cannon et al., 2017; Ibanez et al., 2022; Liu et al., 2008). Myers and van Lear (1998) hypothesized that a causal relationship could exist between these two events, in which the probability of wildfire increases following an intense hurricane. This linkage is attributed to fuel accumulation caused by wind damage during high-intensity hurricanes (Category 3 or higher; ≥ 111 mph), in which canopy damage and limb and stem breakage create large amounts of dry litter on the forest floor. A resulting drier forest microclimate may further increase fire frequency and intensity due to greater solar exposure and wind speeds under a more open canopy (Myers & van Lear, 1998). However, few subsequent studies have supported this theoretical relationship (Ibanez et al., 2022; Liu et al., 2008; Urquhart, 2009), and the literature is notably lacking in quantitative analyses of the spatial and temporal correlations between hurricanes and wildfires.

The hurricane-wildfire interaction has been discussed in numerous ecological studies (Ibanez et al., 2022; Liu et al., 2008; O'Brien et al., 2008; Pope et al., 2023; Webb, 1958) and Cannon et al. (2017) identified wind damage as a potential driver of wildfires. However, modern observational data studying this hypothesis are limited (Ibanez et al., 2022; Liu et al., 2008; Myers & van Lear, 1998). Liu et al. (2008) and Urquhart (2009) support the hypothesis of a hurricane-fire interaction raised by Myers and van Lear (1998) using premodern proxy data from sediment cores. Liu et al. (2008) found that three of the largest wildfires in coastal Alabama during the last 1,200 years occurred after major hurricanes, while Urquhart (2009) identified increased fire activity following both Hurricane Elisenda (~ 3340 years BP) and during the dry season after Hurricane Joan (1988) in Nicaragua.

Nonetheless, there appear to be no modern quantitative nor comprehensive analyses of hurricane-fire interactions, apart from these single-site or single event studies. Additionally, Liu et al. (2008) and Myers and van Lear (1998) both proposed that such interactions may not exist today due to widespread fire suppression and other human-caused fire regime changes.

This study aims to address this gap by using spatial and temporal analyses of historical hurricane and wildfire data to evaluate changes in fire activity following hurricane landfall events along the U.S. Gulf Coast. We use these data to directly test the hypothesis that hurricane-impacted landscapes exhibit elevated wildfire activity following hurricanes.

2 Methods

2.1 Study Site

The Gulf Coast of the United States was chosen for this analysis due to its high frequency of both hurricanes and wildfires, the limited research available on the interaction of these disturbances in the region (Donovan et al., 2023; Liu et al., 2008), and the availability of spatial digital datasets for both disturbances (see sections 2.2 and 2.3). In the United States, the majority of wildfire research has focused on the western U.S., where hurricanes rarely occur and the region's arid climate and fire-adapted ecosystems differ greatly from the Gulf Coast (Donovan et al., 2023; NHC, n.d.), emphasizing the need for regional wildfire analyses (rather than national or larger) (Bowman et al., 2020). The findings of this study may also inform research in other regions characterized by similar ecosystem structure and fire ecology, such as the coastal plains of Central America and the Caribbean islands (O'Brien et al., 2008), as well as southeast Asia and northern Australia (Ibanez et al., 2022).

The Gulf coastline encompasses four Level III Ecoregions defined by the U.S. Environmental Protection Agency (EPA): The Western Gulf Coastal Plain, Mississippi Alluvial Plain, Southern Coastal Plain, and Southern Florida Coastal Plain (U.S. EPA) For this analysis, these ecoregions are consolidated into three broader subregions of approximately equal size: 1) the Western Gulf Coast (corresponding to the Western Gulf Coastal Plain and encompassing Texas and part of Louisiana), 2) the Central Gulf Coast (the remaining coastline of Louisiana, Mississippi, Alabama, and the Florida Panhandle, corresponding to the Mississippi Alluvial and Southern Coastal Plains), and 3) the Florida Peninsula (encompassing part of the Southern Coastal Plain and the Southern Florida Coastal Plain) (Figure 1). The Mississippi Alluvial Plain spans a small portion of the coast compared to the other three ecoregions (thus, why it is combined with the Southern Coastal Plain), and is unique in that it is not fire-prone due to its moist, floodplain environment (Gagnon et al., 2021).

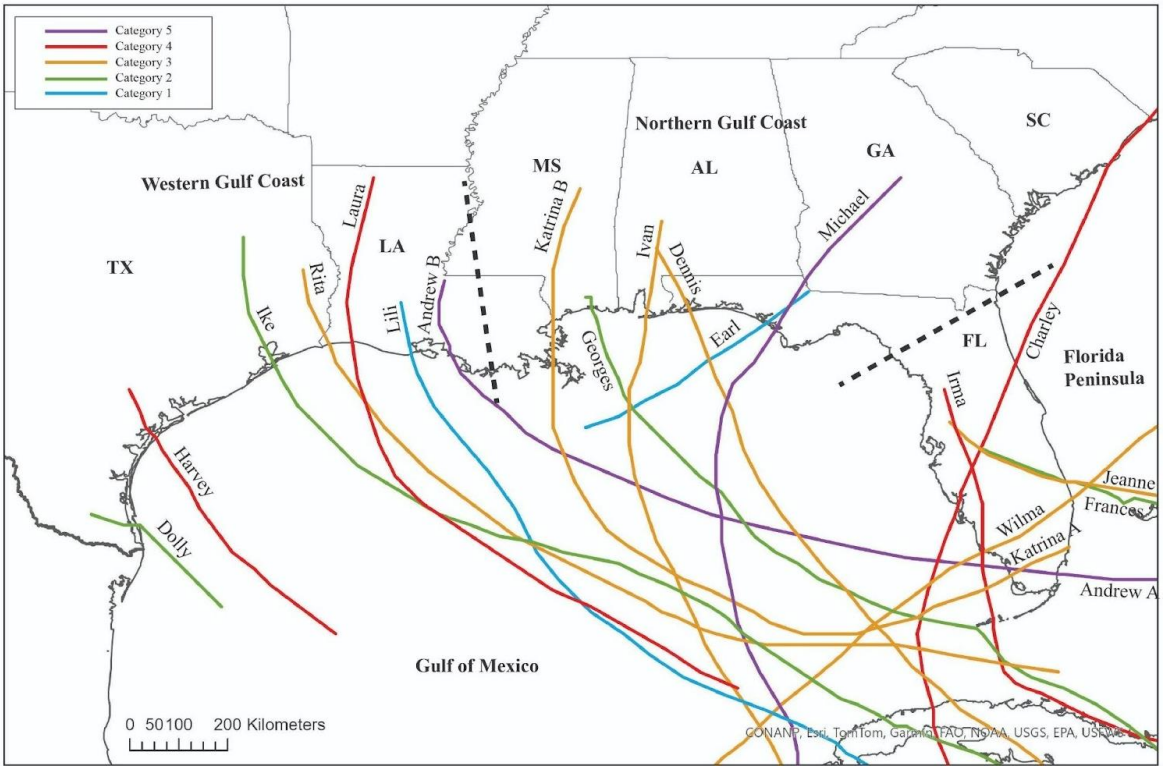


Fig. 1 Study site, storm tracks, and names of all hurricanes used in analysis are shown here. Colors represent each storm's category at landfall and black dashed lines indicate regional boundaries between the Western Gulf Coast, Northern Gulf Coast, and Florida Peninsula. Note that Katrina and Andrew made landfall twice and are split in our analysis but are not distinguished here

2.2 Hurricane Data

Hurricane data for the North Atlantic basin was downloaded from NOAA's International Best Track Archive for Climate Stewardship (IBTrACS) program (https://www.ncei.noaa.gov/products/international-best-track-archive). The data from IBTrACS at the date of analysis (May 2025) covered the period from 1851 to 2024. We focused on hurricanes that made landfall along the Gulf Coast of the United States – the coastlines of Texas, Louisiana, Mississippi, Alabama, and Florida – that were of maximum Category 2 or higher to limit the inclusion of the high number of Category 1 hurricanes (Table 1; Figure 1). Hurricanes were also filtered for only those that made landfall in this region between 1989 and 2019 (with the exception of Hurricane Laura in 2020, where fire data was sufficient), in order to have complete wildfire data for the five-year periods before and after each storm (see section 2.3).

Table 1 Characteristics of hurricanes used for analysis. Storms were filtered for those that made landfall along the Gulf of Mexico coastline between 1989 and 2020, are of maximum Category 2 or higher, and have wildfire data available for the five years prior to and following landfall. Regions represent approximate locations of landfall: Western Gulf Coast (WGC), Northern Gulf Coast (NGC), and Florida Peninsula (FLP). R64 values are unavailable for storms before 2004. Where unavailable, values were assigned based on the median of hurricanes within the same maximum category

Name	Year	Maximum Category	Category at Landfall	Region	Maximum R64 (nautical mi)
Michael	2018	5	5	NGC	40
Irma	2017	5	4	FLP	70
Katrina A[a]	2005	5	1	FLP	90
Katrina B[a]	2005	5	3	NGC	90
Rita	2005	5	3	WGC	75
Wilma	2005	5	3	FLP	90
Ivan	2004	5	3	NGC	100
Andrew A[a]	1992	5	5	FLP	80
Andrew B[a]	1992	5	3	WGC	80
Laura	2020	4	4	WGC	60
Harvey	2017	4	4	WGC	35
Ike	2008	4	2	WGC	100
Dennis	2005	4	3	NGC	55
Charley	2004	4	4	FLP	50
Frances	2004	4	2	FLP	85
Lili	2002	4	1	WGC	60
Georges	1998	4	2	NGC	60
Jeanne	2004	3	3	FLP	60
Dolly	2008	2	2	WGC	35
Earl	1998	2	1	NGC	35

[a] Hurricanes Katrina and Andrew both made landfall in two different locations: Katrina first in southern Florida (8/25/2005) and again in eastern Louisiana (8/29/2005), Andrew first in southern Florida (8/24/1992) and again in western Louisiana (8/26/1992). As both were categorized as hurricanes at each location, they are split into Katrina A, Katrina B, Andrew A, and Andrew B, and analyzed individually

2.3 Wildfire Data

Fire data for the United States was downloaded from Monitoring Trends in Burn Severity's (MTBS) "Burned Areas Boundaries Dataset" (https://www.mtbs.gov/). At the date of analysis (May 2025), the data from MTBS covered the period from 1984 to 2024. This dataset was filtered in ArcGIS Pro for only fires classified as "Wildfires," therefore excluding those that were prescribed burns or of unknown origin.

2.4 Data Analysis

Storm tracks were filtered to include only portions classified as hurricanes (Categories 1-5; ≥ 74 mph wind speeds) (Figure 2a). Buffers were then generated around each hurricane track based on its unique maximum R64 value (Table 1; Figure 2b). R64 represents the radial extent of 64-knot (74 mph) winds, measured in quadrants around the storm at each time step. Although the IBTrACS dataset also provides R50 and R34 values, R64 was selected because it delineates the innermost zone of strongest winds (Senkbeil et al., 2020), and therefore where the

most destruction could occur. Hurricanes of the same Saffir-Simpson category can vary substantially in size; using R64-based buffers therefore standardizes storm-specific impacts while providing a conservative estimate compared to broader wind radii such as R50 (Senkbeil et al., 2020). Because R64 values are only available in the IBTrACS dataset beginning in 2004, storms that made landfall prior to that year were assigned the median R64 value for hurricanes of the same maximum category.

For each hurricane studied, wildfires were filtered to include those that intersect spatially within the boundaries of the R64 hurricane buffers; this was done in order to quantify all wildfires that occurred within the area of destruction. These fires were filtered to include all that occurred in the five-year period before the storm (Figure 2c), i.e. to serve as a pre-hurricane baseline (no hurricane damage), and to serve as a comparison to the wildfires that occurred in the five-years after the storm (Figure 2d), i.e. prone to hurricane damage. The five-year buffer was chosen because (1) forest damage is likely to have begun to recover to something approximating pre-hurricane canopy conditions (Ibanez et al. (2022) report this could take between 2 and 10 years and Addington et al. (2015) state 3-5 for wildfire fuel to recover) and (2) because longer time frames could start to include effects of multiple storms, and the goal of this study is to analyze data storm-by-storm.

Data was then collected for the number of fires, total area burned, and the mean size of fires for every storm's pre-hurricane and post-hurricane periods. The "Summary Statistics" tool in ArcGIS Pro was used to calculate the number of wildfire occurrences, sum of area burned, and mean fire size within each buffer and time period. Output data for all hurricanes were then compiled in Microsoft Excel for further analysis, including percent-change calculations, subregion classification, yearly analysis, and statistical testing (paired t-tests) designed to assess the significance of the observed trends.

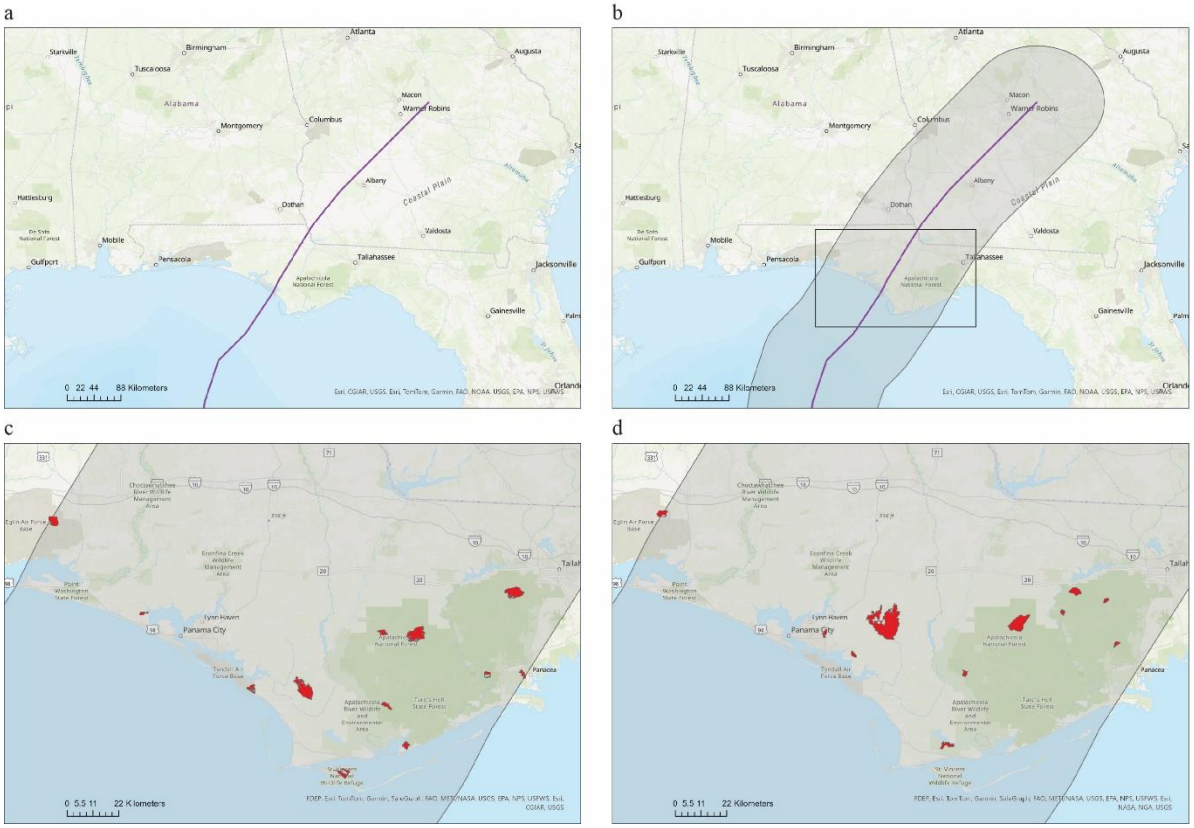


Fig. 2 Example of our methodology in ArcGIS Pro, using the Hurricane Michael (2018, NGC) showing a) storm track, b) buffer based on maximum R64 value, wildfires that occurred within the buffer in the five years before (c; ~2013-2018) and five years after (d; ~2018-2023). Black box in panel b represents the extent of panels c and d.

3 Results

Results show that in the five years following hurricane events, the Gulf Coast region on average experienced a greater number of wildfires, wildfires burned a greater area of land, and their average size increased (Table 2a). The total area burned by wildfires showed the greatest increase following storms (147.37% increase), followed by the number of fires (62.02%), and size of fires (40.26%). When hurricanes are analyzed by region, the Florida Peninsula shows the greatest increase across all three metrics, where area burned almost tripled in the five years following hurricanes compared to the five years previous (Table 2a). The Western Gulf Coast showed little change in the average size of fires (3.58%), but total area burned and number of fires increased by 50.58% and 56.62% respectively (Table 2a). The Northern Gulf Coast similarly showed a small increase in size of fires, but area burned and number of fires increased more substantially (Table 2a). When only years 1-3 are compared pre- and post-hurricane, all three metrics show larger increases when averaged across all storms and FLP remains highest of the three regions (Table 2b).

Table 2a Percent change from the five-year pre-hurricane period to five-year post-hurricane period. Percent change is calculated for each storm and then averaged overall as well as by region. P-values were calculated using total area burned (see Section 3)

	Percent Change			
Region	**Number of Fires**	**Size of Fires**	**Total Area Burned**	**p-value**
WGC	56.62%	3.58%	50.58%	*p = 0.71*
NGC	52.27%	27.88%	85.89%	*p = 0.06*
FLP	76.48%	84.09%	291.8%	*p = 0.32*
All Storms	62.02%	40.26%	147.37%	*p = 0.21*

Table 2b Percent change from the three-year pre-hurricane period to three-year post-hurricane period

	Percent Change			
Region	**Number of Fires**	**Size of Fires**	**Total Area Burned**	**p-value**
WGC	95.46%	-4.86%	83.11%	*p = 0.63*
NGC	133.75%	30.38%	214.05%	*p = 0.09*
FLP	207.48%	182.37%	1001.89%	*p = 0.04**
All Storms	146.15%	71.24%	443.97%	*p = 0.025**

* Indicates statistical significance ($p < 0.05$)

Total area burned was chosen for further analysis (including statistical testing) as it is representative of both number of fires and their size in a given area. This data was analyzed by year relative to hurricane landfall and shows that overall, area burned remains similar to pre-hurricane levels one year after the storm but increases in years two and three before returning to pre-hurricane levels in four and five (Figure 3a). This trend is exemplified well in the FLP region, where the most fire activity occurs two years after a hurricane (Figure 3a, d). Northern and Western Gulf Coast regions differ slightly in that fire activity in the NGC is above that of pre-hurricane levels in years one and two following storms and only in year 3 in the WGC (Figure 3a, b, c). By years four and five post-hurricane, all regions returned to typical pre-hurricane levels (Figure 3a). Statistical tests were performed to assess the significance of this trend, using paired t-tests to compare the 1-3 years post-hurricane to the same years pre-hurricane. This trend is statistically significant (p-value < 0.05) across all storms ($p = 0.025$) as well as for FLP ($p = 0.04$) when separated by region (Table 2b). While not significant to $p < 0.05$, in the NGC region, 5-year totals produce a value of $p = 0.06$ (Table 2a), and for the timespan of 1-3 years pre- and post-hurricane, $p = 0.09$ for NGC (Table 2b).

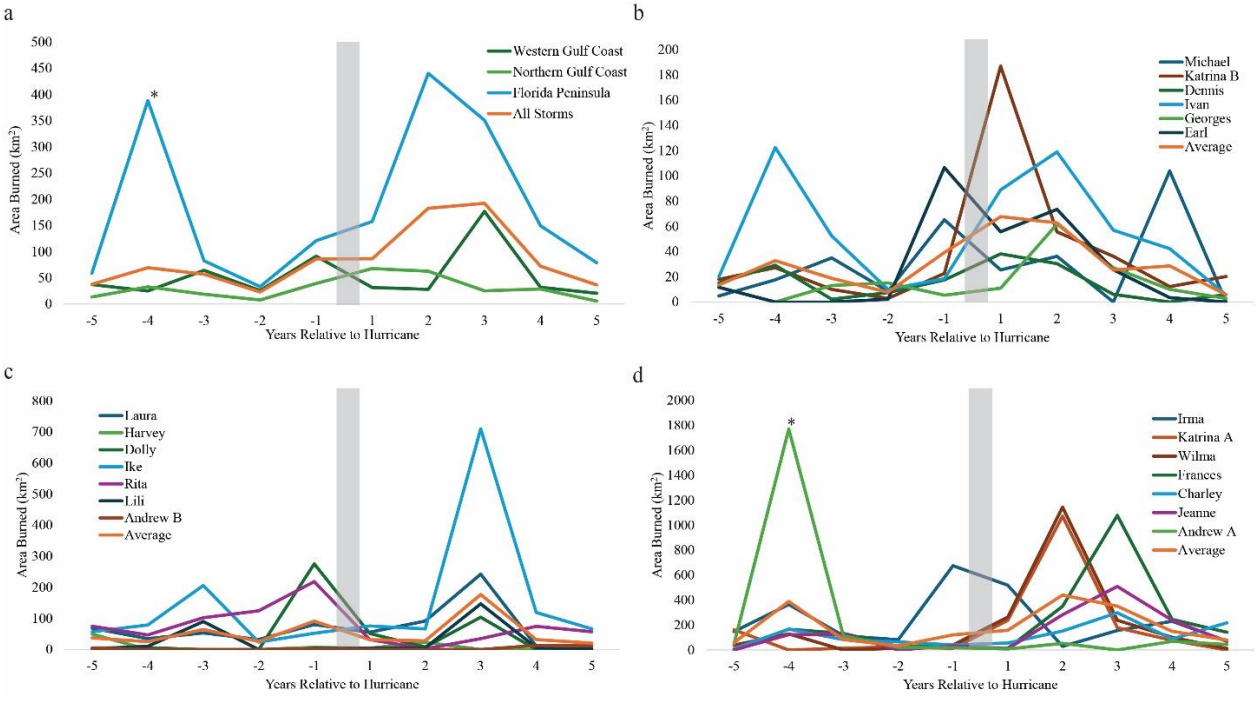


Fig. 3 Total area burned (km^2) by year relative to each storm (where the hurricane represents year 0, designated by the gray bar) separated by a) regional and overall averages, b) Northern Gulf Coast storms, c) Western Gulf Coast storms, and d) Florida Peninsula storms. Note that year -4 within the FLP average is influenced heavily by a major drought (in some areas, 80 to 100-year droughts) (Zuckert, 1990) that contributed to over 1700 km^2 burned 4 years prior to Hurricane Andrew. If the drought is not factored in, the average for FLP year -4 is ~160 km^2, i.e. close to background level

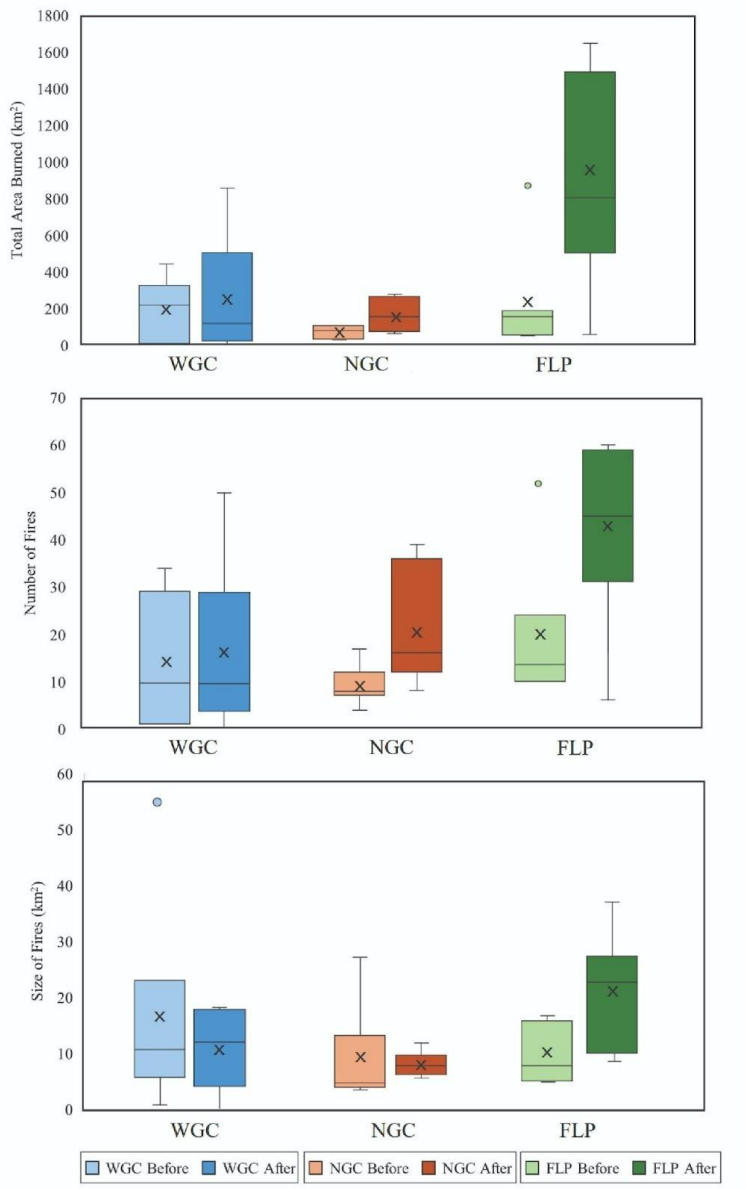


Fig. 4 Box plots showing the distribution of total area burned (km2), number of fires, and size of fires (km2) for the Western Gulf Coast (WGC), Northern Gulf Coast (NGC), and Florida Peninsula (FLP) regions before and after hurricane disturbance. "Before" and "After" refers to data from the 1-3 years pre- and post-hurricane for each region where that storm occurred.

4 Discussion

This study provides important documentation and quantification of the impact of hurricane damage on wildfire occurrence in the Gulf Coast region of the southeastern United States. We find that for hurricanes that made landfall during the period 1989-2020, the number of wildfires, their size, and total area burned increases following storm events, with the most pronounced effects seen in the Florida Peninsula and in the two to three years after a hurricane. These findings serve to fill a previous gap in the literature by providing modern empirical data to support the hypothesis of a hurricane-wildfire interaction raised by Myers and van Lear (1998) and discussed in subsequent

ecological studies (e.g. Cannon et al., 2017; Ibanez et al., 2022; Liu et al., 2008; Urquhart, 2009), but not quantitatively analyzed as done in this current study.

In the five-year post-hurricane period, all three wildfire metrics studied increased compared to corresponding pre-hurricane periods, though spatial and temporal variation is apparent. When averaged across all storms, size of fires increased the least (40.26%) compared to number of fires (62.02%), and total area burned (147.37%), possibly due to wildfire control efforts or forest fragmentation that impedes the spread of fires (Gagnon et al., 2021). While total area burned did not show statistical significance when comparing five-year pre- and post-hurricane periods, trends nevertheless show an increase in all three metrics, regardless of region studied (Table 2a).

Spatial variability in wildfire response to hurricanes is most pronounced in the differences between the FLP region – which shows the greatest increases in fire activity across all metrics (number of fires, size of fires, area burned) – and the NGC and WGC regions, which experience less pronounced increases in wildfire incidence post-hurricane. These spatial differences are likely attributable to variability in climate, such as precipitation events after the hurricane, and forest ecology, including soil type. The NGC exhibits the least fire activity overall (regardless of timing relative to hurricanes; Figure 3a), possibly due to its humid climate and high amount of annual rainfall (140-164 cm), creating conditions less prone to wildfire ignition and spread (National Park Service, 2025). Despite a similarly high amount of yearly rainfall (130-160 cm) (Malone et al., 2025), the FLP region displays the highest total area burned regardless of year relative to hurricanes. This may be due to the seasonal distribution of rainfall within the Florida peninsula, where in areas such as the Everglades National Park, as much as 80% of yearly rainfall occurs during the rainy season of May-October, followed by a dry season that extends through April (Malone et al., 2025). Ecosystems in this region are historically dependent on frequent, low-intensity surface fires during the dry season, with some areas experiencing return intervals of as little as 3 years (Malone et al., 2025; McLeod et al., 2025). Areas such as Gulf Shores (Alabama) along the NGC experience rainfall consistently year-round, more often impeding extreme dry conditions necessary for wildfire ignition compared to areas like southern Florida. The WGC falls somewhere in between the other two regions, with less fire activity than FLP but (during most years) more than NGC (Figure 3a). Though there is much variation along this stretch of coastline, much of it corresponds to the Gulf Prairies and Marshes ecoregion which receives anywhere from 76 to 127 cm of rainfall per year, spread out evenly throughout the year (Texas Parks and Wildlife Department, n.d.). While WGC dry seasons are not as extreme as in southern Florida, lower annual rainfall in WGC may foster a greater number of fires than in the NGC, as is exemplified in our data. Regional rainfall patterns (yearly amount and seasonal distribution) therefore appear aligned with observed fire data quantified in this study, highlighting the role of background precipitation on post-hurricane fire regimes.

The temporal relationship between hurricanes and wildfire also demonstrates a noteworthy lag; for example, when total area burned is plotted by year relative to hurricane events, the greatest intensity of fire activity occurs on average in the 2 and 3 years after hurricanes (Figure 3a). Compared to pre-hurricane levels, fire activity remains relatively steady on average in the first year following storms, before increasing in years 2 and 3 (Figure 3a). This lag in fire activity could be attributed to high levels of soil moisture that persist well into year 1 post-hurricane – this is supported by empirical data from the southeast U.S.A indicating that elevated soil moisture may persist for 3-6 months after passage of a hurricane (Case et al., 2021), thus delaying wildfire response. Late season hurricanes could especially see this lag in fire activity, as the first fire season in the southeast U.S. (usually March through May) follows the end of hurricane season (November 30) by only a few months (National Park Service, 2025). The FLP region follows a similar trend to the average across all storms with a 1-year lag, compared to a 2-year lag in the WGC, and no lag observed for the NGC average (Figure 3a). These differences could be attributed to variation in soil type and their corresponding levels of permeability. NGC soils are mainly well-drained Entisols and Ultisols (National Resources Conservation Service [NRCS], n.d.) that would not hold moisture from storms like hurricanes as long, i.e. creating a shorter (or no) lag time in wildfire response. Though Florida soils vary across the peninsula, they are similarly permeable and Entisols and Spodosols are common, indicating an abundance of sandy

well-drained soils that are prone to drying out (NRCS, n.d.). Conversely, the WGC contains many Vertisols that are rich in smectite clays, able to hold moisture from storms longer than the soils of the NGC or FLP and resulting in a longer lag time (NRCS, n.d.).

Once soils have returned to background moisture conditions (on average years 2-3), however, the influence of increased fuel from fallen debris and increased drying conditions under an open canopy enhance fire risk, following the hypothesis of Myers and van Lear (1998). Fire activity then returns to pre-hurricane levels in the 4 to 5 years after these storms (Figure 3a), indicating that the first 3 years following hurricanes are most critical when considering timing of hurricane-driven wildfires. Paired t-tests comparing 3-year pre- and post-hurricane periods show statistical significance when all storms are considered together; when analyzed as sub-regions, this relationship is statistically significant for the FLP region (Table 2b). The observed return to baseline fire activity in years 4 and 5 post-storm likely explains the lack of statistical significance when 5-year totals were considered, compared to significant differences when only years 1 to 3 post-hurricane were analyzed.

These results support the Myers and van Lear (1998) hypothesis of a hurricane-wildfire interaction in the coastal south; however, they refute the idea that this interaction would only exist in the era before organized fire suppression. Liu et al. (2008), using premodern proxy data, also support the Myers and van Lear (1998) hypothesis and additionally state that this interaction may no longer exist due to fire suppression. Despite modern fire management efforts, our data show that hurricanes continue to drive wildfire activity in the southeast U.S., likely as a result of increased dead-fuel and optimum drying conditions (from increased insolation and wind speeds), as Myers and van Lear (1998) propose. This study, to the authors' knowledge, provides the first modern empirical evidence of increased wildfire activity following hurricanes.

This study's findings contribute to a broader understanding of compounding natural hazards and drivers of wildfires. The association between hurricanes and wildfires means that hurricane tracks and the damage they cause to forests could be incorporated into wildfire management and risk assessment. The lag time seen between hurricane landfall and elevated fire activity in the WGC and FLP provides a valuable advantage for risk planning and mitigation efforts. During this 1–2-year window, prescribed burning may be a valuable management tool, as it can reduce buildup of post-hurricane fuel accumulation in a controlled setting, reducing risk of later uncontrolled wildfires while still providing ecological benefits to fire-dependent forests. Many previous studies have discussed the benefit of prescribed burning in fire-prone forests of the southeast U.S. (Addington et al., 2015; Donovan et al., 2023; Malone et al., 2025; McLeod et al., 2025; Myers & van Lear, 1998). Aside from reducing the risk of high-severity wildfires, studies in Florida show that prescribing burning also helps to maintain ecosystem function and resilience by preventing overgrowth, releasing nutrients into the soil, and managing invasive species (Malone et al., 2025; McLeod et al., 2025). Where prescribed burning is already an established management tool, forest managers may utilize hurricane track data to assess where fuel buildup occurs and target these areas for prescribed burns.

Developing effective strategies for mitigating the effects of hurricane-driven wildfires is necessary, especially as hurricane intensity has been – and is projected to continue – increasing due to human-induced climate change (Ibanez et al., 2022; Senkbeil et al., 2020). An increase in hurricane intensity could further drive a hurricane-wildfire interaction, highlighting the importance of understanding both this trend and broader impacts of climate change on natural disasters. Though this study focuses on relatively short-term impacts of hurricanes on wildfires (5-years post storm only), this interaction could have long term effects as well, potentially altering forest regeneration patterns and composition (Gagnon et al., 2021) and causing more frequent wildfires in areas that previously only rarely experienced them (Ibanez et al., 2022). While we study only Gulf of Mexico hurricanes that made landfall within the southern United States, results could also inform management decisions in similar coastal areas that are prone to both hurricanes and wildfires, such as the broader Caribbean Basin (O'Brien et al., 2008), southeast Asia, and northern Australia (Ibanez et al., 2022).

Further investigation could refine and deepen understanding of the trends identified here. Although we propose mechanisms to explain regional variability and overall spatial and temporal trends, these interpretations may not fully account for variability among individual storms within a given region. Incorporating storm-specific climatic drivers alongside variation in forest structure and fuel composition could help resolve these finer-scale differences. Additionally, this study does not consider fire severity or intensity, which are important for evaluating comprehensive impacts of fires on forests, and could be influenced by hurricanes in ways that this analysis does not represent. Despite these limitations, our results provide a foundation for future work on compound and cascading natural hazards and demonstrate that modern hurricanes measurably influence subsequent wildfire activity in the southeast U.S. despite widespread fire management efforts.

Statements and Declarations

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Competing Interests

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Author Contributions

All authors contributed to the study conception and design. Data collection and analysis were performed by Harper M. Steele under the supervision of Peter C. Ryan and Richard S. Vachula. The first draft of the manuscript was written by Harper M. Steele and all authors contributed to reviewing and editing the manuscript. All authors read and approved the final manuscript.

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