REDI@CSU
Regional Economic Development Institute

Battle Scars: Trends in Wildfire Size and Impact across Colorado

Thomas Gifford and Edward Barbier

REDI Report – March 2025
https://csuredi.org/

- Wildfires in Colorado have increased in both frequency and size since 1990, with especially rapid growth in the 21st century.
- A small number of large fires accounts for the vast majority of burned acreage, with the top 1% of wildfires by area accounting for nearly 50% of total burned acreage.
- Of the 10 largest fires in state history, 8 have occurred since 2012, with 3 occurring in 2020 alone.
- Some counties, including Larimer and Grand, have seen over 15% of their total land area burned, often due to exceptionally large fires.

Wildfire Trends in Colorado (1990-2023)

This report analyzes wildfire activity in Colorado between 1990 and 2023, using data from the National Interagency Fire Center, a collaborative effort among federal agencies to centralize wildfire records across the United States. More information can be found at their website, https://www.nifc.gov/. The data reveals that wildfires in Colorado have become more frequent, larger, and more variable over the previous 30 years.

Table 1: Summary Statistics of Wildfires by Decade

Decade	Annual Fires	Acreage per Fire	SD	Max	Min
1990s	13.00	1,099.41	1,912.39	16,572.9	0.17
2000s	48.80	1,328.89	4,333.95	138,395.8	0.08
2010s	62.50	1,645.75	5,668.09	108,131.3	0.07
2020s	72.00	1,772.69	8,731.53	208,913.1	0.00

As shown in Table 1, the average number of fires per year has increased sharply, rising from 13 in the 1990s to nearly 50 in the 2000s, and surpassing 70 annual fires by the 2020s. Although the average fire size has grown more modestly, from approximately 1,100 acres in the 1990s to over 1,700 acres in the 2020s, the increasing number of large fires has driven up the total area burned each year. The upward trends in both wildfire occurrences and total burned acreage can be seen in Figures 1 and 2.

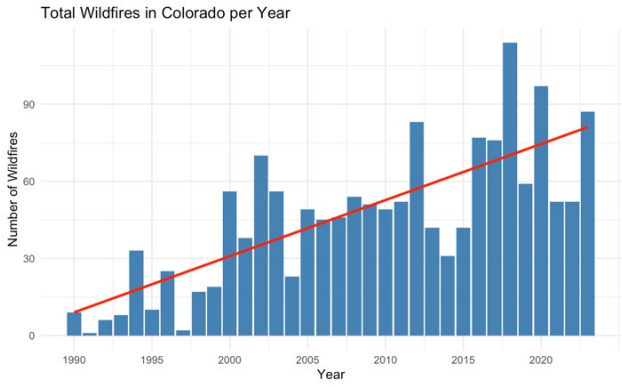

Figure 1: Number of Wildfires per Year

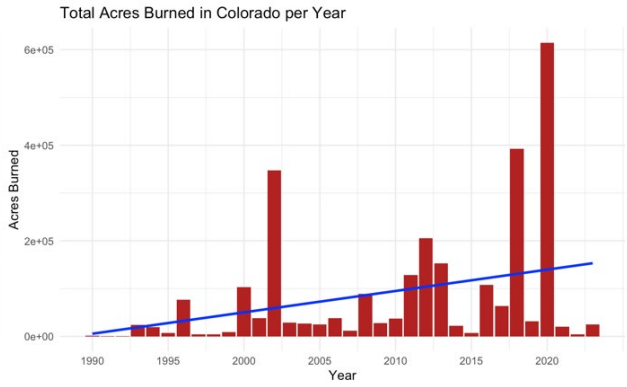

Figure 2: Total Burned Acreage per Year

More notably, the variability in fire size has expanded significantly. The standard deviation of burned acreage rose from about 2,000 acres in the 1990s to over 7,000 acres in the 2020s, reflecting the increased probability of extreme megafires. This is further illustrated by the increase in maximum fire size, which grew from approximately 16,500 acres in the 1990s to over 208,000 acres in the 2020s. These trends are consistent with patterns observed throughout

the western United States, where rising temperatures, extended drought, and fuel accumulation have intensified wildfire behavior over the past several decades (Abatzoglou & Williams 2016).

This increase of wildfires is most apparent in maps of wildfire boundaries across time, seen in Figure 3. In the 1990s, burn scars were relatively sparse and scattered. By the 2000s and especially the 2010s, fire perimeters expanded noticeably in both size and density, with previously unaffected areas marked by large burn scars.

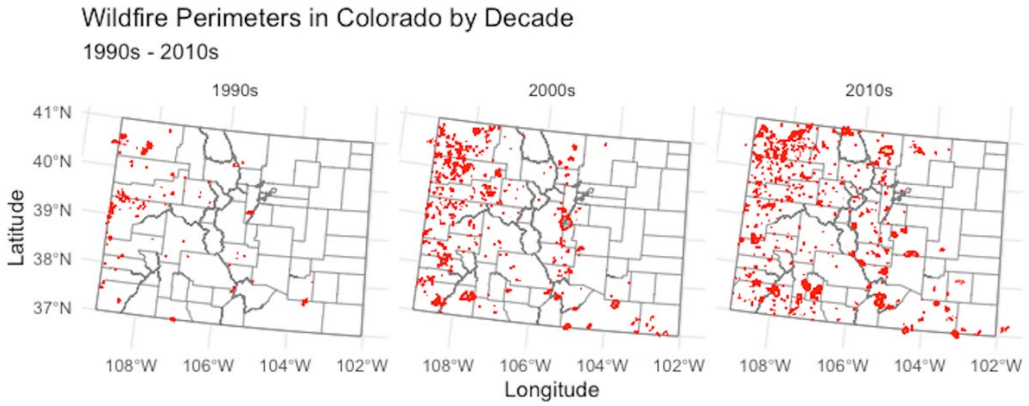

Figure 3: Wildfire Boundaries by Decade

Impacts of Largest Fires

Table 2 lists the ten largest wildfires in Colorado since 1990, all of which occurred in the 21st century, half since 2012, and three in 2020 alone. The Cameron Peak Fire is the largest on record, burning over 208,000 acres of Larimer County in 2020. Other major events include the Hayman Fire (2002) and Pine Gulch Fire (2020), both exceeding 130,000 acres. The rise in extreme fires reflects broader changes in Colorado's fire regime, driven by drought, fuel accumulation, and climate change.

Table 2: Largest Wildfires in Colorado State History

Incident	Year	Acres Burned	Suppression Cost	Incident	Year	Acres Burned	Suppression Cost
Cameron Peak	2020	208,913.05	$133,300,000	High Park	2012	92,547.33	$39,000,000
East Troublesome	2020	193,811.96	$15,682,000	Missionary Ridge	2002	70,440.28	$37,700,000
Pine Gulch	2020	138,802.88	$35,000,000	West Fork	2013	60,690.46	$33,000,000*
Hayman	2002	138,395.79	$39,100,000	416	2018	55,526.47	$39,541,000
Spring Creek	2018	108,131.28	$32,000,000	Papoose	2013	49,293.28	$33,000,000*

*The West Fork and Papoose Fire complexes of 2013 occurred across a large area of Southwest Colorado and suppression costs for fighting these fires are combined in the dataset.

Not all fires are created equally. A small number of fires are responsible for the vast majority of total acreage burned in Colorado. The top 10% of fires by area account for nearly 90% of the total burned area, while the top 1% are responsible for 49.9% of cumulative burned area. This extreme concentration highlights the outsized impact of mega-wildfires which are becoming increasingly common. This reinforces the importance of targeted mitigation strategies for high-risk, high-intensity fire events. While smaller fires are far more common, it is the few massive incidents that shape the overall landscape of wildfire damage in the state. This is evident in the amount spent on containing each fire, with the top 10 fires costing more than $400 million in suppression costs alone.

Counties Most Affected By Wildfire

Some counties have been more heavily impacted by wildfires than others, shown in Table 3. While fire-prone counties like Moffat and Garfield top the list in number of fires, smaller counties such as Grand, Mineral, and Teller rank highly due to a few exceptionally large events. Grand County, for instance, has seen over 17% of its land burned—mostly from the 2020 East Troublesome Fire—while Larimer exceeds 20%, driven by the Cameron Peak and High Park fires.

Table 3: Top 10 Colorado Counties by Percentage of Area Burned

County	Fires	Acres Burned	% Area Burned		County	Fires	Acres Burned	% Area Burned
Larimer	31	343,562.0	20.38%		Garfield	116	231,833.2	12.26%
Grand	15	206,924.9	17.29%		Teller	8	44,242.0	12.37%
Mineral	8	86,367.0	15.37%		Huerfano	14	103,792.8	10.18%
Jefferson	13	68,339.6	13.79%		Moffat	268	270,847.2	8.91%
La Plata	35	135,002.3	12.41%		Douglas	9	43,377.8	8.03%

Wildfire dynamics vary widely across the state. Moffat has experienced over 250 fires, most of them small, while counties like Mineral and Douglas have faced fewer than ten fires each, yet still show high burn percentages due to large-scale incidents. These patterns reflect the dual risks of frequent, low-intensity fires and rare but highly destructive events. Several studies have also linked the occurrences of small, low-intensity wildfires with healthy ecosystem services, while large fires can harm ecosystem health for years after the initial burn (Bayham et al. 2022).

This pattern is illustrated in Figures 4 and 5, in which it is readily apparent that while similar shares of each county have been burned during this time period, Douglas county experienced a smaller number of significantly larger fires than Moffat County.

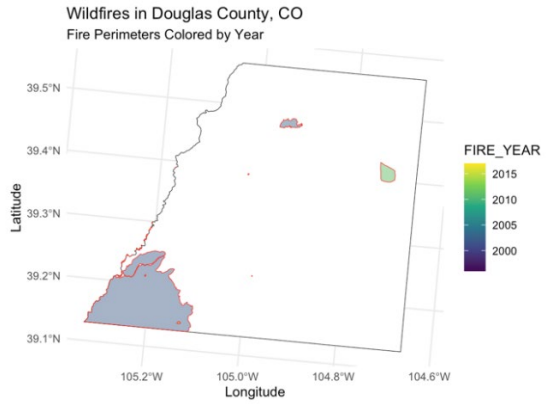

Figure 4: Wildfire Boundaries in Douglas County

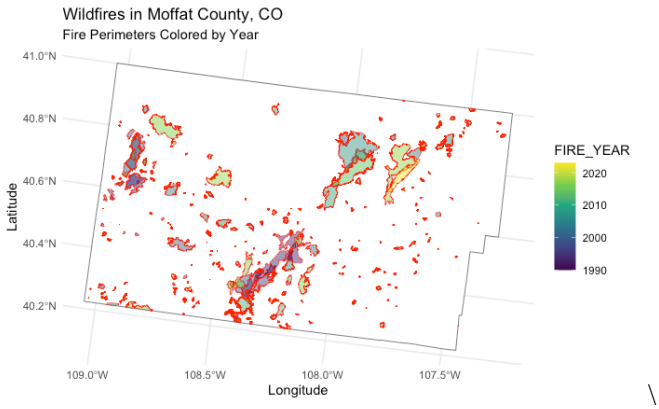

Figure 5: Wildfire Boundaries in Moffat County

Wildfire activity in Colorado has intensified over the past three decades, with larger and more frequent fires reshaping the state's landscapes. While many fires remain small, a growing number of extreme events account for the vast majority of burned area and drive the most severe impacts. These trends reflect broader changes in climate and land conditions, and they underscore the importance of targeted mitigation strategies focused on high-risk areas and large-scale incidents.

References:

Abatzoglou, J. T., & Williams, A. P. (2016). Impact of anthropogenic climate change on wildfire across western US forests. *Proceedings of the National Academy of sciences*, *113*(42), 11770-11775.

Bayham, J., Yoder, J. K., Champ, P. A., & Calkin, D. E. (2022). The economics of wildfire in the United States. *Annual Review of Resource Economics*, *14*(1), 379-401.