



Weather and Climate Disaster Analysis

A Review of 1980-2023 NCEI Data

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WWW.GAZRESEARCH.COM

WHAT WE DO

GAZ Research LLC is newly formed company based on Alan Zimmermann's many decades of insurance industry expertise. The firm's main mission is to provide educational teach-ins on the insurance industry to all levels of participants, including new hires, executives new to the business and recently named directors. The teach-ins are also useful for those in the investment community looking to learn more about how insurance impacts the global financial markets.

Alan Zimmermann has conducted these teach-ins for more than 25 years for more than a thousand participants on three continents.

Teach-ins can be presented in multiple formats including pre-recorded webinars, virtual meetings or in-person presentations. While the focus will be to ensure participants gain a basic industry introduction, presentations can be tailored to include more advanced topics. Custom programs can also be developed upon request.

In addition to the teach-in program, GAZ Research LLC will distribute periodic notes and reports on relevant property-casualty industry topics.

INSURANCE TEACH-INS AND RESEARCH



ALAN ZIMMERMANN

A long-time insurance analyst focuses much of his attention on accounting, regulatory, and other macro-industry matters. He is well known in the insurance industry from his many years on Wall Street. He now spends considerable time conducting educational Teach-ins for all levels in the industry from new hires to executives new to the industry, to recently named directors.

For the last ten years he has been a Managing Director at Assured Research, a research and advisory firm concentrating on the property-casualty industry. Prior to joining Assured Research, he was a Wall Street analyst and executive for many years. He was the head of the property-casualty insurance research team at Macquarie Securities which he joined in 2009 with the acquisition of Fox-Pitt, Kelton. At FPK he held a variety of managerial positions including Director of US Research, Head of US Equities, and international research coordinator.

Prior to joining FPK in 2000, he was an insurance industry analyst at various investment banking firms including Morgan Stanley, Smith Barney, and Prudential Securities, and for many years was named to Institutional Investor Magazine's "All American Research Team" as a top analyst for both the property-casualty and life insurance industries.

Overview

Natural catastrophes are a significant part of the property-casualty industry, as they are both the industry's reason for being and a critical determinant of profitability, particularly in property lines. Therefore, insurers must continually update their perspectives on how catastrophic events have trended over time.

In this report we review the [National Centers for Environmental Information \(NCEI\) database](#) of economic losses over \$1.0 billion from 1980-2023. The information is compiled by type of event, by year, and by state. The data measures economic losses, (not insured losses) and are adjusted for inflation.

The NCEI is the governmental agency responsible for maintaining historical oceanic, atmospheric, and geophysical information. Among its many databases is a compilation of all billion-dollar weather and climate disasters since 1980.

Summary

The NCEI classifies events into seven categories, droughts, floods, freezes, severe storms (chiefly tornadoes and hail), tropical cyclones (chiefly hurricanes), wildfires, and winter storms.

*In the 44 years for which the agency has data there have been 376 billion-dollar events that have resulted in \$2.661 trillion (CPI-adjusted) of economic losses. As **Slide 6** shows, hurricanes have caused the most losses while severe storms have recorded the most events.*

*In 2023 there were 28 events, which was the most in any year (previous high was 22 in 2020), but the losses of \$92.9 billion were down from \$178.7 billion in 2022 which included \$116 billion from Hurricane Ian. (See **Slide 7**).*

Outline

***Slide 8--** shows how the annual number of loss events has increased dramatically in recent years largely because of severe storms.*

***Slide 9—**shows losses have grown at 6% annually with considerable variability because of hurricane losses.*

***Slides 10 and 11—**show losses for top 10 states ranked on total and per capita bases.*

***Slides 12-14—**include comments on hurricanes.*

***Slides 15-17—**include comments on severe storms.*

***Slide 18—**includes comments on wildfires.*

NCEI losses:1980-2023

NCEI \$1.0 billion economic losses:1980-2023

Hurricanes accounted for 52% of the losses, while accounting for 16% of events. Severe storms account for the most events albeit with smaller average losses.

	Cumulative losses		Number of events		Largest Loss	Average Loss
	(\$ Bil.)	%	#	%		
Hurricanes	\$1,379	52%	62	16%	\$195	\$22
Severe storms	\$455	17%	186	49%	\$14	\$2
Drought	\$353	13%	31	8%	\$53	\$11
Flooding	\$197	7%	44	12%	\$45	\$4
Wildfires	\$142	5%	22	6%	\$29	\$6
Winter storms	\$98	4%	22	6%	\$27	\$4
Freezes	\$36	1%	9	2%	\$8	\$4
Total	\$2,661	100%	376	100%		

Source: National Centers for Environmental Information (NCEI), GAZ Research

NCEI losses: 2023 vs. 2022

While 2023 events were up year-over-year, losses were down as 2022 included a \$116 billion loss from Hurricane Ian.

Nineteen was the highest number of severe storms in any year. The previous high was 13 in 2020.

NCEI \$1.0 billion economic losses: 2023 vs. 2022

	2023		2022	
	Events	Costs	Events	Costs
Hurricanes	2	\$7.8	3	\$120.0
Severe Storm	19	\$54.0	11	\$22.4
Drought	1	\$14.5	1	\$22.9
Flooding	4	\$9.2	1	\$1.5
Wildfire	1	\$5.6	1	\$3.2
Winter Storm	1	\$1.8	1	\$8.7
Freeze	0	\$0.0	0	\$0.0
All Events	28	\$92.9	18	\$178.7
Costs in \$ Billion.				

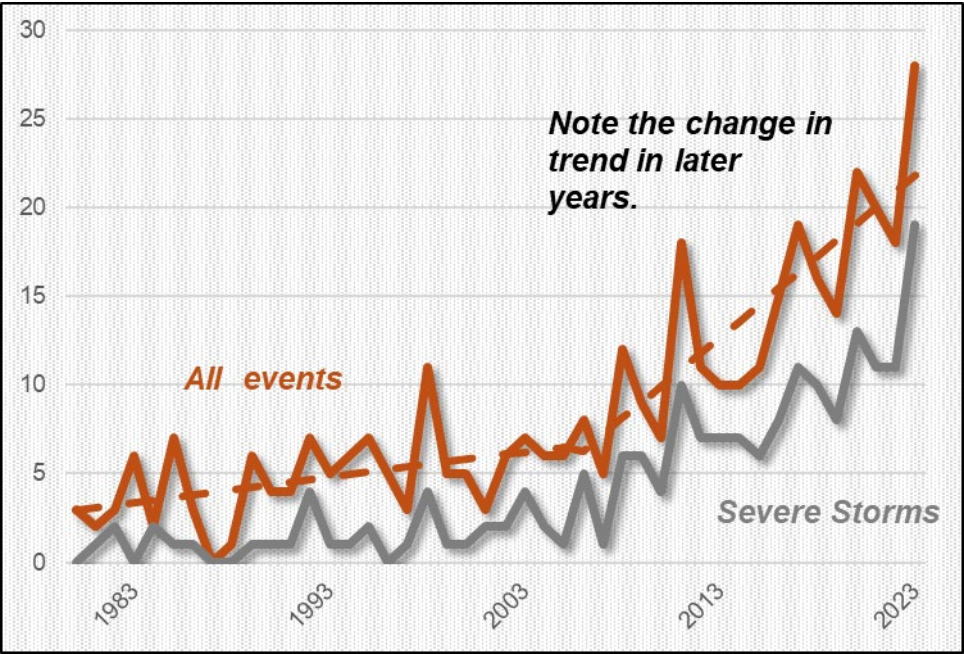
The largest single loss last year was the drought and heatwave that affected the South and Midwest throughout the Spring and Fall.

Maui fire

Source: NCEI, GAZ Research

Billion-dollar events have ramped up

Annual loss events: 1980-2023



The number of events that cause billion-dollar losses have increased dramatically in recent years largely because of severe storm events which increased from an annual average of 1.3 to 8.4.

Years	Annual Loss Events			Storms as % Total
	All Events	Severe Storms	Other Events	
1980-2005	123	35	88	28%
2006-2023	<u>253</u>	<u>151</u>	<u>102</u>	60%
Total	376	186	190	49%
Annual average				
1980-2005	4.7	1.3	3.4	
2006-2023	<u>14.1</u>	<u>8.4</u>	<u>5.7</u>	
2006-2023	8.5	4.2	4.3	

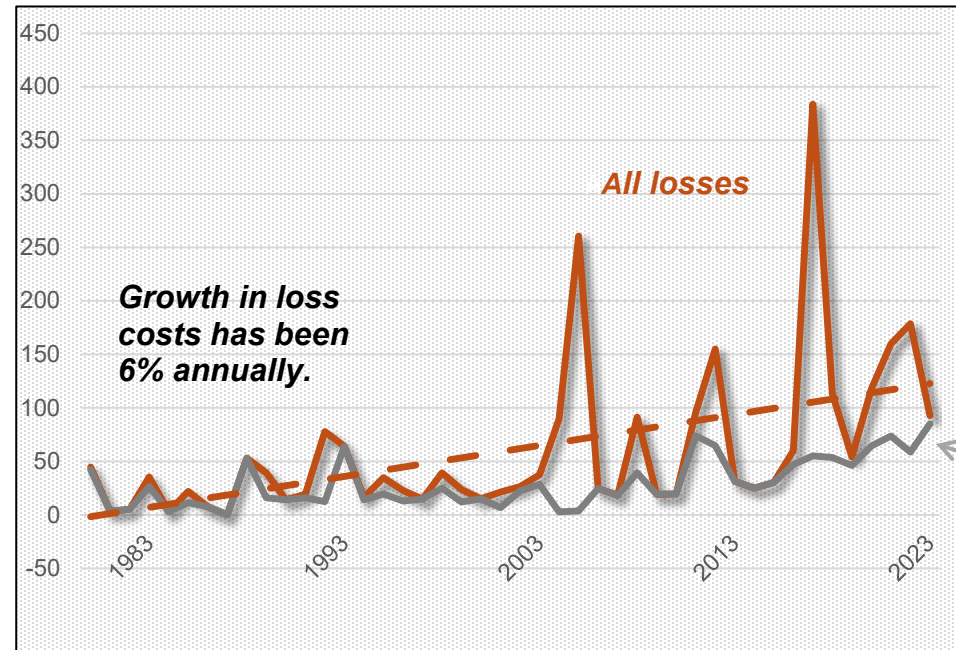
Source: NCEI, GAZ Research

Loss costs have been growing

Annual loss costs have grown at 6% annually, but with considerable variability driven by hurricane losses.

Losses have been a drag on GDP increasing from 32 basis points in 1980-2005 to 48 bp from 2006 to 2023.

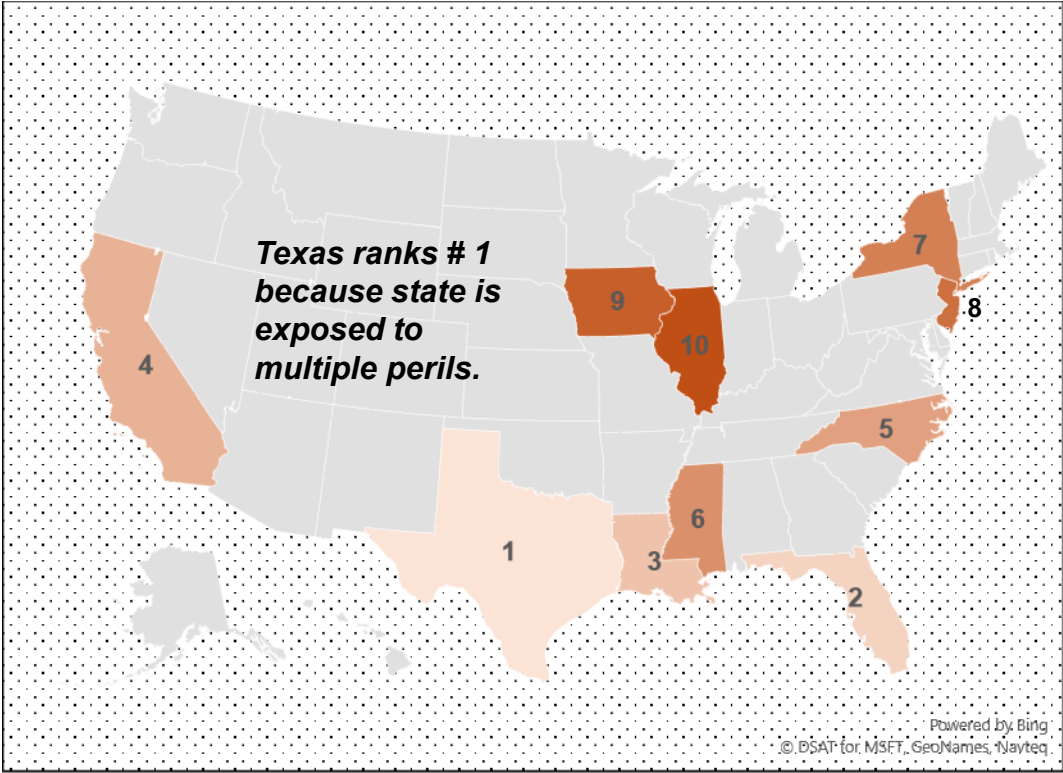
Annual loss costs: 1980-2023 (\$ Billion)



Source: NCEI, Bureau of Economic Analysis, GAZ Research

Top 10 states ranked by losses

Top 10 states ranked by losses



Source: NCEI, GAZ Research

Top 10 states: Losses and major exposures

Rank	State	Losses (\$ Billion)	Major Exposure(s)	% from Exposures
1	Texas	\$402	Hurricanes Severe storms	58% 20%
2	Florida	\$389	Hurricanes	93%
3	Louisiana	\$304	Hurricanes	86%
4	California	\$151	Wildfires	65%
5	North Carolina	\$88	Hurricanes	76%
6	Mississippi	\$84	Hurricanes	72%
7	New York	\$81	Hurricanes	82%
8	New Jersey	\$63	Hurricanes	83%
9	Iowa	\$62	Drought Flood Severe storms	26% 39% 35%
10	Illinois	\$55	Severe storms	44%

Hurricanes are main source of losses in top states.

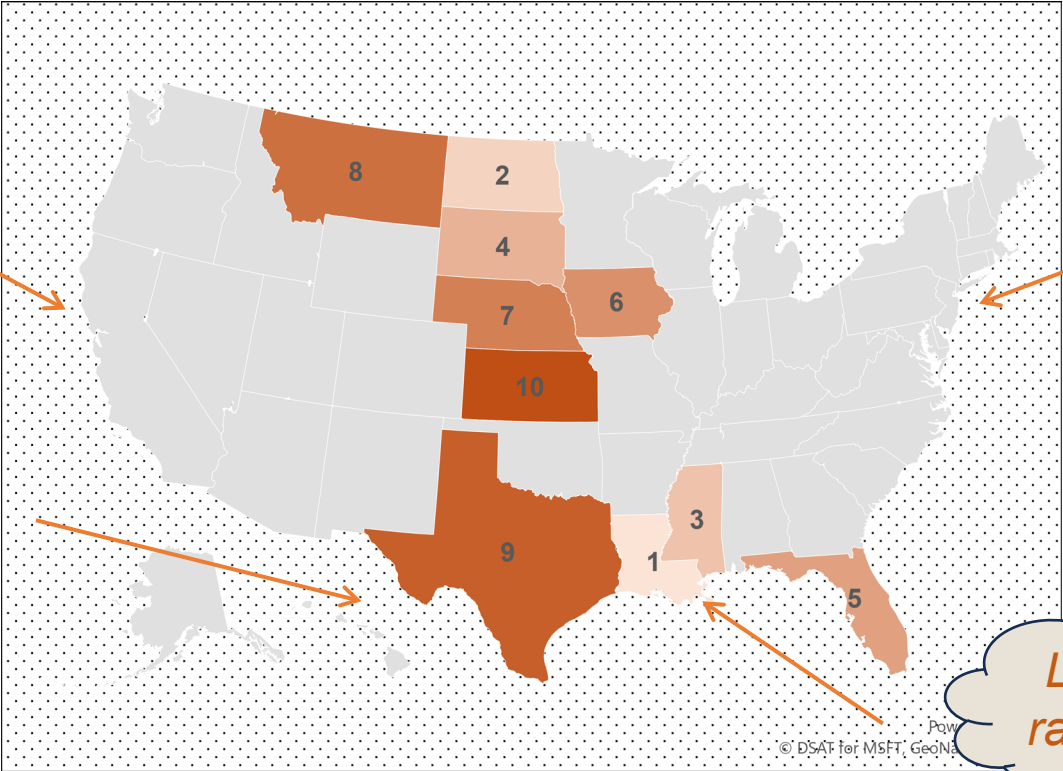
Loss costs per capita

If you look at losses on a per capita basis you get a different picture with Plains states ranked higher.

CA drops out of top ten.

TX falls to # 9; FL # 5

Top ten loss states: per capita



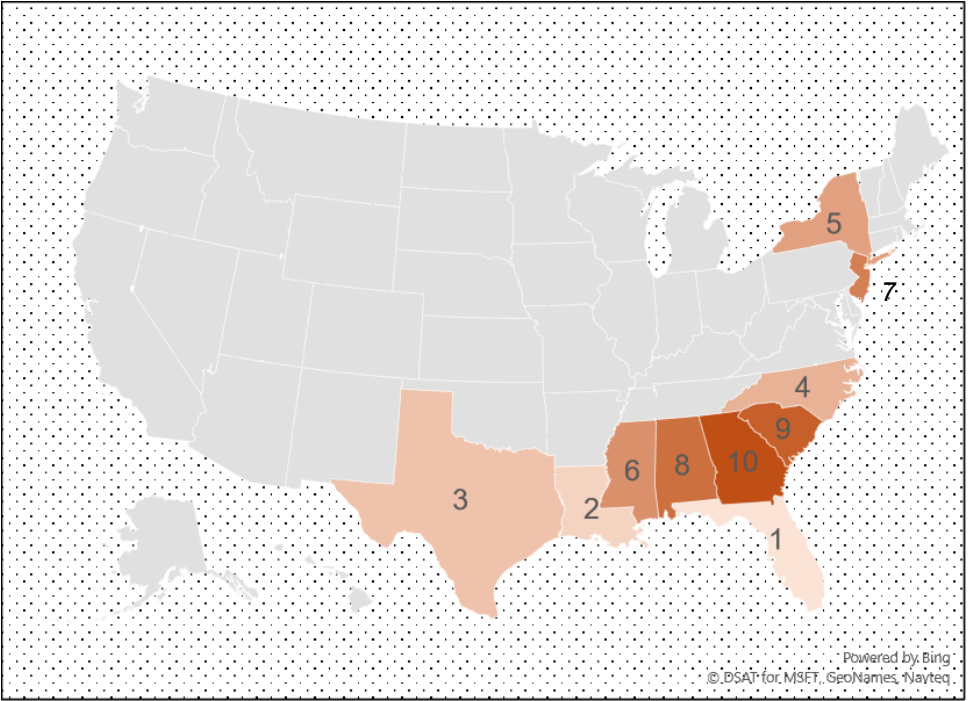
NY NJ no longer ranked.

Louisiana ranked # 1

Source: NCEI, Census Bureau, GAZ Research

Top 10 hurricane loss states

Top 10 hurricane loss states



Rank	State	Losses (\$ Billion)	Hurricanes as % of Losses
1	Florida	\$362	93%
2	Louisiana	\$262	86%
3	Texas	\$234	58%
4	North Carolina	\$67	76%
5	New York	\$67	82%
6	Mississippi	\$60	72%
7	New Jersey	\$52	83%
8	Alabama	\$26	52%
9	South Carolina	\$24	64%
10	Georgia	\$19	43%

No surprise that hurricane losses are concentrated in the Southeast.

New York and New Jersey included because they have major coastal exposures; think Irene and Sandy.

Top 10 states account for 85% of all hurricane losses.

Source: NCEI, GAZ Research

NCEI hurricane losses by categories 1-5

As would be expected most of the losses come from Category 4 and 5 storms.

Category	Loss Events	Hurricane Land Strikes		Losses		Average Loss
		Number	% Which Cause Loss	\$ Billion	% Total	
Cat 1	8	34	24%	\$20	1%	\$3
Cat 2	2	8	25%	\$10	1%	\$5
Cat 3	10	13	77%	\$154	11%	\$15
Cat 4	17	19	89%	\$436	32%	\$26
Cat 5	14	16	88%	\$713	52%	\$51
Subtotal	51	90	57%	\$1,334	97%	\$26
Tropical storms	9			\$34	2%	\$4
Pacific hurricanes	2			\$11	1%	\$6
Total	62			\$1,379	100%	\$22

Source: NCEI, NOAA, GAZ Research

If a Category 4 or 5 storm makes landfall, it will almost always result in a billion-dollar loss.

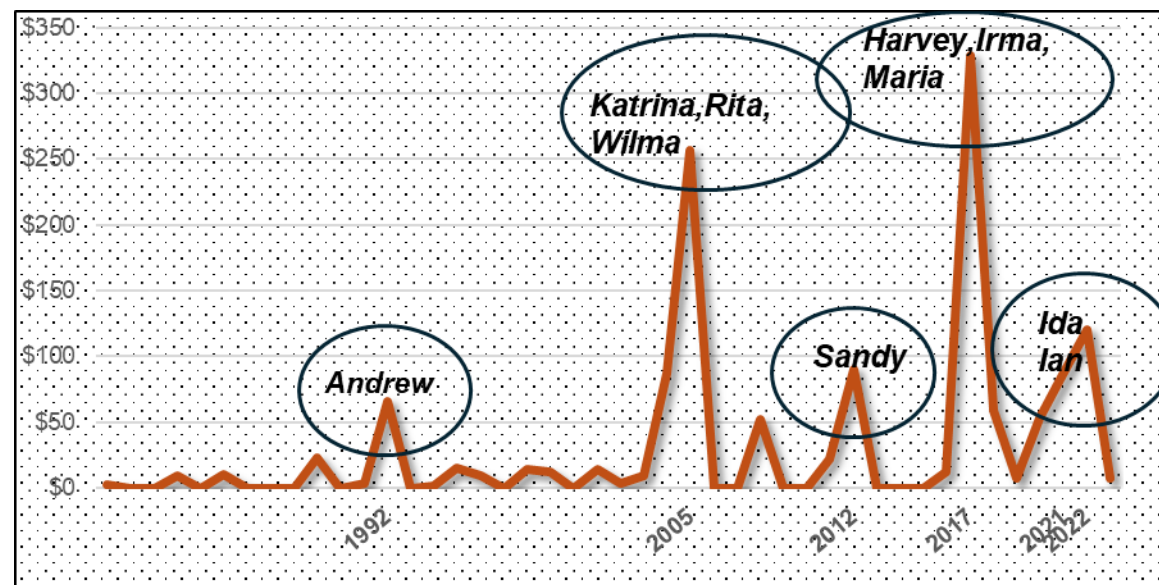
68% of losses from Gulf hurricanes; 32% Atlantic.

Hurricane losses vary dramatically by year

The losses in any year depend on whether the “big one” hits.

Chart shows how losses spike with major hurricanes.

Annual hurricane losses: 1980-2023 (\$ Billion)

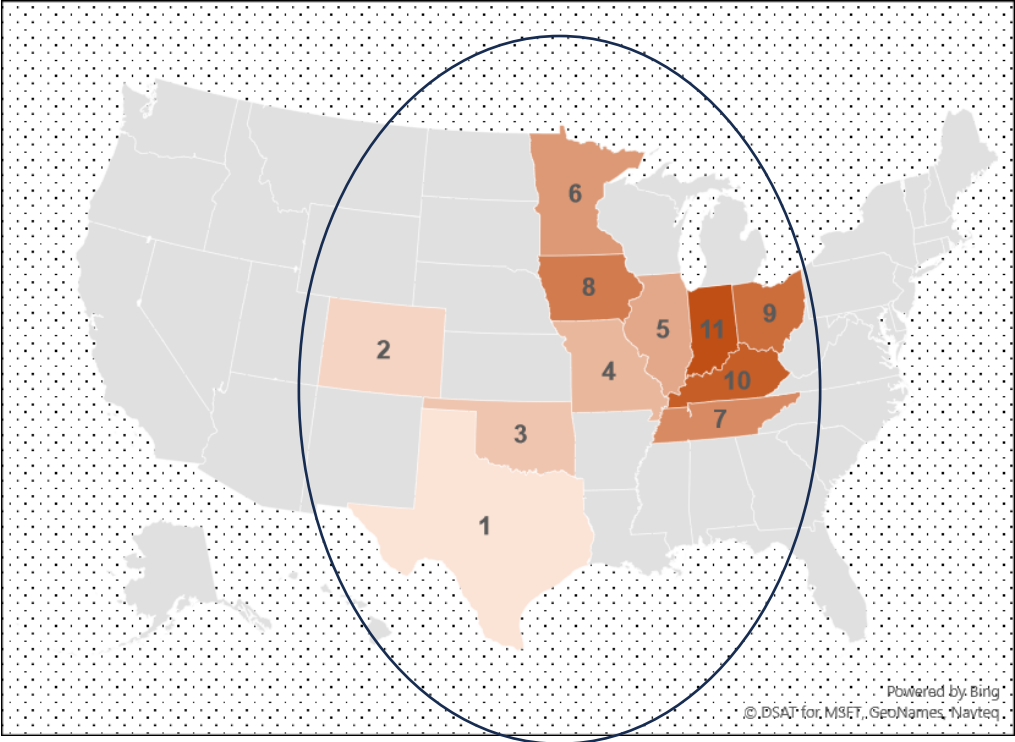


Source: NCEI, NOAA, GAZ Research

Top 10 severe storms loss states

Top 10 severe storm loss states

Severe storm losses are largely centered in the middle of the country.



Rank	State	Losses (\$ Billion)	Storms as % of Losses
1	Texas	\$82	20%
2	Colorado	\$30	65%
3	Oklahoma	\$25	60%
4	Missouri	\$25	45%
5	Illinois	\$24	44%
6	Minnesota	\$23	59%
7	Tennessee	\$22	57%
8	Iowa	\$21	35%
9	Ohio	\$17	57%
10	Kentucky	\$15	57%

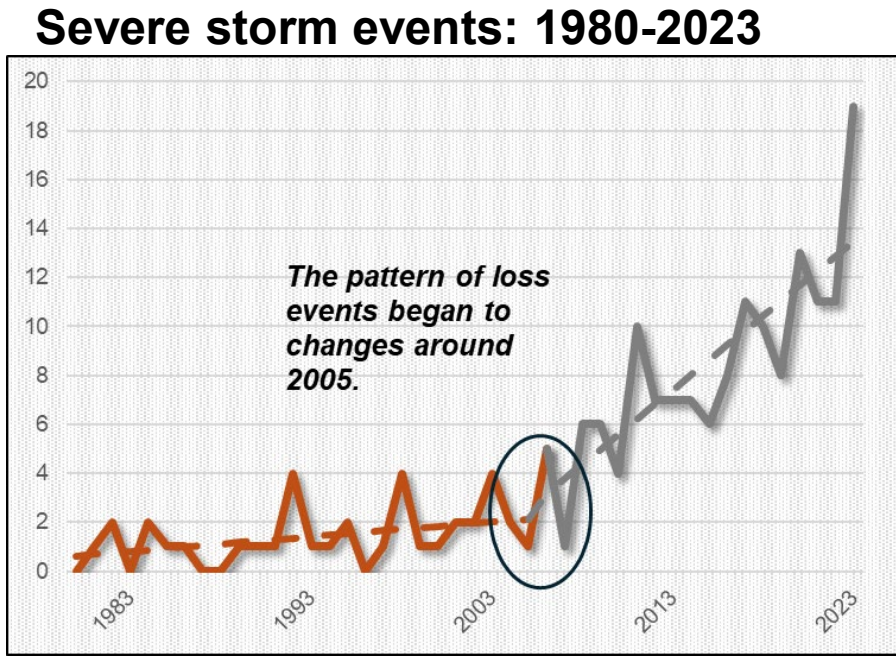
Top 10 states account for 63% of severe storm losses.

Source: NCEI, GAZ Research

Severe storm characteristics

While the number of events has risen sharply the average cost per event has remained about the same

Insurers know that secondary perils have become a problem for the industry. This chart shows why! The number of events have been rising for almost 20 years.



Years	Events	Annual Average	Losses (\$ Billion)	Annual Average
1980-2005	36	1.3	\$82.8	\$2.30
2006-2023	150	8.4	\$372.3	\$2.48
Total	186	4.2	\$455.1	\$2.45

Range	Events	Losses	% Total	
			Events	Losses
Under \$2 billion	111	\$168	60%	37%
\$2-\$5 billion	64	\$196	34%	43%
\$5-\$10 billion	7	\$40	4%	9%
Over \$10 billion	4	\$51	2%	11%
Total	186	\$455	100%	100%

Storm losses tend to be small as 60% of events have losses under \$2.0 billion.

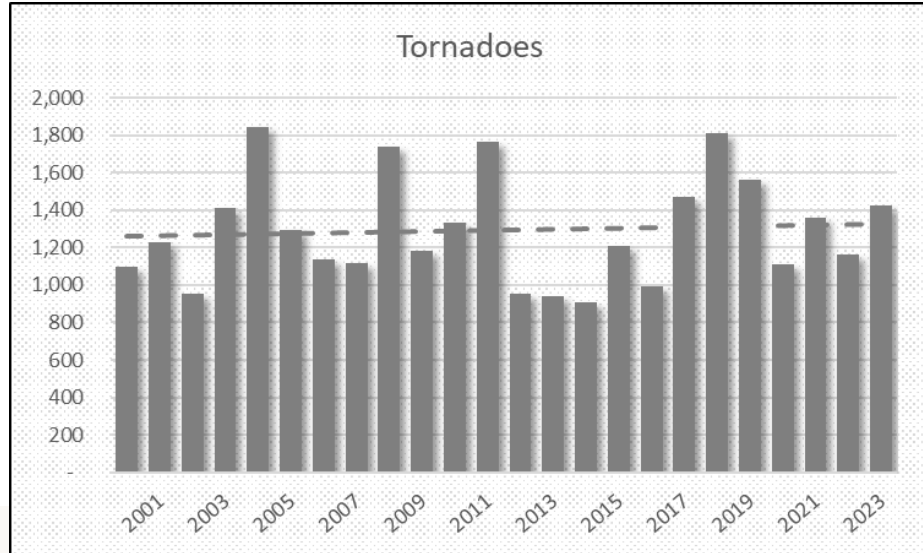
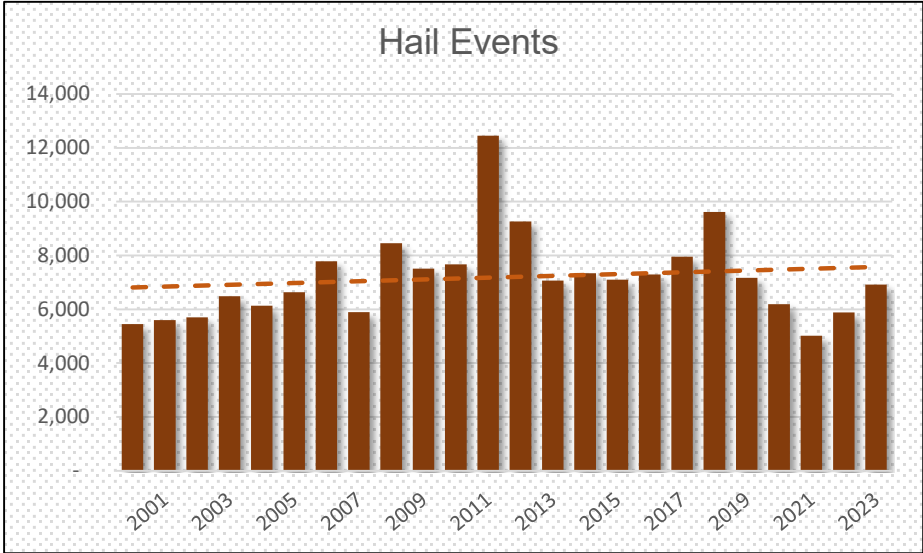
Year	Losses (\$ Billion)	Event
1995	\$11.1	Plains severe weather
2011	\$12.4	Joplin Missouri
2011	\$14.0	Tuskaloosa Alabama
2020	\$13.1	Midwest derecho (Iowa)

Source: NCEI, GAZ Research

While the number of \$1.0 billion loss events has been going up--

The underlying events for severe storms are not rising, as shown in the charts.

MORE PEOPLE ARE MOVING INTO HARMS WAY!



Source: NOAA Storm Prediction Center, GAZ Research

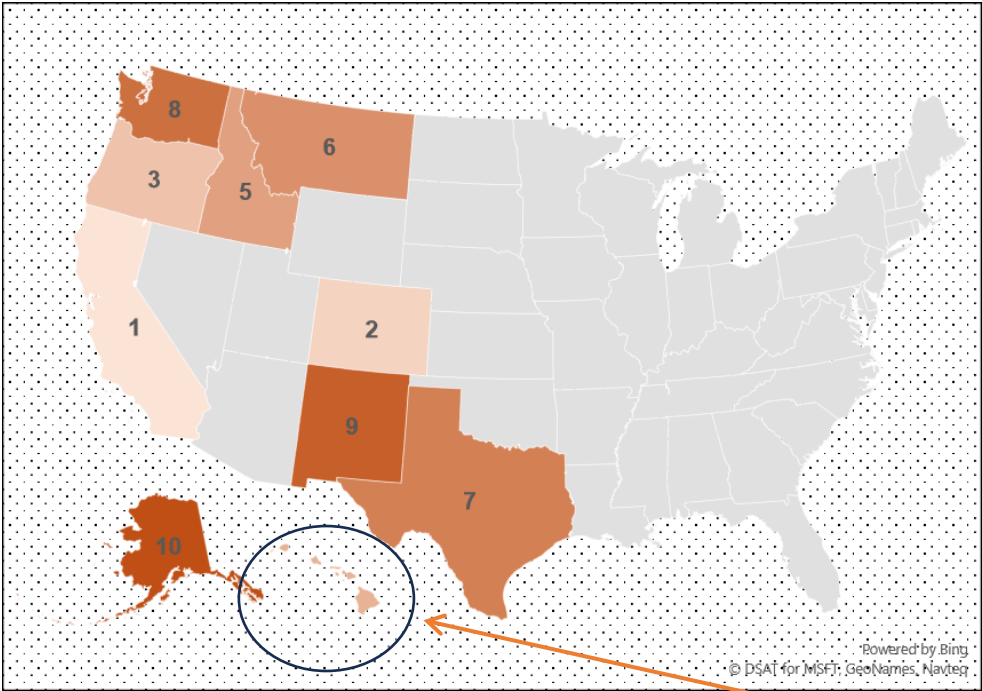
Top 10 wildfire loss states

California accounts for 68% of NCEI wildfire losses, although on a per capita basis it would rank 4th.

Montana ranks 1st per capita in the continental U.S.

Source: NCEI, GAZ Research

Top 10 wildfire loss states



Hawaii ranks 4th in the top 10 because of last years Maui fire.



THANK YOU

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