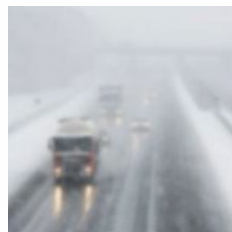
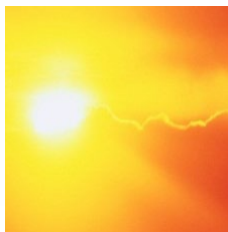




The Use of Federal Data for Costing Weather and Climate Extreme Events: Data Challenges, Needs and Opportunities

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April 23, 2021

Federal Data for Costing Weather and Climate Extreme Events: Data Challenges, Needs, Opportunities

Federal Data for Costing Weather and Climate Extreme Events

Outline:

- **Context for Measuring Disaster Impact**
- Data Sources / What we are Measuring
- Federal Data Challenges and Needs
- Opportunities / Recommendations



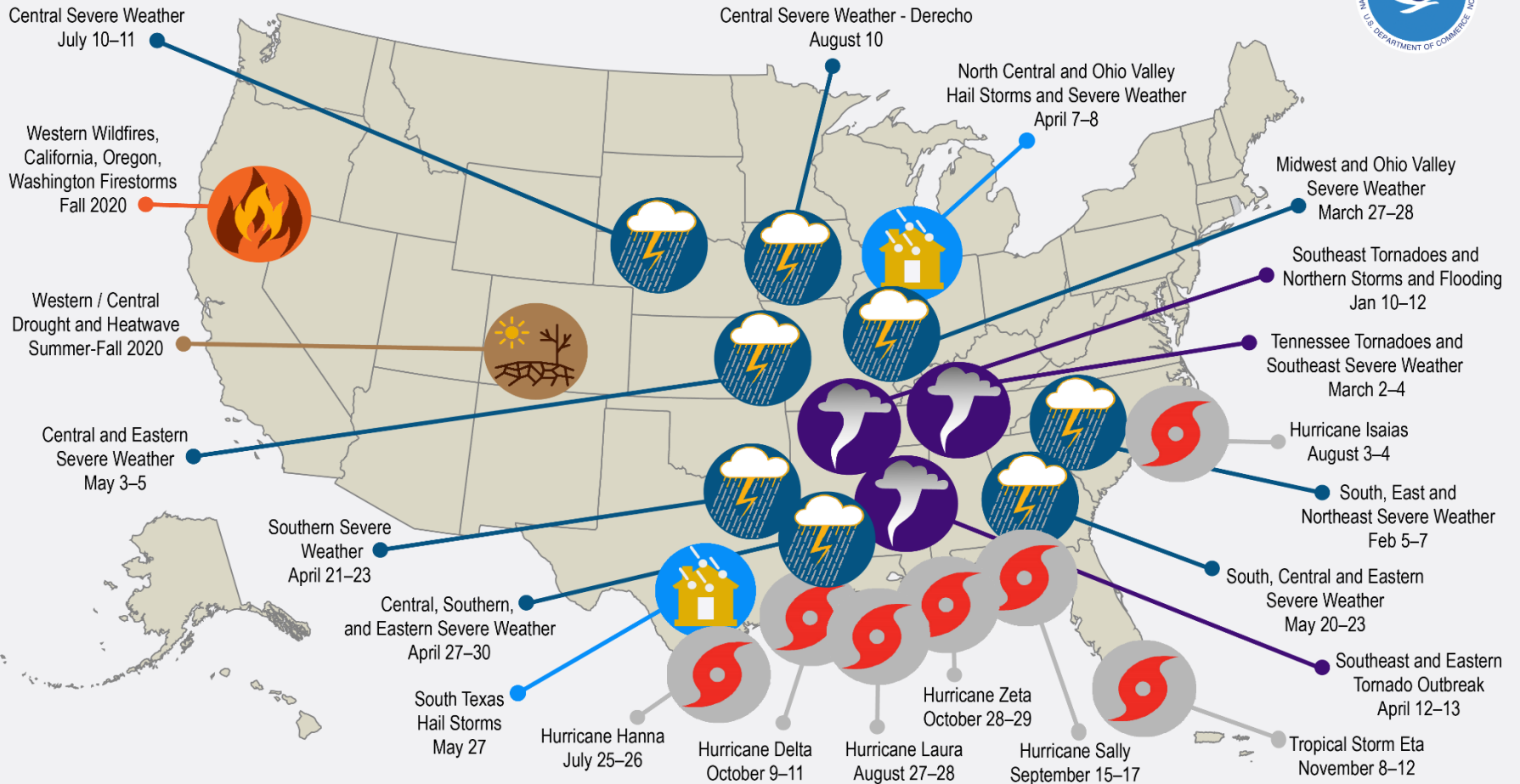
NOAA's National Centers for Environmental Information (NCEI) – Center for Weather and Climate

- Statutory mission to describe the climate of the United States and act as the **"Nation's Scorekeeper"** regarding the trends and anomalies of weather and climate.



- As part of this responsibility we also analyze extreme weather and climate events in the U.S. that have **great economic and societal impacts** known as **“U.S. Billion-dollar Weather & Climate Disasters”**
- **Such extreme events contribute the majority (>80%) of the damage from all recorded U.S. weather and climate events (NCEI; Munich Re).**
 - 1980-2000 ... (~75% of full distribution)
 - 1980-2010 ... (~80% of full distribution)
 - 1980-2020 ... (~85% of full distribution) → **\$1.875 trillion** of \$2.215 trillion in US costs

U.S. 2020 Billion-Dollar Weather and Climate Disasters



This map denotes the approximate location for each of the 22 separate billion-dollar weather and climate disasters that impacted the United States during 2020.

- During **2020**, the U.S. experienced **22 separate billion-dollar disaster events** with impacts from hurricanes, wildfires, drought and numerous events with tornadoes, hail and high wind damage. Total cost for events: **\$95.0 billion**
- **Record-breaking hurricane & wildfire seasons.** Central derecho event also of historic intensity and damage



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Different Ways to Measure Disaster Impact

Disasters



Tornadoes



Wildfires



Floods



Droughts



Heat waves



Snowstorms/
Blizzards



Geophysical



Hurricanes &
Tropical Storms

Impacts

Human Health
and Wellbeing

Business

Public
Infrastructure

Private Property

Environmental Capital
(incl. ecosystem services)

Measures

Loss of
Life

Mental
Health

Physical
Health

Quality of
Life

GDP

Net
Economic

Market

Non-
market

What's the right
- Time scale?
- Space scale?
- Size scale?

To capture losses requires a broad array of **public** and **private** data

	Hurricanes / Tropical Storms	Severe Local Storms	Winter Storms	Crop Freeze	Wildfire	Drought / Heat Wave	Inland / Riverine Flooding
Insurance Service Office - Property Claim Services	X	X	X		X		X
FEMA – Presidential Disaster Declarations	X	X	X	X	X		X
FEMA – National Flood Insurance Program	X						X
USDA – Risk Management Agency	X	X	X	X	X	X	X
National Interagency Fire Center					X		
Energy Information Administration	X	X	X		X	X	
US Army Corps of Engineers							X
State Agencies	X	X	X	X	X	X	X

Account for total, direct losses (i.e., **insured** and **uninsured**) for assets including:

- **physical damage** to residential, commercial, and government buildings
- **material assets** (content) within a building
- **time element losses** (i.e., time costs for businesses; hotel costs for loss of living quarters)
- **vehicles, boats, offshore energy platforms**
- **public infrastructure** (i.e., roads, bridges, buildings)
- **agricultural assets** (i.e., crops, livestock, timber)

We do not account for: natural capital losses; **healthcare-related costs**; all downstream (**indirect**) costs



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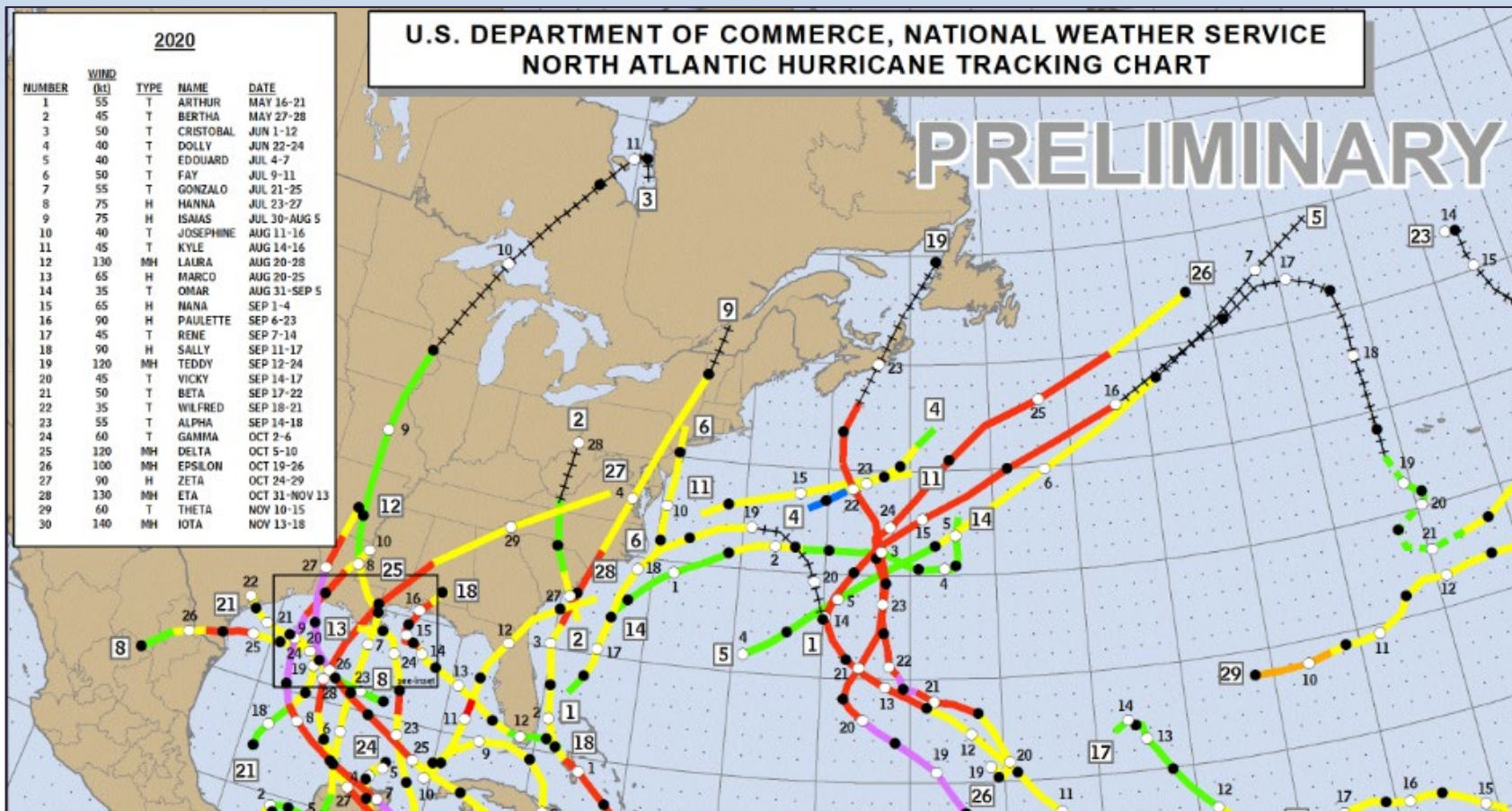
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Federal Data Challenges and Needs:

1. The lack of homogeneous health care cost data (mental or physical) to quantify losses in relation to disaster events. The CDC, the Society of Actuaries and the National Association of Insurance Commissioners (NAIC) are potential partners to develop healthcare data cost standards that are consistent to address these state-level data recording issues.
2. Estimating the indirect costs and economic spillover efforts associated with these disasters. For example – the 2020 Western wildfires. There are large indirect costs as wildfire smoke created months-long unhealthy air quality. The downstream economic impact of wildfires on both natural capital and dependent economic sectors are not captured in our analysis or elsewhere systematically.
3. An economic focus on the compounding effects of high frequency extremes. For example, record-number of hurricanes impacting Louisiana in 2020, makes disaster recovery both longer and more costly (i.e., increased vulnerability; demand surge & cost inflation).

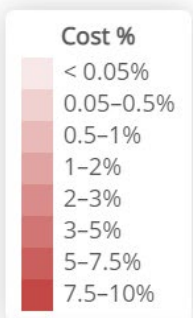
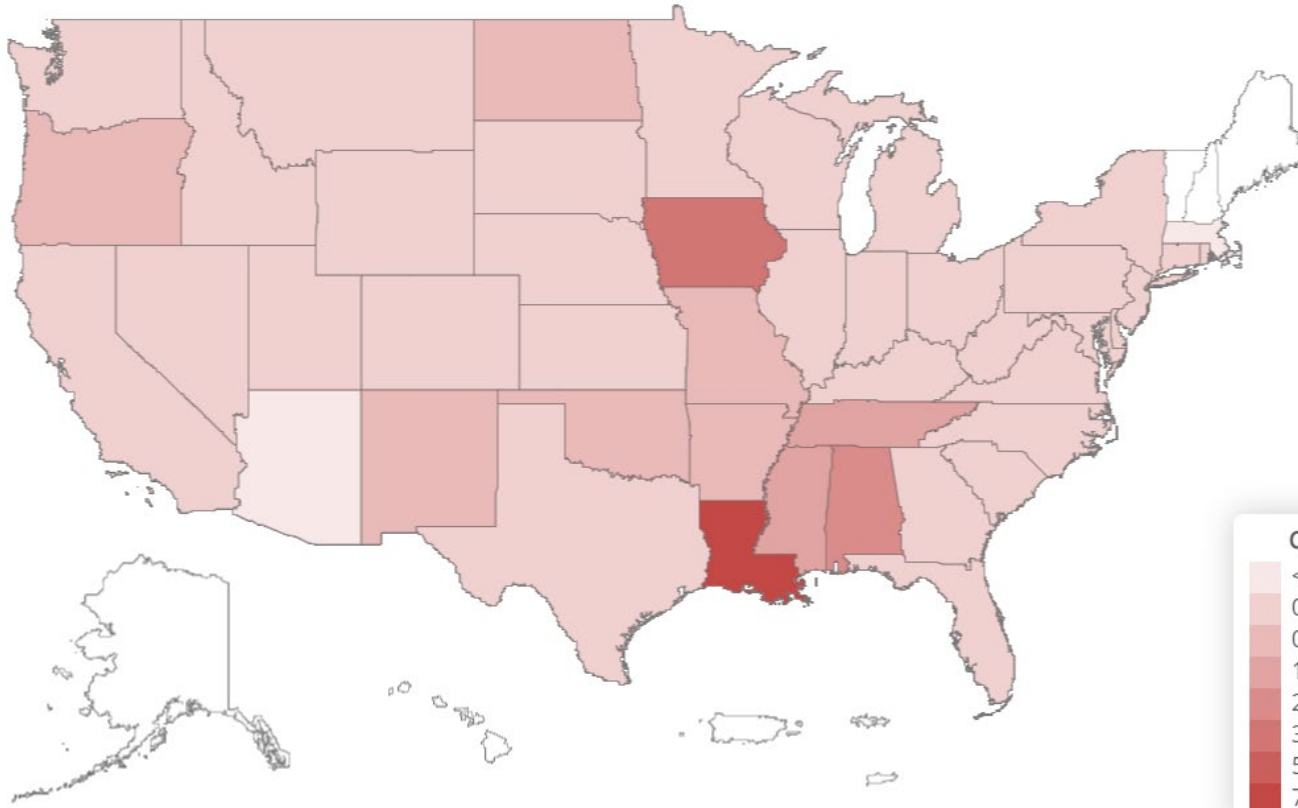
Increase awareness & economic understanding about the potential for multiple, cascading hazards



As noted in the [Climate Science Special Report](#) of the *Fourth National Climate Assessment*, "The physical and socioeconomic impacts of compound extreme events (such as simultaneous heat and drought, wildfires associated with hot and dry conditions, or flooding associated with high precipitation on top of snow or waterlogged ground) can be greater than the sum of the parts."

The **2020 disaster costs** for each state as a % of that state's **2020 GDP** (economic output)... clear impact from billion-dollar disaster events.

2020 Billion-Dollar Weather and Climate Disaster Cost as % of State GDP (CPI-Adjusted)



United States

■ Drought: < 0.05%	■ Flooding: 0%	■ Freeze: 0%	■ Severe Storm: 0.05–0.5%
■ Tropical Cyclone: 0.05–0.5%	■ Wildfire: 0.05–0.5%	■ Winter Storm: 0%	■ All Disasters: 0.05–0.5%

→ Reflects the **severity & vulnerability** of weather & climate events vs. scale of economy



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Data Coordination Opportunities:

1. The COVID-19 pandemic has led to hospitals to provide enhanced reporting on bed capacity, available staff, and illness burden to the Department of Health and Human Services. This moment of enhanced public health reporting **presents an opportunity to design and implement a nationwide system of the mental and physical health costs from disasters in different parts of the country.** A mandate or a regulation could help capitalize on this opportunity.
2. **Create & maintain a national database for U.S. disaster losses focusing on both direct and indirect U.S. disaster loss data.** Create a national focal point for disaster loss reporting at a relevant Federal agency. This focal point would leverage dedicated staff to effectively collect and standardize county, state, and national-level disaster loss data on an annual basis across all hazards.

Recommendations:

1. CDC, NAIC and other relevant bodies conduct a feasibility study on **implementing a set of standards across all states to capture the mental and physical health costs from U.S. geophysical disasters.**
2. Focus **interagency research on cascading, complex geophysical hazards.** Wildfire, hurricanes, drought and flooding events over last several years provide promising framing of the problem. Additional focus on how consecutive disaster events over an area increase social vulnerability & economic fragility.
3. During 2021, **NOAA is integrating** its [U.S. Billion-dollar disasters](#) analysis with county-level exposure and vulnerability data from the [FEMA National Risk Index](#) and the [CDC Societal Vulnerability Index](#). Additional **interagency focus needed to highlight present and future hazard risk** in relation to **exposure, vulnerability and damage potential**, as integrated information available to decision makers.

Interactive data, charts, mapping and disaster summaries: www.ncdc.noaa.gov/billions

Annual report: 2020 U.S. billion-dollar weather and climate disasters in historical context
www.climate.gov/disasters2020



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For more detail on data, methodology and uncertainty, see:

- Smith A.B. and J.M. Matthews, 2015: Quantifying Uncertainty and Variable Sensitivity within the U.S. Billion-dollar Weather and Climate Disaster Cost Estimates. *Natural Hazards*, 77, 1829-1851 (<https://www.ncdc.noaa.gov/billions/docs/smith-and-matthews-2015.pdf>)

- Smith, A.B. and R.W. Katz, 2013: U.S. Billion-dollar weather and climate disasters: Data sources, trends, accuracy and biases. *Natural Hazards*, 67, 387-410 (<https://www.ncdc.noaa.gov/billions/docs/smith-and-katz-2013.pdf>)