

Drought, Hurricane and Wildfire Impact on State and Local Credit

August 19, 2021



Schedule & Materials

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Live Q&A

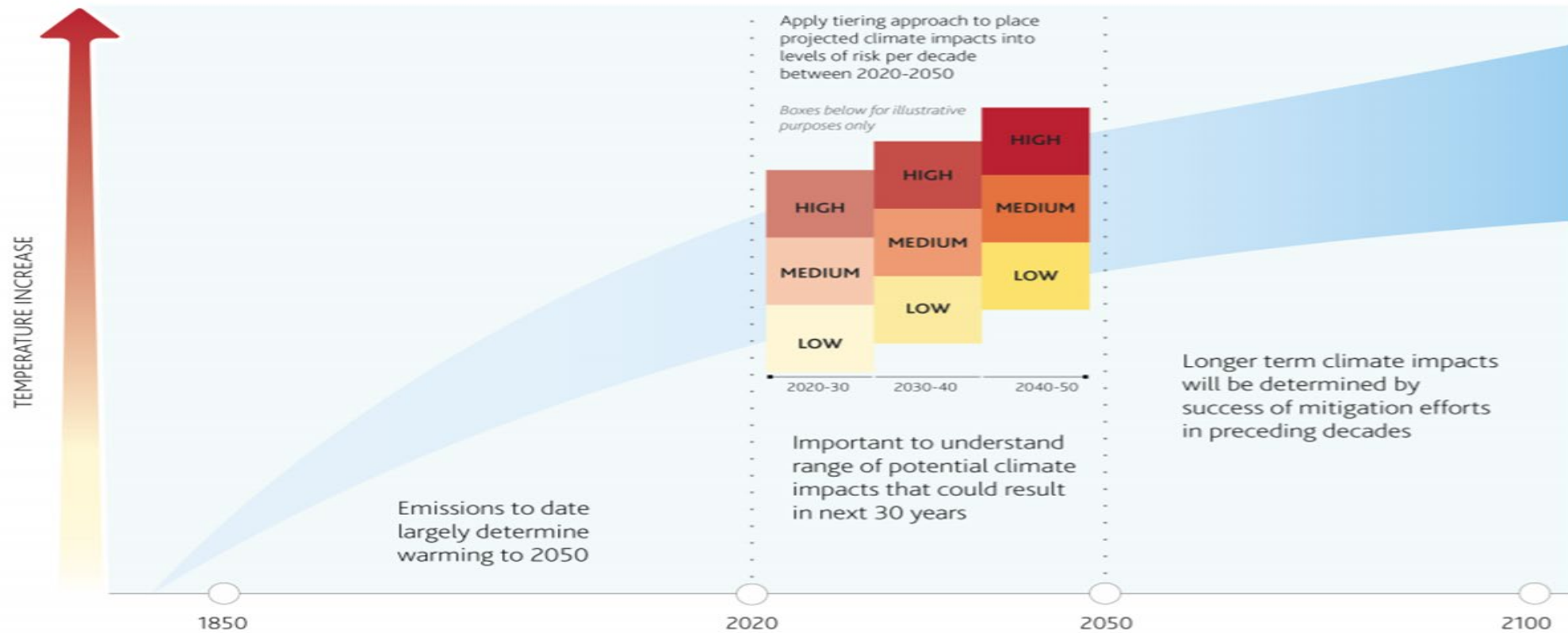
Engage with the analysts and get your questions answered

Physical climate effects projected to increase as temperatures rise through 2050

Climate impacts are “locked-in” over the next 30 years and then start to differ based on mitigation pathways post midcentury

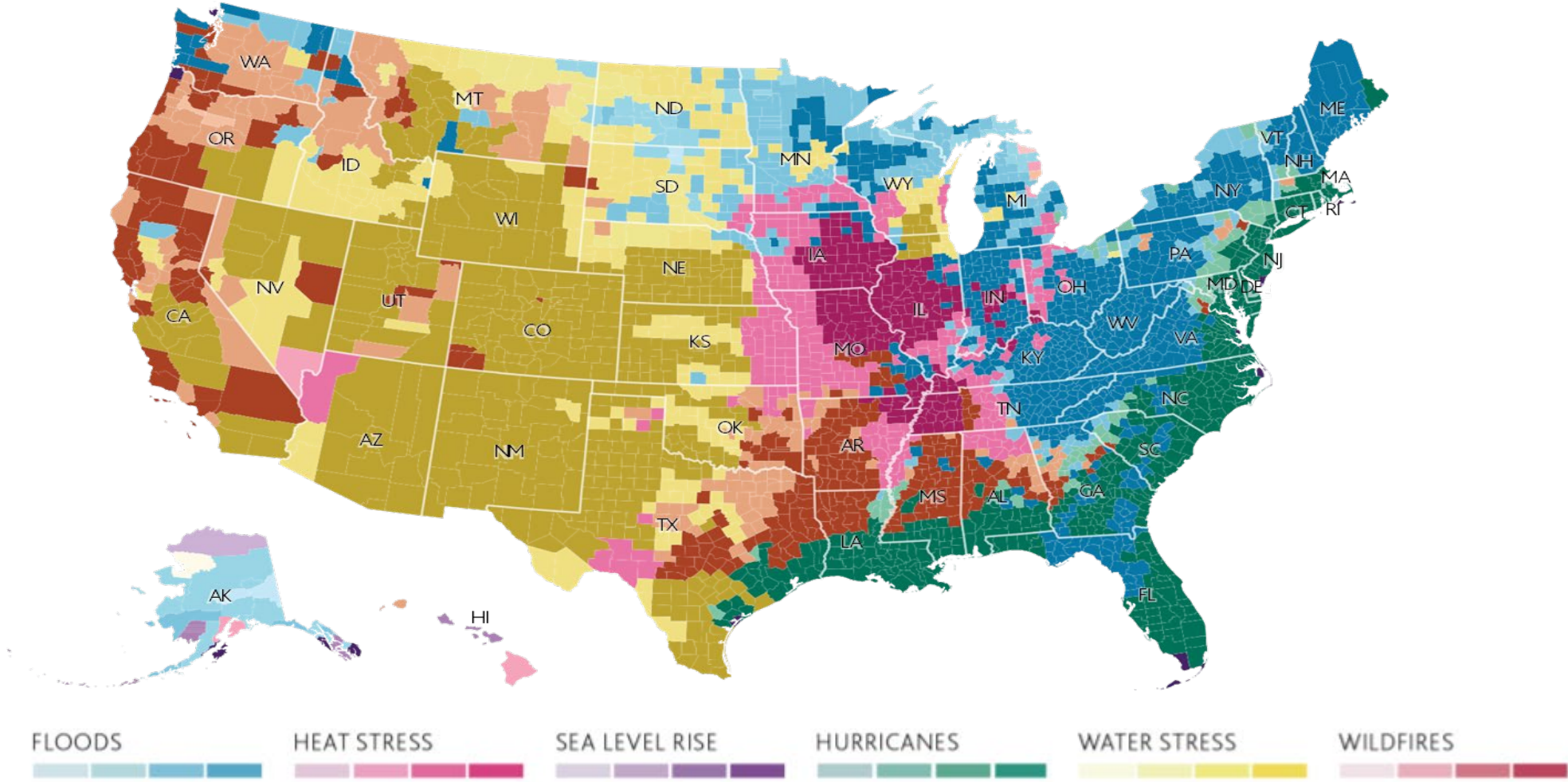
Physical climate impacts over different time frames

Climate impacts are 'locked in' over the next 30 years and then start to differ based on mitigation pathways post midcentury



Source: Moody's Investors Service and Four Twenty Seven

Leading Climate Risks Vary by Region

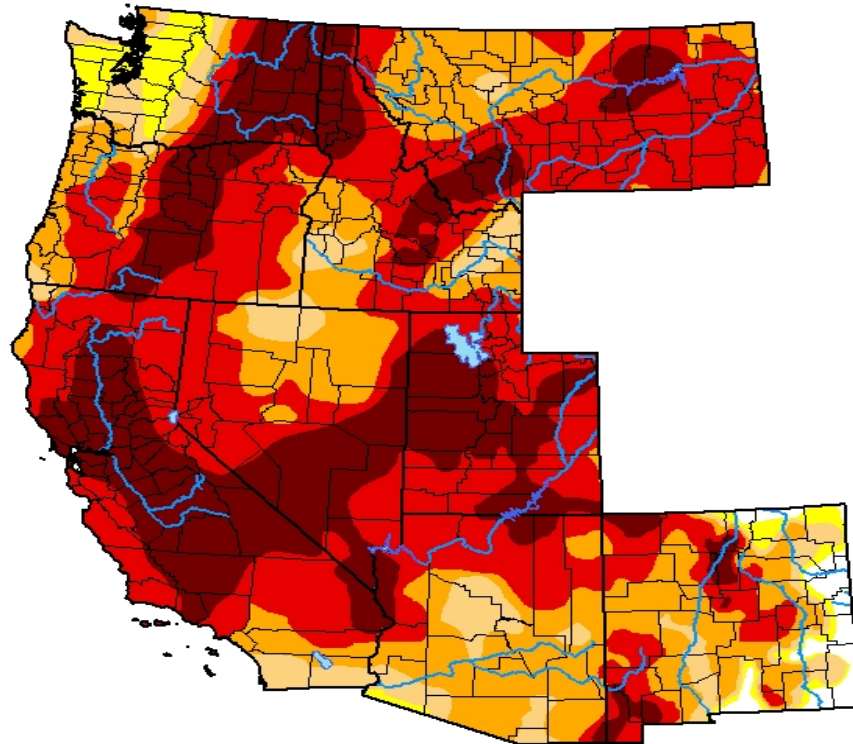


Source: Moody's Investors Service and Four Twenty Seven


Most of the western US is experiencing drought

U.S. Drought Monitor West

August 3, 2021
(Released Thursday, Aug. 5, 2021)
Valid 8 a.m. EDT



Intensity:

-  None
-  D0 Abnormally Dry
-  D1 Moderate Drought
-  D2 Severe Drought
-  D3 Extreme Drought
-  D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>

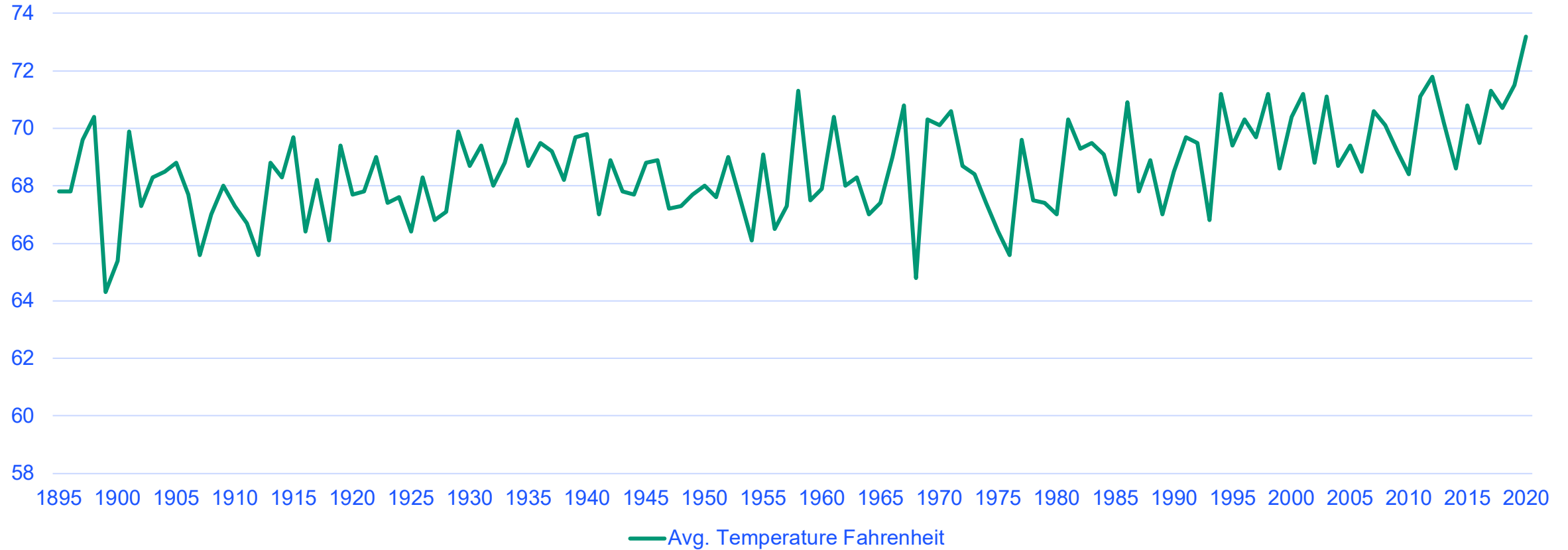
Author:

Richard Tinker
CPC/NOAA/NWS/NCEP



droughtmonitor.unl.edu

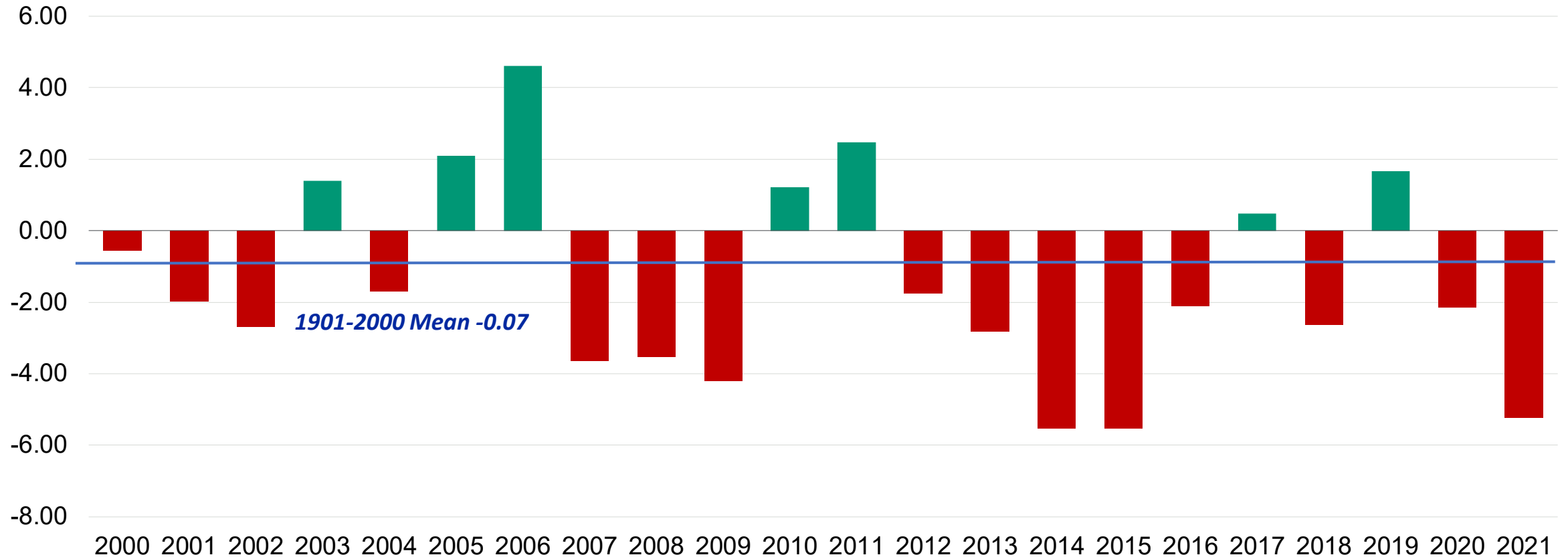
Rockies and westward show rising temperatures



Source: National Centers for Environmental Information, part of the National Oceanic and Atmospheric Administration

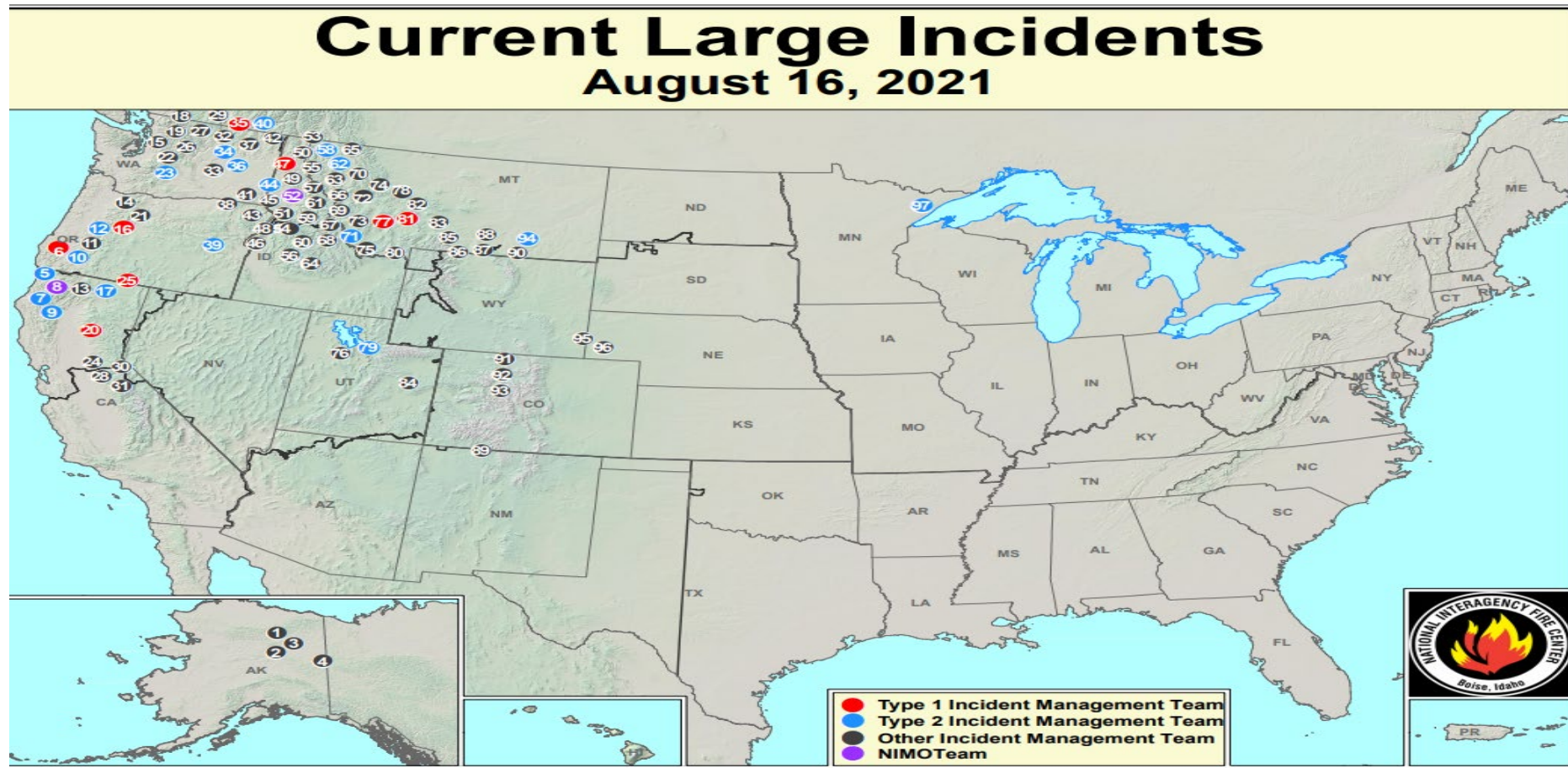
CA drought severity index shows trend of dry years

Figures reflect Palmer Drought Severity Index



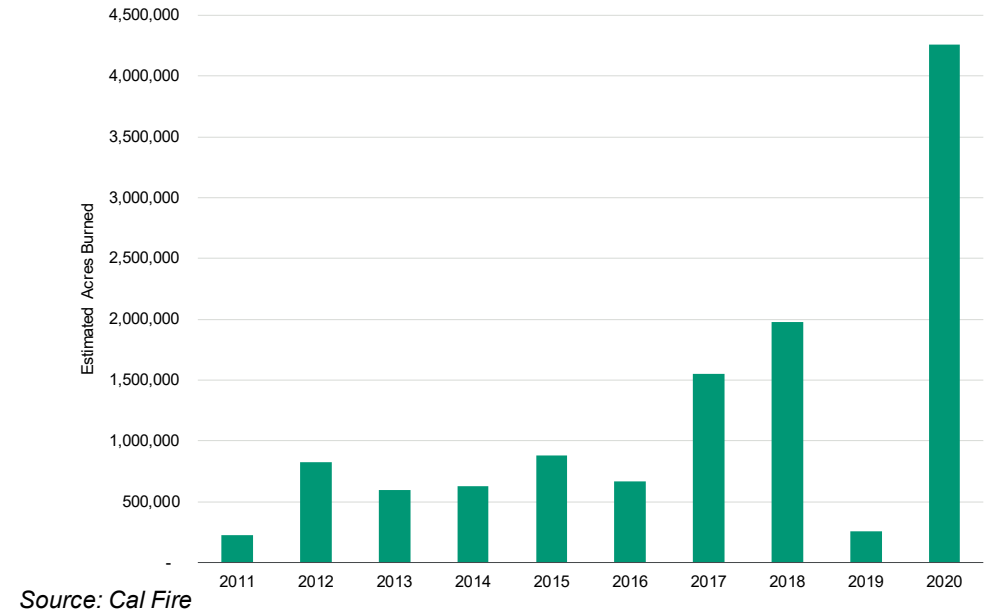
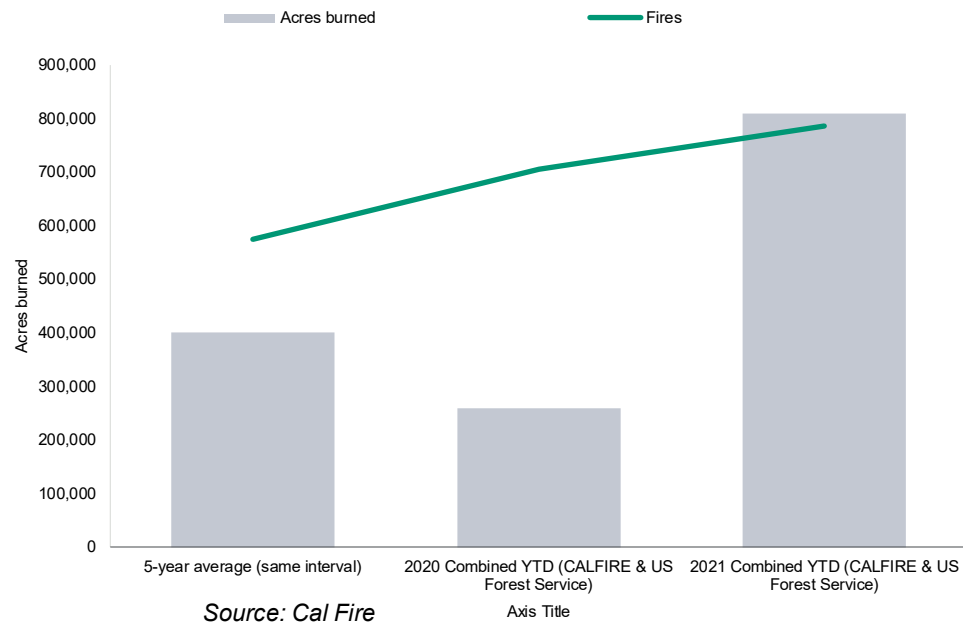
Source: National Centers for Environmental Information, part of the National Oceanic and Atmospheric Administration

Large fire incidents are burning across the northwestern US

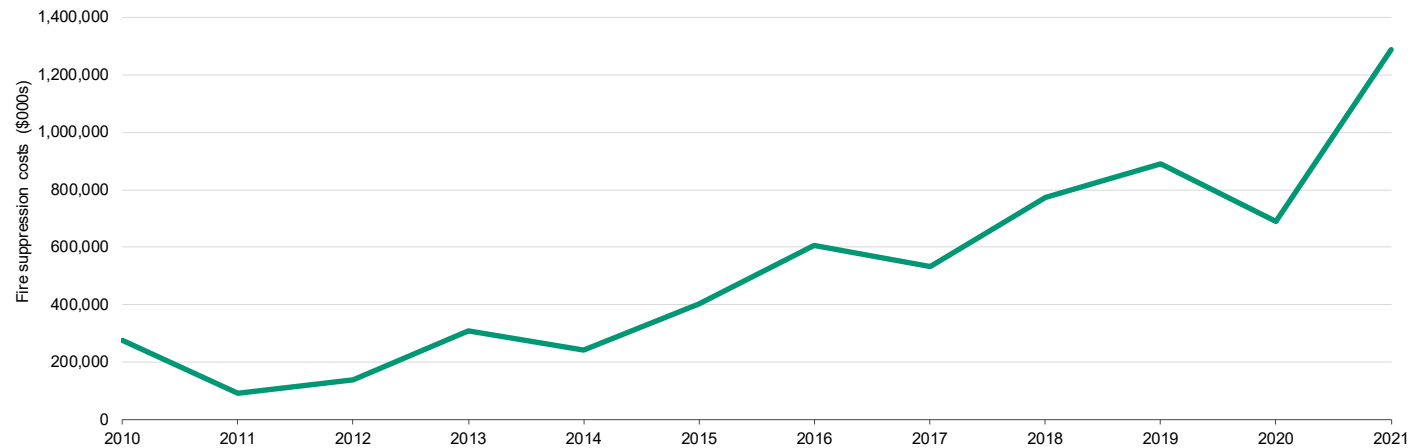


Source: National Interagency Fire Center

CA wildfires are growing in frequency and intensity....



...and cost of extinguishing them is growing as well



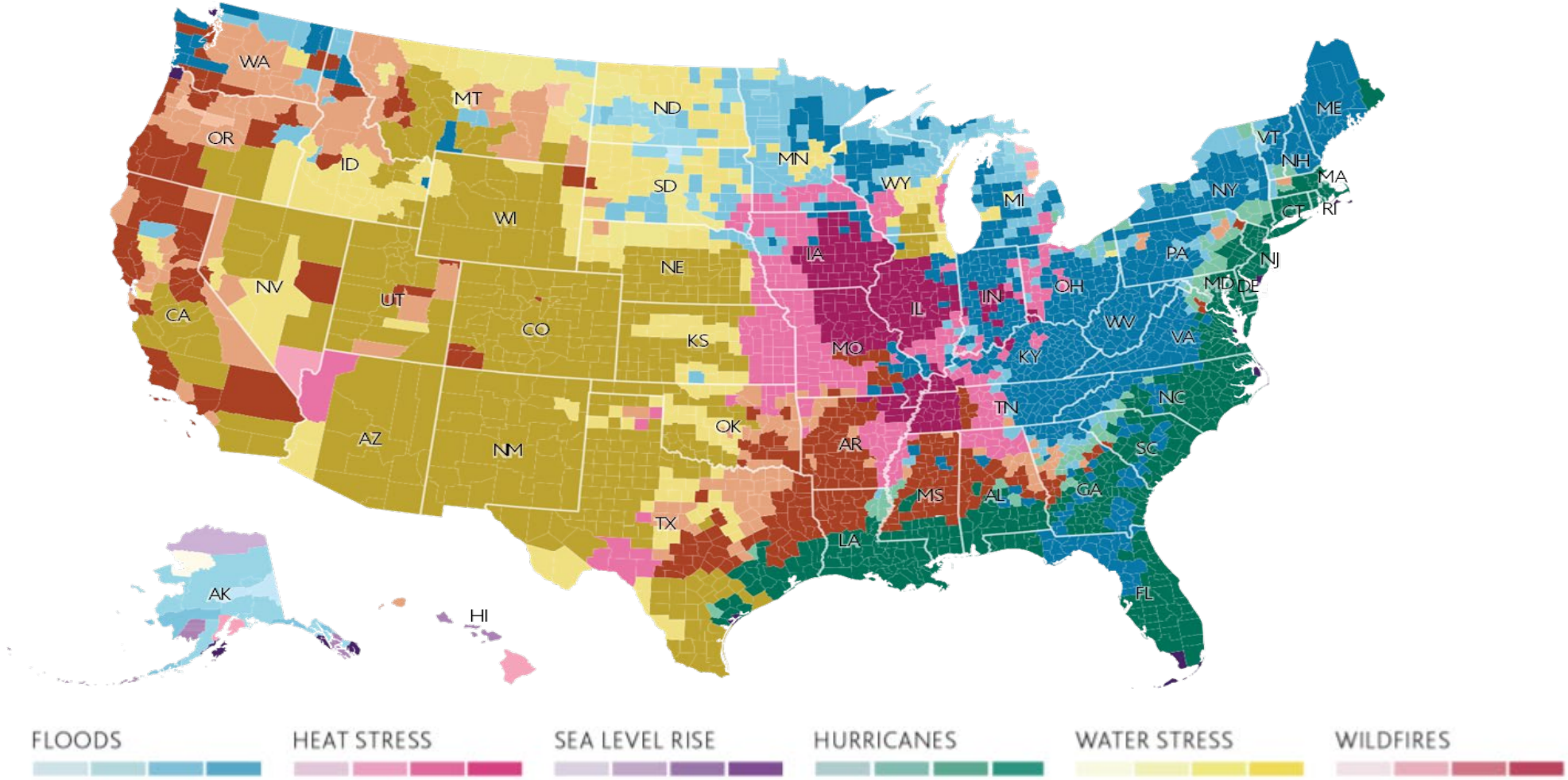
Source: Cal Fire

US has a high vulnerability to hurricanes but low economic impact to the country as a whole

Rank	Country name	Georegion	Income group	Hurricanes & Typhoons - Percent Population Above High Risk	Hurricanes & Typhoons - Percent GDP Above High Risk	Hurricanes & Typhoons - Percent Agriculture Above High Risk
1	TAIWAN	East Asia and Pacific	High income	100%	100%	100%
2	HONG KONG	East Asia and Pacific	High income	100%	100%	100%
3	JAPAN	East Asia and Pacific	High income	99%	100%	93%
4	MAURITIUS	Africa	Upper middle income	100%	100%	100%
5	PHILIPPINES	East Asia and Pacific	Lower middle income	77%	80%	63%
6	KOREA	East Asia and Pacific	High income	46%	54%	80%
7	CHINA	East Asia and Pacific	Upper middle income	17%	17%	8%
8	VIET NAM	East Asia and Pacific	Lower middle income	59%	51%	54%
9	MACAO	East Asia and Pacific		100%	100%	100%
10	BARBADOS	Latin America and the Caribbean	High income	100%	100%	100%
11	SAINT LUCIA	Latin America and the Caribbean	Upper middle income	100%	100%	100%
12	UNITED STATES	North America	High income	12%	11%	4%
13	DOMINICAN REPUBLIC	Latin America and the Caribbean	Upper middle income	32%	30%	28%
14	CUBA	Latin America and the Caribbean	Upper middle income	44%	44%	35%
15	SAINT VINCENT AND THE GRENADINES	Latin America and the Caribbean	Upper middle income	100%	100%	100%

Source: 427

Leading Climate Risks Vary by Region

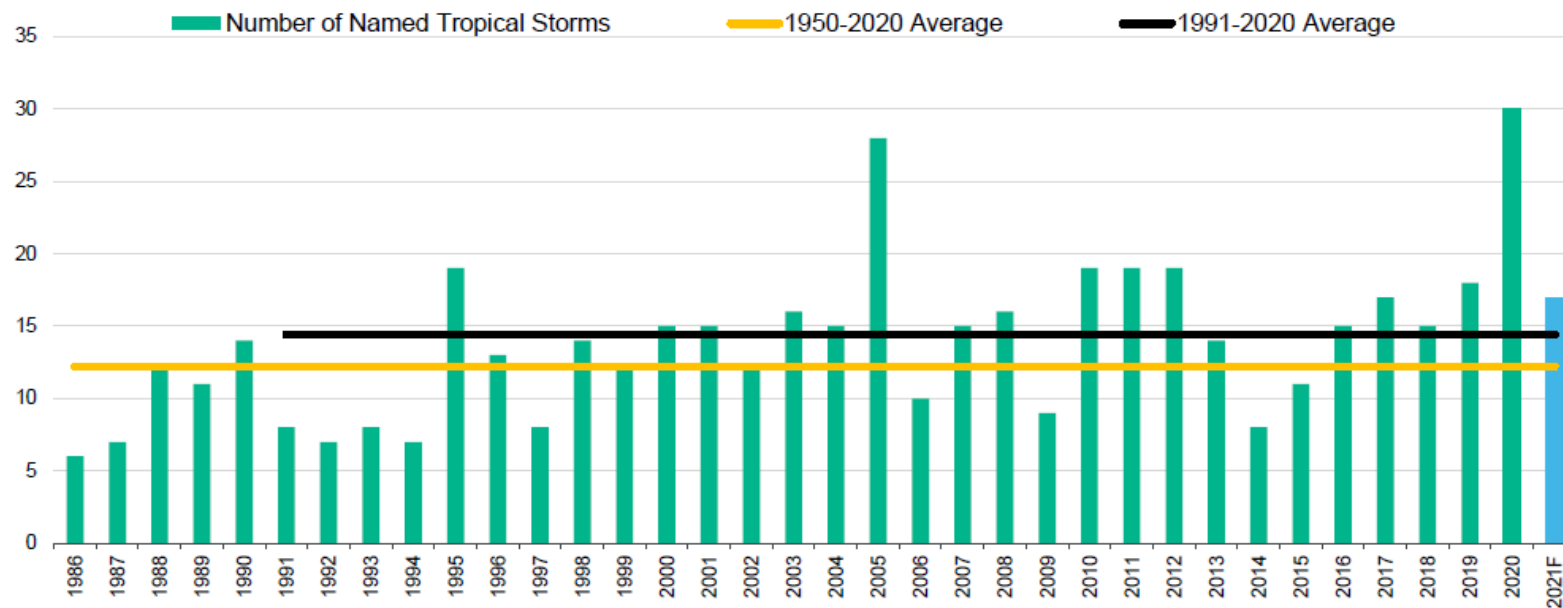


Source: Moody's Investors Service and Four Twenty Seven

2021 hurricane season predicted to be active relative to historical averages

Exhibit 1

Forecasters are calling for an active 2021 Atlantic hurricane season relative to historical averages



Sources: Unisys Weather, National Oceanic and Atmospheric Administration, Moody's Investors Service

Average storm activity increasing, including major hurricanes

Exhibit 2
2021 Atlantic Ocean hurricane forecasts
(April-May 2021 forecasts)

Organization	Forecast Date	ACE Index	Named Storms [1]	Hurricanes [2]	Major Hurricanes [3]
NOAA[4]	20-May		16.5	8.0	4.0
The Weather Company	27-Apr		18.0	8.0	3.0
North Carolina State University[4]	14-Apr		16.5	8.0	2.5
Tropical Storm Risk	27-May	140	18.0	9.0	4.0
Colorado State University	8-Apr	150	17.0	8.0	4.0
AccuWeather[4]	6-May	140	18.0	8.5	4.0
WeatherBELL Analytics[4]	8-Apr	175	19.0	11.0	4.5
UK Met Office	20-May	117	14.0	7.0	3.0
2021 Hurricane Season Average Estimates		144	17	8	4
1950-2020 Average			12	6	3
1991-2020 Average			14	7	3
2020 Observed		180	30	13	6
2019 Observed		130	18	6	3
2018 Observed		129	15	8	2
2017 Observed		226	17	10	6
2016 Observed		141	15	7	4

[1] Includes tropical storms (sustained winds of 39-74 miles per hour) and hurricanes occurring from June to November

[2] Hurricanes are storms with sustained winds of > 74 miles per hour

[3] Hurricanes rated Category 3, 4 or 5, with sustained winds of > 111 miles per hour

[4] Midpoint of forecasted range

Sources: The Weather Company, AccuWeather, Tropical Storm Risk, National Oceanic and Atmospheric Administration, National Hurricane Center, Colorado State University, WeatherBELL Analytics, North Carolina State University, UK Met Office, Moody's Investors Service.

Economic vulnerability varies across states with high hurricane risk

Exhibit 1

Florida has greatest hurricane exposure risk, while Louisiana retains the largest share of employment and wages in hurricane flood zones

Hurricane exposure reflects severity and frequency of storms

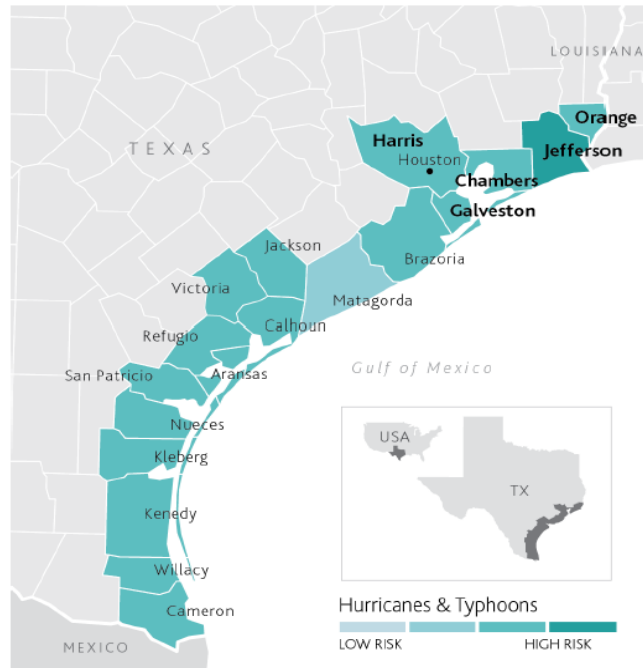
State	Rank of hurricane exposure	Wages earned in hurricane flood zone as a % of total state wages	Employment in hurricane flood zone as a % of total state employment
Florida	1	18.6%	18.5%
Rhode Island	2	3.6%	4.8%
Louisiana	3	30.0%	27.2%
Massachusetts	4	17.8%	14.0%
Delaware	5	8.7%	11.0%
North Carolina	6	1.7%	2.5%
South Carolina	7	9.9%	9.5%
Connecticut	8	6.3%	6.6%
New Jersey	9	13.0%	14.2%
Maryland	10	5.1%	5.2%

Hurricane exposure data from Moody's climate data affiliate Four Twenty Seven.

Sources: Four Twenty Seven and US Bureau of Labor Statistics Quarterly Census of Employment and Wages 2020 Third Quarter

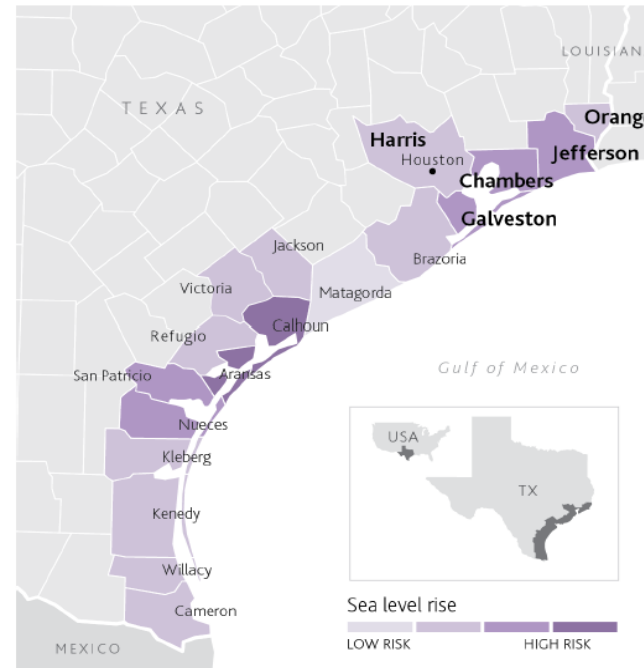
Texas risk lower than eastern states, but economic exposure is high

Exhibit 1
Coastal counties representing almost one-third of state GDP have medium to high hurricane risk...



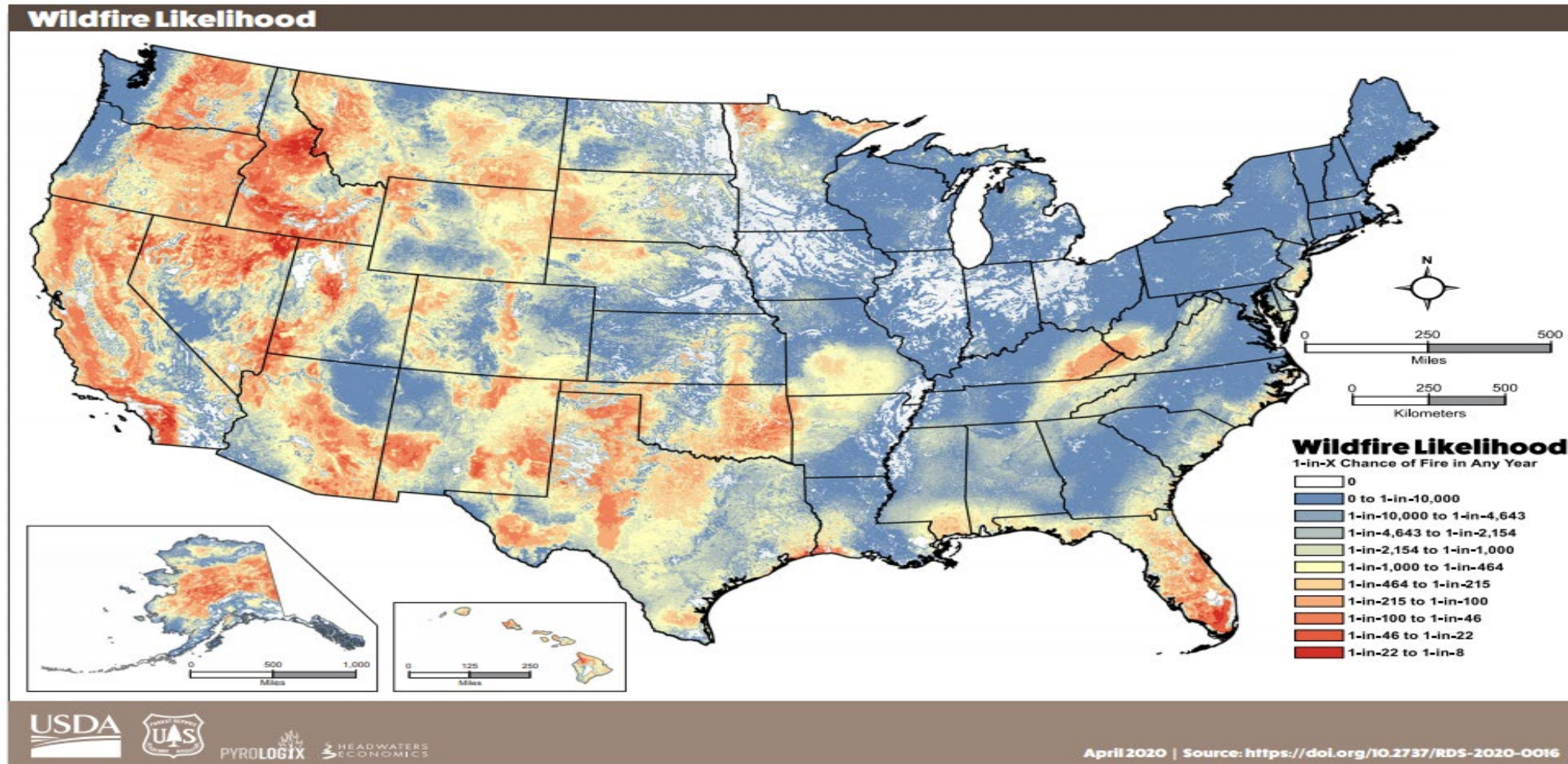
The Gulf Coast Protection District will initially include the counties represented in bold. The other counties are included in the US Army Corps of Engineers' draft October 2020 protection and restoration study, and may be annexed into the district in the future. Sources: Four Twenty Seven and Bureau of Economic Analysis

Exhibit 2
...and varying exposure to rising sea levels



The Gulf Coast Protection District will initially include the counties represented in bold. The other counties are included in the US Army Corps of Engineers' draft October 2020 protection and restoration study, and may be annexed into the district in the future. Sources: Four Twenty Seven and US Bureau of Economic Analysis

Likelihood of wildfires greatest in western US



Source: US Forest Service

Majority of California at elevated risk for wildfires



Source: Four Twenty Seven

Many major reservoir levels at less than half capacity

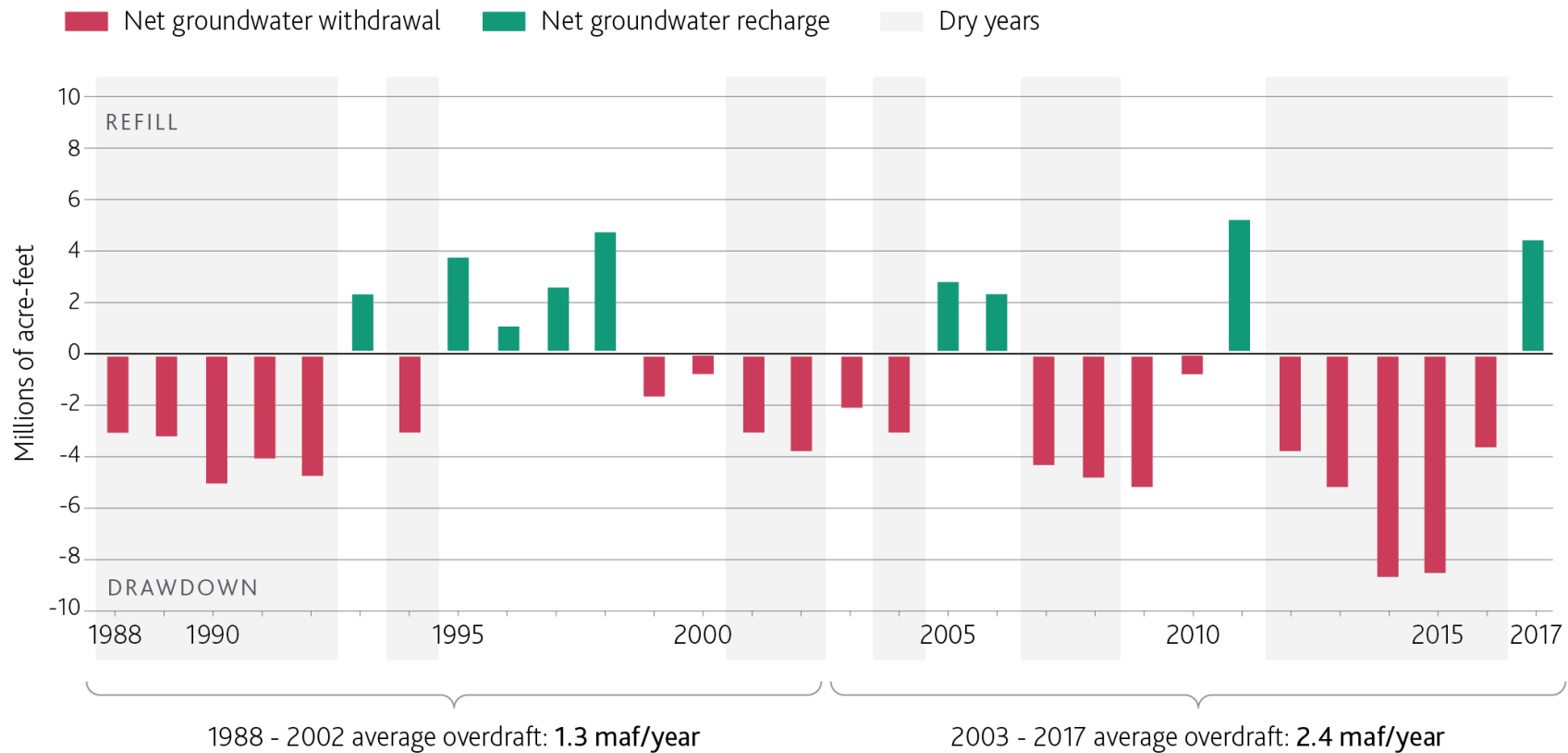
Reservoir	Current level vs. total capacity		Current level vs. historical	
	(as of August 10, 2021)	average	2014 level vs. total capacity	
San Luis, CA	18%	38%	45%	
Pine Flat, CA	20%	43%	28%	
Lake Oroville, CA	24%	34%	41%	
Folsom Lake, CA*	24%	35%	48%	
Exchequer, CA	29%	48%	13%	
Lake Shasta, CA*	30%	44%	49%	
Castaic Lake, CA	36%	43%	33%	
Trinity Lake, CA	39%	50%	39%	
New Melones, CA	41%	68%	17%	
Millerton Lake, CA	43%	75%	32%	
Don Pedro, CA	55%	74%	38%	
Lake Perris, CA	86%	111%	38%	
Deschutes System, OR*	21%	38%		
Lake Powell, UT/AZ*	32%	49%		
Lake Mead, NV/AZ*	35%	59%		
Blue Mesa, CO*	41%	52%		

*Reservoirs currently at lowest levels in 30 years

Sources: California Data Exchange Center and US Bureau of Reclamation

Net ground water withdrawals now exceed deposits

Reductions clearly linked with years of drought



Source: Public Policy Institute of California (PPIC)

Key Strategic Initiatives

California

- 2021 Budget Act includes \$5.1 billion over three years to support water resilience
- 2014 Groundwater Management Act will help preserve long term supplies
- Delta Conveyance Project remains key
- Development of alternative sources
- Attention to smaller utilities with needs

Arizona

- 50- and 100-year water supply assessments
- Ongoing development of multiple water sources
- Water banking and exchange agreements
- Initiatives to reduce reliance on Colorado River Water
- Aquifer recharge
- Multi-year rate adoption

Nevada

- Significant water recycling serves to extend Colorado River
- Interstate agreements increase water banking and future transfer and exchanges
- Increased water storage
- Use of indexed rate increases
- Regulations on uses

Median data for Colorado River Compact States

Operating performance is healthy confronting drought

Key Ratios	Arizona	California	Colorado	Nevada	Utah
Debt Ratio	40.6%	27.9%	17.2%	42.3%	10.0%
Annual Debt Service Coverage	2.6x	2.6x	2.6x	2.7x	2.4x
Days' Cash	298.6	510.3	1,500.3	1,119.1	412.0

Source: Moody's Investors Service

3 examples of credits impacted by wildfires

Santa Cruz County, CA

- Fall 2020 fire destroyed 945 homes
- Estimated \$220 million in lost tax base valuation; and \$23 million in immediate relief costs
- Tax base damage amounted to modest 0.44% of AV and district anticipates FEMA reimbursement for \$16 million of expenses; county has nearly \$120 million in accessible liquidity

Santa Rosa City Schools, CA

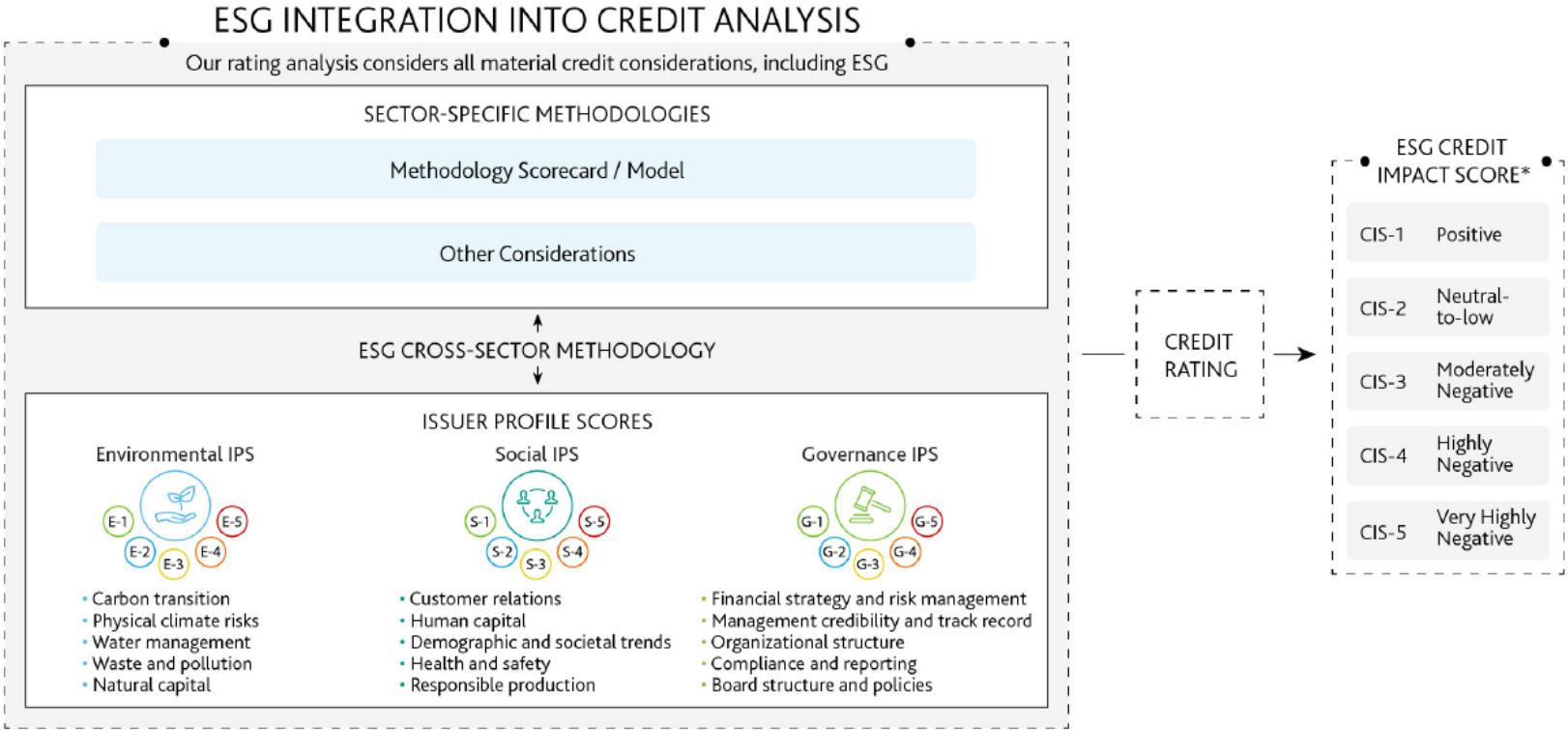
- Fall 2017 damaged district property included elementary school and a farm property
- Sudden loss of 537 students; temporary 5% drop in AV
- Experienced more subdued year-over-year tax base growth; but state granted enrollment waiver and district tax base and finances continue to remain healthy

Paradise, CA

- 2018 fire destroyed about 90% of the town's structures
- Population of Paradise declined by 83%
- Debt service made on time and in full through insurance settlements and state backfill of lost property tax revenue.

ESG Factors in credit ratings

EXHIBIT 1
An Illustration of How ESG Considerations Are Captured in Ratings



*The ESG credit impact score (CIS) is an output of the rating process that more transparently communicates the impact of ESG considerations on the rating of an issuer or transaction.

Source: Moody's Investors Service

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