SOCIETY OF ACTUARIES

Actuarial Weather Extremes September 2020

September 2020

Actuarial Weather Extremes: September 2020

Western US Wildfires, Hurricane Sally

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Overview

This report examines two costly phenomena in September 2020: Wildfires in the Western US states, primarily in California, Oregon and Washington, and Hurricane Sally, a Category 2 hurricane that made landfall on the Alabama Gulf Coast. Each look to be major billion-dollar events in terms of both economic and insured losses.[1][2]

Wildfires

The significant wildfires in the Western US states have been primarily in California, Oregon and Washington. For the US in total, September 2020 had the largest number of acres burned in September vs September of years back to 2000. (see Figure 1)

According to the California Department of Forestry and Protection, a list of the 20 largest wildfires in California history shows that six have occurred in 2020 and for four of those six the number of acres burned was not final as of the October 14, 2020 report date.[3] (see Figure 2)

The heat and drought conditions in the Western US states evolved from Extreme Drought to Exceptional Drought in many areas over the month of September (see Figure 3). Also, in those Western US states, many Global Historical Climatology Network (GHCN) weather stations had the highest average September daily high temperatures (TMAX) in September 2020 for any September average going back to 1960. (see Figure 4)

Hurricane Sally

Hurricane Sally made landfall on September 16 on the Alabama Gulf Coast. Several September single day precipitation records were set at stations in Alabama and Florida on September 15, 16 and 17 when viewing September amounts back to 1960. (see Figure 5) and many inland United States Geological Survey (USGS) stream gage stations were above flood stage in Florida in the days that followed. (see Figure 6)

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[1] September 21, 2020 07:48 ET | **Source:** AIR Worldwide https://www.globenewswire.com/news-release/2020/09/21/2096428/0/en/AIR-Worldwide-Estimates-Insured-Losses-for-Hurricane-Sally-Will-be-Between-USD-1-Billion-and-USD-3-Billion.html

[2] Moody's Says Property/Casualty Insurers Face Significant Losses from Western Wildfires
September 17, 2020 https://www.insurancejournal.com/news/west/2020/09/17/582984.htm

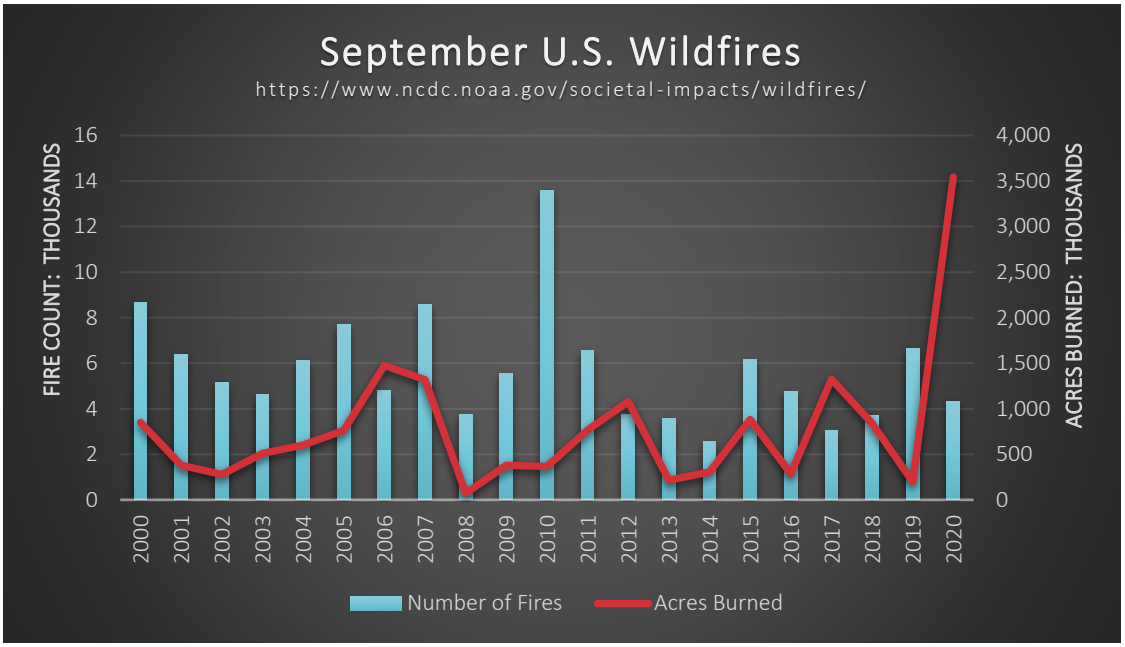
[3] Source: California Department of Forestry and Fire Protection As of October 14, 2020
https://www.fire.ca.gov/media/11416/top20_acres.pdf

Wildfires in the Western US

Figure 1

Utilizing data from the National Oceanic and Atmospheric Administration (NOAA) Societal Impacts Wildfire data which provides wildfire counts and acres burned in the US, the size of the US Wildfires in September 2020 is the largest; looking at September US wildfire data back to the year 2000.

WILDFIRE COUNT AND ACRES BURNED IN MONTH OF SEPTEMBER LAST 21 YEARS IN THE U.S.



Source: NOAA Wildfire data (Accessed October 8, 2020). https://www.ncdc.noaa.gov/societal-impacts/wildfires/month/9.csv

The California Department of Forestry and Protection lists information about the 20 largest California wildfires. It's October 14, 2020 update indicates that many are 2020 wildfires, and for several of those the amount of acres burned was still incomplete at the time.

Figure 2

THREE OF THE SIX LARGEST WILDFIRES IN CALIFORNIA ARE NOT FINAL YET

Top 20 Largest California Wildfires

	FIRE NAME (CAUSE)	DATE	COUNTY	ACRES	STRUCTURES	DEATHS
1	**AUGUST COMPLEX** *(Under Investigation)**	August 2020	Mendocino, Humboldt, Trinity, Tehama, Glenn, Lake, & Colusa	**1,029,140**	933	1
2	**MENDOCINO COMPLEX** *(Under Investigation)*	July 2018	Colusa, Lake, Mendocino & Glenn	**459,123**	280	1
3	**SCU LIGHTNING COMPLEX** *(Under Investigation)**	August 2020	Stanislaus, Santa Clara, Alameda, Contra Costa, & San Joaquin	**396,624**	222	0
4	**LNU LIGHTNING COMPLEX** *(Under Investigation)**	August 2020	Sonoma, Lake, Napa, Yolo & Solano	**363,220**	1,491	6
5	**CREEK FIRE** *(Under Investigation)**	September 2020	Fresno & Madera	**337,655**	856	0
6	**NORTH COMPLEX** *(Under Investigation)**	August 2020	Butte, Plumas & Yuba	**318,930**	2,352	15
7	**THOMAS** *(Powerlines)*	December 2017	Ventura & Santa Barbara	**281,893**	1,063	2
8	**CEDAR** *(Human Related)*	October 2003	San Diego	**273,246**	2,820	15
9	**RUSH** *(Lightning)*	August 2012	Lassen	**271,911 CA / 43,666 NV**	0	0
10	**RIM** *(Human Related)*	August 2013	Tuolumne	**257,314**	112	0
11	**ZACA** *(Human Related)*	July 2007	Santa Barbara	**240,207**	1	0
12	**CARR** *(Human Related)*	July 2018	Shasta County & Trinity	**229,651**	1,614	8
13	**MATILIJA** *(Undetermined)*	September 1932	Ventura	**220,000**	0	0
14	**WITCH** *(Powerlines)*	October 2007	San Diego	**197,990**	1,650	2
15	**KLAMATH THEATER COMPLEX** *(Lightning)*	June 2008	Siskiyou	**192,038**	0	2
16	**MARBLE CONE** *(Lightning)*	July 1977	Monterey	**177,866**	0	0
17	**LAGUNA** *(Powerlines)*	September 1970	San Diego	**175,425**	382	5
18	**SQF COMPLEX** *(Lightning)*	August 2020	Tulare	**167,479**	228	0
19	**BASIN COMPLEX** *(Lightning)*	June 2008	Monterey	**162,818**	58	0
20	**DAY FIRE** *(Human Related)*	September 2006	Ventura	**162,702**	11	0

There is no doubt that there were fires with significant acreage burned in years prior to 1932, but those records are less reliable, and this list is meant to give an overview of the large fires in more recent times.
This list does not include fire jurisdiction. These are the Top 20 regardless of whether they were state, federal, or local responsibility.
*Numbers not final.

10/14/2020

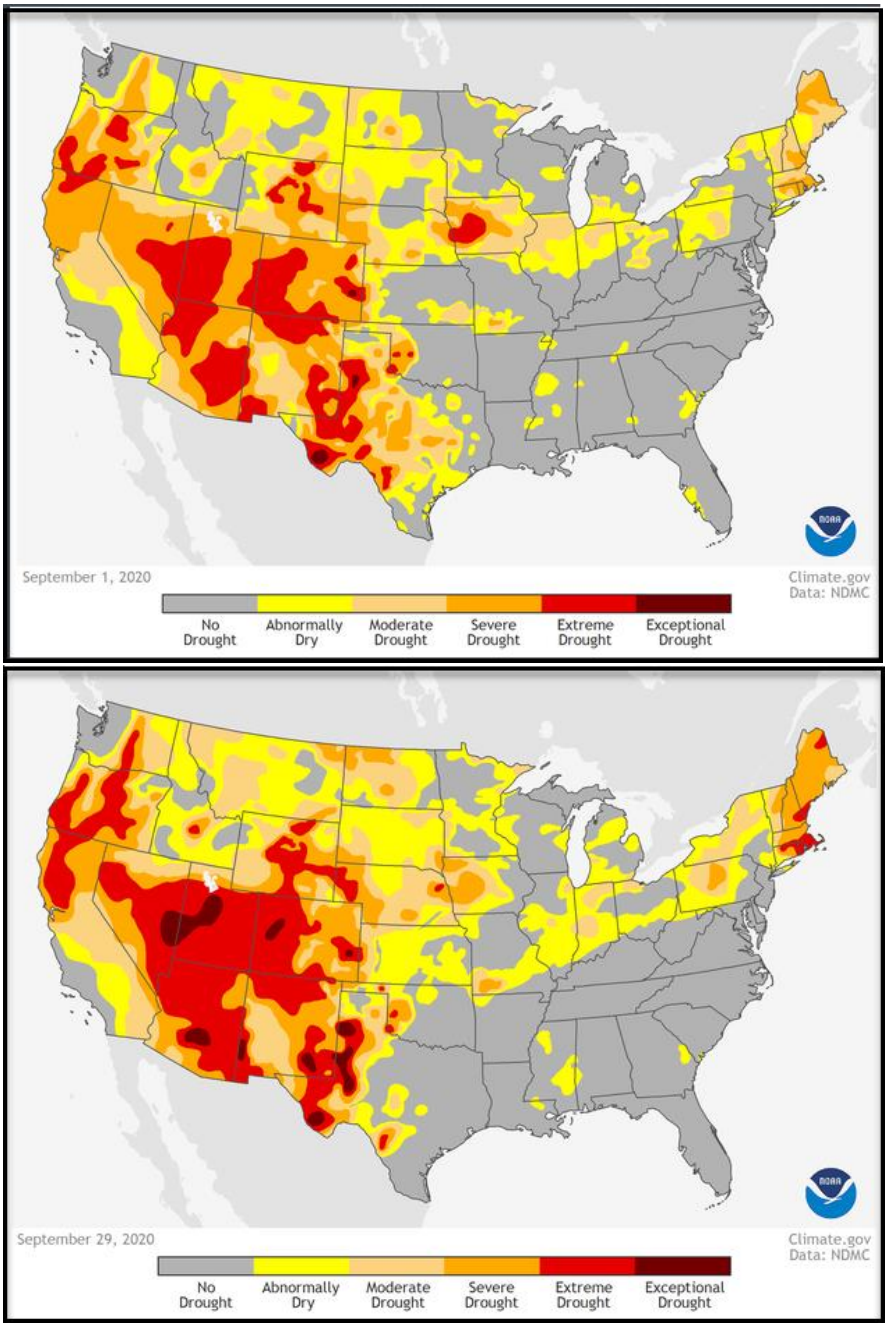
Source: California Department of Forestry and Fire Protection As of October 14, 2020
https://www.fire.ca.gov/media/11416/top20_acres.pdf

Drought and High Temperatures

Figure 3 shows that during the month of September drought conditions worsened in much of the western US, including in those areas that have been impacted by wildfires.

Figure 3

DROUGHT CONDITIONS IN THE CONTINENTAL U.S. EARLY AND LATE SEPTEMBER



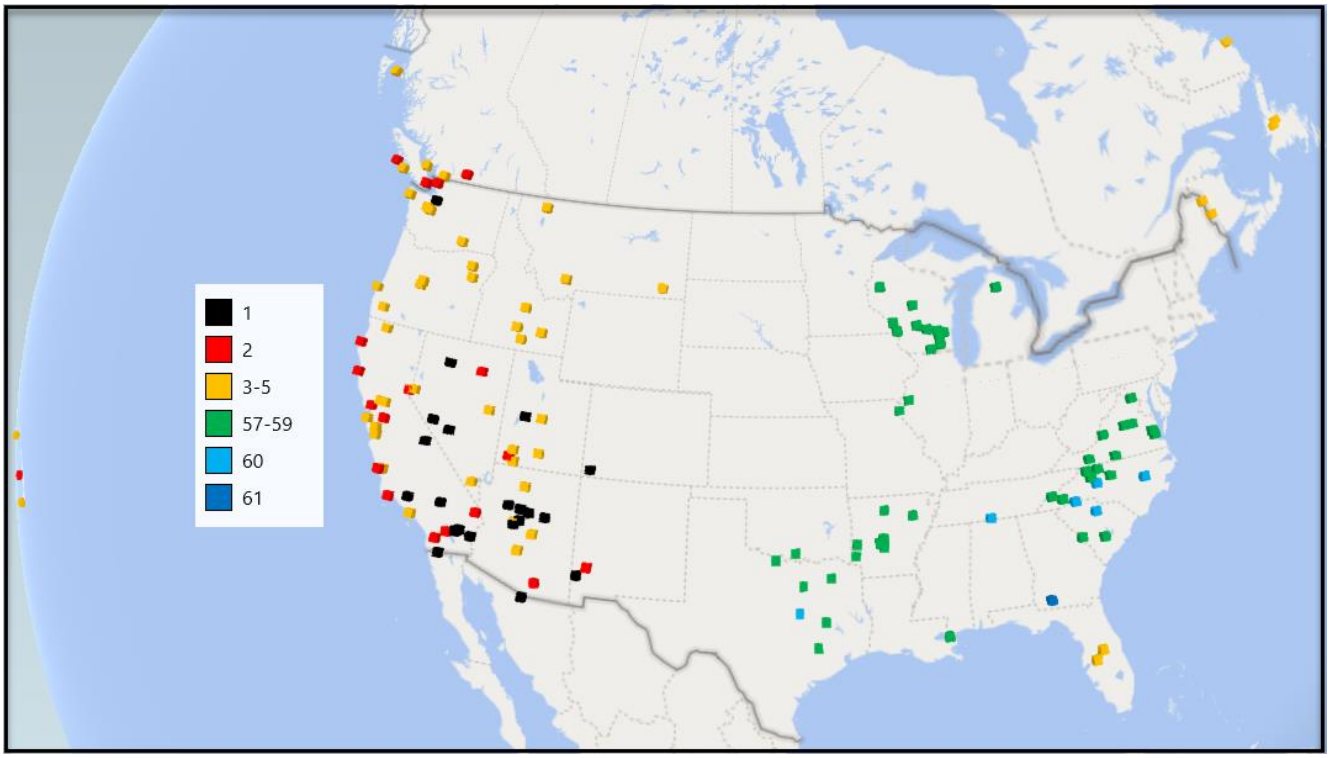
Source: NOAA Climate.gov Drought Monitor (Accessed October 12, 2020). https://www.climate.gov/maps-data/data-snapshots/usdroughtmonitor-weekly-ndmc-2020-09-01?theme=Drought

https://www.climate.gov/maps-data/data-snapshots/usdroughtmonitor-weekly-ndmc-2020-09-29?theme=Drought

Coincidental with the worsening drought conditions in the Western US states in September, many Global Historical Climatology Network (GHCN) stations experienced their highest average daily high temperatures for the month of September in 2020, compared to all September station average values dating back to 1960.

Figure 4

STATIONS IN THE US AND CANADA WHERE SEPTEMBER 2020 AVERAGE DAILY HIGH TEMPERATURE WAS AMONG FIVE HIGHEST (1-5) AND FIVE LOWEST (57-61) DURING SEPTEMBERS DATING BACK TO 1960.



Source: Global Historical Climatology Network (GHCN) station data (Accessed October 6, 2020).
ftp://ftp.ncdc.noaa.gov/pub/data/ghcn/daily/ghcnd_all.tar.gz

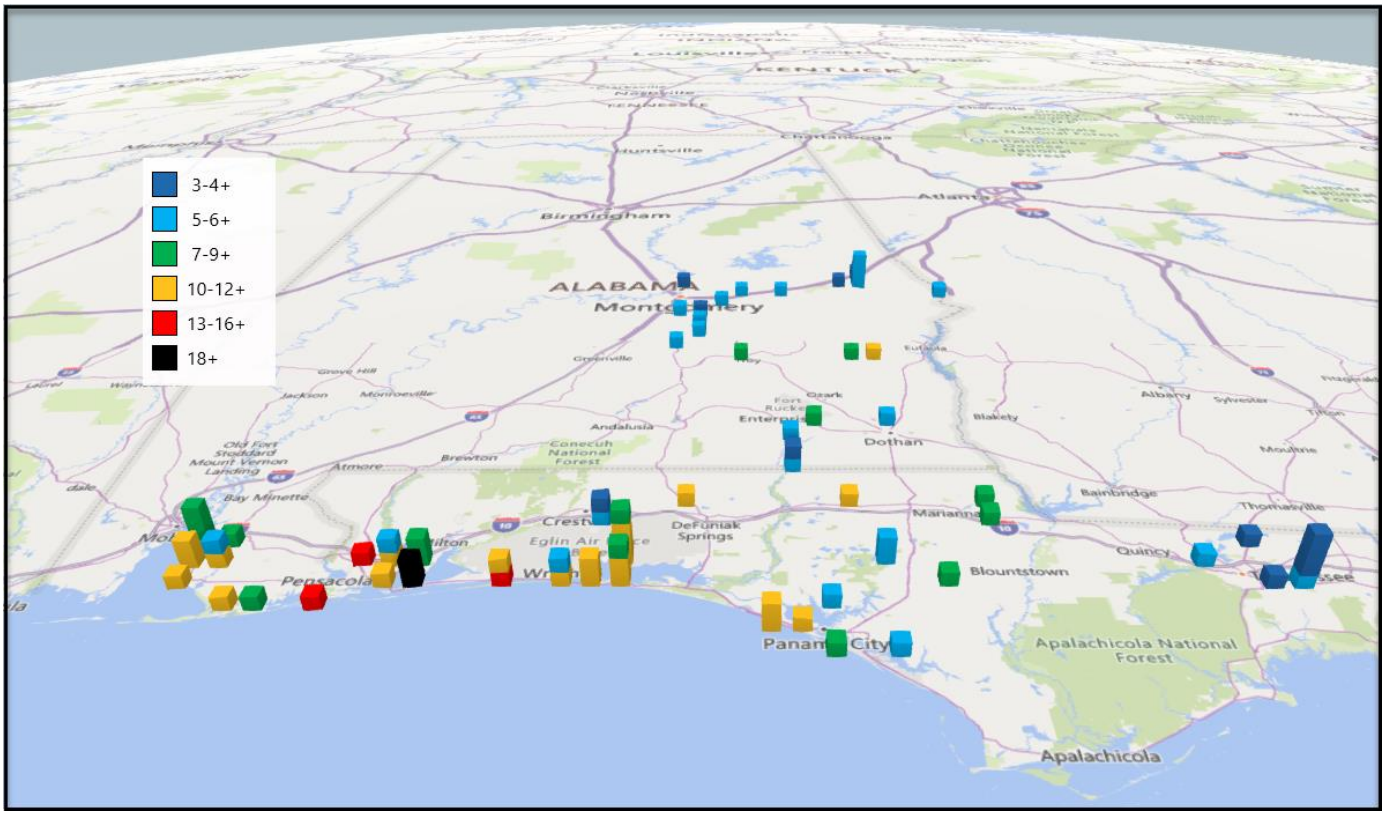
Hurricane Sally

Precipitation and Flooding

Hurricane Sally made landfall near Gulf Shores Alabama on September 16, 2020. [4] Several GHCN stations had record daily rainfall totals for September vs September daily totals back to 1960. Many stations recorded 10 or more inches of rain on either September 16 or 17, 2020.

Figure 5

ALABAMA AND FLORIDA PRECIPTATION RECORDS SET ON SEPTEMBER 15-17, 2020 FOR SEPTEMBER DAILY PRECIPITATION BACK TO 1960. THE CHART INDICATES INCHES OF DAILY RAINFALL.



Source: GHNC station data (Accessed October 6, 2020). ftp://ftp.ncdc.noaa.gov/pub/data/ghcn/daily/ghcnd_all.tar.gz

[4] https://www.usatoday.com/story/news/nation/2020/09/16/hurricane-sally-makes-landfall-near-gulf-shores-alabama/5814231002/ Powerful, drenching Sally makes landfall as Category 2 hurricane, batters Gulf Coast: 'It's just a nightmare' USA Today, September 16, 2020 (John Bacon and Annie Blanks)

Utilizing USGS stream gage station data, Figure 6 below shows that many stations hit flood stage in the days following Hurricane Sally landfall, particularly in Florida.

Figure 6

COUNTS OF USGS STREAMGAGE STATIONS IN FLOOD STAGE IN THE DAYS AROUND HURRICANE SALLY LANDFALL

Flood_Status										Grand Total
										All Days in Sept 2020
Count of station_n										
Row Labels	**9/15/2020**	**9/16/2020**	**9/17/2020**	**9/18/2020**	**9/19/2020**	**9/20/2020**	**9/21/2020**	**9/22/2020**	**9/23/2020**	**Grand Total**
AK	-	-	-	-	-	-	-	1	-	9
AL	-	-	-	-	-	-	1	-	-	1
AR	-	-	-	-	-	-	1	-	1	17
AZ	-	-	-	1	-	-	-	-	-	1
DE	1	1	1	1	1	1	2	1	1	43
FL	6	10	11	10	8	14	10	10	8	283
GA	-	3	3	4	2	3	2	-	-	88
HI	-	-	-	1	-	-	-	-	-	4
ID	1	-	2	3	2	2	4	3	1	30
IL	-	-	-	-	-	-	-	-	-	5
IN	4	3	5	2	2	4	1	2	1	66
KS	-	-	-	1	-	-	-	-	-	16
LA	2	2	3	3	3	4	2	1	2	44
MA	-	1	1	-	-	1	-	-	-	3
MD	1	1	1	2	1	1	1	1	-	41
MI	-	-	-	-	-	-	-	-	-	6
MN	1	1	1	2	2	-	1	-	1	9
MO	2	2	2	4	1	2	2	1	3	67
MS	2	2	2	2	2	3	2	2	3	67
MT	-	-	-	-	-	-	-	-	-	3
NC	2	2	4	4	1	-	-	-	-	64
ND	2	1	-	-	-	-	1	-	-	13
NE	1	1	1	-	-	-	-	-	-	12
NJ	-	-	-	-	-	-	1	-	-	20
NM	1	-	-	1	2	1	-	-	-	19
NY	-	-	-	-	-	-	-	-	-	3
OH	-	-	1	-	-	-	1	1	-	5
OR	-	-	-	-	-	1	-	-	-	4
PA	-	-	-	1	2	2	1	2	3	47
PR	-	-	-	1	1	-	-	-	-	2
SC	1	2	2	2	3	2	2	1	2	51
SD	2	3	2	2	2	2	2	3	2	73
TN	2	2	3	2	2	3	2	2	2	67
TX	1	1	1	2	1	1	2	1	2	51
UT	1	1	1	1	1	1	1	1	1	31
VA	-	-	1	1	1	-	-	2	-	26
VT	-	-	-	-	-	1	-	1	-	7
WA	3	1	1	2	2	3	3	3	2	46
WI	-	-	-	-	-	-	-	1	-	1
WV	2	1	1	2	2	4	3	4	1	41
WY	-	-	-	-	-	1	-	1	2	12
Grand Total	**38**	**41**	**50**	**57**	**44**	**57**	**48**	**45**	**38**	**1,398**

Source: USGS stream gage station data (Accessed October 3, 2020).

Flood Stages https://waterwatch.usgs.gov/webservices/floodstage?format=csv&region=ALL

Daily Values https://waterservices.usgs.gov/rest/DV-Test-Tool.htmlhttps://waterservices.usgs.gov/nwis/dv/?format=rdb&sites=01646500&startDT=2020-09-01&endDT=2020-09-30&parameterCd=00060,00065&siteStatus=all

Rough Assessment of the Losses Caused by Recent Extreme Weather

Economic and insured losses are often difficult to estimate in the immediate aftermath of an extreme weather event. With the passage of time, the extent of the losses gradually becomes clearer.

September 16, 2020 Hurricane Sally

Catastrophe risk modeling firm AIR Worldwide estimates that industry insured losses to onshore property resulting from Hurricane Sally's winds, storm surge, and inland flood will range from USD 1 billion to USD 3 billion, with wind representing the majority of the losses. Included in AIR's estimates are losses to onshore residential, commercial, and industrial properties and automobiles for their building, contents, and time element coverage.[5]

September 2020 Wildfires in Western U.S. States

An Insurance Journal article indicates that according to Moody's, California insured losses would be about $4.8 billion so far assuming CAL FIRE's estimate of about 5,792 structures destroyed or damaged, and an average historic value of about $826,000 per structure. The article also notes that Moody's indicated there is "considerable variability" around the estimate because of the wide range of values for homes and commercial structures in the affected areas. Also, roughly 3,865 structures have been destroyed in Oregon, Washington and other Western states and "Given typically lower home values and construction costs in those states, we expect the per-structure losses in those states to be lower than the California average," Moody's stated. The current overall estimate of insured losses would be in the $5 billion to $8 billion range.[6]

[5] September 21, 2020 07:48 ET | **Source:** AIR Worldwide https://www.globenewswire.com/news-release/2020/09/21/2096428/0/en/AIR-Worldwide-Estimates-Insured-Losses-for-Hurricane-Sally-Will-be-Between-USD-1-Billion-and-USD-3-Billion.html

[6] Moody's Says Property/Casualty Insurers Face Significant Losses from Western Wildfires
September 17, 2020 https://www.insurancejournal.com/news/west/2020/09/17/582984.htm

Data

Temperature and precipitation data used in this report was obtained from the **Global Historical Climatology Network** ("GHCN") weather database, which provides daily weather observations from over 100,000 weather stations worldwide, covering over 180 countries. The database is publicly available through the National Oceanic and Atmospheric Administration (NOAA) via the following FTP site:

ftp://ftp.ncdc.noaa.gov/pub/data/ghcn/daily/ghcnd_all.tar.gz
Filename: ghcnd_all.tar.gz

Stream gage flood data

Flood Stages https://waterwatch.usgs.gov/webservices/floodstage?format=csv&region=ALL

Daily Values https://waterservices.usgs.gov/rest/DV-Test-Tool.htmlhttps://waterservices.usgs.gov/nwis/dv/?format=rdb&sites=01646500&startDT=2020-09-01&endDT=2020-09-30&parameterCd=00060,00065&siteStatus=all

Wildfire data

Source: National Oceanic and Atmospheric Administration (NOAA) Wildfire data (Accessed October 8, 2020).
https://www.ncdc.noaa.gov/societal-impacts/wildfires/month/9.csv

Source: California Department of Forestry and Fire Protection As of October 14, 2020
https://www.fire.ca.gov/media/11416/top20_acres.pdf

Acknowledgments

The authors wish to thank Janie Gilbert, ASA for her contributions to the assimilation of wildfire data and information and Matthew Self, ASA for his contributions to the assimilation of stream gage flood data and information that the author's used for this analysis.

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