

Selective Examples of Infrastructure Services and Assets Affected by Climate Extremes in California

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- 1. Extreme Rains Flood Roads** Historic rains in the winter of 2017 flooded more than 32 roads in Humboldt County, including parts of Highway 101, closing them for days.
 - 2. Extreme Rain Damages Oroville Dam Spillways** Record rainfall in February 2017, combined with years of deferred maintenance, led to significant damage of Oroville Dam's main and emergency spillways. More than 188,000 residents were evacuated when water threatened to breach the dam and wash out the spillways.
 - 3. Drought Reduces Reservoir Storage and Hydropower Generation** The historic drought starting in 2011 significantly reduced California's surface water supply: key reservoir levels dropped to 50% below average in 2014. From 2011 to 2014, total state hydropower—generated by Shasta Dam and many others—fell from 18% to 12% of the electricity mix. More natural gas was burned to compensate, raising consumers' electricity costs by \$1.4 billion and increasing California power plants' carbon and air pollution emissions by 8%.
 - 4. Butte and Valley Fires Damage Power Lines** In September 2015, the Butte and Valley Fires destroyed nearly 3,000 structures and damaged hundreds of power lines and poles, leaving 12,700 customers without power—some for more than a week—and causing nearly \$2 billion in damages.
 - 5. Tropical Storm Floods Major Power Substation** A tropical superstorm hit the northern California coast in December 2014, flooding a key Pacific Gas & Electric substation in San Francisco: more than 85,000 customers from Big Sur to the Oregon border lost power, closing the San Francisco electric bus system and Bay Area and High Sierra schools.
 - 6. Sacramento Highway Buckles during Record Heat Wave** Unseasonably high heat in June 2017 buckled four lanes of Highway 50, causing heavy traffic delays until the road was repaired overnight.
 - 7. Heavy Rain and Landslide Sever Big Sur Bridge** Torrential rains and a resulting landslide in February 2017 rendered Pfeiffer Canyon Bridge impassable, isolating Big Sur residents and causing a loss of about \$2 million in business and tourism revenue per week until its replacement was finished in October 2017.
 - 8. Extreme Precipitation Halts Commuter Trains** Muddy, waterlogged tracks caused a Union Pacific freight train to derail near Stockton in February 2017, sending 22 railcars full of food into the Cosumnes River. Rerouting freight cars onto other tracks canceled Altamont Corridor Express commuter rail service for three days.
 - 9. Wildfire Closes Desert Highland Schools** The Pilot Fire of 2016 struck so quickly—growing 50% overnight and burning 7,500 acres in a day—that three school districts in the San Bernardino mountains were forced to close 46 schools for days due to heavy smoke and poor air quality.
 - 10. Fire Damages Southwest Power Transmission System** In October 2007, a massive wildfire damaged 1,000 San Diego Gas & Electric utility poles, 35 miles of overhead electric wire, and the Southwest Power Link, a high-voltage power line stretching from Arizona to San Diego, causing 80,000 customers across southern California to lose power, some for weeks.

This map highlights a few recent examples of infrastructure failures and service disruptions related to extreme storms, wildfires, heat waves, and other weather-related events that will become more frequent and/or severe in California as climate change intensifies. The combination of deferred maintenance, underinvestment in infrastructure, and continued failure to incorporate climate science in infrastructure planning will make these disruptions and failures more common in the coming century, affecting all regions and communities in California.

SOURCES: 1. GOFF 2017; 2. CBS 2017A; 3. CDWR 2014; GLEICK 2015; 4. AON BENFIELD 2015, PG&E 2015; 5. MENDOZA AND THANAWALA 2014, POGASH 2014; 6. ACOSTA 2017; 7. CBS 2017B, CBS 2017C, CURWEN 2017; 8. AP 2017, CBS 2017D, SERNA 2017; 9. WHITCOMB 2016; 10. EC 2007.