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Double the Trouble: A Playbook for COVID-19 and Evacuations

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### Authors

Wong, Stephen, PhD  
Broader, Jacquelyn  
Cohen, Adam  
[et al.](#)

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# Double the Trouble: A Playbook for COVID-19 and Evacuations

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<b>16. Abstract</b> Evacuation and response plans require thoughtful strategies that build mandatory evacuation order compliance, reduce vehicular congestion, and increase social equity for disadvantaged populations. However, the novel coronavirus (COVID-19) pandemic coincided with a series of devastating disasters in 2020 that have required mass evacuations, leading to several new compounding effects (i.e., “double the trouble”). Strategies typically used in evacuations (e.g., high-capacity vehicles and public congregate shelters) and movements of people (e.g., evacuees, first responders, and volunteers) could increase the risk of COVID-19 spread and exposure. Moreover, disadvantaged populations who are already disproportionately impacted by disasters and COVID-19 separately could face new challenges in dual crises. To address these new and growing challenges, this playbook employs insights from case studies (n=12), survey data of individuals impacted by public safety power shutoff (PSPS) events (n=210), and expert interviews (n=17). Using these data, the playbook: (i) shares recent lessons learned from case studies of compounding disasters during the pandemic; (ii) offers a primer for the potential compounding impact of PSPS events and disasters; (iii) highlights current considerations in the emergency management and evacuation fields; and (iv) provides a series of actionable checklists to address COVID-19 and a compounding disaster. Relevant stakeholders in disasters and evacuations that should use this playbook include public agencies, first responders, community-based organizations, non-governmental organizations, private mobility companies, public health facilities, and other evacuation stakeholders. The playbook can be adapted for multiple hazards, different local contexts, various agency types, and future pandemics.				
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## ABOUT THE UC INSTITUTE OF TRANSPORTATION STUDIES

The University of California Institute of Transportation Studies (UC ITS) is a network of faculty, research and administrative staff, and students dedicated to advancing the state of the art in transportation engineering, planning, and policy for the people of California. Established by the Legislature in 1947, UC ITS has branches at UC Berkeley, UC Davis, UC Irvine, and UCLA.

An initiative of UC ITS, the California Resilient and Innovative Mobility Initiative (CA RIMI) is supported by the four UC ITS branches — UC Berkeley, UC Davis, UC Irvine, and UCLA. The CA RIMI serves as a living laboratory bringing together university experts, policymakers, public agencies, industry stakeholders, and community leaders to inform the transportation system’s immediate COVID-19 response and recovery needs, while establishing a long-term vision and pathway for innovative mobility with the goal to develop sustainable and resilient transportation in California and the United States.

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# Double the Trouble: A Playbook for COVID-19 and Evacuations

Stephen Wong, Ph.D. <sup>12</sup>  
Jacquelyn Broader <sup>1</sup>  
Adam Cohen <sup>1</sup>  
Susan Shaheen, Ph.D. <sup>123</sup>

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[1] Transportation Sustainability Research Center, University of California, Berkeley

[2] University of California Institute of Transportation Studies

[3] Department of Civil and Environmental Engineering, University of California, Berkeley

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## GLOSSARY OF TERMS

211	A free and confidential service that helps people across North America find the local resources they need (e.g., financial, domestic, health or disaster-related) by dialing 211 on a telephone.
511	A free service that helps people access travel information services — related to traffic, public transit, carpool, vanpool, bicycling, and other transportation services — by dialing 511 on a telephone.
Access and functional needs (AFN)	A term used to describe individuals who need additional assistance in disasters including but not limited to individuals who are or have: 1) physical, developmental, or intellectual disabilities; 2) chronic conditions or injuries; 3) limited English proficiency; 4) older adults; 5) children; 6) low-income, homeless and/or transportation disadvantaged; and 7) pregnant women.
Continuity of operations plan (COOP)	A plan that ensures that government departments and agencies are able to continue operations of their essential functions under a broad range of circumstances including all-hazard emergencies as well as natural, man-made, and technological threats and national security emergencies.
COVID-19	An infectious disease caused by a newly discovered coronavirus that has led to a pandemic (also known as SARS-CoV-2).
Emergency operations center (EOC)	The physical location at which the coordination of information and resources to support incident management (on-scene operations) activities normally takes place.
Emergency support functions (ESFs)	A grouping of governmental and certain private sector capabilities into an organizational structure to provide support, resources, program implementation, and services during a disaster or emergency.
Highway advisory radio	A service that disseminates information by broadcast radio to travelers, especially related to traffic advisories and updated travel information.
Personal protective equipment (PPE)	Equipment that is worn to minimize exposure to hazards that cause serious injuries and/or illnesses (e.g., masks, gloves, face shields, etc.).
Public safety power shutoff (PSPS) events	Events conducted by utility companies or providers to deliberately deenergize parts of the electrical grid to reduce wildfire risk.
Social distancing	An action, also known as physical distancing, to limit face-to-face contact with others and keep a safe space between people of different households (set for at least six feet for COVID-19).
Standardized Emergency Management System (SEMS)	A fundamental structure for the response phase of emergency management in California that brings the state’s emergency management community into a single integrated system and standardizes key elements.
Standard operating procedures (SOP)	A series of established or prescribed methods to be followed routinely for the performance of designated operations or in designated situations.

# Contents

## CONTEXT



**Disasters in 2020 (such as wildfires in the West and hurricanes in the Gulf Coast) have coincided with the outbreak of the novel coronavirus (COVID-19), which has dramatically impacted all aspects of society across the world.** As of early-March 2021, the pandemic has led to over 28.8 million positive cases and over 520,000 deaths in the United States (U.S.) alone (Johns Hopkins University, 2021). To control the spread of the virus, governments have issued widespread stay-at-home orders, social distancing measures, and new sanitation policies.

**Yet, natural disasters (particularly hurricanes, wildfires, tsunamis, mudslides, and flooding) require large populations to evacuate to protect lives.** Recent evacuations have also exposed severe challenges related to ensuring compliance to mandatory evacuation orders, decreasing congestion, and building social equity and resources for those most vulnerable (Wong, 2020). To overcome these challenges, governments often implement a wide range of response strategies including: 1) leveraging high-capacity public transit, 2) facilitating resource sharing among neighbors, 3) housing people in congregate public shelters, 4) encouraging friends and family to shelter evacuees, and 5) working in close proximities and directly with the public to manage response and recovery. These strategies highlight three new problems as seen in Figure 1.

**To address critical challenges in evacuations and new issues related to COVID-19, this playbook offers strategies to prepare for, respond to, and recover from simultaneous and compounding emergencies of COVID-19 and disaster evacuations.** The goal of this playbook is to provide actionable checklists for government agencies involved with evacuations to improve evacuation outcomes and decrease negative externalities. Government agencies now have additional considerations including: 1) minimizing the spread of COVID-19; 2) communicating COVID-19 risks to evacuees; 3) notifying evacuees of new plans and procedures for COVID-19; and 4) reducing staying behavior (i.e., individuals who choose not to evacuate), which may arise due to COVID-19 exposure concerns. This playbook will address these new considerations along with traditional challenges in disasters.

## PLAYBOOK PURPOSE



Evacuations are a critical tool to save lives in natural disasters (e.g., wildfires, flooding, hurricanes) and human-caused disasters (e.g., chemical exposures, terrorism). However, the COVID-19 pandemic has coincided with multiple disasters, leading to compounding emergencies. With simultaneous crises, concerted effort is needed to protect public health and ensure safety.

To address “double the trouble,” we assessed and studied best practices for managing evacuations in California during simultaneous crises of COVID-19 and a natural disaster. We employed case studies from January 2020 to December 2020, early public safety power shutoff (PSPS) data, and expert interviews to develop lessons learned and a checklist of key strategies. These strategies inform future preparedness and response efforts beyond just the current COVID-19 crisis to include future pandemics and disasters.

**Figure 1: COVID-19 and Disaster Key Challenges**



**Conflict of Evacuations with Stay-at-Home Orders and Social Distancing**

Strategies to address COVID-19 directly conflict with evacuation orders that typically rely upon high-capacity vehicles and shelters to protect people in disasters (Wong et al., 2020).



**Spread and Exposure of COVID-19 during Disasters**

Disasters could significantly exacerbate the spread of COVID-19 due to the movement and close contact of evacuees, first responders, and volunteers (Pei et al., 2020).



**Disproportionate Impacts of Dual Crises on Vulnerable Populations**

A lack of COVID-19 and evacuation planning may disproportionately harm preparedness, response, and recovery of disadvantaged communities, who have already suffered more during the pandemic (Thakur et al., 2020).

Fig. 1. (Top) Chiu, J. (2020). Virus Outbreak California [Online Image]. Associated Press. Accessed April 21, 2021 via the University of California, Berkeley Library.

(Middle) Herbert, G. (2019). Tropical Weather [Online Image]. Associated Press. Accessed April 21, 2021 via the University of California, Berkeley Library.

(Bottom) Bruno, L. (2021). APTPIX Virus Outbreak Italy Nursing Homes [Online Image]. Accessed April 21, 2021 via the University of California, Berkeley Library.

# PLAYBOOK USERS

This playbook was built off the actionable checklist created by Wong et al. (2020) for key stakeholders and responsible organizations involved in evacuations, as listed below in Figure 2. While the playbook was constructed for a California and COVID-19 context, elements of the playbook are generalizable to many other geographies, disasters, and pandemic types.

**Figure 2: Evacuation Stakeholders and Responsible Organizations**



# METHODOLOGY

This playbook was built using a multi-method approach that analyzed case studies, previously collected data from a public safety power shutoff (PSPS) event, and expert interviews.

## CASE STUDIES

To provide context for this playbook, we tracked evacuations from major disasters around the world in 2020 using multiple Google Alert tags. Keyword alerts included: “evacuation,” “wildfire,” “hurricane,” “earthquake,” “tsunami,” “flooding,” “mudslide,” “landslide,” and “tornado.” Alerts via Google were sent daily to the team and information was entered in a tracking spreadsheet. Criteria for tracking was a disaster with: 1) a federal declaration; 2) a state declaration; and/or 3) an evacuation where orders were issued to 500 people or more. Human-caused disasters were also included. From these disasters, we selected 12 disasters to consider for case studies. Two case studies – Hurricane Laura and the 2020 California Lightning Wildfires – are described in detail in the report. Our selection criteria for these case studies were based on providing a diversity of hazards, geographies, and COVID-19 contexts. We also focused on wildfires, which are a major hazard in California. Using newspaper articles, official social media feeds, and press releases, we identified key problems and strategies for evacuating people during COVID-19 from these case studies. These findings and lessons learned are offered in Appendix A.

## PUBLIC SAFETY POWER SHUTOFF ANALYSIS

Public safety power shutoff (PSPS) events in California offer an early example of a compounding crisis. PSPS events involve the deliberate shutdown and deenergizing of parts of the electrical grid to reduce wildfire risk. Typically, PSPS events are conducted when wildfire danger is highest (i.e., high wind, dry vegetation, hot temperatures, low humidity). However, these shutoffs can also occur concurrently with wildfires and evacuations if the fire starts from another source. To better understand these compounding events, we employed data from an online survey of residents living in the East Bay of the San Francisco Bay Area (n=210). Administered between November 2019 and February 2020, the survey asked questions related to travel behavior during two October PSPS events in 2019. The data were analyzed via descriptive statistics to understand PSPS travel behavior and offer several lessons learned from the data. This PSPS analysis offers a starting point for future research, planning, and policy on the compounding threat of PSPS events. Additional analyses are located in Appendix B. Preparedness and response strategies developed by experts for PSPS events can be found in Appendix D.

## EXPERT INTERVIEWS

Between June and August 2020, we interviewed 17 high-ranking California experts from 13 organizations involved in evacuations and emergency management (Appendix C). Interviewees were chosen based on their knowledge of disaster preparedness, response, recovery, and mitigation. We aimed to collect diverse opinions and ideas from experts working in various topical areas in disasters (e.g., transportation, sheltering, emergency management); geographies (e.g., urban, rural); and levels of government (e.g., local, regional, state). During the one hour-long interviews, experts were asked to identify critical

challenges and possible strategies in simultaneously managing COVID-19 and evacuations. We used a semi-structured approach that gave experts the ability to discuss challenges and strategies in their area of expertise. From these expert interviews, we conducted content analysis to formulate key takeaways for the evacuation and emergency management fields and construct actionable preparedness and response strategies. Additional checklists for key actions apart from a COVID-19 context are provided in Appendix D.

# HOW TO USE THIS GUIDE

This playbook was designed to assist agencies and other stakeholders in evacuations to prepare for and respond to simultaneous emergencies of COVID-19 and a disaster, with a focus on evacuations, that:

- Shares recent lessons learned from case studies of compounding disasters during the pandemic;
- Offers a primer for the potential compounding impact of PSPS events and disasters;
- Highlights current considerations in the emergency management and evacuation fields; and
- Provides a series of actionable checklists to address COVID-19 and a compounding disaster.

Figure 3 presents a graphical outline of these playbook elements. One important note is that earlier sections help inform the final set of strategies and actions for agencies. This playbook also holistically addresses the compounding impacts of COVID-19 and disasters by integrating lessons learned and best practices in other areas beyond transportation including emergency management, public communication, public health, access and functional needs (AFN) populations, and care and shelter.

Disaster preparedness and response are highly complex and involves a number of diverse stakeholders from the public, private, and non-profit sectors. To assist playbook users, Table 1 defines the lead stakeholder for the key topical areas. The table aligns with the current Emergency Support Function (ESF) roles outlined in the California Emergency Plan (see Appendix E). ESFs are a grouping of governmental and certain private sector capabilities into an organizational structure to provide support, resources, program implementation, and services during a disaster or emergency.

The table helps the user identify their organizations' lead and supporting roles in disasters, which directs them to the appropriate sections and checklists in the playbook. For example, a transportation agency (e.g., California Department of Transportation, Contra Costa Transportation Authority) would find that they are a lead actor in transportation and evacuations. They would also be a supporting actor in emergency management, public communications, and AFN. The corresponding checklists for these areas are found in the "Preparedness & Response Strategies" section. For each checklist, agencies should review each listed item and determine steps needed (or already taken) to achieve that strategy.

**Figure 3: Graphical Outline of Playbook Elements**





**Table 1: Emergency Response Areas and Key Stakeholders Responsibility Mapping (Lead Actors Highlighted in Yellow)**

	Emergency Management	Public Communications	Public Health	Access and Functional Needs (AFN)*	Transportation and Evacuations	Care and Shelter
<b>California Emergency Support Function (ESF) Alignment</b>	ESF 5	ESF 2 ESF 15	ESF 8	No ESF See Note	ESF 1 ESF 13	ESF 6**
<b>Key Stakeholders</b>						
Transportation Agencies	X	X		X	X	
Public Transit Operators	X			X	X	
Private Mobility Operators	X			X	X	
Emergency Management Agencies	X	X	X	X	X	X
Fire Services	X	X		X	X	
Law Enforcement	X	X		X	X	
MPOs	X	X		X	X	
CBOs/NGOs	X		X	X	X	X
Social Service Agencies	X		X	X		X
Public Health Agencies	X		X	X		X
Health Facilities	X		X	X	X	X

\*Access and Functional Needs (AFN): A term used to describe individuals who need additional assistance in disasters including but not limited to individuals who are or have: 1) physical, developmental, or intellectual disabilities; 2) chronic conditions or injuries; 3) limited English proficiency; 4) older adults; 5) children; 6) low-income, homeless and/or transportation disadvantaged; and 7) pregnant women (California Office of Emergency Services, 2020).

\*\* Care and Shelter is often handed over to NGOs/CBOs (e.g., American Red Cross) by social service agencies, which often fall under public health agencies in California.

Note: Access and Functional Needs (AFN) are not specifically mapped to an ESF in the California Emergency Plan. The Office of Access and Functional Needs at the California Office of Emergency Services (i.e., state-level) aims to integrate needs and resources for AFN populations across emergency management systems. Consequently, emergency management is considered the lead actor.

# KEY TAKEAWAYS AND CONTEXT

In the following three sections, we present key takeaways from the 12 tracked case studies, PSPS event data, and expert interviews. These takeaways were used to help clarify and refine the preparedness and response strategies discussed by experts to address COVID-19 and an evacuation.

## CASE STUDIES OF COVID-19 AND EVACUATIONS

In this section, we present key takeaways below from 12 tracked case studies that involved an evacuation during COVID-19. Appendix A provides additional information from the 12 case studies including characteristics of the disaster, evacuation details, and strategies and challenges related to COVID-19.



**Strategies to reduce COVID-19 spread and exposure were most prevalent for care and sheltering, especially for congregate shelters.** Agencies and officials took two different approaches: enhancing sanitation at congregate shelters (e.g., spacing out beds, conducting COVID-19 tests and symptom checks) or redirecting evacuees to non-congregate shelters (e.g., offering hotel vouchers to evacuees).



**Strategies to address COVID-19 were not common for transportation or during evacuations.** While efforts were made during Hurricane Laura to decrease bus capacity and contract additional vehicles, most cases did not involve concerted changes to increase transportation safety. One possible explanation is that most smaller agencies, especially in more rural locations, do not have a public transit-based evacuation plan. Moreover, most evacuees tend to leave using a personal vehicle.



**Communication of COVID-19 risks and the distribution of PPE to evacuees was sporadic and dependent on individual case.** In some cases, agencies were proactive with stockpiling PPE and distributing resources at shelters. However, these actions were not consistent across cases.



**Almost no case study considered the specific needs of AFN populations.** This severe gap suggests that social equity continues to be an afterthought in evacuation planning. As a result, disadvantaged populations will struggle the most in disasters and evacuations, compounding inequalities related to COVID-19.



**With the exception of a few cases, agencies and local officials failed to produce comprehensive and holistic strategies to address the simultaneous crises of COVID-19 and an evacuation.** This indicates that the strategies in the following sections will offer considerable guidance for agencies moving forward.

## PUBLIC SAFETY POWER SHUTOFF EVENTS

This section on PSPS events offers a primer for decision-making in a multi-hazard context, which parallels the compounding impacts of COVID-19 and disasters. PSPS events were first used extensively in the U.S. following the Witch and Rice Canyon Wildfires in San Diego in 2007, when investigators determined that the fires were caused by downed power lines owned by San Diego Gas and Electric (SDG&E) (Nikolewski, 2017). In 2017 and 2018, multiple unprecedented wildfires caused by electrical equipment owned by companies and individuals renewed conversations around PSPS events as a wildfire mitigation tool. More recently, large-scale PSPS events, instituted by Pacific Gas & Electric (PG&E) and Southern California Edison (SCE) in 2019, led to the loss of power of millions of Californians (Luna et al., 2019; CPUC, 2019a; CPUC, 2019b; see Figure 4). Below, we present key takeaways from an analysis of two PSPS events in October 2019 using survey data from 210 East Bay, California residents. Appendix B provides demographic information of the survey respondents and more analyses.



**Preparedness activities were largely focused on charging electronics (both to be fully charged and with a backup charge available).** Other important preparedness activities included buying gas, learning more about the PSPS event from PG&E, getting cash, and gathering food/water.



**Nearly all participants received information about the PSPS event, indicating that information was widespread and delivered through multiple methods.** While most people found the sources of information to be trustworthy, only about one-third found the information to be extremely clear. With so many communication methods reaching respondents, agencies and utilities should ensure that messaging is consistent and clear.



**A very small proportion of the sample conducted an “evacuation,” in other words leaving their residence for an extended period time and staying overnight in another location.** While this indicates that less people would need to be evacuated if a wildfire occurred, the reduction of people at home may not be enough to significantly decrease evacuation congestion.



**About two-thirds of participants across all days for both PSPS events (October 9 to 11, 2019 and October 26 to 28, 2019) did not change their travel.** Typical travel was more common for the second PSPS event, likely because the event was not as widespread. The results indicate that travel patterns, even for large PSPS events, will be somewhat stable.



**When asked why participants left their residence during the PSPS event, participants were more likely to select: lack of access to power, lack of Internet, and lack of cell service.** Access to water, food, and medical care was less of an issue, though a small portion of the sample left their residence for those resources.



**A sizable percentage of the sample conducted an “extended trip” during the PSPS event.** These individuals returned home for the night but spent a significant portion of the day in another location. This is likely a result of the need to find power or Internet service, especially for those that needed to work from home.



**Respondents were most satisfied with the decision to shut off power and the communication of power outages.** However, a high percentage of respondents were not satisfied with PG&E actions related to providing resources to individuals without power and assistance to vulnerable and disadvantaged individuals. This indicates that social equity concerns must be addressed for future PSPS events by PG&E, regulators, and government agencies.

As PSPS events become more regular, local, regional, and state agencies must prepare for, respond to, and recover from these events, which can last upwards of a week. While PSPS events generally reduce wildfire risk (and therefore increase safety), several unexpected problems arise that still require research and planning including:

- The loss of power significantly reduces everyday functions at home and work, making it difficult to conduct regular tasks.
- Individuals that require power for medical assistance (e.g., breathing machines, home dialysis, oxygen), mobility (e.g., electric wheelchair, electric scooters), or refrigeration (e.g., medicine, food) will be severely endangered, impacting their health, quality of life, and safety.
- Power loss impacts several critical systems including transportation and lighting, which makes travel more difficult.
- The loss of power (and sometimes mobile phone signal and data) may lead to significant challenges in distributing mandatory evacuation orders and facilitating safe and effective evacuations if a wildfire still occurs during the event from a different ignition sources (e.g., lightning, campfires, vehicle fire, other human activity).

**Figure 4: Darkened Buildings in Oakland, CA during a PSPS Event to Reduce Wildfire Risk**  
(Source: Noah Berger/AP)



Fig. 4. Berger, N. (2019). California Wildfires Power Shutoffs [Online Image]. Associated Press. Accessed April 21, 2021 via the University of California, Berkeley Library.

## EXPERT INTERVIEWS

In this section, we present key takeaways (in no specific order) from the expert interviews that continue to set the playbook's context. The takeaways below offer considerations for and apart from COVID-19 response and give a high-level synopsis of evacuation and transportation strategies for disasters in California. Each takeaway is expanded in the following pages.



### **Complex Processes**

Evacuation and emergency management actions are highly complex, involving different stakeholders with different experience levels.



### **Responsibility**

Responsibility is highly fractured, especially in evacuations.



### **Local Expectations**

All levels of government expect local agencies to carry out most disaster preparedness, response, and recovery strategies.



### **Communication**

Communication to the public and coordination among agencies is vital but remains an ongoing challenge for many jurisdictions.



### **COVID-19 Protections**

COVID-19 measures in disasters are largely focused on reducing spread and exposure.



### **Shelters in COVID-19**

Shelters are challenged with ensuring COVID-19 protections and making spaces comfortable for evacuees.



### **Social Equity**

Social equity remains an important, but not integral, part of evacuation and disaster planning.



### **Ongoing Challenges**

Challenges unrelated to COVID-19 in evacuations and disasters are still not being addressed (e.g., providing enough public transit in disasters).



### **PSPS Events**

PSPS events are a growing concern for California and potentially for other fire-prone states.



### **Best Practices**

Best practices are largely known for emergency management, but not all agencies implement them due to limited funding and resources.



**Evacuation and emergency management actions are highly complex, involving different stakeholders with different experience levels.** While emergency management agencies are often the primary responders (and lead agency) in disasters, other agencies are designated as support or even leads for aspects of disaster management. For example, the California Department of Transportation (Caltrans) is designated as the lead for the Emergency Support Function (ESF) #1 – Transportation. However, the California Emergency Plan is not clear on how Caltrans responds in a disaster, leaving most decisions up to internal Caltrans guidance. Moreover, local level agencies without experience in disasters may be unprepared for a major event. Experts noted that local level agencies often do not have the resources, time, or funding to plan for disasters or evacuations.



**Responsibility is highly fractured, especially in evacuations.** In multiple cases, experts did not know who would be in charge of an evacuation. This fracturing was especially apparent between the local and state level, as it is unclear at what point state agencies should begin to assist local agencies. Moreover, laws and regulations in California do not clearly designate a lead agency for evacuations. While law enforcement is often cited in emergency plans and typically conducts door-to-door notifications and traffic management, they are not necessarily the entity to issue evacuation orders. This confusion in responsibility further increases the chances of failed evacuations, which is exacerbated as new levels of government and other emergency personnel begin to respond to the disaster.



**All levels of government expect local agencies to carry out most disaster preparedness, response, and recovery strategies.** While local agencies are perceived to be more flexible and able to quickly implement new protocols (e.g., mask mandates), agencies at every level will likely need to adjust their actions to better manage disasters. Local agencies can provide more nuanced information on local needs and capacity. However, local agencies may need to work with regional, state, and federal agencies to procure needed resources (e.g., personnel, PPE). Agencies from the local to the federal level may need to conduct self-evaluations to identify potential areas of weaknesses. In addition, agencies at every level can leverage lessons learned from previous disasters (e.g., wildfires, norovirus) and resources (e.g., social media) to address challenges.



**Communication to the public and coordination among agencies is vital, but this remains an ongoing challenge for many jurisdictions.** Communication and coordination are key elements for emergency management. Preemptive actions, such as gaining resources (e.g., time and money for trainings) and developing relationships with partners to support systems and plans (e.g., Standardized Emergency Management System [SEMS], Continuity of Operations Plan [COOP]) are critical, particularly in times when agencies and stakeholders are limited in resources (e.g., supplies, staff). Communication to the public needs to be clear, direct, truthful, frequent, and available in a variety of languages and platforms. These messages should also use visual aids/graphics and come from trusted resources (e.g., governor, social media influencers). Despite these important strategies, multiple experts noted that severe communication and coordination challenges remain, especially for large-scale events that

cross multiple jurisdictions (e.g., expansive wildfires). Key issues include: differing levels of preparedness between jurisdictions, slow decision-making in a multi-jurisdictional disaster, use of opt-in communication systems to alert the public, and lack of public trust of some sources of information. Similar to other challenges, minimal funding and staffing decreases preparedness and response capabilities for communication and coordination.



**COVID-19 measures in disasters are largely focused on reducing spread and exposure.**

Experts focused on measures that would protect evacuees and disaster workers from COVID-19 spread and exposure. However, experts spent less time discussing how measures would be communicated to the public or how to rethink evacuations in the long-term to handle another pandemic. Moreover, experts generally did not consider how COVID-19 may impact evacuee behavior. For example, residents in danger may be less likely to evacuate over fear of exposure to COVID-19. Strategies used on public transit during normal conditions, such as requiring mask wearing (see Figure 5), offer mechanisms to reduce exposure and spread.

**Figure 5: Evacuees with Masks Escape Hurricane Laura on Evacuation Buses (Source: Gerald Herbert/AP)**



Fig. 5. Herbert, G. (2020). Tropical Weather [Online Image]. Associated Press. Accessed April 21, 2021 from the University of California, Berkeley Library.



**Shelters are challenged with ensuring COVID-19 protections and making spaces comfortable for evacuees.**

Sheltering, which is a fragmented and ad hoc process, is typically assigned to the American Red Cross, CBOs, and other NGOs. Experts noted that evacuees would stay in shelters for a long period of time, increasing possible exposure. Other concerns included: a limited pool of volunteers due to COVID-19 concerns, burnout from medical professionals, and decreased goods access from increased demand and disrupted supply chains. Historically, shelters also have not been designed with people's comfort in mind (e.g., lack of privacy). Non-congregate sheltering (e.g., hotels, motels, college dorms) used to reduce COVID-19 spread could be leveraged in future disasters after the pandemic to improve shelter quality.



**Social equity remains an important, but not integral, part of evacuation and disaster planning.** Experts were generally concerned with providing transportation, sheltering, and resources to vulnerable populations. However, not all actionable strategies considered the social equity implications, suggesting that AFN populations have not been fully integrated into the philosophy or planning of evacuations. These populations may face unique challenges in disasters that are not readily known. For example, personal savings are often cited as a critical component of preparedness, but many disadvantaged people may not be able to achieve the level of savings needed to evacuate. A lack of accessible transportation and sheltering also continues to be a major issue in evacuations, especially for populations that are more vulnerable to COVID-19 (e.g., people with medical conditions, individuals with disabilities, older adults).



**Challenges unrelated to COVID-19 in evacuations and disasters are still not being addressed.**

While experts were prompted to provide challenges and strategies for a dual scenario of COVID-19 and an evacuation, experts often shifted to challenges and strategies that only addressed evacuations and related disasters (without considering COVID-19). The implication of this framing is that many challenges in evacuations remain the same, with or without COVID-19. For example, providing enough transportation resources via public transit for carless individuals to evacuate remains an ongoing challenge. Evacuations also require rapid and early alerts (e.g., through multiple media outlets), which experts noted as sometimes not occurring. The identification of these non-COVID-19 issues by experts (see Appendix D) reinforces that strategies must look beyond COVID-19 to address systemic challenges.



**PSPS events are a growing concern for California and potentially for other fire-prone states.**

Experts were prompted on challenges and strategies related to PSPS events, and many spent a significant amount of time discussing the effects of this new hazard. The cascading impact of power failure on emergency operations and transportation in evacuations presents a new crisis that requires upfront planning. Long-term measures (e.g., back-up power, increase grid resilience) require immediate attention through legislation and other policy mechanisms. Utility companies must also overcome trust and communication challenges. Altogether, the challenges arising from PSPS events will require new preparedness plans, coordination, and emergency management efforts in California and other states to mitigate wildfire risk.



**Best practices are largely known for emergency management, but not all agencies implement them due to limited funding and resources.**

Best practices mentioned by experts focused largely on flexibility and continual knowledge-building. Evacuation and response plans should be short, scalable, and have checklists. Communication, especially with vulnerable populations, must occur rapidly, regularly, and accurately with easy accessibility for all members of the public. Other best practices included: working with specialists to help inform evacuation plans, practicing table top exercises, continually updating rosters and staff lists, recruiting and training volunteers, and developing processes for after-action reports and hot washes. Despite these known practices, small and local agencies have struggled implementing these practices without adequate funding or staff resources.



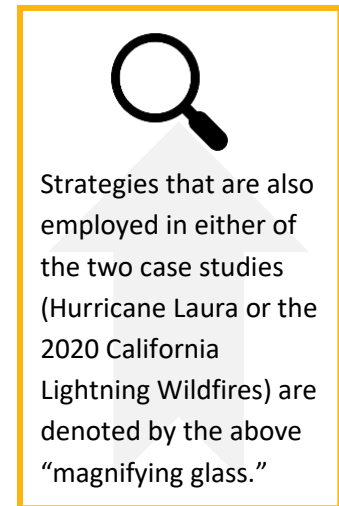
# PREPAREDNESS & RESPONSE STRATEGIES

The disaster cycle consists of four phases: preparedness, response, recovery, and mitigation. Though some definitions of the disaster cycle name these phases differently, the concept is largely consistent. In this playbook, we focus on strategies related to preparedness and response. Preparedness involves readiness actions and capabilities that need to be taken or be built prior to a crisis. Response involves actions and strategies that are implemented during the crisis. In both cases, pre-planning is necessary. From the expert interviews, we categorized strategies as follows:

1. Disaster and COVID-19 specific preparedness strategies; and
2. Disaster and COVID-19 specific response strategies.

These strategies were integrated into checklists and grouped by topical area that correspond to stakeholder responsibilities (see Table 1):

- Checklist 1: Emergency Management;
- Checklist 2: Public Communication;
- Checklist 3: Public Health;
- Checklist 4: Access and Functional Needs (AFN);
- Checklist 5: Transportation and Evacuations; and
- Checklist 6: Care and Shelter.



Together, these response and preparedness strategies offer holistic guidance to public agencies and other stakeholders in evacuations during the COVID-19 pandemic. Additional disaster preparedness and response strategies that are not specifically focused on COVID-19 are presented in Appendix D. Strategies should be adjusted based on local contexts and fine-tuned based on the potential hazard.

## LIMITATIONS OF STRATEGIES





The expert interviews were conducted in Summer 2020, when governments were responding to the COVID-19 pandemic but had conducted little preparation for a disaster during COVID-19. Consequently, the expert interviews focused on the preparedness and response elements of the disaster cycle. While experts were asked about possible recovery strategies, they did not discuss the strategies in conjunction with COVID-19. Consequently, the recovery strategies are not included in this playbook. Future work should update this playbook with both recovery and mitigation elements, especially for the potentially endemic nature of COVID-19 and future pandemics.

While experts represented multiple different fields, the following checklists only contain a portion of strategies for preparing for and responding to a disaster and COVID-19. Agencies should not consider these checklists as complete, but rather as a starting point. This is especially true for the public communication, public health, and access and functional needs (AFN) checklists. Supplementary checklists that do not directly involve COVID-19 can be found in Appendix D. These additional strategies also provide comprehensive guidance to agencies but should not be considered as complete or static.

# EMERGENCY MANAGEMENT

Emergency management is led by emergency management agencies at the local, regional, and state levels. Other government agencies, CBOs, NGOs, and private sector companies interface with emergency management agencies during a disaster. The primary tasks of emergency management agencies are to mitigate, prepare for, respond to, and recover from disasters. When a disaster is not occurring, agencies are predominately tasked with planning for future disasters. Checklist 1 presents emergency management strategies for stakeholders to address both a disaster and COVID-19. Stakeholders should: 1) review each listed strategy in Checklist 1, and 2) determine steps needed (or already taken) to achieve that strategy.



## Checklist 1: Emergency Management Strategies for a Disaster and COVID-19

Disaster and COVID-19 Preparedness	
<input type="checkbox"/> <b>Update Plans:</b> Continually update evacuation and emergency plans (e.g., in response to COVID-19 and other evolving threats)	
<input type="checkbox"/> <b>Adapt Emergency Operation Centers:</b> Rethink emergency operation centers (EOCs) to abide by COVID-19 requirements (e.g., social distancing/sanitation)	
<input type="checkbox"/> <b>Develop and Revisit Mutual Aid Agreements:</b> Develop/enhance rapidly deployable mutual aid agreements (e.g., state-to-state), memoranda of understanding with companies, and community-based programs (e.g., neighbor-to-neighbor) along with revisiting contracts with suppliers of hygiene equipment (e.g., for trailers, washing stations, toilets, showers), personal protective equipment (PPE) providers, and paratransit operators	
<input type="checkbox"/> <b>Develop Online Training Programs:</b> Develop online training programs (e.g., for public transit operators, shelter workers, volunteers) to learn how to safely move and shelter vulnerable populations (e.g., people with disabilities, houseless populations), reduce COVID-19 exposure, and provide high quality assistance	
<input type="checkbox"/> <b>Bolster Supply Stockpiles:</b> Increase stockpiles of critical supplies, especially PPE (e.g., masks, gloves) and identify storage facilities through memoranda of understanding and mutual aid agreements	
<input type="checkbox"/> <b>Create Standard Procedures and Systems:</b> Develop standard operating procedures (SOPs) (e.g., replicable step-by-step instructions) for COVID-19 and other communicable diseases and standardize emergency management systems (e.g., radio frequencies, firefighting couplings)	
<input type="checkbox"/> <b>Engage with Public Health Departments:</b> Engage with public health officials and designate key liaisons in public health departments across resources (e.g., transportation, sheltering, etc.)	
Disaster and COVID-19 Response	
<input type="checkbox"/> <b>Enhance Testing of Traveling Groups:</b> Provide COVID-19 testing for people that are moving regularly across that state during a disaster (e.g., firefighters, immigrants, inmates, etc.)	
<input type="checkbox"/> <b>Create End Points for Supplies:</b> Leverage parking lots/curbspace/rights-of-way for effective delivery, pickup and drop-off locations for key COVID-19 and disaster relief supplies	

# PUBLIC COMMUNICATION

Public communication is led by emergency management agencies at the local, regional, and state levels. However, multiple other government agencies, CBOs, and NGOs may assist in public-facing communication. Public communication typically involves the development and distribution of messages across multiple platforms to the public regarding the disaster, associated evacuations, resources, recovery mechanisms, and other important information. Checklist 2 presents public communication strategies for stakeholders to address both a disaster and COVID-19. Stakeholders should: 1) review each listed strategy in Checklist 2, and 2) determine steps needed (or already taken) to achieve that strategy.

## Checklist 2: Public Communication Strategies for a Disaster and COVID-19

<b>Disaster and COVID-19 Preparedness</b>	
<input type="checkbox"/>	<b>Standardize COVID-19 Guidelines:</b> Coordinate COVID-19 requirements and directives (developed by health departments) between jurisdictions (e.g., mask requirement) and provide messaging to the public
<b>Disaster and COVID-19 Response</b>	
<input type="checkbox"/>	<b>Change Frontline Communication Systems:</b> Rethink how frontline workers and personnel receive information (e.g., apps, smartphones, loudspeakers) to improve situational awareness and reduce the spread of COVID-19 that can occur during mass communication meetings 
<input type="checkbox"/>	<b>Enhance Public Messaging:</b> Develop clear, direct, truthful, and frequent messaging and communication regarding COVID-19 and evacuations that employs visual aids, graphics, and information delivery in multiple languages, accessibility formats, and are distributed by trusted information providers (such as those who provide COVID-19 information such as the governor, social media influencers, local officials) 

# PUBLIC HEALTH

Public health in disasters is led by public health agencies at the local, regional, and state levels. Public health agencies are tasked with responding to public health needs before, during, and after disasters, especially as it relates to emergency medical services. During the COVID-19 pandemic, many agencies are also tasked with reducing COVID-19 exposure and spread during a disaster. Checklist 3 presents public health strategies for stakeholders to address both a disaster and COVID-19. Stakeholders should: 1) review each listed strategy in Checklist 3, and 2) determine steps needed (or already taken) to achieve that strategy.


## Checklist 3: Public Health Strategies for a Disaster and COVID-19

<b>Disaster and COVID-19 Preparedness</b>
<input type="checkbox"/> <b>Develop Medical Facility Plans:</b> Develop hospital/medical facility patient movement plans and evacuation plans (e.g., leveraging public transit, transportation network companies or ridehailing, paratransit, and/or old ambulances) to other hospitals/medical facilities that reduce the spread of and exposure from COVID-19
<b>Disaster and COVID-19 Response</b>
<input type="checkbox"/> <b>Build COVID-19 Capabilities:</b> Devote support staff to specifically address COVID-19 needs (separate from other emergencies and disasters to not overwhelm first responders and key emergency/disaster personnel in the EOC)
<input type="checkbox"/> <b>Support COVID-19 Needs and Social Distancing:</b> Ensure social distancing measures are maintained and encouraged (e.g., markings on the ground, visual and audio reminders, continuous instructions from volunteers and employees, reduced capacity in shelters and vehicles) and provide an adequate supply of PPE (e.g., masks, gowns, shields) to medical facilities for use in all disaster phases

## ACCESS AND FUNCTIONAL NEEDS (AFN)

Individuals with AFN are individuals who need additional assistance in disasters including but not limited to individuals who are or have: 1) physical, developmental, or intellectual disabilities; 2) chronic conditions or injuries; 3) limited English proficiency; 4) older adults; 5) children; 6) low-income, homeless and/or transportation disadvantaged; and 7) pregnant women. While this topic area is not an ESF, most preparedness, response, and recovery planning and activities for these individuals are conducted by an emergency management agency. Ensuring social, racial, and environmental equity in disasters is strongly linked to assisting AFN populations. Checklist 4 presents AFN strategies for stakeholders to address both a disaster and COVID-19. Stakeholders should: 1) review each listed strategy in Checklist 4, and 2) determine steps needed (or already taken) to achieve that strategy.

### Checklist 4: Access and Functional Needs Strategies for a Disaster and COVID-19

<b>Disaster and COVID-19 Preparedness</b>	
<input type="checkbox"/> <b>Identify Needs and Improve Assistance:</b> Identify people with disabilities (e.g., through comprehensive lists of baseline needs that maintains privacy) so that further assistance can be distributed, and people can be protected from COVID-19 exposure*	
<input type="checkbox"/> <b>Conduct Outreach Activities:</b> Create and sustain active outreach to disability communities and disability experts to increase emergency preparedness and identify needs as they relate to disasters and COVID-19	
<p>*This identification and needs assessment process will need to occur prior to a disaster and associated evacuation.</p>	
<b>Disaster and COVID-19 Response</b>	
<input type="checkbox"/> <b>Protect Vulnerable Populations:</b> Enforce/develop laws and regulations (e.g., Americans with Disabilities Act, alert systems, planning requirements) and provide critical assistance (e.g., transportation, sheltering, reentry, settlement, supplies) to protect people during evacuations and COVID-19	

## Hurricane Laura Case Study

Hurricane Laura was an Atlantic hurricane that impacted the Greater Antilles, Lesser Antilles, and multiple states in the U.S. (i.e., Louisiana, Texas, Florida, Mississippi, and Arkansas) in late August 2020 (NOAA, 2020a). At the time, most impacted areas had health orders to prevent COVID-19 spread (e.g., voluntary or mandatory mask wearing, social distancing), but did not have restrictive stay-at-home orders (NASHP, 2021). Reaching a Category 4 classification, Hurricane Laura led to evacuation orders for over 500,000 people in Texas and Louisiana and caused storm surges of over 17 feet in some locations (Augustin et al., 2020; NOAA, 2020a).

Months before Hurricane Laura developed, in March 2020, the Texas Department of Emergency Management began preparing for a disaster compounded with COVID-19 (McCullough and Garnham, 2020). Some early COVID-19 actions, including stockpiling PPE for evacuees, first responders, and volunteers, assisted in increasing available resources during the hurricane (McCullough and Garnham, 2020). With the storm approaching, officials in Texas worked to incorporate COVID-19 precautions into their mandatory evacuation order messaging and contracted more buses from transportation providers to allow for social distancing of carless evacuees (Augustin et al., 2020; Fernandez and Svitek, 2020; Feuer, 2020; McCullough and Garnham, 2020). In Texas and Louisiana, these buses were stocked with PPE and had reduced capacity to decrease potential COVID-19 exposure and spread (Martinez, 2020; Augustin et al., 2020). Evacuees were sent to central locations, where they were required to wear masks and be socially distant (Childs, 2020; Murphy and Siemaszko, 2020) (see Figure 6 for an example before Hurricane Laura).

**Figure 6: Socially Distanced and Masked Evacuees Wait for Evacuations Buses Before Hurricane Laura (Source: Gerald Herbert/AP)**



Fig. 6. Herbert, G. (2020). Tropical Weather Louisiana [Online Image]. Associated Press. Accessed April 21, 2021 from the University of California, Berkeley Library.

Rather than reconfigure congregate shelters, officials in Texas and Louisiana (in conjunction with the American Red Cross) decided to send evacuees from centralized locations to hotel and motel rooms (Sweat, 2020; Karlin, 2020; Childs, 2020; McCullough and Garnham, 2020). Individual meals and other goods were delivered through different agencies, such as by American Red Cross volunteers (Sweat, 2020). However, both states experienced setbacks – Texas struggled with distributing key goods to evacuees at non-congregate shelters including prescriptions, baby formula, and diapers (Sweat, 2020), while Louisiana faced challenges in finding enough hotel rooms for evacuees (Karlin, 2020). For congregate shelters that were established, social distancing was practiced, and some shelters provided PPE, COVID-19 testing materials, and other medical resources (Feuer, 2020; Augustin et al., 2020)

With concerns over COVID-19 that sometimes superseded the hurricane hazard (Henderson, 2020), research suggested that evacuees might make different choices in evacuations as a result of COVID-19 (Dahl, 2020). Low-income households, people of color, and other vulnerable populations have also been disproportionately impacted by COVID-19, especially economically (e.g., job losses, pay reductions) (Declet-Barreto, 2020). As a result, some members of these demographic groups did not have enough resources to evacuate and chose to remain behind to reduce their COVID-19 exposure (Vasquez et al., 2020; Natario, 2020). The inequitable and compounding impacts of COVID-19 and disasters led to a challenging decision: risk contracting COVID-19 or risk severe injury or death from Hurricane Laura. Key findings from the case study are summarized below in Figure 7.





**Figure 7: Key Takeaways from Hurricane Laura Case Study**

Planning	COVID-19 Protocols	Equitable Resources
<ul style="list-style-type: none"><li>• Medical, sheltering, and transportation resources should be planned in advance, especially resources needed to reduce COVID-19 exposure and spread.</li></ul>	<ul style="list-style-type: none"><li>• Communication of COVID-19 protocols should be conducted broadly and regularly through established channels, including via evacuation orders.</li></ul>	<ul style="list-style-type: none"><li>• Resources need to be directed to vulnerable populations with evacuation hesitancy AND those who have been disproportionately impacted by COVID-19.</li></ul>

# TRANSPORTATION AND EVACUATIONS

Transportation and evacuations are led by transportation agencies and law enforcement. Transportation refers to the management of: 1) the transportation infrastructure, and 2) the movement of people and/or goods in and out of disaster areas. Checklist 5 presents transportation and evacuation strategies for stakeholders to address both a disaster and COVID-19. Stakeholders should: 1) review each listed strategy in Checklist 5, and 2) determine steps needed (or already taken) to achieve that strategy.

## Checklist 5: Transportation and Evacuation Strategies for a Disaster and COVID-19







<b>Disaster and COVID-19 Preparedness</b>	
<input type="checkbox"/> <b>Develop Private Vehicle Evacuation Plans:</b> Create/bolster evacuation plans and response measures for private vehicle travel (which reduces COVID-19 spread) that decrease congestion (e.g., phased evacuation plans, signal priority) and encourage resident to leave early and quickly*	
<input type="checkbox"/> <b>Implement Standardized COVID-19 Protocols:</b> Implement standardized COVID-19 response and protocols (based on Centers for Disease Control and Prevention, American Public Transportation Association guidelines) for vehicles across public transit agencies in disasters	
<input type="checkbox"/> <b>Support Social Distancing:</b> Develop procedures/operations that support social distancing of people within a public transit or shared vehicle (e.g., taping off seats, capacity reduction)	
<input type="checkbox"/> <b>Support Safe Work:</b> Ensure transportation professional workforce has either Internet training (i.e., within a virtual Emergency Operations Center, traffic management systems) or COVID-19 safe in-person training (if the job is not remote) to perform disaster tasks during COVID-19	
<input type="checkbox"/> <b>Review Lessons Learned:</b> Research lessons learned from Ebola, norovirus, and other viruses to inform transportation and emergency response during COVID-19	
<p>*A parallel public transit plan should also be developed for individuals without access to a vehicle.</p>	
<b>Disaster and COVID-19 Response</b>	
<input type="checkbox"/> <b>Increase Sanitation:</b> Increase cleaning frequency and thoroughness of vehicles (e.g., disinfectant fog at the end of the day/route; surface cleaning on touchpoints)	
<input type="checkbox"/> <b>Require Masks:</b> Require masks to be worn on all public transit vehicles and transfer points	
<input type="checkbox"/> <b>Supply Personal Protective Equipment:</b> Supply drivers and evacuees with PPE including masks, face shields, and gloves, and other key supplies (e.g., hand sanitizer)	
<input type="checkbox"/> <b>Implement COVID-19 Operator Protection Efforts:</b> Implement barriers (e.g., plastic sheets), new protocols (e.g., rear-door boarding), contactless payment (e.g., cashless), and/or new procedures (e.g., safe protocols for helping individuals with disabilities) to protect operators from COVID-19	
<input type="checkbox"/> <b>Leverage Existing Communications:</b> Leverage changeable message signs and traveler information (e.g., 211, 511, Highway Advisory Radio) to inform people of evacuations and COVID-19	
<input type="checkbox"/> <b>Leverage Shared Mobility:</b> Use shared mobility options (e.g., ridesharing, carsharing, taxis) and other right-sized vehicles (e.g., shuttles) to move people and reduce COVID-19 spread	



## CARE AND SHELTER

Care and shelter is typically led by social service agencies, which often reside within public health agencies. However, most care and shelter management is coordinated by NGOs (such as the American Red Cross) and/or local CBOs. Assistance beyond sheltering, such as the distribution of food, clothing, non-medical care, family reunification, and victim recovery, is also covered by this topic area. Checklist 6 presents care and shelter strategies for stakeholders to address both a disaster and COVID-19. Stakeholders should: 1) review each listed strategy in Checklist 6, and 2) determine steps needed (or already taken) to achieve that strategy.

### Checklist 6: Care and Shelter Strategies for a Disaster and COVID-19

Disaster and COVID-19 Preparedness	
<input type="checkbox"/> <b>Consider Non-Congregate Shelters:</b> Consider and pre-plan for providing non-congregate sheltering options (e.g., hotels, motels, fairgrounds, college dorms, stadiums, peer-to-peer sharing) in disasters and access to transportation for AFN populations to reduce potential COVID-19 exposure	
<input type="checkbox"/> <b>Designate a Health Liaison for Sheltering:</b> Designate at least one public health official to determine needs for shelters to reduce COVID-19 exposure and spread	
Disaster and COVID-19 Response	
<input type="checkbox"/> <b>Implement Screening:</b> Implement pre-shelter screening checks for key symptoms and critical care needs (e.g., COVID-19 positive, AFN) and create a protocol for COVID-19 positive evacuees to be directed to quarantined spaces or non-congregate shelters	
<input type="checkbox"/> <b>Space Out Evacuees:</b> Set up partitions around beds, space beds 6 feet or more apart, and create isolated rooms/tents	
<input type="checkbox"/> <b>Designate Quarantine Space:</b> Create separate quarantine space for COVID-19 positive evacuees (e.g., isolated rooms/tents, non-congregate shelters to reduce exposure)	
<input type="checkbox"/> <b>Supply Personal Protective Equipment:</b> Provide PPE (e.g., masks, gloves) and sanitizing supplies (e.g., hand sanitizer) to all evacuees and volunteers at shelters	
<input type="checkbox"/> <b>Mandate Masks:</b> Require masks be worn at all shelter facilities	
<input type="checkbox"/> <b>Improve Air Systems:</b> Improve filters on shelters' ventilation systems and increase amount of frequency of cleaning/sanitization to reduce exposure	
<input type="checkbox"/> <b>Reduce Food Sharing:</b> Offer pre-packaged food, rather than shared buffet meals	

## 2020 California Lightning Wildfires Case Study

In mid-August 2020, a series of lightning storms ignited multiple large-scale wildfires including the CZU Complex Fire, SCU Complex Fire, and LNU Complex Fire, all in the San Francisco Bay Area. These complex fires (i.e., multiple fires in close proximity managed by the same firefighting unit) together burned approximately 840,000 acres, destroyed over 3,000 structures, killed six people, and led to evacuation orders for an estimated 127,000 people (Cal Fire, 2020a; Cal Fire, 2020b; Green, 2020; Szydlowski, 2020; Evans, 2021; KTVU Staff, 2020a; KTVU Staff, 2020b; KCRA Staff, 2020; Fimrite, 2020; ABC10 Staff, 2020; KQED Staff, 2020). At this time, California was under a restrictive shelter-in-place order that limited business openings, required mask wearing in most public places, and encouraged social distancing with members of other households (NASHP, 2021).

Following the outbreak of the wildfires, public officials and the American Red Cross opened multiple congregate shelters for evacuees. Shelters took precautions against COVID-19 including instituting temperature checks, requiring mask wearing, placing beds six feet apart, keeping cleaning supplies on hand, and eliminating buffet lines to reduce food sharing (Sierra and Nguyen, 2020; Ting, 2020). In addition to these modifications to reduce COVID-19 exposure and spread, officials in San Mateo County provided hotel vouchers to evacuees to reduce the number of people at congregate shelters (Sierra and Nguyen, 2020). However, concerns remained about possible exposure in public shelters (Bion, 2020), even leading some to refuse to evacuate (Romo, 2020).

**Figure 8: An Outdoor and Temporary Evacuation Point in Butte County, CA for Wildfires in September 2020 (Source: Adam Beam/AP)**

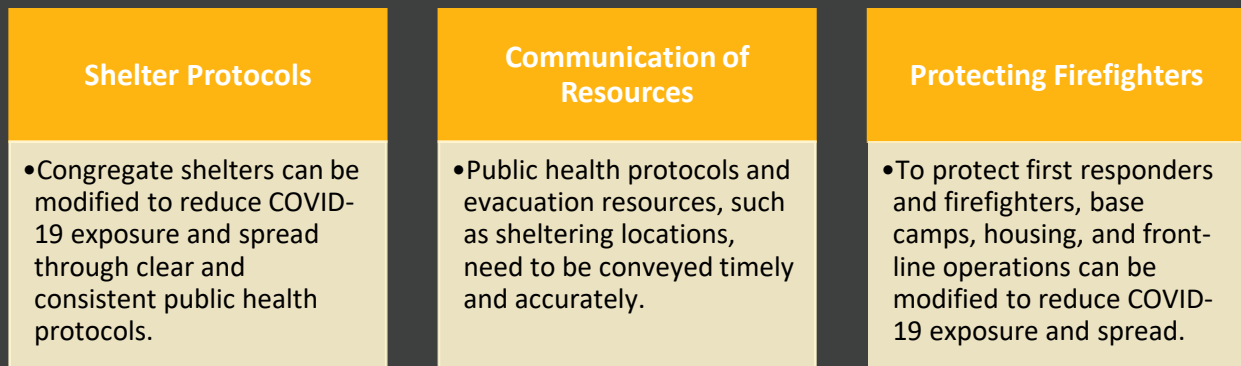


Fig. 8. Beam, A. (2020). California Wildfires [Online Image]. Associated Press. Accessed April 21, 2021 via the University of California, Berkeley Library.

San Mateo County also set up several evacuation checkpoints (see Figure 8 for an example in Butte County, CA), which provided evacuees with information about available resources rather than having evacuees go to shelters to receive this information (Sierra and Nguyen, 2020). However, due to breakdowns in communication, some evacuees of the LNU Lightning Complex Fire failed to receive timely emergency alerts and did not know the location and availability of evacuation and animal shelters (Booth, 2020). The hazardous air from wildfire smoke was also a concern: weakening of the lungs could increase COVID-19 vulnerability (Bion, 2020).

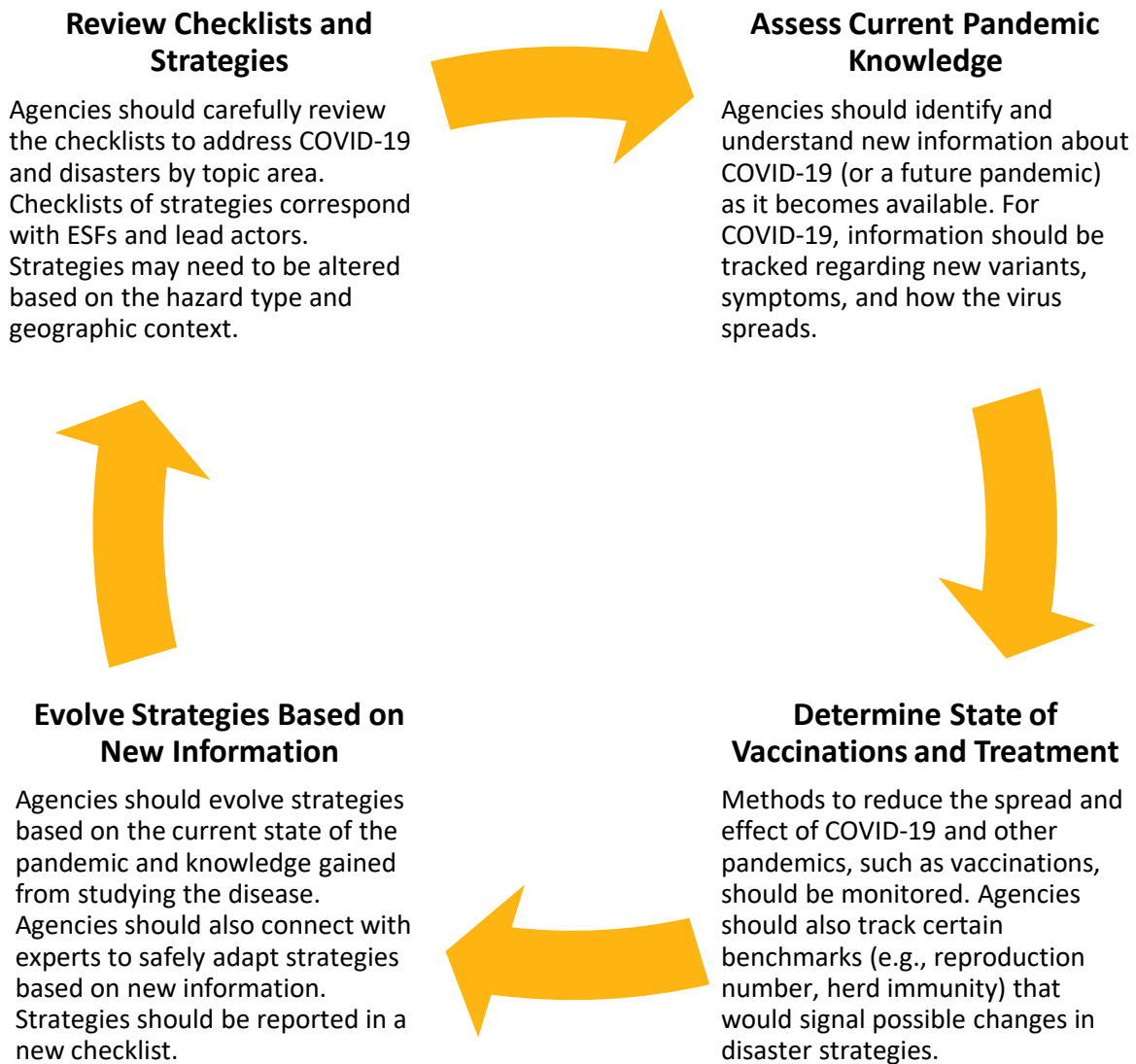
A significant number of actions to curb COVID-19 spread during the wildfires focused on firefighters (Bion, 2020). At firefighting camps, crews from different regions of the country practiced social distancing from other crews, temperatures were checked frequently, and firefighters were required to wear masks (Siegler, 2020; Romo, 2020; Murphy, 2020). Camps also had sanitation stations, and meals were boxed and distributed by masked and gloved workers (Siegler, 2020). Daily briefings were administered remotely, rather than the traditional process of large group gatherings (Murphy, 2020). In other cases, firefighters were provided housing at hotels (Murphy, 2020). On the frontlines, firefighters were equipped with PPE (Romo, 2020), though some firefighters reported that they struggled to breathe through the masks while battling the blazes (Murphy, 2020). Key takeaways from the case study are summarized below in Figure 9.

**Figure 9: Key Takeaways from the 2020 California Lightning Wildfires Case Study**



## EVOLUTION OF STRATEGIES

The above checklists are not static and should be viewed as a starting point for agencies. New information about COVID-19, emerging variants, and changes to vaccination and treatment efforts should be consistently tracked and assessed. These evolving aspects of the pandemic will also need to be addressed in disasters. Consequently, agencies must use current information and knowledge to guide the development of evolved and adapted strategies for addressing both COVID-19 and a disaster. In addition, the checklists should also be adapted based on different epidemics and pandemics. Characteristics of diseases, such as how they are spread, could significantly alter the strategies presented in this playbook. For example, a virus that spreads significantly via surfaces (in addition as an aerosol) would require additional precautions.



# CONCLUSIONS

This playbook provides a series of strategies and key takeaways that agencies involved in evacuations should take in the event of a major disaster during COVID-19. The playbook:

- Shares recent lessons learned from case studies of compounding disasters during the pandemic;
- Offers a primer for the potential compounding impact of PSPS events and disasters;
- Highlights current considerations in the emergency management and evacuation fields; and
- Provides a series of actionable checklists to address COVID-19 and a compounding disaster.

This playbook was developed as an actionable guide for various local, regional, and state agencies involved in disasters and evacuations. Given the limitations in methodology and sample sizes, the playbook is by no means complete. Additional lessons learned and best practices over the course of 2021 will offer more evidence for specific actions presented here. Moreover, the playbook requires adaptation to fit local circumstances, hazards, and contexts. Despite these limitations, the research, playbook, and actionable checklists provide an easy tool for agencies to address key challenges related to COVID-19 and evacuations, protecting people from both disasters and pandemics.

# APPENDIX A – CASE STUDY TABLE OF DISASTERS IN 2020

In Appendix A, Table 2 presents information on 12 case studies of disasters that occurred during COVID-19. While other disasters were also tracked, these cases represent important examples where COVID-19 strategies were employed or from which lessons learned could be developed.

**Table 2: Case Studies of 12 Disasters in 2020 that Coincided with COVID-19**

Case Study	Location	Approximate Evacuation	Estimated Description*	COVID-19 Lessons Learned/Strategies	Sources
<p><b>Hurricane Laura</b></p> <p>August 20, 2020 - August 29, 2020</p>	<p><b>Greater Antilles; Lesser Antilles;</b> Louisiana, Texas, Florida, Mississippi, and Arkansas, <b>U.S.</b></p>	<p>About 500,000 people ordered to evacuate in Texas and Louisiana</p>	<ul style="list-style-type: none"> <li>• <b>Storm Strength:</b> Category 4</li> <li>• <b>Landfall:</b> 1 am CDT in Cameron, Louisiana with 150 mile per hour (mph) winds</li> <li>• <b>Storm Surge:</b> Over 17 feet in some locations</li> <li>• <b>Deaths:</b> At least 20 people</li> </ul>	<p><b>Emergency Management:</b> The Texas Department of Emergency Management began preparing for a disaster, such as Hurricane Laura, and COVID-19 in March 2020.</p> <p><b>Public Communication:</b> When releasing evacuation orders, Texas officials reminded people to be cautious of COVID-19.</p> <p><b>Public Health:</b> Emergency management agencies in Texas provided cleaning supplies and masks where needed following the hurricane.</p> <p><b>Public Health:</b> Residents may have felt more at risk from COVID-19 in shelters than the storm.</p> <p><b>Public Health:</b> Texas stockpiled PPE to prepare for a simultaneous disaster and COVID-19.</p> <p><b>AFN:</b> Low-income households were disproportionately impacted by COVID-19 and some did not have the financial resources needed to evacuate.</p> <p><b>AFN:</b> People of color and other vulnerable populations were disproportionately impacted by COVID-19 and Hurricane Laura.</p> <p><b>Transportation and Evacuations:</b> Texas increased the number of contracted buses for evacuations from 50 to 400 to allow for social distancing on vehicles.</p> <p><b>Transportation and Evacuations:</b> Texas and Louisiana ordered 400 and 65 buses, respectively, to help evacuate more than 4,000 people. The buses were stocked with PPE and carried less passengers than full capacity to accommodate social distancing.</p> <p><b>Transportation and Evacuations:</b> COVID-19 may have impacted decision-making for a variety of residents and evacuees.</p> <p><b>Care and Shelter:</b> Some people evacuated to North Texas where the American Red Cross provided rooms at local hotels (to allow for social distancing) and three meals a day. A partner organization, Trusted World, helped distribute toiletries and clothing. However, the Red Cross had difficulties distributing goods including prescriptions, baby formula, and diapers.</p> <p><b>Care and Shelter:</b> Louisiana public officials struggled finding hotels to provide rooms for evacuees. As a result, some evacuees traveled to neighboring states. In Louisiana, only a few hundred people were sheltered in congregate shelters, compared to thousands in non-congregate shelters.</p> <p><b>Care and Shelter:</b> Congregate shelters were limited in capacity to ensure social distancing.</p> <p><b>Care and Shelter:</b> Austin, Texas established a medical shelter for evacuees with COVID-19 symptoms or other medical conditions. Texas provided evacuees with PPE and sent COVID-19 testing materials and staff to shelters.</p>	<p>NOAA (2021a); Sweat (2020); Karlin (2020); Childs (2020); Fernandez and Svitek (2020); Augustin et al. (2020); Vasquez et al. (2020); Declat-Barreto (2020); Martinez (2020); Feuer (2020); Henderson (2020); Dahl (2020); McCullough and Garnham (2020); Murphy and Siemaszko (2020); Natario (2020)</p>

<p><b>Hurricane Isaias</b></p> <p>July 30, 2020 - August 6, 2020</p>	<p><b>Bahamas;</b> Southeast, Mid-Atlantic, and Northeast, <b>U.S.</b></p>	<p>Several thousand people in North Carolina and voluntary orders distributed in coastal and low-lying areas of Florida</p>	<ul style="list-style-type: none"> <li>• <b>Storm Strength:</b> Category 1</li> <li>• <b>Characteristics:</b> Strong winds (e.g., upwards of 90 mph) and heavy rainfall in Florida and Georgia</li> <li>• <b>Storm Surge:</b> 2.7-foot storm surge in some locations</li> <li>• <b>Other:</b> Flooded roads, downed power lines and trees</li> </ul>	<p><b>Public Health:</b> Florida officials prepared 10,000 PPE kits to distribute to evacuees.</p> <p><b>Transportation and Evacuations:</b> Florida officials were concerned about a lack of volunteers to support evacuations and sheltering.</p> <p><b>Care and Shelter:</b> Shelters were opened in Florida and North Carolina but very few people evacuated to them, likely due to concerns regarding COVID-19. In Florida, 10 shelters were opened but only had 266 people and in North Carolina, 17 shelters were opened but remained mostly empty.</p> <p><b>Care and Shelter:</b> Florida developed a program to give individuals with COVID-19 symptoms hotel vouchers.</p> <p><b>Care and Shelter:</b> Florida counties struggled with finding space for shelters that abided by CDC guidelines.</p> <p><b>Care and Shelter:</b> Miami-Dade County planned on screening evacuees for COVID-19, separating infected and non-infected individuals, deploying rapid result tests, booking hotel rooms for infected individuals, requiring face masks, and making COVID-19 kits available.</p>	<p>NOAA (2021b); The Weather Channel Staff (2020); Frank (2020); Wesner Childs (2020); Charles and Harris (2020); Cohen (2020)</p>
<p><b>CZU Lightning Complex Fire</b></p> <p>August 16, 2020 - September 22, 2020</p>	<p>Santa Cruz and San Mateo Counties, California, <b>U.S.</b></p>	<p>About 77,000 people ordered to evacuate</p>	<ul style="list-style-type: none"> <li>• <b>Cause:</b> Lightening</li> <li>• <b>Acres Burned:</b> 86,509</li> <li>• <b>Structures Destroyed:</b> 1,490</li> <li>• <b>Structures Damaged:</b> 140</li> <li>• <b>Deaths:</b> 1 person</li> </ul>	<p><b>Emergency Management:</b> Firefighters enroute to fires were spaced out in a greater number of vehicles to increase social distancing.</p> <p><b>Transportation and Evacuations:</b> San Mateo County opened two evacuation checkpoints where evacuees could check in with staff for resources. Officials provided hotel vouchers to evacuees to reduce the number of people at congregate shelters.</p> <p><b>Care and Shelter:</b> Local agencies took precautions against COVID-19 including requiring temperatures checks before entering shelters, placing beds six feet apart, and keeping cleaning supplies on hand.</p>	<p>Green (2020); Szydowski (2020); Sierra and Nguyen (2020); Bion (2020); Evans (2021)</p>
<p><b>SCU Lightning Complex Fire</b></p> <p>August 16, 2020 - October 1, 2020</p>	<p>Santa Clara, Alameda, Contra Costa, San Joaquin, Merced, and Stanislaus Counties, California, <b>U.S.</b></p>	<p>About 7,000 people ordered to evacuate</p>	<ul style="list-style-type: none"> <li>• <b>Cause:</b> Lightning</li> <li>• <b>Acres Burned:</b> 396,624</li> <li>• <b>Structures Destroyed:</b> 222</li> <li>• <b>Structures Damaged:</b> 26</li> <li>• <b>Injuries:</b> 6 people</li> </ul>	<p><b>Emergency Management:</b> At firefighting camps, crews from different regions in the U.S. practiced social distancing from other crews and had their temperature checked before entering the camp. The camps also had sanitation stations, and all meals were boxed and distributed by masked and gloved workers. Daily briefings were administered remotely, rather than the traditional process of large group gatherings.</p> <p><b>Emergency Management:</b> There was not widespread COVID-19 testing at the firefighter base camps.</p> <p><b>Care and Shelter:</b> Evacuation centers and shelters were modified to support social distancing practices including using temperature checks, requiring people to wear masks, and eliminating buffet lines for food distribution.</p>	<p>Siegler (2020); KTVU Staff (2020a); Cal Fire (2020a); Ting (2020)</p>

<p><b>LNU Lightning Complex Fire</b></p> <p>August 16, 2020 - October 2, 2020</p>	<p>Napa, Sonoma, Lake, Yolo, and Solano Counties, California, <b>U.S.</b></p>	<p>At least 35,000 (Napa/Sonoma) and 8,000 (Solano) people ordered to evacuate</p>	<ul style="list-style-type: none"> <li>• <b>Cause:</b> Lightning</li> <li>• <b>Acres Burned:</b> 363,220</li> <li>• <b>Structures Destroyed:</b> 1,491</li> <li>• <b>Structures Damaged:</b> 232</li> <li>• <b>Deaths:</b> 5 people</li> <li>• <b>Injuries:</b> 4 people</li> </ul>	<p><b>Emergency Management:</b> Firefighting crews were equipped with PPE, required to maintain social distancing, and provided with housing in hotels or other remote locations with greater access to handwashing stations.</p> <p><b>Emergency Management:</b> Firefighters reported struggling to breathe through masks.</p> <p><b>Public Communication:</b> Residents failed to receive emergency alerts on a timely basis, expressed confusion over evacuation boundaries, and experienced little clarity in the location and availability of evacuation and animal shelters.</p>	<p>Cal Fire (2020b); KCRA Staff (2020); Fimrite (2020); KTVU Staff (2020b); Booth (2020); Romo (2020); Murphy (2020); KQED Staff (2020); ABC10 Staff (2020)</p>
<p><b>Cameron Peak Fire</b></p> <p>August 13, 2020 - October 14, 2020</p>	<p>Larimer County, Colorado, <b>U.S.</b></p>	<p>About 13,000 people ordered to evacuate</p>	<ul style="list-style-type: none"> <li>• <b>Cause:</b> Unknown</li> <li>• <b>Spread:</b> Extreme temperatures, low humidity, rough terrain, gusty wind</li> <li>• <b>Acres Burned:</b> 208,913</li> <li>• <b>Structures Destroyed:</b> 461</li> <li>• <b>Other:</b> Largest fire in Colorado history</li> </ul>	<p><b>Emergency Management:</b> An after-action debriefing from the Incident Management Teams that responded to the Cameron Peak and Williams Fork fires resulted in a variety of future best practices including: providing consistent expectations (e.g., social distancing protocols), replacing the previous Resource Order Capability system with the new Interagency Resource Ordering Capability for improved capacity (e.g., for contact tracing), establishing a public health coordinator within the incident team, developing protocols to test for COVID-19, offering mass testing, conducting contact tracing, and improving communications about COVID-19 testing.</p> <p><b>Emergency Management:</b> Firefighter base camps abided by local county COVID-19 regulations (e.g., isolating, contact tracing) and had a separate COVID-19-focused medical unit. Firefighters were also sometimes housed in local hotels.</p> <p><b>Shelter and Care:</b> The Red Cross paid for more than 27,000 hotel nights and housed 2,271 evacuees in 35 hotels and two "Kampgrounds of America" campgrounds.</p> <p><b>Shelter and Care:</b> Hotels and other shelters were cleaned regularly and abided by COVID-19 precautions.</p>	<p>Ferrier (2020); US Forest Service (2021); Cameron Peak FLA Team (2020); Powell (2020); Udell (2020); Fleskes (2020)</p>
<p><b>East Troublesome Fire</b></p> <p>October 14, 2020 - November 30, 2020</p>	<p>Grand County, Colorado, <b>U.S.</b></p>	<p>About 35,000 people ordered to evacuate</p>	<ul style="list-style-type: none"> <li>• <b>Cause:</b> Under investigation</li> <li>• <b>Spread:</b> High winds, low humidity</li> <li>• <b>Acres Burned:</b> 193,812</li> <li>• <b>Structures Damaged:</b> 250</li> <li>• <b>Deaths:</b> 2 people</li> </ul>	<p><b>Transportation and Evacuation:</b> In cleared evacuated areas, firefighters provided 2-hour windows twice a week for residents to visit their homes for necessities and insurance purposes.</p> <p><b>Shelter and Care:</b> Grand County used a credentialing system to collect evacuee information and help with relocation.</p> <p><b>Shelter and Care:</b> Hotels and lodges were used to shelter evacuees.</p>	<p>Kirk (2020); D'Argonne (2020); Oravetz et al. (2020); US Forest Service (2020); Cote and Sylte (2020); Nicholson (2020)</p>
<p><b>Pine Gulch Fire</b></p> <p>July 31, 2020 - September 23, 2020</p>	<p>Mesa and Garfield Counties, Colorado, <b>U.S.</b></p>	<p>Unknown (discrepancy of number)</p>	<ul style="list-style-type: none"> <li>• <b>Cause:</b> Lightning strike</li> <li>• <b>Acres Burned:</b> 139,007 acres</li> </ul>	<p><b>Emergency Management:</b> Firefighting crews from throughout the state abided by local COVID-19 requirements.</p> <p><b>Emergency Management:</b> Firefighters were required to have daily temperature checks, and individuals who contracted COVID-19 were isolated.</p> <p><b>Emergency Management:</b> To reduce COVID-19 spread and exposure, firefighting base camp designs and operations were altered with COVID-19 screenings, radio-based briefings, separated camps, and delivered meals.</p>	<p>Mesa County Sheriff's Office (2020); Vincent (2020); Sylte (2020); Brown (2020)</p>



<p><b>Five Mile Swamp Fire</b></p> <p>May 4, 2020 - May 14, 2020</p>	<p>Santa Rosa County, Florida, <b>U.S.</b></p>	<p>About 1,100 <i>households</i> ordered to evacuate</p>	<ul style="list-style-type: none"> <li>• <b>Cause:</b> Loss of control of prescribed burn</li> <li>• <b>Spread:</b> Strong winds, low humidity</li> <li>• <b>Acres Burned:</b> 2,215</li> </ul>	<p><b>Shelter and Care:</b> Initially, shelters were not opened due to spreading and exposure concerns with COVID-19.</p> <p><b>Shelter and Care:</b> A shelter was opened at the Milton Community Center, and staff asked individuals to abide by guidelines developed by the Centers for Disease Control and Prevention.</p>	<p>Pensacola News Journal Staff (2020); WTXL Staff (2020); Little (2020); WEAR Staff (2020)</p>
<p><b>Midland Dam Crisis and Flooding</b></p> <p>May 19, 2020</p>	<p>Midland County, Michigan, <b>U.S.</b></p>	<p>About 10,000 people ordered to evacuate (3,500 homes)</p>	<ul style="list-style-type: none"> <li>• <b>Event:</b> Rainwaters led to flooding of the Edenville and Sanford dams</li> <li>• <b>Flood Height:</b> 35 foot high in some locations</li> <li>• <b>Structures Damaged/Destroyed:</b> 2,500 homes and businesses</li> <li>• <b>Damage:</b> Total of \$175 million</li> </ul>	<p><b>Public Health:</b> Evacuees were told to wear masks and practice social distancing.</p> <p><b>Public Health:</b> Some COVID-19 protocols were temporarily suspended to allow for faster emergency response.</p> <p><b>Transportation and Evacuations:</b> Mid-Michigan Medical Center in Midland transferred more than 100 patients (including COVID-19 patients on ventilators) to other nearby hospitals, preparing for the potential impact of flooding.</p> <p><b>Shelter and Care:</b> Shelters took precautions against COVID-19 (e.g., increasing cleaning procedures, turning away volunteers). The American Red Cross opened nine shelters that abided by COVID-19 best practices at the time.</p>	<p>Matheny (2020); New York Times Staff (2020); Nelson (2020); Chavez et al. (2020); Clarke (2020); Oosting (2020); Thompson (2020)</p>
<p><b>2020 Aegean Sea Earthquake</b></p> <p>October 30, 2020</p>	<p>Samos, Greece; Izmir, <b>Turkey</b></p>	<p>Unknown</p>	<ul style="list-style-type: none"> <li>• <b>Size:</b> 7.0 magnitude</li> <li>• <b>Aftershocks:</b> 470 (16 with magnitudes over 4.0)</li> <li>• <b>Deaths:</b> 100+ people in Turkey/Greece</li> <li>• <b>Injuries:</b> 800+ people in Turkey/Greece</li> <li>• <b>Tsunami:</b> Waves averaging around two meters</li> </ul>	<p><b>Public Health:</b> The World Health Organization provided emergency assistance and monitored the COVID-19 infections in Greece and Turkey after the earthquake.</p> <p><b>Public Health:</b> The local governor encouraged people to maintain social distancing and wear masks.</p> <p><b>Public Health:</b> Turkey's Health Ministry distributed masks and disinfectants to protect against COVID-19.</p>	<p>Mack (2020); CNN Staff (2020); BBC News Staff (2020); Manchanda (2020); Bilginsoy and Becatoro (2020); UNESCO (2020); Wilks (2020); UC Berkeley Seismology Lab (2020); Sariyuce et al., (2020)</p>
<p><b>2020 Guatemala Landslides</b></p> <p>November 5, 2020</p>	<p>Queja, <b>Guatemala</b></p>	<p>About 3,000 people ordered to evacuate</p>	<ul style="list-style-type: none"> <li>• <b>Event:</b> Rainfall from Hurricane Eta resulting in a landslide</li> <li>• <b>Deaths:</b> 125 people</li> <li>• <b>Structures Destroyed:</b> 20-25 homes</li> </ul>	<p><b>Emergency Management:</b> The local national coordinator for disaster reduction suspended searching for bodies due to concerns about risks (e.g., from COVID-19, land instability).</p> <p><b>Public Health:</b> Local organizations were seeking donations of supplies to protect evacuees against COVID-19 (e.g., face masks, hand sanitizer).</p>	<p>Wirtz and Semple (2020); Cuffe (2020)</p>
<p>* Some detailed numbers (e.g., fatalities, damaged structures, acres burned, etc.) sometimes differ by source. These numbers should be considered as estimates.</p>					

# APPENDIX B – ANALYSIS OF PUBLIC SAFETY POWER SHUTOFF EVENT DATA

Appendix B contains additional exploratory analysis of PSPS event data from 210 East Bay, California residents regarding two separate PSPS events in 2019. The analysis focuses on transportation and mobility questions, along with key questions about the impact of the event, communications related to the event, and resident opinions of PG&E’s decision-making. Table 6 and Table 7 present key demographic information of the sample. Key takeaways from the analysis are presented in the section of “Public Safety Power Shutoff Events” in “Key Takeaways and Context.”

## IMPACT OF PSPS EVENTS ON EAST BAY RESIDENTS

We first present key descriptive statistics on the impact of two October 2019 PSPS events on East Bay residents in Contra Costa and Alameda Counties (see Table 3). Several key takeaways were developed based on the data below.

- A significant portion of residents lost power in both events (including a majority for the October 9-11 Event), which corresponds with the widespread outages for millions of Californians.
- While residences lost power, workplaces were much less likely to lose power, probably because most job centers in the Bay Area are not in the wildland-urban interface (WUI) (i.e., the boundary between urban/developed land and undeveloped land) or in high fire risk zones. It should be noted a large portion of the sample does not work.
- Most people did not miss a day of work or school during the PSPS events.
- Preparedness activities were less common during the October 26 to 28 event, likely because less residences lost power and some activities for the first event may have prepared the household for the second event. Almost all individuals conducted some preparations.
- A significant number of people prepared/restocked emergency supply kits, learned about their community's emergency plans, and updated their own emergency plans. These activities are a positive outcome of the events, as they can lead to longer-term preparedness for crises and increased awareness of hazards and risks.

**Table 3: Impact of PSPS Events on East Bay Residents (n=210)**

	October 9-11	October 26-28
<b>Residence Lost Power</b>	<i>n=210</i>	<i>n=210</i>
Yes	65%	46%
No	33%	49%
No answer	2%	6%
<b>Place of Work Lose Power</b>	<i>n=210</i>	<i>n=210</i>
Yes	16%	11%
No	36%	39%

Not employed	45%	44%
No answer	3%	6%
<b>Days off from Work/School</b>		
	<i>n=210</i>	<i>n=210</i>
Zero	50%	51%
One	5%	7%
Two	4%	3%
Three	3%	0%
Four	1%	0%
Not employed/Not a student	33%	30%
No answer	3%	8%
<b>Pre-PSPS Preparedness Actions (select all that apply)</b>		
	<i>n=210</i>	<i>n=210</i>
Prepared electronics to be fully charged	84%	67%
Bought gas	67%	48%
Learned more about the PSPS event from PG&E	66%	44%
Prepared electronics with backup charging (e.g., power bank)	61%	53%
Got cash ahead of time	55%	39%
Bought food/water	47%	33%
Prepared/restocked emergency supply kit	42%	28%
Left car out of garage	31%	27%
Made arrangements with family/friends/neighbors	23%	14%
Learned about community's emergency plans	22%	17%
Bought/prepared a generator	19%	17%
Updated family emergency plans	18%	11%
Other	16%	11%
Did not prepare	5%	15%
<b>Stayed Overnight Away from Residence at Any Point</b>		
	<i>n=210</i>	<i>n=210</i>
Yes	7%	7%
No	90%	86%
No answer	3%	7%

Note: Percentages may not equal 100% due to rounding

## COMMUNICATION OF PSPS EVENTS

In a PSPS event, communication of information — including when power will be stopped and restored, resources for disadvantaged individuals, and preparedness guidelines — are critical for an effective response. Table 4 presents key descriptive statistics of the communication of PSPS events. Several key takeaways include the following below.

- Participants received information most about the PSPS event through text messages, communication methods via PG&E, and alerts from subscribed services. The results suggest that

mobile phones are a primary tool for disseminating information. Moreover, uptake of alert subscription services is high in the East Bay.

- Social media remains a highly used form of communication, along with more traditional television and radio announcements.
- Official sources were a highly used method for information as opposed to word-of-mouth which can be less accurate.

**Table 4: Communication of PSPS Events**

	<b>October 9-11</b>	<b>October 26-28</b>
<b>Received Information About PSPS Event</b>	<i>n=210</i>	<i>n=210</i>
Yes	96%	92%
No	4%	4%
No Answer	0%	4%
<b>Communication Regarding PSPS Event (select all that apply)</b>	<i>n=201</i>	<i>n=193</i>
Text message	76%	69%
Any communication method via PG&E	69%	54%
Alert from a subscribed service	58%	55%
Television announcement	41%	45%
Social media (Facebook, Instagram, Twitter, etc.)	39%	42%
Radio announcement	36%	37%
Government or governmental agency website	35%	32%
Newspaper website or news website	28%	28%
Smartphone application	24%	25%
Told by a friend	21%	17%
Told by a family member	20%	18%
Reverse 911 call	17%	16%
Physical newspaper	17%	18%
Told by someone else (coworker, neighbor, etc.)	17%	13%
Employer	14%	12%
Flyer	5%	3%
Personal interaction with a public official	3%	4%
Billboard or road message board	2%	2%
Other	1%	1%
<b>Sought Additional Information</b>	<i>n=201</i>	<i>n=193</i>
Yes	79%	70%
No	18%	25%
No answer	3%	5%
<b>Trust Level of Sources</b>	<i>n=201</i>	<i>n=193</i>
Very high	50%	42%
Somewhat high	32%	36%

Neither high nor low	10%	10%
Somewhat low	4%	5%
Very low	2%	3%
No answer	2%	4%
<b>Clarity of Information</b>	<i>n=201</i>	<i>n=193</i>
Extremely clear	31%	32%
Somewhat clear	39%	41%
Neither clear nor unclear	8%	7%
Somewhat unclear	13%	10%
Extremely unclear	7%	7%
No answer	2%	3%

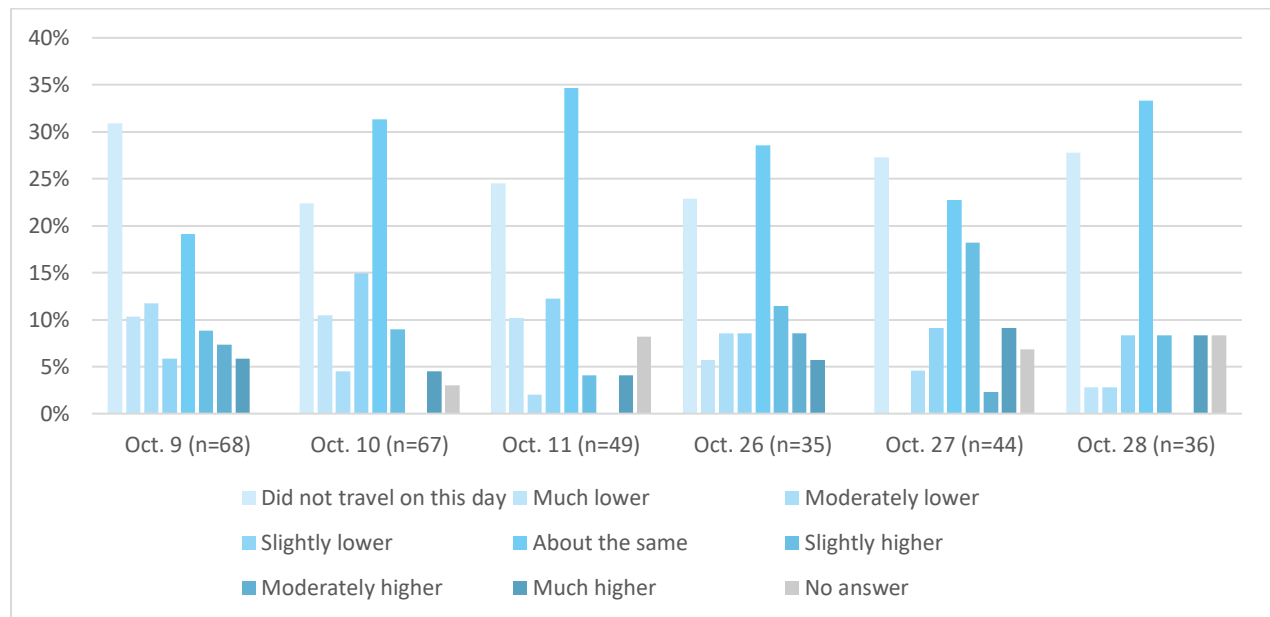
Note: Percentages may not equal 100% due to rounding

## CHANGES IN TRAVEL BEHAVIOR DURING PSPS EVENTS

Despite the increasing occurrence of PSPS events, little is known about how people make travel decisions during them. We asked participants if they altered their travel, followed by what trips were added or subtracted. Results are shown in Table 5, and key takeaways are provided below.

- Of those who changed their travel, more people took less trips or did not travel (see Figure 10). A significant proportion of people also traveled about the same. Results suggest that PSPS events largely decrease the number of trips taken, which indicates more shelter-in-place behavior at the residence. Officials do not need to expect significant congestion during the event, allowing for more targeted response related to supplying electricity to only key intersections, transportation systems (e.g., rail), and facilities (e.g., tunnels).
- For changes in trip purposes, people generally took less trips to the grocery store, restaurants and bars, and social/recreational events for both PSPS events. Work trips and non-shopping errands decreased for the first PSPS event.
- However, some people took more trips for restaurants and bars for both events, indicating that some people still wanted to conduct leisure activities. Grocery shopping and commute to work also increased for some individuals.
- Of those who changed their travel, a very small proportional altered their transportation mode. It should be noted that this may change as transportation continues to electrify.

**Figure 10: Change in Number of Trips during PSPS Events (who did not conduct typical travel)**



**Table 5: Changes in Travel Behavior During PSPS Events**

	Oct. 9	Oct. 10	Oct. 11	Oct. 26	Oct. 27	Oct. 28
<b>Change in Travel Behavior</b>		<i>n=210</i>			<i>n=210</i>	
Typical Travel	61%	62%	68%	74%	70%	72%
Changed Travel	32%	32%	23%	17%	21%	17%
No answer	7%	6%	9%	9%	9%	11%
<i>Sample of Those Who Changed Travel</i>	<i>n=68</i>	<i>n=67</i>	<i>n=49</i>	<i>n=35</i>	<i>n=44</i>	<i>n=36</i>
<b>Percent of People Who Took Less Trips by Purpose</b>						
Grocery shopping	40%	34%	16%	34%	30%	14%
Non-shopping errands	22%	15%	6%	0%	0%	0%
Commute for work	21%	13%	16%	9%	9%	17%
Restaurant/bar	18%	16%	12%	29%	18%	14%
Social/recreational events (e.g., sports events, concerts, hikes)	18%	10%	6%	6%	11%	11%
Other shopping (non-grocery)	13%	7%	4%	0%	0%	0%
Gym	12%	12%	6%	6%	9%	8%
Healthcare services or medical appointment	10%	7%	0%	6%	0%	0%
Pickup or drop off children	9%	4%	0%	0%	2%	0%
Buying items on the Internet	7%	4%	0%	3%	7%	6%
Visit friends or relatives	6%	3%	6%	3%	7%	0%
Commute for school	4%	4%	4%	3%	2%	3%
Long-distance trip	3%	1%	0%	9%	0%	0%
Travel to/from transit	3%	1%	0%	0%	2%	0%

Airport	3%	0%	0%	0%	2%	0%
Other	1%	1%	2%	3%	5%	6%
<b>Percent of People Who Took More Trips by Purpose</b>						
Restaurant/bar	15%	18%	10%	17%	9%	14%
Other shopping (non-grocery)	13%	7%	4%	0%	0%	0%
Grocery shopping	12%	7%	2%	20%	9%	8%
Non-shopping errands	10%	6%	0%	0%	0%	0%
Commute for work	6%	6%	4%	11%	9%	11%
Long-distance trip	3%	0%	4%	6%	11%	8%
Visit friends or relatives	3%	1%	4%	9%	7%	3%
Gym	3%	1%	2%	0%	2%	3%
Commute for school	1%	3%	0%	0%	2%	6%
Social/recreational events (e.g., sports events, concerts, hikes)	1%	1%	2%	0%	2%	0%
Buying items on the Internet	1%	3%	0%	0%	5%	0%
Travel to/from transit	0%	0%	0%	0%	0%	0%
Pickup or drop off children	0%	0%	0%	0%	2%	3%
Healthcare services or medical appointment	0%	0%	0%	0%	5%	3%
Airport	0%	0%	0%	0%	0%	0%
Other	6%	6%	4%	9%	11%	6%
<b>Mode of Transportation Change</b>						
Yes	9%	7%	6%	11%	9%	6%
No	84%	78%	73%	83%	70%	69%
No answer	7%	15%	20%	6%	20%	25%
<b>Extended Trip During Day due to PSPS</b>						
Yes	34%	27%	29%	43%	34%	25%
No	65%	64%	57%	54%	52%	61%
No answer	1%	9%	14%	3%	14%	14%
<b>Reasons to Leave Residence due to PSPS (select all that apply)</b>						
Did not have power	37%	36%	27%	46%	36%	25%
Did not have Internet	37%	31%	24%	40%	27%	19%
Did not have cell service	16%	18%	16%	17%	16%	19%
Did not have heating/cooling	16%	13%	10%	23%	7%	6%
Did not feel safe	12%	9%	8%	9%	9%	11%
Did not have access to water	3%	1%	2%	3%	0%	0%
Did not have access to food	3%	1%	4%	6%	5%	6%
Needed medical care	1%	1%	2%	3%	0%	0%
Other	19%	16%	22%	29%	32%	17%

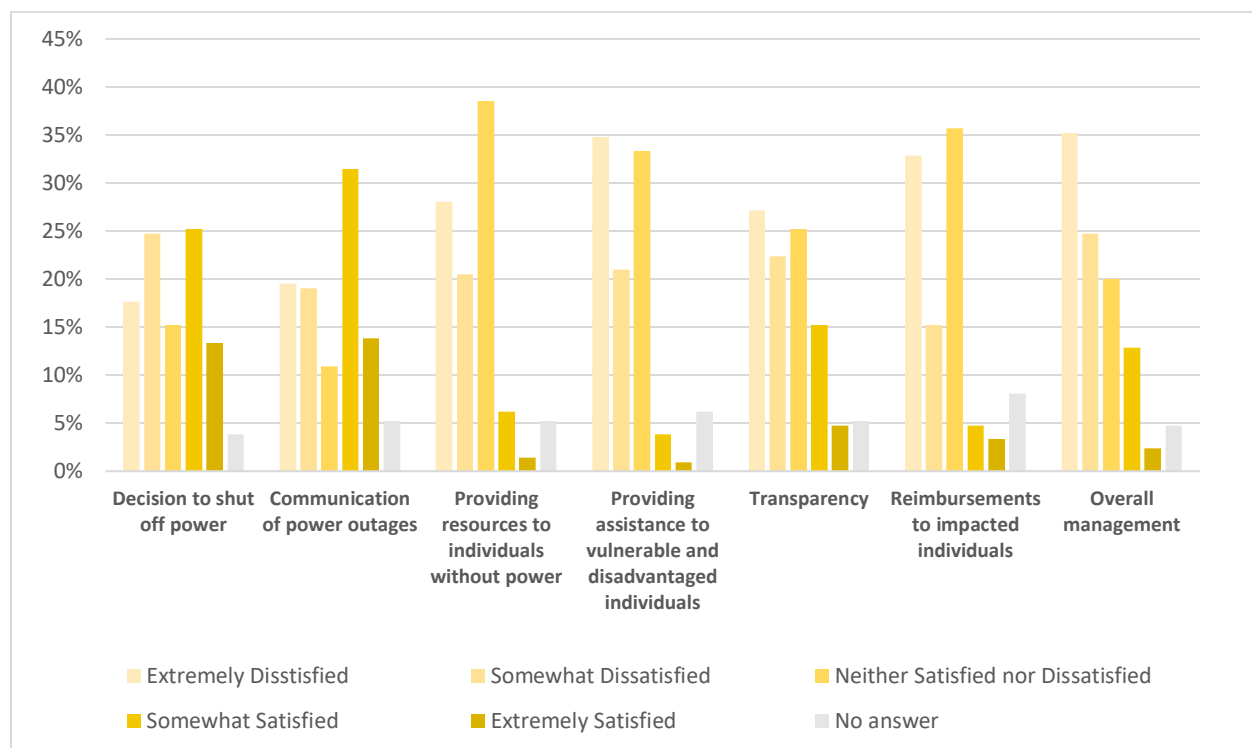
Note: Percentages may not equal 100% due to rounding

## OPINIONS OF PG&E ACTIONS DURING PSPS EVENTS

Finally, we asked participants about their opinion of actions by PG&E during the PSPS events in Figure 11 and Figure 12. These questions were aimed at uncovering possible directions for policymaking in PSPS events to better serve the needs of impacted communities. Several key takeaways are provided below.

- Satisfaction between PSPS events was relatively similar, indicating that any major issues during the first PSPS event were not resolved by PG&E in the second event.
- Respondents were generally not satisfied with transparency, though satisfaction did rise slightly for the October 26 to 28 PSPS event. PG&E (and other utilities) should establish more trust with the public through transparent decision-making.
- Most respondents were not satisfied with reimbursements to impacted individuals. While PG&E has a set policy for long power outages due to storms, the utility does not have a set policy for reimbursement from PSPS events.<sup>1</sup>
- Most people expressed neutral satisfaction or dissatisfaction in PG&E’s overall management of the PSPS events. While satisfaction improved slightly for the October 26 to 28 PSPS event, only a small percentage of the sample was extremely or somewhat satisfied.

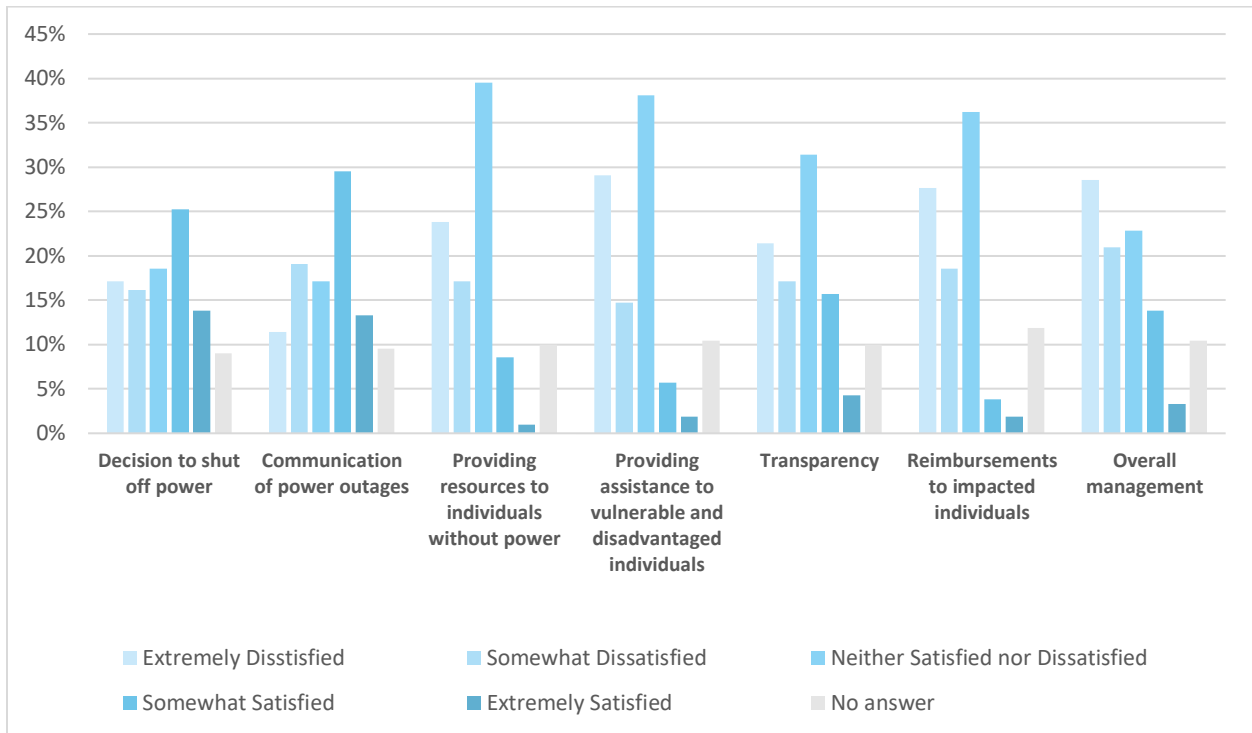
**Figure 11: Satisfaction of PG&E Actions - October 9-11**



<sup>1</sup> PG&E did provide reimbursements via a bill credit of \$100 to customers (\$250 for small businesses) for the October 9-12 PSPS event. However, this was not extended for any other event (Bender, 2019).



**Figure 12: Satisfaction of PG&E Actions - October 26-28**



**Table 6: Individual Characteristics of PSPS East Bay Sample (n=210)**

<b>Gender</b>		<b>Cell Phone Type</b>	
Male	35.2%	Do not own a cell phone	1.0%
Female	64.8%	Own a typical cell phone (non-smartphone)	3.3%
		Own a smartphone	95.7%
<b>Age</b>		<b>Access to Internet at Home</b>	
18-24	1.0%	Yes	98.6%
25-34	7.1%	No	1.4%
35-44	11.9%	<b>In-Vehicle or Smartphone Navigation</b>	
45-54	19.0%	Yes	87.6%
55-65	24.8%	No	12.4%
65+	36.2%	<b>Primary Mode of Transportation</b>	
<b>Race</b>		Drive alone using a car, SUV, pickup, or van	71.9%
Asian	7.6%	Rail (e.g., light/heavy, subway/metro, trolley)	9.0%
Black or African American	2.4%	Work from home or telecommute	4.3%
Mixed	3.3%	Other	3.8%
Native American/Alaska Native	0.5%	Carpool/vanpool	2.9%
Native Hawaiian or Pacific Islander	0.5%	Bus	2.4%
Other	4.3%	Bicycle	1.9%
Prefer Not to Answer	3.3%	Walk	1.9%
White	78.1%		

<b>Ethnicity</b>		Prefer not to answer	1.4%
Hispanic	6.7%	Shuttle service	0.5%
Not Hispanic	86.7%		
Prefer not to answer	6.7%	<b>Previous Wildfire Evacuee</b>	
		Yes	23.3%
		No	76.7%
<b>Education</b>		<b>Previous Wildfire Experience</b>	
Less than high school	0.0%	Zero	64.3%
High school graduate	1.4%	One	18.1%
Some college	9.5%	Two	7.1%
2-year degree	4.3%	Three	1.9%
4-year degree	39.0%	Four	2.4%
Professional degree	34.8%	Five	1.0%
Doctorate	10.5%	More than 5	5.2%
Prefer not to answer	0.5%		
<b>Employment Status</b>		<b>Evacuated from Oakland Hills Fire</b>	
Employed full time	37.1%	Yes	11.9%
Employed part time	9.5%	No	88.1%
Unemployed looking for work	4.8%		
Unemployed not looking for work	5.7%	<b>Evacuated from Any Other East Bay Hills Fire</b>	
Retired	41.9%	Yes	6.7%
Student	0.0%	No	93.3%
Disabled	0.5%		
Prefer not to answer	0.5%	<b>Previous Earthquake Experience (+4.5 magnitude)</b>	
		Yes	89.0%
		No	11.0%
<b>Marriage Status</b>		<b>Previous Flooding Experience</b>	
Never married	12.4%	Yes	17.6%
Married	72.9%	No	82.4%
Divorced	10.0%		
Widowed	2.4%		
Separated	2.4%		
		<b>Decision Making Role in Emergencies</b>	
		I am the sole decision maker	19.0%
		I am the primary decision maker with input from another household member	29.0%
		I share equally in making decisions with another household member(s)	50.5%
		I provide input into the decisions, but I am not the primary decision maker	0.5%
		Another person is the sole decision maker	0.5%
		Prefer not to answer	0.5%

Note: Percentages may not equal 100% due to rounding

**Table 7: Household Characteristics of PSPS East Bay Sample (n=210)**

<b>Household Characteristics</b>		<b>Length of Residence</b>	
Household with disabled person(s)	17.6%	Less than 6 months	2.4%
Household with child/children	28.1%	6 to 11 months	2.9%
Household with older adult(s)	48.6%	1 to 2 years	4.8%
Households with pet(s)	64.3%	3 to 4 years	11.0%
Households with livestock	5.2%	5 to 6 years	7.6%
Households with vehicle(s)	98.6%	7 to 8 years	7.6%
		9 to 10 years	4.8%
		More than 10 years	59.0%
<b>Annual Household Income (2018)</b>		<b>Residence Structure</b>	
Less than \$10,000	0.5%	Site build (single home)	92.4%
\$10,000 - \$14,999	0.5%	Site build (apartment)	6.2%
\$15,000 - \$24,999	1.0%	Mobile/manufactured home	0.5%
\$25,000 - \$34,999	1.4%	I don't know	1.0%
\$35,000 - \$49,999	3.8%		
\$50,000 - \$74,999	6.7%	<b>Homeowner</b>	
\$75,000 - \$99,999	9.0%	Yes	89.0%
\$100,000 - \$149,999	19.0%	No	11.0%
\$150,000 - \$199,999	11.9%		
More than \$200,000	23.8%	<b>Live in Cal Fire Risk Area*</b>	
Prefer not to answer	22.4%	Yes	49.0%
		No	24.3%
		I don't know	26.7%
<b>County of Residence</b>			
Alameda	42.4%		
Contra Costa	57.6%		

\*High or Very High Fire Risk Severity Zone (California Department of Forestry and Fire Protection)

Note: Percentages may not equal 100% due to rounding

## APPENDIX C – LIST OF EXPERTS

We interviewed 17 California experts with experience in disasters, evacuations, and/or transportation. Using these interviews, we crafted key takeaways along with preparedness and response strategies for evacuations and COVID-19. A full list of experts by topical area and organization (at the time of interview) is provided in Table 8.

**Table 8: List of Experts by Area and Organization**

<b>Name</b>	<b>Topical Area</b>	<b>Organization at Time of Interview</b>
Gabriele Almon	Communications	Brain & Bullish
Alex Ghenis	Emergency Management	World Institute on Disability
Jeff Toney	Emergency Management	San Diego County Office of Emergency Services
Lee Dorey	Emergency Management	California Office of Emergency Services
Luis Vance Taylor	Emergency Management	California Office of Emergency Services
Luke Beckman	Emergency Management	American Red Cross
Jake Hess	Fire Service	California Department of Forestry and Fire Protection
Mary Massey	Public Health	California Hospital Association
JR Antablian	Social Services	Department of Social Services
LeAnn Raffanti	Social Services	Department of Social Services
Michael Pimentel	Public Transit	California Transit Association
Vanessa Rauschenberger-Formanek	Public Transit	Gold Coast Transit District
Dana Hendrix	Transportation	California Department of Transportation
Gerald Kracher	Transportation	California Department of Transportation
Larry Wooster	Transportation	California Department of Transportation
Randy Iwasaki	Transportation	Contra Costa Transportation Authority
Stephen Terrin	Transportation	Metropolitan Transportation Commission

# APPENDIX D – STRATEGY CHECKLISTS FOR ANY DISASTER

## EMERGENCY MANAGEMENT STRATEGIES – ANY DISASTER

In this section, we present emergency management strategies for stakeholders to address any disaster (with or without COVID-19). Stakeholders should: 1) review each listed strategy below, and 2) determine steps needed (or already taken) to achieve that strategy. Stakeholders can determine if they lead or support these strategies via Table 1: Emergency Response Areas and Key Stakeholders Responsibility Mapping.

### Emergency Management Strategies for Any Disaster

<b>Disaster Preparedness</b>
<ul style="list-style-type: none"> <li><input type="checkbox"/> <b>Develop Multi-Jurisdictional Relationships:</b> Build early relationships across local jurisdictions, states, and Tribal Nations using the 5 C’s (e.g., communication, coordination, cooperation, collaboration, and connection) to establish key liaisons between agencies and levels of government</li> <li><input type="checkbox"/> <b>Develop Continuity Plans:</b> Create continuity of business and operations of government plans to identify essential services, needs, and employee requirements</li> <li><input type="checkbox"/> <b>Reevaluate Emergency and Evacuation Planning and Preparedness Measures:</b> Hold regular meetings and exercises pre-disaster (e.g., tabletop exercises, workshops, full-scale exercises, drills, games) to reevaluate existing planning and preparedness measures</li> <li><input type="checkbox"/> <b>Increase Community Preparedness:</b> Develop bottom-up, community-based approaches (e.g., via community-based organizations, non-governmental organizations, voluntary organizations active in disasters) to increase community preparedness</li> <li><input type="checkbox"/> <b>Enhance Situational Awareness:</b> Create unified, early notification and situational awareness systems (e.g., a situational awareness team, early detection via sensors, cameras, residents) to address problems in disasters more quickly</li> <li><input type="checkbox"/> <b>Establish Emergency Management Funding Sources:</b> Identify alternative and stable funding streams (e.g., property tax, split tax) to support emergency operations</li> <li><input type="checkbox"/> <b>Promote Mitigation Efforts:</b> Consider, fund, and implement long-term mitigation strategies (e.g., infrastructure hardening [e.g., earthquake resilient roads, fireproofing structures], managed retreat) for regular disasters</li> <li><input type="checkbox"/> <b>Identify a Lead Logistics Agency:</b> Designate a lead agency for bulk ordering and building resource partnerships (e.g., state-to-state aid, county-to-county aid)</li> <li><input type="checkbox"/> <b>Engage with Private Sector:</b> Engage with large businesses and retailers (e.g., through corporate responsibility measures, stakeholder meetings, tabletop exercises, partnerships) to support communities and AFN populations during emergencies</li> </ul>

<b>Disaster Response</b>
<ul style="list-style-type: none"> <li><input type="checkbox"/> <b>Engage with Leaders:</b> Continuously engage with key officials (e.g., Governor, mayors) throughout the disaster cycle, especially in the response phase on disaster updates, community needs, and recovery actions</li> <li><input type="checkbox"/> <b>Open Seats in the Emergency Operations Center:</b> Provide open seats in the EOC for neighboring communities and other key partners that often do not sit in the EOC (e.g., businesses, utilities, public transit agencies, community-based organizations, etc.)</li> <li><input type="checkbox"/> <b>Alter Weight Regulations:</b> Reduce road and weight restrictions for trucks to allow relief supplies and resources to be transported more quickly</li> </ul>

**PUBLIC COMMUNICATION STRATEGIES – ANY DISASTER**

In this section, we present public communication strategies for stakeholders to address any disaster (with or without COVID-19). Stakeholders should: 1) review each listed strategy below, and 2) determine steps needed (or already taken) to achieve that strategy. Stakeholders can determine if they lead or support these strategies via Table 1: Emergency Response Areas and Key Stakeholders Responsibility Mapping.

**Public Communication Strategies for Any Disaster**

<b>Disaster Preparedness</b>
<ul style="list-style-type: none"> <li><input type="checkbox"/> <b>Evaluate System Capacity:</b> Ensure local communication systems (e.g., county alert systems) can meet the capacity of federal programs (e.g., Wireless Emergency Alerts System) and withstand power outages (such as from PSPS events)</li> <li><input type="checkbox"/> <b>Gain Expert Insight:</b> Work closely with transportation, emergency management, and disability experts with diverse knowledge in the field to craft messages</li> <li><input type="checkbox"/> <b>Increase Reach of Alert Systems:</b> Develop a public campaign to register mobile phones and other devices for alerts about disasters, including across county boundaries</li> <li><input type="checkbox"/> <b>Establish Communication Lines:</b> Create clear lines of communication between emergency management agencies and other key responding agencies (e.g., EOCs, Web EOC, phone contacts, etc.) before a disaster occurs</li> <li><input type="checkbox"/> <b>Develop Checklists:</b> Develop publicly available checklists and guidelines for residents to prepare for a disaster (e.g., key emergency supplies for a “go bag,” evacuation tips, meeting points for families) that can be flexibly applied throughout the state and for different disasters</li> </ul>
<b>Disaster Response</b>
<ul style="list-style-type: none"> <li><input type="checkbox"/> <b>Employ Red Flag Warnings:</b> Communicate red flag conditions (issued for weather events which may result in extreme fire behavior) early to signal activation of preparedness plans</li> </ul>

- Leverage Data:** Create data-based feeds and dashboards for more efficient communication, identification of asset location, transportation disruption monitoring, wildfire assessments, and/or organization of crowdsourced information (e.g., Google Maps, Waze)

## PUBLIC HEALTH STRATEGIES – ANY DISASTER

In this section, we present public health strategies for stakeholders to address any disaster (with or without COVID-19). Stakeholders should: 1) review each listed strategy below, and 2) determine steps needed (or already taken) to achieve that strategy. Stakeholders can determine if they lead or support these strategies via Table 1: Emergency Response Areas and Key Stakeholders Responsibility Mapping.

### Public Health Strategies for Any Disaster

<b>Disaster Preparedness</b>
<ul style="list-style-type: none"> <li><input type="checkbox"/> <b>Identify Key Facilities:</b> Identify the location and emergency needs of hospitals and nursing homes/assisted living facilities, including their capability to accept patients from other facilities</li> <li><input type="checkbox"/> <b>Assess Environmental Impacts:</b> Evaluate environmental impacts of sanitation practices (e.g., vehicle sanitation) and products (e.g., disinfectant fog) to ensure safe use</li> </ul>
<b>Disaster Response</b>
<ul style="list-style-type: none"> <li><input type="checkbox"/> <b>Supply Resources to Medical Facilities:</b> Provide a supply of PPE (e.g., masks) and other key medical supplies (e.g., gowns, shields) to medical facilities for use in disasters</li> </ul>

## ACCESS AND FUNCTIONAL NEEDS (AFN) STRATEGIES – ANY DISASTER

In this section, we present AFN strategies for stakeholders to address any disaster (with or without COVID-19). Stakeholders should: 1) review each listed strategy below, and 2) determine steps needed (or already taken) to achieve that strategy. Stakeholders can determine if they lead or support these strategies via Table 1: Emergency Response Areas and Key Stakeholders Responsibility Mapping.

### Access and Functional Needs Strategies for Any Disaster

<b>Disaster Preparedness</b>
<ul style="list-style-type: none"> <li><input type="checkbox"/> <b>Integrate Vulnerable Populations in Planning:</b> Integrate access and functional needs populations in evacuation and emergency response plans across all aspects, not just selective sections of consideration</li> <li><input type="checkbox"/> <b>Consult with Experts:</b> Consult with disability and AFN experts to determine best practices and lessons learned for designing plans and protocols for disasters</li> </ul>

**Increase Financial Resource Access:** Increase financial empowerment and resources (e.g., banking, credit, assistance programs) for AFN populations to allow them to better prepare for and respond to disasters

**Create Resource Networks:** Leverage CBOs, NGOs, and volunteers to develop resource networks that assist people with disabilities and AFN populations with reentry, settlement (including in other states), transportation, and supplies

#### Disaster Response

**Develop Communication Accessibility:** Develop accessible communication practices specifically for people with disabilities (e.g., screen reader capabilities, multiple languages, sign language translators, etc.)

### TRANSPORTATION AND EVACUATION STRATEGIES – ANY DISASTER

In this section, we present transportation and evacuation strategies for stakeholders to address any disaster (with or without COVID-19). Stakeholders should: 1) review each listed strategy below, and 2) determine steps needed (or already taken) to achieve that strategy. Stakeholders can determine if they lead or support these strategies via Table 1: Emergency Response Areas and Key Stakeholders Responsibility Mapping.

#### Transportation and Evacuation Strategies for Any Disaster

#### Disaster Preparedness

**Strengthen Evacuation Plans:** Develop/strengthen statewide and regional transportation plans (e.g., defined evacuation routes, evacuation destinations, lead agencies, transportation assets, emergency procedures, coordination processes) and mutual aid agreements that can pull resources from non-impacted areas

**Identify Vehicle Fleets for Evacuations:** Identify a supply of vehicles (e.g., transit vehicles) to assist the evacuation of vulnerable populations (e.g., people with disabilities, transit-dependent households)

**Develop Critical Points and Services:** Create pick-up points, identify temporary evacuation points, and/or provide door-to-door service (including paratransit) for evacuees, especially those with mobility challenges

**Build Supply Chain Hub Partnerships:** Increase discussion with supply chain hubs (e.g., ports, airports) and build necessary partnerships to ensure steady supply distribution and enough critical supplies in a disaster

**Safeguard Evacuation Routes:** Create fuel breaks (i.e., sections of little to no vegetation) along key evacuation routes



- Leverage Shared Resources:** Create neighborhood evacuation teams via community emergency response teams (CERTs) or CBOs to encourage neighbor-to-neighbor assistance
- Create a Central Structure:** Designate a clearinghouse agency (e.g., a metropolitan planning organization, a state department of transportation) to collect damage reports and distribute transportation resources

#### Disaster Response

- Offer Free Public Transit:** Waive fares on public transit (e.g., rail, buses, ferries) for evacuations
- Employ Traffic Management Strategies:** Implement traffic management strategies swiftly during an evacuation (e.g., contraflow, signal prioritization, route closures) and ensure proper supplies (e.g., cones) and protocols are prepared for implementation
- Supplement Resources via Networks:** Supplement transportation resources through sharing rides/vehicles in peer-based networks or volunteer organizations (e.g., Functional Assessment Service Teams [FAST], Volunteer Organizations Active in Disasters [VOAD])
- Support Enroute Resources:** Open and maintain rest stops for truck drivers and other supply carriers, including providing food via food trucks
- Respond Dynamically to Congestion:** Build dynamic response capabilities (e.g., rapid deployment of first responders) in traffic centers for real-time knowledge of vehicles, congestion, and crashes in both normal and evacuation conditions

### CARE AND SHELTER STRATEGIES – ANY DISASTER

In this section, we present care and shelter strategies for stakeholders to address any disaster (with or without COVID-19). Stakeholders should: 1) review each listed strategy below, and 2) determine steps needed (or already taken) to achieve that strategy. Stakeholders can determine if they lead or support these strategies via Table 1: Emergency Response Areas and Key Stakeholders Responsibility Mapping.

#### Care and Shelter Strategies for Any Disaster

#### Disaster Preparedness

- Develop Replicable Guidance:** Produce replicable and consistent guidance for local jurisdictions on sheltering protocols
- Reserve Accessible Rooms:** Ensure the first floor of hotels/motels and all accessible rooms are provided only to people with disabilities and mobility challenges
- Create a State Sheltering Plan:** Develop plans for state-run shelters (e.g., by a public health or social services agencies) if the disaster is large enough and overwhelms local resources

### Disaster Response

- Provide In-Shelter Assistance:** Provide translators, interpreters, medical professionals, functional assessment service teams (FAST), and financial resources (e.g., vouchers, disaster assistance, bank access) at shelters
- Offer Transportation:** Provide transportation options (e.g., shuttles) from shelters to stores (e.g., for food, medicine, supplies) and medical facilities (e.g., hospitals, urgent care, primary care)
- Communicate Shelter Location:** Communicate the location of available shelters to evacuees (e.g., through television, radio, social media, websites, etc.) along with key information (e.g., if pets can be brought, how many spaces left)
- Consider Federal Resources:** Consider leveraging federal medical resources and floating hospitals for additional beds, especially if evacuees need additional medical assistance

## PSPS EVENT STRATEGIES – ANY DISASTER

In this section, we present PSPS event strategies for stakeholders to address any disaster (with or without COVID-19). Stakeholders should: 1) review each listed strategy below, and 2) determine steps needed (or already taken) to achieve that strategy. Since the California Emergency Plan does not identify PSPS events in an ESF, it is assumed that Emergency Management would be the lead actor, with all other organizations acting in supporting roles. This structure would align with the Emergency Management topical area in Table 1: Emergency Response Areas and Key Stakeholders Responsibility Mapping (Lead Actors Highlighted in Yellow).

### PSPS Event Strategies

#### Disaster Preparedness

- Meet Consistently with Stakeholders:** Hold consistent meetings among key stakeholders (e.g., emergency management, utilities, fire, law enforcement, transportation, businesses, community-based organizations) to discuss more robust plans and regulations for concurrent wildfires and PSPS
- Identify and Bolster Power Sources:** Develop plans and legislation for alternative power sources and resources (e.g., generators, batteries, solar panels, microgrids, infrastructure hardening) for transportation, sheltering, and medical care for PSPS mitigation and disaster response
- Bolster PSPS Communication:** Improve and explore effective (e.g., wide-reaching, accurate, informative, rapid) communication (e.g., wireless emergency alerts, radio, television, social media, print sources, reverse 911, neighbor-to-neighbor communication) of outages to the public, especially vulnerable individuals
- Procure Satellite Phones:** Procure satellite phones for emergency response personnel if the power goes out

### Disaster Response

- Supply Temporary Shelters with Resources:** Plan and implement cooling centers, community centers, and non-congregate shelters with resources for respite and charging during PSPS events
- Employ Technology:** Leverage data, updated weather models, and drone technology to predict and respond to PSPS events

# APPENDIX E – CALIFORNIA EMERGENCY SUPPORT FUNCTIONS

Appendix E presents Table 9 which provides a list of emergency support functions (ESFs), the definition of the function, the lead agency, and the corresponding federal ESF. This table reflects information provided in the California State Emergency Plan, updated most recently in 2017.

**Table 9: Emergency Support Functions from the California State Emergency Plan 2017**

CA-ESF Title	Definition	Lead Agency	Federal ESF
ESF 1 Transportation	Assists in the management of transportation systems and infrastructure during domestic threats or in response to incidents.	California Transportation Agency	ESF #1 – Transportation
ESF 2 Communications	Provide resources, support, and restoration of government emergency telecommunications, including voice and data.	California Governor’s Office of Emergency Services	ESF #2 – Communications
ESF 3 Construction and Engineering	Organizes the capabilities and resources of the State government to facilitate the delivery of services, technical assistance, engineering expertise, construction management, and other support to local jurisdictions.	California Government Operations Agency	ESF #3 –Public Works and Engineering
ESF 4 Fire and Rescue	Monitors the status of fire mutual aid activities. Coordinates support activities related to the detection and suppression of urban, rural, and wildland fires and emergency incident scene rescue activities and provide personnel, equipment, and supplies to support local jurisdictions.	California Governor’s Office of Emergency Services	ESF #4 – Firefighting
ESF 5 Management	Coordinates and resolves issues among the CA-ESFs in the four phases of emergency management to ensure consistency in the development and maintenance of the SEP annexes. During emergencies, serves in an advisory capacity to the EOC Director.	California Governor’s Office of Emergency Services	ESF #5 – Emergency Management
ESF 6 Care and Shelter	Coordinates actions to assist responsible jurisdictions to meet the needs of victims displaced during an incident including food assistance, clothing, non-medical care and sheltering, family reunification, and victim recovery.	California Health and Human Services Agency	ESF #6 –Mass Care, Emergency Assistance, Housing and Human Services

ESF 7 Resources	Coordinates plans and activities to locate, procure, and pre-position resources to support emergency operations.	California Government Operations Agency	ESF #7 –Logistics Management and Resource Support
ESF 8 Public Health and Medical	Coordinates Public Health, Environmental Health, and Emergency Medical Services activities statewide in support of local jurisdiction resource needs for preparedness, response, recovery, and mitigation from emergencies and disasters.	California Health and Human Services Agency	ESF #8 –Public Health and Medical Services
ESF 9 Search and Rescue	This Emergency Support Function was merged into CA-ESF 4 Fire and Rescue for Urban Search and Rescue requests and CA-ESF 13 Law Enforcement for Wilderness Search and Rescue.	California Governor’s Office of Emergency Services	ESF #9 –Search and Rescue
ESF 10 Hazardous Materials	Coordinates State resources and supports the responsible jurisdictions to prepare for, prevent, minimize, assess, mitigate, respond to, and recover from a threat to the public or environment by actual or potential hazardous materials releases, including oil spills.	California Environmental Protection Agency	ESF #10 –Oil and Hazardous Materials Response
ESF 11 Food and Agriculture	Supports the responsible jurisdiction and coordinates activities during and immediately following a disaster, impacting the agriculture and food industry, and supports the recovery of impacted industries and resources post disaster.	California Department of Food and Agriculture	ESF #11 – Agriculture and Natural Resources
ESF 12 Utilities	Provide resources and support to responsible jurisdictions and in partnership with the private sector to restore gas, electric, water, wastewater and telecommunications.	California Natural Resources Agency	ESF #12 –Energy
ESF 13 Law Enforcement	Coordinates State law enforcement personnel and equipment to support responsible law enforcement agencies, coroner activities, Wilderness Search and Rescue, and public safety in accordance with Law Enforcement and Coroner’s Mutual Aid Plans.	California Governor’s Office of Emergency Services	ESF #13 –Public Safety and Security
ESF 14 Recovery	Supports and enables economic recovery of communities and California from the long-term consequences of extraordinary emergencies and disasters.	California Governor’s Office of Emergency Services	ESF #14 –Long-Term Community Recovery
ESF 15 Public Information	Supports the accurate, coordinated, timely, and accessible information to affected audiences, including governments, media,	California Governor’s Office of Emergency Services	ESF #15 – External Affairs

	the private sector, and the local populace, including the special needs population.		
ESF 16 Evacuation	This Emergency Support Function was merged into CA-ESF 13 Law Enforcement in August 2013.	N/A	N/A
ESF 17 Volunteer and Donations Management	Supports responsible jurisdictions in ensuring the most efficient and effective use of affiliated and unaffiliated volunteers and organizations and monetary and in-kind donated resources to support incidents requiring a State response.	California Volunteers	N/A
ESF 18 Cybersecurity	Coordinates resources to prepare, mitigate, respond to, and recover from a significant cybersecurity event.	California Governor’s Office of Emergency Services	N/A

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