



# 19. WILDLAND FIRE

## 19.1 HAZARD PROFILE

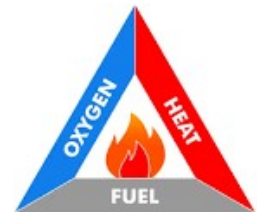
### 19.1.1 HAZARD DESCRIPTION

#### Overview

Wildland fires are uncontrolled fires that burn in natural areas such as forests, grasslands, or prairies (DHS 2024). They can spread quickly, burning brush, trees, and structures located in the path of the flames. These fires often result in significant economic losses due to property damage and business disruptions, while also posing serious public health risks through reduced air quality and smoke inhalation.

#### Wildland Fire Causes

Wildfires require three main components to start and sustain themselves: fuel, heat, and oxygen. These elements work together in a chemical reaction (combustion) to create and propagate a fire. Removing any one of these components can extinguish the fire.



- Fuel—Any material that can burn, including wood, grass, leaves, and other vegetation, serves as fuel for a wildfire. Removing or thinning vegetation creates fire breaks, which deprives the fire of fuel.
- Heat—Heat is needed to raise the temperature of the fuel to its ignition point, allowing the combustion process to begin. Applying water or fire retardants can reduce heat transfer.
- Oxygen—Oxygen from the atmosphere is essential for the combustion process. While oxygen is abundant, it can be reduced or eliminated to extinguish a fire. Smothering flames with water, foam, or other materials can deprive the fire of oxygen.

Ignition sources of wildland fires can be either natural or human-caused. On O‘ahu, human activities are the primary cause of wildland fires (HWMO 2024).

- Human Caused Ignitions—Human caused wildland fires may result from accidental or intentional acts. Human-caused fires result from campfires left unattended, the burning of debris, fireworks, equipment use and malfunctions such as sparks from mowers or overhead power lines, negligently discarded cigarettes, and intentional acts of arson (Short 2017, USDA and BLM n.d.).
- Natural Causes Ignitions—Lightening is the most frequent natural cause of wildland fires.

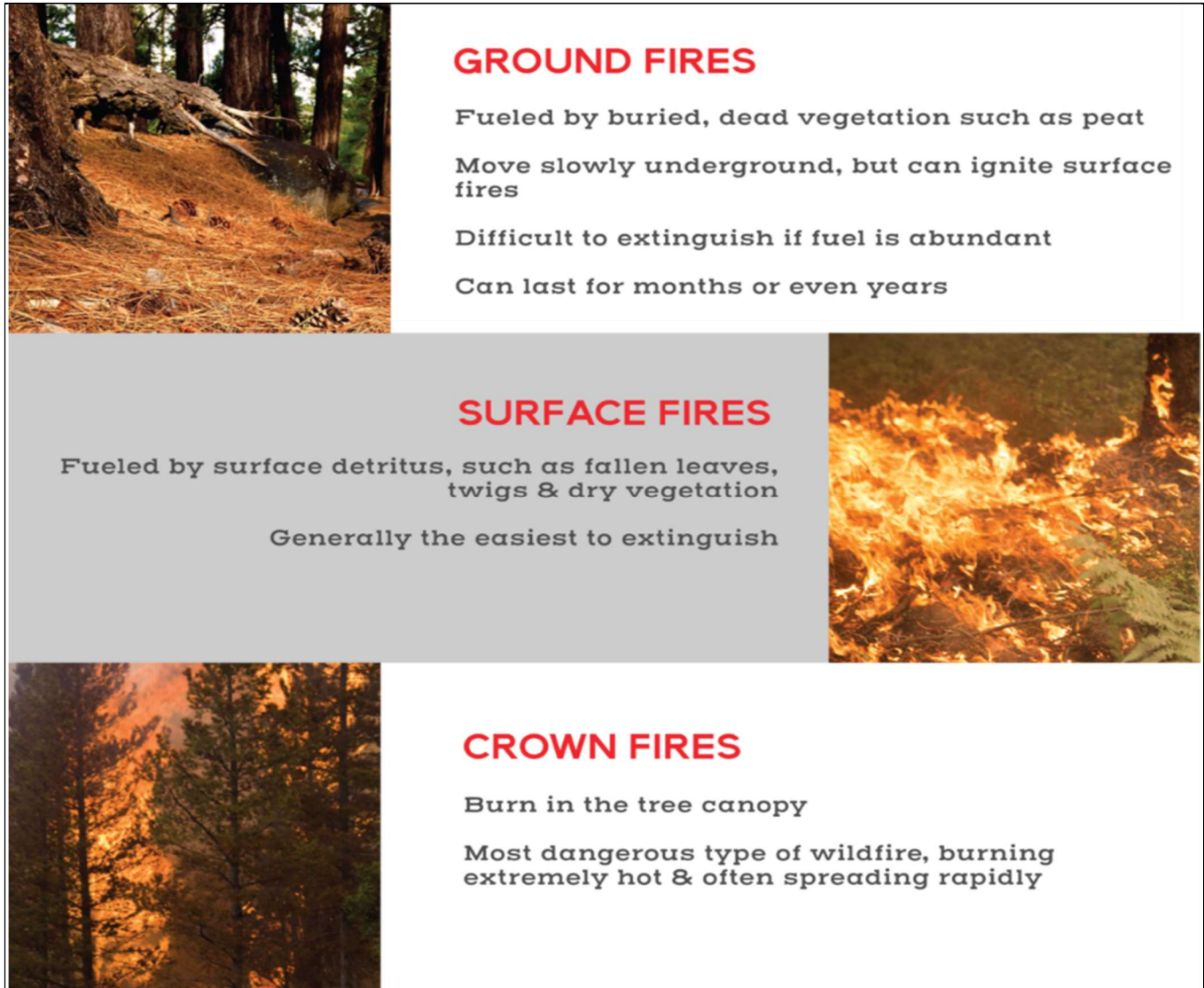
Wildland fire spread and behavior is influenced by a combination of weather conditions, fuel availability, and terrain. These are addressed in more detail in Section 19.1.3.



## Wildland Fire Characteristics

“Wildland fire” is an umbrella term that encompasses three types of fire, each with its own unique fire behavior, as described in Figure 19-1

Figure 19-1. Types of Wildland Fires



Source: (WFCA 2024)

## Potential Impacts

Wildland fires have the potential to cause injury or death, damage property, and impact native ecosystems and biodiversity, including threatened and endangered plant and animal species. Wildland fires also result in the loss of cultural and economic resources and disruptions to community infrastructure.



Wildland-urban interface (WUI) areas, where urban development meets fire-prone landscapes, are particularly vulnerable. Many O'ahu communities have limited evacuation routes, which exacerbates wildfire risk. Downslope winds and steep topography further complicate fire response efforts.

Wildfire smoke can cause a range of short-term and long-term health problems, from minor irritations to serious respiratory and cardiovascular issues. The main concern is particle pollution, especially fine particles (PM 2.5), which can penetrate deep into the lungs and potentially enter the bloodstream. These particles can exacerbate existing conditions like asthma and heart disease and can cause new respiratory problems.

Following wildland fires, cascading hazards such as debris flow, landslides, and flooding may occur due to the reduction or elimination of plant materials and root systems to stabilize soils. Flooding after a wildland fire is often more severe, as debris and ash left from the fire can form mudflows. During and after a rain event, as water moves across charred and denuded ground, it can also pick up soil and sediment and carry it in a stream of floodwaters. These mudflows have the potential to cause significant damage to impacted areas. Areas directly affected by fires and those located below or downstream of burn areas are most at risk for flooding (FEMA 2020). For detailed information regarding flooding, see Chapter 10.

## 19.1.2 LOCATION

Wildland fires occur throughout the populated areas of O'ahu. Wildland fires spread through available combustible vegetation, and they can ignite new areas even from a distance, as wind-carried sparks can travel for remarkably long distances before landing on ignitable materials (manmade and natural). Temperature, moisture, and wind conditions are factors in where a wildland fire will occur. Trade wind inversions can accelerate fire behavior, particularly in dry leeward areas.

Figure 19-3 shows areas where ignitions have occurred, with areas in yellow representing a higher concentration of ignitions and blue representing lower ignitions. All sides of the island experience fire ignitions that require a suppression response, despite a local misunderstanding that fires only occur in the dry leeward areas of the island or where they get large enough to be publicized. The lack of data points in the upland areas is a reflection of a gap in tracking and documenting fires in remote areas. To provide an accurate assessment of wildland fire occurrence, better mapping and tracking of data is essential.

Information about areas with elevated wildland fire risk can be accessed through Community Wildfire Protection Plans (CWPP). Three CWPPs were developed by the Hawaii Wildfire Management Organization (HWMO) within the City: North Shore O'ahu Community Wildfire Protection Plan, West O'ahu Community Wildfire Protection Plan, and East Honolulu. Two additional CWPPs that will cover Central O'ahu and Windward O'ahu are in development. These CWPPs do not represent all the areas at elevated risk of wildland fire on O'ahu. Locations of concern, as identified in the existing CWPPs, are summarized below. However, it is important to note that CWPPs do not represent all areas at elevated risk of wildland fire on O'ahu because of the gaps in CWPP coverage.





Former sugar cultivation lands in the area have been overtaken by fire-prone invasive plant species. Fires ignited in these areas can rapidly spread into and around residential zones, threatening property, lives, critical infrastructure, and both natural and cultural resources.

The North Shore experiences varying rainfall and humidity levels depending on season and elevation. Coastal areas generally have drier conditions, increasing wildland fire risk in nearby neighborhoods. However, under certain circumstances, wildland fires can occur even in more humid areas. Higher elevations typically receive more rainfall due to prevailing winds, though some areas remain dry due to specific wind patterns.

Wind speeds across the North Shore vary by location. Sheltered inland areas average around 8 mph, while more exposed areas like the north and west coastlines or mountain ridges can experience wind speeds between 12 and 21 mph, with occasional stronger gusts. High wind speeds contribute to the spread of wildland fire flames and embers.

The Resilient Landscapes Action Priorities, meant to identify proactive strategies to modify landscapes and reduce risk, includes hazard reduction, community education, natural resource protection, and planning and/or policy.

## Western O‘ahu

Originally developed in 2016 and updated in 2024, the West O‘ahu CWPP notes that the West O‘ahu landscape is defined by steep topography, rugged terrain, strong wind patterns, and a high prevalence of highly flammable invasive grass species. These environmental factors, combined with high temperatures and frequent droughts, contribute to an increased wildland fire risk in the region. The area's history of human-caused fire ignitions further exacerbates this risk. The close proximity of urban development to fire-prone wildland areas creates hazardous conditions that endanger both communities and natural resources in Western O‘ahu (HWMO 2024b).

The Wai‘anae Mountain range rises sharply from O‘ahu's leeward coast and central plains, featuring steep, rugged, and often inaccessible terrain. This geographical configuration creates dangerous conditions during wildland fire incidents. It hampers the ability of emergency response agencies to effectively contain and suppress fires, while also limiting evacuation options for residents.

The Action Plan prioritized hazard reduction through fuel breaks, multi-agency wildland fire outreach campaign, improved reporting of wildland fires, re-establishment of active agriculture, reforestation, and converting fuels to drought-tolerant, fire-resistant plants.

## East Honolulu

Developed in 2024, the East Honolulu CWPP notes that wildland fires are a recurring problem in East Honolulu, particularly in Hawai‘i Kai. This area is exposed to northerly winds that sweep around the island's eastern side. Hawai‘i Kai's proximity to dry grassy fields, shrublands, steep cliffs, and ridges increases its vulnerability. The region's combination of steep terrain, strong winds, and abundant non-native, easily ignitable vegetation creates ideal conditions for wildland fires (HWMO 2024).



East Honolulu's topography, with its valleys and ridges, significantly influences fire behavior. As slope gradient increases, both the rate of fire-spread and intensity typically escalate in the uphill direction.

Wildland fire occurrence on O'ahu correlates with broader climate patterns, resulting in more frequent and intense fires in arid leeward areas. East Honolulu, situated on the island's leeward side, features south-facing slopes that experience drier conditions at mid and lower elevations compared to the northern Ko'olau range's north-facing slopes. These environmental factors make leeward O'ahu neighborhoods and landscapes particularly prone to wildland fire ignition. Greater sun exposure in these areas leads to higher air temperatures and lower relative humidity, further elevating wildland fire risk.

The Wildfire Action Plan prioritized projects to mitigate threats to aquatic and terrestrial natural resources, reduce vegetation fuels buildup, and mitigate vulnerable fire-prone zones.

### 19.1.3 EXTENT

Hazard extent refers to the potential severity or magnitude of hazard events in a given area. This section describes measurements used to indicate the extent of this hazard and the systems in place for monitoring severity and providing warnings as necessary.

#### Contributing Factors

Wildland fire extent is influenced by a complex interplay of factors, including climate and weather conditions, fuel availability and type, topography, and human activities.

#### CLIMATE AND WEATHER CONDITIONS

Hot, dry, and windy weather conditions are the primary drivers of wildfire fuel and spread. Low humidity and high temperatures, particularly during periods of drought, dry out vegetation, making it more susceptible to ignition and spread. Strong winds can rapidly carry flames and spread fire over vast areas. Wind pushes flames forward, supplies oxygen, and carries embers that can ignite new fires.

#### FUEL AVAILABILITY

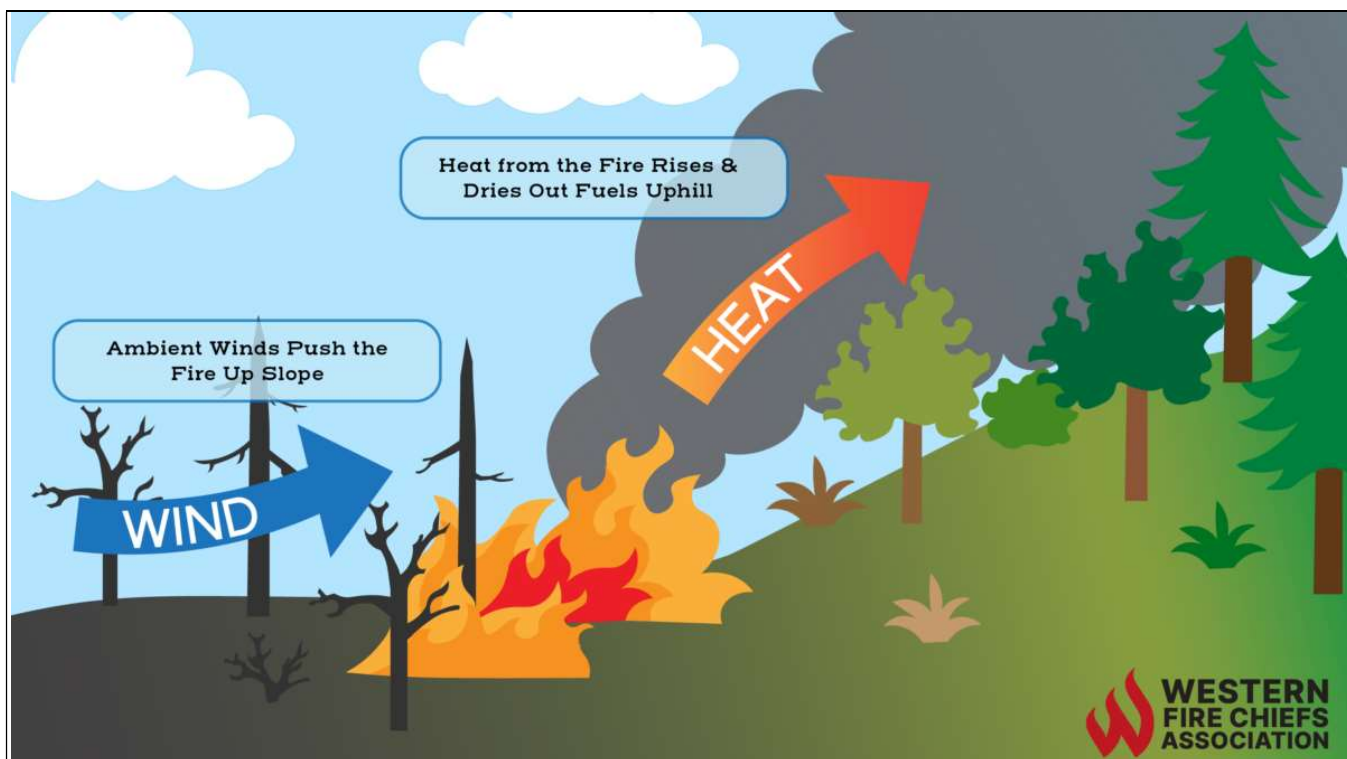
Dry vegetation provides fuel for wildland fires. Fuel load (the amount and type of fuel available) and fuel continuity (the spatial arrangement of fuel) impact the rate of spread and intensity. In Hawaii non-native and invasive grasses, like Guinea grass, are particularly problematic because they form dense stands, outcompete native plants, and have high fine fuel loads, increasing fire potential and spread. Dry grasslands and shrubs around neighborhoods increase fire risk, and once ignited, these fires can quickly threaten homes, lives, essential services, and both natural and cultural resources. Human activities, such as land management practices, also contribute. Across the state, the decline of plantation agriculture and ranching have contributed to highly flammable and unmanaged, non-native grasslands on fallow agricultural land.



### TERRAIN

O‘ahu’s mountainous topography can also influence wildland fire behavior, as fires tend to spread in the same direction as the ambient wind – usually uphill. In addition, rising smoke and heat dries out the fuel further up the slope, making the landscape more susceptible to ignition, as depicted in Figure 19-3. Downslope winds, especially when combined with dry conditions, can also significantly increase the risk and intensity of wildfires, as seen in the 2023 Maui wildfires. These winds, which originate at higher elevations and accelerate as they descend into lower areas, can create strong gusts and carry embers long distances, rapidly spreading fires.

**Figure 19-3. Why Wildland Fires Spread Faster Uphill**



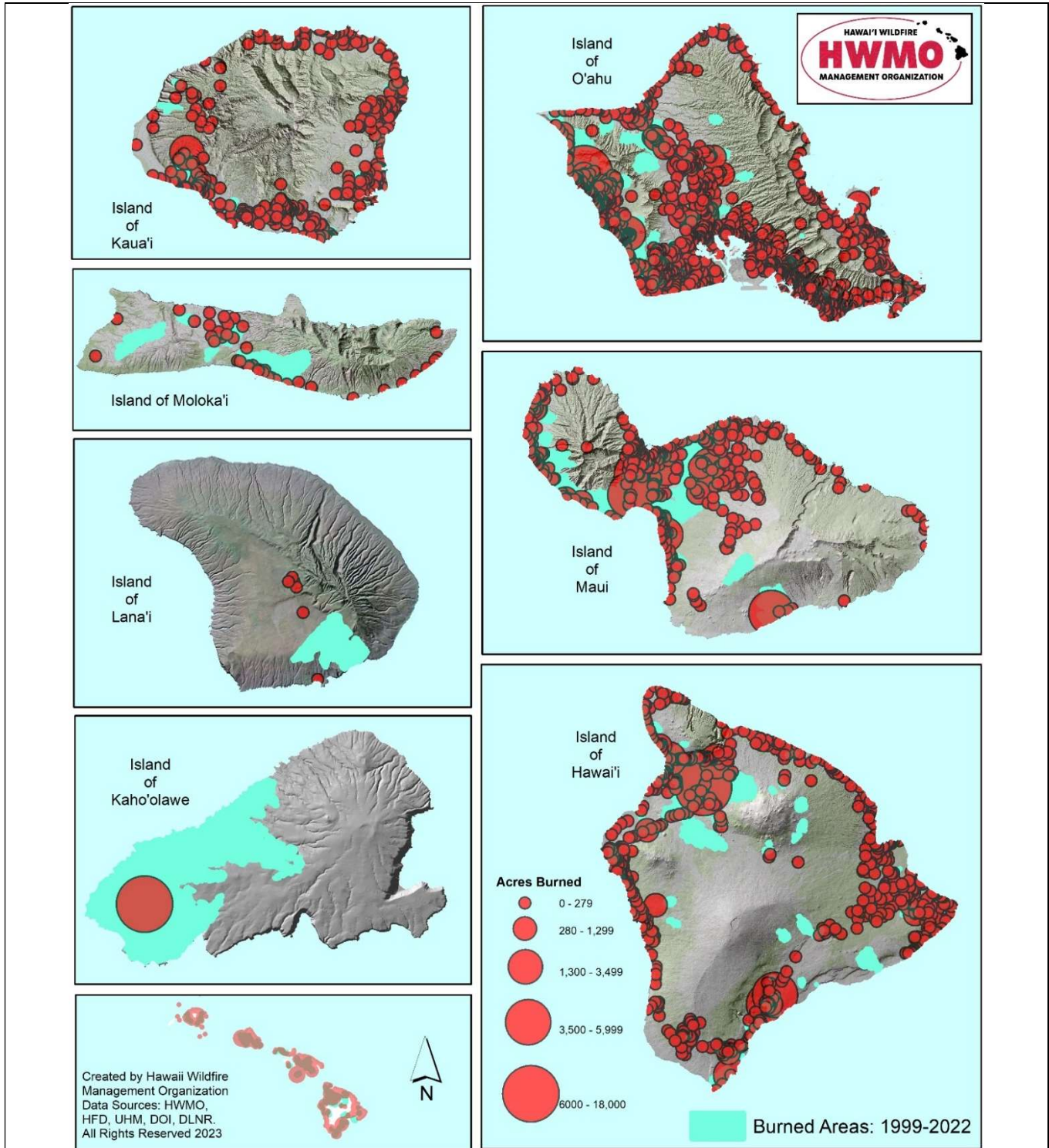
Source: (WFCFA 2024)

### Historical Wildfire Extent Based on Acres Burned

Figure 19-4 measures wildland fire incidents by acres burned. Other measures of wildland fires severity include the number of deaths and the number of buildings destroyed.



Figure 19-4. Hawaii Wildland Fire Incidents, 1999-2022



Source: (HWMO 2024c)



## Monitoring and Warning

Wildland fires occur with no warning. The National Weather Service monitors for conditions that increase the risk of fire danger and issues the following warnings and watches.

- **Fire Weather Watch**—A Fire Weather Watch is issued when there is a high potential for the development of a Red Flag event. Fire Weather Watches may be issued 12 to 72 hours prior to the expected onset of criteria.
- **Red Flag Warning**—The criteria for Red Flag events is a Keetch-Byram Drought Index greater than or equal to 600, relative humidity less than or equal to 45 percent, and winds greater than or equal to 20 mph. Red Flag Warnings alert of the potential for widespread ignitions or control problems with new or existing fires.

However, most wildfires on O‘ahu occur where no such warning products are issued.

Following the 2023 Maui Wildfires, a number of State efforts were initiated to improve wildland fire monitoring and detection. The Department of Land and Natural Resources (DLNR) and the Hawaii Department of Transportation (HDOT) have collaborated to purchase six new remote automated weather stations, which will add more weather data related to fire conditions across O‘ahu (Hawaiian Electric 2025).

The Hawaiian Electric Company (HECO) has also installed a network of 12 weather stations in wildfire-prone areas on O‘ahu to provide information about wind speed, temperature and relative humidity. This helps to better predict and respond to fire weather conditions (Hawaiian Electric 2025).

Moreover, HECO has also begun deploying a network of high-resolution video cameras using AI technology to provide enhanced awareness and early detection of ignitions in elevated fire risk areas. Each location has two cameras to provide a full 360-degree view, and will be monitored 24/7, with live feeds that the public will have access to (Hawaiian Electric 2025).

### 19.1.4 PREVIOUS OCCURRENCES

This section provides an overview of hazard occurrences since the publication of the previous LHMP, which covers the period between January 2020 and February 2025. It identifies significant events that resulted in federal disaster declarations and/or state or local emergency proclamations. For events prior to 2020, refer to the 2020 LHMP.

#### Recent Events

Table 19-1 shows recent events for O‘ahu. Events included in this table include events identified in the 2023 State of Hawai‘i Hazard Mitigation Plan and events identified in the NOAA National Centers for Environmental Information (NCEI) Storm Events Database. Events in the NOAA NCEI database include the following:



- Occurrences having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce
- Rare, unusual, occurrences that generate media attention
- Other significant events that occur in connection with the occurrence

**Table 19-1. Wildland Fire Events in the City (2020 to 2024)**

Event Date	Disaster Declaration/ Proclamation			Description
	Federal	State	Mayoral	
August 16 - 18, 2020	No	No	No	A fire blackened around 2,000 acres of mainly dry brush in rugged terrain in the northwest part of O’ahu. The cause of the blaze was not known, but it did close Kaukonahua Road near Waialua for a time as firefighters battled the flames. There were no reports of serious injuries or property damage.
August 20, 2023	No	No	No	A wildfire broke out on the west side of O’ahu near Kaena Point. A brush fire ignited on the Keawaula side of Kaena Point State Park. The Beach parked remained closed that day as the firefighters worked to put out the blaze.
September 24, 2023	No	No	No	A brush fire near Dillingham airfield burned approximately 30 acres of land. There were no reports of damage or injuries.
October 30 - 31, 2023	No	No	No	A wildfire broke out on O’ahu in Mililani Mauka. The fire burned about 1,300 acres.
October 18, 2024	No	Yes	No	A brush fire broke out on Nui Avenue at around 3:00pm. Officials said that the fire burned around five acres in the Poamoho area.

Source: (HIEMA 2023) (NOAA 2024)

## Federal Disaster Declarations

Under the Stafford Act, the President of the United States may issue an Emergency Declaration (EM) or Major Disaster Declaration (DR) for health related events and activate certain federal assistance programs based on factors related to the magnitude of the hazard threat or impacts. No Stafford Act declarations for this hazard type that included the City occurred during this period.

## State and Local Proclamations

State law authorizes the Governor to issue emergency proclamations if an emergency or disaster has occurred, or there is imminent danger or threat of an emergency or disaster in any portion of the state. County Mayors



have the authority to issue local emergency proclamations when such conditions exist within any part of their respective jurisdictions. One state emergency proclamation related to this hazard was issued for the City during this period, as noted in Table 19-1.

### 19.1.5 PROBABILITY OF FUTURE OCCURRENCES

The historical data regarding wildland fire occurrences in the City has been utilized to assess the likelihood of future events. There have been significant wildland fires across the island in the past, resulting in extensive damage. Notable historical incidents include:

- August 22, 2015—The Makakilo fire, which burned 1,000 acres, began near residential areas and progressed toward the Honouliuli Forest Reserve.
- March 17, 2016—One of the largest fires in O’ahu’s history burned 2,500-acres in Nānākuli Valley. The wildland fire began atop a steep cliff on the southeastern edge of the valley and headed downslope toward homes and burned right to the edge of homes, prompting voluntary evacuations. Steep, inaccessible terrain and windy conditions made the wildland fire a difficult one for firefighters to suppress.
- August 4-6, 2024—Approximately 9,000 acres burned in the Wai'anae and Mākaha wildland fires.

Information on previous wildland fire occurrences in the City was used to calculate the probability of future occurrence of such events. Table 17-4 lists the number of events from the 2023 State of Hawai’i Hazard Mitigation Plann and NOAA NCEI Storm Event Database over the 74-year period from 1950 to 2024, which is the most complete period of record for all sources reviewed. Based on these records, the probability of occurrence for wildland fire in the City is considered “frequent.”

Table 19-2. Probability of Future Wildland Fire Events in the City

Hazard Type	Number of Occurrences Between 1998 and 2024	Percent Chance of Occurring in Any Given Year
Wildland Fire	79	100%

Source: (HIEMA 2023) (NOAA 2024)

Note: The time period presented in this table is the most complete period of record for the various data sources reviewed. 100% probability indicates that it is statistically likely for an event to occur every year. It does not indicate that the occurrence of an event is a certainty in any given year.”

## 19.2 VULNERABILITY AND IMPACT ASSESSMENT

To understand risk, a community must evaluate what assets are exposed and vulnerable in the identified hazard area. The following text evaluates and estimates the potential impact of the wildland fire hazard on the City.



### 19.2.1 LIFE, HEALTH, AND SAFETY

Wildland fires can have devastating impacts on the health, safety and welfare of communities. The effects extend beyond immediate physical safety, often causing long-term social upheaval. These fires often force residents to evacuate and damage and destroy homes, communities and livelihoods, leading to temporary or even permanent displacement. Such displacements can severely disrupt community structures, weaken established social networks, and place significant strain on emergency services and local resources.

Reducing wildland fire risk requires proactive engagement from residents and local organizations. Communities can play a critical role in wildland fire preparedness by taking action at the individual, neighborhood, and regional levels. Expanding community participation in the Firewise USA program is a key strategy for reducing wildland fire risk. Firewise communities take collective action to assess local hazards, create defensible space, and implement long-term wildland fire mitigation measures. This program is carried out by a partnership between the HWMO and DLNR-DOFAW.

Health problems related to wildland fire smoke exposure can be as mild as eye and respiratory tract irritation and as serious as worsening of heart and lung disease, including asthma, and even premature death (EPA 2024). The smoke from wildland fires can severely degrade air quality, leading to respiratory problems that particularly affect vulnerable populations such as children, the elderly, and individuals with pre-existing health conditions. These vulnerabilities were highlighted in a recent UH report that measured the impact of the 2023 Maui Wildfires on survivor health. The study found that (FSRI 2024):

- Nearly half of the participants (46%) reported a decline in health compared to one year ago
- Approximately 74% of participants face a heightened risk of cardiovascular disease due to elevated or prehypertension levels
- Kidney function may be compromised in 8–20% of participants, and up to 60% may suffer from poor respiratory health
- About 30% of participants reported symptoms of moderate or severe anxiety

People who speak no or limited English are particularly vulnerable during evacuations because they may not understand the urgency of the messaging. Older adults and people with disabilities do not have the mobility many others have, which can slow or prevent evacuation.

### 19.2.2 GENERAL BUILDING STOCK

The most vulnerable structures to wildland fire events are those within the wildland fire urban interface/intermix hazard area. Buildings constructed of wood or vinyl siding are generally more likely to be impacted by the fire hazard than buildings constructed of brick or concrete. One of the leading causes of structural loss in wildland fires is ember ignition, as wind-driven embers can travel miles ahead of an active fire front.



The vulnerability of structures to wildland fires has emerged as a critical priority in wildland fire risk management across Hawai'i, particularly following the devastating 2023 wildland fire-ignited urban conflagrations. CWPPs across O'ahu and the broader state have increasingly emphasized the need to fire-harden homes, businesses, and infrastructure in WUI, where the risk wildland-urban fires is high. Evolving science and public understanding in Hawai'i has demonstrated the need to reduce fuels in the built environment, which were what allowed the Lahaina fire to spread rapidly and lead to the loss of 105 residents, the largest loss of life in US history in 100 years (FSRI 2024). Protecting structures from ember intrusions and direct flame exposure has become a cornerstone of mitigation efforts, and every CWPP on O'ahu acknowledges this as a core priority to harden homes and address the ignition zone vegetation and combustibles around each structure.

While wildland fires tend to impact less populated areas compared to other natural hazards, their economic consequences are far-reaching. These impacts include diminished real estate values, insurance payouts, forest loss, property damage, lost revenue, and health-related costs. The U.S. Joint Economic Committee estimates that the total economic burden of wildland fires in the United States ranges between \$394 and \$893 billion annually (JEC 2023). This staggering figure emphasizes the growing national concern over wildland fire management and prevention, particularly as climate change exacerbates fire risks across the country, including in Hawaii.

The 2023 State HMP notes that building stock on O'ahu located in the high wildland fire risk hazard area has a replacement cost value of \$17.4 billion.

The economic losses from wildland fires are particularly severe in areas dependent on a single industry, as exemplified by the recent Lahaina Wildfire. A month after this devastating event, the Hawaii Department of Business, Economic Development and Tourism (DBEDT) estimated that the daily total business revenue loss from destroyed Lahaina businesses was \$2.7 million (DBEDT 2023). The wildland fires caused almost half of the participants to lose their jobs; however, 80% have since secured employment, leaving 20% still unemployed a year later, and 74% have experienced a reduction in household income (FSRI 2024). This significant loss illustrates the profound and immediate economic impact of wildland fires on local communities in Hawaii, highlighting the urgent need for comprehensive wildland fire mitigation strategies and economic resilience planning across the state.

### 19.2.3 COMMUNITY LIFELINES AND OTHER CRITICAL FACILITIES

Key lifeline vulnerabilities highlighted by CWPPs include the following:

- **Transportation**—As noted in prior chapters, several communities on the island have one road to enter and exit their community, including the Waianae, North Shore, and Koolau areas. If a wildland fire closes the major roadway into these areas, people may be prevented from evacuating.
- **Water Systems**—Ensuring sufficient access to water for wildland fire suppression efforts in risk areas is a priority.
- **Safety and Security**—Increased frequency and magnitude of wildland fires creates more demands on firefighting resources and increases wildfire-specific training and adequate suppression capabilities.



## 19.2.4 NATURAL, HISTORIC AND CULTURAL RESOURCES

### Natural

Wildland fires are a natural disturbance that significantly influence ecosystems in the City. The ecological consequences of these fires depend on various factors, including the type of fire, the ecosystem's structure, and the frequency of repeated fires. These elements interact to define the fire's effects on an ecosystem and its response to the disturbance (USFS 2016).

Wildland fires threaten vegetation and wildlife habitats, with both short-term and long-term effects. Short-term losses can include the destruction of forest, wildlife habitats, and watersheds. In Hawaii, where many native species are not adapted to frequent fires, and are already threatened or endangered, the increasing occurrence of wildland fires poses a unique threat to the islands' biodiversity and ecosystem stability.

### Cultural and Historic

O'ahu is home to 487 historic structures listed on the Federal and State Register of Historic Places. These structures were built more than 50 years ago and usually constructed out of wood, not fire-resistant materials. Furthermore, these structures were often built before the implementation of strict building codes and before there was a comprehensive understanding of wildland fire risks.

Wildland fires pose a particular threat to Native Hawaiian communities, as they can destroy culturally significant sites, artifacts, and landscapes. This destruction can result in an irreplaceable loss of cultural heritage, undermining the connection between people and their ancestral lands.

## 19.2.5 FUTURE CHANGES THAT MAY AFFECT RISK

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The following sections examine potential conditions that may affect hazard vulnerability.

### Potential or Planned Development

Non-urban zoned lands throughout the state are being urbanized rapidly. From 2000 to 2030, housing density is projected to substantially increase on approximately 8% (65,000 acres) of Hawaii's private forest land (USDA 2014). On O'ahu, growth is directed by the O'ahu General Plan and Community Development Plans, which include areas outside the Primary Urban Center. The 'Ewa area is planned to help relieve housing pressures across the island but is located in the WUI and a hot spot for wildland fire ignitions (Honolulu 2021).

In wildland fire-prone areas, following the state fire code, including WUI codes, in new developments, and implementing other risk reduction recommendations, will be key to reducing risk. Examples include the design of roads (adequate width, fire truck access and turnarounds, more than one ingress/egress, etc.), layout of



structures (spacing), building materials (non-combustible and fire resistant), and maintenance of internal and surrounding vegetation.

In other areas where land use changes have occurred due to the removal of active agriculture, fire hazard has increased and would be mitigated if converted and hardened for development or managed as open space.

To address this challenge comprehensively, fire agencies, policymakers, land-use planners, and community organizations across Hawai'i are working collaboratively to advance a multi-layered strategy across the entire building system. This includes construction standards, land-use planning, policy enforcement, incentives, and community education, ensuring that new and existing structures align with the escalating wildland fire risk. The efforts are evolving to address the risks posed by the built environment.

## Projected Changes in Population

The population of Honolulu is projected to reach 1,060,110 residents by 2050 (DBEDT 2024). As previously noted, most wildland fires in the State of Hawai'i are human-caused. This population growth may lead to an increase in human-caused wildland fires as more people move into less developed areas and engage in activities that could accidentally spark fires.

In addition to the growing resident population, Hawai'i is experiencing an increase in visitor numbers. Tourists may be less familiar with wildland fire risks and the necessary precautions to prevent or limit fire ignition. This influx of both residents and visitors could strain existing resources for wildland fire suppression, as more water will be needed for human use and consumption.

## Climate Change

Climate change create conditions that will increase the frequency and intensity of wildland fires on O'ahu. Increased temperatures and changes in rainfall patterns associated with climate change threaten to create dry conditions that increase wildland fire fuels and spread.

- By the year 2100, the City is projected to experience temperature increases ranging from 1.8°F to 7.2°F (CCSR 2024). These conditions will dry out vegetation, creating more fuel for wildland fires.
- From 1920 to 2012, 90% of Hawai'i saw a decline in rainfall; for O'ahu specifically, precipitation on the leeward side of the island is projected to decrease by 60% (CCSR 2024). This trend is accompanied by an increase in the frequency, duration, and magnitude of droughts all contributing to an increased risk of wildland fires.

Climate change is expected to intensify storms, bringing stronger winds that can rapidly spread fires and make them harder to control. Increased storm activity may also increase the chances of lightning strike ignitions of wildland fires.

The changing climate may also facilitate the spread of invasive, fire-prone species like guinea grass, which can rapidly grow during wet periods and dry out during droughts, increasing flammable material in the landscape.



Native Hawaiian plants, less adapted to fire, may struggle to compete with these invasives, potentially altering the landscape to become more susceptible to wildland fires.

These changes present significant challenges for fire management, as the combination of more frequent wildland fires, invasive species, and changing climate conditions complicates suppression efforts. The potential impacts extend beyond immediate fire damage, as secondary impacts from wildland fires, such as debris flow, landslides, flooding, and health impacts will also increase in frequency.