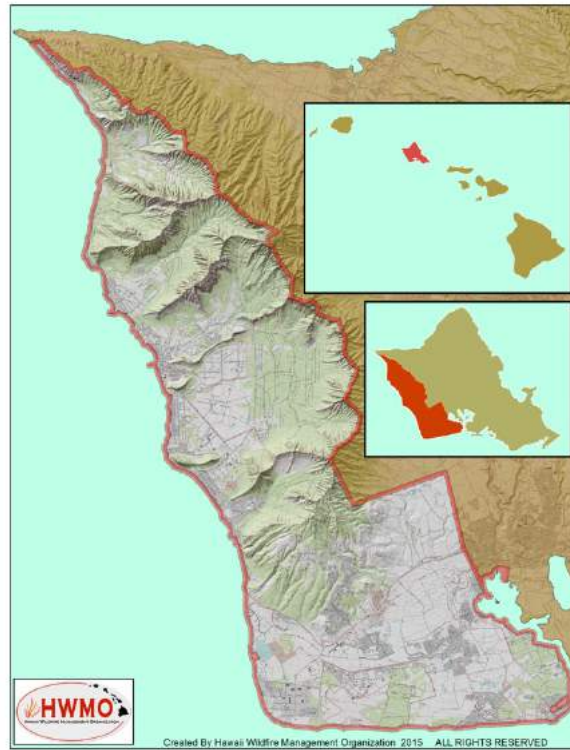


# Community Wildfire Protection Plan



## Western O'ahu 2016

# WESTERN O'AHU COMMUNITY WILDFIRE PROTECTION PLAN



DEVELOPED BY HAWAII WILDFIRE MANAGEMENT ORGANIZATION © 2016



IN PARTNERSHIP WITH:  
HONOLULU FIRE DEPARTMENT AND  
HAWAII DEPARTMENT OF LAND AND NATURAL  
RESOURCES - DIVISION OF FORESTRY AND WILDLIFE



## ACKNOWLEDGEMENTS

**Project Developed and Coordinated by:** Hawai'i Wildfire Management Organization (HWMO), a 501 (c)3 nonprofit organization dedicated to protecting communities and natural resources in Hawai'i and the Pacific from wildfire. [hawaiiwildfire.org](http://hawaiiwildfire.org)

**Plan Written by:** Elizabeth Pickett and Pablo Beimler, HWMO.

**Contributor to Fire Environment and Fire Impacts Sections:** Dr. Clay Trauernicht, University of Hawai'i, Manoa, College of Tropical Agriculture and Human Resources.

**Public Input Meetings Led by:** Elizabeth Pickett and Ilene Grossman, HWMO, with assistance from agency and community partners.

**Public Input Process Coordinated, Advertised, and Planned by:** Ilene Grossman, HWMO.

**Maps Created by:** Orlando Smith, HWMO.

**Special Thanks to:**

- ◇ O'ahu Wildfire Information and Education Coordinating Group.
- ◇ Assistant Chief Socrates Bratakos, Battalion Chief Terry Seelig, and Captain David Jenkins of Honolulu Fire Department.
- ◇ Ryan Peralta, Rob Hauff, Dietra A. Myers Tremblay, and Wayne Ching of Hawai'i Department of Land and Natural Resources- Division of Forestry and Wildlife.

**Completed using funds from:** 2014-16 US Forest Service Competitive Western WUI Grant from the Cooperative Fire Program of the U.S. Forest Service, Department of Agriculture, Pacific Southwest Region. In accordance with Federal law and U.S. Department of Agriculture policy, this institution is prohibited from discriminating on the basis of race, color, national origin, sex, age, or disability. (Not all prohibited bases apply to all programs.) To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326 W. Whitten Building, 1400 Independence Avenue, SW, Washington, DC 20250-9410 or call (202) 720-5964 (voice and TDD). USDA is an equal opportunity provider and employer.



## TABLE OF CONTENTS

Acknowledgements.....	ii
<b>MUTUAL AGREEMENT SIGNATURE PAGE .....</b>	<b>1</b>
<b>INTRODUCTION.....</b>	<b>2</b>
Goals and Objectives .....	2
Planning Area Boundaries and Overview .....	3
Planning Process, Methods, and Participants .....	4
<b>WILDFIRES IN WESTERN O’AHU .....</b>	<b>8</b>
Fire Environment.....	8
Fire History.....	17
Wildfire Impacts .....	26
<b>GENERAL OVERVIEW OF CWPP PLANNING AREA.....</b>	<b>28</b>
Communities at Risk from Wildfire .....	35
Wildfire Risk Assessment .....	36
Emergency Management .....	45
<b>HAZARD REDUCTION PRIORITIES .....</b>	<b>48</b>
Stakeholder Concerns and Recommended Actions .....	48
Hazardous Fuels Reduction .....	55
Reducing Structural Ignitability.....	56
<b>ACTION PLAN .....</b>	<b>61</b>
Near-Term Action Plan.....	61
Recommended Next Steps.....	62
CWPP Implementation and Maintenance .....	64
Signatory Contact Information .....	65
<b>LISTS OF TABLES, FIGURES, MAPS, PHOTOS .....</b>	<b>67</b>
<b>REFERENCES.....</b>	<b>72</b>



**MUTUAL AGREEMENT SIGNATURE PAGE**  
**WESTERN O'AHU COMMUNITY WILDFIRE PROTECTION PLAN**

This Community Wildfire Protection Plan was developed for Western O'ahu, Hawai'i by the Hawai'i Wildfire Management Organization. This plan:

- Was collaboratively developed by agencies, entities, community members, and individuals with interest or jurisdiction in Western O'ahu.
- Identifies and prioritizes areas for hazardous fuel reduction treatments and recommends the types and methods of treatment that will mitigate wildfire in Western O'ahu, Hawai'i.
- Recommends measures to reduce the ignitability of structures throughout the planning area.

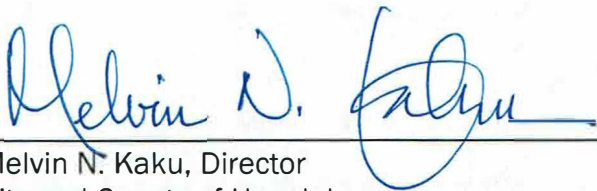
The following entities mutually agree with the contents of this Community Wildfire Protection Plan:



Manuel P. Neves, Fire Chief  
Honolulu Fire Department

MAR 21 2017

Date



Melvin N. Kaku, Director  
City and County of Honolulu  
Department of Emergency Management

3/24/17

Date



David G. Smith, Administrator  
State of Hawai'i  
Department of Land and Natural Resources-  
Division of Forestry and Wildlife

4/4/17

Date

## INTRODUCTION

### WESTERN O'AHU COMMUNITY WILDFIRE PROTECTION PLAN

## GOALS AND OBJECTIVES

This Community Wildfire Protection Plan (CWPP) was developed by the Hawai'i Wildfire Management Organization (HWMO) with guidance and support from government agency representatives, private resource managers, community members, and decision makers concerned about wildfire issues in Western O'ahu. State of Hawai'i Department of Land and Natural Resources- Division of Forestry and Wildlife (DLNR-DOFAW), Honolulu Fire Department (HFD), and O'ahu Wildfire Information and Education Coordinating Group (OWIE) were the primary partners in developing this plan.

This plan addresses elements of fire protection, hazard assessment, wildfire mitigation priorities, and community outreach and education. The process used to develop this plan engaged a diversity of agencies and individuals concerned with the at-risk area, following the guidelines and requirements of federal programs such as the Federal Emergency Management Agency (FEMA) Pre-Disaster Mitigation program and the National Fire Plan (NFP).

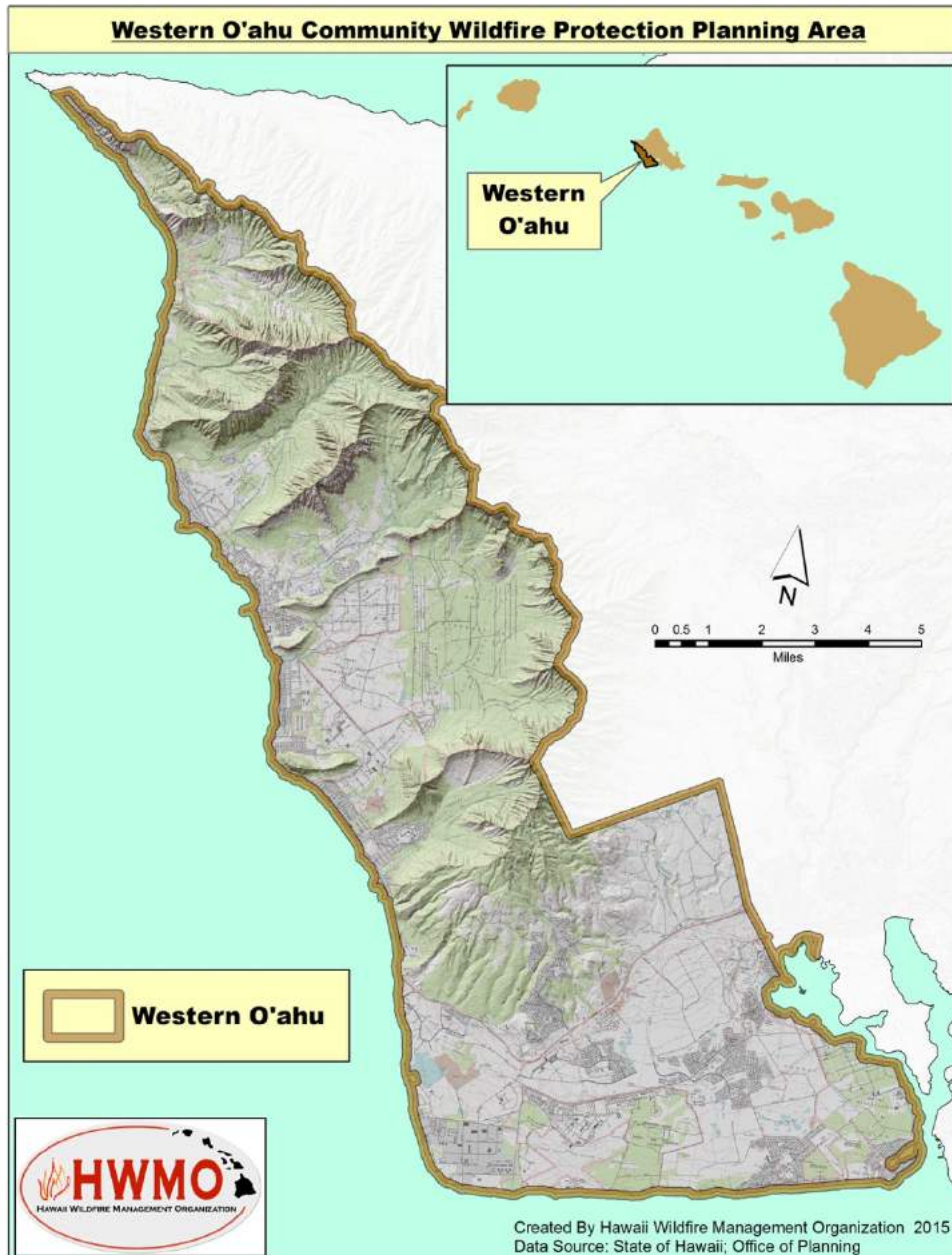
The goals and objectives of this plan follow the intent and requirements of the *Healthy Forests Restoration Act (HFRA) of 2003– HR 1904*, which describes a CWPP as a fire mitigation and planning tool for an at-risk community that:

- Is developed within the context of the collaborative agreements and the guidance established by the Wildland Fire Leadership Council and agreed to by the applicable local government, local fire department, and state agency responsible for forest management, in consultation with interested parties and the federal land management agencies managing land in the vicinity of the at-risk community.
- Identifies and prioritizes areas for hazardous fuel reduction treatments and recommends the types and methods of treatment on federal and non-federal land that will protect one or more at-risk communities and essential infrastructure.
- Recommends measures to reduce structural ignitability throughout the at-risk community.<sup>1</sup>

Stakeholder participants in the development of this plan agree that wildfire threats are imminent and can have widespread damage to Western O'ahu watersheds, natural resources, and human communities. The dangers and impacts of fire are related to high numbers of human-caused fires and high fire potential of vegetation. In the last decade, numerous areas of Western O'ahu have burned. The CWPP is an important step toward public-private collaborative action toward wildfire preparedness and protection.

## PLANNING AREA BOUNDARIES AND OVERVIEW

The Western O'ahu CWPP planning area lies on the Island of O'ahu, Hawai'i, and encompasses the Wai'anae and 'Ewa watershed management districts as defined by the Board of Water Supply. This includes the lands that lie between Ka'ena Point in the north and 'Ewa Beach in the south. For most of its length, the planning area is bounded by the Wai'anae Mountain Ridge on the east and the Pacific Ocean on the west. The southeastern corner of the planning area is bounded by Pearl Harbor. This area encompasses over 71,000 acres, which is approximately 18 percent of O'ahu's 385,280-acre land mass.



**Map 1.** Western O'ahu CWPP Planning Area Map.



## PLANNING PROCESS, METHODS, AND PARTICIPANTS

### CWPP PROCESS AND METHODS

The process of developing a CWPP helps to clarify and refine priorities for the protection of life, property, and critical infrastructure in the wildland-urban interface areas. Local residents, landowners, fire suppression agencies, and community leaders have participated in valuable discussions regarding wildfire history, resources at risk, areas of concern, and priority mitigation actions. The methods used to create this CWPP followed the guidelines established by the HFRA, which requires involving decision makers, government agency representatives, and interested parties during the planning process.

The Western O’ahu CWPP followed these guidelines and additionally satisfies the requirements of the Federal Emergency Management Agency (FEMA) Pre-Disaster Mitigation program and the National Fire Plan (NFP).

### PARTICIPANTS

#### State and Local Agencies

Representatives of the agencies that have jurisdictional responsibilities in the vicinity of the Western O’ahu CWPP planning area, and who have been involved in the development of the Western O’ahu CWPP are:

Agency	Representative(s)
Honolulu Fire Department	Socrates Bratakos, Assistant Chief, Support Services Terry Seelig, Battalion Chief, Fire Prevention Bureau 40+ firefighters who attended public meetings to provide input
Hawai'i Department of Land and Natural Resources- Division of Forestry and Wildlife	Robert Hauff, State Protection Forester Ryan Peralta, Forest Management Supervisor I Deitra A. Meyers Tremblay, Program Specialist David G. Smith, Administrator Deborah Ward, Public Information Officer

**Table 1.** CWPP Participants: State and Local Agencies.

#### Federal Agencies

The following federal agencies were consulted for area-specific and regional fire and environmental information and expertise:

Agency	Representative(s)
Federal Fire Department	Jeffrey Fernaays, Prevention Chief
US Fish and Wildlife Service	Dawn Bruns – Acting Assistant Field Supervisor Section 7 & Habitat Conservation Plans

**Table 2.** CWPP Participants: Federal Agencies.

#### Decision Makers

The decision makers contacted for input and involvement in the development of the Western O’ahu CWPP are represented in the following table. HWMO called and emailed each of the following politicians for input and assistance in advertising about the public input meetings in their districts and region. Many responded via email or sent representatives from their offices to the public input meetings.

Local Government	Name	Representing
Hawai'i State House of Representatives	Rep. Ty J.K Cullen	H District 39: Royal Kunia, Village Park, Waipahu, Makakilo, West Loch
	Rep. Sharon Har	H District 42: Kapolei, Makakilo
	Rep. Jo Jordan	H District 44: Wai'anae, Makaha, Makua, Maili
	Rep. Matthew LoPresti	H District 41: 'Ewa, 'Ewa Beach, 'Ewa Gentry, 'Ewa Villages, Hoakalei, Ocean Pointe
	Rep. Bob McDermott	H District 40: 'Ewa, 'Ewa Beach, 'Ewa Gentry, Iroquois Point
	Rep. Andria P. L. Tupola	H District 43: 'Ewa Villages, Kalaeloa, Honokai Hale, Nanakai Gardens, Ko Olina, Kahe Point, Nanakuli, Luolualei, Maili
Hawai'i State Senate	Sen. Mike Gabbard	S District 20: Kapolei, Makakilo, and portions of 'Ewa, Kalaeloa, and Waipahu
	Sen. Maile S. L. Shimabukuro	S District 21: Kalaeloa, Honokai Hale, Ko 'Olina, Nanakuli, Ma'ili, Wai'anae, Makaha, Makua
	Sen. Will Esparro;	S District 19: 'Ewa Beach, Ocean Pointe, 'Ewa by Gentry, Iroquois Point, portion of 'Ewa Villages
Honolulu City Council	Councilmember Kymberly Pine	District 1: 'Ewa, 'Ewa Beach, Kapolei, Makakilo, Kalaeloa, Honokai Hale, Ko Olina, Nanakuli, Wai'anae, Makaha, Keaau, Makua, Maili

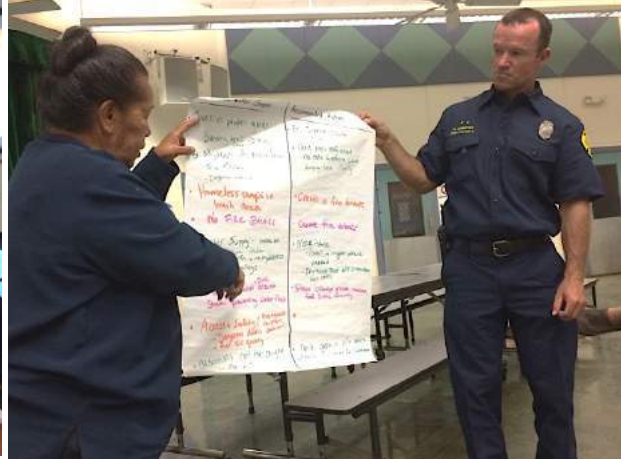
**Table 3.** CWPP Participants: Decision Makers.

### Interested Parties

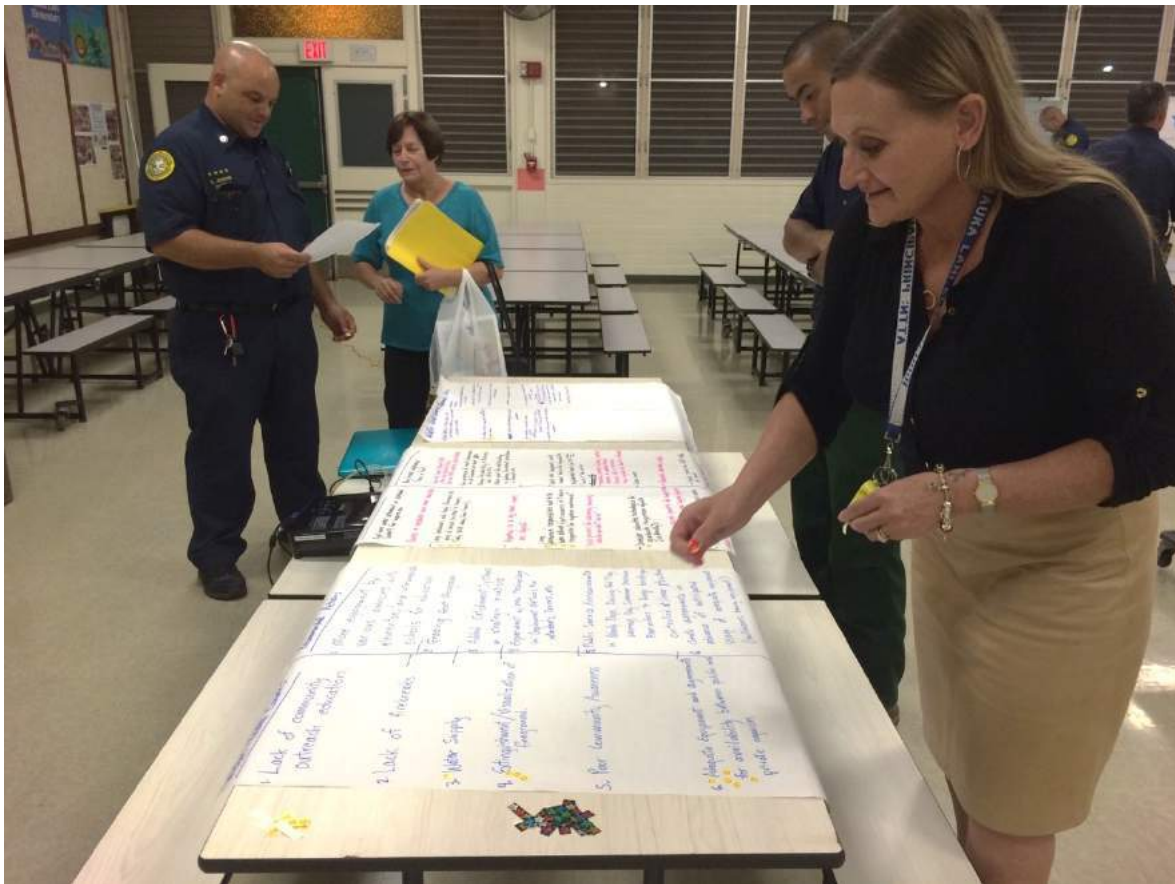
The parties from our community that have shown interest in forest/fire management and contributed input into the Western O'ahu CWPP are:

Interested Parties	Affiliation
Large Landowners	Gill Ewa Lands, LLC Ka'ala Farms Palehua Ranch
Local Associations and Organizations	UH Honolulu Community College, Fire Science Program 'Ewa Neighborhood Board Nanakuli/Maili Neighborhood Board Wai'anae Neighborhood Board Wai'anae Mountains Watershed Partnership
Private Citizens	General Public

**Table 4.** CWPP Participants: Interested Parties.



**Photo 1 (above left).** Six community meetings were held throughout Western O’ahu to collect wildfire-related concerns and recommended action ideas from residents. HFD and DLNR-DOFAW were also represented at each meeting to provide input to the plan and information to public participants. **Photo 2 (above right).** Meeting participants separated into small groups to discuss wildfire issues and came back together toward the end of each meeting to share their highest priorities with the larger group.



**Photo 3.** Once all groups shared the wildfire-related concerns and suggestions generated by small group discussions, participants voted using stickers to identify their highest priorities.



**Photo 4.** Diverse groups of residents and firefighters shared their concerns and recommended actions regarding wildfire mitigation with each other at public meetings.



**Photo 5.** Agency-based meetings facilitated the collection of input from the leadership of HFD and DLNR-DOFAW, and many additional firefighters attended and provided input at community meetings.

## WILDFIRES IN WESTERN O'AHU

### BACKGROUND

Steep slopes, rough terrain, strong winds, and a large percentage of highly ignitable invasive grasses characterize the Western O'ahu landscape. This, coupled with warm weather, recurring drought conditions, and a history of human-caused fire starts puts the area at increased risk of wildfire. The proximity of development to fire-prone wildlands present hazardous conditions that now threaten Western O'ahu communities and natural resources. Overgrown vegetation close to homes, pockets of open space within subdivisions, and an increase of non-native high fire-intensity plants around developed areas pose increasing threats to commercial, community, environmental, and residential resources. Together, these factors create the fire environment that puts Western O'ahu at risk of wildfire. This section discusses those factors in detail.

### FIRE ENVIRONMENT

#### *CLIMATE*

Wildfire occurrence on O'ahu is tied to broad climate patterns, in that more and larger fires typically occur in drier leeward areas. Rainfall in Western O'ahu is highly variable over space and time and can greatly influence fire risk.

Typical of many areas, larger fires tend to occur during droughts and drier seasons, but wet periods may increase the quantity of available vegetative fuels, leading to an increase both in fire risk and in the frequency that mitigation measures such as firebreaks and fuels reduction need to be applied. Drier conditions tend to persist at lower elevations (Map 2), making neighborhoods and lands near the coast particularly vulnerable to wildfire starts. Rainfall is typically greater in mauka (upland) areas, which may result in lower fire risk on average in these areas. However, due to more abundant vegetation in the higher elevations, mauka areas frequently experience moderate to high wildfire risk during periods of drought. Daily weather patterns including diurnal thermal winds also influence fire risk.

Key factors indicating high fire danger in Hawai'i are low relative humidity (RH), temperature, and high wind speeds (see Map 3). The combination of drought, low RH and high winds are tracked at the Honolulu International Airport by the National Weather Service and used to issue Red Flag warnings when high fire danger conditions are present.

#### *TOPOGRAPHY*

Wildfires spread more quickly as they progress upslope, and sun-exposed, south-facing slopes will be drier and burn at higher intensity. The Wai'anae mountain range rises abruptly from the leeward coast and central plains of O'ahu and is characterized by steep, rugged, and often inaccessible terrain (see Map 4). This topography creates dangerous conditions when wildfires occur, limits the ability of emergency response agencies to effectively contain and suppress wildfires, and constrains evacuation options for local communities.

All leeward communities (northward from Nanakuli) have only one egress option (south) along Farrington Highway (which turns from a four-lane route to a two-lane route in Makaha). In addition, many of the communities in valleys and ridges (i.e., Makakilo) have only single access routes. These constraints can often limit emergency response access to the fire-prone, wildland areas behind homes. Once wildfires

spread into steep, upland areas, the lack of roads and difficult terrain frequently limit fire response to costly aerial operations (i.e., bucket drops by helicopters), as conditions are often too dangerous to put firefighters on the ground.

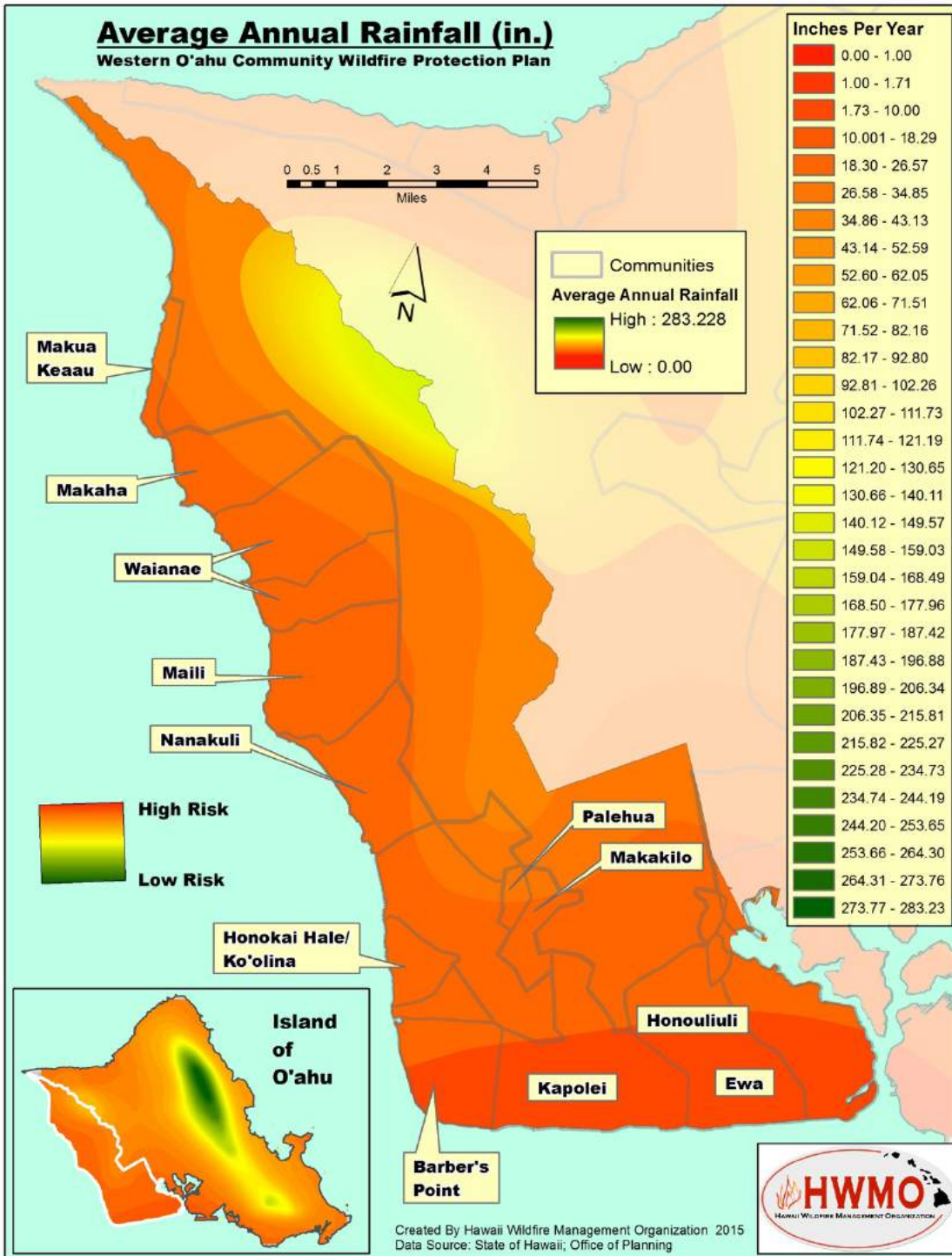
#### VEGETATION AND NATURAL RESOURCES

The widespread establishment of nonnative grasslands and shrublands, especially in lower elevation areas, is a leading cause of increased fire risk in Western O‘ahu. Guinea grass (*Megathyrsus maximus*), buffel grass (*Cenchrus ciliaris*) and ‘ekoa (*Leucaena leucocephala*) create continuous, highly flammable fuel beds over much of the landscape. These grasses provide abundant fine fire fuels that cure rapidly in dry conditions, are easily ignitable even in humid conditions, and allow fires to spread rapidly which create dangerous conditions for fire responders. In addition, interviews with firefighters indicate that ‘ekoa produces abundant embers capable of traveling long distances, creating spot fires and endangering homes (most homes lost to wildfires are the result of embers). Nonnative grasslands and shrublands often act as uninterrupted ‘wicks’ that allow fires to spread from areas near communities (where ignition risk is highest) into the upland forested areas of the Wai‘anae Mountains.

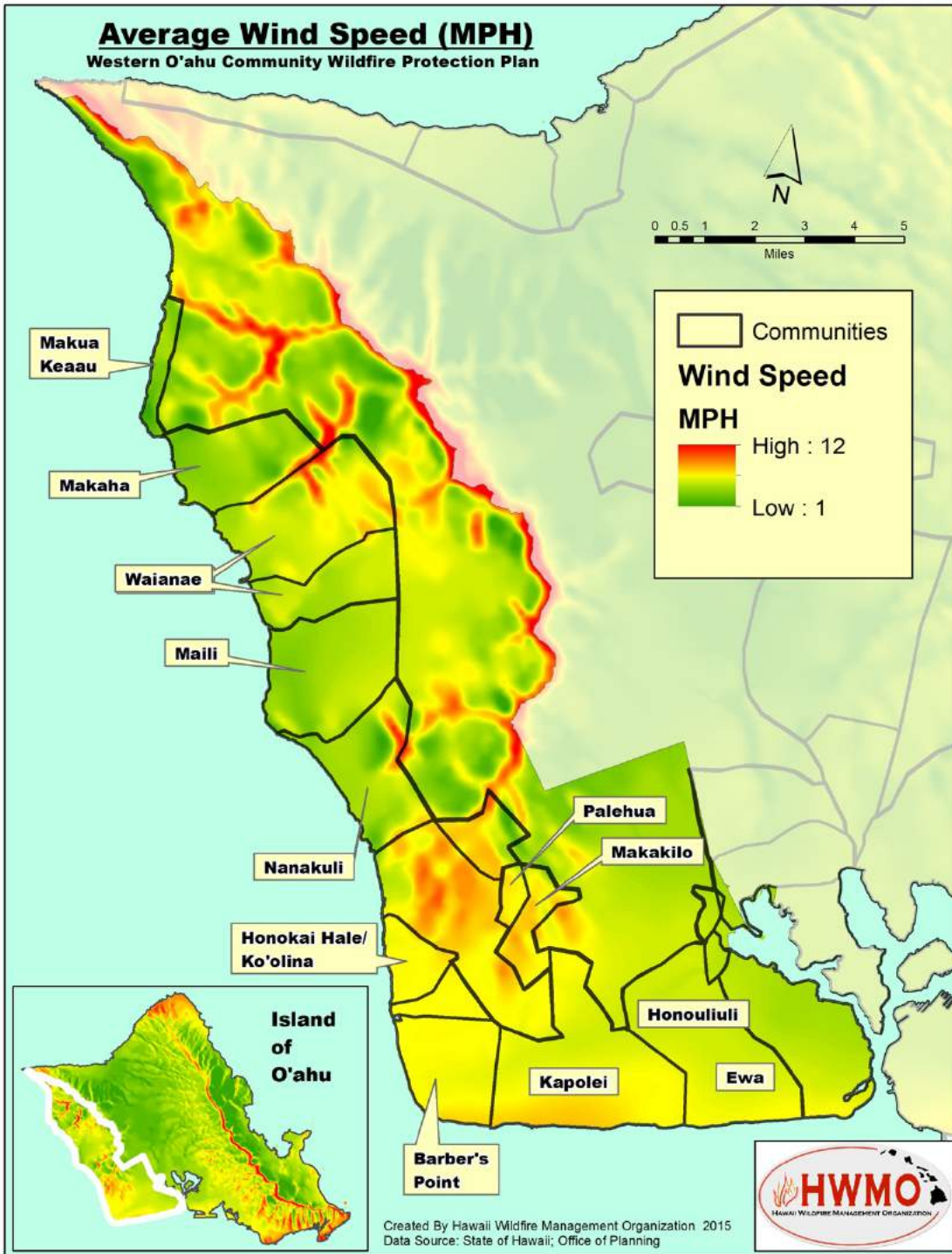
Recurrent fires in these lower elevation grasslands and shrublands effectively ‘erode’ the edges of upland forested areas, which become replaced by grasses and increase the risk of future fires over time. Lower elevation forests typically consist of nonnative tree species such as silk oak (*Grevillea robusta*), strawberry guava (*Psidium cattleianum*), Christmas berry (*Schinus terebinthifolius*), iron wood (*Casuarina equisetifolia*) and eucalyptus species. Fire behavior in these mixed forests is poorly documented, but the dominance of eucalyptus can create areas of high fire risk. Chemical content in eucalyptus leaves and bark prevents decomposition, resulting in large and persistent fuel loads beneath live trees. These increased fuel loads can result in high intensity fires that result in ‘torching’ or vertical fire spread into tree canopies as has been observed in eucalyptus stands during wildfires across the state. (See Map 5 for land cover type, which depicts the types of vegetation that exists within the Western O‘ahu CWPP planning area).

Upper elevation forests in the Wai‘anae mountains contain some of the few remaining tracts of native mesic forest (i.e., drier than rainforest) on O‘ahu, with species such as koa (*Acacia koa*), ‘ohi‘a (*Metrosideros polymorpha*), alahe‘e (*Psychradax odorata*), lama (*Diospyros sandwicensis*) and lonomea (*Sapindus oahuensis*). Western O‘ahu’s native forests are highly valuable for native habitat conservation with higher species diversity than wet forest areas and contain over 40 threatened and endangered plant and animal species. See Map 6 for densities of threatened and endangered species and Map 7 for the areas classified by the U.S. Fish and Wildlife Service (USFWS) as priority habitat conservation areas. Map 8 depicts the types of vegetation within the USFWS priority landscapes area. Map 9 demonstrates fire boundaries in relation to endangered species.

Lower elevation nonnative forests are more exposed to loss from wildfire due to the proximity of fire-prone grasslands and shrublands. However, several recent fires have impacted and/or threatened native forest both from starts within native forested areas – such as the 10 acre Kumaipo Ridge fire between Makaha and Wai‘anae Kai valleys – as well as from lower elevation starts that have spread to upland areas – such as the 7,000 acre Waialua Fire in 2007 that destroyed several populations of endangered plant species including the Hawai‘i State flower, ma‘o hao hele (*Hibiscus brackenridgei*).

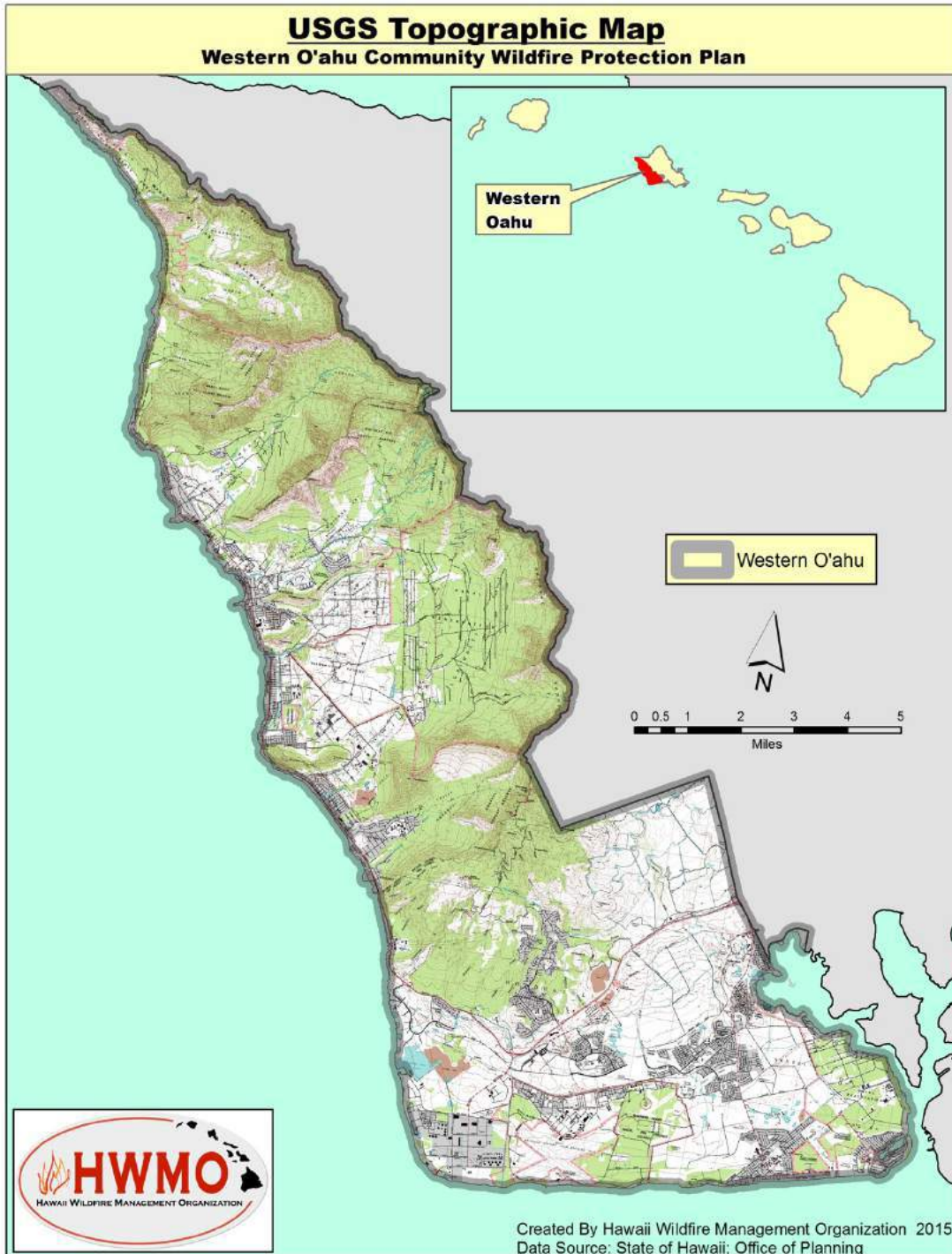


Map 2. Average Annual Rainfall Map.

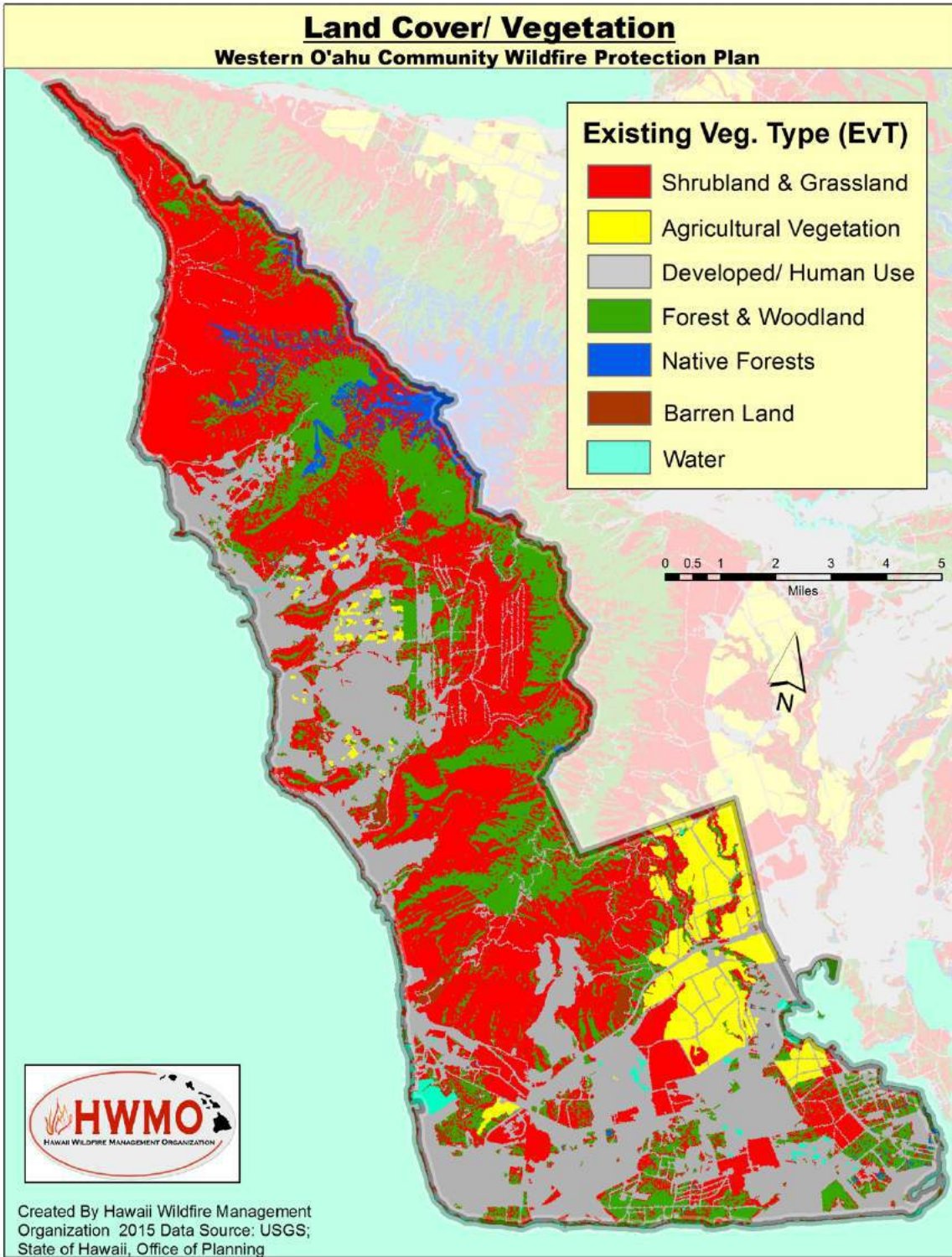


Map 3. Average Wind Speed Map.

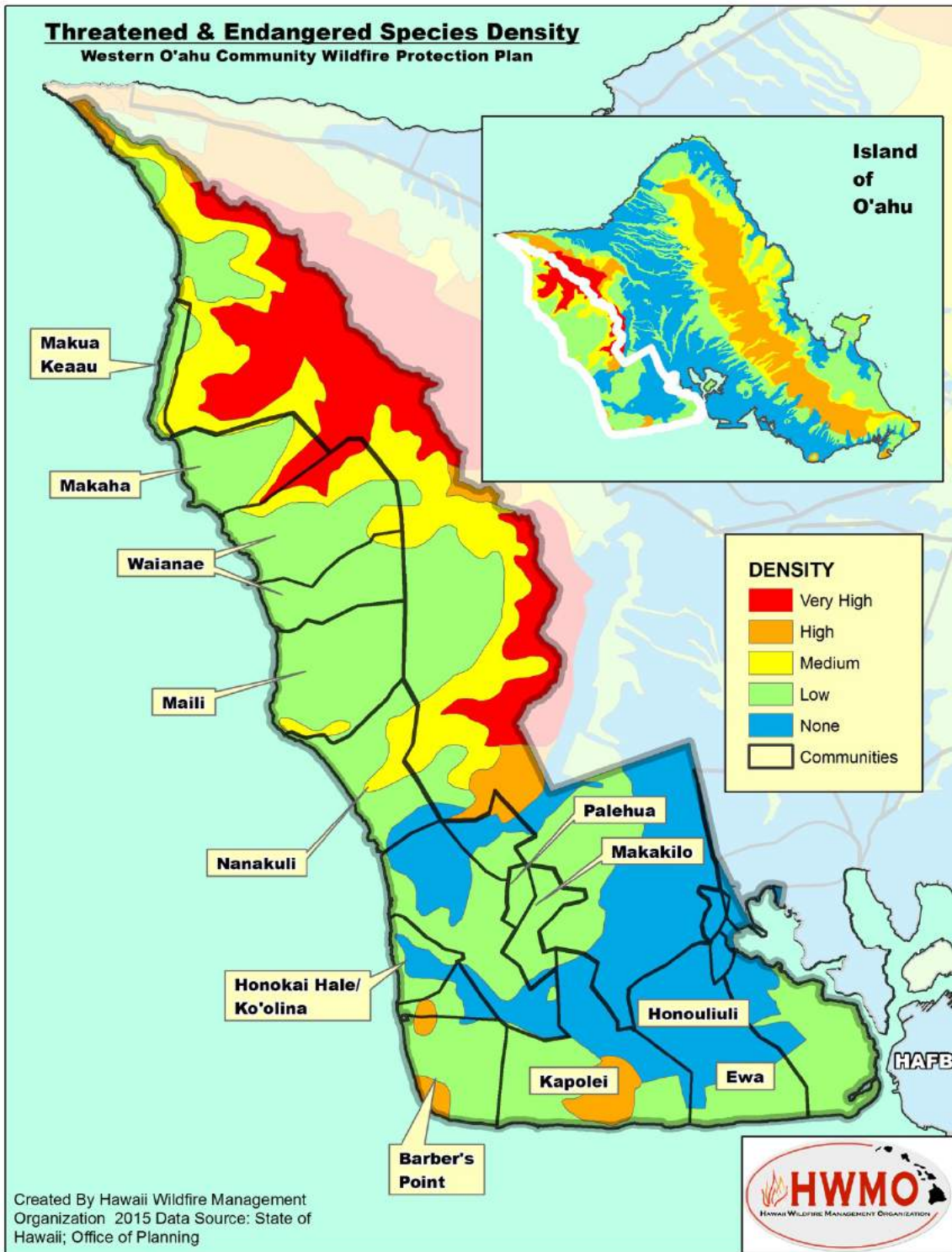




**Map 4.** Topographic Map of Western O'ahu CWPP planning area, based on US Geological Survey data.



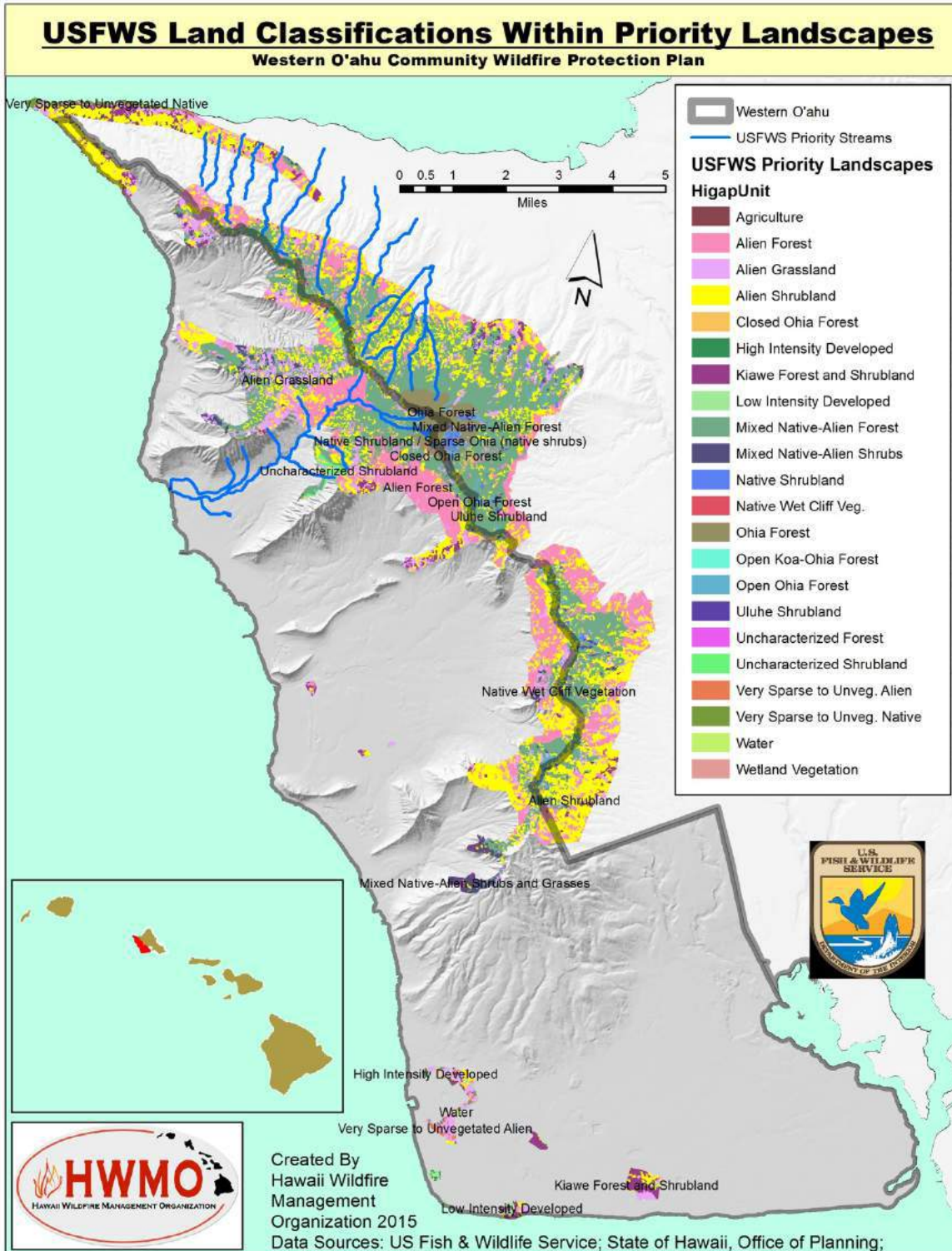
Map 5. Land Cover/ Vegetation Map.



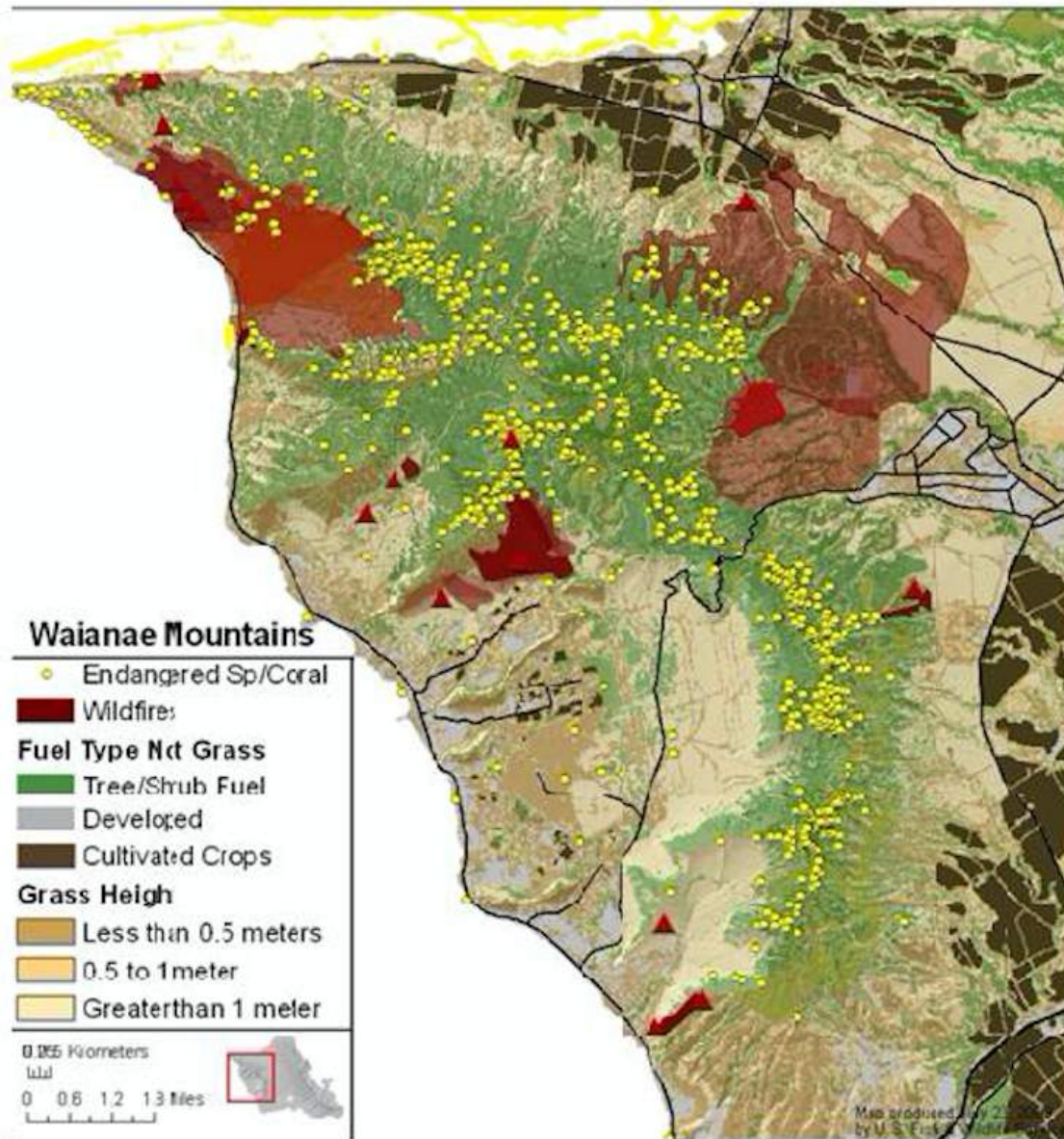
Map 6. Threatened and Endangered Species Density Map.



Map 7. USFWS map of Priority Landscapes within the CWPP planning area.



**Map 8.** USFWS map of land cover type within their Priority Landscapes in and adjacent to the Western O'ahu CWPP planning area.



**Map 9.** Wildfire Threats to Endangered Species. Map provided by Dawn Bruns, USFWS.

## FIRE HISTORY

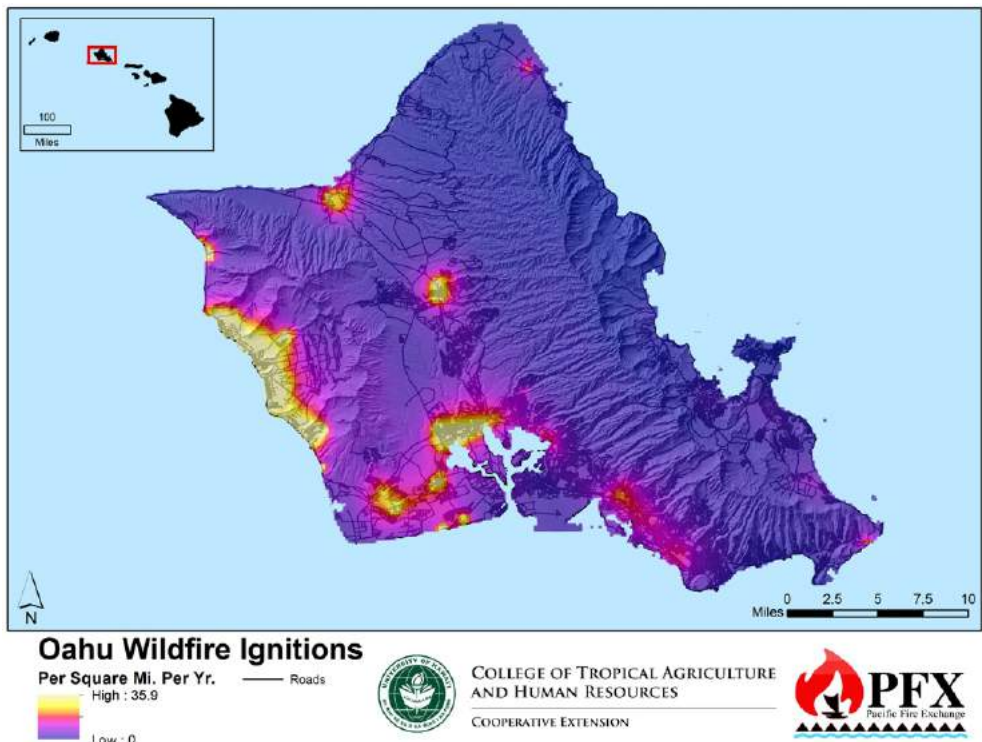
The WUI— the wildland-urban interface area along which developed areas, roads, and community infrastructure abut undeveloped land— is where the majority of wildfire ignitions occur in all of Hawai'i. The Western O'ahu CWPP planning area is no exception. Because of this, WUI areas often experience the greatest risk of loss of property, life, and natural resource function due to wildfire. The majority of wildfires on O'ahu are caused by human error or arson, especially near developments, power line right of ways, and along roadsides. Additionally, sprawling dry, invasive, fire-prone grasslands surround many communities. Once ignited along the interface, wildfire can spread rapidly through residential areas, threatening both property and life. Wildfires can also spread from the interface to higher elevations, threatening natural areas, including protected species.

Many of the valleys and ridges along the northeastern boundary of the planning area have access roads (multiple ignition points) and contain irreplaceable cultural and natural resources. These roads vary from paved with public access to unpaved and/or restricted in access. Significant fire hazards include unmanaged grasses and shrubs, unattended campfires, and sparking power lines. Once ignited, these fires spread rapidly and threaten nearby community infrastructure, neighborhoods, grazing lands, and valuable native flora and fauna.

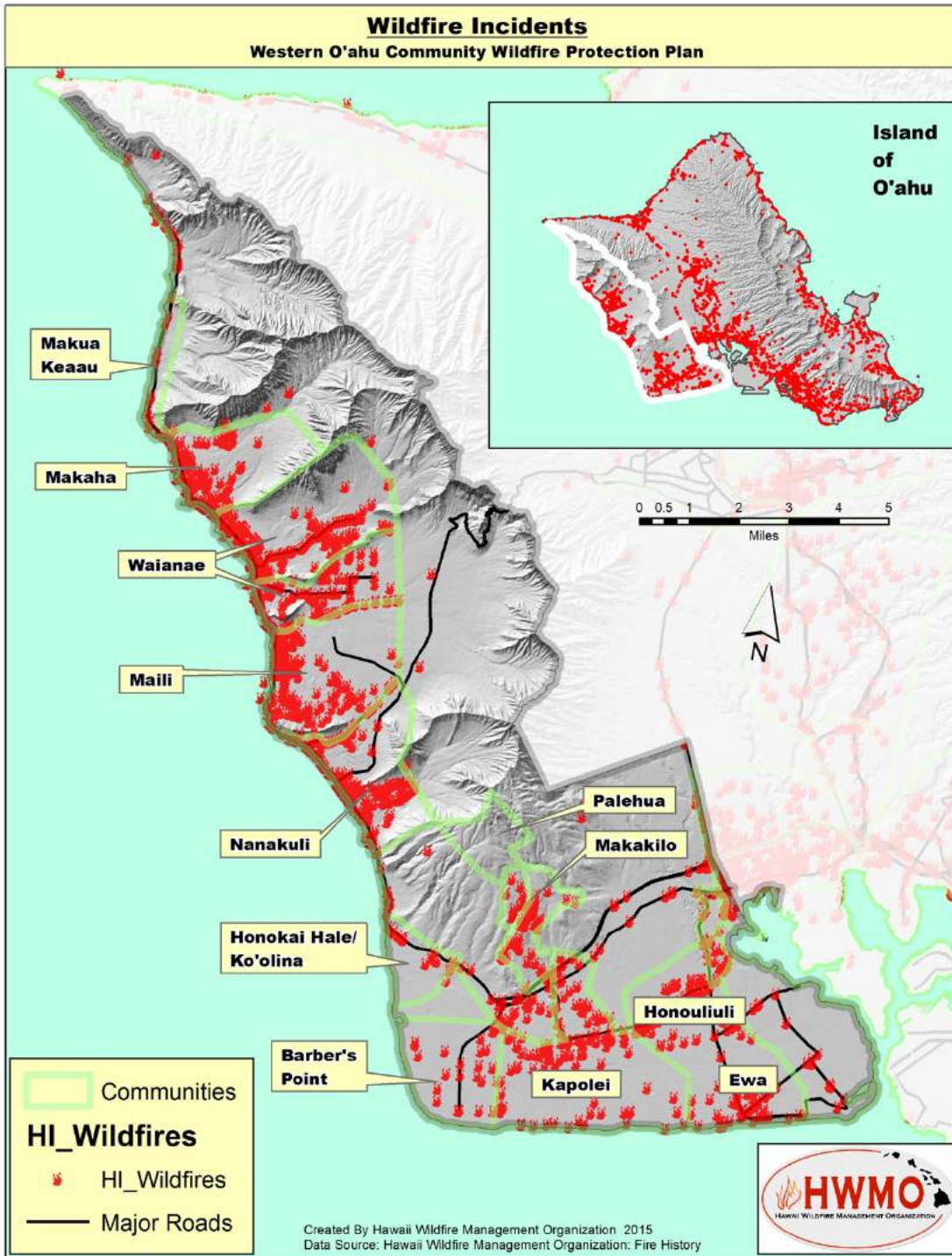
**FIRE INCIDENTS AND IGNITION DENSITIES**

In 2013, HWMO completed its effort to compile wildfire records from fire suppression agencies across the state, which resulted in a statewide wildfire database, as well as region-specific wildfire incident maps. The Western O’ahu Wildfire Incident Map (Map 11) includes HFD’s documented responses to wildfires between January 2000 and January 2011 and wildfire ignition points recorded by DLNR-DOFAW since 1998. The map displays ignition points, and does not indicate the final perimeter of burned areas. However, using this and other information, Dr. Clay Trauernicht at University of Hawai’i Cooperative Extension, College of Tropical Agriculture and Human Resources was able to analyze the frequency of ignitions per area and create Map 10, which shows wildfire ignition densities. Western O’ahu emerges as a “hot spot” for its high density of ignitions per square mile.

Ignitions are important for understanding trends and patterns of fires. Map 11 demonstrates that WUI, roadside, and human access area fire starts are important trends across Western O’ahu, and the island in general. While larger fires tend to occur in the drier and/or less developed areas such as those in mauka (upland) regions, the high frequency of ignitions along every WUI interface road and trail is of concern. As drought conditions become more frequent (and they are predicted to increase), there are concerns that large fires in dense unmanaged vegetative fuels will also increase.



**Map 10.** Wildfire Ignition Density Map. Bright regions on the map show areas with the highest number of wildfire ignitions per square mile. Note that Western O’ahu stands out for its high density of ignitions.



**Map 11.** Western O'ahu Wildfire Incidents Map. Incidents depicted were recorded from 1988-2011. Note: points displayed are ignition sites only and do not indicate perimeter boundaries of burned areas.



## SIGNIFICANT FIRES

Numerous large wildfires (over 100 acres) have taken place in the Western O‘ahu region. Detailed records are scant before 2000, but many since that time have received media attention or been noted for their significant impacts. Table 5 highlights the fires on record that were significant in terms of size, media coverage, or impact between 2000-early 2016

Incident Name	Location	Date Started	Acres	Cause	Property/ Vegetation	Notes
<b>Makua Valley</b>	Makua Valley	June 14, 2005 (1:40 p.m. - first alarm)	2,820	Debris Burning	N/A	Between 2001 to 2012, largest brushfire in
<b>Nanakuli ('Ewa) Fire</b>	Upper slopes of Nanakuli Valley (makai) heading towards Makakilo	August 14, 2005 (1:15 p.m. - first alarm)	2,800	Arcing on utility pole	N/A	See detailed description below
<b>Nanakuli</b>	Pikaiolena Street, Waiea Pl., Huikala moving east	March 17, 2016 (3:00 p.m. - first alarm)	2500	N/A	N/A	
<b>Makua</b>	Makua	July 22, 2003 (2:12 p.m. - first alarm)	2,100	Misc.	N/A	See detailed description below
<b>Wai'anae Valley '02</b>	85-1570 Wai'anae Valley Road;	July 24, 2002 (8:20 p.m. - first alarm); Contained July 26, 2002	1,700	Misc.	State ag lease lands and Wai'anae Forest Reserve; Brush and grass mixture	See detailed description below
<b>Yokohama</b>	Yokohama (Keawaula) - 81-601 Farrington Highway	August 15, 2003 (7:45 p.m. - first alarm)	1,700	Incendiary	Brush and grass mixture	Also large fire in 1998 of 1500 acres in same area
<b>Makakilo</b>	Umena Street towards Honouliuli Forest Reserve	August 22, 2015 (afternoon - first alarm)	1,000+	Matches	Scalded 2-3 homes	HFD Cost: \$54,060; See detailed description below
<b>Makua-Kea'au</b>	Makua-Kea'au & Kuaokala Forest Reserve	August 5, 1970 (9:00 a.m. - first alarm)	1,525	Incendiary	State land	
<b>Nanakuli 2005</b>	Ulei Loop, Nanakuli	May 10, 2005 (12:27 p.m. - first alarm)	1,508	Incendiary	N/A	
<b>Yokohama</b>	Yokohama (Keawaula)	August 24, 1998 (9:59 p.m. - first alarm)	1,500	N/A	Brush and grass mixture	Also large fire in 2003 of 1700 acres in same area
<b>Nanakuli Valley 1990</b>	Started between Maile Point and Nanakuli above BWS facility	June 20, 1990 (1:34 a.m. - first alarm)	1,000	Misc.	N/A	
<b>Lualualei/ Wai'anae Kai</b>	87-1041 Oheohe Street to 86-119 Kuwale Road	June 3, 2012 (2:28 p.m. - first alarm)	1,100	Railroads	Open land or field with brush-and-grass mixture. Excludes crops or areas under cultivation.	See detailed description below
<b>Kea'au Fire 1993</b>	Kea'au area (started in Makaha)	July 4, 1993 (9:30 p.m. - first alarm)	1,000	Misc.	N/A	
<b>Kaneaki</b>	Waianae Valley Road towards Punanaula Heiau	March 15, 2000 (2:00 p.m. - first alarm)	1,000	Misc.	N/A	
<b>Yokohama '06</b>	Keawaula State Park	July 12, 2006 (10:30 p.m. - first alarm)	760	Misc.	State land	

<b>Kumaipo</b>	Waianae Valley Road in vicinity of "Small Mountain"	October, 9, 2001 (12:13 p.m. - first alarm)	700	Misc.	Open land or field with brush-and-grass mixture. Excludes crops or areas under cultivation.	
<b>Yokohama '93</b>	Kaena Point Tracking Station Area (along road and next to Kuaokala Trail)	April 28, 1993 (6:30 p.m. - first alarm)	600	Smoking	State land	
<b>Makakilo/Palikua</b>	Northeast of Makakilo - Campbell Estate lands	July 12, 1990 (1:12 p.m. - first alarm)	557	Debris Burning	Private land	
<b>Waianae '07</b>	84-680 Kili Drive to Farrington Highway	October 19, 2007 (3:10 p.m. - first alarm)	500	Hot ember or ash	Open land or field with brush-and-grass mixture. Excludes crops or areas under cultivation.	
<b>Waianae '06</b>	Kili Drive	January 3, 2006 (4:53 p.m. - first alarm)	500	Railroads	Brush-and-grass-mixture	
<b>Waianae Valley 1995</b>	Waianae Valley - Waianae Kai Forest Reserve	May 1, 1995 (3:30 p.m. - first alarm)	420	Incendiary	N/A	
<b>Mauka of Yokohama Bay - Continuous Burn</b>	Kaena Point AFS guard house - Makua Range Land	November 6, 1990 (6:39 a.m. - first alarm)	418	Misc.	N/A	
<b>Pu'u Makakilo</b>	Pu'u Makakilo	August 16, 1972 (11:14 a.m. - first alarm)	368	Smoking	N/A	
<b>Nanakuli Valley 1990</b>	Nanakuli Valley	June 18, 1990 (1:34 a.m. - first alarm)	350	Misc.	N/A	
<b>Makakilo #2</b>	Makakilo - 200' elevation; SE aspect along H1 Freeway	August 8, 1974 (12:07 p.m. - first alarm)	325	Smoking	N/A	
<b>Farrington Highway - Kahe Point</b>	Kahe Point in Honokai Hale	October 19, 1990 (1:25 p.m. - first alarm)	300	Misc.	N/A	
<b>Waianae '03</b>	82-180 to 83-501 Farrington Highway	November 20, 2003 (12:21 a.m. - first alarm)	300	Railroads	Brush-and-grass-mixture	
<b>Makua Valley '05</b>	87-739 Hakimo Road	August 2, 2005 (8:27 p.m. - first alarm)	300	Incendiary	Brush-and-grass-mixture	
<b>Kamaileunu</b>	85-180 Ala Akau Street - Kamaileunu Ridge	March 6, 2007 (10:30 a.m. - first alarm)	300	Misc.	Open land or field with brush-and-grass mixture. Excludes crops or areas under cultivation.	
<b>Waianae Valley - Rekindle '92</b>	Waianae Valley	July 30, 1992 (9:58 a.m. - first alarm)	300	Misc.	N/A	
<b>Iroquois Point '12</b>	Iroquois Point Road - 'Ewa Villages	November 10, 2012 (2:47 p.m. - first alarm)	100	Undetermined	Brush and grass mixture	See detailed description below

**Table 5.** Western O'ahu Large and Significant Wildfires.

Narrative accounts and published photos of some of the more notable fires in Western O'ahu are provided below. The majority of the following accounts were originally published as news articles by Hawaii News Now, Honolulu Star-Bulletin, Honolulu Advertiser, Star-Advertiser, and KHON, as noted. Wherever possible, additional information from fire agencies and HWMO has been added.

## **Nanakuli Fire- March 17, 2016**

The following information is based largely on KHON<sup>2</sup> reporting:

On March 17th, 2016, one of the largest wildfires in Western O'ahu's history burned 2,500 acres in Nanakuli Valley. The wildfire began atop a steep cliff on the southeastern edge of the valley and headed downslope toward homes along Pikaiolena Street, Waiea Place, and Huikala Place. The fire burned right to the edge of homes, prompting voluntary evacuations. Westbound lanes of Farrington Highway at Ko Olina were shut down by police.

Steep, inaccessible terrain and windy conditions made the wildfire a difficult one for firefighters to suppress. Firefighters commented at the time in local papers as follows:

"It's been difficult cause of weather, weather plays a big role cause in the daytime the wind usually comes down the slope but at night time things change and the wind changes direction and goes up slope so it plays tricks on the fire and helps go in a different direction," said HFD Capt. James Todd.

"The challenges are mainly because of terrain, it's kind of steep out there, even in the lower areas, it wasn't always easily accessible. But we got some guys down there. They did a great job putting out the edge of the fire..." explained Paul Miguel, HFD.

On the steep slopes, firefighters relied on additional helicopter support from DLNR-DOFAW, who was coordinating the helicopter base and logistics, as well as providing ground crews.<sup>3</sup> Along with threatening homes, the fire threatened nearby communication towers and lines, but firefighters were able to protect the homes and infrastructure. The fire, however, did burn from residential areas into natural areas, where it threatened pockets of sensitive native preserves.

The fire came at a time when drought conditions were worsening as a result of a strong El Niño. "Usually a fire like this doesn't happen until the summer but it's drier than normal for this time of year, so I think the brush fire season started a little bit early," said Battalion Chief Bill Steinke of HFD.



**Photo 6.** Nanakuli 2016 fire burning upslope of residential areas. (Photo Credit: Kristopher Pinero/ KHON).



**Photo 7.** The March 2016 Nanakuli fire burned along the wildland-urban interface, threatening community resources. (Photo Credit: Hawaii News Now).

### **Makakilo Fire- August 22, 2015**

*The following information was originally published in Hawai'i News Now: <sup>4</sup>*

Two seven-year-old brothers were playing with lighters behind their home when they accidentally sparked one of the largest wildfires in Makakilo's history. Starting on August 22, 2015, the 1,000-acre fire began near homes along Umena Street and up toward Honouliuli Forest Reserve, which is home to the endangered O'ahu elepaio and kahuli tree snails.



**Photo 8.** *Smoke from the Makakilo Fire can be seen billowing over the wildland-urban interface. The fire impacted both wildland areas and residents, who were evacuated. (Photo credit: Miguel Gonzalez/Hawaii News Now).*

Homes along Palehua Ridge, a notoriously difficult area to access for firefighters due to tall vegetation, winding roads, and high elevation, were threatened. Firefighters were able to gain access with the help of Thomas Anuhealii, Forest Ranger for Gill Ewa Lands, to protect homes and phone towers. Dozens of homes and cabins were evacuated, including Camp Timberline visitors and occupants. Red Cross established an emergency shelter at Makakilo Community Park, where they hosted 40 or so residents.

The fire was one of the more challenging ones in recent history. "This fire is rather difficult. It's on steep, rough terrain. The wind has been gusting up to 20 to 30 mph. There are some inaccessible areas where the firefighters are unable to get to" explained Captain Jenkins of HFD. Water supply was also an issue as there were no hydrants to access at higher elevations. In all, a few homes suffered minor damage, but no homes or lives were lost. The family of the children who accidentally set the fire went through a fire safety class with HFD.

### **Iroquois Point '12 Fire- November 10, 2012**

*The following information was originally published in Hawai'i News Now<sup>5</sup> and Star-Advertiser:<sup>6</sup>*

'Ewa Beach experienced its largest wildfire between 2001 and 2012 on November 10, 2012. The fire started near the intersection of Hoomaka Street and Iriquois Road in an area of dry grass and brush. According to Captain Gary Lum of HFD, "the blaze was 'complicated' by drought conditions, uncontrolled vegetation, strong winds and difficult access to water. Early on in the firefight, homes were threatened but there wasn't any immediate danger and thus no evacuation calls were made. Another fire near White Plains Beach in 'Ewa occurred on the same day, making firefighters stretched for resources. Both fires were suppressed relatively quickly.

### **Lualualei/ Wai'anae Kai Fire - June 6, 2012**

*The following information is based largely on agency<sup>7</sup> and Star-Advertiser<sup>8</sup> reporting:*

Starting on June 3, 2012 and lasting three days, a 1,100-acre brush fire prompted over 100 firefighters to work to save homes in the Lualualei and Waianae Valleys. The fire began at the Lualualei Naval Magazine near a radio transmitting facility. The fire came dangerously close to two housing areas in

Lualualei and Wai‘anae Valley. The American Red Cross established a shelter at Wai‘anae District Park. Residents of Haleahi Road were prompted to evacuate although many chose to stay and watch or help the firefighting efforts. The cause of the fire was undetermined according to Federal Fire investigators.



**Photo 9.** HFD battling the brush fire along Haleahi Road and the hills above. (Photo credit: F Morris/ Honolulu Star Advertiser).



**Photo 10.** Federal firefighter working on a hotspot from the Lualualei fire. (Photo credit: Federal Fire Department).

The size of the fire, its rapid spread, and the proximity to rare endangered plants prompted helicopter water drops and aerial mapping of both the burn area and threatened/damaged natural resources. The fire also burned through remnant native shrublands, native cliff communities, and small remnant patches of native dry forest, significantly impacting several federally listed endangered species and their habitat.

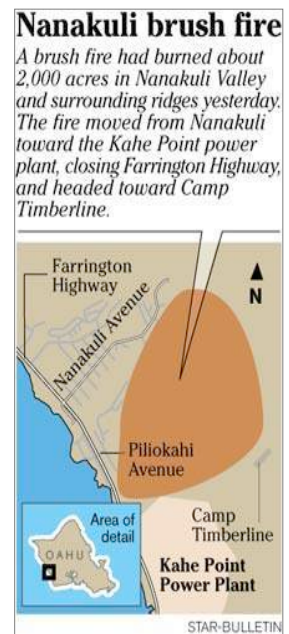
### Nanakuli (‘Ewa) Fire- August 14, 2005

The following information is based on articles published in Honolulu Star-Bulletin<sup>9</sup> and Honolulu Advertiser:<sup>10</sup>

Nanakuli residents experienced one of the area’s worst wildfires in recent years starting on August 14, 2005. According to HWMO data, it was the second largest wildfire between 2001 and 2012, and began due to electrical arcing on a utility pole near the west-facing ridge line of Nanakuli Valley. More than 100 firefighters battled the blaze in the initial hours of the fire, working to protect homes within the Valley and up on Palehua Road. The fire also threatened the Kahe Power Plant, utility towers, and the Nanakuli and Honouliuli Forest Reserves. The fire eventually burned areas where native plants were established.

The wildfire shut down Farrington Highway twice, cutting off access to and from Wai‘anae. Army personnel opened Kolekole Pass for emergency access for civilian traffic during the highway shut downs. Nearby schools also were closed as a safety precaution. Firefighters were staged at the end of various cul-de-sacs off of Nankuli Avenue in order to keep the blaze from burning homes. Residents, including a 79-year-old man, also joined the fight by using their garden hoses alongside firefighters. Many others decided to stay rather than evacuate their homes, even as “thick smoke blanketed the homes as black ash rained down.”

Newspapers captured the reactions of residents:



**Figure 1.** Nanakuli Brushfire location. (Credit: Honolulu Star- Bulletin).

"I will not leave my property. If it consumes everything it will have to consume me with it," said May Wright, 74, who sat outside her home with a white cloth held over her mouth as flames crept down a hill nearby. Edwin Wright, a 29-year-old Nanakuli resident, said "It was like a volcano... You know, like lava coming down the mountain."

Many residents feared the worst but showed much appreciation for the firefighters. "Jodie Makue watched as a helicopter made a water drop, hoping it would hit the flames getting close to homes. When it did she waved a 'thank you. 'My house is not too bad, but we've known everybody so long," she said at the thought of losing her neighbors. 'It's scary.'"

The area has seen a number of wildfires over the years, and some residents explained they had grown accustomed to the frequent fires, a "hallmark of summertime" as was described in the Honolulu Advertiser article on June 16, 2005. "It can be kind of scary but I'm kind of used to it," said Becky Dalere, 61, who has been a Nanakuli resident for 26 years...This was one of the worst fires I've seen."

#### **Makua Fire- July 22, 2003**

*The following information was originally published in Honolulu Star-Bulletin<sup>11</sup> and Honolulu Advertiser:<sup>12,13</sup>*

A controlled burn at Makua Military Reservation turned into a large 2,100-acre wildfire that became the third largest wildfire between 2001 and 2012. Army officials originally planned for a 500 acre burn in Kahanahaiki Valley, but an increase in wind speed and change in direction caused the fire to burn outside the area the Army had intended to clear. Areas listed as critical habitat to native and endangered plants and animals, including snails and O'ahu elepaio, were destroyed due to the blaze. As explained by Gina Shultz, assistant field supervisor for USFWS in Hawai'i, "even if the elepaio were able to fly away, if their habitat burned, it's definitely an impact to the species... Elepaio are territorial and there is a limited amount of suitable habitat for them."

The fire also jumped Farrington Highway, burning 10 acres of public land along Makua Beach. The controversial fire brought the Army's environmental management planning into question from various agency representatives and community groups. Fires in the reservation, which at the time was used by soldiers for live ammunition training, are part of the Army's



**Photo 11.** Fire approaches the Hawaiian Electric Co.'s Kahe Point power plant.<sup>3</sup> (Photo credit: Gregory Yamamoto/Honolulu Advertiser).



**Photo 12.** Smoke obscures the HECO power plant and firefighters, as flames move toward Farrington Highway.<sup>3</sup> (Photo credit: Carol Cunningham/Special to Advertiser).



**Photo 13.** An Army Black Hawk helicopter dropping a load of water on the blaze at Makua Valley. (Photo credit Spc. Daniel P. Kelly/U.S. Army).<sup>6</sup>

overall plan to manage the area, conduct ordinance clearing and continue archaeological surveys. Col. David Anderson, U.S. Army Hawai'i Garrison commander at the time, stated the burn "was part of a 'good-faith effort' to clear the area of ordinance and get more access to cultural sites as the Army is supposed to do under the settlement agreement with Malama Makua."

### **Wai'anae Valley '02 Fire- July 24, 2002**

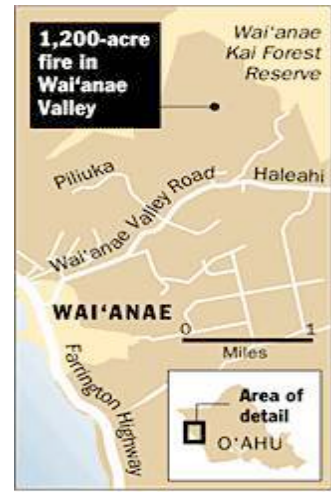
*The following information was originally published in Honolulu Advertiser:<sup>14</sup>*

One of the "biggest ever in Wai'anae Valley," as described by fire officials, the Wai'anae Valley '02 fire that began on July 24, 2002 burned nearly 1,700 acres. With variable winds swirling at 25 mph, a lot of brush providing fuel, and the valley sides sweeping up into cliffs and gorges, the conditions for a bad blaze, foresters and firefighters agreed, were perfect. Firefighters were able to contain the fire by Friday, July 26, 2002, avoiding major damage to the livestock and agricultural farm lots.<sup>15</sup>

The fire, which sparked firefighting efforts from Honolulu FD and federal and state agencies, threatened a number of floral nurseries and livestock operations. Also in harm's way were native forest reserves under DLNR-DOFAW's jurisdiction. Native plants in those reserves included nehe and uhiuhi, according to Kapua Kawelo of U.S. Army Garrison Hawai'i.



**Photo 14 (above left).** Fire Department helicopter, Air One, was joined by a helicopter chartered by the DLNR-DOFAW from Cherry Helicopters, and two Army UH-60 Black Hawks from the 25th Infantry Division at Schofield Barracks to aid suppression for the Wai'anae 2002 fire.<sup>7</sup> (Richard Ambo/Honolulu Advertiser).



**Figure 2 (above right).** Wai'anae Valley Fire '02 location. (Source: Honolulu Advertiser).

## **WILDFIRE IMPACTS**

### **IMPACTS TO NATURAL AND CULTURAL RESOURCES**

Many of the natural and cultural resources in Western O'ahu are exposed to wildfire impacts given the dominance of highly flammable surrounding fuels (grasslands and shrublands), its dry climate and episodic droughts, and the high number of human-caused ignitions. These impacts are compounded by the fact that land-based, aquatic, and marine-based natural and cultural resources all lie within close proximity across the region.

Recurrent wildfires result in the conversion of both native and nonnative forested areas to fire-adapted grasslands and shrublands – and are one of the reasons these fire-prone ecosystems are expanding in many parts of the state. Wildfire is a major cause of the loss and degradation of native forest and other habitat. The upland areas of the Wai'anae mountains contain O'ahu's most biologically diverse native ecosystems with high concentrations of threatened and endangered species. Most of the plant and animal species within these native ecosystems do not survive and/or recover from wildfires. More

generally, the conversion of forest to grasslands due to fire increases the potential for future and larger fires by expanding the availability of fine fuels.

Wildfire also increases the potential for erosion and sediment delivery from upland to coastal and nearshore areas. The immediate loss of vegetation after a wildfire directly exposes soils to rainfall, which can dramatically increase erosion. Wildfire can also alter the physical and chemical properties of soils, making them more prone to surface run-off which can increase the downstream flooding and sediment delivery. Forest conversion to grassland due to recurrent wildfires over the long-term also alters water cycling. The replacement of deep-rooted trees by shallow, matted root systems of grasses results in a higher water table and reduces the ability of rainfall to infiltrate into the soil. This causes an increase in surface runoff during rainfall events and thus the risk of flooding and sediment delivery downstream.

Forest loss and increased downstream sediment delivery to nearshore reefs have important implications for cultural resources as well in terms of tourism, recreation, food resources, and spiritual practices. Sediment loading destroys reefs and impacts nearshore fisheries which are critical subsistence resources to many Western O'ahu families. Burned areas can remain closed to the public for days to months due to landslide and tree-fall danger, limiting access to areas for hiking, hunting, gathering plants, and tending cultural sites. The valleys of Western O'ahu contain some of the highest concentrations of archaeological sites in the state. Although fire may have limited direct impacts on these resources, suppression efforts, such as water drops and the use of bulldozers, can damage these culturally important landscape features.

#### *IMPACTS TO COMMUNITIES AND MUNICIPAL ACTIVITIES*

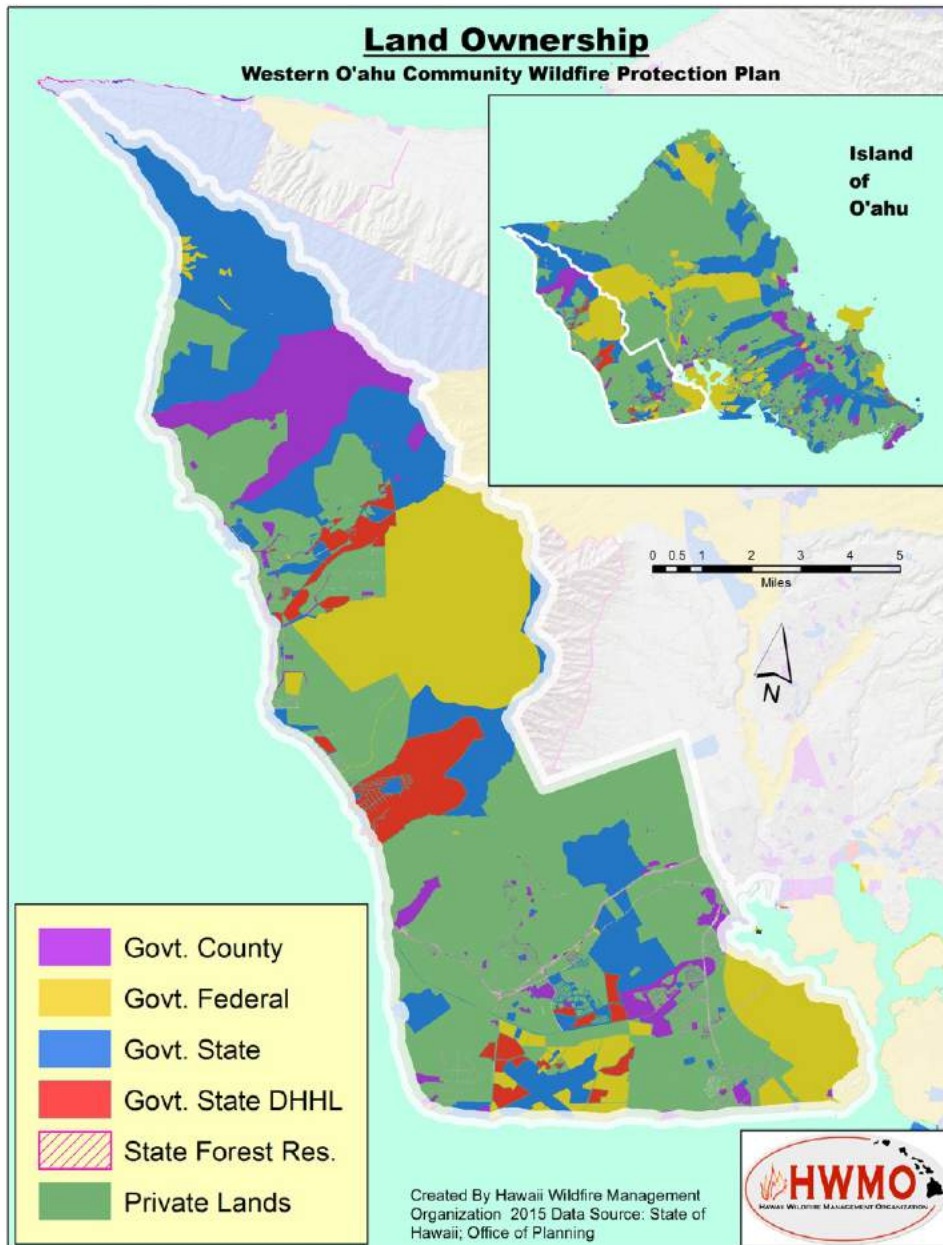
Wildfires threaten lives, homes, and human health in several ways. Many neighborhoods have unmanaged/untended fire fuels interspersed within developed areas, promoting fire spread through communities and into surrounding areas. This creates an increased hazard to lives and homes in the area. Air quality is greatly reduced from smoke during fires and for months to years after fire due to high levels of wind-born dust. This dust is due to fire-caused changes to soil that leaves it water-repellant, and therefore easily lifted into the air.

Wildfires also impact economic and municipal infrastructure and activities. Burned soil from wildfires decreases groundwater recharge, which can affect drinking water supplies. As noted above, post-fire rain events cause erosion that damages nearshore resources (coral reefs, fisheries), which can have effects on one of the area's primary economic bases— coastal and marine-based tourism, as well as resident and visitor recreational activities. Frequent fires also impact powerlines, communication infrastructure and lead to road closures – exacerbating the already congested traffic of Western O'ahu. Traffic and road closures during fire events and post-fire flooding can block access routes and keep people from their homes and work, and are costly to local government.



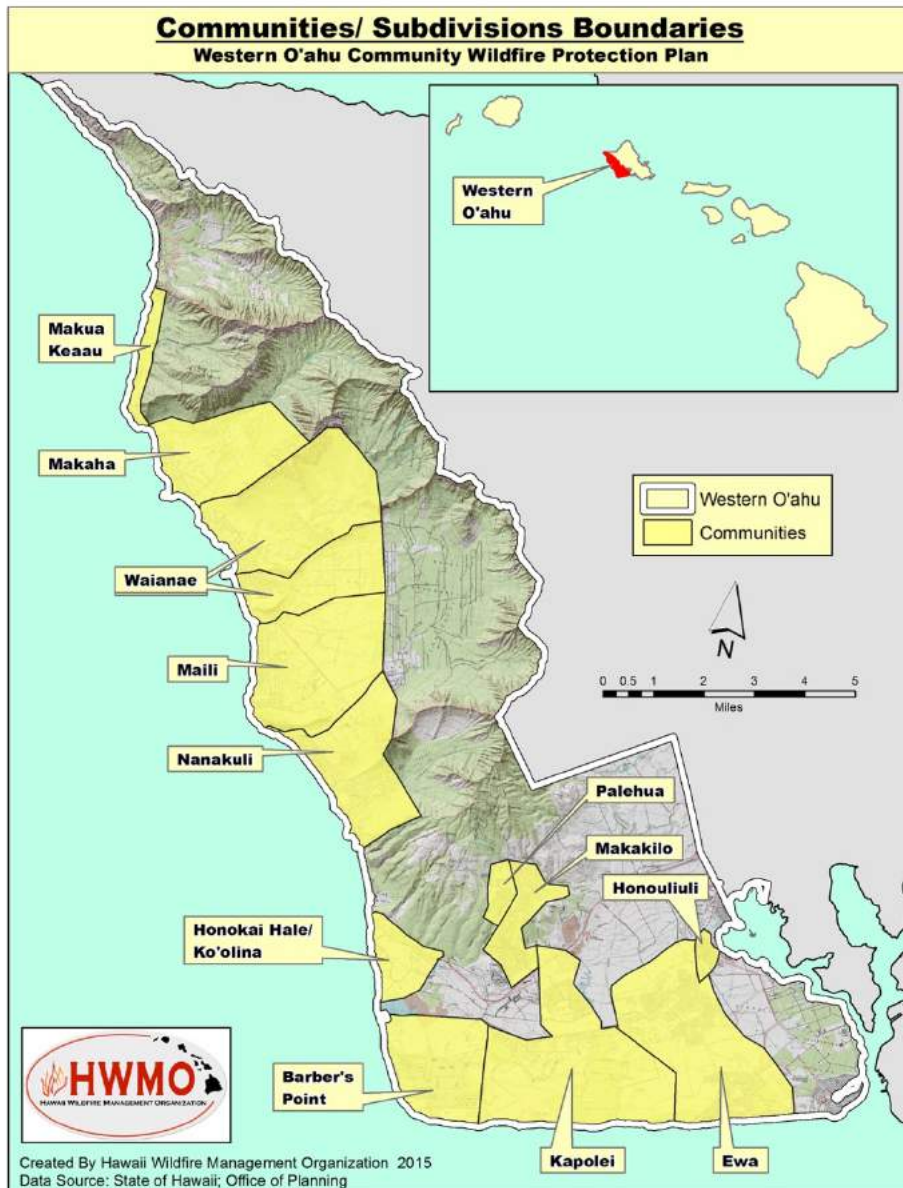
**GENERAL OVERVIEW OF CWPP PLANNING AREA  
WESTERN O'AHU**

The area comprising Western O'ahu, as defined in this plan, includes government and privately owned lands (see Map 12). The CWPP planning boundaries also concurrently define the WUI, which include both developed and undeveloped areas to ensure adequate protection of both. This area was chosen through stakeholder meetings and addresses one of O'ahu's priority fire prone regions.



**Map 12.** Land Ownership Map for the Western O'ahu CWPP planning area.

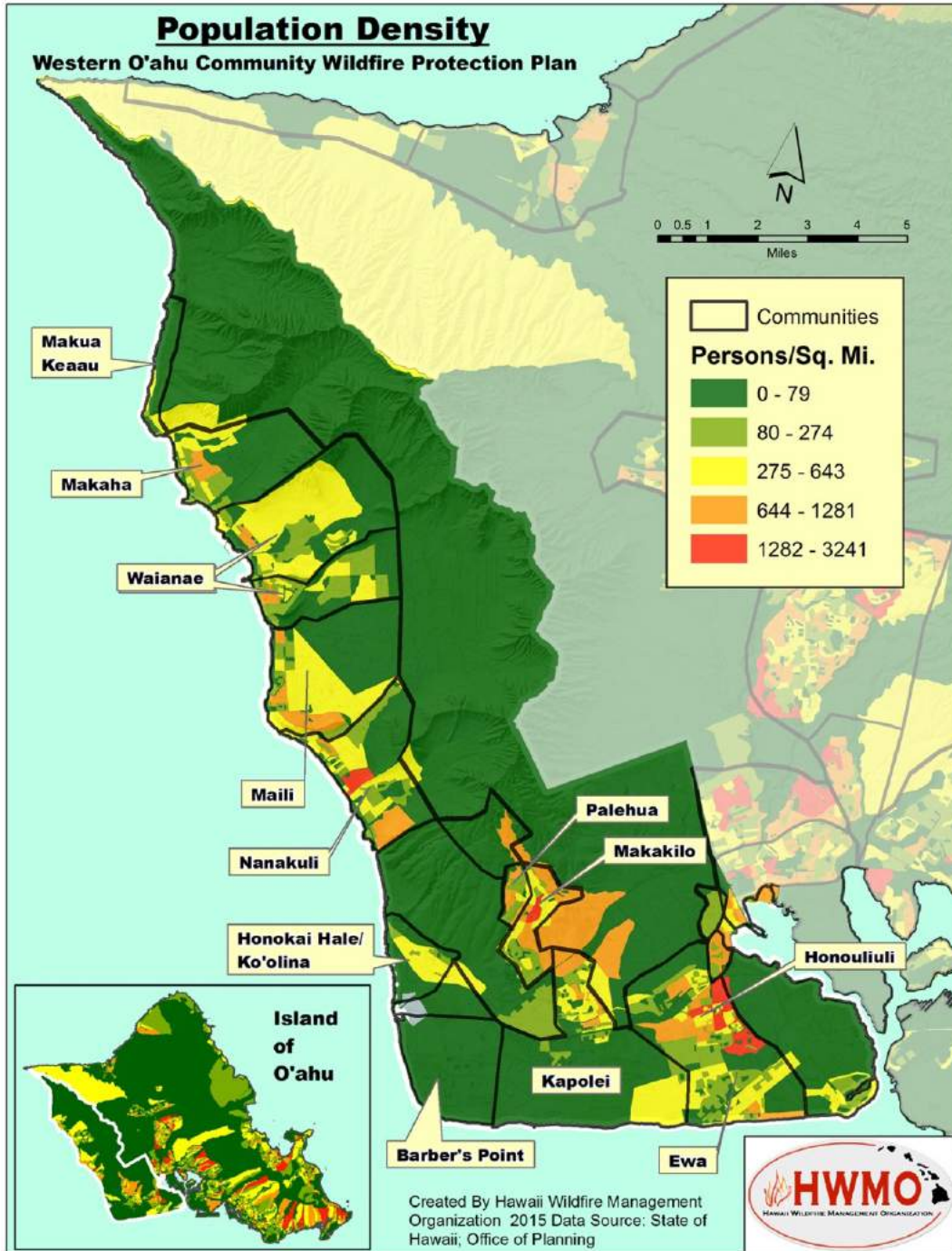
For the purposes of assessing hazards and wildfire threats to resources, residential areas within the Western O’ahu CWPP planning area were simplified into thirteen “communities” (see Map 13). The boundaries depict the areas determined by DLNR-DOFAW to have similar features in terms of wildfire hazard characteristics and have long been the boundaries used in the Division’s Communities at Risk from Wildfire Maps, which are developed every few years to assess Hawai’i’s communities for wildfire threats (See next section, *Communities at Risk from Wildfires* for more information and maps).



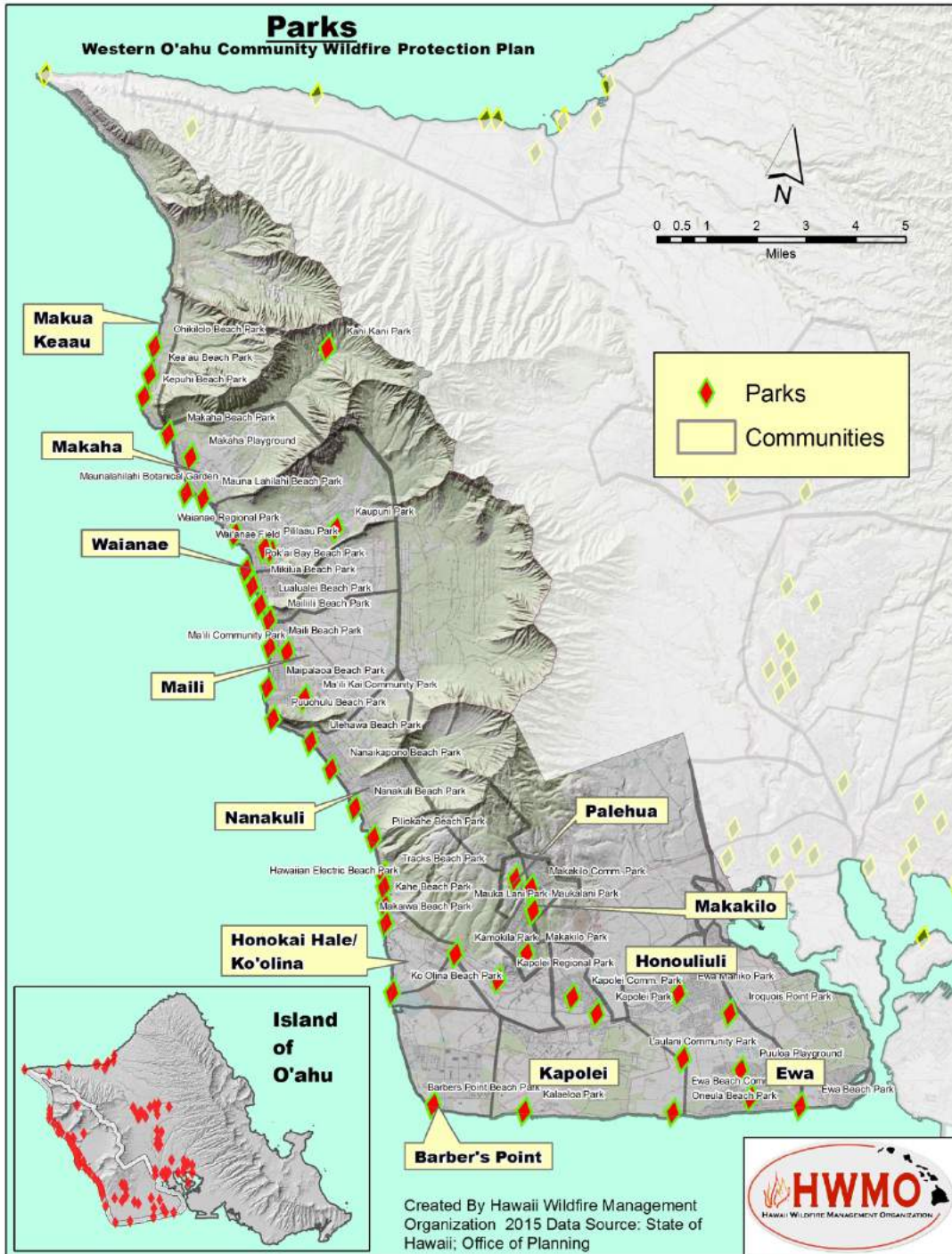
**Map 13.** Simplified community delineations used within the Western O’ahu CWPP planning area. These boundaries were provided by DLNR-DOFAW to replicate those used in the Division’s Communities at Risk from Wildfires Maps.

Western O’ahu exemplifies a WUI, in that it contains both undeveloped fire prone wildland areas adjacent to heavily populated subdivisions and developed areas (see Map 14). There are numerous community assets, resources, and infrastructural features at risk of wildfire in Western O’ahu, to include civil,

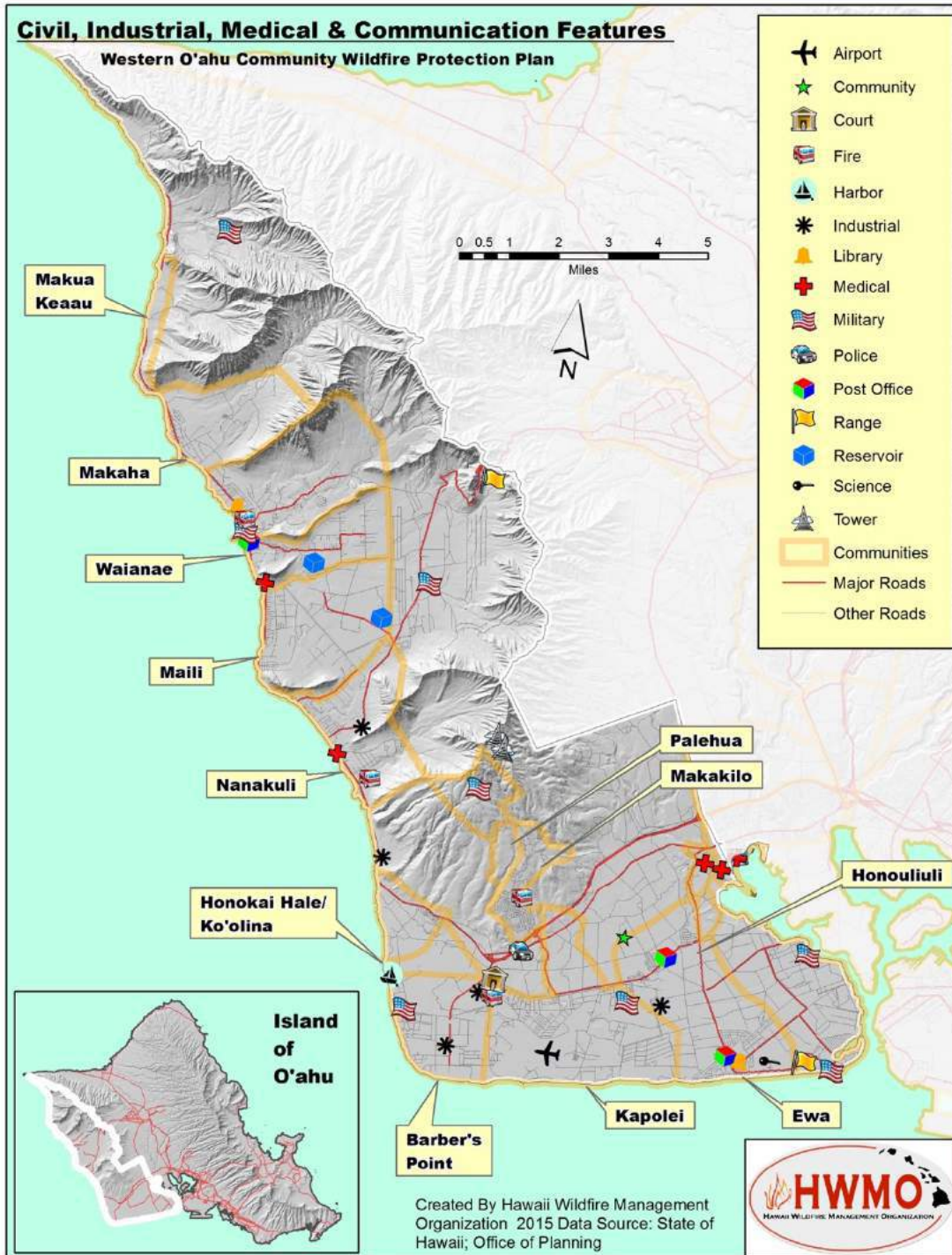
industrial, medical, educational, and recreational features. These are depicted on Maps 15-18. These features may or may not be directly threatened by the flames of wildfire, but all are subject to the broader impacts of wildfire, such as changes in water quality and availability, post-fire erosion and mudslides, smoke and dust, changes in access, traffic, and more.



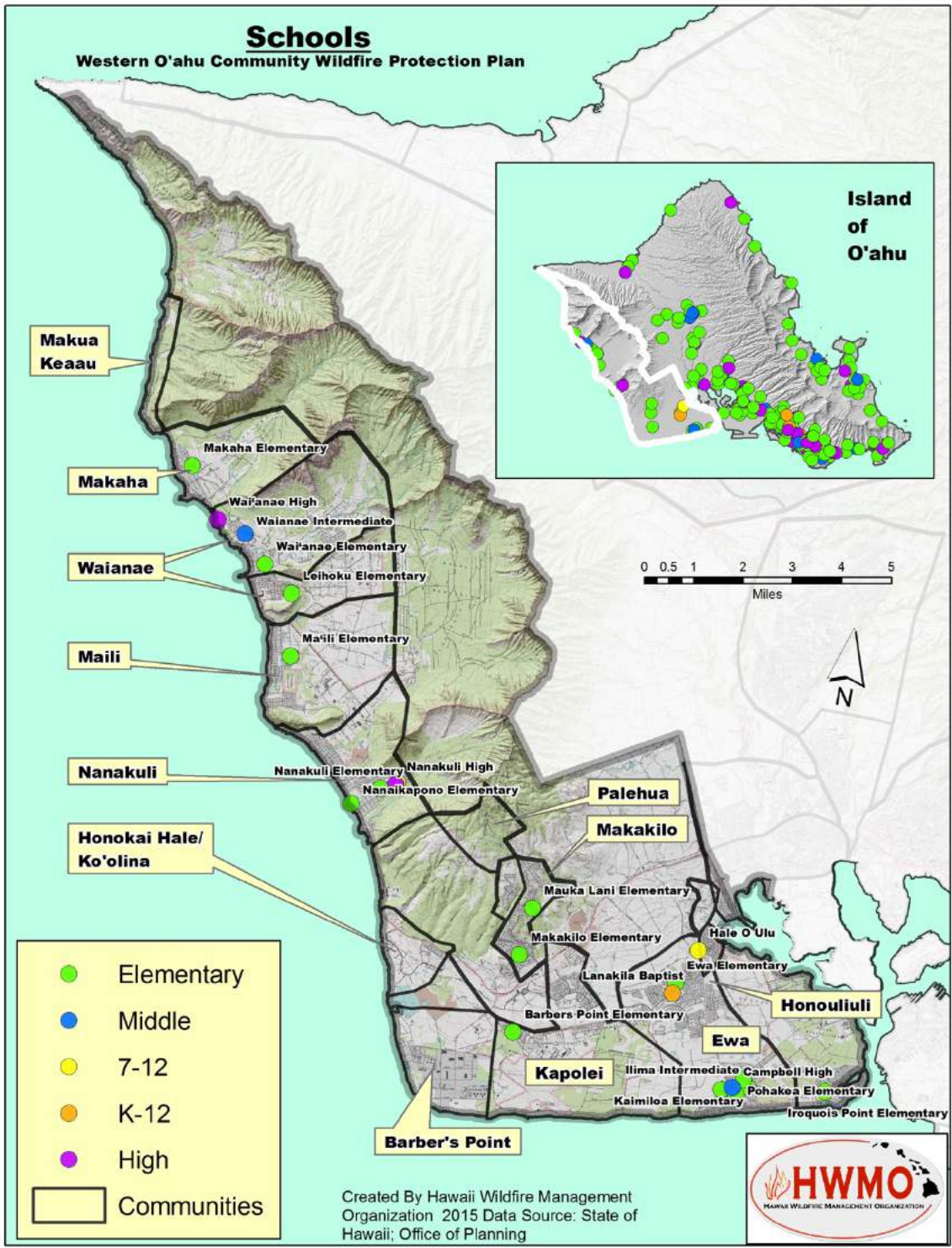
Map 14. Western O'ahu Population Density Map.



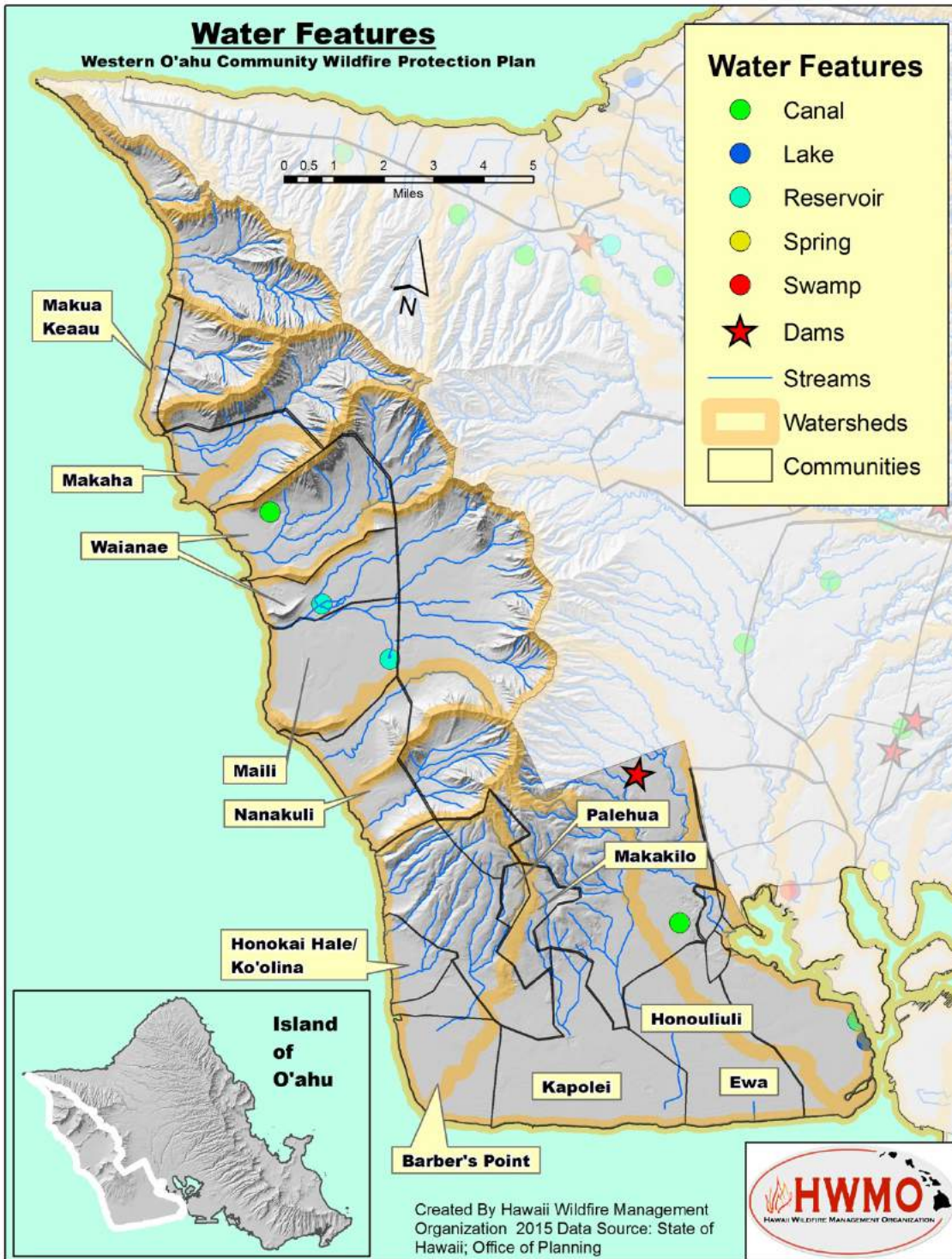
Map 15. Parks in the Western O'ahu CWPP planning area.



Map 16. Civil, industrial, medical, and communication features in the Western O'ahu CWPP planning area.



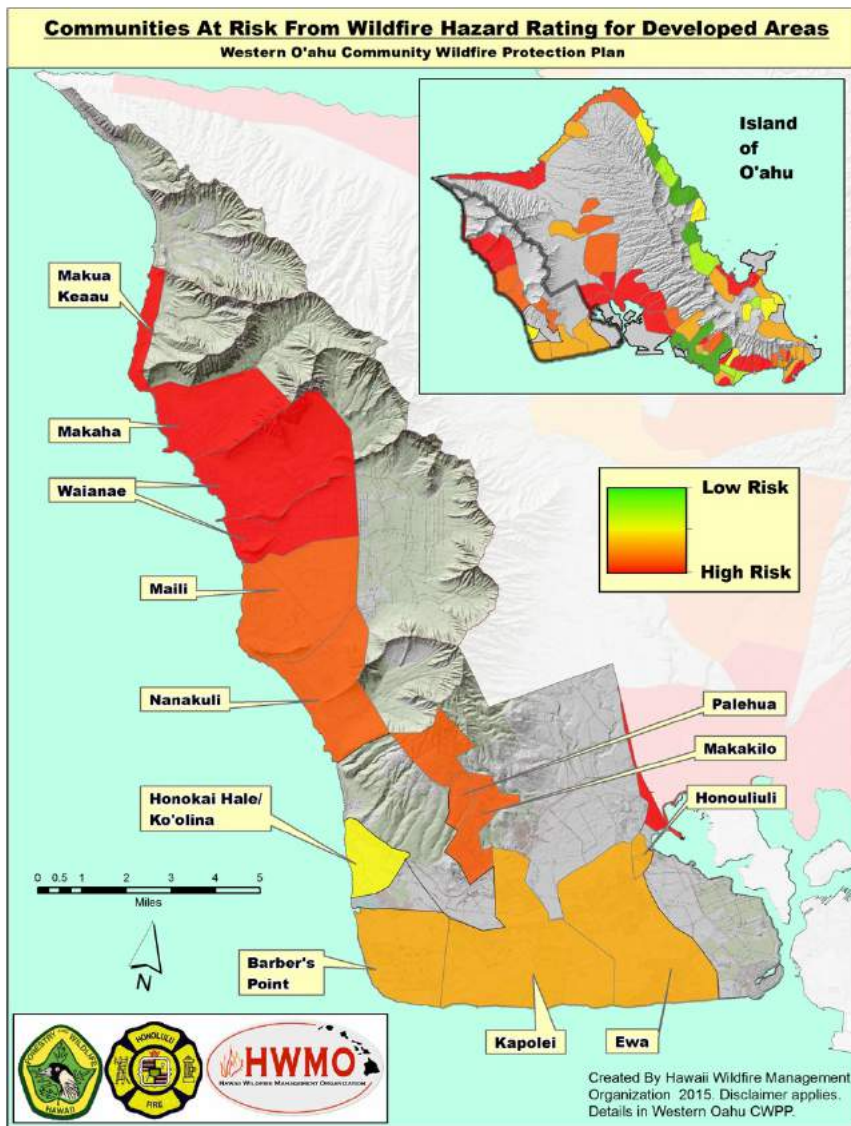
Map 17. Schools in the Western O'ahu CWPP planning area.



Map 18. Water features in the Western O'ahu CWPP planning area.

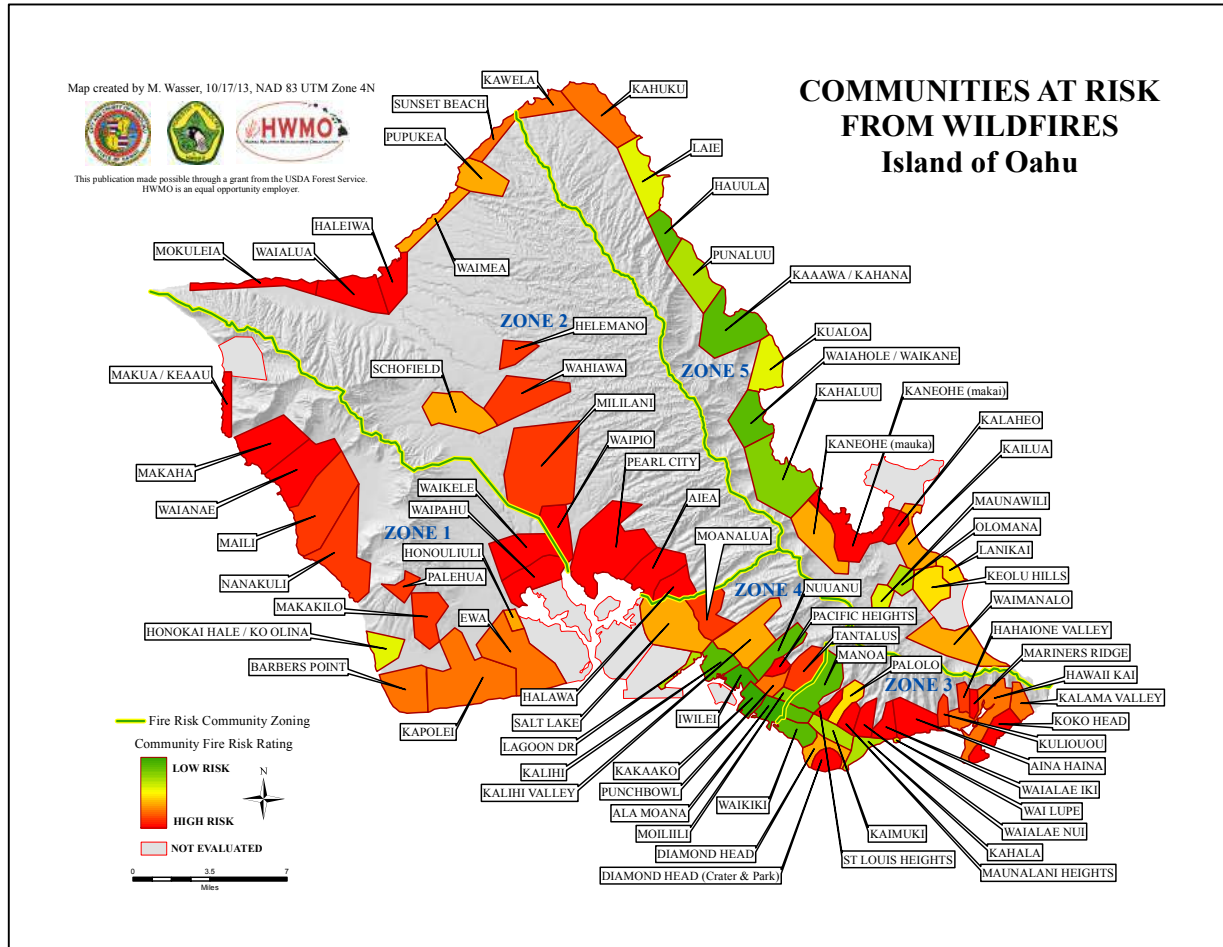
## COMMUNITIES AT RISK FROM WILDFIRE

Nationally, Communities at Risk from Wildfires (CARW) Maps delineate communities that share similar environmental conditions, land use characteristics, fuel types, hazards, and general wildfire issues, and provide ratings to characterize generalized hazards in each area. DLNR-DOFAW has been developing Hawai'i CARW maps for more than a decade, and has developed streamlined community boundaries for the purposes of the Hawai'i CARW map. In 2013, HWMO partnered with DLNR-DOFAW and the county fire departments across Hawai'i to update the Hawai'i CARW maps. The original community boundaries were replicated in the 2013 map update, with changes made to reflect current hazards and subdivision expansions. Map 19 depicts the hazard ratings for Western O'ahu developed areas. Map 20 provides the Island of O'ahu map for context.



Map 19. Western O'ahu Communities at Risk from Wildfires Map- Hazard Ratings for Developed Areas.





Map 20. Island of O'ahu 2013 Communities at Risk from Wildfires Map.

## WILDFIRE RISK ASSESSMENT

### PURPOSE AND METHODS

The purpose of the required community risk assessment is to:

- Provide site-specific information to the public to promote wildfire awareness;
- Help identify and prioritize areas for treatment; and
- Determine the highest priority uses for available financial and human resources.

The methods for this plan's community wildfire risk assessment followed the guidelines established by the HFRA, which requires the following actions:

- Establish Community Base Maps (see Maps 12-18, 26)
- Develop a Community Hazard Assessment (see *Wildfire Hazard Assessment* section)
- Identify Overall Community Priorities (see *Hazard Reduction Priorities*)

The wildfire risk assessment also follows the guidelines and requirements of the Federal Emergency Management Agency (FEMA) Pre-Disaster Mitigation program and the National Fire Plan (NFP). Locally, we have opted to name the effort *Wildfire Hazard Assessment*, rather than *Wildfire Risk Assessment*.

## WILDFIRE HAZARD ASSESSMENT

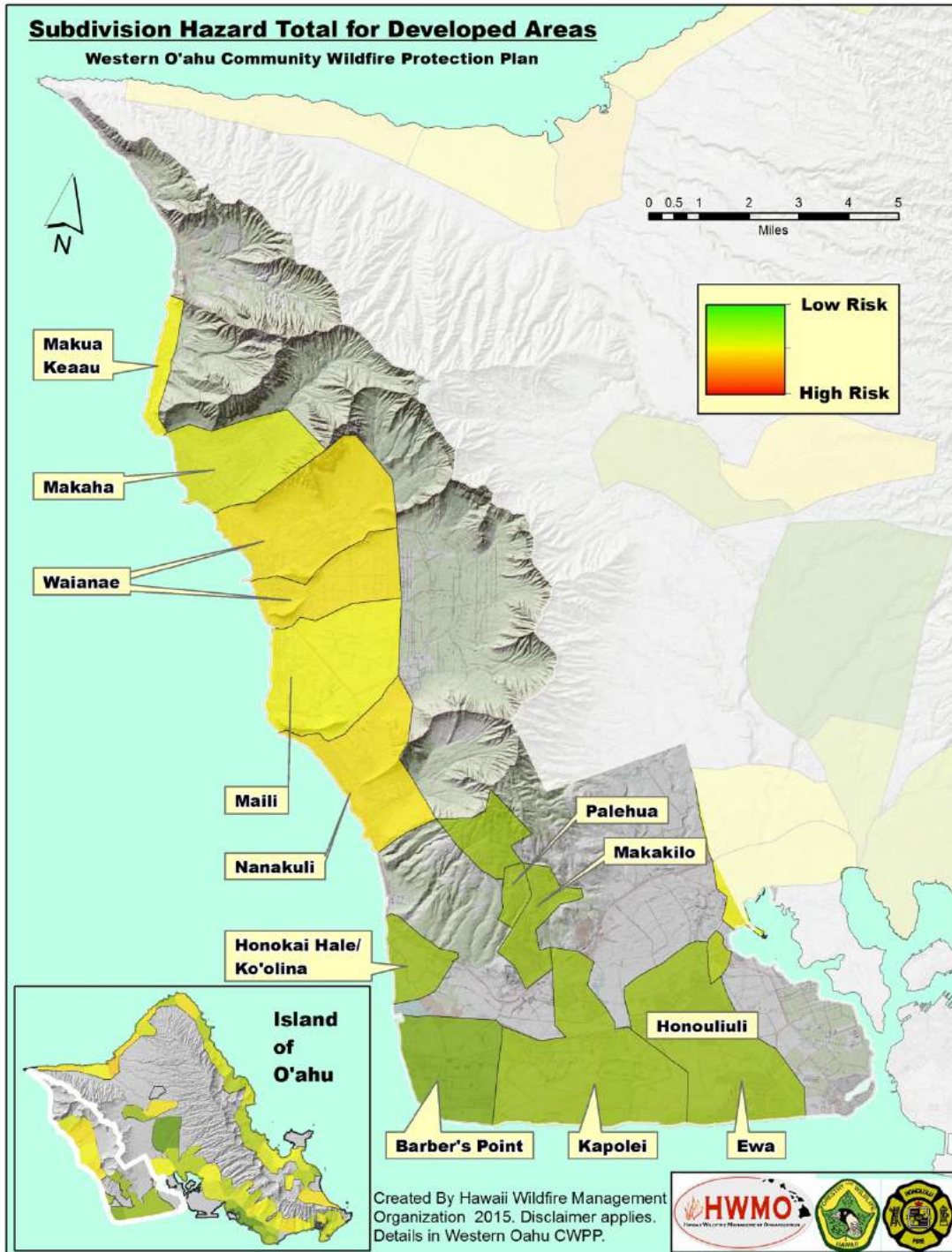
In partnership with DLNR-DOFAW and HFD, HWMO assessed the communities within Western O‘ahu for 36 wildfire hazard characteristics, which have been further grouped into 5 categories. Community delineations for the assessment followed those for the CARW map. The five categories assessed for wildfire hazard are as follows.

- Subdivision Hazard
- Vegetation Hazard
- Building Hazard
- Fire Environment Hazard
- Fire Protection Hazard

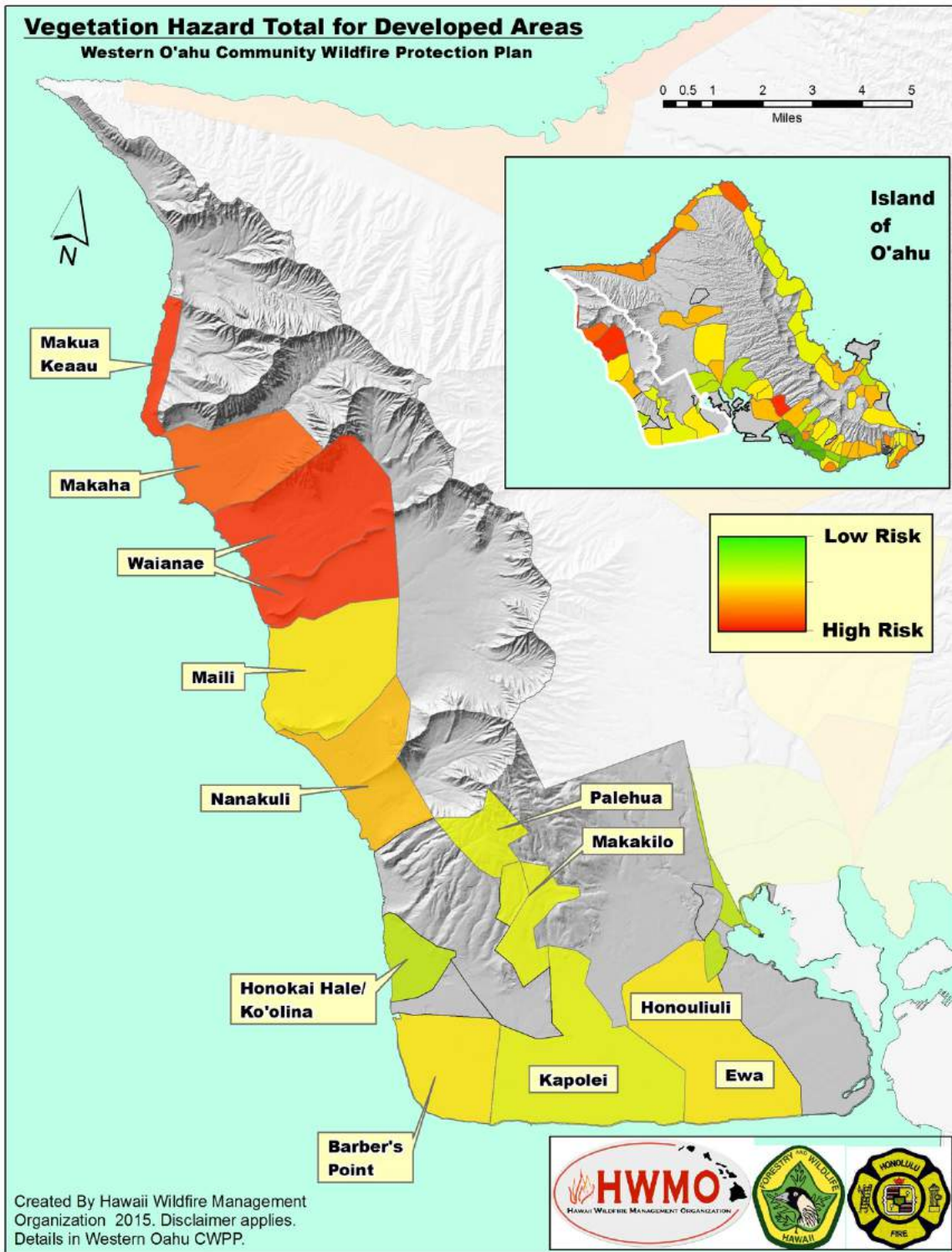
Maps are provided for each of the five categories below, and demonstrate the total hazard per category based on a calculation of that category’s individual hazards, as detailed in Table 6. Individual hazard maps can be found in Appendix C.

Hazard Category (See Maps 21-25)	Individual Hazards Assessed
Subdivision Hazard Total	<ul style="list-style-type: none"> <li>• Fire Service Access</li> <li>• Home Setbacks</li> <li>• Ingress/Egress</li> <li>• Private Landowner Firewise landscaping &amp; Defensible Space</li> <li>• Proximity of Subdivision to Wildland Areas</li> <li>• All Season Road Condition</li> <li>• Road Maintenance</li> <li>• Road Width</li> <li>• Street Signs</li> <li>• Structure Density</li> <li>• Unmanaged, Untended, Undeveloped Lands</li> </ul>
Vegetation Hazard Total	<ul style="list-style-type: none"> <li>• Defensible Space: Fuels Reduction Around Homes &amp; Structures</li> <li>• Fuel Loading</li> <li>• Fuel Structure &amp; Arrangement</li> <li>• Proximity of Flammable Fuels Around Subdivision</li> <li>• Vegetation Within 300’ of Homes</li> </ul>
Building Hazard Total	<ul style="list-style-type: none"> <li>• Siding/Soffits</li> <li>• Roofing Assembly</li> <li>• Structural Ignitability</li> <li>• Under skirting Around Decks, Lanais, Post &amp; Pier Structures</li> <li>• Utilities Placement; Gas &amp; Electric</li> </ul>
Fire Environment Hazard Total	<ul style="list-style-type: none"> <li>• Average Rainfall</li> <li>• Prevailing Wind Speeds &amp; Direction</li> <li>• Slope</li> <li>• Topographic Features that Adversely Affect Wildland Fire Behavior</li> <li>• Seasonal or Periodic High Hazard Conditions</li> <li>• Ignition Risk</li> </ul>
Fire Protection Hazard Total	<ul style="list-style-type: none"> <li>• Response Time</li> <li>• Community Planning Practices &amp; Ordinances</li> <li>• Community Fire Safe Efforts &amp; Programs Already in Place</li> <li>• Fire Department Structural Training &amp; Expertise</li> <li>• Local Emergency Operations Group or Citizen Group</li> <li>• Proximity to Fire Stations</li> <li>• Water Source Availability</li> <li>• Wildland Firefighting Capacity of Initial Response Agency</li> </ul>

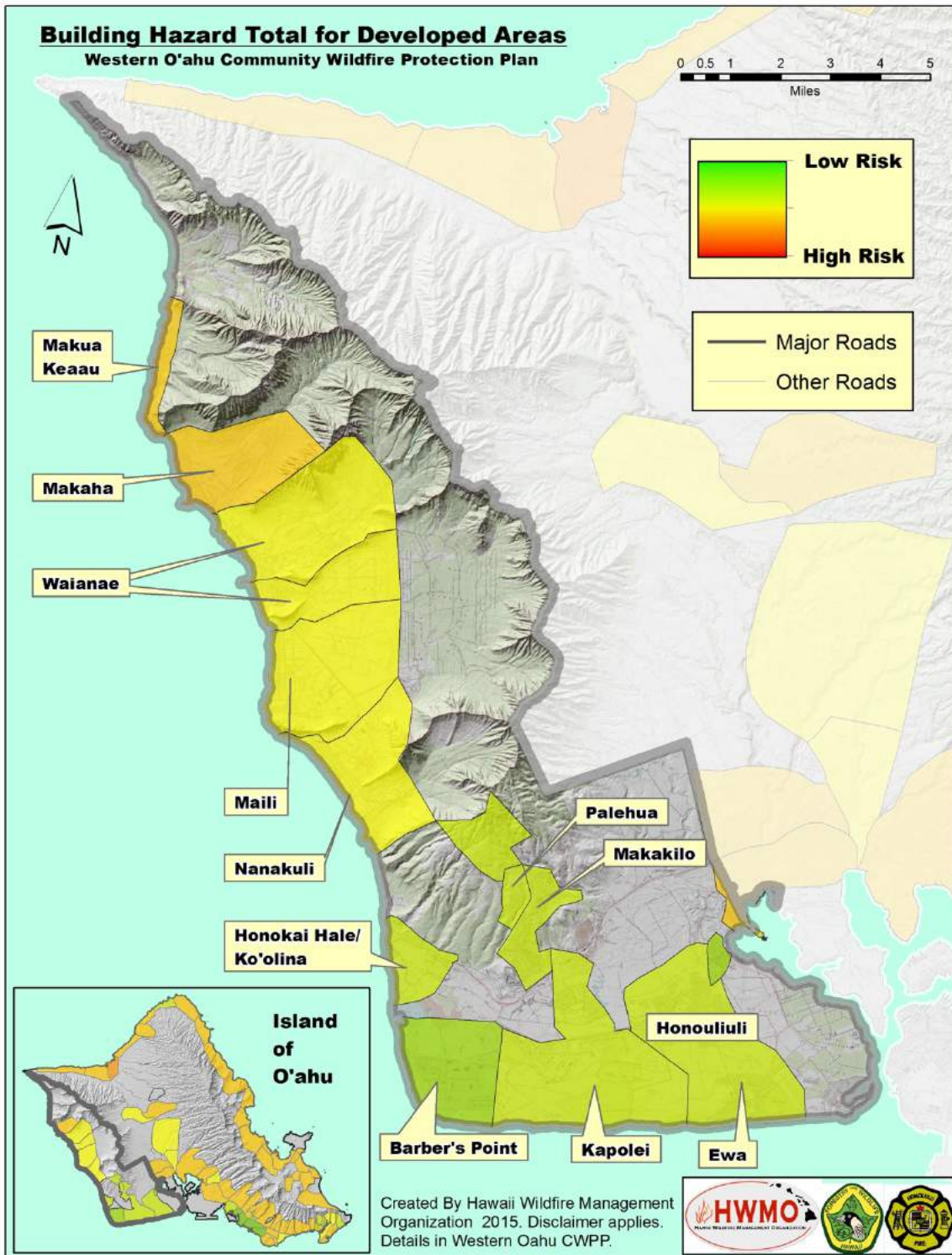
**Table 6.** Overview of hazard assessment categories and the individual hazards that comprise each category.



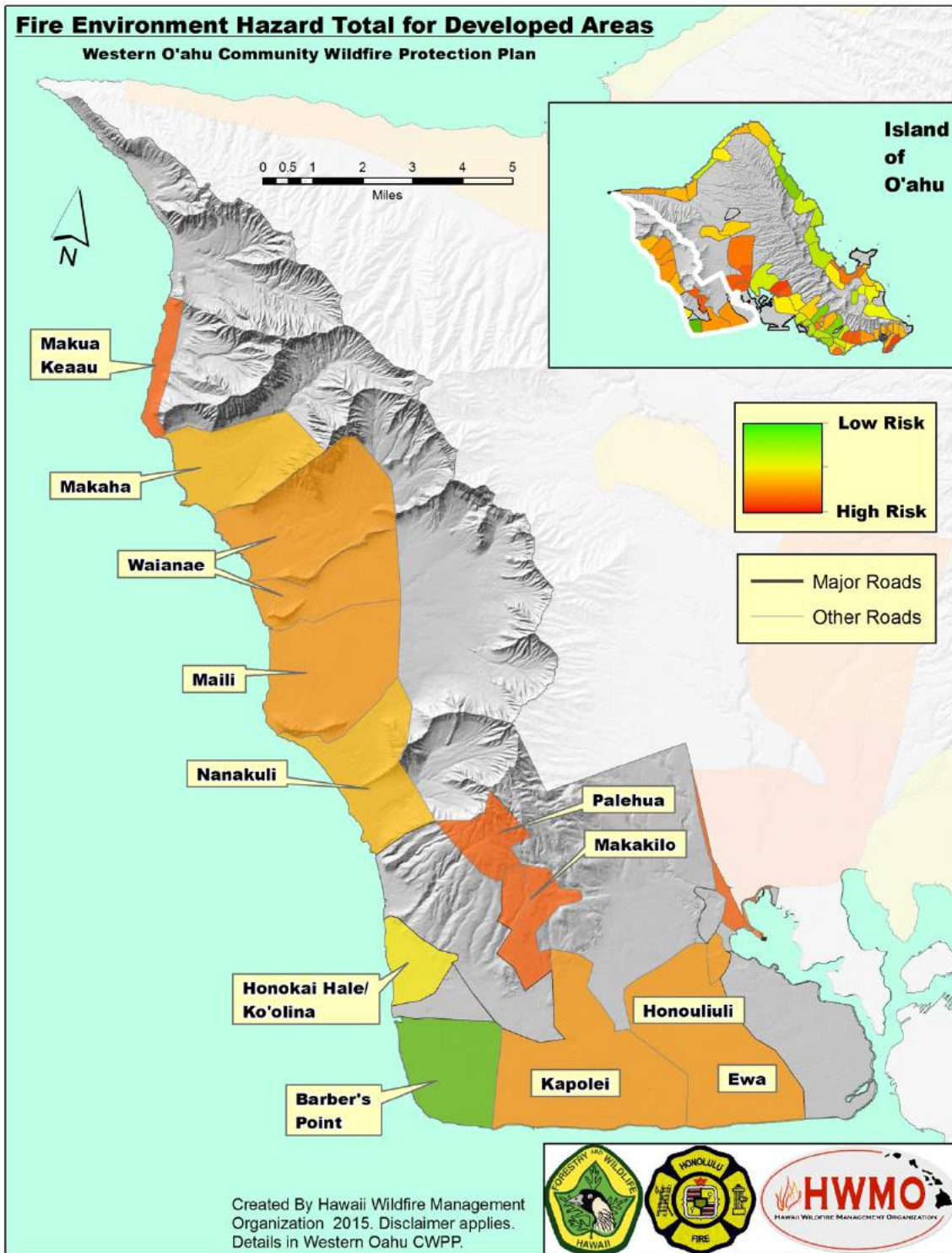
**Map 21. Subdivision Hazard Total for Developed Areas of Western O'ahu CWPP planning area.** Reflects hazard assessment findings related to the following categories: Fire Service Access; Home Setbacks; Ingress/Egress; Private Landowner Firewise landscaping & Defensible Space; Proximity of Subdivision to Wildland Areas; All Season Road Condition; Road Maintenance; Road Width; Street Signs; Structure Density; and Unmanaged, Untended, Undeveloped Lands.



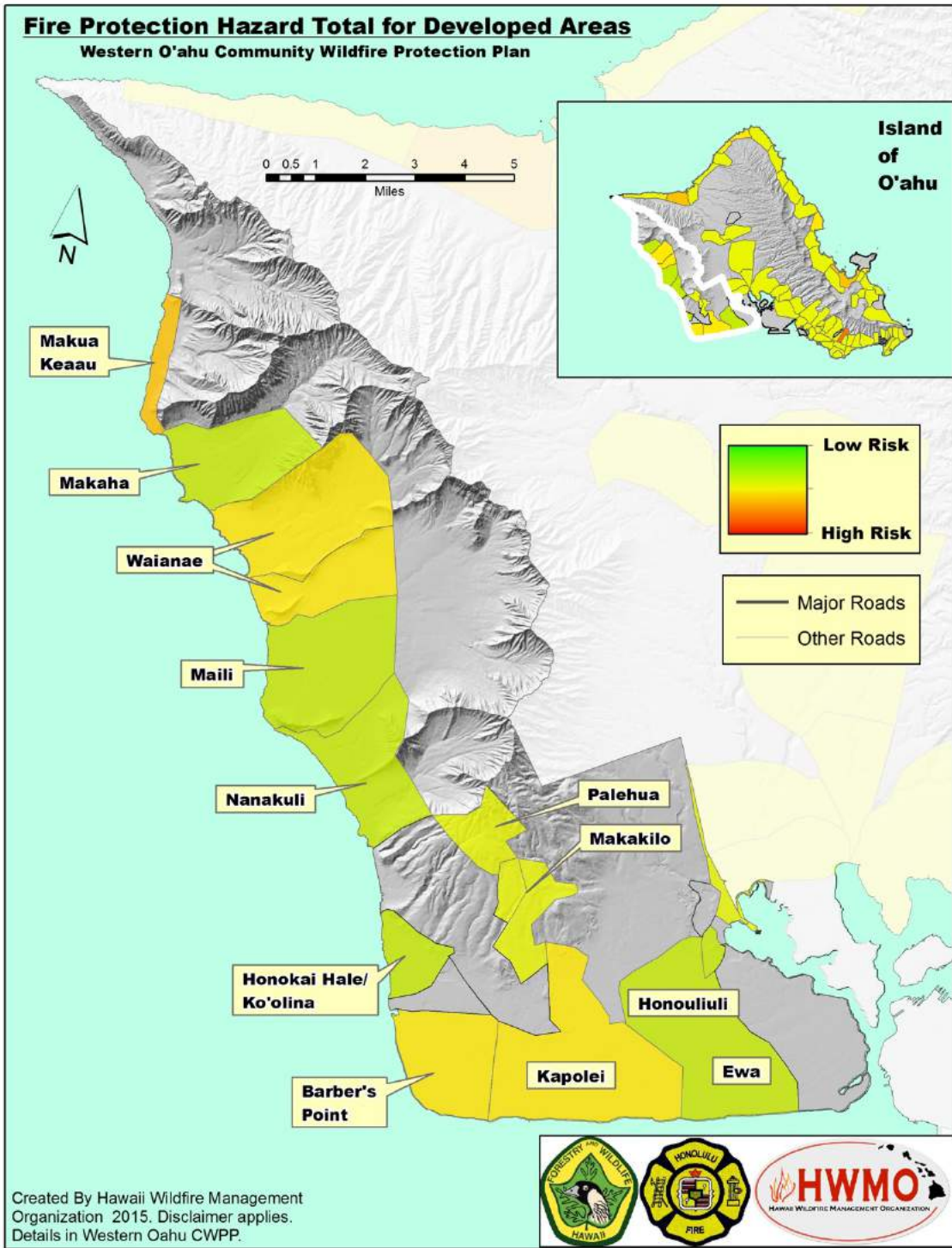
Map 22. Vegetation Hazard Total for Developed Areas of Western O'ahu CWPP planning area. Reflects hazard assessment findings related to the following categories: Defensible Space; Fuels Reduction Around Homes & Structures; Fuel Loading; Fuel Structure & Arrangement; Proximity of Flammable Fuels Around Subdivision; Vegetation Within 300' of Homes.



Map 23. Building Hazard Total for Developed Areas of Western O'ahu CWPP planning area. Reflects hazard assessment findings related to the following categories: Sidings/Soffits; Roofing Assembly; Structural Ignitability; Under Skirting Around Decks, Lanais, Post & Pier Structures; Utilities Placement.



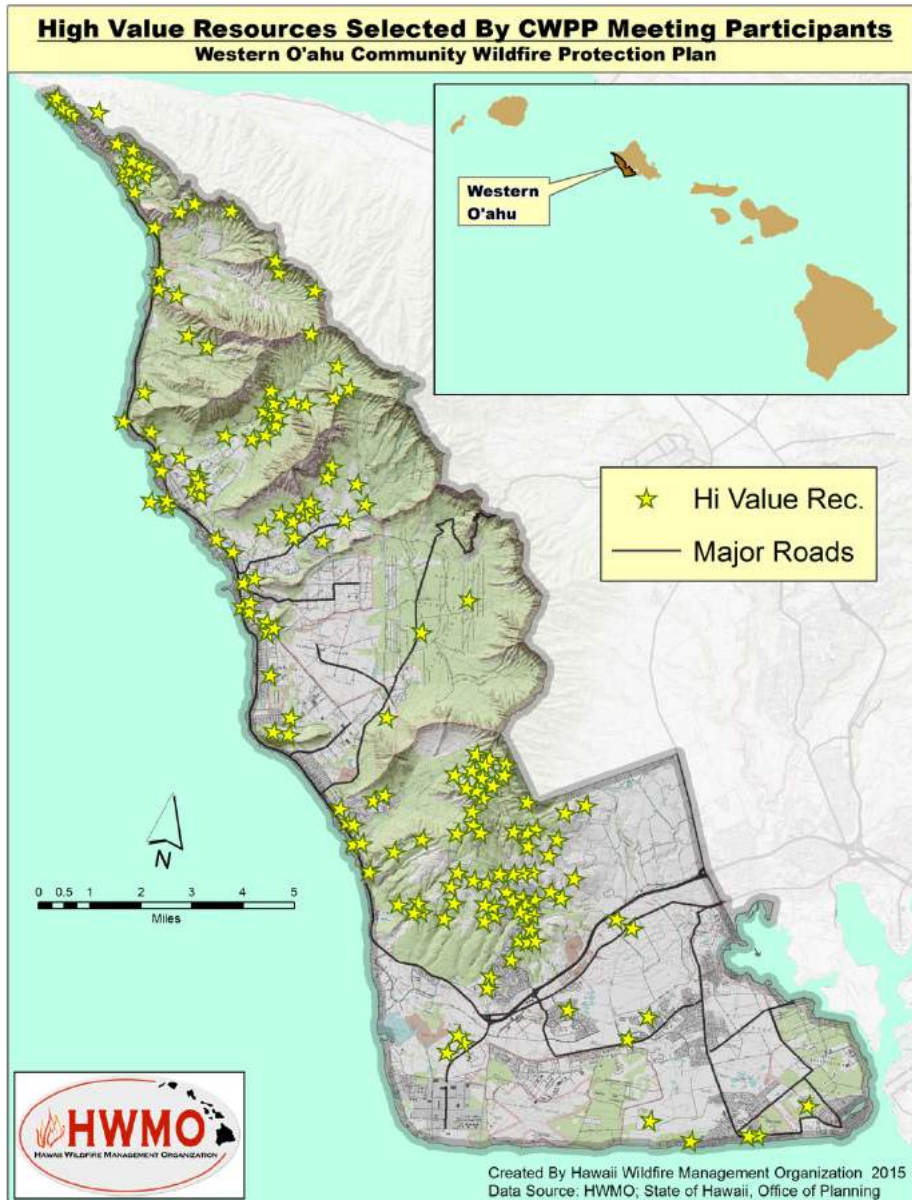
**Map 24. Fire Environment Hazard Total for Developed Areas of Western O’ahu CWPP planning area.** Reflects hazard assessment findings related to the following categories: Average Rainfall; Prevailing Wind Speeds & Direction; Slope; Topographic Features that Adversely Affect Wildland Fire Behavior; and Seasonal or Periodic High Hazard Conditions; and Ignition Risk.



**Map 25. Fire Protection Hazard Total for Developed Areas of Western O'ahu CWPP planning area.** Reflects hazard assessment findings related to the following categories: Response Time; Community Planning Practices & Ordinances; Community Fire Safe Efforts & Programs Already in Place; Fire Department Structural Training & Expertise; Local Emergency Operations Group or Citizen Group; Proximity to Fire Stations; Water Source Availability; and Wildland Firefighting Capacity of Initial Response Agency

## COMMUNITY VALUES

Civic, environmental, and cultural value were determined for the Western O'ahu CWPP planning area by stakeholders during input meetings. Map 26 demonstrates the points on the map selected by the public and agency participants during CWPP meetings as high priorities for mitigation/protection based on their personal, cultural, and community values, priorities, and overall risk of wildfire. Due to the sensitive nature of cultural resources in Hawai'i, participants were not required to name the priority resources, only to share the area or location of the valued resources by marking the map poster with stickers. See also Photos 15-17.



**Map 26.** Stakeholder-determined High Value Priority Resources to Protect from Wildfire in the Western O'ahu CWPP planning area.





**Photo 15.** High value resources were selected by participants.



**Photo 16.** (Above left). Firefighters selected areas they believe need greater fire protection based on their experience. **Photo 17.** (Above right). Meeting participants discussed their own fire-related priorities as they identified places of high personal importance to them.

## EMERGENCY MANAGEMENT

### FIRE SUPPRESSION CAPABILITIES AND RESOURCES

HFD has the following equipment available for round-the-clock use in the Western O’ahu CWPP planning area. Additional resources and equipment are spread across the entire island and are made available when needed if they are not already in use.

Honolulu Fire Department (HFD) CWPP Planning Area-Specific Suppression Resources	
Helicopters	2 x McDonnell-Douglas MD 520N No Tail Rotor (NOTAR®) helicopters
Engines and Vehicles	Communications Vehicle 43 x Fire Engines (500-750 gallons) 5 x Tractor-Driven Ladder Apparatuses (Tillers) 8 x Quintuple Combination Pumps (Quints) 2 x Towers 1 x Mobile Command Center 1 x Prime Mover 2 x Rescue Squads
Other Resources	HAZMAT Response Units BAMBI Bucket for aerial suppression of wildfires Live Fire Training Simulator Mass Decontamination Trailer 2 x Rescue Boats

**Table 7.** HFD Suppression Resources.

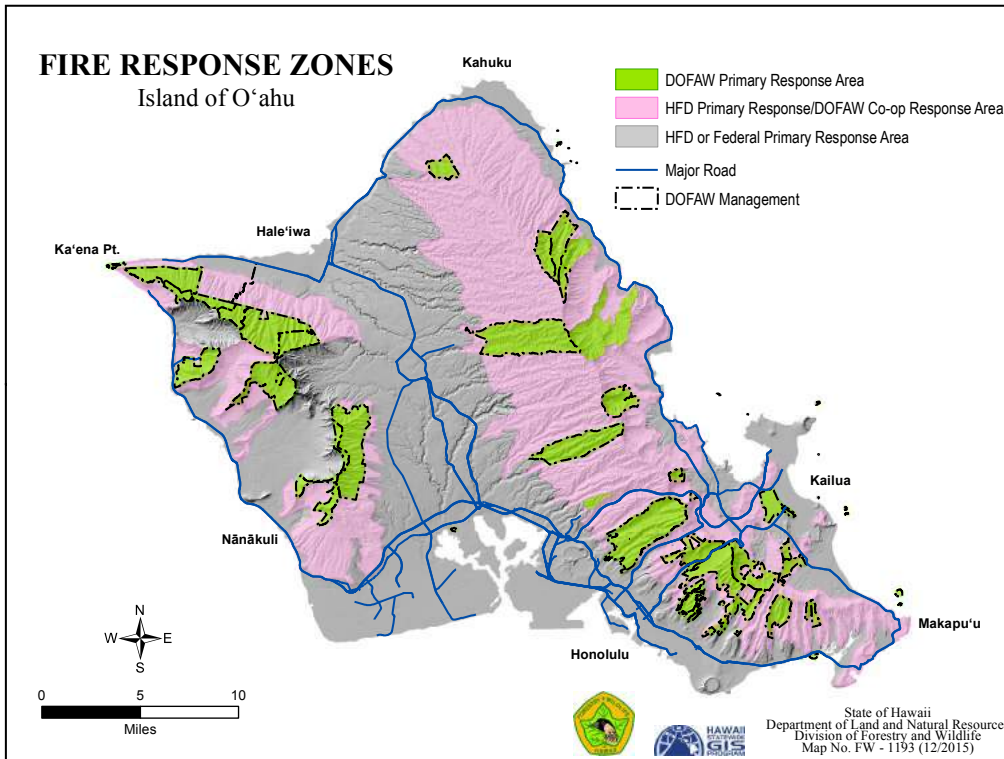
The following DLNR-DOFAW wildland fire suppression resources are available for use in the event of a wildfire in the Western O’ahu CWPP planning area:

Department of Land and Natural Resources – Division of Forestry and Wildlife (DLNR–DOFAW) Suppression Resources	
Helicopters (contract services)	Type II and Type III
Engines and Vehicles	6 x Type VI (2 x 150 gallon and 4 x 300 gallon) 4x4 Vehicle
Other Resources	6 x portable pumps 4 x Helicopter tanks (2 x 1000 gallon and 2 x 500 gallon) Contract heavy equipment, dozers, backhoes, skid steers, etc

**Table 8.** Division of Forestry and Wildlife (DLNR–DOFAW) Suppression Resources.

Initial response to the majority of wildfires (as well as all medical and other emergencies) is the responsibility of the HFD. DLNR-DOFAW responds to wildfire events on State of Hawai’i lands and

provides additional wildland fire fighting assistance when State of Hawai'i lands are threatened and/or mutual aid agreements are invoked. Map 27 was developed by DLNR-DOFAW and demonstrates the independent and shared response zones of each agency in the CWPP planning area.



**Map 27.** HFD and DLNR-DOFAW Fire Suppression Response Zones. (Map Source: DLNR-DOFAW).

#### EMERGENCY MANAGEMENT DOCUMENTS AND PLANS

The CWPP is non-regulatory and cooperative in nature. The plan provides (1) a foundation for increased communication, coordination and collaboration among agencies and the public, (2) identification and prioritization of areas for hazardous fuel reduction projects and wildfire mitigation actions, and (3) assistance meeting federal and state planning requirements and qualifying for assistance programs.<sup>16</sup>

The CWPP is intended to complement and support existing policies, practices, efforts, plans, programs, statutes, and mandates, including but not limited to:

##### City and County of Honolulu:

City and County of Honolulu Drought Mitigation Strategies<sup>17</sup>

Multi-Hazard Pre-Disaster Mitigation Plan, Department of Emergency Management

Board of Water Supply Watershed Management Plans:

Wai'anae Watershed Management Plan<sup>18</sup>

'Ewa Watershed Management Plan (in development at time of CWPP plan writing)

State of Hawai'i:

State Drought Plan and the County Drought Mitigation Strategies<sup>19</sup>

State of Hawai'i Multi-Hazard Mitigation Plan<sup>20</sup>

Hawai'i Forest Action Plan/ Statewide Assessment of Forest Conditions and Resource Strategies<sup>21</sup>

State Division of Forestry and Wildlife Operational Policy for Wildfire Control<sup>22</sup>

*MULTIPLE-AGENCY AGREEMENTS*

Federal, State of Hawai'i, and Honolulu City and County fire agencies have organized into the O'ahu Wildfire Information and Education coordinating group (OWIE). OWIE coordinates the public relations, information, and educational programs of the participating wildland fire agencies on O'ahu and provides a forum for leadership, cooperation and the exchange of information. Additionally, all fire suppression agencies on O'ahu have mutual aid agreements in place.

Multiple-agency agreements exist among the fire suppression agencies across O'ahu. As an example, DLNR-DOFAW has established Memorandums of Agreement, Memorandums of Understanding, and/or Mutual Aid Agreements in place with all four county fire departments as well as with federal land management agencies, such as National Park Service, U.S. Fish and Wildlife Service, and U.S. military. According to DLNR-DOFAW,<sup>23</sup> these, "are the cornerstones by which DLNR-DOFAW's Fire Management Program is based. These. . . identify the responsibilities of each party as well as other fire management activities such as joint participation in prevention, training, and equipment acquisition."

*EVACUATION PROTOCOLS AND NEEDS*

Evacuation protocols for neighborhoods and areas in Western O'ahu have been determined for natural hazards such as tsunamis, and can be found on the Department of Emergency Management website and public education materials.<sup>24</sup> However, fire safety zones for all neighborhoods and areas of Western O'ahu are yet to be determined, and are a priority action determined by the public as part of this CWPP process.

Additionally, there is now an app for digital devices to enable residents of O'ahu to be ready for hurricanes, tsunamis, and other natural or man-made disasters.<sup>25</sup> It can be downloaded from Google play and iTunes. Features include real time local weather and public health alerts, customized emergency plans, maps of shelters and tsunami evacuation zones, emergency supplies checklists, what to do during various emergencies, and disaster history across Hawai'i.

*FIRE CODE RELATED TO WILDFIRE ISSUES IN THIS CWPP<sup>26</sup>*

The Hawai'i State Fire Code is the 2012 NFPA 1, Uniform Fire Code. It has both State of Hawai'i and Honolulu City and County amendments. The State of Hawai'i amendments contribute to the State Fire Code. Each county then adopts amendments to the State Fire Code to create the County Fire Code.

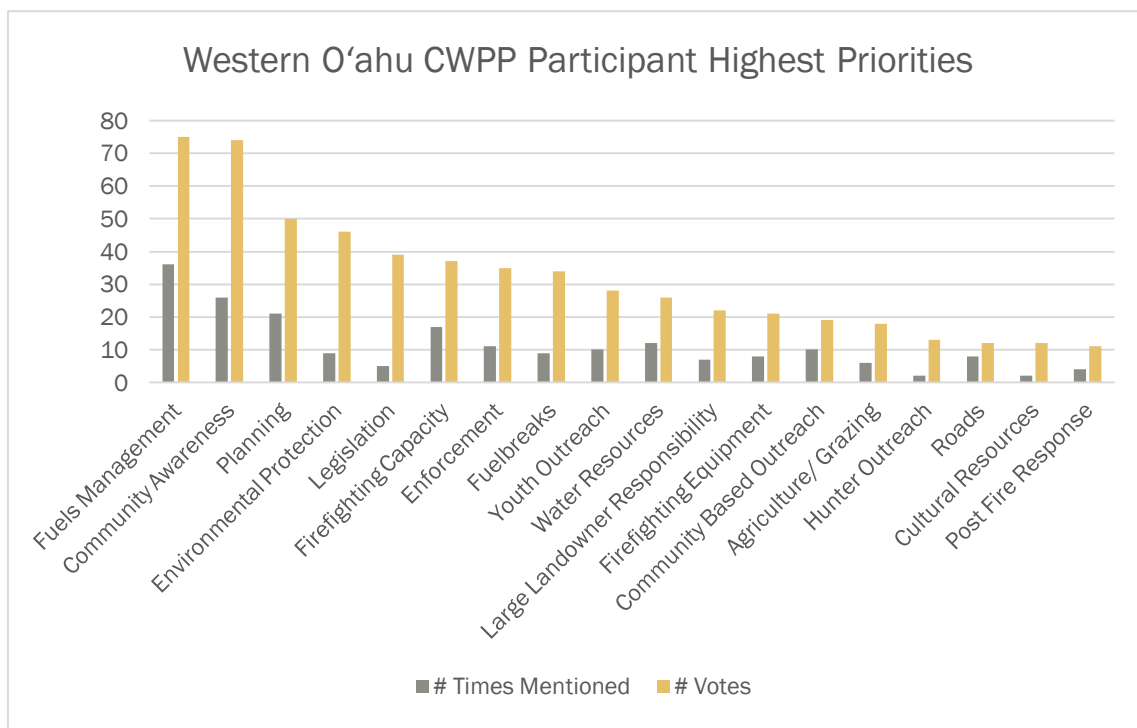
Most relevant to the discussion and public input for the Western O'ahu CWPP Update is the chapter on the WUI, which is described in 2012 NFPA 1, Chapter 17.

## HAZARD REDUCTION PRIORITIES WESTERN O’AHU

### PURPOSE AND METHODS

Public and agency participants during the CWPP planning process identified hazard reduction priorities for Western O’ahu. The wildfire-related concerns and actions provided by stakeholders were focused toward enhancing wildfire response capabilities, addressing priority public concerns and wildfire impacts, and reducing risk and hazards through proactive wildfire mitigation. HFRA guidelines were followed by including community hazard reduction priorities, hazardous fuels reduction, and recommendations to reduce structural ignitability.

### STAKEHOLDER CONCERNS AND RECOMMENDED ACTIONS



**Figure 3.** Western O’ahu CWPP Participant Highest Wildfire-Related Priorities.

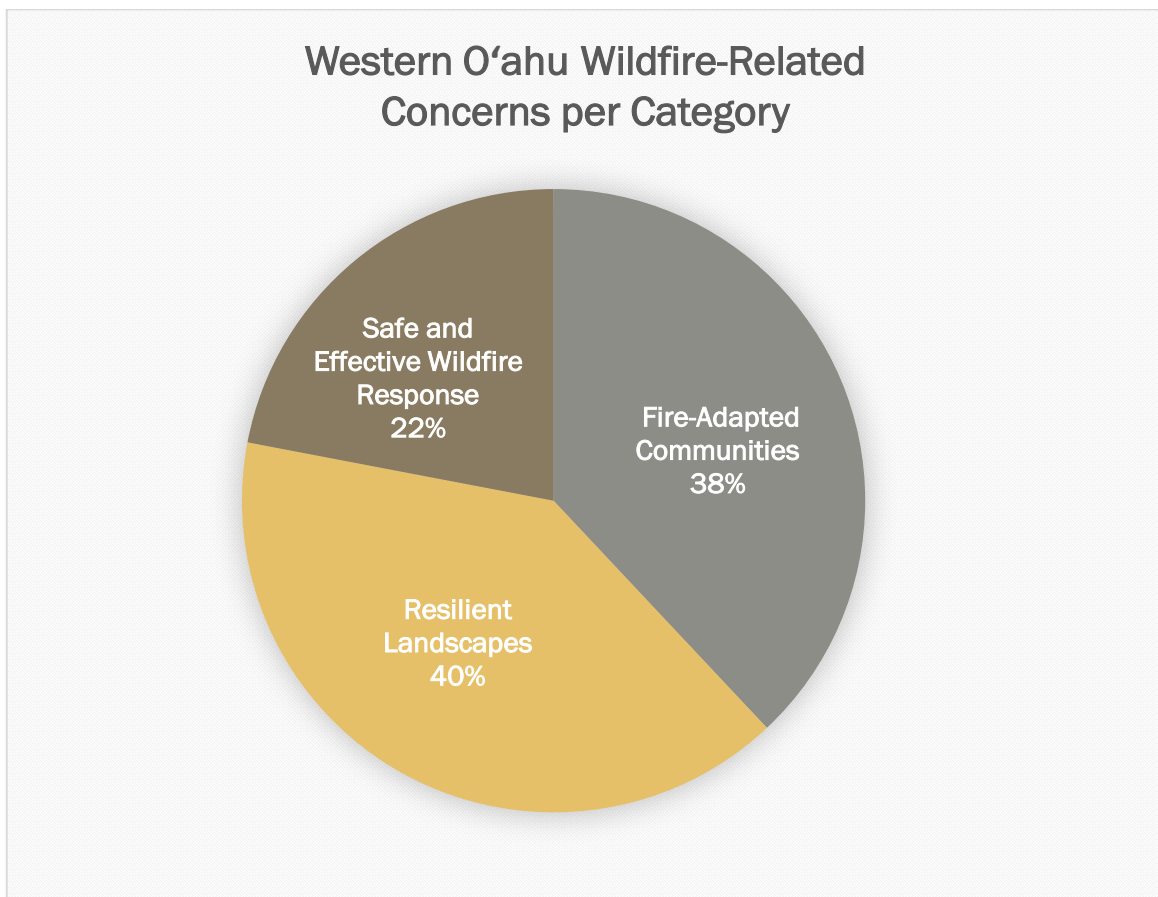
A total of ten agency and public meetings were held to allow interested public participants to provide their wildfire concerns and recommended actions. HWMO held six meetings for the general public and four meetings with fire response agencies and natural resource managers. Additional meetings were held with decision makers and large landowners as noted in the Planning Process chapter of this document.

Agency partners provided input at both public meetings and at separate meetings for OWIE and Wai’anae Mountains Watershed Partnership. Additionally, fire response agency representatives were offered an opportunity to provide written input regarding concerns, challenges, priorities and recommendations for improved wildfire mitigation and management.

While Western O’ahu CWPP participant input yielded diverse and broad concerns and recommended actions, certain topics came up with greater frequency. All input was aggregated and analyzed to capture an overview of the most frequently raised concerns. Figure 3 displays the highest concerns and priorities of CWPP participants, based on the number of times the issue was raised and how many votes the topic received at meetings as a top priority.

### THREE CATEGORIES OF STAKEHOLDER CONCERNS AND RECOMMENDED ACTIONS

Public, agency, and decision maker input yielded stakeholder-prioritized feedback regarding wildfire-related concerns and recommended actions. The input was extensive and has been organized to align with the categories used within the National Cohesive Wildland Fire Management Strategy.<sup>27</sup> Refer to Appendix A for comprehensive list of public input per category.



**Figure 4.** Community Concerns Organized by National Cohesive Strategy Categories.

The National Cohesive Wildland Fire Management Strategy encourages communities to develop a dynamic approach to planning for, responding to, and recovering from wildland fires. It provides a framework for wildfire-related discussion, efforts, and goals across the United States. The overarching national strategy is further divided into three regions for tighter collaboration and coordination in each area. Hawai’i falls into the Western Region. Public input details for Western O’ahu are organized

according to the following categories so that they fit into the national framework of priorities and funding opportunities.

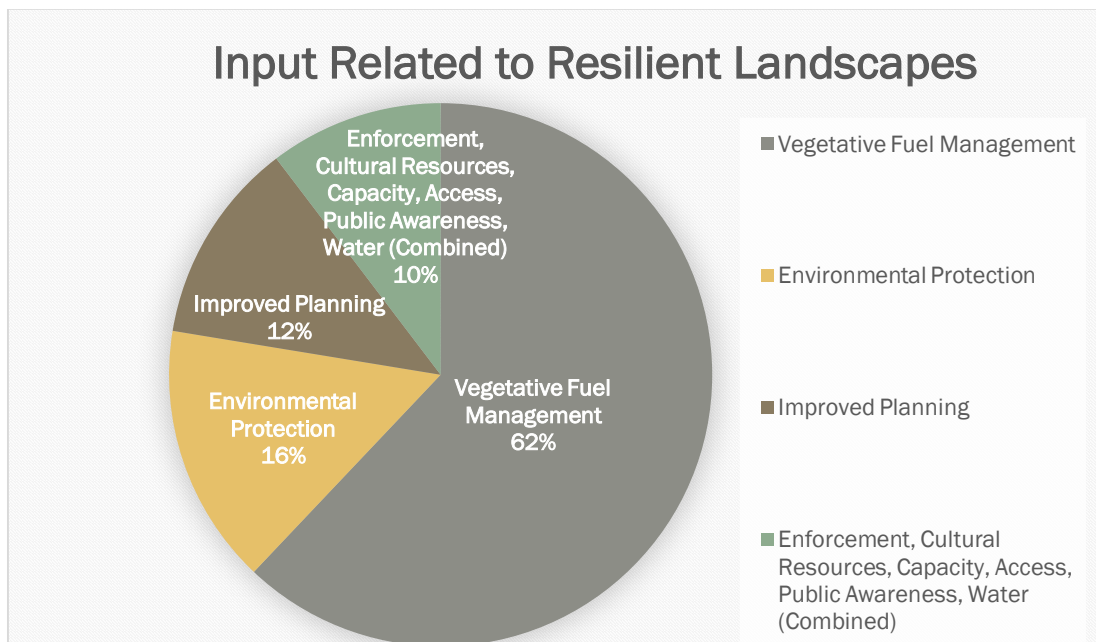
- Resilient Landscapes
- Fire-Adapted Communities
- Safe and Effective Wildfire Response

Figure 4 indicates how much of the participant concerns for Western O’ahu fall within each category.

### RESILIENT LANDSCAPES

The Resilient Landscapes category of CWPP participant input focuses on all input related to restoring, protecting, or maintaining landscapes. For Western O’ahu, this includes the protection of native species and watersheds from wildfire impacts and the management of vegetation to reduce the ignition capacity and spread of wildfire. The top concerns were prioritized as follows, also depicted in Figure 5:

1. Vegetative fuel management
2. Environmental protection
3. Improved planning
4. Increased enforcement, cultural resource protection, improved access, public awareness about resilient landscape issues, water (tied at less than 2% each).



**Figure 5.** CWPP participant input related to restoring and maintaining landscapes to reduce wildfire impacts.

### FIRE-ADAPTED COMMUNITIES

38% of Western O’ahu CWPP participant input was related to the need to work toward fire awareness, readiness, prevention, and general fire-adaptation by communities and residents. These goals support the concept of Fire-Adapted Communities, defined by the United States Forest Service as "a

knowledgeable and engaged community in which the awareness and actions of residents regarding infrastructure, buildings, landscaping, and the surrounding ecosystem lessens the need for extensive protection actions and enables the community to safely accept fire as a part of the surrounding landscape."<sup>28</sup> The Wildland-Urban Interface Mitigation Committee of the National Wildfire Coordinating Group defines a Fire-Adapted Community as "A human community consisting of informed and prepared citizens collaboratively planning and taking action to safely co-exist with wildland fire."<sup>29</sup>

The primary goal of working toward fire adaptation is that wildfire preparedness and readiness efforts in a community become an ongoing and broadly supported part of living in, working in, and civically managing an area, and that all activities, from roadside fuels management and agriculture to development designs and community activities, work together to consistently and regularly support wildfire protection. This is opposed to the idea that wildfire preparedness is seasonal or can wait until the last minute, or that it is the responsibility of only one party (community association, fire department, etc.) to aid the community in wildfire preparedness. Generally across Hawai'i, wildfires are addressed on an as-needed, reactive basis. With the development of this and other CWPPs across Hawai'i, communities, organizations, and agencies are coming together to move toward becoming proactive, consistent, and collaborative, which is aligned with the framework and objectives for Fire-Adapted Communities. Figure 6 portrays the various roles each member of society can take to work toward fire adaptation.

This CWPP was developed via a collaborative process that included a diversity of stakeholders with homes, businesses, personal interests, and jurisdictions in the Western O'ahu CWPP planning area. The wildfire-related concerns and recommended actions demonstrate the range of responsible parties, timelines, and actions that need to be taken toward comprehensive wildfire prevention, preparedness, and protection of Western O'ahu. These are the basic tenets of becoming fire-adapted. For the purposes of analyzing and presenting the Western O'ahu CWPP stakeholder input, stakeholder concerns and recommendations related to the human side of fire adaptation are presented in this section. Managing vegetation and increasing fire suppression capacity are presented individually (See *Resilient Landscapes and Safe and Effective Wildfire Response* sections).

Participant input related to the human side of wildfire preparedness in Western O'ahu resulted in four categories of concern, prioritized as follows:

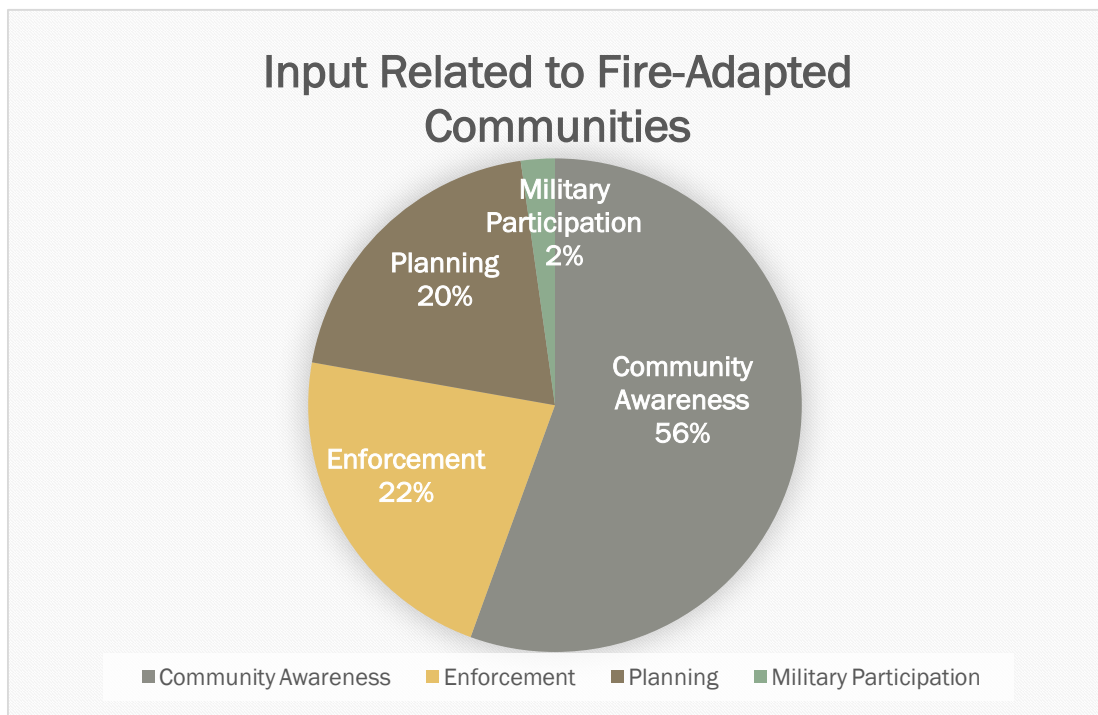
1. Increasing community awareness
2. Increasing or ensuring enforcement of wildfire-related codes and ordinances
3. Improving planning efforts (of many types and scales) to include wildfire prevention and risk reduction
4. Improvement in military participation in preventing wildfires in and around communities.

Figure 7 depicts the breakdown of how much input was provided within each of these categories.





**Figure 6.** Fire-Adapted Communities Infographic.<sup>30</sup> There is a role for everyone when working toward a region becoming Fire-Adapted, as seen in this infographic from the Fire-Adapted Communities website, FireAdapted.org.



**Figure 7.** Community concerns related to the human side of wildfire preparedness and protection, as part of working toward Fire-Adapted Communities goals.

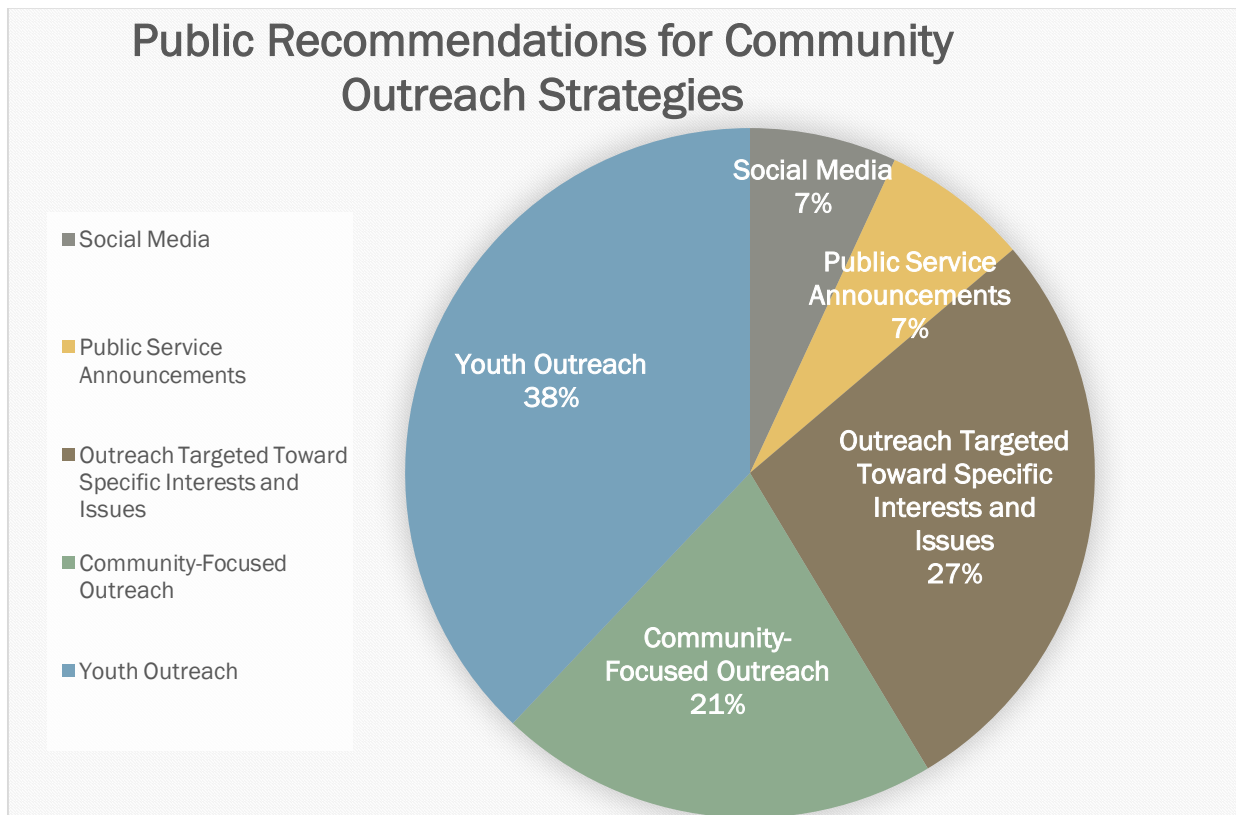
56% of all community-focused input was related to increasing community awareness. There was an urgency and emphasis of participant concerns regarding the general lack of awareness of the threats and impacts of wildfire among all community members from residents to decision makers.

Further analysis revealed a more detailed understanding of the community-recommended strategies for bolstering wildfire awareness. This yielded a breakdown of suggested outreach methods (see Figure 8), which is of great help to those in the area working toward increasing community awareness.

The next highest percentages of concerns related to the goals of Fire-Adapted Communities were the need for improved enforcement and planning. Both of these categories were diverse in their concerns and recommendations, having no one topic clearly dominate the category.

Enforcement-related concerns covered arson, vegetation management by large landowners, illegal dumping, collaboration among decision makers and residents toward improved wildfire legislation, and fireworks.

Input related to improved planning included the need for fire management plans, better legislation, point of contact for wildfire information, wildfire risk reduction for new and current developments including required buffer zones, increased collaboration and planning for wildfire education among agencies, an established process for addressing wildfire related concerns, and increased participation from the Department of Planning, planners, and policy makers in wildfire protection.



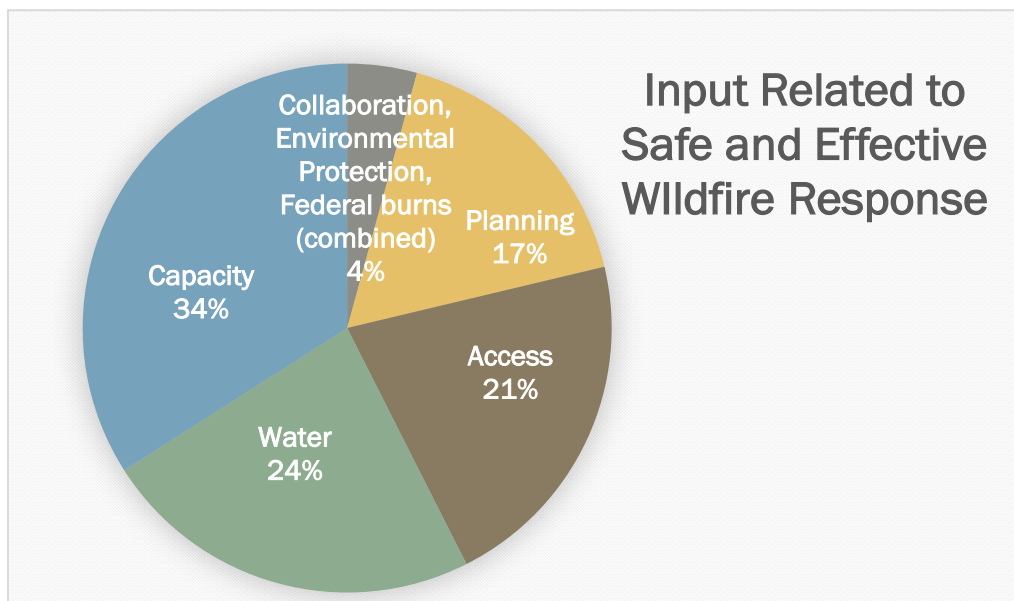
**Figure 8.** CWPP participant recommended methods for increasing public awareness regarding wildfire threats, impacts, and preparedness strategies.

## SAFE AND EFFECTIVE WILDFIRE RESPONSE

Comprehensive and effective wildfire preparedness and protection includes preventing ignitions, minimizing the ability of fire to travel across structures and landscapes, and maximizing the likelihood for fires to be suppressed quickly to keep them as small and minimally impacting as possible. Since the majority of all fires in Western O’ahu (and Hawai’i in general) are human-caused, ignition prevention largely is a matter of community outreach and education (addressed in *Fire-Adapted Communities* section). Minimizing vegetative fuels and structural ignitability can help keep fires from spreading (see *Resilient Landscapes* section and *Reducing Structural Ignitability* section).

Once a fire is ignited, however, the responsibility for taking action rests solely on fire suppression and emergency management departments and personnel. While prevention and preparedness are key to reducing the threats and impacts of wildfire, suppression is the final piece of the protection equation that needs to be proficient, equipped, effective, and adequately supported. Western O’ahu CWPP participants demonstrated an understanding of this and provided prioritized concerns related to wildfire response (firefighting). Additionally, while the protection of life, property, and natural resources are the functions of fire and emergency management efforts, the safety and health of firefighters was also of utmost importance to CWPP input meeting participants. The input was clustered into like categories and resulted in the following action steps, prioritized as follows: (See also Figure 9)

1. Increasing capacity (such as personnel, training, and resources such as equipment and vehicles).
2. Improving and increasing water infrastructure and availability.
3. Improving and increasing firefighting access (through road and firebreak development and maintenance).
4. Improved planning.
5. Increased collaboration.
6. Firefighting efforts better connecting to environmental protection efforts.
7. Concerns about fires originating on federal land.



**Figure 9.** Public input related to safe and effective wildfire response.

## HAZARDOUS FUELS REDUCTION

A CWPP must identify and prioritize areas for hazardous fuel reduction treatments and recommend the types and methods of treatment that will protect one or more at-risk communities and essential infrastructure. Based on the fuel hazard ratings acquired during the hazard assessment, recommendations for the type and method of vegetative fuels reduction treatments for high fuel hazard areas are listed in Table 9.

Community Resource, Structure, or Value at Risk	Fuel Hazard Rating	Type of Treatment	Treatment Method Options
Mauka forested lands, parks, and reserves	HIGH OR EXTREME IF UNMANAGED	Mechanical, hand labor, chemical, animal, fuels conversion	Utilize well-managed grazing, weed whip, mow, hand-pull, herbicide where appropriate with follow-up vegetation removal. Reforestation and restoration. Fuels conversion and “living” or “shaded” fuelbreaks.
Homes and structures with large lots	MOD-EXTREME	Mechanical, hand labor, chemical, animal, fuels conversion	Firewise home ignition zones. Reduce fuel along property boundaries and roadsides. Convert fuels to drought-tolerant, fire-resistant (preferably native) plants. Reduce ladder fuels.
Densely arranged homes and structures	MOD-EXTREME	Mechanical, hand labor, chemical, fuels conversion	Firewise home ignition zones. Weed whip, mow, hand-pull, and herbicide where appropriate. Convert fuels to drought-tolerant, fire-resistant (preferably native) plants. Reduce ladder fuels.
Historical sites throughout Western O’ahu	MOD-EXTREME	Hand labor, chemical, animal, fuels conversion	Weed whip, mow, hand-pull, well managed grazing, and herbicide where appropriate. Convert fuels to drought-tolerant, fire-resistant plants.
Roadsides	MOD-EXTREME IF UNMANAGED	Mechanical, chemical, animal, fuels conversion	Conduct roadside fuels treatments in accordance with fuel growth (keep low), maximize width of roadside reduction areas. Convert roadside fuels to fire-resistant plants that require little or no maintenance and are less ignitable.
Resorts	LOW-MOD	Mechanical, hand labor, chemical, fuels conversion	Continue regular maintenance and irrigation. Convert fuels to drought-tolerant, fire-resistant plants.
Fallow Agricultural lands	HIGH OR EXTREME IF UNMANAGED	Mechanical, animal, chemical, re-establish active agriculture	Install fuelbreaks along roads and property boundaries, or in lines perpendicular to slope to provide access and minimize erosion. Reduce fuels in patches to create fuel mosaics. Utilize well-managed grazing. Re-establish active agriculture. Initiate reforestation and/or restoration while also maintaining fuels.

**Table 9.** Hazardous Fuels Treatment Recommendations.

## REDUCING STRUCTURAL IGNITABILITY

A CWPP must recommend measures that homeowners and communities can take to reduce the ignitability of structures. Individuals and community associations can reduce structural ignitability throughout their community by taking the following measures recommended by the Firewise, Ready, Set, Go!, and HWMO outreach programs, summarized below. <sup>31, 32, 33</sup>

The following pages are written with the resident in mind, and can be removed and used independently from the CWPP as a general set of guidelines for reducing hazards in the home ignition zone. It is highly recommended that individuals and communities conduct a simple native vegetation assessment and/or consult with appropriate biologists or foresters before clearing trees and significant amounts of vegetation that may be important to protect, or may be important to leave in place to prevent erosion.

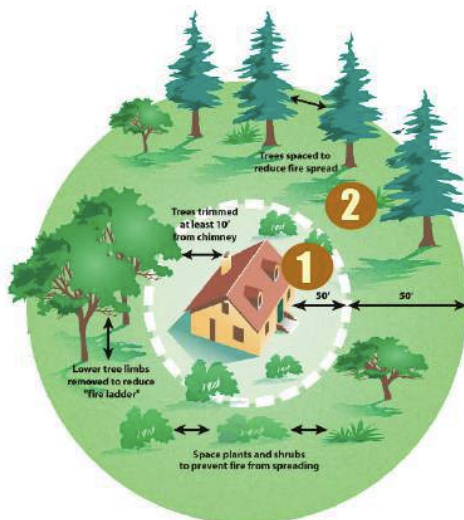
Creating defensible space does not necessarily mean eliminating the presence of greenery on your property. You can still landscape around your home to make it fire-safe without compromising beauty and aesthetics. By planting native, drought-tolerant plants (xeriscaping) around your home, you can:

- Protect your home from wildland fire ignition and spread
- Beautify your property
- Perpetuate an important natural and cultural resource
- Decrease the maintenance needs of your landscaping

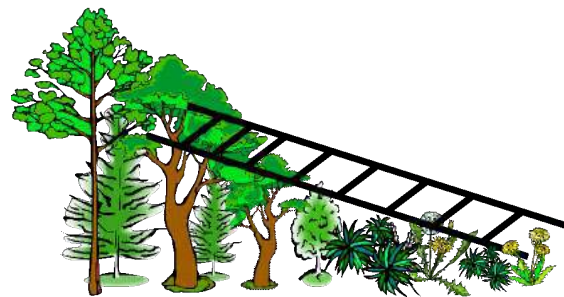
For the drier areas of Hawai'i, consider that native dryland plants are specially adapted to local conditions and require less upkeep, water, and fire maintenance, saving yourself a great deal of time, money, and resources. Non-native, lush plants often drop hazardous debris and can become fire-prone in drought conditions.

### DEFENSIBLE SPACE ZONES AROUND STRUCTURES

To reduce structural ignitability, it is recommended that residents think in zones around their home, and begin addressing risk reduction activities in Zone 1, working out from there to Zone 2 and beyond.



**Figure 10.** Defensible space zones around structures.<sup>28</sup>



**Figure 11.** Ladder Fuels Diagram.<sup>34</sup> Ladder fuels form a pathway for ground fires to climb vegetation and become crown fires, which are much more difficult to suppress. It is important to limb low hanging branches and keep ground vegetation short so that vegetation is separated inhibiting fire from easily "climbing" up to canopy where wind is often stronger.

The following actions are recommended per zone:

**Zone One** extends 30 feet out from buildings, structures, decks, etc.

- Remove all dead or dying vegetation.
- Remove “ladder fuels” (low-level vegetation that allows the fire to spread from the ground to the tree canopy, see Figure 11). Create at least 6 feet of separation between low-level vegetation and tree branches. This can be done by reducing the height of low-level vegetation and/or trimming low tree branches.
- Create “fire-free” area within 5 feet of home, using non-flammable landscaping materials and/or high-moisture content, drought-resistant vegetation.
- Trim tree canopies regularly to keep their branches a minimum of 10 feet from structures and other trees.
- Remove leaf litter (dry leaves/pine needles) from yard, roof and rain gutters.
- Relocate woodpiles or other combustible materials into Zone Two.
- Remove combustible material and vegetation from around and under decks, lanai, or the entire house if foundation is post-and-pier.
- Remove or prune vegetation near windows.

**Zone Two** extends 30 to 100 feet out from buildings, structures and decks. You can minimize the chance of fire jumping from plant to plant by removing dead material and removing and/or thinning vegetation. The minimum spacing between vegetation is three times the dimension of the plant.

- Remove “ladder fuels” (see Figure 11).
- Cut or mow annual grass down to a maximum height of 4 inches.
- Trim tree canopies regularly to keep their branches a minimum of 10 feet from other trees/cluster of trees.
- For larger properties, consider areas outside of Zone Two as a third zone to address. Continue reducing ladder fuels, managing fuels, hardening structures, and properly storing combustible materials.

#### **GENERAL DEFENSIBLE SPACE RECOMMENDATIONS**

- As stated above, ensure you have at least a 100-foot radius of defensible space (cleared, managed, and maintained vegetation) around your home. Note that even more clearance may be needed for homes in severe hazard areas. This means looking past what you own to determine the impact a common slope or neighbors’ yard will have on your property during a wildland fire.
- Cut dry weeds and grass before noon when temperatures are cooler to reduce the chance of sparking a fire.
- Landscape with drought-resistant plants that have a high moisture content and are low-growing.
- Keep woodpiles, propane tanks and combustible materials away from your home and other structures such as garages, barns and sheds.
- Ensure that trees are far away from power lines.
- Weed around the property regularly, especially areas that a lawn mower is not appropriate for (tall dry grasses, rocky terrain, etc.)
- Remove leaf litter and other debris that accumulate around the building, under vegetation, and

other collection areas.

- Remove leaf litter, straw and other debris from under and around propane tanks to create 10 feet of clearance around it.
- Eliminate ladder fuels by pruning tree branches on trees around the property to within at least 6 feet of the ground, using a bypass lopper, pruner saw, or long reach/hand pruner.
- Remove flammable materials from underneath the house, decks, porches, and lanai.
- Common flammables include scrap-wood, firewood, and combustible furniture.
- Mow the lawn regularly to keep grasses shorter than 4 inches tall around the home. Do not mow in the heat of the day or when the wind is blowing. Never mow in dry vegetation.
- Non-native trees, such as ironwood constantly drop needles, leaves, branches, and other debris, so it's best to stay on top of removing them from the ground before the pile becomes a major project. Consider reforesting these areas with native trees that don't drop large amounts of debris.
- Invasive grasses such as guinea and fountain grass grow rapidly when unmanaged and can dry out very quickly, creating a major fire hazard. Weed them often and consider replanting with low-lying, drought-tolerant, native ground cover.

## HARDEN YOUR HOME

Creating defensible space, as detailed above, decreases the likelihood of wildfire spreading through vegetation that surrounds structures on the home site or yard. The second and equally important set of actions to reduce wildfire-caused ignitions of residences and structures is to harden the home or structure with non-combustible building materials and ignition-reducing strategies. The following is a step-by-step list of recommended actions per component of a structure or home. Some of these actions are inexpensive and some are costly. All are important. It is recommended that residents take the simple and easier steps right away, and prioritize hardening the rest of the home or structure as soon as possible. Note: relying on the ability to water the roof when fire is approaching will not necessarily provide adequate structural protection, and it puts you in danger. It also takes water and personnel resources away from firefighters, who need the water and full attention toward firefighting rather than search and rescue for late evacuees. Preparation and early evacuation are key actions recommended by the national Ready, Set, Go! Program. Prepare your home as follows:



**Figure 12.** Covering vents with 1/8-inch or smaller metal mesh blocks embers from entering a home or structure.



**Figure 13.** Keep windows free of vegetation to reduce likelihood of heat-caused breakage that lets embers into your home.

**Roof:** Your roof is the most vulnerable part of your home because it can easily catch fire from wind-blown embers. Homes with wood-shake or shingle roofs are at high risk of being destroyed during a wildland fire. Build your roof or re-roof with fire-resistant materials such as composite, metal, or tile. Block any spaces between roof decking and covering to prevent ember intrusion. Clear leaves and other debris from your roof and gutters. Cut any tree branches within 10 feet of your roof.

**Vents:** Vents on homes are particularly vulnerable to flying embers. All vent openings should be covered with 1/8-inch or smaller metal mesh. Do not use fiberglass or plastic mesh because they can melt and burn. Attic vents in eaves or cornices should be baffled or otherwise protected to prevent ember intrusion (mesh is not enough).

**Deck/Patio Cover:** Use heavy timber or non-flammable construction material for decks. Enclose the underside of balconies and decks with fire-resistant materials to prevent embers from blowing underneath. Keep your deck clear of combustible items, such as baskets, dried flower arrangements and other debris. The decking surface must be ignition resistant if it's within 10 feet of the home.

**Windows:** Heat from a wildland fire can cause windows to break even before the home ignites. This allows burning embers to enter and start internal fires. Single-paned and large windows are particularly vulnerable. Install dual-paned windows with the exterior pane of tempered glass to reduce the chance of breakage in a fire. Limit the size and number of windows in your home that face large areas of vegetation.

**Non-Combustible Enclosed Eaves:** Box in eaves with non-combustible materials to prevent accumulation of embers.

**Walls:** Wood products, such as boards, panels or shingles, are common siding materials. However, they are combustible and not good choices for fire-prone areas. Build or remodel with fire-resistant building materials, such as plaster, cement, masonry or stucco. Be sure to extend materials from foundation to roof.

**Rain Gutters:** Screen or enclose rain gutters to prevent accumulation of plant debris.

**Chimney:** Cover your chimney and stovepipe outlets with a non-flammable screen of 1/4-inch wire mesh or smaller to prevent embers from escaping and igniting a fire. Make sure that your chimney is at least 10 feet away from any tree branches.



**Figure 14.** Make sure your eaves are enclosed with non-combustible materials to prevent ember entry.



**Figure 15.** Rain gutters should have screens to keep leaf debris from accumulating. Maintain gutters to keep them clear and clean.



**Figure 16.** Wood fencing can act like a fire wick straight to a home. Use non-combustible materials for all fencing and yard structures.



**Garage:** Have a fire extinguisher and tools such as a shovel, rake, bucket and hoe available for fire emergencies. Install a solid door with self-closing hinges between living areas and the garage. Install weather stripping around and under door to prevent ember intrusion. Store all combustibles and flammable liquids away from ignition sources.

**Non-Combustible Fencing:** Make sure to use non-combustible fencing materials, and to keep combustible fences away from homes. Wooden fences leading straight to the home act as wicks and bring the fire straight to the structure, greatly increasing the likelihood of the home igniting.

**Driveways and Access Roads:** Driveways should be designed to allow fire and emergency vehicles and equipment to reach your house. Access roads should have a minimum 10-foot clearance on either side of the traveled section of the roadway and should allow for two-way traffic. Ensure that all gates open inward and are wide enough to accommodate emergency equipment. Trim trees and shrubs overhanging the road to a minimum of 13 1/2 feet to allow emergency vehicles to pass.

**Address:** Make sure your address is clearly visible from the road.

**Water Supply:** Have multiple garden hoses that are long enough to reach any area of your home and other structures on your property. If you have a pool or well, consider getting a pump.

**Inside:** Keep fire extinguishers on hand and in good working order. Install smoke alarms on each level of your home and near bedrooms. Test them monthly and change the batteries twice a year.

## ACTION PLAN

### WESTERN O’AHU COMMUNITY WILDFIRE PROTECTION PLAN

The Western O’ahu CWPP Action Plan follows the guidelines for HFRA, which includes developing an action plan along with an implementation and maintenance strategy, and finalizing the plan.

The Western O’ahu CWPP Action Plan was developed through an analysis of the issues identified in the hazard assessments and overall risk assessment, public and agency meetings, and through a review of other Community Wildfire Protection Plans throughout Hawai’i. Federal, state, and county agencies, private entities and landowners, and area residents and homeowners were invited to submit projects that provide protection and reduce risk. Public concerns and input served as the basis for the projects listed below that will guide hazard reduction efforts in the future.

Landowners and agencies are invited to continue to submit projects that provide community protection and mitigate wildfire risk. OWIE, along with HWMO when possible, intend to meet periodically to evaluate progress on projects and mutually agree on treatment priorities. Additional projects will be attached as appendices and included in updated versions of this plan.

## NEAR-TERM ACTION PLAN

Agencies and organizations involved in the CWPP process provided a list of action item projects for the next 1-5 years. Community meeting participants provided their concerns and priorities during the public meetings. This information was used to inform and develop the following project list.

1-5 Year Projects			
Proposed and/or Planned Project	Anticipated Cost	When	Lead
Wai’anae Kai Forest Reserve – Green Break: breaking the grass fire cycle by replacing guinea grass with mostly native shrubs and trees that will shade out the grass. Weed mat is also laid down to inhibit grass growth. Education is a strong component of this project. Thousands of volunteer hours by school kids have been logged for this project.	\$100,000/year	Ongoing	Wai’anae Mountains Watershed Partnership, DLNR-DOFAW
Wai’anae Kai Forest Reserve Fuels Conversion–Honua Riparian Project: Restore and reestablish abandoned lo’i to create a riparian area in the FR. This riparian area will be a living fire break to inhibit fire spread.	\$50,000/year	In Initial Phases	DLNR-DOFAW
Wai’anae Kai Forest Reserve Fuel break: Maintenance of approximately ¾ of a mile to prevent fire from hitting the FR from neighboring ranch.	\$40,000/year	Ongoing	DLNR-DOFAW
Wai’anae Kai Forest Reserve: Retardant treatment-Spraying retardant along roads and plantings to inhibit fire spread.	\$30,000/year	Ongoing	DLNR-DOFAW

Honouliuli Forest Reserve – Fuel break and access: maintenance of roads for firebreaks and fire access.	\$20,000/year	Ongoing	DLNR-DOFAW
Makua Keaau Forest Reserve - Fuel break and access: maintenance of roads for firebreaks and fire access. Approx \$20K per year	\$20,000/year	Ongoing	DLNR-DOFAW
Kuaokala Game Management Area - Fuel break and access: Maintenance of roads for firebreaks and fire access. Approx \$15K per year	\$15,000/year	Ongoing	DLNR-DOFAW
Nanakuli Ranch - Fuel break and access: maintenance of roads for firebreaks and fire access.	\$10,000/year	Ongoing	DLNR-DOFAW
Smokey Bear and other signage – Install and maintain “Smokey Bear, Prevent Wildfire Signs” throughout project area.	\$10,000/year	ASAP	DLNR-DOFAW
Assist interested communities in completing Firewise Communities certification process	\$5,000/community	Ongoing	HWMO
Provide outreach to students at schools in fire-prone communities	Varies, part of broader workplan and set of expenses	Ongoing	HWMO, OWIE
Develop wildfire prevention and drought awareness and preparedness materials	Variable	In Initial Phases	HWMO, OWIE
Launch wildfire and drought awareness campaign	Variable, depending on strategies employed	In Initial Phases	HWMO, OWIE, DLNR-DOFAW
Host wildfire preparedness information and materials for residents and decision makers on website	Variable	Ongoing	HWMO, DLNR-DOFAW
Utilize social media to promote wildfire awareness	Variable	Ongoing	HWMO, OWIE
Consult county land use planners regarding wildfire issues and input	Variable	ASAP, as part of CWPP process	HWMO

**Table 10.** Near-Term Action Plan and Projects.

## RECOMMENDED NEXT STEPS

In addition to projects that are ongoing or being initiated at the time of writing this CWPP, numerous other priority projects were proposed by participating agencies and organizations involved in the CWPP planning process. Table 11 details the proposed projects in no priority order. Projects are to be completed as funding, personnel, and opportunities become available for implementation.

Longer-Term Projects		
Proposed Project	Anticipated Cost	Lead
Continue and expand all-agency unified wildfire outreach campaign, such as Wildfire & Drought Lookout	TBD	HWMO, OWIE
Improve national reporting of wildfires in Hawai'i	TBD	DLNR-DOFAW, USFS, HWMO
Improve initial attack capacity	Project dependent	TBD
Work to appropriately graze fallow areas where fuels are building, Fund fencing and water troughs to make lease areas more economically feasible to graze	200,000 for fencing multiple areas	DLNR-DOFAW
Install water tanks around margins of communities to serve as dip tanks for helicopter fire suppression. Have tanks double as water troughs for ranching and conservation/restoration efforts	\$20-60,000 per diptank	TBD
Increase outreach to community associations (workshops, presentations)	Variable	HWMO, OWIE
Increase K-12 wildfire-focused outreach and education	TBD	HWMO, OWIE
Provide wildfire education for decision makers	TBD	HWMO, OWIE
Seed collection and storage for post-fire replanting	TBD	DLNR-DOFAW
Create fuelbreak maps (existing and desired)	\$50,000	HWMO
Work with large landowners to encourage fuels management	TBD	OWIE, HWMO
Develop plan for increased water to areas such as Yokohama Bay	TBD	OWIE, DOFAW
Maintain and add RAWS	TBD	DLNR-DOFAW, OWIE
Work with partners and residents to garner support for increasing DOFAW's budget for fire response	TBD	HWMO
Extend successes in Wai'anae Kai to other Forest Reserves and Makaha (Honolulu Board of Water Supply)	TBD	DLNR-DOFAW
Increase DOFAW nursery capacity (i.e., add a horticulturalist position)	TBD	DLNR-DOFAW
Submit WUI proposals for projects in the CWPP area	TBD	DLNR-DOFAW
Work with state and federal land-owner assistance programs to incorporate wildland fire concerns	TBD	DLNR-DOFAW
Develop fire-specific situational awareness and evacuation plans, education, and resources for communities	TBD	TBD
Increase community and agency fire danger and fuels monitoring capacity	TBD	HWMO, UH

**Table 11.** Proposed Future Projects.

## CWPP IMPLEMENTATION AND MAINTENANCE

### *PLAN IMPLEMENTATION AND MAINTENANCE*

The Healthy Forest Restoration Act (HFRA) requires that HFD, Honolulu Department of Emergency Management, and DLNR-DOFAW all agree on the final contents of the Western O'ahu CWPP. The plan is signed by each agency in order to meet HFRA and FEMA requirements. Because of the non-regulatory nature of the CWPP, the relevance and effectiveness of the Western O'ahu CWPP will rely heavily upon agency and community initiative and involvement. Expertise, technical support, and implementation assistance will be provided by the appropriate agencies and organizations involved in fire issues in the Western O'ahu CWPP area. Area residents are urged to contribute time and effort toward creating defensible space, reducing structural ignitability, and working at the community level to initiate and maintain wildfire protection projects.

HWMO, in cooperation with the OWIE coordinating group, will provide technical support, identify and coordinate funding when possible, and serve as a centralized resource for wildfire risk reduction efforts in Western O'ahu. Together, representatives will work to identify sources of funding for projects, initiate projects, document the successes and lessons learned from those projects, and evaluate and update the CWPP as needed.

HWMO will provide outreach and educational programs to youth and adults through school programs, community events, homeowners/community association programs, and workshops in the coming years to catalyze and support community involvement in implementing the actions identified in this plan. Additionally, HWMO will work with interested communities to go through the Firewise certification process, to include forming local Firewise committees and action teams and completing comprehensive hazard assessments and plans specific to their subdivisions.

Many Western O'ahu CWPP action items will require continuing support for wildfire risk mitigation projects. This will involve actively pursuing funding for projects, staying informed and in contact with one another, and updating the CWPP regularly so that it remains a "living" document. Continuing to build community awareness of these issues and actions will assist with fostering individual and community investment in projects.

## SIGNATORY CONTACT INFORMATION

The following agencies have a high level of interest in the protection of the Western O’ahu region from wildfire, and have reviewed and support this CWPP. Contact information for principal government stakeholders is listed below.

### HONOLULU FIRE DEPARTMENT

---

**Manuel P. Neves, Fire Chief**  
**Lionel E. Camara, Jr., Deputy Fire Chief**  
636 South Street  
Honolulu, Hawai‘i 96813  
Phone: (808) 723-7139



### CITY AND COUNTY OF HONOLULU, DEPARTMENT OF EMERGENCY MANAGEMENT

---

**Melvin N. Kaku, Director**  
**Peter J.S. Hirai, CEM, Deputy Director**  
Frank F. Fasi Municipal Building  
650 South King Street, Basement  
Honolulu, Hawai‘i 96813-3078  
Phone: (808) 723-8960  
TTY: (808) 723-8966  
Fax: (808) 524-3439  
Email: [dem@honolulu.gov](mailto:dem@honolulu.gov)



### STATE DEPARTMENT OF LAND AND NATURAL RESOURCES- DIVISION OF FORESTRY AND WILDLIFE

---

**David G. Smith**  
**Administrator**  
Kalanimoku Building  
1151 Punchbowl St. Room 325  
Honolulu, HI 96813  
Ph: (808) 587-0166



The Signature Page presented at the beginning of this document demonstrates the required multi-agency participation and acknowledgement of this plan.

For inquiries related to the development of this plan, to add supplementary action plan projects, or for printed copies, please contact:



Hawai'i Wildfire Management Organization  
65-1279 Kawaihae Rd. Ste 211  
Kamuela, HI 96743  
Email: [admin@hawaiiwildfire.org](mailto:admin@hawaiiwildfire.org)  
Website: [Hawaiiwildfire.org](http://Hawaiiwildfire.org)

TABLES

Table #	Description	Page #
1	CWPP PARTICIPANTS: STATE AND LOCAL AGENCIES.	4
2	CWPP PARTICIPANTS: FEDERAL AGENCIES.	4
3	CWPP PARTICIPANTS: DECISION MAKERS.	5
4	CWPP PARTICIPANTS: INTERESTED PARTIES.	5
5	WESTERN O’AHU LARGE AND SIGNIFICANT WILDFIRES.	21
6	OVERVIEW OF HAZARD ASSESSMENT CATEGORIES AND THE INDIVIDUAL HAZARDS THAT COMPRISE THEM.	37
7	HFD SUPPRESSION RESOURCES.	45
8	DIVISION OF FORESTRY AND WILDLIFE (DLNR–DOFAW) SUPPRESSION RESOURCES.	45
9	HAZARDOUS FUELS TREATMENT RECOMMENDATIONS.	55
10	NEAR-TERM ACTION PLAN AND PROJECTS.	61-62
11	PROPOSED FUTURE PROJECTS.	63



## FIGURES

Photo #	<i>Description</i>	<i>Page #</i>
1	NANAKULI BRUSH FIRE NEWSPAPER GRAPHIC.	24
2	WAI'ANAЕ VALLEY FIRE NEWSPAPER GRAPHIC.	26
3	WESTERN O'AHU CWPP PARTICIPANT HIGHEST WILDFIRE-RELATED PRIORITIES.	48
4	COMMUNITY CONCERNS ORGANIZED BY COHESIVE STRATEGY CATEGORIES.	49
5	CWPP PARTICIPANT INPUT RELATED TO RESILIENT LANDSCAPES.	50
6	FIRE-ADAPTED COMMUNITIES INFOGRAPHIC.	52
7	COMMUNITY CONCERNS RELATED TO FIRE-ADAPTED COMMUNITIES.	52
8	CWPP PARTICIPANT RECOMMENDED METHODS FOR INCREASING PUBLIC AWARENESS.	53
9	PUBLIC INPUT RELATED TO SAFE AND EFFECTIVE WILDFIRE RESPONSE.	54
10	DEFENSIBLE SPACE ZONES AROUND STRUCTURES.	56
11	LADDER FUELS DIAGRAM.	56
12	SCREENED VENTS.	58
13	WINDOWS CLEAR OF VEGETATION.	58
14	ENCLOSED EAVES.	59
15	GUTTER GUARDS OR SCREENS.	59
16	NON-COMBUSTIBLE FENCING.	59

## MAPS

Map #	<i>Description</i>	Page #
1	WESTERN O’AHU CWPP PLANNING AREA MAP.	3
2	AVERAGE ANNUAL PRECIPITATION MAP.	10
3	AVERAGE WIND SPEED MAP.	11
4	TOPOGRAPHIC MAP OF WESTERN O’AHU.	12
5	LAND COVER/ VEGETATION MAP FOR WESTERN O’AHU CWPP PLANNING AREA.	13
6	THREATENED AND ENDANGERED SPECIES DENSITIES MAP.	14
7	USFWS MAP OF PRIORITY LANDSCAPES WITHIN THE CWPP PLANNING AREA.	15
8	USFWS MAP OF LAND COVER TYPE WITHIN THEIR PRIORITY LANDSCAPES IN AND ADJACENT TO THE WESTERN O’AHU CWPP PLANNING AREA.	16
9	WILDFIRE THREATS TO ENDANGERED SPECIES AS PER USFWS.	17
10	IGNITION DENSITIES MAP. (MAP SOURCE: TRAUERNICHT, UNIVERSITY OF HAWAI’I, CTAHR)	18
11	WESTERN O’AHU FIRE INCIDENT MAP.	19
12	LAND OWNERSHIP MAP FOR WESTERN O’AHU CWPP PLANNING AREA.	28
13	SIMPLIFIED COMMUNITY DELINEATIONS USED WITHIN THE WESTERN O’AHU CWPP PLANNING AREA.	29
14	WESTERN O’AHU POPULATION DENSITY MAP.	30
15	PARKS IN WESTERN O’AHU CWPP PLANNING AREA.	31
16	CIVIL, INDUSTRIAL, MEDICAL, AND COMMUNICATION FEATURES IN THE WESTERN O’AHU CWPP PLANNING AREA.	32
17	SCHOOLS IN THE WESTERN O’AHU CWPP PLANNING AREA.	33
18	WATER FEATURES IN THE WESTERN O’AHU CWPP PLANNING AREA.	34
19	WESTERN O’AHU COMMUNITIES AT RISK FROM WILDFIRES MAP- HAZARD RATINGS FOR DEVELOPED AREAS.	35
20	ISLAND OF O’AHU 2013 COMMUNITIES AT RISK FROM WILDFIRES MAP.	36

21	SUBDIVISION HAZARD TOTAL FOR DEVELOPED AREAS OF WESTERN O’AHU CWPP PLANNING AREA.	38
22	VEGETATION HAZARD TOTAL FOR DEVELOPED AREAS OF WESTERN O’AHU CWPP PLANNING AREA.	39
23	BUILDING HAZARD TOTAL FOR DEVELOPED AREAS OF WESTERN O’AHU CWPP PLANNING AREA	40
24	FIRE ENVIRONMENT HAZARD TOTAL FOR DEVELOPED AREAS OF WESTERN O’AHU CWPP PLANNING AREA.	41
25	FIRE PROTECTION HAZARD TOTAL FOR DEVELOPED AREAS OF WESTERN O’AHU CWPP PLANNING AREA.	42
26	STAKEHOLDER-DETERMINED ‘HIGH VALUE PRIORITY RESOURCES’ TO PROTECT FROM WILDFIRE IN THE WESTERN O’AHU CWPP PLANNING AREA.	43
27	HFD AND DLNR-DOFAW FIRE SUPPRESSION RESPONSE ZONES. (MAP SOURCE: DLNR-DOFAW)	46

PHOTOS

<i>Photo #</i>	<i>Description</i>	<i>Page #</i>
1	CWPP PROCESS PHOTO 1	6
2	CWPP PROCESS PHOTO 2	6
3	CWPP PROCESS PHOTO 3	6
4	CWPP PROCESS PHOTO 4	7
5	CWPP PROCESS PHOTO 5	7
6	NANAKULI 2016 FIRE; PHOTO 1	22
7	NANAKULI 2016 FIRE; PHOTO 2	22
8	MAKAKILO 2015 FIRE	23
9	LUALUALEI/ WAI'ANAE KAI; PHOTO 1	24
10	LUALUALEI/ WAI'ANAE KAI; PHOTO 2	24
11	NANAKULI 2005 FIRE; PHOTO 1	25
12	NANAKULI 2005 FIRE; PHOTO 2	25
13	MAKUA 2003 FIRE	25
14	WAI'ANAE VALLEY FIRE	26
15	HIGH VALUE RESOURCES SELECTED BY PARTICIPANTS; PHOTO 1	44
16	HIGH VALUE RESOURCES SELECTED BY PARTICIPANTS; PHOTO 2	44
17	HIGH VALUE RESOURCES SELECTED BY PARTICIPANTS; PHOTO 3	44

## REFERENCES

- <sup>1</sup> **Healthy Forests Restoration Act of 2003– HR 1904. US Federal Register.**  
[http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=108\\_cong\\_bills&docid=f:h1904enr.txt.pdf](http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=108_cong_bills&docid=f:h1904enr.txt.pdf)
- <sup>2</sup> **2,500-acre brush fire along Nanakuli ridge now 90-percent contained.** Alexander Zannes and staff. KHON. March 17, 2016. <http://khon2.com/2016/03/17/2500-acre-brush-fire-along-nanakuli-ridge-now-80-percent-contained/>
- <sup>3</sup> **Dietra A. Myers Tremblay.** Internal review and edits to Western O’ahu CWPP. DLNR-DOFAW.
- <sup>4</sup> **Crews continue to battle Makakilo brush fire.** Chelsea Davis. Hawai’i News Now. August 22, 2014.  
<http://www.hawaiinewsnow.com/story/26351504/20-homes-evacuated-in-palehua-over-100-firefighters-on-scene>
- <sup>5</sup> **Crews continue to battle Makakilo brush fire.** Chelsea Davis. Hawai’i News Now. August 22, 2014.  
<http://www.hawaiinewsnow.com/story/26351504/20-homes-evacuated-in-palehua-over-100-firefighters-on-scene>
- <sup>6</sup> **O’ahu crews battle 2 brush fires.** Star Advertiser staff. Star Advertiser. November 10, 2012.  
<http://www.staradvertiser.com/breaking-news/oahu-crews-battle-2-brush-fires/>
- <sup>7</sup> **Lualualei Naval Magazine/Waianae Kai Forest Reserve Fire,** Memorandum for Record. Appendix ES-4  
Waianae Kai Fire Report. June 2012.
- <sup>8</sup> **Waianea, Lualualei brushfires mostly contained.** Star-Advertiser staff. Honolulu Star-Advertiser. June 6, 2012.  
<http://www.staradvertiser.com/breaking-news/waianae-lualualei-brush-fires-mostly-contained/>
- <sup>9</sup> **Nanakuli Wildfires put area on alert.** Leila Fujimori. Honolulu Star-Bulletin. August 16, 2005.  
<http://archives.starbulletin.com/2005/08/16/news/index1.html>
- <sup>10</sup> **Nanakuli fire sweeps valley 'like a volcano'.** Peter Boylan and Loren Moreno. Honolulu Advertiser. August 16, 2005.  
<http://the.honoluluadvertiser.com/article/2005/Aug/16/In/FP508160333.html>
- <sup>11</sup> **Controlled burn at Makua scorches additional acres.** Honolulu Star-Bulletin. Gregg K. Kakesako. July 23, 2003. <http://archives.starbulletin.com/2003/07/23/news/index7.html>
- <sup>12</sup> **Makua fire heats debate.** Mike Gordon. Honolulu Advertiser. July 24, 2003.  
<http://the.honoluluadvertiser.com/article/2003/Jul/24/In/In22a.html>
- <sup>13</sup> **Fire set in Makua now out of control.** Mike Gordon. Honolulu Advertiser. July 23, 2003.  
<http://the.honoluluadvertiser.com/article/2003/Jul/23/br/br03p.html>
- <sup>14</sup> **Huge Wai’anae brush fire threatening farms.** Vicki Viotti. Honolulu Advertiser. July 25, 2002.  
<http://the.honoluluadvertiser.com/article/2002/Jul/25/br/br04p.html>
- <sup>15</sup> **Wai’anae Valley brushfire blackens up to 1,500 acres.** Walter Wright. Honolulu Advertiser. July 26, 2002.  
<http://the.honoluluadvertiser.com/article/2002/Jul/26/In/In01a.html>
- <sup>16</sup> **Adapted from Linn County Community Wildfire Protection Plan.** ECONorWest 2007  
[https://scholarsbank.uoregon.edu/xmlui/bitstream/handle/1794/5795/Linn\\_County\\_Wildfire\\_Plan.pdf?sequence=1](https://scholarsbank.uoregon.edu/xmlui/bitstream/handle/1794/5795/Linn_County_Wildfire_Plan.pdf?sequence=1)

- 
- 17 **City and County of Honolulu Drought Mitigation Strategies**  
<http://state.hi.us/dlnr/drought/preparedness/OahuDroughtMitigationStrategies.pdf>
- 18 **Wai'anae Watershed Management Plan**  
[http://www.boardofwatersupply.com/files/WWMP\\_Final\\_Report\\_Full\\_Aug2009.pdf](http://www.boardofwatersupply.com/files/WWMP_Final_Report_Full_Aug2009.pdf)
- 19 **State Drought Plan and the County Drought Mitigation Strategies.**  
<http://hawaii.gov/dlnr/drought/preparedness.htm>
- 20 **State of Hawai'i Multi-Hazard Mitigation Plan.** 2007.  
[http://scd.state.hi.us/HazMitPlan/executive\\_summary.pdf](http://scd.state.hi.us/HazMitPlan/executive_summary.pdf)
- 21 **Hawai'i State Forest Action Plan.** <http://dlnr.hawaii.gov/forestry/info/fap/>
- 22 **Operational Policy Handbook for Wildfire Control.** 2008.  
[http://dlnr.hawaii.gov/forestry/files/2013/09/fire\\_ops\\_handbook.pdf](http://dlnr.hawaii.gov/forestry/files/2013/09/fire_ops_handbook.pdf)
- 23 **DLNR-DOFAW Mutual Aid Agreements.** <http://dlnr.hawaii.gov/forestry/fire/mutual-aid/>
- 24 **Department of Emergency Management.** <http://www.honolulu.gov/dem.html>
- 25 **Ready Hawai'i Smartphone App flyer.** [http://www.honolulu.gov/rep/site/dem/Ready\\_Hawaii\\_App\\_flyer.pdf](http://www.honolulu.gov/rep/site/dem/Ready_Hawaii_App_flyer.pdf)
- 26 Email by Chief Seelig, Honolulu City and County Fire Department. June 14, 2016. Additional information provided by Dietra A. Myers Tremblay during internal review and edits of Western O'ahu CWPP.
- 27 **National Cohesive Wildland Fire Management Strategy** <http://www.forestsandrangelands.gov/strategy/>
- 28 **Frequently Asked Questions – Fire-Adapted Communities.** USDA Forest Service, Fire and Aviation. 2014.  
[http://www.fs.fed.us/fire/prev\\_ed/fac/faqs.pdf](http://www.fs.fed.us/fire/prev_ed/fac/faqs.pdf)
- 29 **National Wildfire Coordinating Group. 2014. Glossary of Wildland Terminology.** PMS 205.  
<http://www.nwccg.gov/?q=filebrowser/download/1828>
- 30 **Fire-Adapted Communities Infographic. Do you know your role?** <http://fireadaptednetwork.org/about/learn-about-wildfire-resilience/>
- 31 **Ready, Set, Go!** <http://www.wildlandfirersg.org>
- 32 **Hawai'i Wildfire Management Organization.** Ready, Set, Go! Personal Wildland Fire Action Guide- Hawai'i Edition. <http://www.hawaiiwildfire.org>
- 33 **Firewise** <http://www.Firewise.org>
- 33 **Ladder Fuels diagram.** <http://people.uwec.edu/jolhm/eh3/group9/wildfirehowfireworks.htm>

Hawaiian language diacriticals were based on Hawaiian place name lexicology as listed on Ulukau: The Hawaiian Electronic Library. Hyphens were removed to utilize more common spellings.  
<http://www.ulukau.org/cgi-bin/hpn?!=haw>

---

## APPENDICES

Appendix A: Detailed Public Input Per National Cohesive Strategy Category

Appendix B: WUI Community Assessment Photos

Appendix C: Wildfire Hazard Assessment Maps for Western O'ahu

Appendix D: DLNR-DOFAW Forest Reserves on O'ahu

Western O'ahu Community Wildfire Protection Plan  
 APPENDIX A  
 Detailed Public Input Per National Cohesive Strategy Category

<b>Public Input Related to FIRE ADAPTED COMMUNITIES</b>	
<b>Wildfire Concern</b> (In public-prioritized order)	<b>Recommended Actions</b> (Summarized from all public input statements)
1. Community Awareness (Education and Outreach)	<ul style="list-style-type: none"> <li>• Create a culture of community-level fire awareness:               <ul style="list-style-type: none"> <li>○ Involve schools and youth</li> <li>○ Send information home through Department of Education (DOE), post on DOE and school websites, school email blasts</li> <li>○ Stress parent involvement</li> <li>○ Focus on elementary and middle schools</li> <li>○ Deter senior classes from burning behind Nanakuli</li> <li>○ Get into schools and grow existing programs</li> <li>○ Add wildfire to Fire Prevention Week</li> <li>○ Begin a juvenile fire setter program, target concern areas</li> <li>○ Add wildland firefighting to career days</li> </ul> </li> <li>• Develop and offer classes/training/information for neighborhood boards and community associations. Include:               <ul style="list-style-type: none"> <li>○ Fire history &amp; impacts</li> <li>○ Fire threat signs</li> <li>○ Non-combustible building materials</li> <li>○ Firewise landscaping</li> <li>○ Defensible space</li> <li>○ Proper storage of ignitable materials</li> <li>○ Fire suppression details (evacuation, emergency response teams, resident and neighbor roles)</li> <li>○ Clutter and combustible materials around homes</li> </ul> </li> <li>• Improve public outreach               <ul style="list-style-type: none"> <li>○ PSAs, videos, tv, social media</li> <li>○ Public announcements when conditions have high fire likelihood</li> </ul> </li> <li>• Provide targeted outreach to:               <ul style="list-style-type: none"> <li>○ Large landowners</li> <li>○ Hunters (who might be able to help with students)</li> <li>○ Specific communities</li> </ul> </li> <li>• State should provide funding &amp; increase/contribute to outreach &amp; education</li> <li>• Talk to politicians about fire education and enforcement issues</li> </ul>
2. Enforcement	<ul style="list-style-type: none"> <li>• Increase capacity of fire department and others who are supposed to enforce fire code</li> <li>• Change fire code policy on fuelbreaks from 30 feet to 50 feet</li> <li>• Enforce fuel abatement codes on large landowners and vacant lot owners</li> <li>• Enforce codes and rules regarding:               <ul style="list-style-type: none"> <li>○ Fire threats and junk in people's yards</li> </ul> </li> </ul>



Public Input Related to FIRE ADAPTED COMMUNITIES	
Wildfire Concern (In public-prioritized order)	Recommended Actions (Summarized from all public input statements)
	<ul style="list-style-type: none"> <li>○ Trash burning</li> <li>○ Illegal dumping</li> <li>○ Homeless encampments</li> <li>○ Fireworks</li> </ul> <ul style="list-style-type: none"> <li>● Develop partnerships to help notify authorities of violations to fire code</li> <li>● Catch arsonists and charge with suppression costs</li> <li>● Add fuel-abatement to Adopt-A-Highway expectations</li> <li>● Address underlying issues to fire ignitions such as homeless encampments</li> </ul>
3. Planning (and Legislative Actions)	<ul style="list-style-type: none"> <li>● Involve planners and policy makers in wise development, to emphasize wildfire preparedness: <ul style="list-style-type: none"> <li>○ Be Firewise from the start (of new developments)</li> <li>○ Require buffer zones</li> <li>○ Communicate with City and County Department of Planning, Land use planners, policy makers</li> </ul> </li> <li>● Develop fire management plans for the region</li> <li>● Establish a process, hotline, or contact for addressing wildfire preparedness or violation issues</li> <li>● Regulate urban expansion so it does not impact native species</li> </ul>
4. Military participation	<ul style="list-style-type: none"> <li>● Work with military (Navy) on arson and fire starts on old structures on Navy properties</li> </ul>

**Public Input Related to  
RESILIENT LANDSCAPES**

<b>Wildfire Concern</b> (In public-prioritized order)	<b>Recommended Actions</b> (Summarized from all public input statements)
--	---

<p>1. Vegetative fuels management</p>	<p>General fuels management recommendations:</p> <ul style="list-style-type: none"> <li>• Manage fuels around subdivisions</li> <li>• Manage fuel loads below natural areas to prevent spread into forests and biologically sensitive areas</li> <li>• Create a service road around community perimeters to serve as both a fuelbreaks and access</li> <li>• Maintain access roads and firebreaks in large unused agricultural areas</li> <li>• Communities should all have chippers to decrease fuel load</li> </ul> <p>Grazing:</p> <ul style="list-style-type: none"> <li>• Sheep/goat grazing in interface; Naked Cow Dairy needs 500+ acres of grazing lands</li> <li>• Create goat grazing programs in small unmanaged fuel areas</li> <li>• Work with UH grazing specialist to develop grazing paddocks around Ka’ala farms</li> <li>• Support leasing of federal properties for grazing to reduce fuels</li> </ul> <p>Large landowners:</p> <ul style="list-style-type: none"> <li>• Support, educate, and enforce large landowners to manage vegetation on residential boundaries</li> <li>• Work toward grant to help large landowners plant native groundcover or convert flammable fuels to less flammable vegetation</li> <li>• Help define large landowners’ roles in fire mitigation better</li> </ul> <p>Fuelbreak standards and policies:</p> <ul style="list-style-type: none"> <li>• Increase HFD policy from 30 feet to 50 feet of vegetation management for fuel abatement</li> <li>• Help smaller homeowners get permission to cut fuelbreaks 24 feet beyond own property boundaries when adjacent to high fuels</li> </ul> <p>Government-related fuels reduction:</p> <ul style="list-style-type: none"> <li>• Deal with unexploded ordinance in Army range areas</li> <li>• Involve Department of Transportation in better roadside fuels management and converting roadside vegetation to Firewise plants</li> <li>• All government lands should prioritize and fund fire access roads and fuels management</li> </ul>
---------------------------------------	---

<p>2. Environmental Protection</p>	<p>Constructed wetlands:</p> <ul style="list-style-type: none"> <li>• Aquifer recharge through fishpond/constructed wetlands (Io’i)</li> <li>• Constructed wetlands (increase political will DLNR) and restore Io’i &amp; fish ponds; grazing lands designation</li> </ul> <p>Post fire:</p> <ul style="list-style-type: none"> <li>• Increase post fire restoration efforts and capabilities, including temporary water lines</li> <li>• Develop common native seed bank and sources</li> <li>• Schedule re-planting immediately after fire and replant with less combustible plants</li> </ul>
------------------------------------	--

<b>Public Input Related to RESILIENT LANDSCAPES</b>	
<b>Wildfire Concern</b> (In public-prioritized order)	<b>Recommended Actions</b> (Summarized from all public input statements)
	<ul style="list-style-type: none"> <li>• Plan post fire planting efforts with nurseries and seed providers</li> <li>• Fund and create a post-fire team</li> </ul> <p>Protected and sensitive species and areas:</p> <ul style="list-style-type: none"> <li>• Provide locations of threatened and endangered species to firefighters for prioritized fire protection</li> <li>• Protect natural resources in protected valleys</li> <li>• Conduct fuels management below forests to prevent fire from traveling from below natural areas into forests</li> <li>• Protection for Waianae watershed</li> </ul> <p>Other environmental:</p> <ul style="list-style-type: none"> <li>• Beautification projects to convert flammable fuels to less flammable</li> </ul>
3. Planning	<ul style="list-style-type: none"> <li>• Support legislation in session to allow "Taro Lands Designation" for constructed wetlands and lo'i</li> <li>• Identify responsible parties for mitigation and recovery when fires cross boundaries (for example, fires in Waianae Valley crossed back and forth across jurisdictions)</li> <li>• Identify at-risk communities and work with them most</li> <li>• Develop fire management plan for region</li> <li>• Fund and develop maps of the network of trails and roads for firefighters</li> </ul>
4. Enforcement	<ul style="list-style-type: none"> <li>• Enforce fuel abatement laws, especially by large landowners with unmanaged fuels next to populated subdivisions</li> </ul>
5. Cultural Resources	<ul style="list-style-type: none"> <li>• Restore and protect lo'i and fishponds</li> </ul>
6. Capacity	<ul style="list-style-type: none"> <li>• Increase post-fire response and restoration capacity <ul style="list-style-type: none"> <li>○ Develop common seed bank and sources of seeds for after fire</li> </ul> </li> <li>• Increase funding and support for fuels management between residential and natural areas</li> </ul>
7. Access	<ul style="list-style-type: none"> <li>• Create better access/roads around subdivisions that can also serve as fuelbreaks to protect natural areas from fires that start within subdivisions and spread into native and protected areas</li> </ul>
8. Public Awareness	<ul style="list-style-type: none"> <li>• Education and outreach to large landowners about importance of managing fire fuels</li> <li>• Work with landowners, work toward buy-in for responsibility; Neighborhood boards (ex. PCA Palehua Community Assn.); County &amp; State entities</li> </ul>
9. Water	<ul style="list-style-type: none"> <li>• Recharge aquifer. "More water in streams equals more green not brown on mountain"</li> </ul>

**Public Input Related to  
SAFE AND EFFECTIVE WILDFIRE RESPONSE**

<b>Wildfire Concern</b> (In public-prioritized order)	<b>Recommended Actions</b> (Summarized from all public input statements)
1. Capacity	<p>Equipment:</p> <ul style="list-style-type: none"> <li>• Ensure adequate firefighting equipment, more aircrafts for response</li> <li>• Explore new technologies for fire suppression (i.e. deployment methods, eco-friendly retardant, drones, etc.)</li> <li>• Increase air support</li> <li>• Add additional resources and partnerships to increase air assets &amp; maintenance</li> <li>• Pursue research &amp; development funding for wildland firefighting techniques, equipment, and resources</li> </ul> <p>Personnel:</p> <ul style="list-style-type: none"> <li>• Need fire crew dedicated to wildland fire and pre-suppression activities and mitigation</li> <li>• Increase personnel</li> </ul> <p>Pre-Suppression and Mitigation</p> <ul style="list-style-type: none"> <li>• Supplement medical services in region via mobile organizations to assist with disaster</li> <li>• Develop pre-suppression crew</li> <li>• Increase dedicated funding for pre-suppression</li> </ul> <p>Training</p> <ul style="list-style-type: none"> <li>• More training for Hawai'i DOFAW staff; Need funding for staff to train on the mainland on larger scale fires</li> </ul> <p>Other Firefighting resources:</p> <ul style="list-style-type: none"> <li>• Funding for firefighting infrastructure- water lines, diptanks</li> <li>• Funding for informational traffic signs for HPD and HFD use</li> <li>• Funding to develop quicker public notification system for incidents</li> <li>• Develop better traffic management strategies for firefighting and community safety</li> </ul>
2. Water	<ul style="list-style-type: none"> <li>• Increase water supply and infrastructure for firefighting <ul style="list-style-type: none"> <li>○ Establish more diptanks, water tanks, reservoirs</li> <li>○ Add catchment systems in strategic locations</li> <li>○ Add tanks or tankers</li> <li>○ Improve water supply from the Board of Water Supply</li> <li>○ Install more fire hydrants and pressurized water on both sides of road</li> </ul> </li> <li>• Install fire hydrants between Kea'au beach park and Ka'ena Point</li> <li>• Research suitable water supplies/infrastructure for air operations with landowners and agencies</li> </ul>
3. Access	<ul style="list-style-type: none"> <li>• Increase access by developing and maintain roads and fuelbreaks in all areas</li> <li>• Add bypass roads to aid evacuations and traffic</li> <li>• Increase access for firefighting in remote areas</li> </ul>

<b>Public Input Related to SAFE AND EFFECTIVE WILDFIRE RESPONSE</b>	
<b>Wildfire Concern</b> (In public-prioritized order)	<b>Recommended Actions</b> (Summarized from all public input statements)
4. Planning	<ul style="list-style-type: none"> <li>• Provide firefighters with plans and maps of protected species</li> <li>• Plan for better traffic management</li> <li>• Conduct surveys and map trail networks</li> <li>• Develop visitor evacuation plan</li> <li>• Landowners should develop plans and practice staff and visitor evacuations</li> </ul>
5. Collaboration	<ul style="list-style-type: none"> <li>• Work to better determine fire causes</li> <li>• Develop more streamlined process between agencies for aerial firefighting</li> <li>• Create agreements in advance of anticipated usage of equipment (bulldozers, heavy equipment)</li> </ul>
6. Environmental Protection	<ul style="list-style-type: none"> <li>• Work better during fire to minimize post fire damage</li> <li>• Implement post-fire planting immediately after fire</li> </ul>
7. Federal Burns	<ul style="list-style-type: none"> <li>• Manage federal controlled burns more appropriately</li> </ul>

Western O'ahu Community Wildfire Protection Plan  
APPENDIX B  
WUI Community Assessment Photos

The following photos provide examples of community resources/assets at risk, hazards, and existing protective features in the Western O'ahu CWPP planning area.

Photo assessments were completed for developed areas from Maili and Makua through Kapolei and Ewa.

Wildland-Urban Interface Communities in the West O'ahu CWPP planning area.  
Photo assessment of community resources at risk, hazards, and examples of existing protective features and actions.

Māili



Wai'anae Comprehensive Health Center – entrance to parking lot



Roadside fuels between Mā'ili'ili Road and canal



Example of homes surrounded by tall kiawe and grasslands



Example of homes surrounded by steep grassy hillside and kiawe



Empty lots with trash dumped are a fire hazard



Example of roads with no vegetation management on shoulders under powerlines



Example of some vegetation management along roadside on Mā'ili'ili Road



Empty lot on Mā'ili'ili Road with heavy dead and down fuels



Naval Transmitting Facility along Paakea Road



Homes along the canal with dense fuels surrounding them



Empty lot with abandoned cars buried in tall grasses a fire hazard



Paakea Road with shoulders overgrown with grasses and 'ekoa

Wildland-Urban Interface Communities in the West O'ahu CWPP planning area.  
Photo assessment of community resources at risk, hazards, and examples of existing protective features and actions.

Mākaha



Mākaha Community Center with tall grasses and kiawe forest surrounding it



Mākaha Beach with high surf



Kill Drive with no shoulders and Mākaha Valley in the background



Succulents planted along roadside on Kill Drive an example of good Firewise landscaping



Mākaha Valley Towers



Mākaha Valley Country Club bordered by dead trees and tall grassland



Mākaha Valley Country Club structure with shake roof and lack of defensible space



Mākaha Resort with unmanaged vegetation



Mākaha Valley Country Club homes surrounded by kiawe forest



Mākaha Valley Country Club entrance with dead trees next to powerlines



Mākaha Valley Road home with tall fuels surrounding it



Example of cars parked in overgrown vegetation in empty lot



Wildland-Urban Interface Communities in the West O‘ahu CWPP planning area.  
Photo assessment of community resources at risk, hazards, and examples of existing protective features and actions.

Mākaha (cont.)



Example of home with tall grasses between structure and roadside



Road shoulders with overgrown grass next to homes a fire hazard



Shake roof home with tall kiawe overhanging it



Home surrounded by flammable palms, shrubs, and grasses



Tall, dense, overgrown bougainvillea near homes common in area



Road shoulders on Jade Street recently cleared of fuels



Example of the many vacant homes in the area



Mākaha Valley Shopping Center with tall grasses next to parking lot

Wildland-Urban Interface Communities in the West O'ahu CWPP planning area.  
 Photo assessment of community resources at risk, hazards, and examples of existing protective features and actions.

Mākuā/Kea'au



Road to Our Lady of Kea'au - example of good fuels management next to unmanaged grassland



Public Hunting access road an ignition hazard



Camping at Kea'au Beach Park (north end)



Highway along Kea'au Beach Park with no drivable shoulders



Unmanaged fuels under powerlines along main highway a high ignition risk



Continuous grasses and kiawe on the south end of Kea'au Beach Park



Homes across from south end of Kea'au Beach Park surrounded by unmanaged kiawe forest



Kea'au Beach Park



Homes and vehicles across from Kea'au Beach Park with tall kiawe and grasses



Home in makai neighborhood with yard kept maintained and vegetation piled along roadside for pickup



Abandoned lot with various types of overgrown vegetation and dead and down fuels



One of many vacant lots with overgrown vegetation next to occupied homes

Wildland-Urban Interface Communities in the West O'ahu CWPP planning area.  
Photo assessment of community resources at risk, hazards, and examples of existing protective features and actions.

Mākuā/Kea'au (cont.)



Commonly used bougainvillea overgrown on fenceline



Overgrown vegetation next to one of a few abandoned homes



Example of home with well-maintained yard



Well-maintained grass lawn with minimal vegetation

Wildland-Urban Interface Communities in the West O'ahu CWPP planning area.  
Photo assessment of community resources at risk, hazards, and examples of existing protective features and actions.

Wai'anae



Wai'anae High School



Back of Wai'anae High School with tall grasses and kiawe forest



Wai'anae Regional Park fields with Wai'anae Mountains in background



Wai'anae Intermediate School with well-maintained vegetation next to unmanaged adjacent land



Wai'anae Community Center with sculpture and sitting area



Wai'anae Fire Station



Active tree trimming at Pililaa Park



Homes along canal off of Plantation Road across from overgrown wildland



Canal-side path with overgrown vegetation off of Plantation Road



Shoulders with tall shrubs (mostly bougainvillea) off of Plantation Road



Dense and tall kiawe and ekoa forest near homes (Plantation Road)



Wai'anae Valley homes next to tall ekoa and grass along shoulders of street

Wildland-Urban Interface Communities in the West O'ahu CWPP planning area.  
Photo assessment of community resources at risk, hazards, and examples of existing protective features and actions.

Wai'anae (cont.)



Wai'anae Valley homes with dead trees on road shoulder



Example of agricultural field (basil) in back of Wai'anae Valley



Pockets of dense vegetation surrounding and within Kaneaki Street subdivision



Kaneaki Street subdivision home with tall grass on berm



Kolealiilii Street an ignition hazard with tall grass and 'ekoa on shoulders and ATV traffic



End of Kolealiilii Street an illegal dumping ground



End of Kolealiilii Street a fire hazard with illegal green waste dumping



Kolealiilii Street abandoned nursery with overgrown vegetation



Kaneaki Street subdivision surrounded by tall grasses and dead and down fuel



Kaneaki Street subdivision WUI



Plantation Road homes protected from roadside fuels with neighboring agricultural fields

Wildland-Urban Interface Communities in the West O'ahu CWPP planning area.  
Photo assessment of community resources at risk, hazards, and examples of existing protective features and actions.

Nānākuli



Hakimo Road homes next to agricultural lot



Example of good defensible space and fire-free zone



Tall grasses and kiawe on Hakimo Road shoulders



Hakimo Road homes along WUI



Example of waste dumped along residential street with no shoulders



Example of one of a few abandoned vehicles on road shoulders with overgrown vegetation



Mulch piles surrounded by heavy fuels a fire hazard for nearby homes



Row of abandoned homes with overgrown vegetation



Example of home with flammable sidings but good defensible space



Sea Country subdivision WUI



Sea Country subdivision homes with tall kiawe on berm



Example of good defensible space in Sea Country subdivision

Wildland-Urban Interface Communities in the West O'ahu CWPP planning area.  
Photo assessment of community resources at risk, hazards, and examples of existing protective features and actions.

Nānākuli (cont.)



Example of home in Sea Country subdivision with overgrown berm behind structure



Sea Country subdivision example of xeriscaping



Rush hour traffic on main highway



Nānāikapono Elementary School



Nānāikapono High and Intermediate School with mowed grass and pockets of overgrown grass



Homes near Nānāikapono Schools with tall kiawe behind them (pre-2016 Nānākuli Fire)



Lyman Ranch



WUI view of homes near Nānākuli Schools



Nānākuli Beach Park lifeguard towers



Nānākuli Beach Park area with fuels next to parking lot

Wildland-Urban Interface Communities in the West O‘ahu CWPP planning area.  
Photo assessment of community resources at risk, hazards, and examples of existing protective features and actions.

‘Ewa



‘Ewa Makai Middle School front entrance



Kapolei Parkway Community Center with large green grass lawn



Kapolei Parkway neighborhood with wide road and well-maintained sidewalks



House on Peone Place that burned down in structure fire



‘Ewa Beach Road home with fire-free zone along combustible fence line



‘Ewa Beach Road – one of a few vacant homes with fuel buildup



‘Ewa Beach Park



Pu‘uloa Range Training Facility overgrown vegetation and pockets of dense kiawe



Homes along North Road across from unmanaged kiawe forest



Tall kiawe and unmanaged vegetation along road shoulder on North Road



Mowed grass shoulders near Neal Burton Memorial Field



Contrast between unmanaged and managed road shoulders on West Lock Drive



Wildland-Urban Interface Communities in the West O‘ahu CWPP planning area.  
Photo assessment of community resources at risk, hazards, and examples of existing protective features and actions.

‘Ewa (cont.)



Agricultural lands with unmanaged adjacent grasslands along Highway 746



Clear turnout along Highway 746 with barricade along unmanaged lands



Pōhinahina fuelbreak along road shoulder in neighborhood near Holomua School



Area in need of a fuelbreak in Holomua School neighborhood



Fuelbreak behind homes in Holomua School area



Thomas Gentry Community Association next to large green lawn – a buffer between homes and wildland



‘Ewa Beach Fire Station



‘Ewa USPS

Wildland-Urban Interface Communities in the West O'ahu CWPP planning area.  
Photo assessment of community resources at risk, hazards, and examples of existing protective features and actions.

Barber's Point/Kapolei



Turnout across from Chevron Refinery with mulch piles and tall kiawe



Unmanaged vegetation on road shoulders across from Chevron Refinery



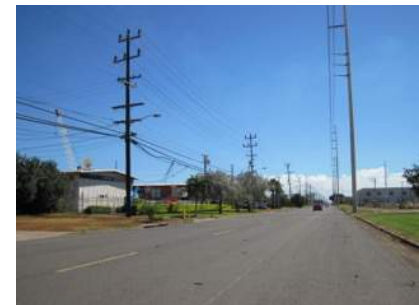
Unmanaged 'ekoa on road shoulders across from Chevron Refinery



Ships docked at Barber's Point Harbor with Palehua WUI in background



High truck traffic at Barber's Point Harbor with unmanaged vegetation along road shoulders



Example of typical street in Industrial Park



Example of mulch piles and dry grass surrounding a business



One of many areas in Industrial Park with unmanaged fuels along sidewalks



Dense shrubs and trees touching building in Industrial Park



Canal with dry unmanaged dry grasses within Industrial Park



Example of good defensible space around Industrial Park building



Lumber yard adjacent to lot with unmanaged 'ekoa and grasses

Wildland-Urban Interface Communities in the West O'ahu CWPP planning area.  
 Photo assessment of community resources at risk, hazards, and examples of existing protective features and actions.

Barber's Point/Kapolei (cont.)



Dry grasses in Kapolei along Farrington Highway



Turnout along Farrington Highway with tall grasses on shoulder



Wildland area bordering UH West O'ahu campus



Use of native plants (pōhinahina and naupaka) for landscaping around UH West O'ahu campus



UH West O'ahu parking lot with small fuelbreak separating it from grassland



UH West O'ahu student garden with hale



UH West O'ahu building adjacent to area of flammable unmanaged grass



Small fuelbreak cleared alongside sidewalk on Kualaka'i Parkway



Dry grass on sidewalk along Kekahili Street



High density, non-combustible roofs, and green lawns - characteristics of homes in Kekahili Street neighborhood



Mailbox pick-up area in Kekahili Street neighborhood with tall dry grasses on edges



Kekahili Street homes directly abut dry grassland

Wildland-Urban Interface Communities in the West O'ahu CWPP planning area.  
Photo assessment of community resources at risk, hazards, and examples of existing protective features and actions.

Barber's Point/Kapolei (cont.)



Home with minimal vegetation and good defensible space



Dry grass growing up onto combustible fence near home



Fire hydrant and hose on Kekahili Street



East Kapolei Fire Station



Ho'okele Elementary School with fire hydrant



Kapolei High School



Overgrown vegetation directly borders new development at Mohana



Large turnaround area at end of Kunehi Street



Firebreak behind homes near Kunehi Street



Construction for new Kekala Street development with pockets of unmanaged vegetation



Grassland next to Home Depot at Kapolei Parkway Shops



Turnout with tall grasses and shrubs along driveway next to Kapolei Parkway Shops

Wildland-Urban Interface Communities in the West O'ahu CWPP planning area.  
Photo assessment of community resources at risk, hazards, and examples of existing protective features and actions.

Barber's Point/Kapolei (cont.)



Green waste and logs alongside Boxer Road – high hazard area



Tall flammable fuels directly adjacent to lamp post on Boxer Road



Walking path next to wildland area along FDR Avenue



Downed utility pole next to wildland area along FDR Avenue



Electric facility surrounded by kiawe and grass along FDR Avenue



Snags and downed utility pole on decommissioned road off of FDR Avenue



Waiākea Gardens apartments with well-maintained green lawn



Turnaround area in Barber's Point Housing neighborhood



Wildland area between commercial area and Barber's Point Housing



Tall kiawe forest across from Barber's Point Housing homes



Living fuelbreak between wildland and Barber's Point Housing



Christmas tree dumped in wildland area near Barber's Point Housing homes

Wildland-Urban Interface Communities in the West O‘ahu CWPP planning area.  
Photo assessment of community resources at risk, hazards, and examples of existing protective features and actions.

Barber’s Point/Kapolei (cont.)16



Kalaeloa Airport



One of many abandoned buildings with unmanaged fuels near Kalaeloa Airport



Dead trees along powerlines next to Barber’s Point Golf Course



Geiger Park with sprinklers on



East Kapolei Fire Station No. 43



Busy intersection – Farrington and Kealanani



Farrington Highway traffic next to Kapolei during rush hour

Wildland-Urban Interface Communities in the West O'ahu CWPP planning area.  
Photo assessment of community resources at risk, hazards, and examples of existing protective features and actions.

Iroquois Point



Pualena Dog Park



Iroquois Point Elementary



Iroquois Point Elementary School  
rainbow eucalyptus and plumeria



Kiawe forest close to homes



Typical street in the area



Elua Cove parking lot, facilities, and  
beach



Elua Cove beach looking out toward  
Honolulu



Makai home with green grass lawn  
next to unmanaged grassland and  
kiawe



No dumping sign on makai side



Event along waterfront

Wildland-Urban Interface Communities in the West O‘ahu CWPP planning area.  
 Photo assessment of community resources at risk, hazards, and examples of existing protective features and actions.

Makakilo



Welo Street homes WUI



Kalihi Street neighborhood canal with dense ‘ekoa



Park sign with no open fires in Kalihi Street neighborhood



Homes along fuelbreak with non-combustible wall in Kalihi Street neighborhood



Homes with non-combustible roofs and green front lawns in Kalihi Street neighborhood



Example of homes along WUI with grasses on steep slopes



Turnaround area at the end of Kalihi Street



Small fuelbreak next to home at the end of Kalihi Street



Commonly found in area: mix of ‘uhaloa, dry grass and ‘ekoa



Wildland area alongside bougainvillea shrubs and sidewalk on Kalihi Street



View of WUI from Kalihi Street



Christmas trees left on curb in end of February



Wildland-Urban Interface Communities in the West O'ahu CWPP planning area.  
Photo assessment of community resources at risk, hazards, and examples of existing protective features and actions.

Makakilo (cont.)



Makakilo Fire Station



Steep 'ekoa and kiawe forest below Makakilo Fire Station



View of Kapolei-Ewa



Tall eucalyptus trees and norfolk pines at top of Makakilo Drive



Wildland area across from condos at top of Makakilo Drive



Tall dry grass and bougainvillea along sidewalk on top of Makakilo Drive



Turnaround area in Pueonani neighborhood – homes next to fuelbreak



Pu'u with kiawe forest behind homes in Pueonani neighborhood



Layers of WUI in Makakilo



Fuelbreak on steep slope under homes in Pueonani neighborhood



Turnaround area in Pueonani neighborhood



Example of fuels on steep slope right below homes

Wildland-Urban Interface Communities in the West O'ahu CWPP planning area.  
Photo assessment of community resources at risk, hazards, and examples of existing protective features and actions.

Makakilo (cont.)



Pōhinahina on berm



Mixed fuels near home with good defensible space



Workers weedwhacking grasses on berm next to homes



Hookomo neighborhood WUI



Example of xeriscaping



Tiled roofs in Hookomo neighborhood



Makakilo Community Center and Park



Irrigated berm behind homes near Makakilo Community Park



Mauka Lani Elementary School



Homes near Makakilo Schools – high density



Dry unmanaged grasses on sidewalk near Makakilo Schools



Makakilo Elementary School

Wildland-Urban Interface Communities in the West O'ahu CWPP planning area.  
Photo assessment of community resources at risk, hazards, and examples of existing protective features and actions.

Palehua



Fuels along roadside to Camp Timberline



Homes along gulch near Camp Timberline



Gulch with tall grasses and eucalyptus on road to Camp Timberline



Grazed area on road to Camp Timberline



Example of heavy erosion



Grazing using cattle near homes



Example of heavy erosion near Camp Timberline



Homes along Makakilo Fire 2014 – grasses returned within a few months



Post-fire 2014



Makakilo Fire 2014 wildland



Makakilo Fire 2014 – burned to edge of homes



Makakilo Fire 2014 – burned to edge of homes

Wildland-Urban Interface Communities in the West O‘ahu CWPP planning area.  
Photo assessment of community resources at risk, hazards, and examples of existing protective features and actions.

Palehua (cont.)



Palailai Neighborhood Park



Homes along interface on Waiko Place



Xeriscaping in fire-free zone



Palahia Street (north end) turnaround



Examples of non-combustible tile roofs



Example of good defensible space with clumps of shrubs



High home density on Eleele Street



View of Barber's Point



Vegetated fuelbreak on slope in Eleele Street neighborhood



Condos with wildland below



Gulch on Palaia Street

Wildland-Urban Interface Communities in the West O‘ahu CWPP planning area.  
Photo assessment of community resources at risk, hazards, and examples of existing protective features and actions.

Aerial Photos



Aerial view of Kapolei/Ewa



Aerial view of Kapolei/Makakilo



Aerial view of Barber’s Point with large swell



Aerial view of Nānākuli



Aerial view of Nānākuli Valley

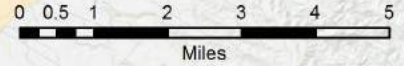
Western O'ahu Community Wildfire Protection Plan  
 APPENDIX C  
 Wildfire Hazard Assessment Maps for Western O'ahu

Hazard Category (Maps provided in CWPP main document)	Individual Hazard Maps (Maps provided below in the following order)
Subdivision Hazard Total	<ul style="list-style-type: none"> <li>• Fire Service Access</li> <li>• Home Setbacks</li> <li>• Ingress/Egress</li> <li>• Private Landowner Firewise Landscaping &amp; Defensible Space</li> <li>• Proximity of Subdivision to Wildland Areas</li> <li>• All Season Road Condition</li> <li>• Road Maintenance</li> <li>• Road Width</li> <li>• Street Signs</li> <li>• Structure Density</li> <li>• Unmanaged, Untended, Undeveloped Lands</li> </ul>
Vegetation Hazard Total	<ul style="list-style-type: none"> <li>• Defensible Space: Fuels Reduction Around Homes &amp; Structures</li> <li>• Fuel Loading</li> <li>• Fuel Structure &amp; Arrangement</li> <li>• Proximity of Flammable Fuels Around Subdivision</li> <li>• Vegetation Within 300' Of Homes</li> </ul>
Building Hazard Total	<ul style="list-style-type: none"> <li>• Siding/Soffits</li> <li>• Roofing Assembly</li> <li>• Structural Ignitability</li> <li>• Under Skirting Around Decks, Lanais, Post &amp; Pier Structures</li> <li>• Utilities Placement; Gas &amp; Electric</li> </ul>
Fire Environment Hazard Total	<ul style="list-style-type: none"> <li>• Average Rainfall</li> <li>• Prevailing Wind Speeds &amp; Direction</li> <li>• Slope</li> <li>• Topographic Features That Adversely Affect Wildland Fire Behavior</li> <li>• Seasonal or Periodic High Hazard Conditions</li> <li>• Ignition Risk</li> </ul>
Fire Protection Hazard Total  (high capacity and capability= low hazard)	<ul style="list-style-type: none"> <li>• Response Time</li> <li>• Community Planning Practices &amp; Ordinances</li> <li>• Community Fire Safe Efforts &amp; Programs Already In Place</li> <li>• Fire Department Structural Training &amp; Expertise</li> <li>• Local Emergency Operations Group or Citizen Group</li> <li>• Proximity to Fire Stations</li> <li>• Water Source Availability</li> <li>• Wildland Firefighting Capacity of Initial Response Agency</li> <li>• Interagency Cooperation</li> </ul>

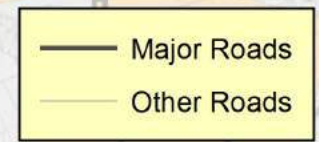
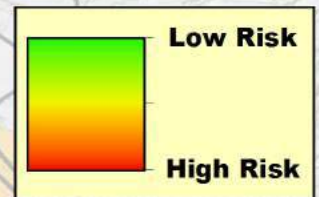
## SUBDIVISION HAZARD FOR DEVELOPED AREAS

# Fire Service Access Hazard for Developed Areas

## Western O'ahu Community Wildfire Protection Plan



FIRE SERVICE ACCESS		
<b>LOW HAZARD</b>	<b>MODERATE HAZARD</b>	<b>HIGH HAZARD</b>
Adequate turnaround space is available for large fire equipment.	<300' with no turnaround. Short or dead-end streets will become crowded with homeowner's vehicles.	300'+ with no turnaround. Long dead-end streets will become crowded with vehicles. Two-way visibility is an issue.



Makua  
Keaau

Makaha

Waianae

Mali

Nanakuli

Honokai Hale/  
Ko'olina

Palehua

Makakilo

Honouliuli

Kapolei

Barber's Point

Ewa



Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.

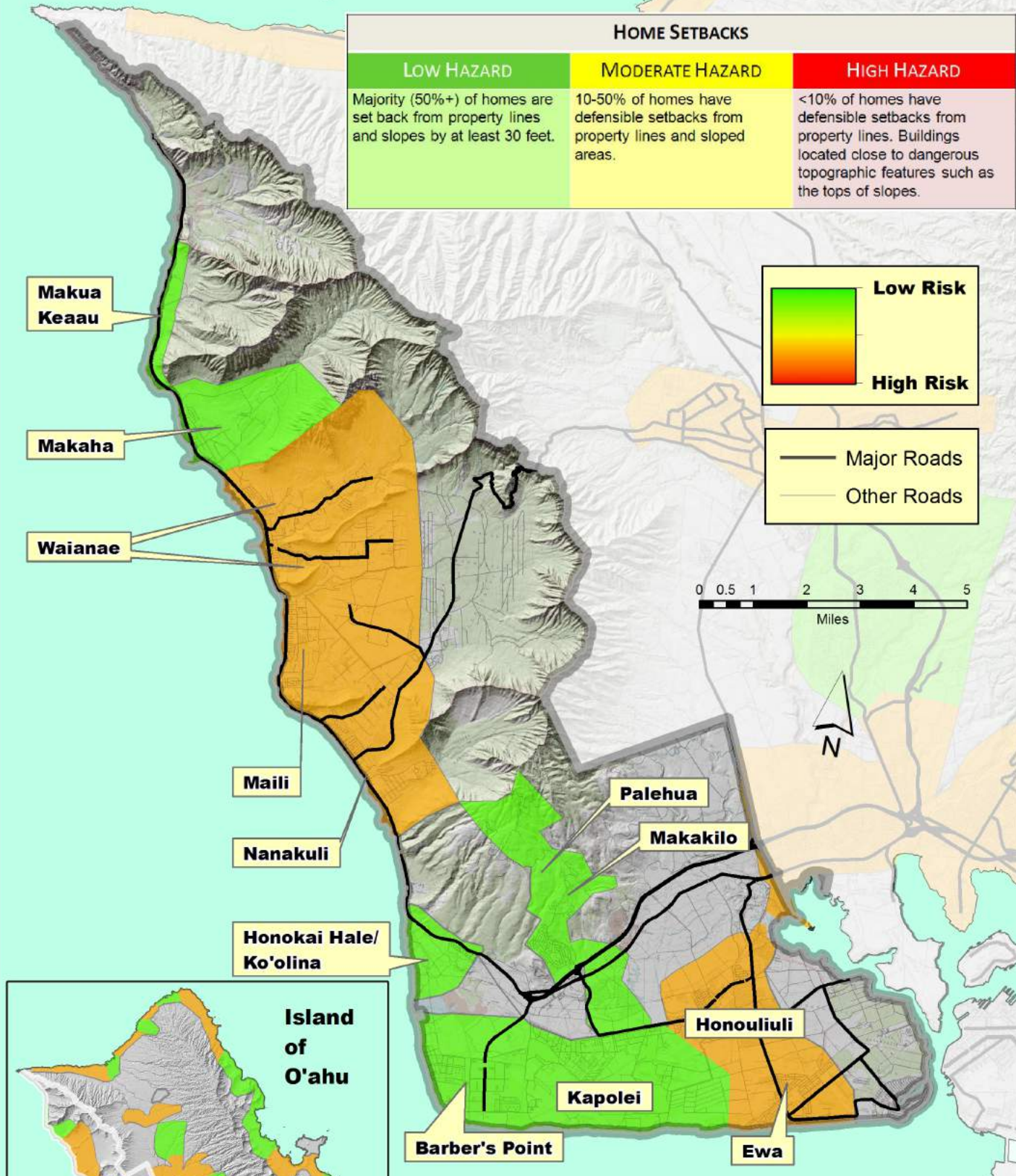
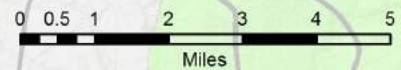
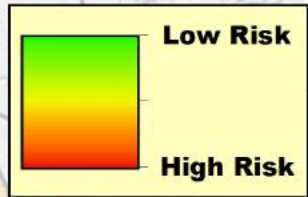




# Home Setbacks Hazard for Developed Areas

Western O'ahu Community Wildfire Protection Plan

HOME SETBACKS		
LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
Majority (50%+) of homes are set back from property lines and slopes by at least 30 feet.	10-50% of homes have defensible setbacks from property lines and sloped areas.	<10% of homes have defensible setbacks from property lines. Buildings located close to dangerous topographic features such as the tops of slopes.



Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.

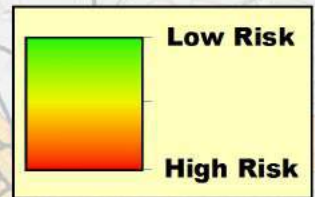


# Ingress/Egress Hazard for Developed Areas

Western O'ahu Community Wildfire Protection Plan



INGRESS / EGRESS		
LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
Multiple entrances and exits are well equipped for fire trucks with turnarounds.	Limited access routes. Two ways in and two ways out. Moderate grades.	Narrow, dead end roads or one way in, One way out. Steep grades.



Makua  
Keaau

Makaha

Waianae

Mali

Nanakuli

Honokai Hale/  
Ko'olina

Palehua

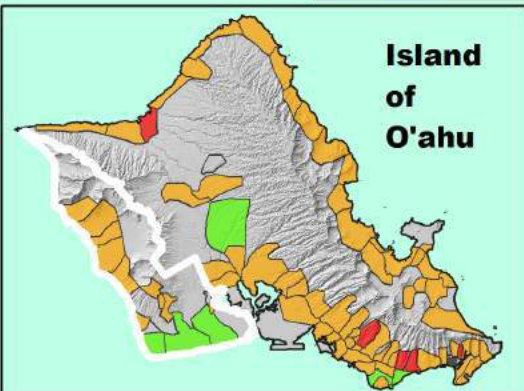
Makakilo

Honouliuli

Kapolei

Barber's Point

Ewa

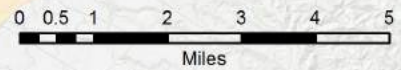


Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.

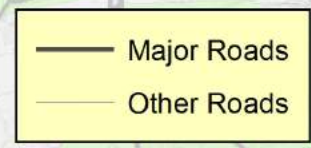
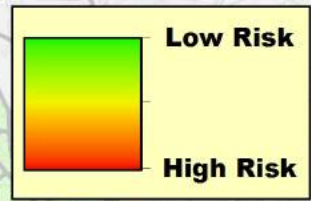


# Private Landowner Actions Hazard for Developed Areas

## Western O'ahu Community Wildfire Protection Plan



PRIVATE LANDOWNER FIREWISE LANDSCAPING/ DEFENSIBLE SPACE		
<b>LOW HAZARD</b>	<b>MODERATE HAZARD</b>	<b>HIGH HAZARD</b>
70% of homes have improved survivable space around property, reduced ignition risk, hardened homes, and no ladder fuels.	30-70% homes have improved survivable space around property and well-maintained landscapes.	<30% of homes have defensible space, hardened home features, or Firewise landscaping



**Makua  
Keaau**

**Makaha**

**Waianae**

**Mali**

**Nanakuli**

**Honokai Hale/  
Ko'olina**

**Palehua**

**Makakilo**

**Honouliuli**

**Kapolei**

**Barber's Point**

**Ewa**

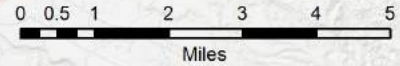


Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.

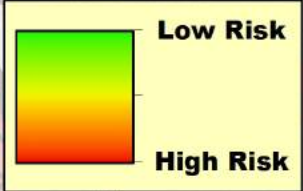


# Proximity To Wildland Areas Hazard for Developed Areas

## Western O'ahu Community Wildfire Protection Plan



PROXIMITY TO WILDLAND AREAS		
LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
Wildland areas share no borders with the subdivision. Little to no undeveloped and unmaintained vegetated areas within community. Little to no ladder fuels along community boundaries.	Wildland areas adjoin subdivision on 1-2 sides.	Wildland areas surround subdivision on at least 3 sides.



Makua  
Keaau

Makaha

Waianae

Maili

Nanakuli

Honokai Hale/  
Ko'olina

Palehua

Makakilo

Honouliuli

Kapolei

Barber's Point

Ewa

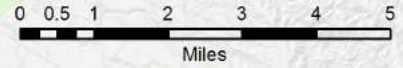


Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.

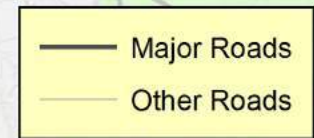
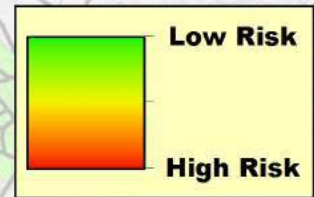


# All Season Road Condition Hazard for Developed Areas

Western O'ahu Community Wildfire Protection Plan



ALL SEASON ROAD CONDITION		
LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
Flat or gently sloping surfaced roads can support high volumes of large fire equipment.	Surfaced road with 5%+ grade or non-surfaced road with <5% grade that can still support fire equipment. Road and right-of-way maintenances is essential for access and visibility.	Narrow, steep, or non-surfaced roads are difficult to access. One-way traffic is a hazard. Overhanging brush may damage fire equipment. Jeep trails and seasonal roads limit 2wd emergency response equipment.



Makua  
Keaau

Makaha

Waianae

Mali

Nanakuli

Honokai Hale/  
Ko'olina

Palehua

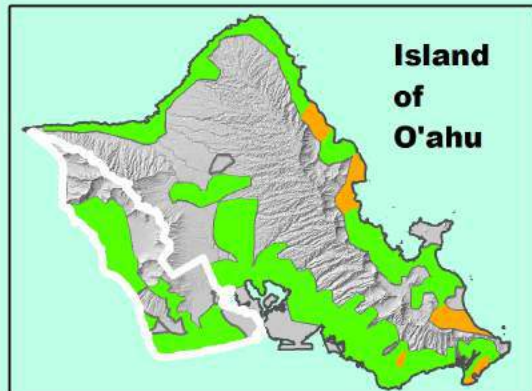
Makakilo

Honouliuli

Kapolei

Barber's Point

Ewa

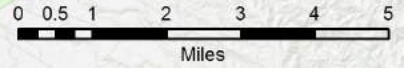


Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.

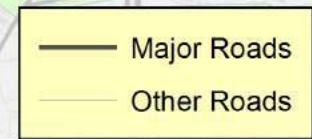
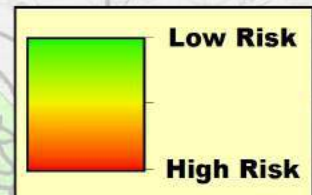


# Road Maintenance Hazard for Developed Areas

Western O'ahu Community Wildfire Protection Plan



ROAD MAINTENANCE		
LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
Wide loop roads that are maintained, paved or solid surface with shoulders.	Roads maintained. Some narrow two lane roads with no shoulders.	Narrow and or single lane, minimally maintained, no shoulders.



Makua  
Keaau

Makaha

Waianae

Mali

Nanakuli

Honokai Hale/  
Ko'olina

Palehua

Makakilo

Honouliuli

Kapolei

Barber's Point

Ewa



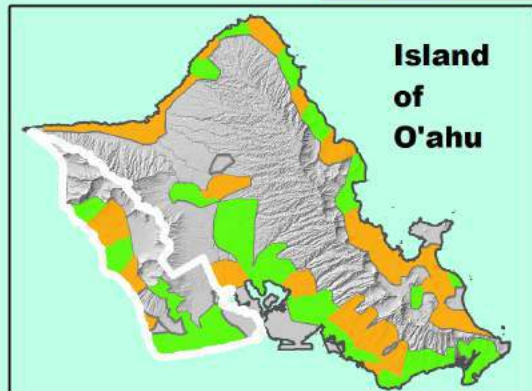
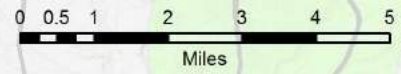
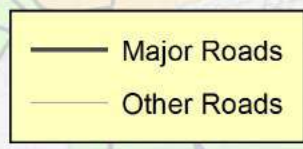
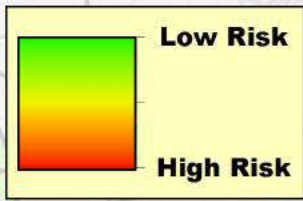
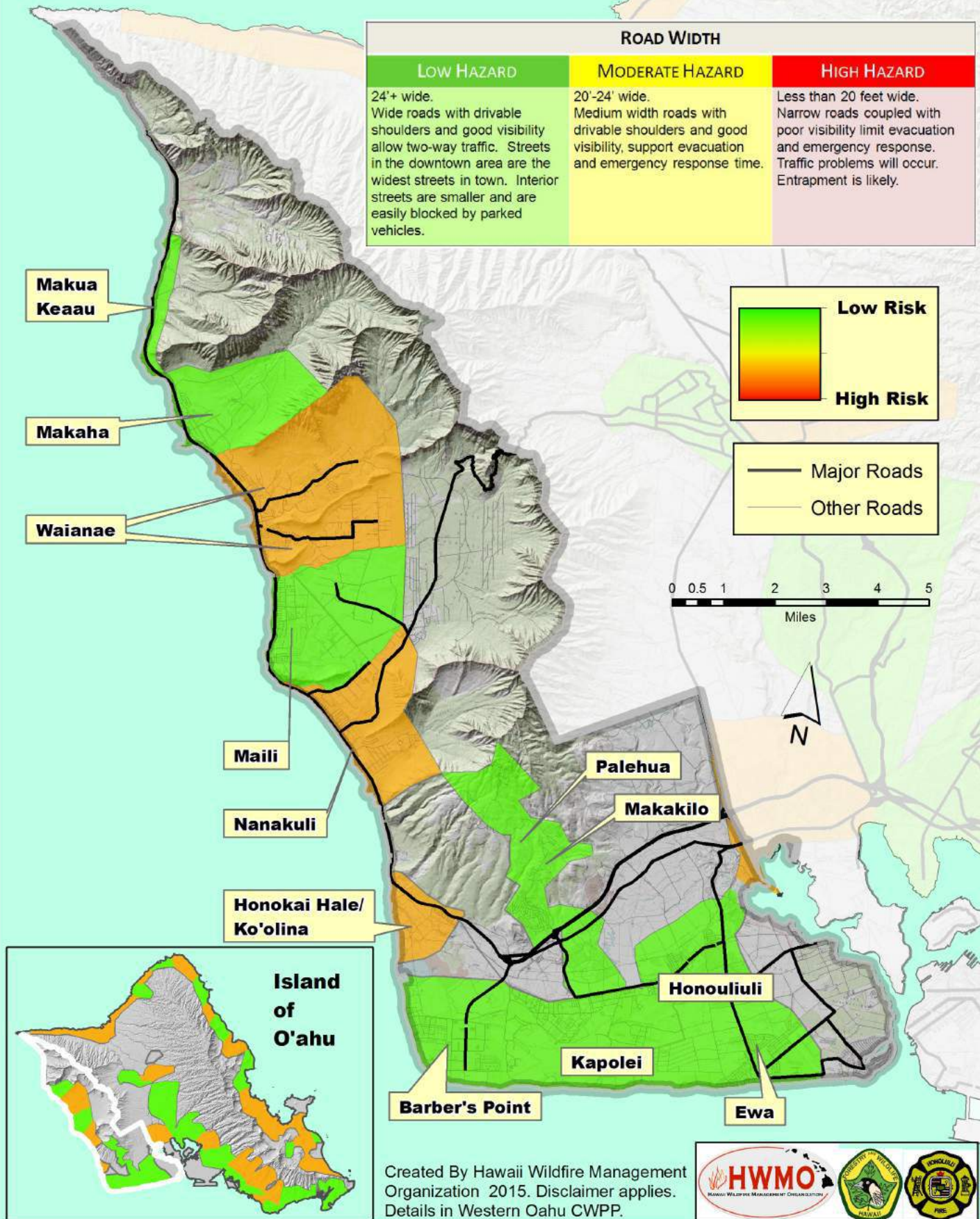
Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.



# Road Width Hazard for Developed Areas

Western O'ahu Community Wildfire Protection Plan

ROAD WIDTH		
LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
24'+ wide. Wide roads with drivable shoulders and good visibility allow two-way traffic. Streets in the downtown area are the widest streets in town. Interior streets are smaller and are easily blocked by parked vehicles.	20'-24' wide. Medium width roads with drivable shoulders and good visibility, support evacuation and emergency response time.	Less than 20 feet wide. Narrow roads coupled with poor visibility limit evacuation and emergency response. Traffic problems will occur. Entrapment is likely.

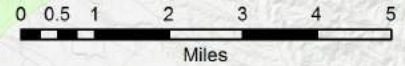


Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.

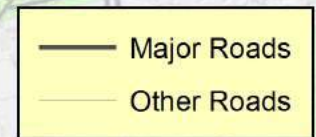
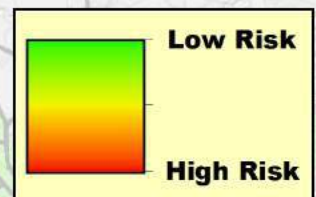


# Street Signs Hazard for Developed Areas

## Western O'ahu Community Wildfire Protection Plan



STREET SIGNS		
LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
Present. Most are at least 4' in size and are reflectorized.	Present and reflectorized with some exceptions.	Not present.



Makua  
Keaau

Makaha

Waianae

Mali

Nanakuli

Honokai Hale/  
Ko'olina

Palehua

Makakilo

Honouliuli

Kapolei

Barber's Point

Ewa



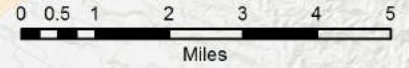
Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.



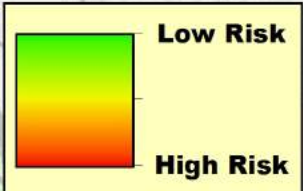


# Structure Density Hazard for Developed Areas

Western O'ahu Community Wildfire Protection Plan



STRUCTURE DENSITY		
<b>LOW HAZARD</b>	<b>MODERATE HAZARD</b>	<b>HIGH HAZARD</b>
Low structure density and low ignition probability.	Density and ignition probability are both moderate, or one is high but is balanced by the other being low.	Dense structures with high ignition probability.



Makua  
Keaau

Makaha

Waianae

Mali

Nanakuli

Honokai Hale/  
Ko'olina

Palehua

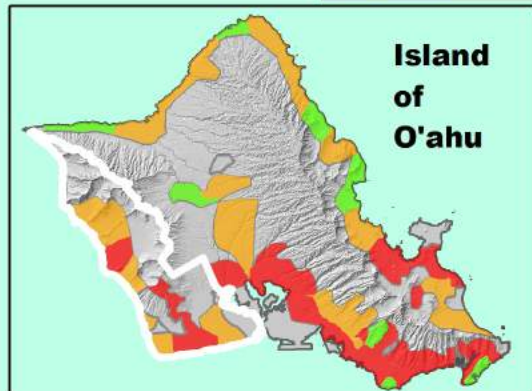
Makakilo

Honouliuli

Kapolei

Barber's Point

Ewa

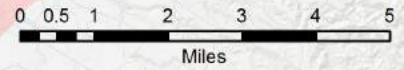


Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.

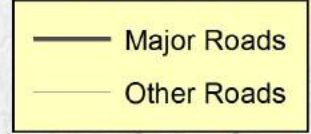
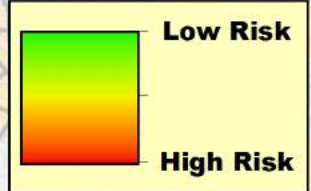


# Untended Lands Hazard for Developed Areas

Western O'ahu Community Wildfire Protection Plan



UNTENDED LANDS		
LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
Few to no weedy vacant lots. Few to no undeveloped unmaintained vegetated areas or corridors between homes. Less than 10% of lots remain undeveloped and pose an additional wildfire hazard due to lack of maintenance and/or restricted access.	Some isolated unmaintained lots or undeveloped vegetated areas within subdivision. 10-50% of lots have not been developed and pose an additional wildfire hazard due to lack of maintenance and/or restricted access. Hazard ranking is dependent on ignition risk, size of area, and fuel type.	Abundant unmaintained, vegetated corridors and vacant lots throughout community. Agricultural lands irregularly maintained leaving dry weedy species causing increased ignition risk. Numerous ladder fuels and high risk fuels. Greater than 75% of lots have not been developed or Separation of adjacent structures that can contribute to fire spread



Makua  
Keaau

Makaha

Waianae

Mali

Nanakuli

Honokai Hale/  
Ko'olina

Palehua

Makakilo

Honouliuli

Kapolei

Barber's Point

Ewa



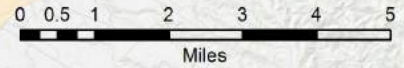
Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.



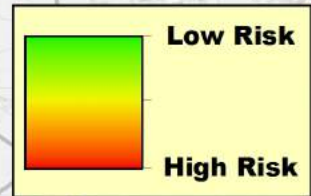
## VEGETATION HAZARD FOR DEVELOPED AREAS

# Defensible Space: Fuels Reduction Around Homes Hazard for Developed Areas

Western O'ahu Community Wildfire Protection Plan



DEFENSIBLE SPACE- FUELS REDUCTION AROUND HOMES		
<b>LOW HAZARD</b>	<b>MODERATE HAZARD</b>	<b>HIGH HAZARD</b>
Vegetation is treated 100 feet or more from structures.	31-100 ft. of vegetation treatment from structures.	Less than 30 ft. of vegetation treatment from structures.



Makua  
Keaau

Makaha

Waianae

Mali

Nanakuli

Honokai Hale/  
Ko'olina

Palehua

Makakilo

Honouliuli

Barber's Point

Kapolei

Ewa

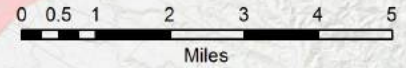


Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.

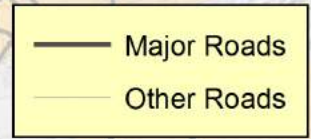
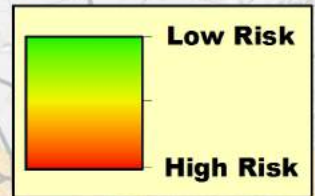


# Fuel Loading Hazard for Developed Areas

## Western O'ahu Community Wildfire Protection Plan



FUEL LOADING		
LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
0-30% vegetated cover	31-70% vegetated cover	71-100% vegetated cover



Makua  
Keaau

Makaha

Waianae

Mali

Nanakuli

Honokai Hale/  
Ko'olina

Palehua

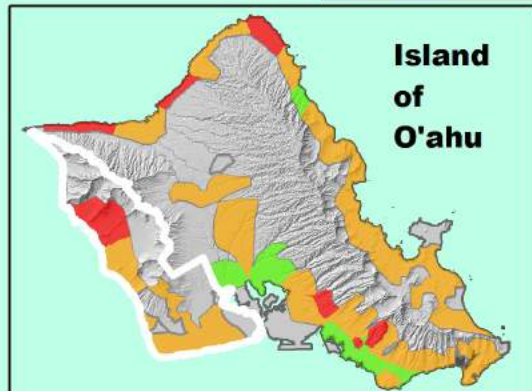
Makakilo

Honouliuli

Kapolei

Barber's Point

Ewa



Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.

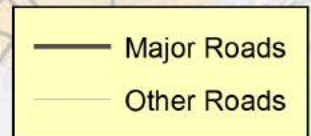
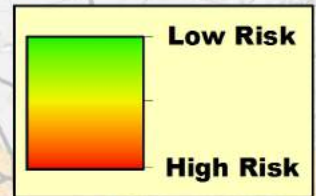


# Fuel Structure and Arrangement Hazard for Developed Areas

Western O'ahu Community Wildfire Protection Plan



FUEL STRUCTURE AND ARRANGEMENT		
LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
Non-contiguous or patchwork arrangement. Little to no ladder fuels.	Some areas of contiguous vegetation. Few ladder fuels.	Uninterrupted vegetation, pervasive ladder fuels.



Makua  
Keaau

Makaha

Waianae

Maili

Nanakuli

Honokai Hale/  
Ko'olina

Palehua

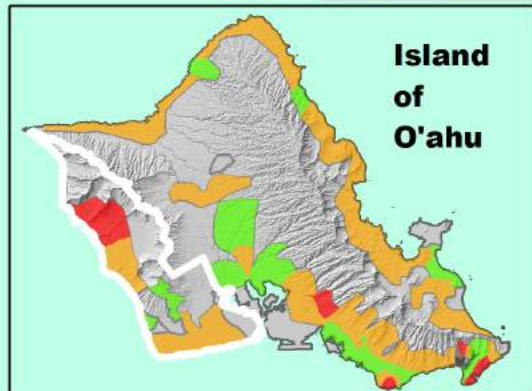
Makakilo

Honouliuli

Kapolei

Barber's Point

Ewa

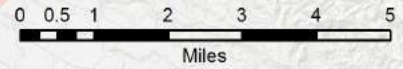


Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.

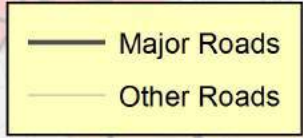
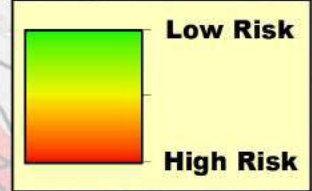


# Proximity of Flammable Fuels Around Subdivision Hazard for Developed Areas

Western O'ahu Community Wildfire Protection Plan



PROXIMITY OF FLAMMABLE FUELS AROUND SUBDIVISION		
LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
Greater than 100'	40-100'	Less than 40'



Makua  
Keaau

Makaha

Waianae

Mali

Nanakuli

Honokai Hale/  
Ko'olina

Palehua

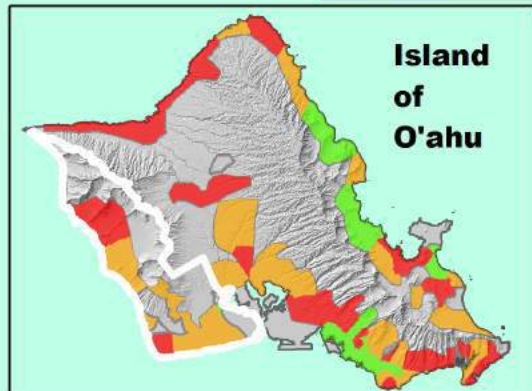
Makakilo

Honouliuli

Kapolei

Barber's Point

Ewa

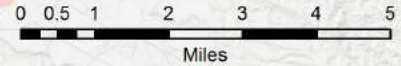


Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.

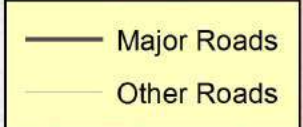
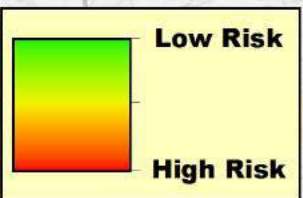


# Vegetation Type Hazard for Developed Areas

## Western O'ahu Community Wildfire Protection Plan



VEGETATION TYPE WITHIN 300' OF HOMES		
LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
Grasses less than 6 inches in height. Light leaf litter.	Grasses 6–12 inches in height. Light brush and small trees. Patchy fuels.	Dense grass, brush, timber, and/or hardwoods. Moderate to heavy dead and downed vegetation. Fuels greater than 12 feet tall. Heavy vegetation.



Makua  
Keaau

Makaha

Waianae

Mali

Nanakuli

Honokai Hale/  
Ko'olina

Palehua

Makakilo

Honouliuli

Kapolei

Barber's Point

Ewa



Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.



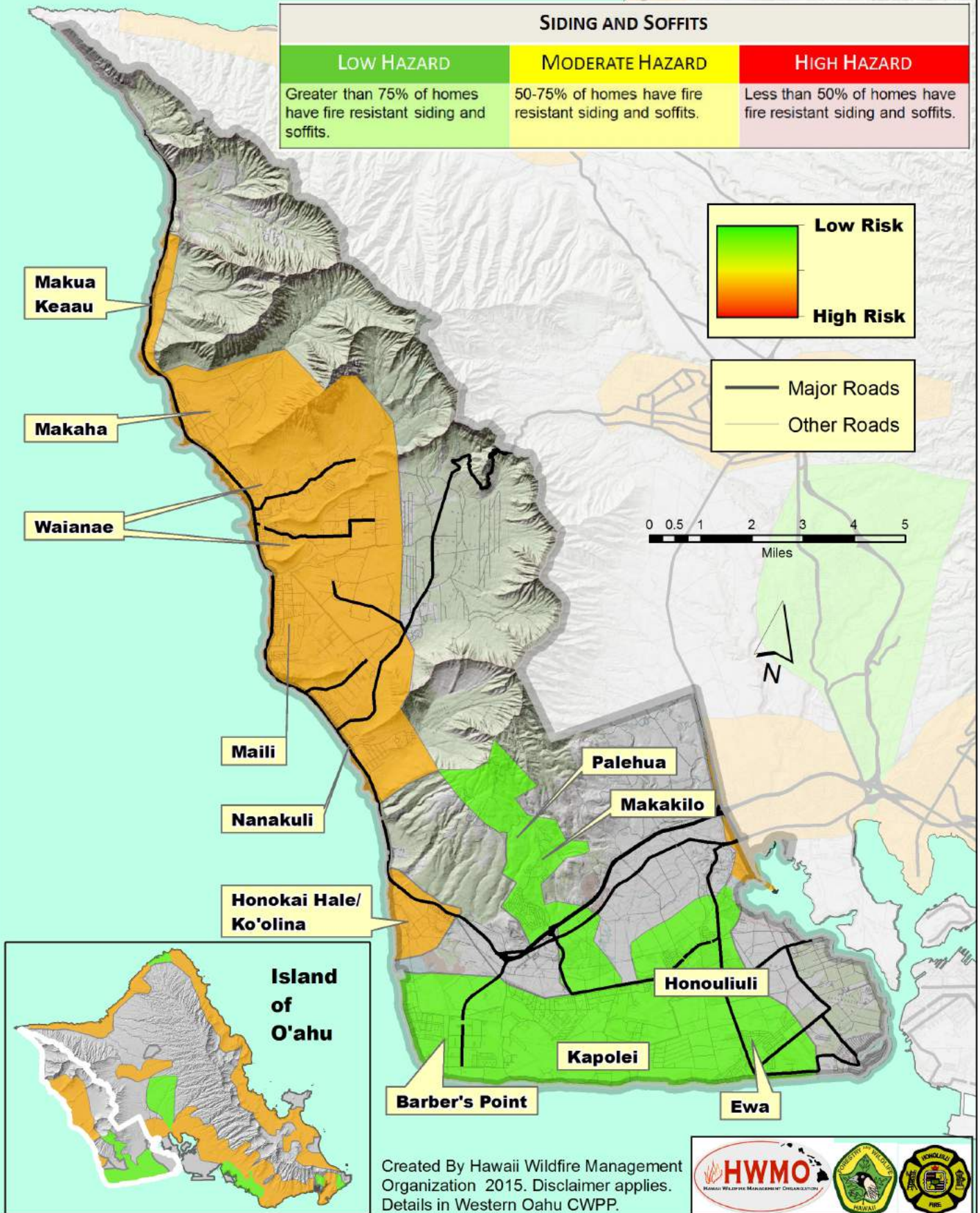
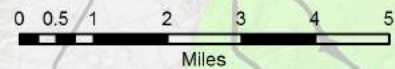
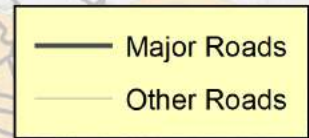
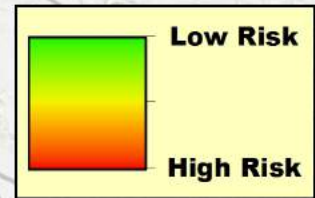


## BUILDING HAZARD FOR DEVELOPED AREAS

# Siding And Soffits Hazard for Developed Areas

Western O'ahu Community Wildfire Protection Plan

SIDING AND SOFFITS		
<b>LOW HAZARD</b>	<b>MODERATE HAZARD</b>	<b>HIGH HAZARD</b>
Greater than 75% of homes have fire resistant siding and soffits.	50-75% of homes have fire resistant siding and soffits.	Less than 50% of homes have fire resistant siding and soffits.

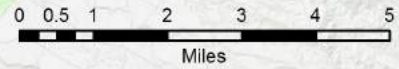


Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.

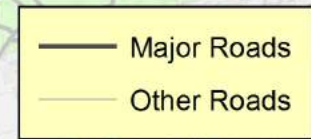
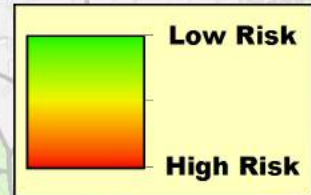


# Roof Assembly Hazard for Developed Areas

## Western O'ahu Community Wildfire Protection Plan



ROOFING ASSEMBLY		
<b>LOW HAZARD</b>	<b>MODERATE HAZARD</b>	<b>HIGH HAZARD</b>
Greater than 75% of homes have Class A roofs (metal, asphalt, or fiberglass roofing material).	50-75% have Class A roofing.	Less than 50% of homes have Class A roofing.



**Makua  
Keaau**

**Makaha**

**Waianae**

**Mali**

**Nanakuli**

**Honokai Hale/  
Ko'olina**

**Palehua**

**Makakilo**

**Honouliuli**

**Kapolei**

**Barber's Point**

**Ewa**



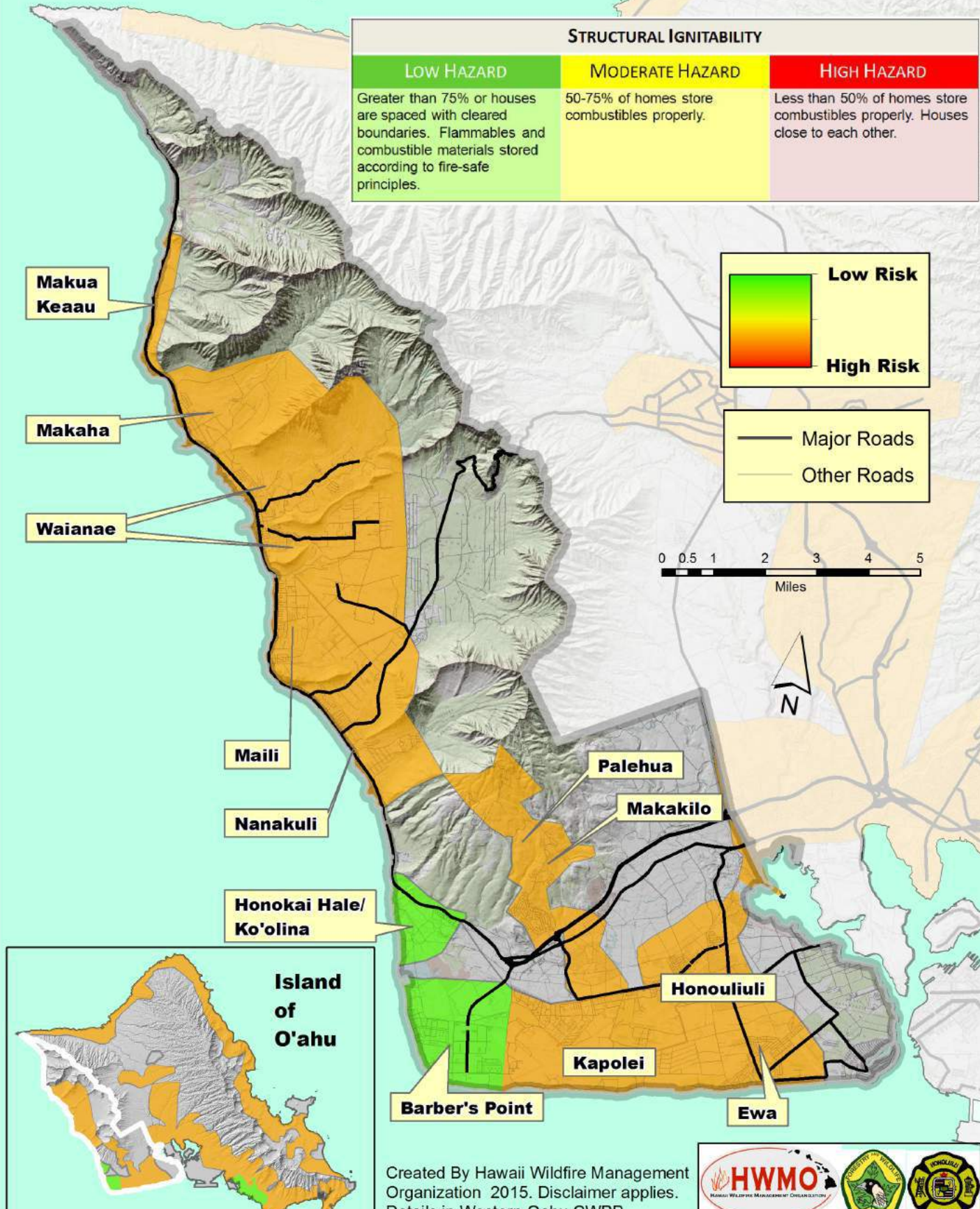
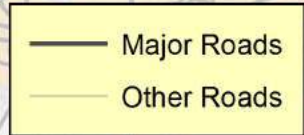
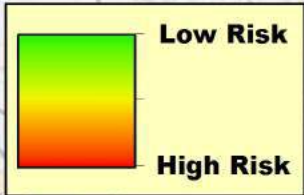
Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.



# Structural Ignitability Hazard for Developed Areas

Western O'ahu Community Wildfire Protection Plan

STRUCTURAL IGNITABILITY		
Low HAZARD	MODERATE HAZARD	HIGH HAZARD
Greater than 75% of houses are spaced with cleared boundaries. Flammables and combustible materials stored according to fire-safe principles.	50-75% of homes store combustibles properly.	Less than 50% of homes store combustibles properly. Houses close to each other.

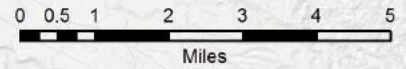


Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.

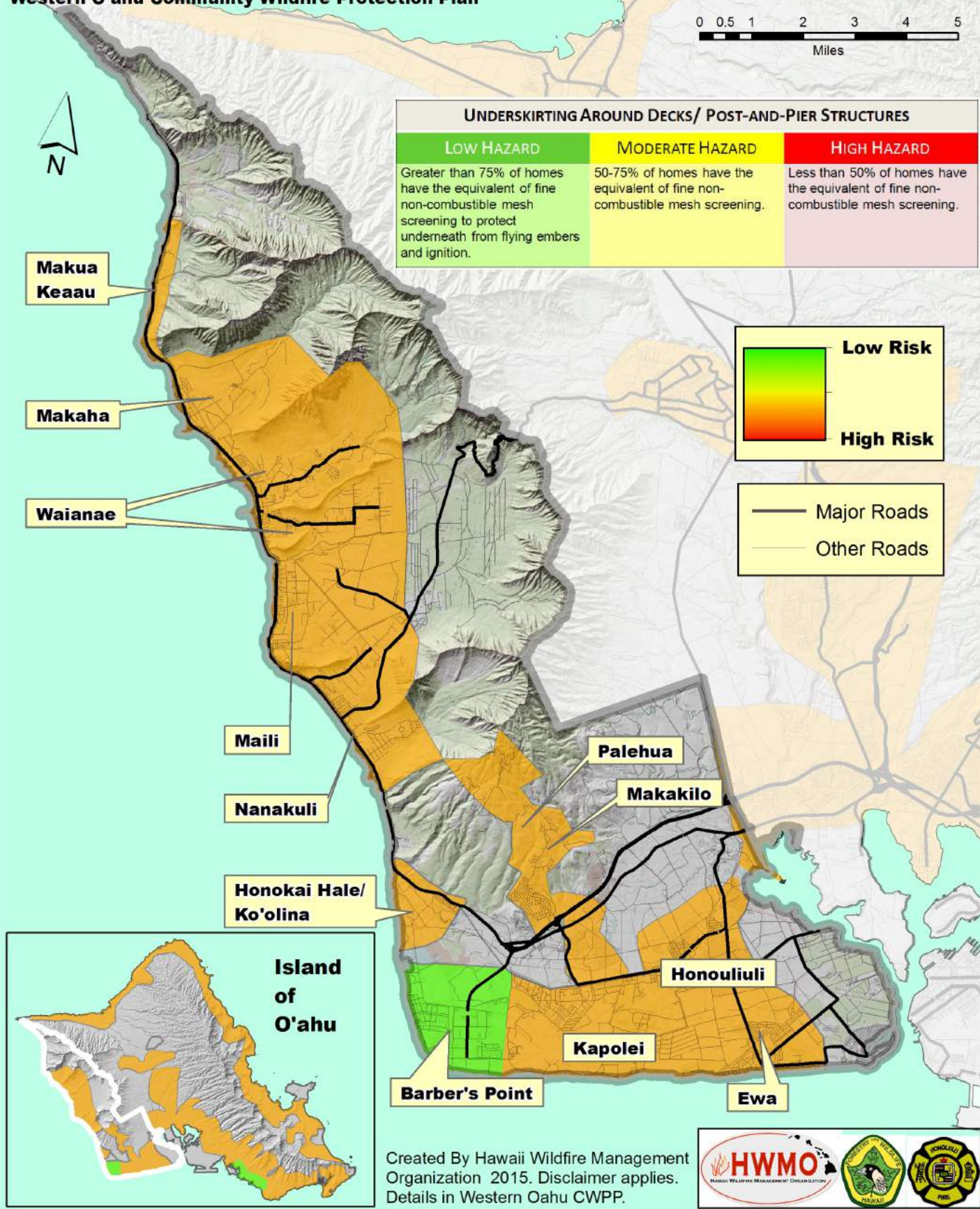
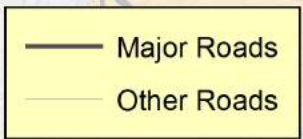
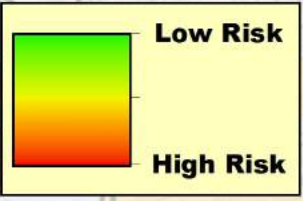


# Underskirting Around Decks: Post & Pier Structures Hazard for Developed Areas

Western O'ahu Community Wildfire Protection Plan



UNDERSKIRTING AROUND DECKS/ POST-AND-PIER STRUCTURES		
LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
Greater than 75% of homes have the equivalent of fine non-combustible mesh screening to protect underneath from flying embers and ignition.	50-75% of homes have the equivalent of fine non-combustible mesh screening.	Less than 50% of homes have the equivalent of fine non-combustible mesh screening.

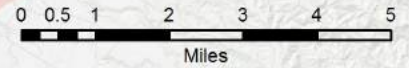


Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.

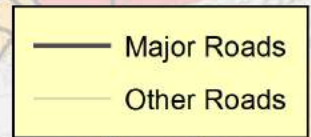
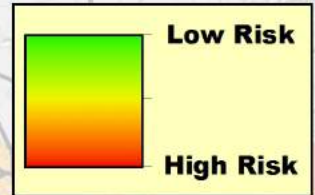


# Utilities Placement: Gas & Electric Hazard for Developed Areas

Western O'ahu Community Wildfire Protection Plan



UTILITIES PLACEMENT- GAS AND ELECTRIC		
LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
All underground or none.	One underground, one above ground.	Both above ground.



Makua  
Keaau

Makaha

Waianae

Mali

Nanakuli

Honokai Hale/  
Ko'olina

Palehua

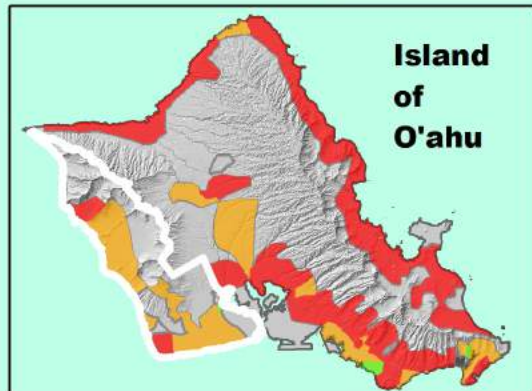
Makakilo

Honouliuli

Kapolei

Barber's Point

Ewa



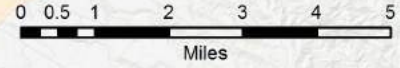
Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.



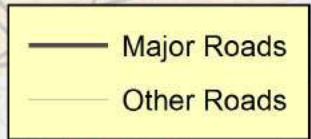
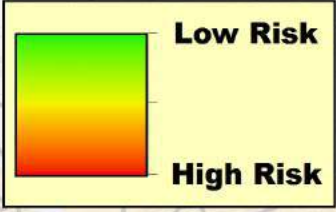
## FIRE ENVIRONMENT HAZARD FOR DEVELOPED AREAS

# Average Rainfall Hazard for Developed Areas

## Western O'ahu Community Wildfire Protection Plan



AVERAGE RAINFALL		
LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
High Precipitation	Moderate Precipitation	Low Precipitation



Makua  
Keaau

Makaha

Waianae

Maui

Nanakuli

Honokai Hale/  
Ko'olina

Palehua

Makakilo

Honouliuli

Barber's Point

Kapolei

Ewa



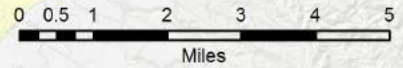
Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.



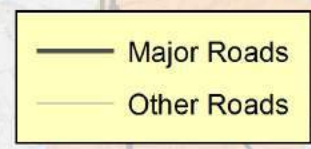
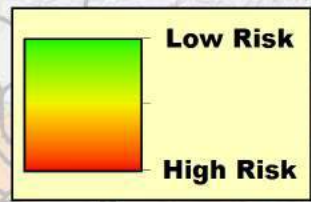


# Prevailing Wind: Speed and Direction Hazard for Developed Areas

Western O'ahu Community Wildfire Protection Plan



PREVAILING WIND SPEEDS AND DIRECTION		
LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
Wind rarely (less than 10% of time) exceeds 15 mph. Protection from predominant winds.	Wind rarely (less than 10% of time) exceeds 15 mph.	Wind frequently (50% or more of time) exceeds 15 mph or frequent exposure to predominant winds or transitional/converging wind directions.



Makua  
Keaau

Makaha

Waianae

Mali

Nanakuli

Honokai Hale/  
Ko'olina

Palehua

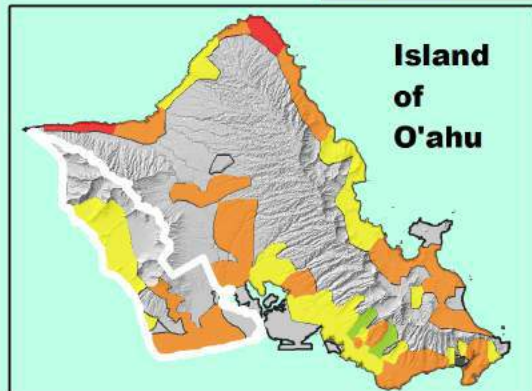
Makakilo

Honouliuli

Kapolei

Barber's Point

Ewa

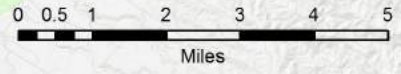


Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.

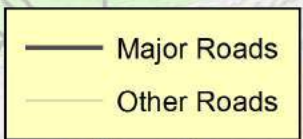
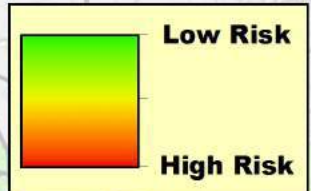


# Slope Hazard for Developed Areas

## Western O'ahu Community Wildfire Protection Plan



SLOPE		
LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
Flat to slight slope (10%)	Moderate slopes (10-30%)	Steep slopes (>30%)



Makua  
Keaau

Makaha

Waianae

Mali

Nanakuli

Honokai Hale/  
Ko'olina

Palehua

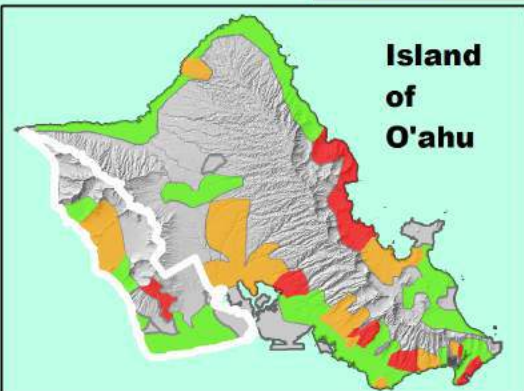
Makakilo

Honouliuli

Kapolei

Barber's Point

Ewa



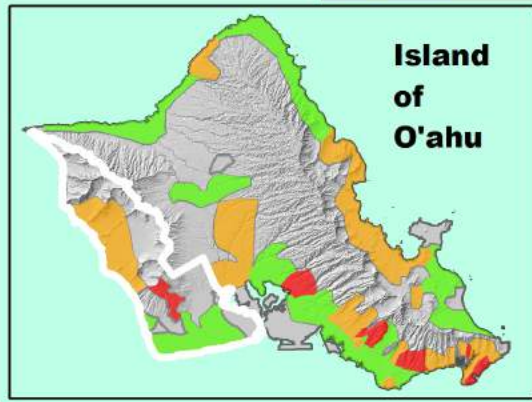
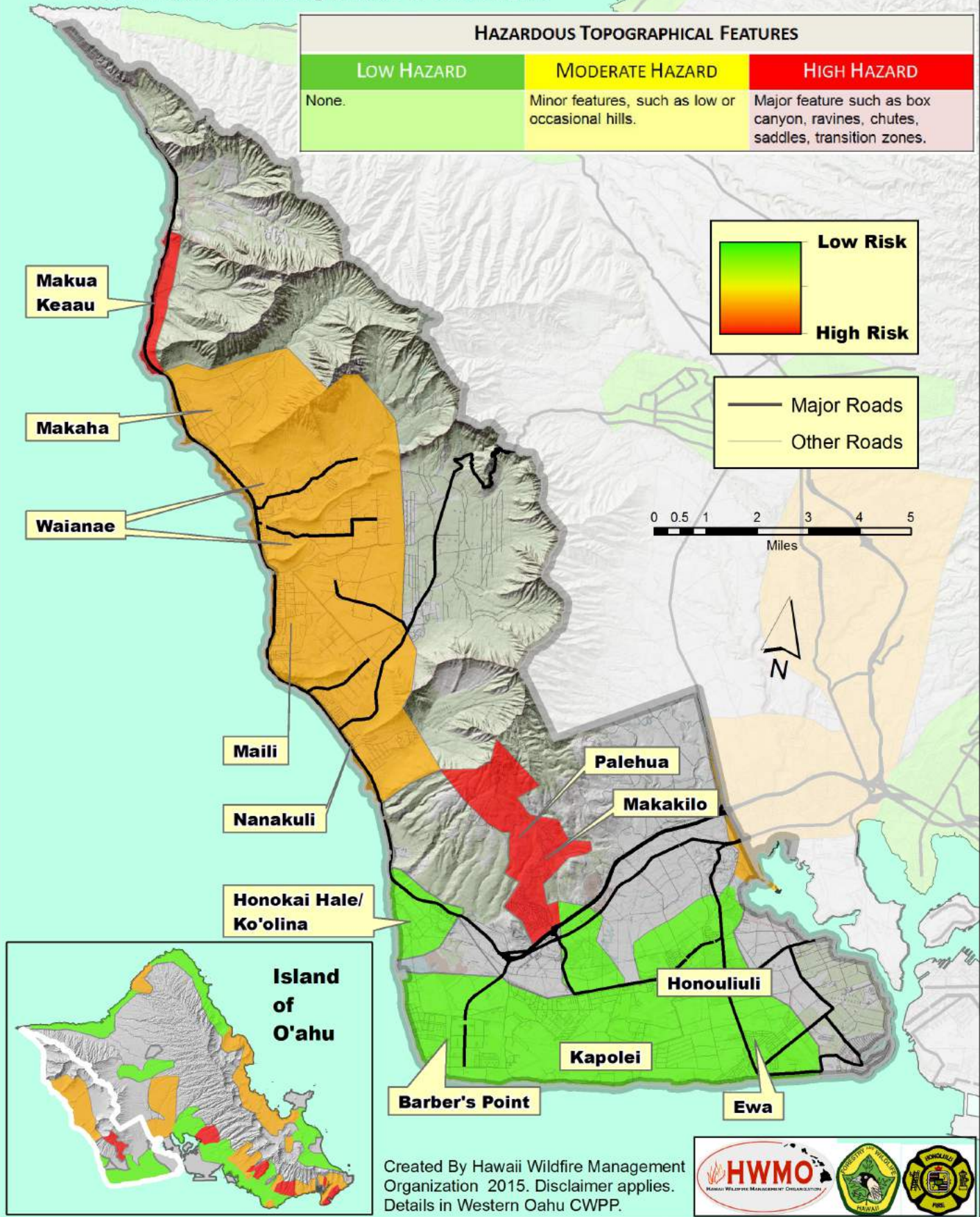
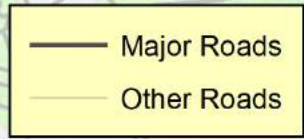
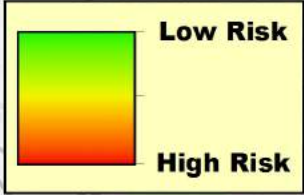
Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.



# Topographical Features Hazard for Developed Areas

Western O'ahu Community Wildfire Protection Plan

HAZARDOUS TOPOGRAPHICAL FEATURES		
LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
None.	Minor features, such as low or occasional hills.	Major feature such as box canyon, ravines, chutes, saddles, transition zones.



Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.

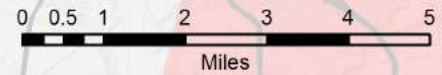
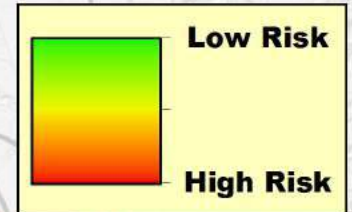


# Seasonal Or Periodic High Risk Conditions Hazard for Developed Areas

## Western O'ahu Community Wildfire Protection Plan

### SEASONAL OR PERIODIC HIGH HAZARD CONDITIONS

LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
Area has no major seasonal increase of fire hazard.	Area is occasionally (e.g., once per decade) exposed to fire prone conditions: drought, lightning storms, desiccated vegetation, and/or strong dry winds.	Area is seasonally exposed to unusually severe fire weather, drought conditions, lightning storms, desiccated vegetation, and/or strong dry winds.



**Makua Keaau**

**Makaha**

**Waianae**

**Maili**

**Nanakuli**

**Honokai Hale/  
 Ko'olina**

**Palehua**

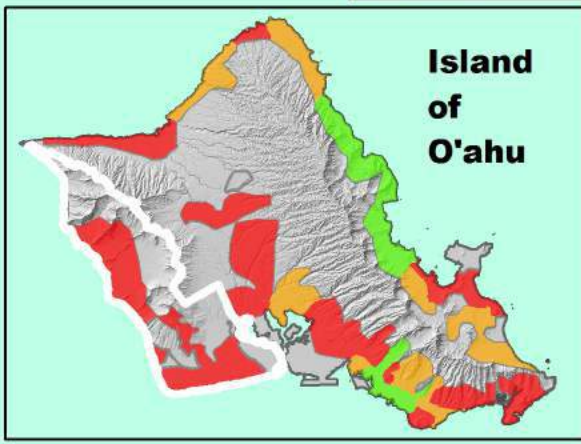
**Makakilo**

**Honouliuli**

**Kapolei**

**Barber's Point**

**Ewa**

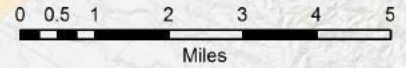


Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.

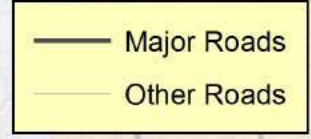
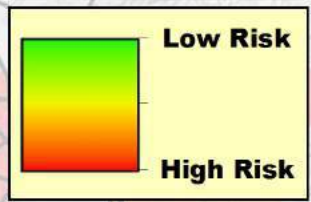


# Ignition Risk Hazard for Developed Areas

## Western O'ahu Community Wildfire Protection Plan



IGNITION RISK		
LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
Little to no natural (lightning or lava) ignition risk. No history of arson. Wildland areas absent or distant from public and/or vehicular access.	Some history of wildfire, but not particularly fire prone area due to prevailing lack of fire prone conditions, weather, and vegetation type.	Most historic wildfire events were anthropogenic with easy access to wildland areas via roads or proximity to development OR natural ignition sources such as lightning or lava are prevalent. Fire prone area. High rate of ignitions or history of large scale fires and/or severe wildfire events.



Makua  
Keaau

Makaha

Waianae

Maili

Nanakuli

Honokai Hale/  
Ko'olina

Palehua

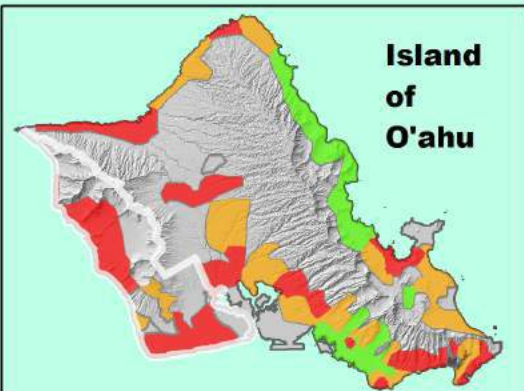
Makakilo

Honouliuli

Kapolei

Barber's Point

Ewa



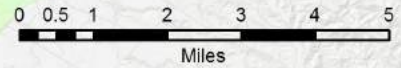
Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.



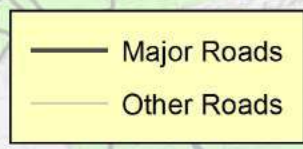
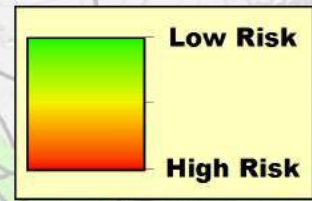
## FIRE PROTECTION HAZARD FOR DEVELOPED AREAS

# Response Time Hazard for Developed Areas

## Western O'ahu Community Wildfire Protection Plan



RESPONSE TIME		
LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
Within 15 minutes	16-30 minutes	Greater than 30 minutes



Makua  
Keaau

Makaha

Waianae

Mali

Nanakuli

Honokai Hale/  
Ko'olina

Palehua

Makakilo

Honouliuli

Kapolei

Barber's Point

Ewa



Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.



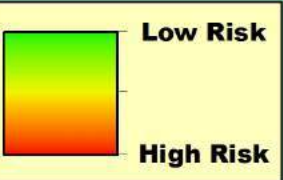
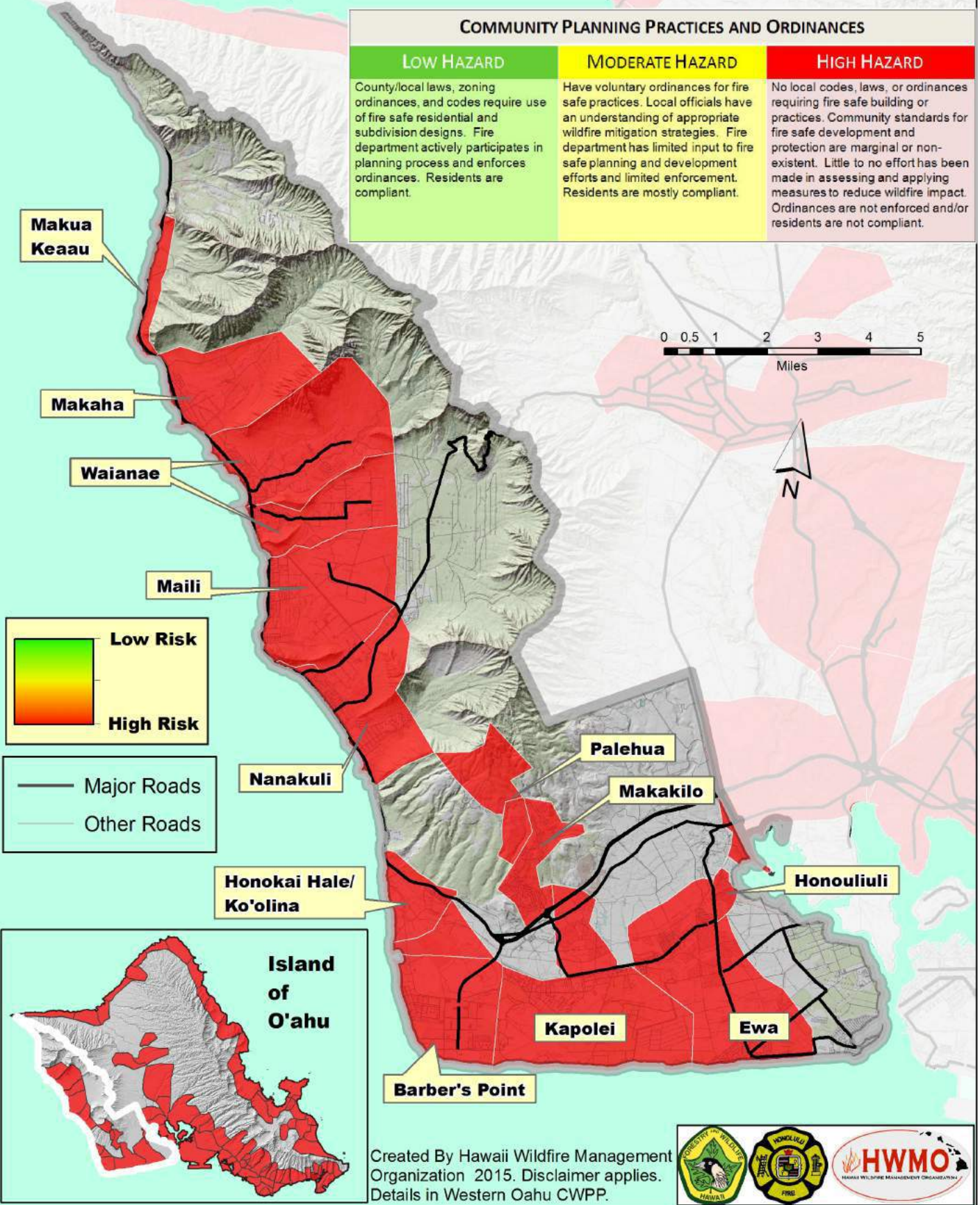
# Community Planning Practices & Ordinances

## Hazard for Developed Areas

### Western O'ahu Community Wildfire Protection Plan

#### COMMUNITY PLANNING PRACTICES AND ORDINANCES

LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
County/local laws, zoning ordinances, and codes require use of fire safe residential and subdivision designs. Fire department actively participates in planning process and enforces ordinances. Residents are compliant.	Have voluntary ordinances for fire safe practices. Local officials have an understanding of appropriate wildfire mitigation strategies. Fire department has limited input to fire safe planning and development efforts and limited enforcement. Residents are mostly compliant.	No local codes, laws, or ordinances requiring fire safe building or practices. Community standards for fire safe development and protection are marginal or non-existent. Little to no effort has been made in assessing and applying measures to reduce wildfire impact. Ordinances are not enforced and/or residents are not compliant.



Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.



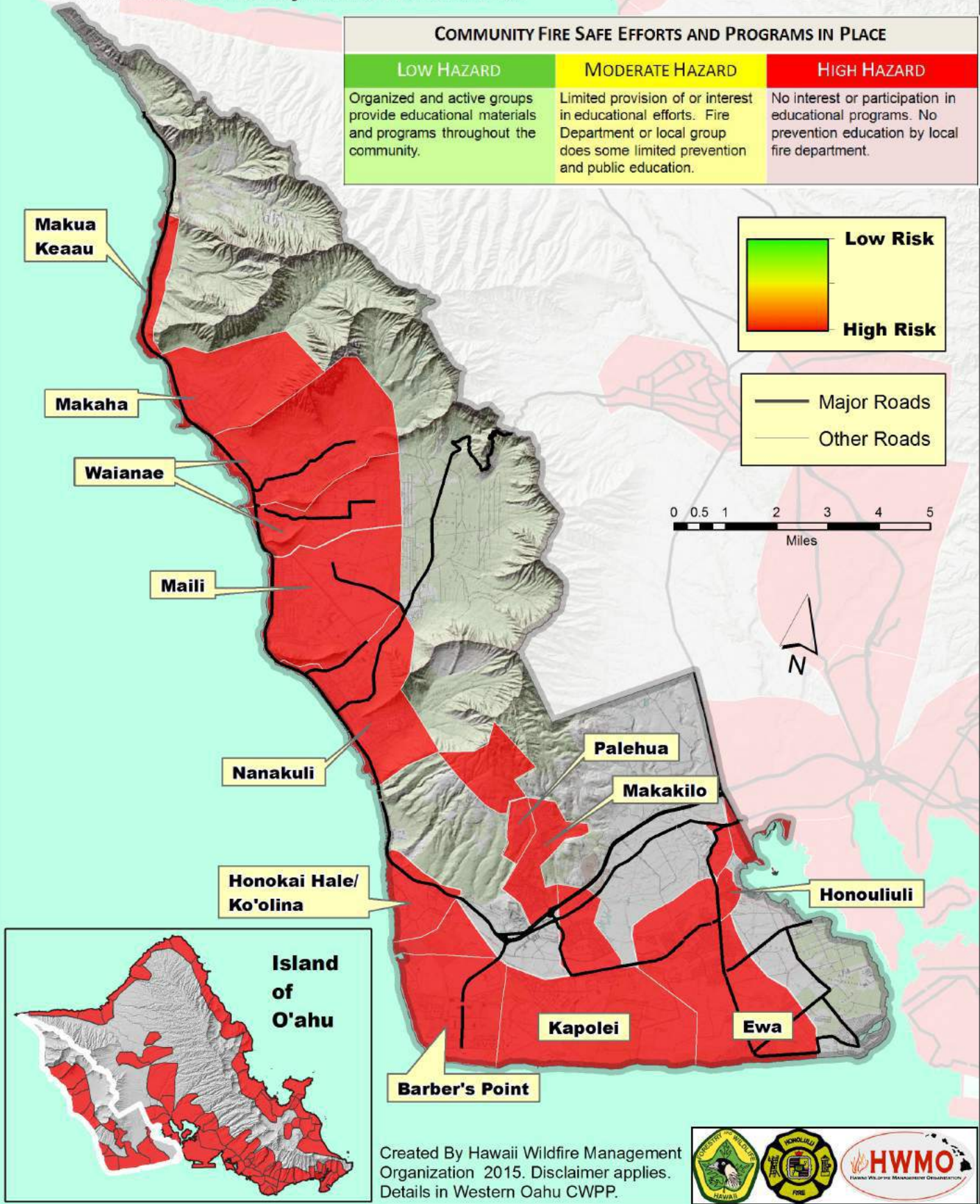


# Community Fire Safe Efforts & Programs Already In Place Hazard for Developed Areas

## Western O'ahu Community Wildfire Protection Plan

### COMMUNITY FIRE SAFE EFFORTS AND PROGRAMS IN PLACE

LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
Organized and active groups provide educational materials and programs throughout the community.	Limited provision of or interest in educational efforts. Fire Department or local group does some limited prevention and public education.	No interest or participation in educational programs. No prevention education by local fire department.

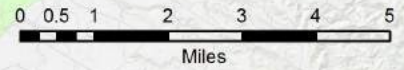


Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.

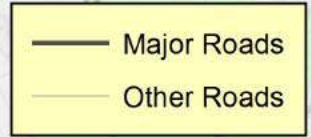
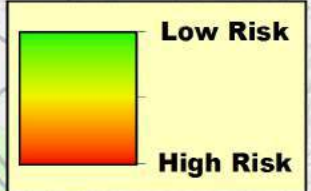


# Fire Department Structural Training & Expertise Hazard for Developed Areas

Western O'ahu Community Wildfire Protection Plan



FIRE DEPARTMENT STRUCTURAL TRAINING AND EXPERTISE		
LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
Large fully paid fire department with personnel that meet NFPA or NWCG training requirements and have adequate equipment.	Mixed fire department. Some paid and some volunteer personnel. Limited experience, training, and equipment to fight fire.	Small, all volunteer fire department. Limited training, experience, and budget with regular turnover of personnel. Do not meet NFPA or NWCG standards.



Makua  
Keaau

Makaha

Waianae

Mali

Nanakuli

Honokai Hale/  
Ko'olina

Palehua

Makakilo

Honouliuli

Kapolei

Barber's Point

Ewa



Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.



# Citizen Or Local Emergency Operations Group

## Hazard for Developed Areas

### Western O'ahu Community Wildfire Protection Plan

#### CITIZEN OR LOCAL EMERGENCY OPERATIONS GROUP

##### LOW HAZARD

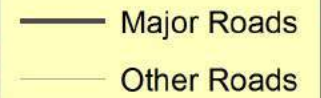
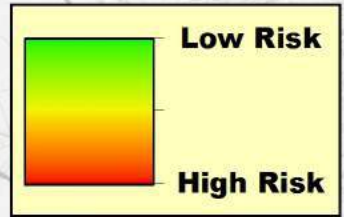
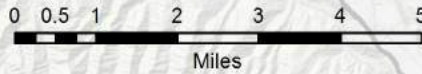
Active EOG or CERT.  
Evacuation plan in place.

##### MODERATE HAZARD

Limited participation in EOG or similar. Have some form of evacuation process.

##### HIGH HAZARD

No effective activity or strategy in place.



Makua  
Keaau

Makaha

Waianae

Mali

Nanakuli

Honokai Hale/  
Ko'olina

Palehua

Makakilo

Honouliuli

Kapolei

Ewa

Barber's Point

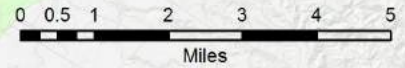
Island  
of  
O'ahu

Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.

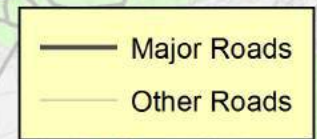
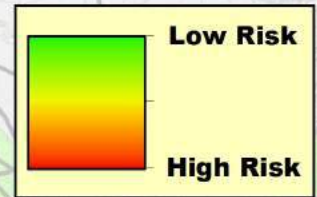


# Proximity To Fire Station Hazard for Developed Areas

Western O'ahu Community Wildfire Protection Plan



PROXIMITY TO FIRE STATION		
LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
Less than 5 miles	6-10 miles	More than 10 miles



Makua  
Keaau

Makaha

Waianae

Maili

Nanakuli

Honokai Hale/  
Ko'olina

Palehua

Makakilo

Honouliuli

Kapolei

Barber's Point

Ewa

HAFB



Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.

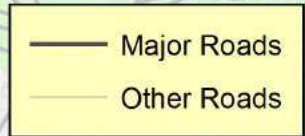
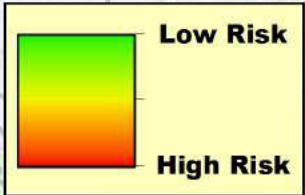
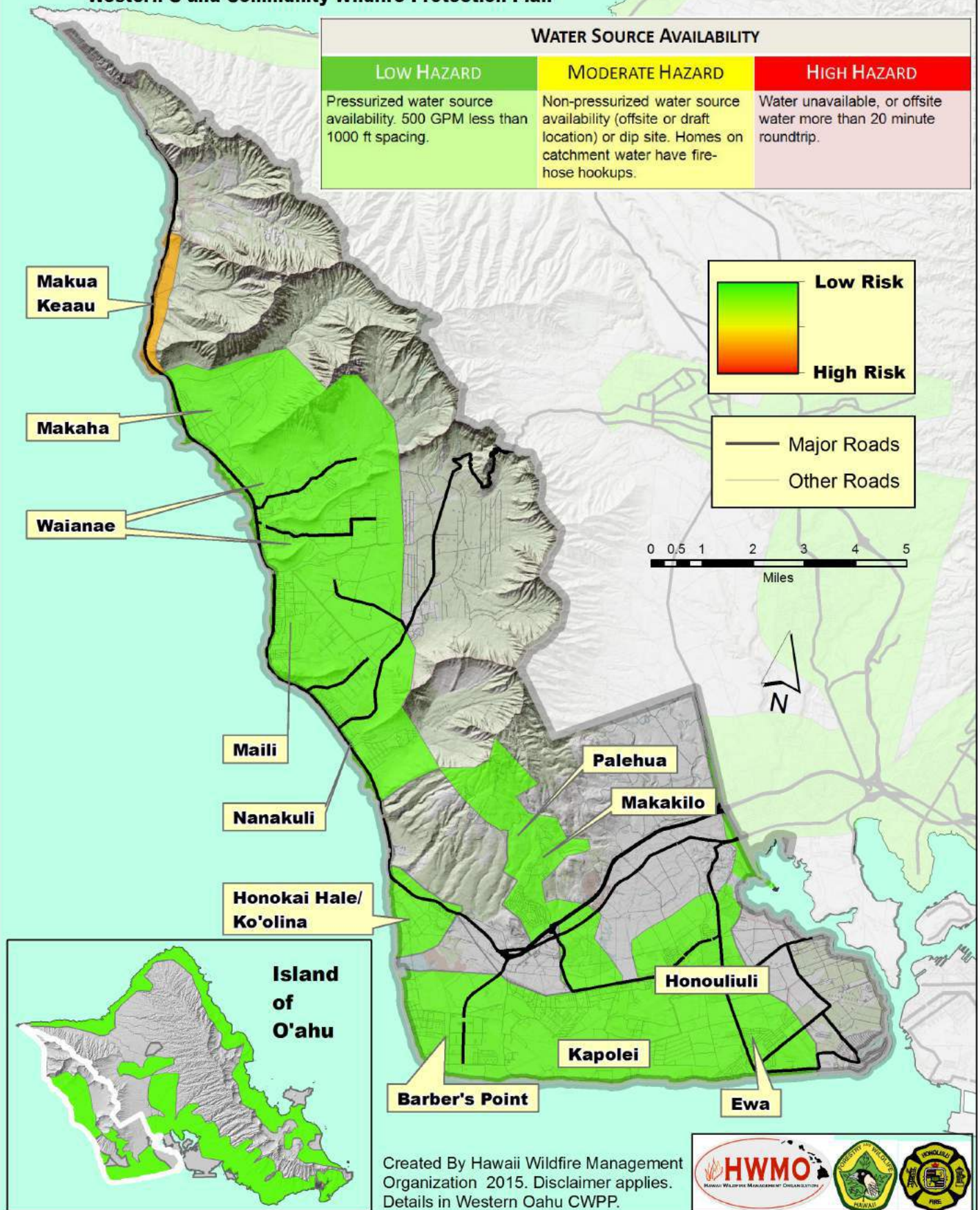


# Water Source Availability Hazard for Developed Areas

Western O'ahu Community Wildfire Protection Plan

## WATER SOURCE AVAILABILITY

LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
Pressurized water source availability. 500 GPM less than 1000 ft spacing.	Non-pressurized water source availability (offsite or draft location) or dip site. Homes on catchment water have fire-hose hookups.	Water unavailable, or offsite water more than 20 minute roundtrip.

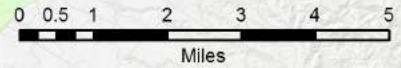


Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.

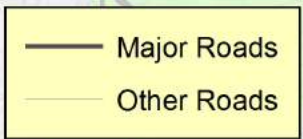
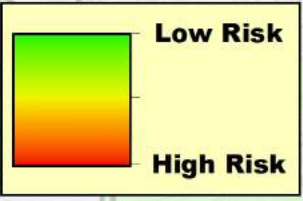


# Wildland Firefighting Capacity Of Initial Response Agency Hazard for Developed Areas

Western O'ahu Community Wildfire Protection Plan



WILDLAND FIREFIGHTING CAPACITY OF INITIAL RESPONSE AGENCY		
LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
Sufficient personnel, equipment, and wildland firefighting capability and experience. Good supply of structural and wildland fire apparatus and misc specialty equipment	Limited personnel, and or equipment but with some wildland firefighting expertise and training. Smaller supply of fire apparatus in fairly good repair with some specialty equipment.	Fire department non-existent or untrained/unequipped to fight wildland fire. Minimum amount of fire apparatus, which is old and in need of repair. None or little specialty equipment.



Makua  
Keaau

Makaha

Waianae

Mali

Nanakuli

Honokai Hale/  
Ko'olina

Palehua

Makakilo

Honouliuli

Kapolei

Barber's Point

Ewa



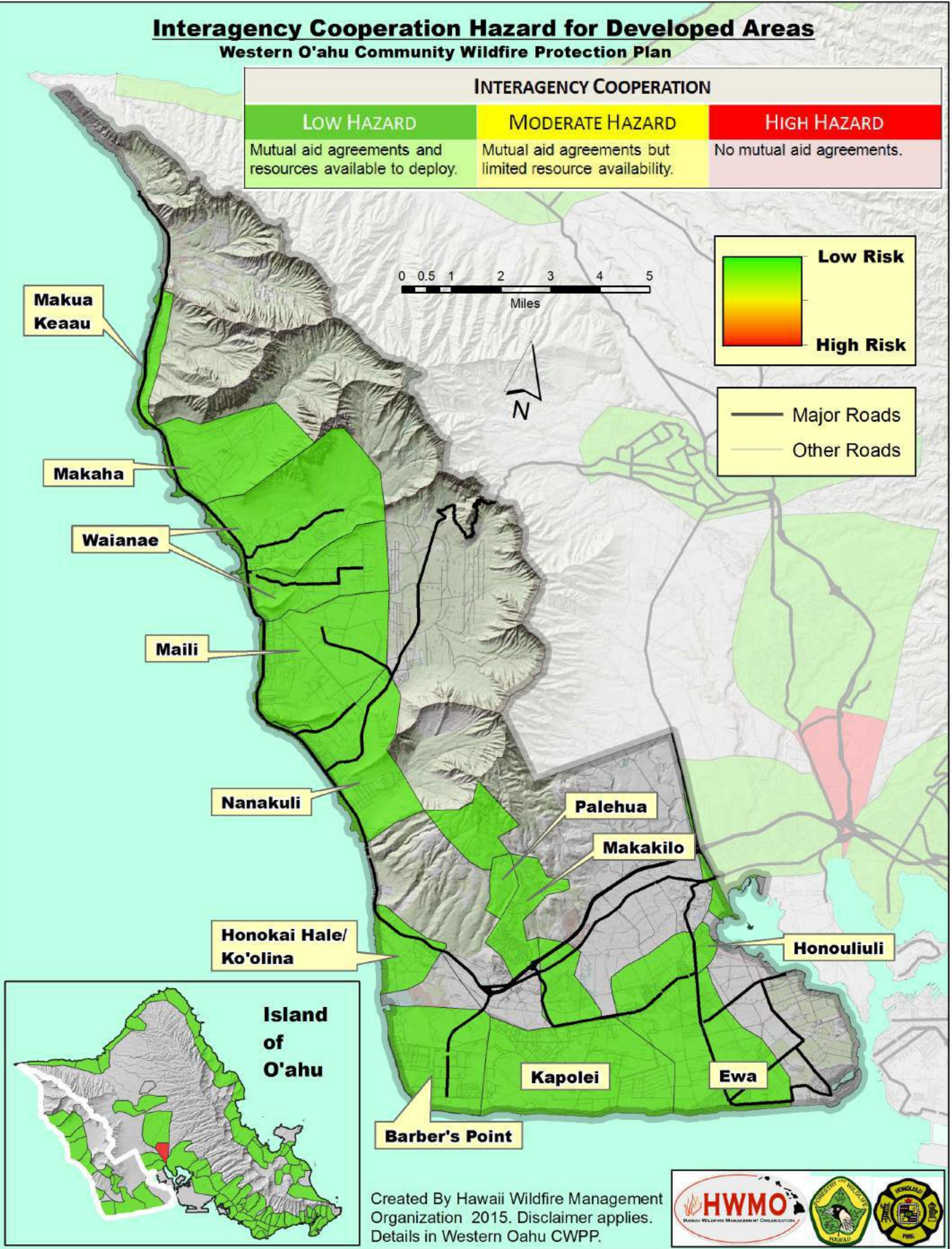
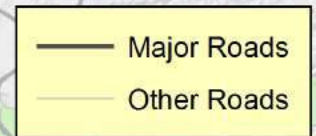
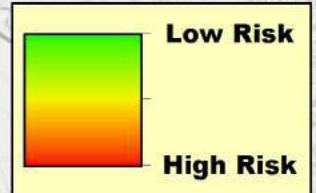
Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.



# Interagency Cooperation Hazard for Developed Areas

## Western O'ahu Community Wildfire Protection Plan

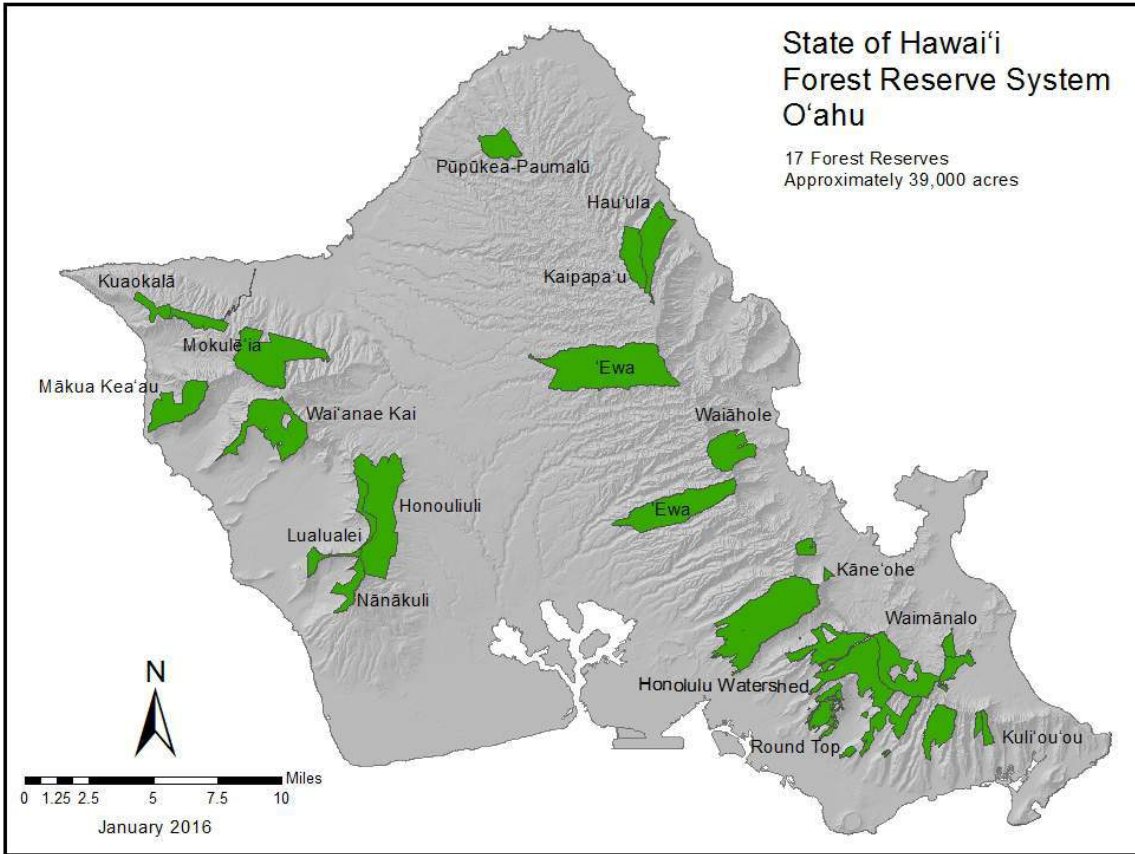
INTERAGENCY COOPERATION		
<b>LOW HAZARD</b>	<b>MODERATE HAZARD</b>	<b>HIGH HAZARD</b>
Mutual aid agreements and resources available to deploy.	Mutual aid agreements but limited resource availability.	No mutual aid agreements.



Created By Hawaii Wildfire Management Organization 2015. Disclaimer applies. Details in Western Oahu CWPP.



Western O'ahu Community Wildfire Protection Plan  
APPENDIX D  
DLNR-DOFAW Forest Reserves on O'ahu



Source: DLNR-DOFAW