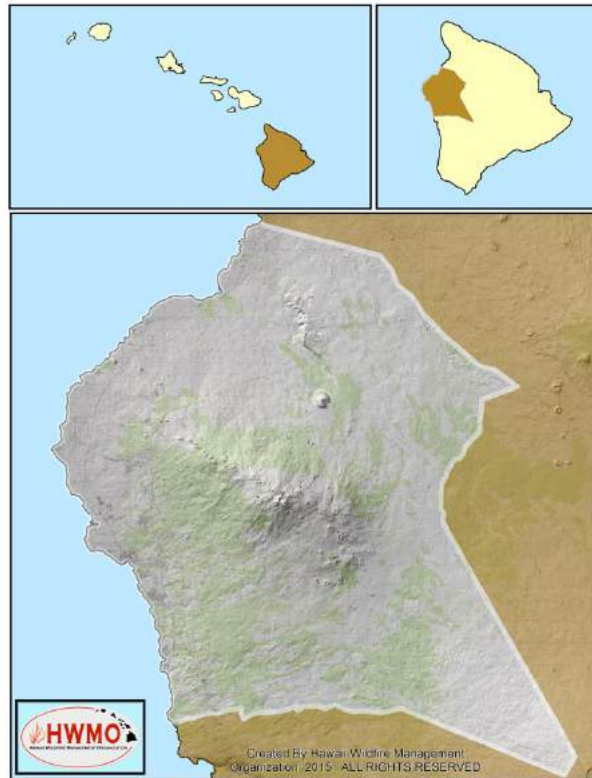


Community Wildfire Protection Plan



North Kona 2016

NORTH KONA COMMUNITY WILDFIRE PROTECTION PLAN



DEVELOPED BY HAWAI'I WILDFIRE MANAGEMENT ORGANIZATION © 2016



IN PARTNERSHIP WITH:
HAWAI'I FIRE DEPARTMENT; DEPARTMENT OF LAND AND NATURAL RESOURCES- DIVISION
OF FORESTRY AND WILDLIFE; AND HAWAI'I COUNTY CIVIL DEFENSE AGENCY



ACKNOWLEDGEMENTS

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

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Public Input Process Coordinated and Led by: Elizabeth Pickett and Ilene Grossman, HWMO with assistance and participation from agency partners and community members.

Maps Created by: Orlando Smith, HWMO.

Special Thanks to: All partners within the Big Island Wildfire Coordinating Group and Dr. Clay Trauernicht, University of Hawai'i, CTAHR.

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MUTUAL AGREEMENT SIGNATURE PAGE
NORTH KONA COMMUNITY WILDFIRE PROTECTION PLAN

This Community Wildfire Protection Plan was developed for North Kona, 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 North Kona.
- Identifies and prioritizes areas for hazardous fuel reduction treatments and recommends the types and methods of treatment that will mitigate wildfire in North Kona, Hawai'i.
- Recommends measures to reduce the ignitability of structures throughout the planning area.

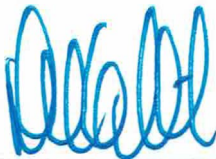
The following entities mutually agree with the contents of this Community Wildfire Protection Plan:



Darren Rosario, Fire Chief
Hawai'i Fire Department

12/21/2016

Date



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

1/9/17

Date

INTRODUCTION

NORTH KONA 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 agencies and representatives, private resource management entities, community members, and decision makers concerned about wildfire issues in North Kona.

This plan includes 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:

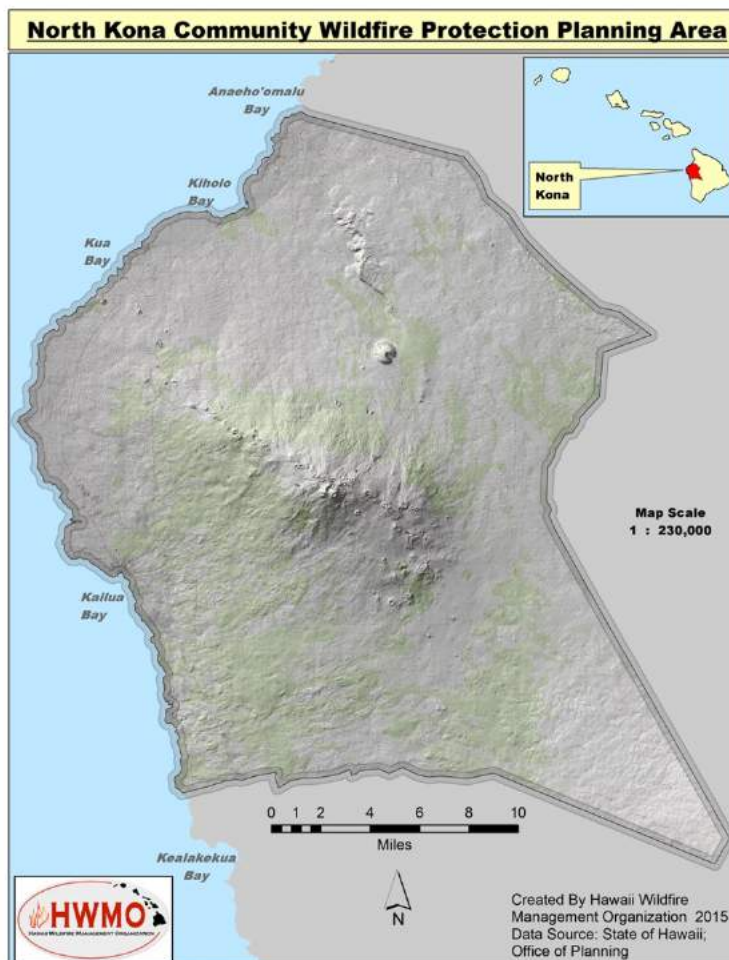
- Is developed within the context of the collaborative agreements and the guidance established by the Wildland Fire Leadership Council and agreed to by the applicable local government, local fire department, and state agency responsible for forest management, in consultation with interested parties and 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.¹

Stakeholder participants in the development of this plan agree that wildfire threats are imminent and can have widespread damage to North Kona watersheds, natural resources, and human communities. The danger of fire is related to high numbers of human-caused fires, dry conditions, strong winds, and high fire potential of vegetation. In the last decade, numerous areas of North Kona have burned. The CWPP is an important step toward increased collaboration in wildfire preparedness and protection.

PLANNING AREA BOUNDARIES

The North Kona CWPP planning area generally covers the district of North Kona in Hawai'i County, on the Island of Hawai'i, in Hawai'i State. The planning area lies between the districts of South Kohala and South Kona, and occupies the portion of the west side of Hawai'i Island that had never before been covered with a CWPP.

The North Kona CWPP includes federal, state, county, and privately owned lands. Its planning area boundaries meet other Hawai'i Island CWPP boundaries, comprehensively defining the leeward side of Hawai'i Island as a wildland-urban interface (WUI) at-risk area. The simultaneous WUI and CWPP designations for the North Kona district ensure adequate protection of natural areas and associated human communities from the threat of wildfire. The North Kona CWPP is part of a series of new and updated CWPPs in Hawai'i. See Map 1 for the North Kona CWPP planning area boundaries.



Map 1. North Kona CWPP Planning Area Map.

PLANNING PROCESS, METHODS, AND PARTICIPANTS



Photo 1. Several North Kona residents gathered at the Pu'u Anahulu Community Center to provide input to the CWPP.

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 WUI 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 the following actions during the planning process: contact decision makers, involve federal, state, and local agencies, and engage interested parties.

This CWPP followed these guidelines and additionally satisfies the requirements of the FEMA Pre-Disaster Mitigation program and NFP.

PARTICIPANTS

State and Local Agencies

The representatives of the state and local agencies that have jurisdictional responsibilities in the vicinity of the North Kona CWPP planning area, and who have been involved in the development of the North Kona CWPP are:



Photo 2. North Kona CWPP participants gathered at both the Kona Civic Center and Kealakehe Intermediate School to discuss wildfire related concerns.

Agency	Representative(s)
Hawai'i Fire Department	Darren Rosario Fire Chief
Hawai'i Department of Land and Natural Resources- Division of Forestry and Wildlife	Jay Hatayama, Forest Management Supervisor I David G. Smith, Administrator Robert Hauff, State Protection Forester
County of Hawai'i Civil Defense	Darryl Oliveira and Ed Teixeira (as part of Big Island Wildfire Coordinating Group)

Table 1. CWPP Participants: State and Local Agencies.

Federal Agencies

The following federal agencies were consulted and/or given opportunities to review and comment on area-specific and regional fire and environmental information:

Agency	Representative(s)
US Fish and Wildlife Service (USFWS)	Dawn Bruns, Acting Assistant Field Supervisor Section 7 & Habitat Conservation Plans
Various, as part of Big Island Wildfire Coordinating Group	Andrew Kikuta, Fire Management Specialist, Hawai'i/Pacific Islands, USFWS Ross Williams, Fire Management Officer, NPS Eric Moller, Fire Chief USAG-FES

Table 2. CWPP Participants: Federal Agencies.

Decision Makers

The decision makers contacted for input and involvement in the development of the North Kona CWPP are represented in the following table. Of the three listed and contacted, Karen Eoff responded with input and support.

Local Government	Name	Representing
Hawai'i County Council	Maile David	Volcano Village, Hawaiian Orchid Island Estates, Pahala, Punalu'u, Nā'ālehu, South Point, Ocean View, Miloli'i, Ho'okena, Hōnaunau, Ke'ei, Nāpō'opo'o, Captain Cook, Portion of Kealakekua, Keōpuka Heights, Kona Hospital, Keōpuka Kai
	Dru Mamo Kanuha	Portion of Kealakekua, Kona Scenic Subdivision, Kainaliu, Honalo, Keauhou, Kahalu'u, Hōlualoa, Kona Hillcrest, Pualani Estates, Sunset View, Kuakini Heights, Kona Vistas, Ali'i Heights, Kona Industrial, Lono Kona
	Karen Eoff	Kailua View Estates, Malulani Gardens, Hualālai Farms, Keōpū Mauka, Kailua Heights, Kealakehe, Honokōhau, Kaloko, Kohanaiki, Kalaoa, Keāhole, Mākālei, Makalawena, Pu'uanahulu, Waikōloa Beach Resort

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 North Kona CWPP are:

Interested Parties	Affiliation
Private Citizens	General Public
Hawai'i Wildfire Management Organization	Various public agency fire experts and other technical advisors

Table 4. CWPP Participants: Interested Parties.



Photo 3. The Big Island Wildfire Coordinating Group, several land managers and large landowners, and the Hawai'i Wildfire Management Organization staff and board gathered to discuss and prioritize wildfire projects, many of which pertained to North Kona and were included in this plan.

WILDFIRES IN NORTH KONA BACKGROUND

Steep slopes, rough terrain, strong winds, and a large percentage of highly ignitable invasive grasses characterize the North Kona landscape. This, coupled with warm weather, recurring drought conditions, and a history of human-caused fires put the area at increased risk of wildfire. The proximity of development to fire-prone wildlands present hazardous conditions that now threaten North Kona 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 North Kona at risk of wildfire. This section discusses those factors in detail.

FIRE ENVIRONMENT

CLIMATE^{2,3}

Wildfire occurrence in North Kona is tied to broad climate patterns, in that more and larger fires typically occur in the drier areas or areas affected by drought conditions. Rainfall in North Kona 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. 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 and seasonal weather patterns also influence fire risk in the North Kona area. In the lee of Hualālai and Mauna Loa to the south, light diurnal land-sea breezes and rain patterns prevail, bringing peak precipitation in the afternoon, with heaviest rainfall coming in the summer months, which is in contrast to much of the state in terms of time of day and season. Rainfall increases from the shoreline to higher elevations, reaching a peak between about 2,000- 2,500 feet elevation, where 60-80 inches can fall annually in some areas. Above and below this band, rainfall progressively declines to approximately 20 inches per year near the summits and between 10-20 inches near the shore.

TOPOGRAPHY

The North Kona CWPP planning area stretches for approximately 60 miles along the western coast of Hawai'i Island. The area is characterized by a combination of commercial areas, residential neighborhoods, rugged, often inaccessible terrain in the upland regions, and the Pacific Ocean on its

downslope boundary (Map 4). Topography influences fire behavior, as wildfires spread more quickly as they progress upslope and drier areas burn at higher intensity. North Kona's diverse and steep topography also places constraints on emergency access and evacuation options for local communities. Once wildfires spread into steep, upland areas, the lack of roads and difficult terrain frequently can limit fire response to costly aerial operations (i.e., bucket drops by helicopters).

The North Kona CWPP area's steep topography and shallow, somewhat undefined, drainage ways create post-fire challenges, as well. Heavy rainfall events can easily exceed the capacity of shallow drainageways, resulting in flooding of adjoining areas. Less heavy rainfall easily is absorbed into porous lava substrate.

VEGETATION AND NATURAL RESOURCES

The North Kona CWPP region has natural resource areas that include lava fields, nonnative grasslands and shrublands, mixed forests, native forests, shoreline, and anchialine ponds. The upland native wet forest provides essential habitat and watershed functions. Anchialine ponds are home to a unique assemblage of invertebrate and algal species, some of which are known to exist only in this habitat.³

Native species exist throughout the region in varied habitats and concentrations (Maps 5-8). Many are rare, threatened, and/or endangered plant and animal species. These include but are not limited to animals: Hawai'i Creeper (*Loxops mana*), Hawaiian Crow ('Alalā, *Corvus hawaiiensis*), Hawai'i Hawk ('Io, *Buteo solitarius*), anchialine pool shrimp (*Halocaridina rubra*), and several trees: 'ahakea (*Bohea brevipes*), kauila (*Alphitonia ponderosa*), halapepe (*Pleomele hawaiiensis*), lo'ulu (*Pritchardia hillebrandii*), 'aiea (*Nothocestrum breviflorum*), ma'aloa (*Neraudia ovata*). Some of these species do not live in protected areas.

The widespread establishment of nonnative grasslands and shrublands is a leading cause of increased fire risk in North Kona. In many areas, native forests have been replaced by nonnative species, such as fountain grass (*Pennisetum setaceum*), silk oak (*Grevillea robusta*), 'ekoa (*Leucaena leucocephala*), and tree tobacco (*Nicotiana glauca*), and kiawe (*Prosopis pallida*), to name a few. These and other fire prone nonnative species occupy large unmaintained land areas, as well as vacant lots and undeveloped pockets within and around developed areas. They provide an abundance of fire fuels that cure rapidly in dry conditions, are easily ignitable even in humid conditions, and allow fires to spread from communities and roads (where ignition risk is highest) into areas that have contiguous fuels, more challenging access for firefighting efforts, and rare and endangered species.

The nearby US Army Pohakuloa Training Area has its own natural resource protection and management efforts and its own fire department, and there are three state-managed reserves in the North Kona CWPP area: Wai'aha Forest Reserve, Honua'ula Forest Reserve, and Pu'u Wa'awa'a Forest Reserve. The largest

of these is Pu'u Wa'awa'a. Pu'u Wa'awa'a Forest Reserve contains a significant diversity of historical, natural, cultural and recreational resources. It is public land, managed by DLNR-DOFAW, and consists of approximately 37,600 acres. The adjacent Kiholo State Park Reserve shoreline area is managed by DLNR- Division of State Parks. All of the forest reserves experience high fire risk due to fire prone invasive species in or near their boundaries, proximity to roads (where 99% of wildfires start in Hawai'i), challenging firefighting access, and limited water resources for fire suppression.

Much of the North Kona CWPP area is comprised of government reserves and private large landholdings. However, vegetation in and around communities is also a contributing factor to the fire environment. These residential and commercial areas are described in detail in the general overview of the CWPP planning area and in the *Communities at Risk of Wildfire* section.

The following maps depict area-specific fire environment information for the North Kona CWPP region:

Map 2- Average annual rainfall.

Map 3- Average wind speed.

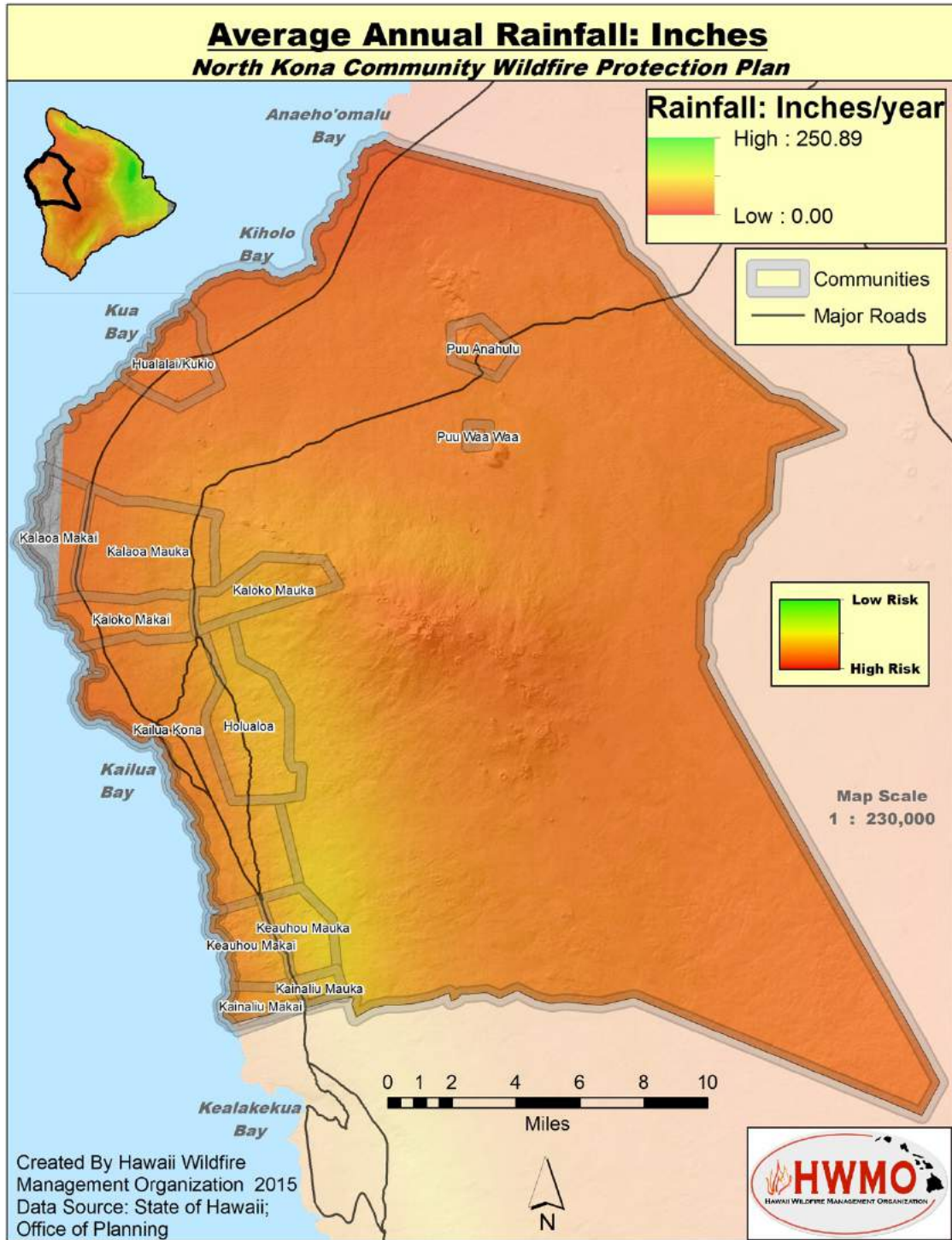
Map 4- Topography.

Map 5- Land cover types, showing the types of vegetation that exists within the CWPP planning area.

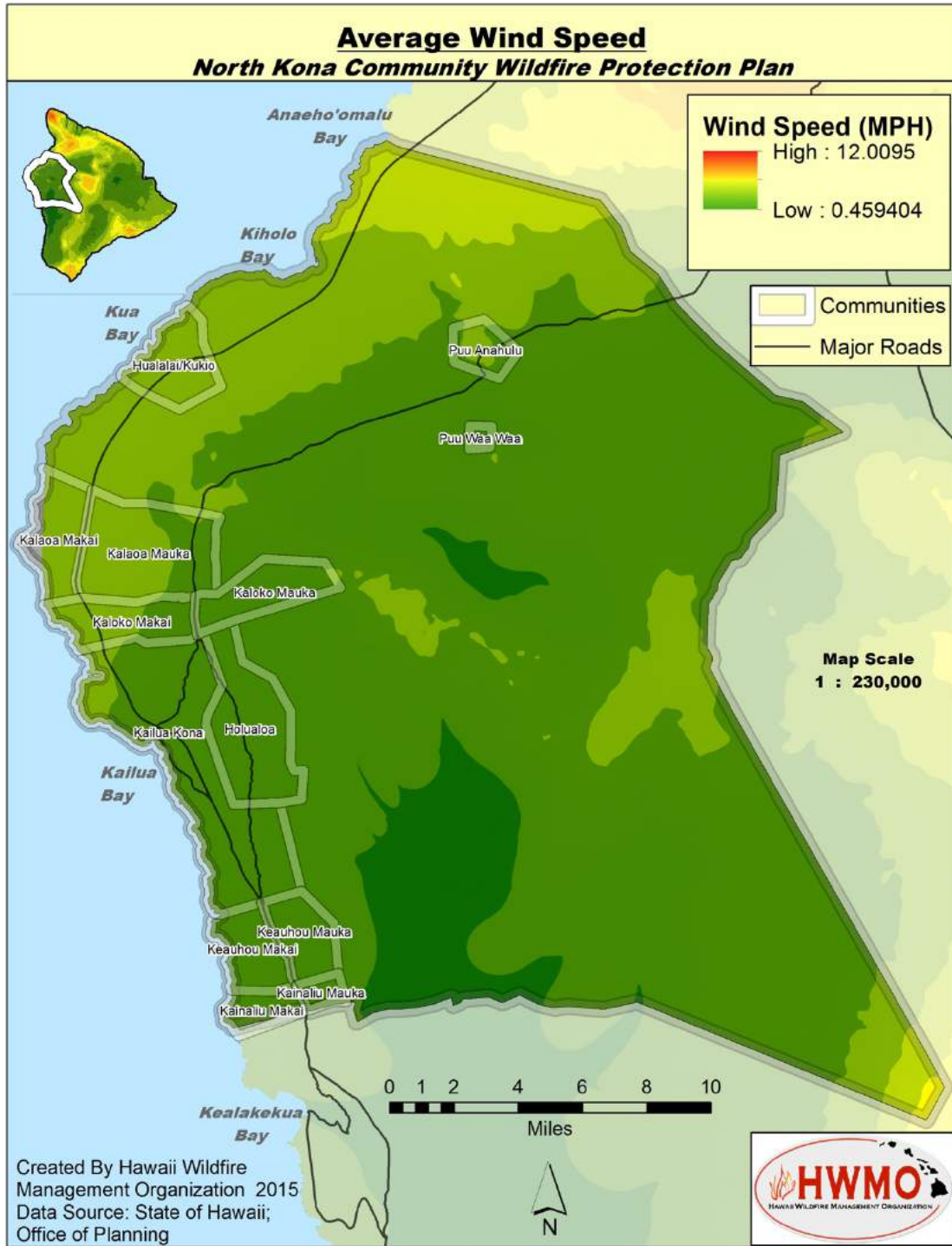
Map 6- Densities of Threatened and Endangered species.

Map 7- Areas classified by USFWS as priority habitat conservation areas.

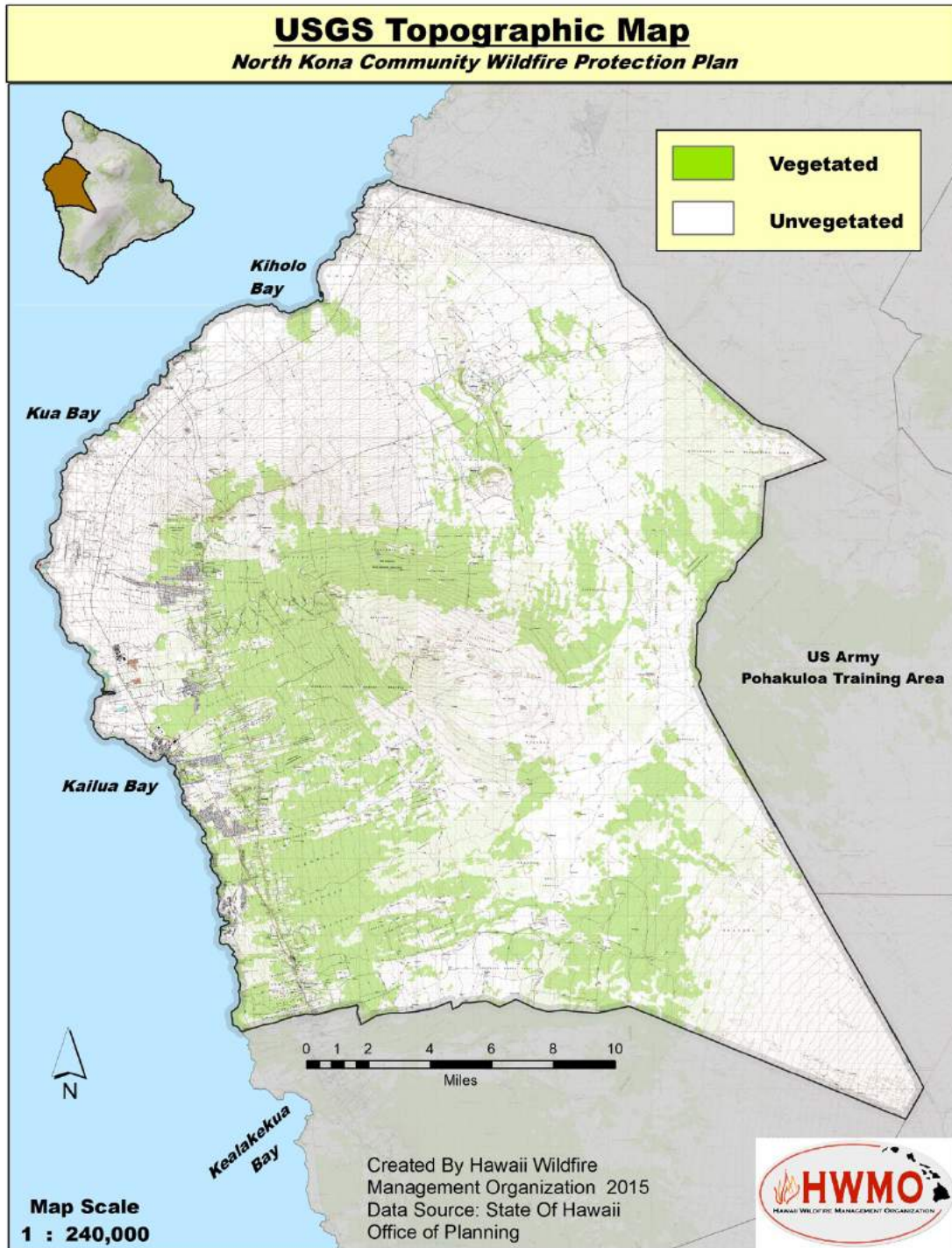
Map 8- Types of vegetation within the USFWS priority landscapes area.



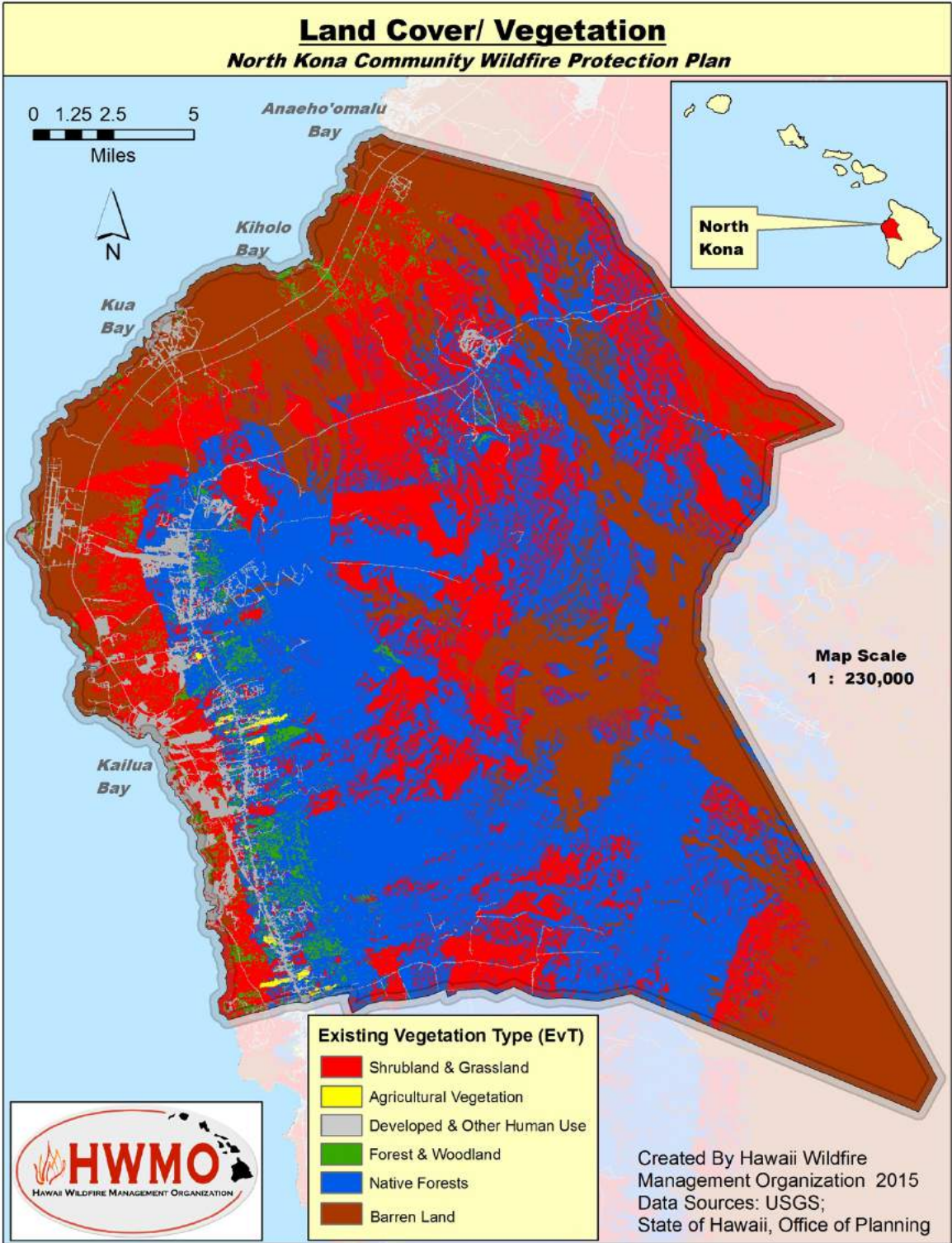
Map 2. Average Annual Precipitation Map.



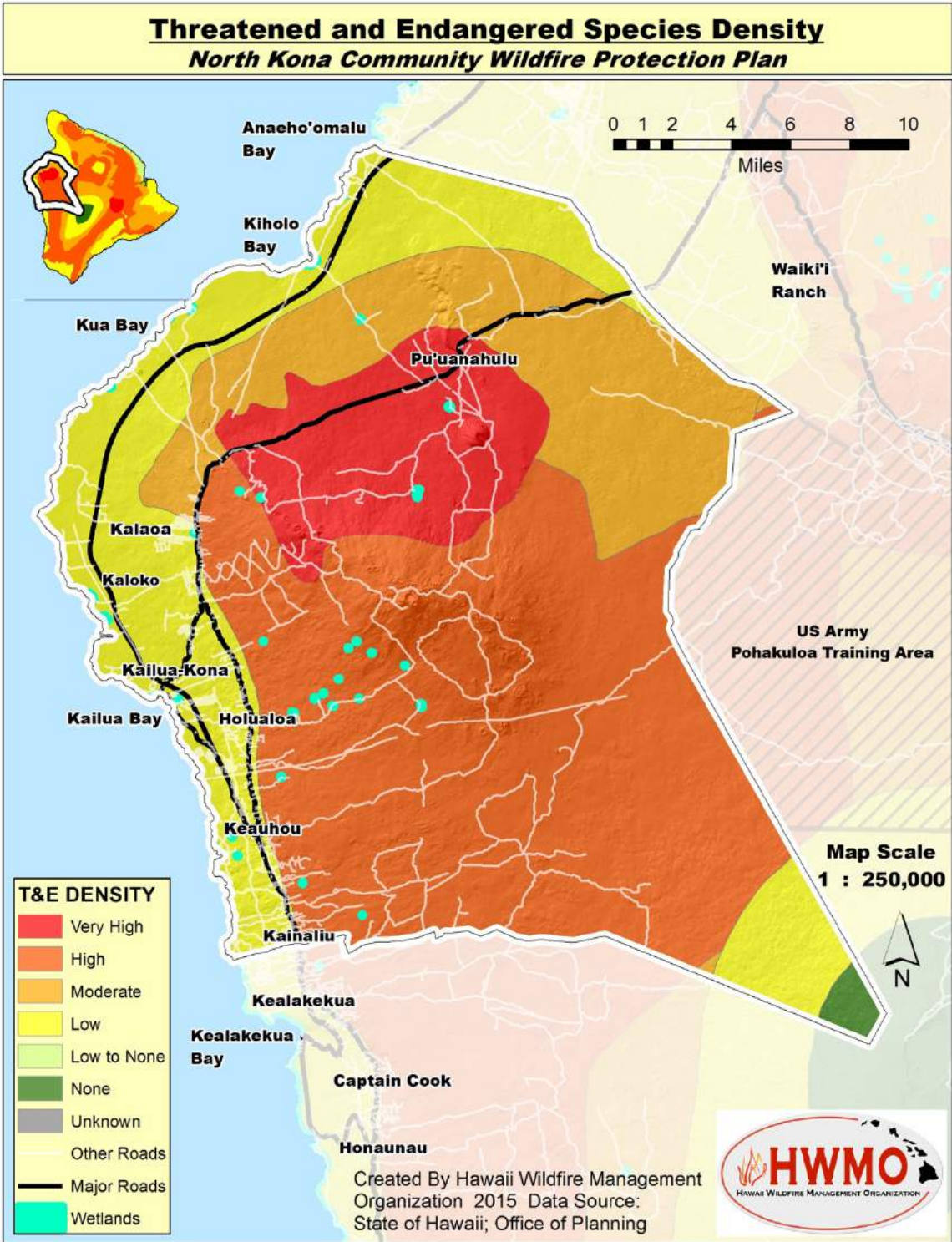
Map 3. Average Wind Speed Map.



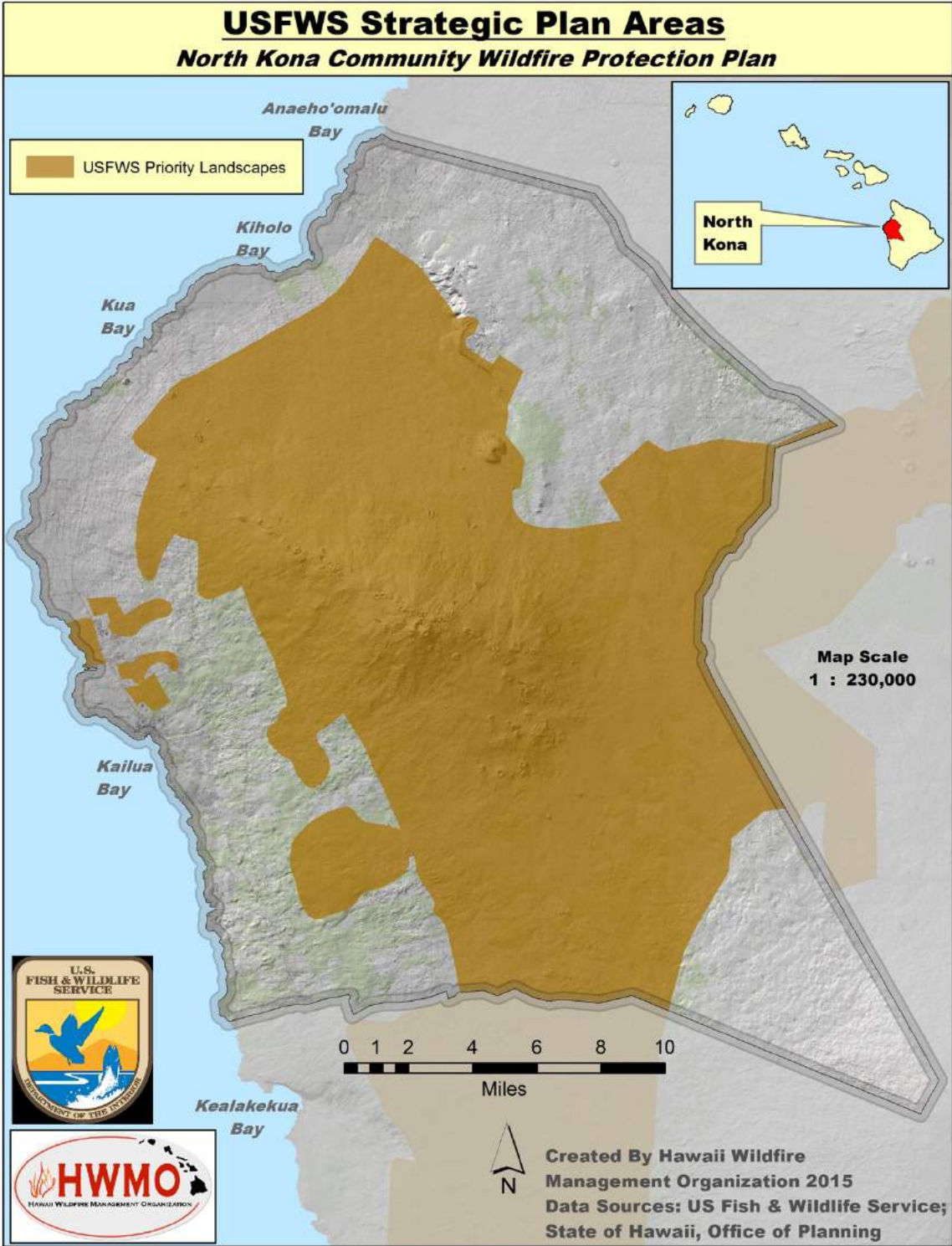
Map 4. Topographic Map of North Kona CWPP planning area, based on US Geological Survey data.



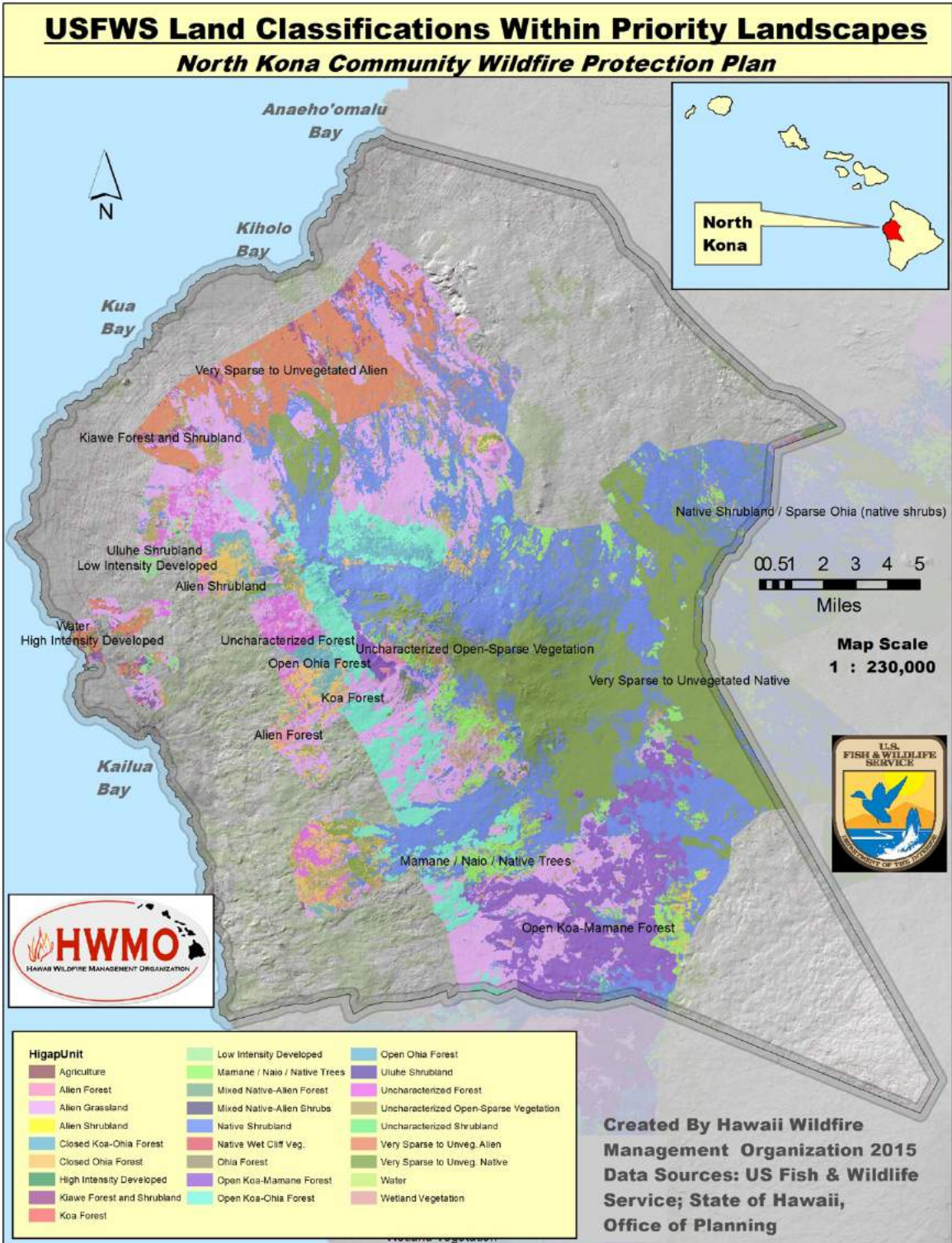
Map 5. Land cover/ Vegetation Map for North Kona CWPP planning area.



Map 6. Threatened and Endangered Species Densities Map for the North Kona CWPP planning area.



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



Map 8. USFWS map of land cover type within their Priority Landscapes areas of North Kona.

FIRE HISTORY

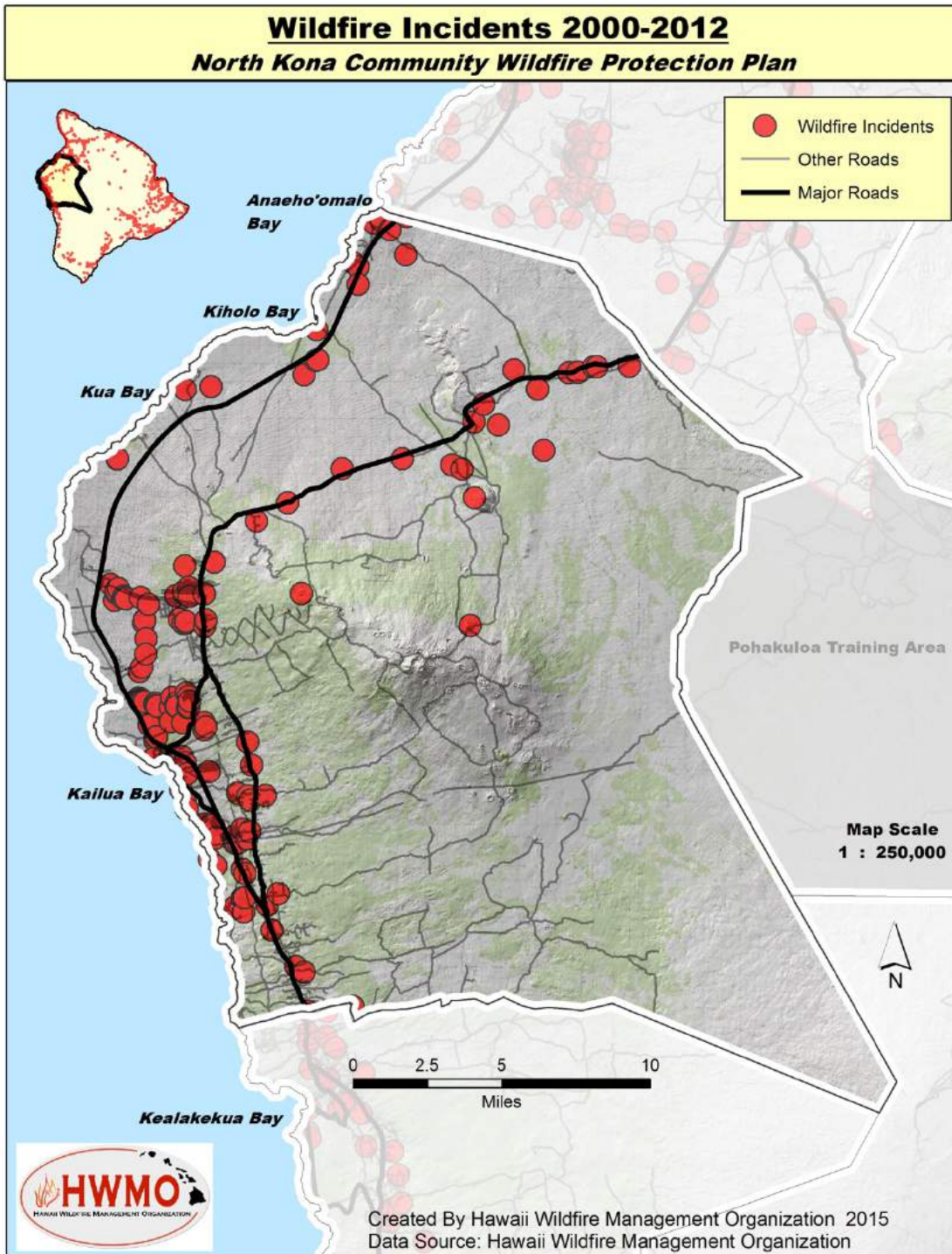
IGNITIONS

The WUI- the wildland-urban interface 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 North Kona 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 Hawai'i are caused by human error or arson, especially near developments, power line right of ways, and along roadsides. Additionally, sprawling dry nonnative grasslands surround many communities. These unmanaged fire fuels create a significant hazard in North Kona. Once ignited along the interface, wildfire can spread rapidly through and around residential areas, threatening both property and life. Wildfires in lesser developed areas, fallow agricultural lands, and in the higher elevations also spread and threaten natural areas, and the native and protected species they may contain.

FIRE INCIDENT MAP

In 2013, HWMO completed an 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 North Kona Wildfire Incident Map (Map 9) includes HFD's documented responses to wildfires between January 2000 and January 2011 and wildfire ignition points recorded by DLNR-DOFAW from 1998-2012. The map displays ignition points, and does not indicate the final perimeter of burned areas.

Ignitions are important for understanding trends and patterns of fires. Map 9 demonstrates that WUI, roadside, and human access area fire starts are important trends across Hawai'i. While larger fires tend to occur in the drier areas with unmanaged vegetative fuels, the high frequency of ignitions along every WUI is of concern. As drought conditions become more frequent (and they are predicted to increase), there are concerns that large fires in dense unmanaged vegetation will correspondingly increase. This plan addresses stakeholder-identified and recommended actions for prevention, pre-fire mitigation, and vegetation management activities across the entire North Kona region.



Map 9. North Kona Fire Incident Map. Incidents recorded from 1988-2011. Note: points displayed are ignition sites only and do not indicate perimeter boundaries of burned areas.

SIGNIFICANT FIRES

Numerous smaller fires (less than 100 acres) and several large wildfires (over 1000 acres) have taken place in the North Kona region. Detailed narrative records are scant before 2000, but many since that time have received media attention or have been noted for their significant impacts. Photos 4-9 and Table 5 highlights the fires on record that were significant in terms of size, media coverage, or impact.



Photo 4. Photo shows smoke flumes from the February 2016 multi-fire incident around Pu'u Anahulu. Photo credit: Rick Winters/West Hawai'i Today.



Photo 5. (Above). A close call with a wildfire in a residential area in Kailua-Kona was averted on March 2nd, 2016. Starting near Banyan Apartments off of Ali'i Drive, the 25-acre blaze spread rapidly toward Komohana Kai subdivision, threatening a number of homes. As remarked by HFD Assistant Chief Gantry Andrade, the fire came "right up to the property lines and pretty close to some homes" (West Hawai'i Today, 3/2/16). Some residents voluntarily evacuated due to heavy smoke. No homes were lost. Photo credit: Denny Miller/ Special to West Hawai'i Today.

Photo 6. (Above right). 200 acres burned near the new Pāalamanui Hawai'i Community College campus in January 2016.

Photo 7. (Right). In 2013, 35 acres behind the Pines Subdivision in Kailua-Kona burned, sending 25 residents to emergency evacuation shelters. Photo credit: Hawai'i News Now.



Incident Name	Location	Date Started	Acres	Property/ Vegetation	Notes
Pu'u Anahulu Game Management Area	Highway 190, 14 mile marker - Road near first entrance to Puu Anahulu Game Management Area (mauka)	Date Started: August 4, 1999 (11:53 a.m. - first alarm) Date Contained: August 7, 1999 (6:45 p.m.) Date Controlled: August 13, 1999 (3:00 p.m.)	Acres: 10,000 Cause: Incendiary	Property Type: Government Game Management Area Vegetation Type: Fountain grass with scattered ekoa, lantana, ohia; upper area: ohia, sandalwood, kolea, kawau, maile, dubautia, aalii, ulei	HDF Cost: \$204,836 Damage Costs: \$3,200,000 Structures/Homes Lost: 1
Pu'u Wa'awa'a Makai	Queen Kaahumanu Highway, 80 mile marker - Kiholo Bay	Date Started: October 7, 1999 (10:30 a.m. - first alarm) Date Contained: October 15, 1999 (Time N/A)	Acres: 5,000 Cause: Misc.	Property Type: Local government Vegetation Type: Fountain grass with scattered ekoa and lantana; scattered overstory of uhi-uhi, kauila, halapepe, lama, ohia, wiliwili	HDF Cost: \$108,999 Damage Costs: \$20,500,000
Pu'u Anahulu Makai '06	Puu Anahulu - Hwy190, 18 mm	Date Started: October 3, 2006 (11:13 a.m. - first alarm) Date Contained: October 8, 2006 (2:00 p.m.) Date Controlled: October 11, 2006 (1:00 p.m.)	Acres: 1,000 Cause: Lightning	Property Type: Local government property Vegetation Type: Fountain grass with scattered ohia	HDF Cost: \$88,531 Damage Costs: N/A Structures/Homes Lost: 2 Structures/Homes Threatened: 250
Pines Subdivision	Kona, behind Pines Subdivision	Date Started: 2013 2:00pm	Acres: 35		25 people evacuated
Palamanui Campus	Kona, Near Queen Ka'ahumanu Hwy.	Date Started: January 16, 2016	Acres: 200	Vegetation Type: Fountain grass	N/A
String of Pu'u Anahulu fires	1) Mauka of intersection of Daniel K. Inouye Hwy (mm 50) and Hwy 190 2) Hwy 190, mm 16 3) Hwy 190 near mm 17 on mauka side of highway	Date Started: February 10, 2016 (4:00 p.m. - first alarm) Date Contained: February 11, 2016	Acres: 1,150 Cause: Incendiary	Vegetation Type: Brush and grass mixture	HDF Cost: N/A Damage Costs: N/A Structures/Homes Lost: 0
Komohana Kai	Komohana Kai subdivision and Banyan Apartments on Ali'i Drive	Date Started: March 2, 2016 Date Contained: March 2, 2016	Acres: 25 Cause: N/A	Vegetation Type: Brush and grass mixture	HDF Cost: N/A Damage Costs: N/A Structures/Homes Lost: 0
Hwy 190 Makalei	Hwy 190 between Makalei and Daniel K. Inouye Hwy	Date Started: March 23, 2016	Acres: 2500	Vegetation Type: Brush and grass mixture	

Table 5. North Kona Large and Significant Wildfires.



Photo 8. (Above left). Suspicious wildfire ignitions in North Kona and South Kohala led officials to install roadside signage requesting motorists to report suspicious activity to the Hawai'i Police Department. Photo credit: Hawai'i DLNR/ Special to West Hawai'i Today.

Photo 9. (Above right). Over 2500 acres burned near Saddle Road between Ka'imani Road and the Daniel K. Inouye Hwy. Intersection in Kona in March 2016. HFD and DLNR-DOFAW worked together to suppress the lightning-caused fire. Photo credit: Rachel Riley/ Big Island Now.

WILDFIRE IMPACTS

Many of the community, economic, natural, and cultural resources in North Kona are exposed to wildfire impacts. 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.

IMPACTS TO NATURAL RESOURCES

Across Hawai'i, 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, a particular concern in North Kona, which has a high concentration of threatened and endangered species. Most of the plant and animal species within native ecosystems in Hawai'i do not survive and/or recover from wildfires. More generally, the conversion of forests to grasslands due to fire and the conversion of active agricultural areas into fallow unmanaged weed fields 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 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 increases the risk of flooding and sediment delivery downstream.

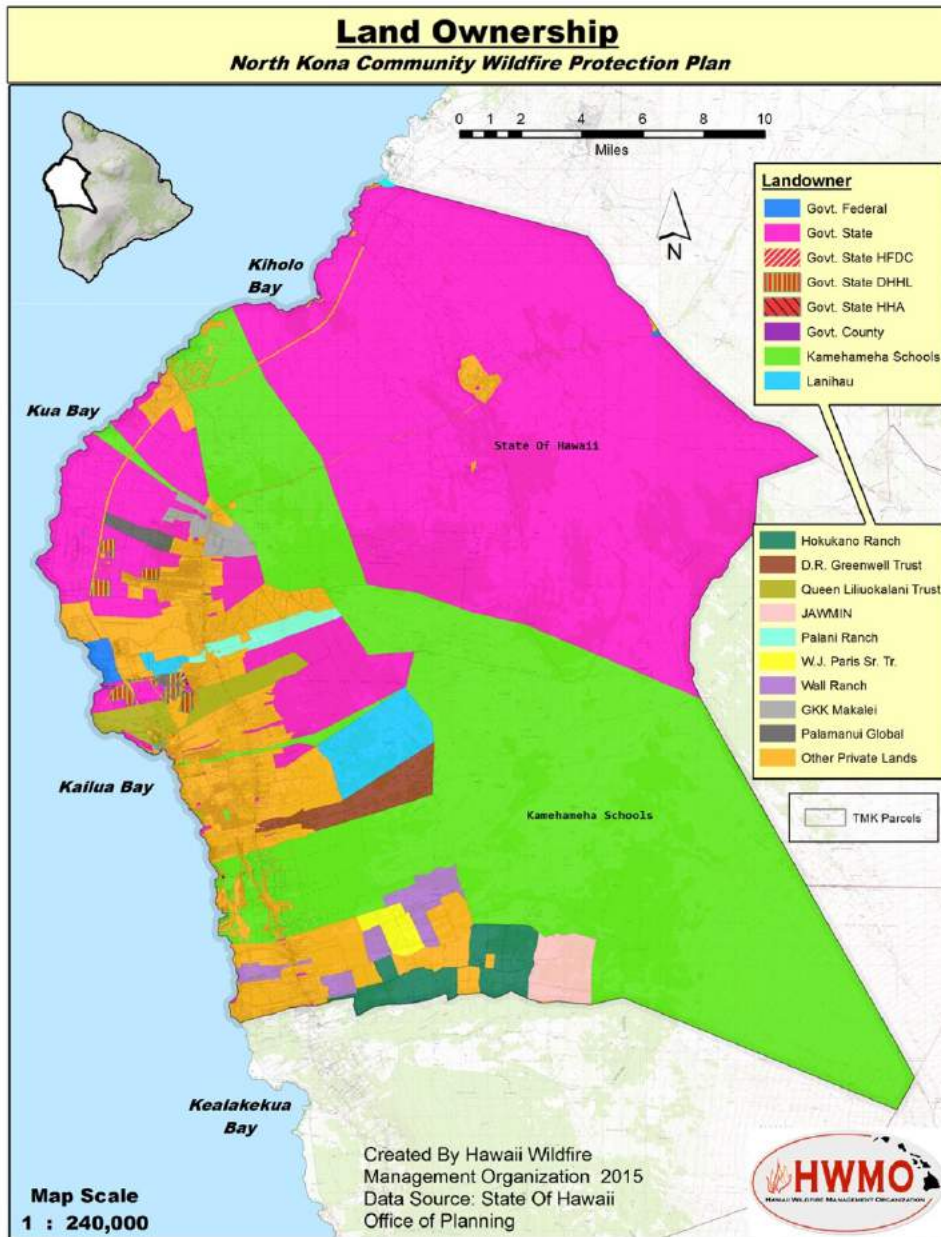
IMPACTS TO COMMUNITIES AND MUNICIPAL ACTIVITIES

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. 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.

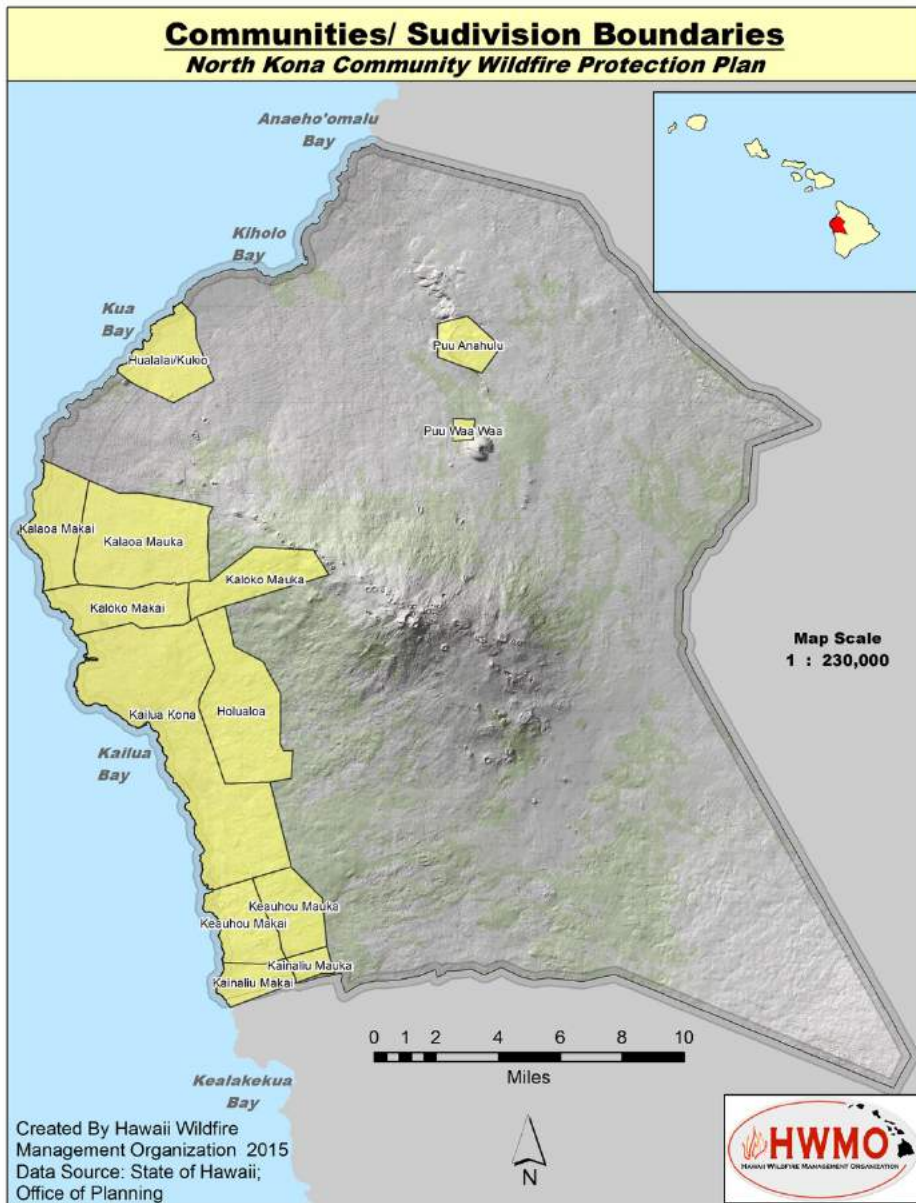
**GENERAL OVERVIEW OF CWPP PLANNING AREA
NORTH KONA**

The area comprising North Kona, as defined in this plan, includes federal, state, county, and privately owned lands (Map 10). The CWPP planning boundaries simultaneously define the entire region as a WUI at-risk area, delineated this way to ensure adequate protection of natural areas and associated human communities. The CWPP boundaries were chosen through stakeholder meetings.



Map 10. Land ownership within North Kona CWPP planning area.

For the purposes of assessing hazards and wildfire threats to resources, residential areas within the North Kona CWPP planning area were simplified into thirteen “communities” (Map 11). The boundaries depict the areas determined by DLNR-DOFAW to have similar features in terms of wildfire hazard characteristics. They have long been the boundaries used in the Division’s Communities at Risk from Wildfire Maps, which are updated every few years to assess and depict wildfire threats to developed areas and communities. See next section, *Communities at Risk from Wildfires*, for more information and hazard assessment summary maps.

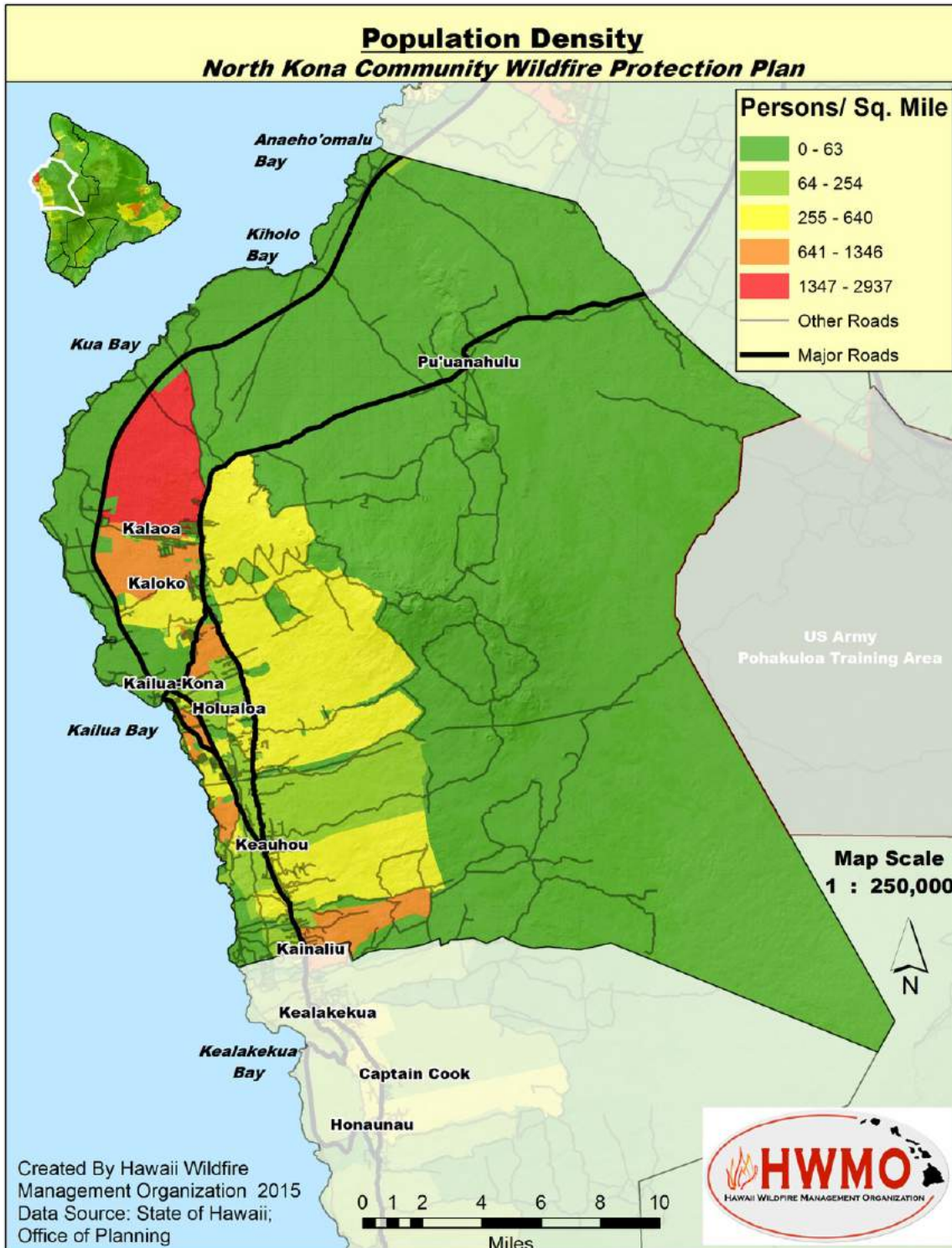


Map 11. Simplified community delineations used within the North Kona CWPP planning area.

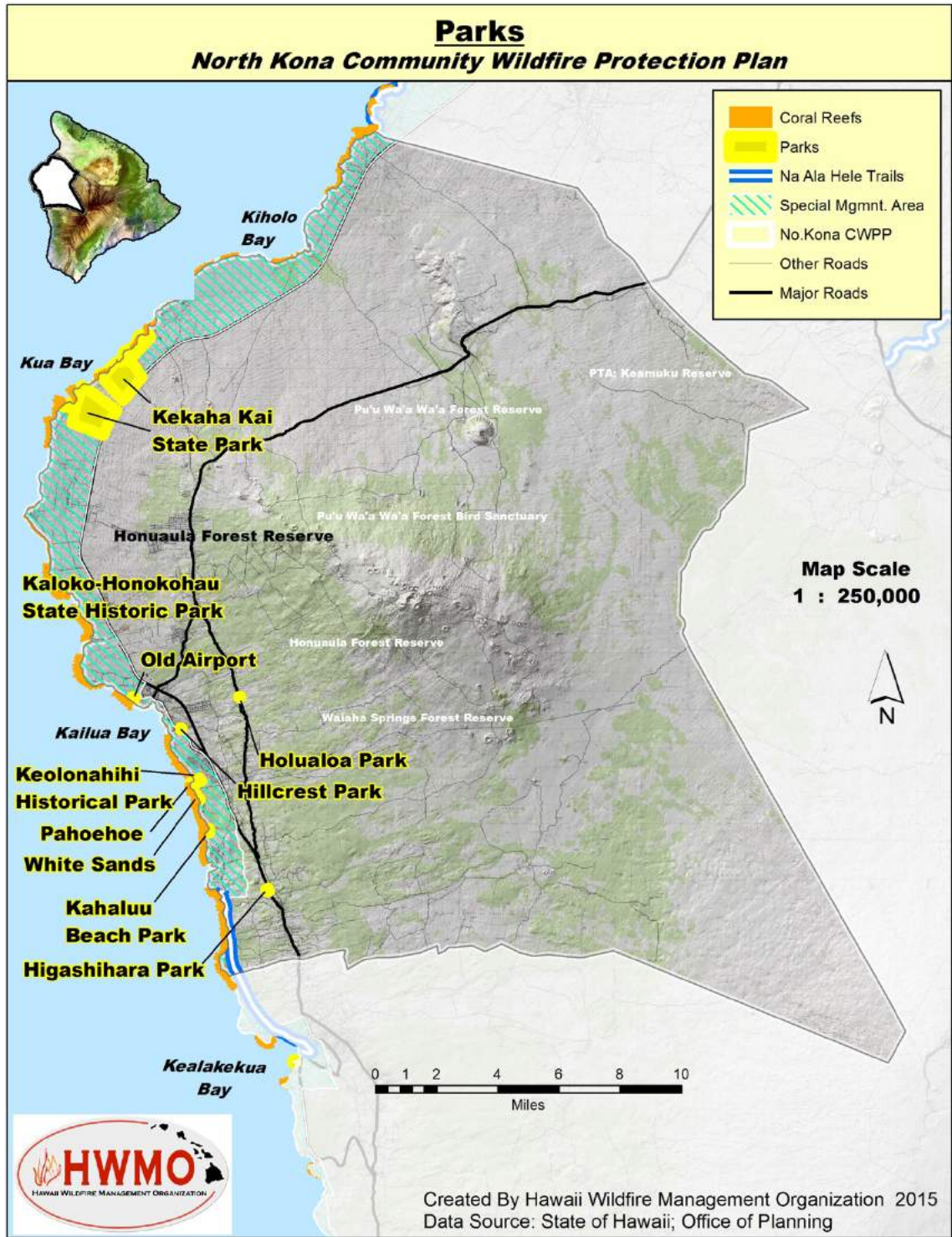
North Kona exemplifies a WUI interface, in that it contains both undeveloped fire prone wildland areas adjacent to populated subdivisions and developed areas (Map 12). There are numerous community assets, resources, and infrastructural features at risk of wildfire in North Kona, to include civil, industrial, medical, educational, recreational, and environmental features. These are depicted on Maps 13-16. 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.

The North Kona area is unique on the Island of Hawai'i, in that it is the primary base of tourism, which fuels much of the island's economy. It also contains some of the state's most threatened and endangered plants, animals, and habitats as described in the *Natural Resources* section. It is a complex and populated area. In addition to housing the majority concentration of commercial, industrial, and residential areas in the region, it hosts the annual Ironman World Championship triathlon, the annual Kona Coffee Festival, and the Hawaiian International Billfish Tournament, bringing visitors from all over the world to patronize its business and recreate in its natural areas. Kailua-Kona is the major town within the North Kona CWPP area. Its oceanfront street is designated as a Hawai'i Scenic Byway. There are numerous archeological and historical sites in town and throughout the entire North Kona CWPP planning area.

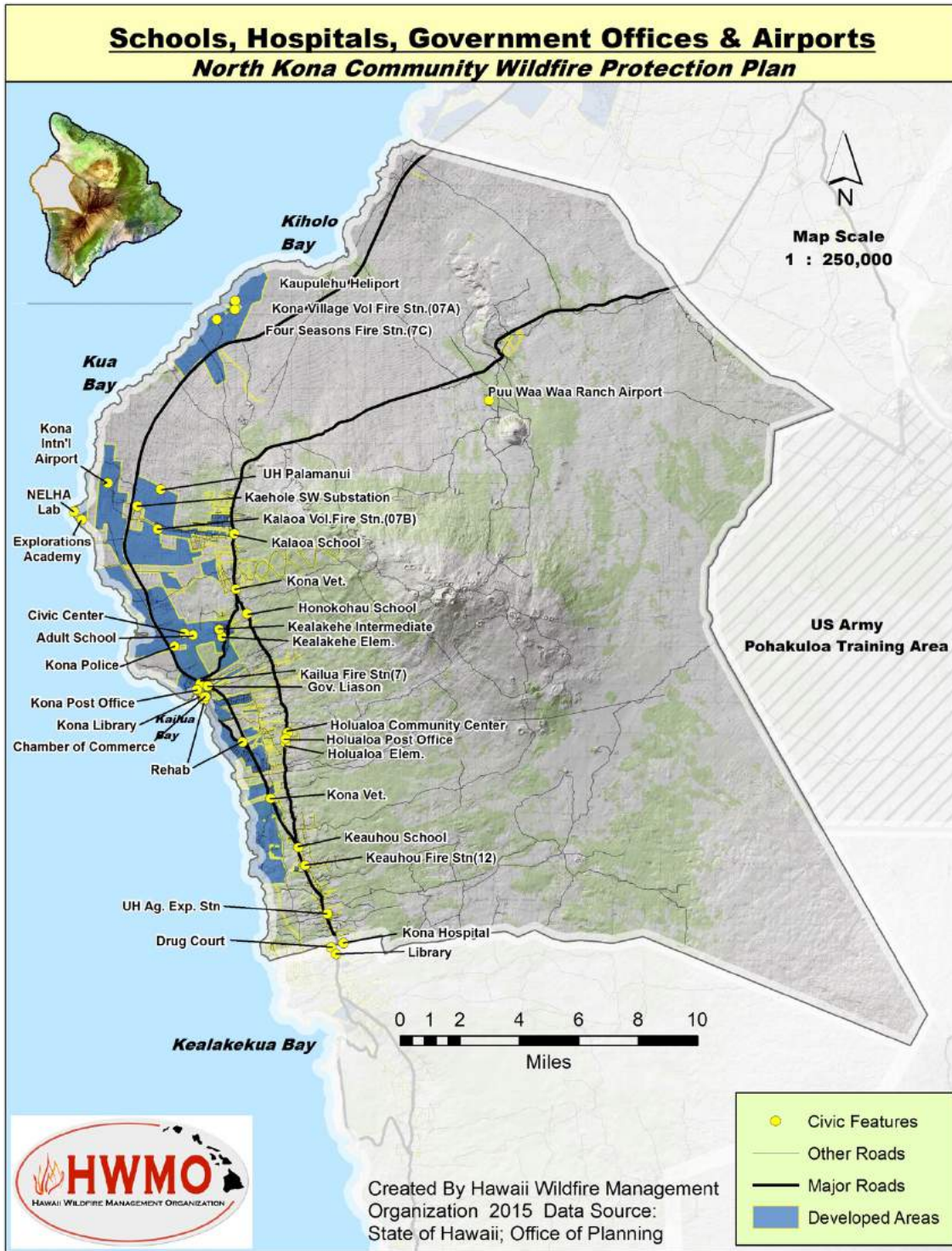
The North Kona CWPP area houses the Kona International Airport, one of three airports on the island. The Kona International Airport is the largest of the three and the only on the west side of Hawai'i Island. Also in North Kona is the University of Hawai'i, Hawai'i Community College Pāalamanui campus, a recent addition to the area. The new, sustainably designed campus was created to serve the West Hawai'i community, and has worked with HWMO to include wildfire mitigation and prevention planning into its long-term design to maximize safety despite its location amid fire prone grasslands and shrublands.



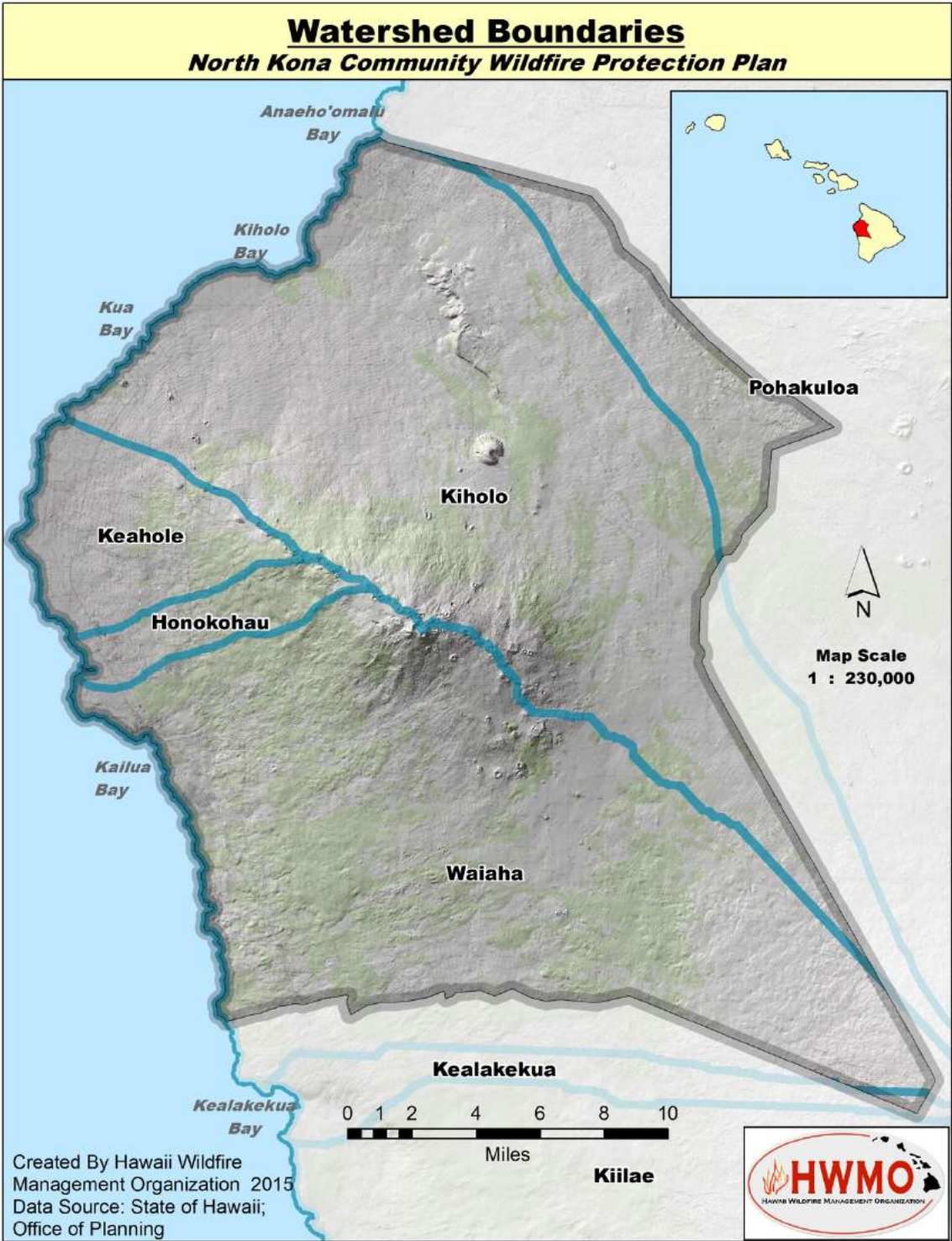
Map 12. North Kona Population Density Map.



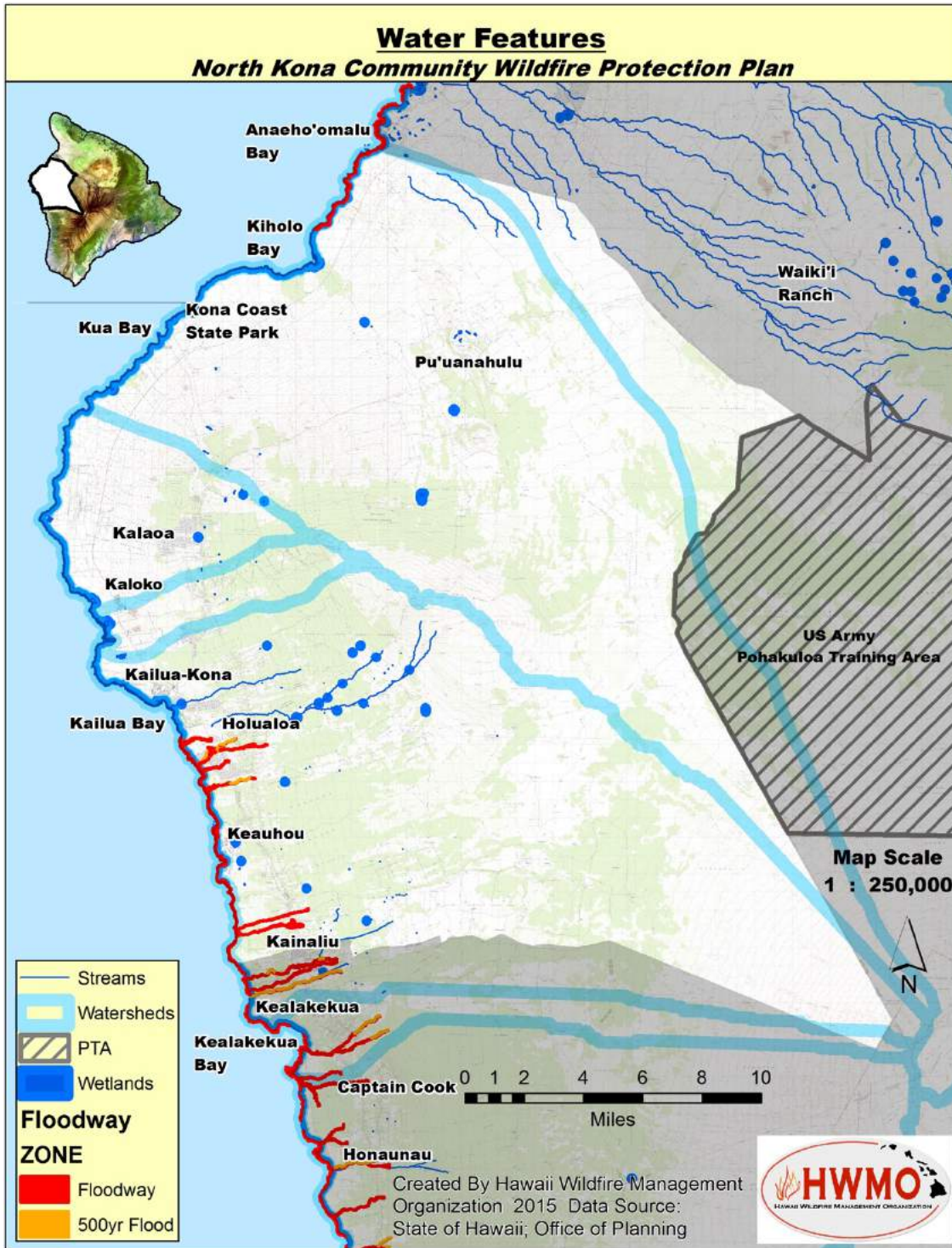
Map 13. Parks and Reserves in North Kona CWPP planning area.



Map 14. Community/government service features in the North Kona CWPP planning area.



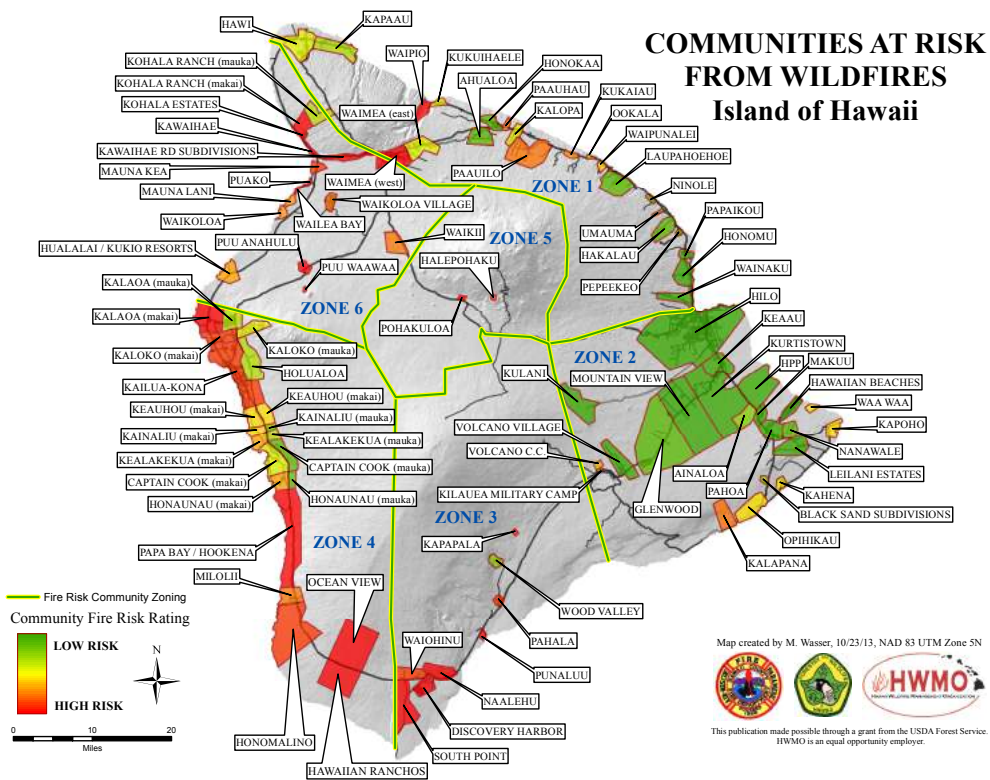
Map 15. Watershed areas with in the North Kona CWPP planning area.



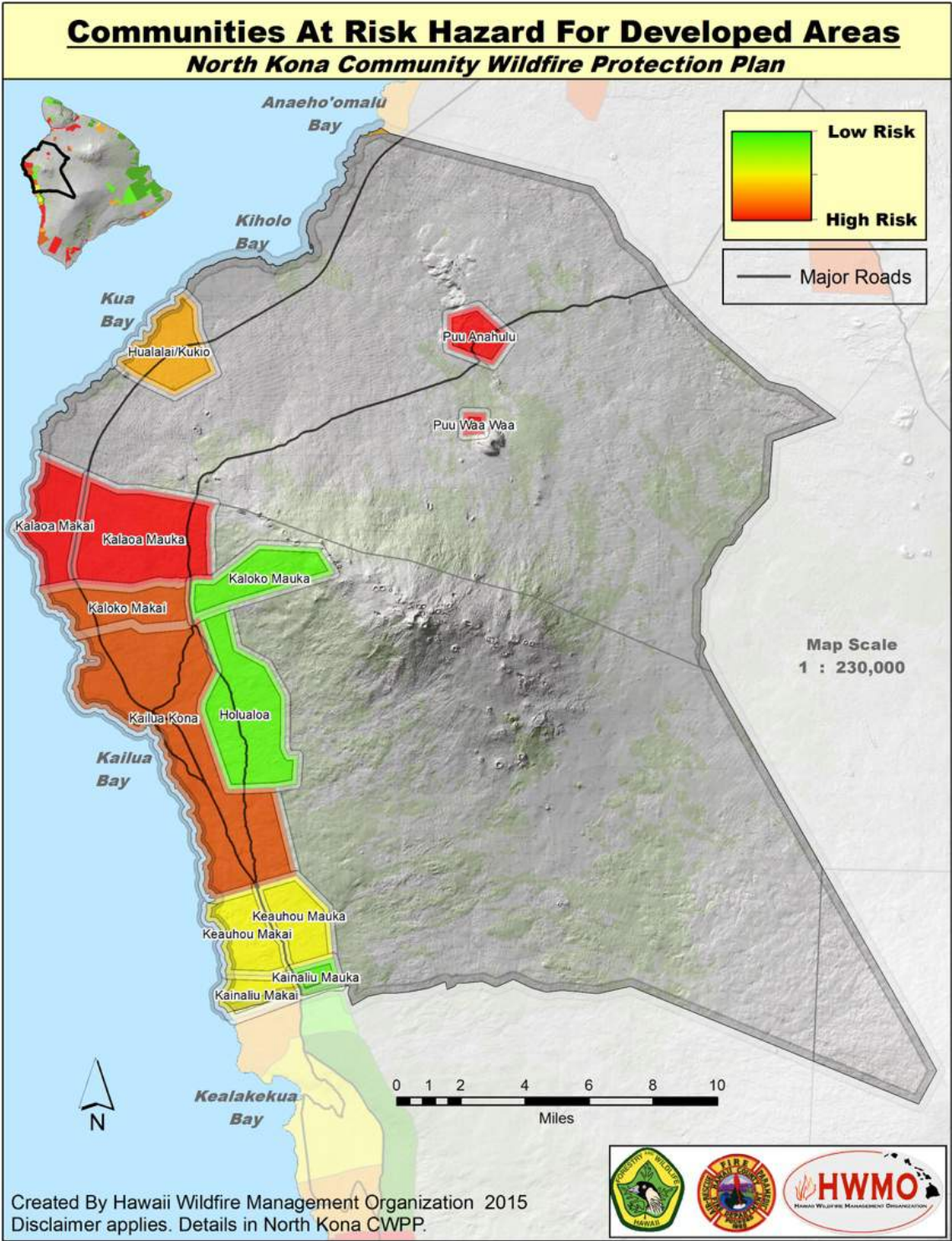
Map 16. Water features in the North Kona CWPP planning area.

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 17 provides the Island of Hawai'i's overall CARW map for context. Map 18 depicts the hazard ratings for North Kona developed areas. It is important to note that many factors were weighed into developing the hazard level, so areas with like environmental conditions may be rated differently based on other differing hazard factors, such as ingress/egress, community Firewise activities, etc.



Map 17. Island of Hawai'i 2013 Communities at Risk from Wildfires Map.



Map 18. North Kona Communities at Risk from Wildfires Map- Hazard Ratings for developed Areas.

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.
- 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 a Community Base Map (see Maps 13-16)
- Develop a Community Hazard Assessment (see *Wildfire Hazard Assessments* section)
- Identify Overall Community Priorities (see *Hazard Reduction Priorities* section)

The wildfire risk assessment also follows the guidelines and requirements of the FEMA Pre-Disaster Mitigation program and the NFP. Locally, we have opted to name the effort *Wildfire Hazard Assessment*, rather than *Wildfire Risk Assessment*.

WILDFIRE HAZARD ASSESSMENT

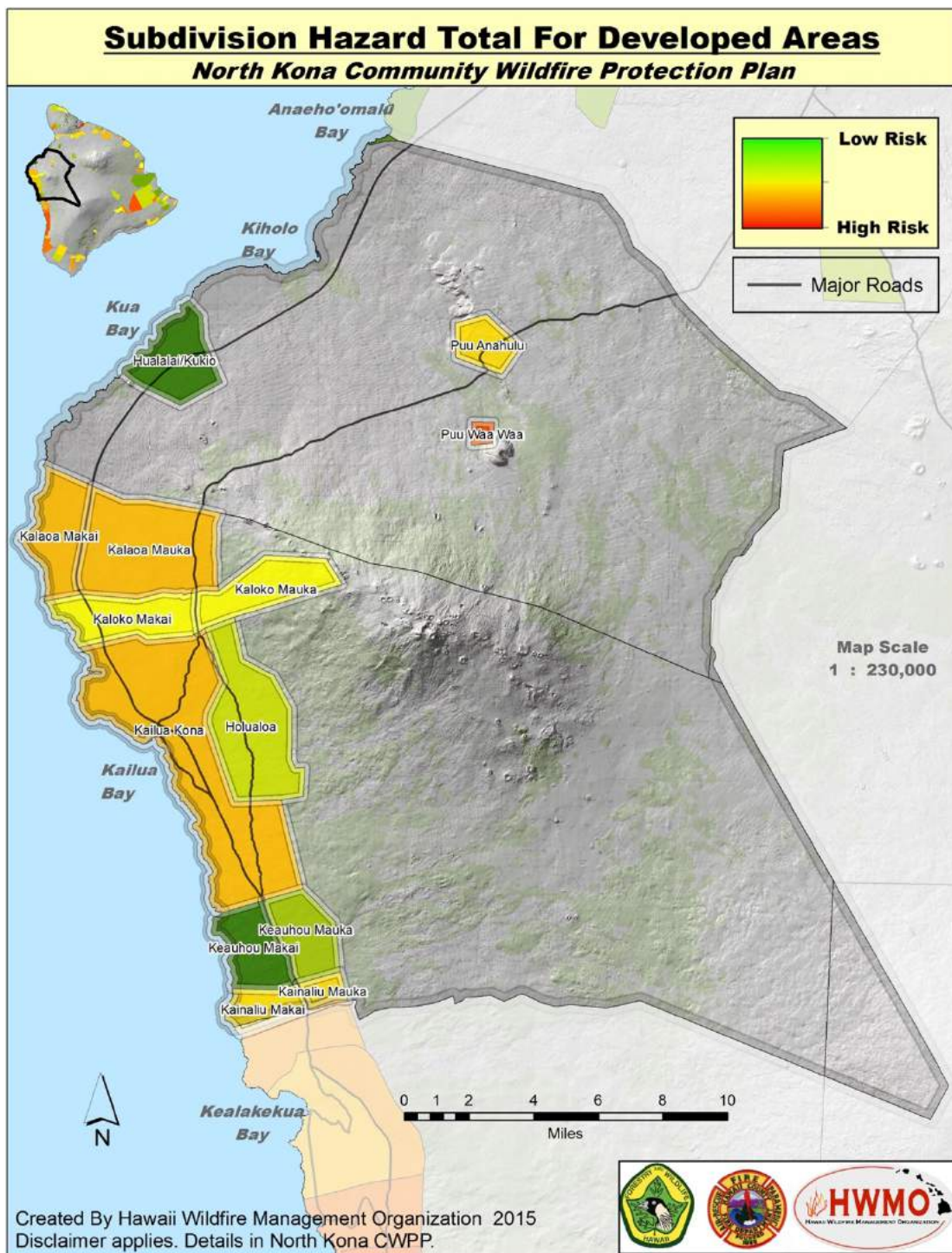
In partnership with DLNR-DOFAW and HFD, HWMO assessed the communities within North Kona for 36 wildfire hazard characteristics, which have been grouped into 5 categories. Community delineations for the assessment followed those for the CARW map. The five categories assessed for wildfire hazard are as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

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

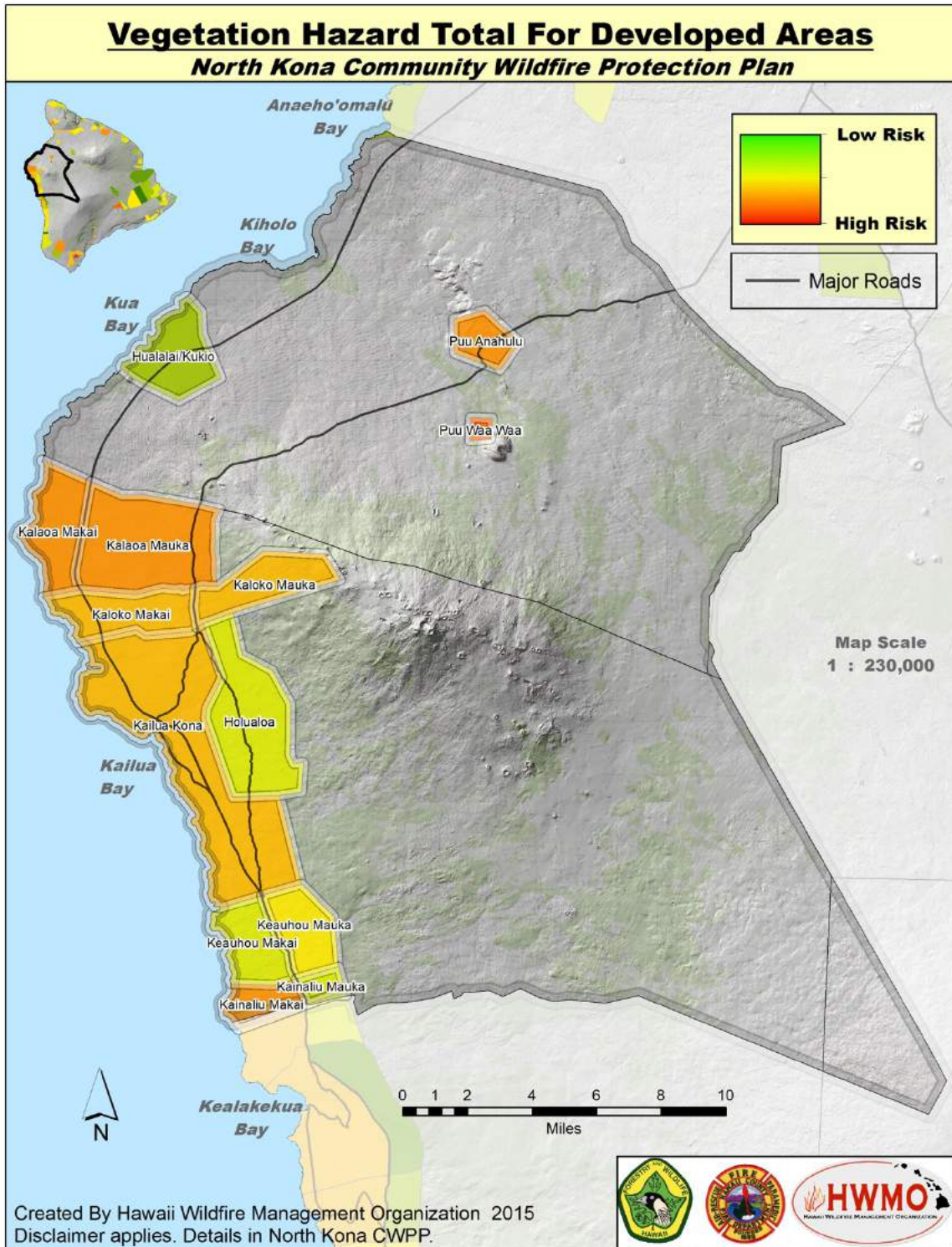
Maps are provided for each of the five categories, and demonstrate the total hazard per category based on a calculation of that category's individual hazards, as detailed in Table 6.

Hazard Category (See Maps 19-23)	Individual Hazards Assessed (Maps for each individual hazard included in Appendix B)
Subdivision Hazard Total	<ul style="list-style-type: none"> • 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 • Unmanaged, Untended, Undeveloped Lands
Vegetation Hazard Total	<ul style="list-style-type: none"> • Defensible Space: Fuels Reduction Around Homes & Structures • Fuel Loading • Fuel Structure & Arrangement • Proximity of Flammable Fuels Around Subdivision • Vegetation Within 300' Of Homes
Building Hazard Total	<ul style="list-style-type: none"> • Siding/Soffits • Roofing Assembly • Structural Ignitability • Under Skirting Around Decks, Lanais, Post & Pier Structures • Utilities Placement; Gas & Electric
Fire Environment Hazard Total	<ul style="list-style-type: none"> • Average Rainfall • Prevailing Wind Speeds & Direction • Slope • Topographic Features That Adversely Affect Wildland Fire Behavior • Seasonal or Periodic High Hazard Conditions • Ignition Risk
Fire Protection Hazard Total	<ul style="list-style-type: none"> • 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 • Wildland Firefighting Capacity of Initial Response Agency • Interagency Cooperation

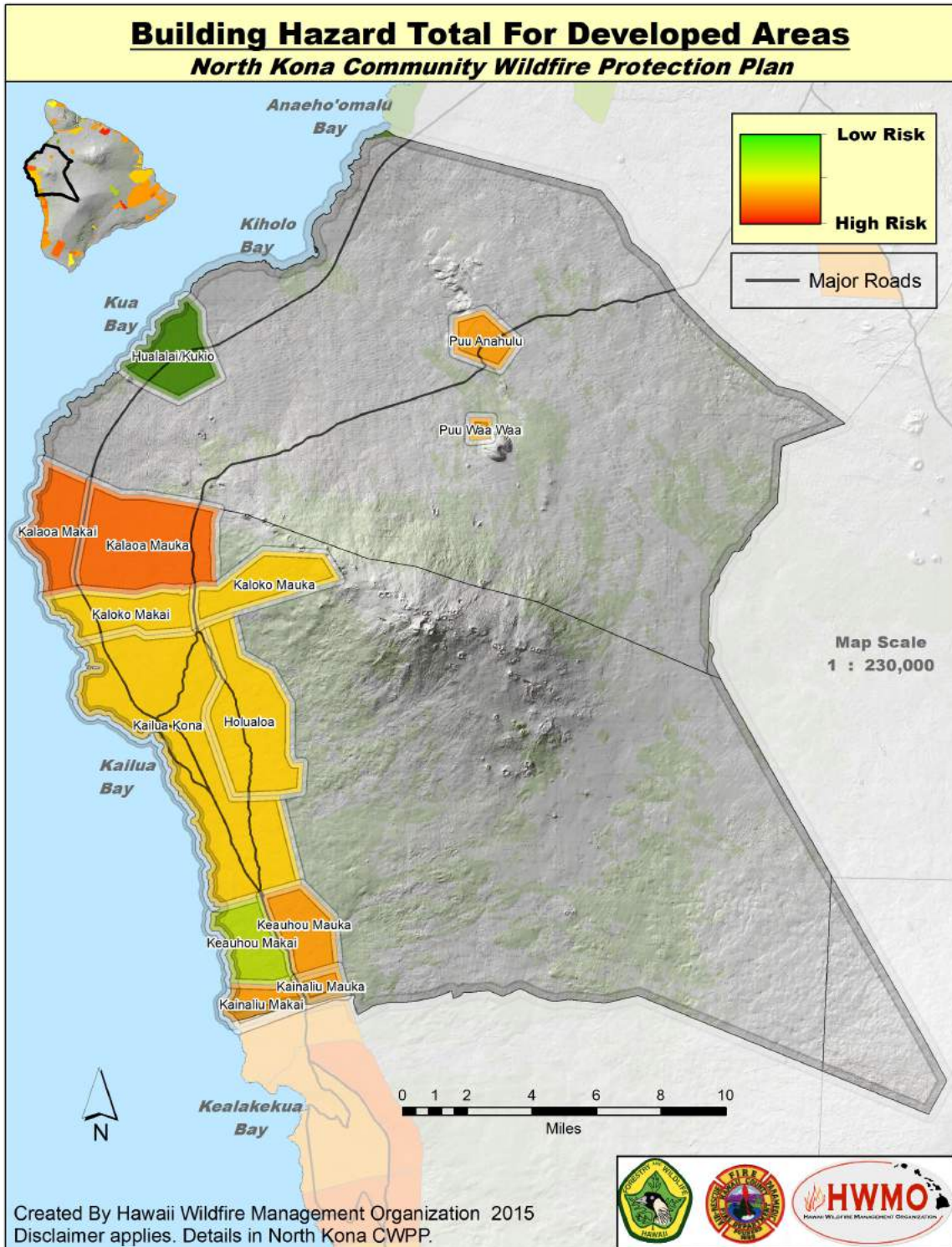
Table 6. Overview of hazard assessment categories and the individual hazards that comprise them.



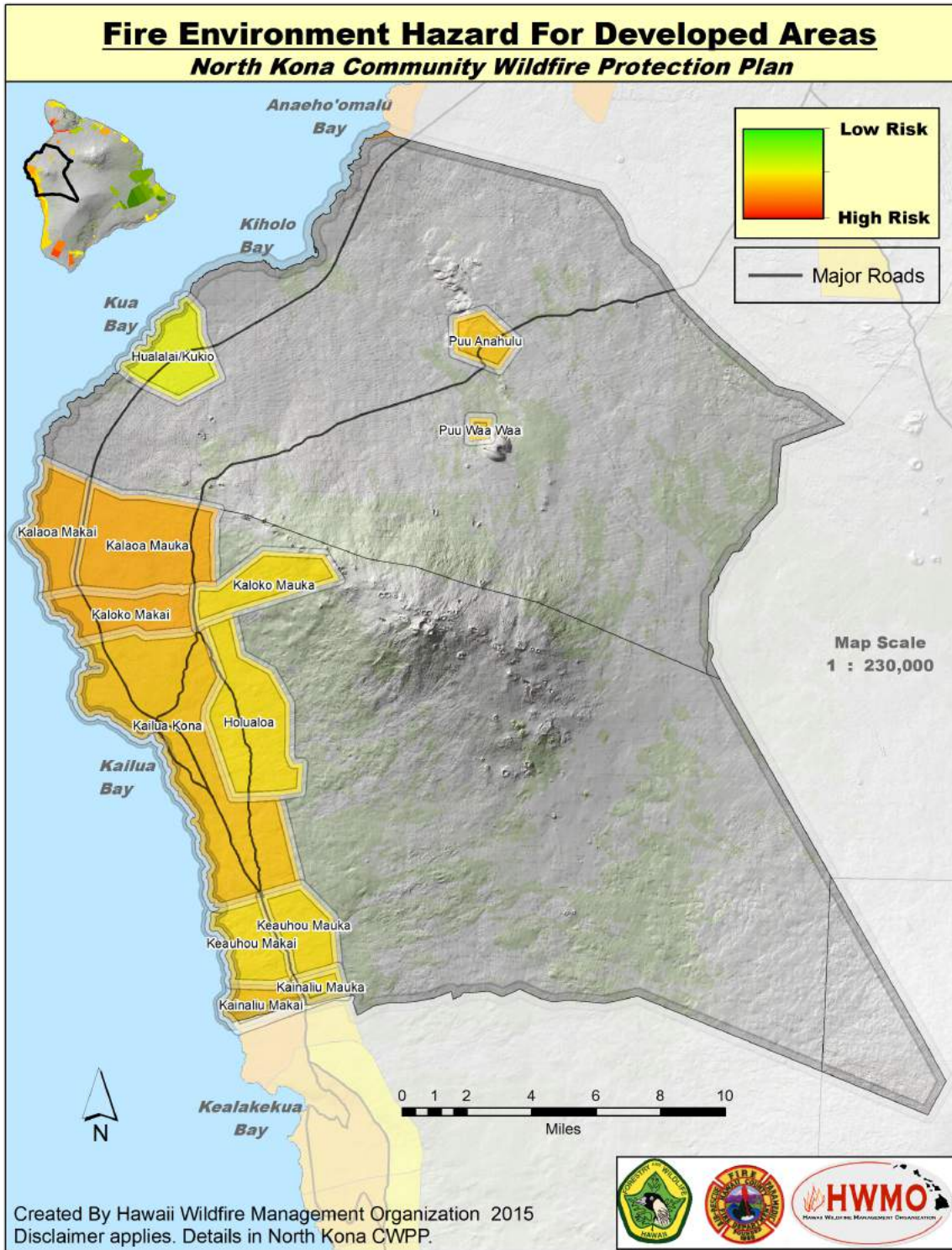
Map 19. Subdivision Hazard Total for Developed Areas of North Kona CWPP planning area. Reflects hazard assessment findings related to the following categories: Fire Service Access; Home Setbacks; Ingress/Egress; Private Landowner Firewise landscaping & Defensible Space; Proximity of Subdivision to Wildland Areas; All Season Road Condition; Road Maintenance; Road Width; Street Signs; Structure Density; and Unmanaged, Unattended, Undeveloped Lands.



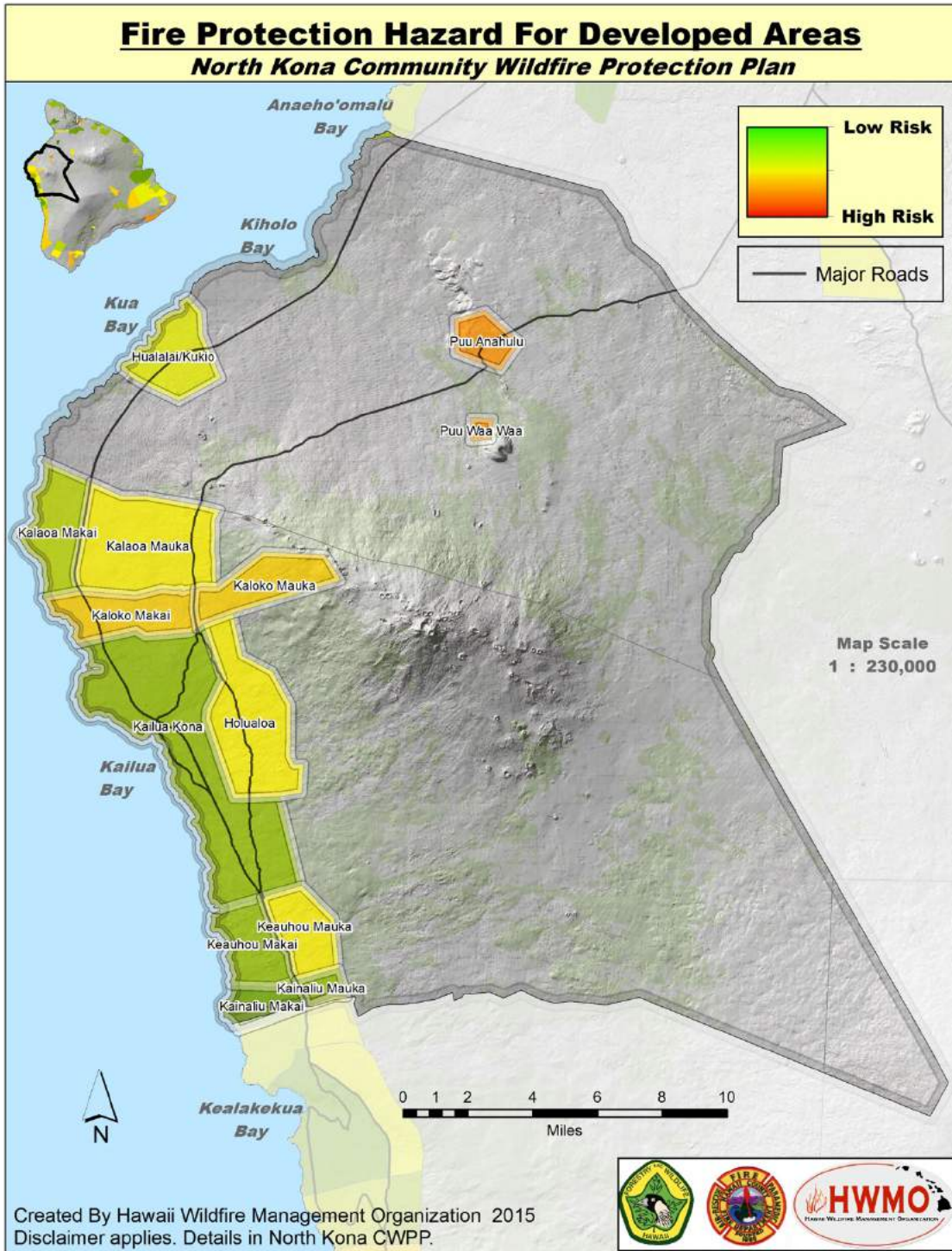
Map 20. Vegetation Hazard Total for Developed Areas of North Kona CWPP planning area. Reflects hazard assessment findings related to the following categories: Defensible Space: Fuels Reduction Around Homes & Structures; Fuel Loading; Fuel Structure & Arrangement; Proximity of Flammable Fuels Around Subdivision; Vegetation Within 300' of Homes.



Map 21. Building Hazard Total for Developed Areas of North Kona CWPP planning area. Reflects hazard assessment findings related to the following categories: Siding/Soffits; Roofing Assembly; Structural Ignitability; Under Skirting Around Decks, Lanais, Post & Pier Structures; and Utilities Placement for Gas & Electric.



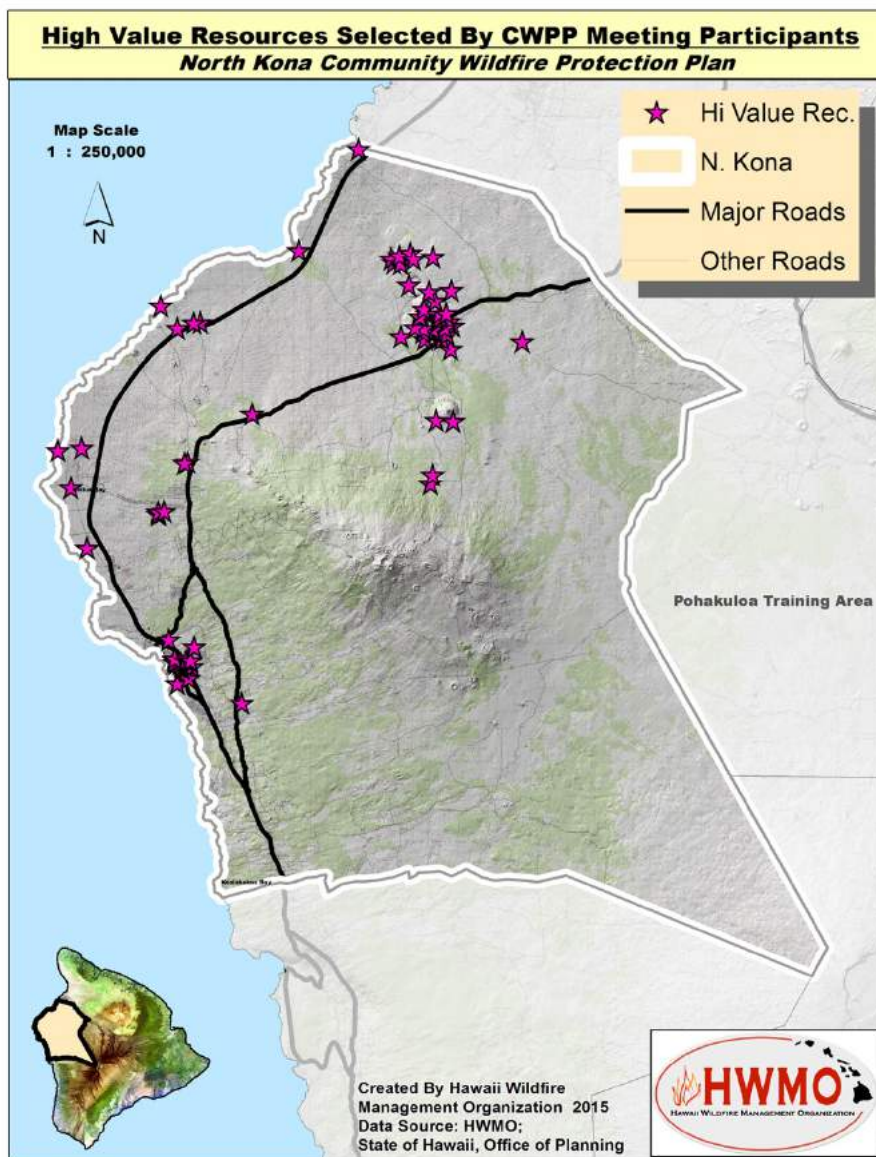
Map 22. Fire Environment Hazard Total for Developed Areas of North Kona CWPP planning area. Reflects hazard assessment findings related to the following categories: Average Rainfall; Prevailing Wind Speeds & Direction; Slope; Topographic Features that Adversely Effect Wildland Fire Behavior; and Seasonal or Periodic High Hazard Conditions; and Ignition Risk.



Map 23. Fire Protection Hazard Total for Developed Areas of North Kona CWPP planning area. Reflects hazard assessment findings related to the following categories: Firefighter 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 North Kona CWPP planning area by stakeholders during input meetings. Map 24 demonstrates the points on the map selected by public and agency participants during CWPP meetings as high priorities for mitigation and protection. These were based on their personal, cultural, and community values and priorities, as well as overall risk of wildfire. (See Photos 10-12). 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.



Map 24. Stakeholder-determined High Value Priority Resources to Protect from Wildfire in the North Kona CWPP planning area.



Photo 10. High value resources in North Kona were selected by participants who attended North Kona CWPP input meetings.



Photo 11 (above left). Community members selected areas they believe need prioritized fire protection.

Photo 12 (above right). Meeting participants discussed their own fire-related priorities as they identified places and wildfire-related issues of high personal importance to them.

EMERGENCY MANAGEMENT

FIRE SUPPRESSION CAPABILITIES AND RESOURCES

The Hawai'i Fire Department (HFD) is primarily responsible for fire protection and suppression, pre-hospital emergency medical services, land and sea search and rescue, hazardous materials response, ocean safety, and fire prevention and public education for the County of Hawai'i⁴. HFD fire stations within the North Kona CWPP planning area are listed in the Table 7. Additional stations and firefighting resources and equipment are spread across the county/island and are made available when needed if they are not already in use.

Hawai'i Fire Department North Kona CWPP Area Fire Stations	
<u>Fire Station #, Location</u>	<u>Location and/or public contact information</u>
Kailua-Kona Fire Station #7	Address: 74-5537 Palani Rd., Kailua-Kona, HI 96740 Phone: (808) 327-3545
Keauhou Fire Station, #12	Address: 78-7159 Puuloa Rd., Kailua-Kona, HI 96740 Phone: (808) 322-5627
West Hawai'i Fire Prevention Bureau	Address: 74-5044 Ane Keohokalole Hwy., Bldg. E, Kailua-Kona, HI 96740 Phone: (808) 323-4760 Fax: (808) 323-4768
Volunteer Fire Station 7-A	Kona Village, specific address n/a
Volunteer Fire Station 7-B	Kalaoa, specific address n/a
Volunteer Fire Station 7-C	Four Seasons, specific address n/a

Table 7. HFD CWPP Planning Area Fire Station Locations

A complete list of HFD equipment and resources is provided in Appendix C. DLNR-DOFAW wildland fire suppression resources are listed in Table 8.

Initial response to the majority of wildfires (as well as all medical and other emergencies) is the responsibility of HFD. DLNR-DOFAW responds to wildfire events on state lands and provides additional wildland fire fighting assistance when state lands are threatened and/or mutual aid agreements are invoked. Map 25 was developed by DLNR-DOFAW and demonstrates the independent and shared response zones of each agency in the CWPP planning area.

**Department of Land and Natural Resources – Division of Forestry and Wildlife
(DLNR – DOFAW) Suppression Resources**

Waimea:*	Waimea: 2 x 1000-gallon water tenders 2 x Type-6 engines (gamma goats)
Hilo:*	1 x 1000-gallon water tender 1 x 2000-gallon water tender 1 x 4000-gallon water tender 2 x Type-6 engines (gamma goats) 3 x Type-6 brush trucks

Table 8. DLNR-DOFAW Suppression Resources. *Vehicles will be moved back and forth between the 2 base yards depending on maintenance and fire danger rating for the area.



Map 25. Fire suppression response zones. (Source: DLNR-DOFAW)

EMERGENCY MANAGEMENT DOCUMENTS AND OTHER 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.⁵ The CWPP is designed to work in conjunction with other community, local, county, and state plans operational policies, assessments, and programs, etc., including but not limited to:

District of North Kona:

Kona Community Development Plan²

County of Hawai'i:

County of Hawai'i General Plan⁶

County of Hawai'i Drought Mitigation Strategies⁷

County of Hawai'i Multi-Hazard Mitigation Plan

State of Hawai'i:

State Drought Plan and the County Drought Mitigation Strategies⁸

State of Hawai'i Multi-Hazard Mitigation Plan⁹

State Division of Forestry and Wildlife Operational Policy for Wildfire Control¹⁰

Hawai'i Statewide Assessment of Forest Conditions and Resource Strategy¹¹

MULTIPLE-AGENCY COOPERATION AND AGREEMENTS¹²

On Hawai'i Island, there is a coordinating group established to deal with and discuss wildfire issues, mitigation, and response. The Big Island Wildfire Coordinating Group (BIWCG) was established to coordinate the programs of the participating federal, state, and local fire agencies and non-governmental organizations on Hawai'i Island and provide a forum for leadership, cooperation and the exchange of information. Additionally, it serves to further inter-agency cooperation, communications and coordination, and to implement directions and standards for various incident management activities. By pooling the resources of the various agencies, the combined strength and efforts would afford the people of the Island of Hawai'i more extensive and effective protection of lives, property, natural and cultural resources.

The Big Island Wildfire Coordinating Group:

- Provides leadership and a coordinated direction to fire management programs on the island of Hawai'i.
- Provides a forum for the exchange of ideas and the development of consistent policies.
- Fosters cooperation, avoid wasteful duplication, and facilitate maximum efficiency in fire management programs through coordinated planning and the utilization of shared resources;

- Establishes and maintains an interagency approach to fire management programs through the development and nurturing of interagency bonding and facilitation of a high degree of professionalism, trust, and mutual assistance among member agencies;
- Identifies issues, establish priorities, develop alternatives, and recommend a unified course of action to respective agency administrators.

Core members include:

- | | |
|--|---|
| • Hawai'i Fire Department | • U.S. Army |
| • Hawai'i County Civil Defense Agency | • Hawai'i Community College |
| • Dept. of Land & Natural Resources -
Division of Forestry and Wildfire | • Hawai'i Wildfire Management
Organization |
| • National Park Service | • Pacific Fire Exchange |
| • U.S. Fish & Wildlife Service | • Dept. of Transportation -Airports Div.,
Hawai'i District |

Additionally, all agencies have cooperative agreements in place to promote, enable, and coordinate mutual aid for fire suppression purposes.

EVACUATION PROTOCOLS AND DISASTER PREPAREDNESS

Evacuation protocols for neighborhoods and areas in North Kona have been determined for natural hazards such as tsunamis, and can be found in the documents listed below. However, fire safety zones for all neighborhoods and areas of North Kona are yet to be determined, and are a priority action determined by the public as part of this CWPP process.

The following resources are available for disaster preparedness information:

- County of Hawai'i Civil Defense Agency Website¹³
- Hawai'i Disaster Preparedness: Get Ready Hawai'i, County of Hawai'i Webpage¹⁴
- Hawai'i County Emergency Response Team Program (CERT in North Kona is based in Palisades)¹⁵
- Hawai'i Wildfire Management Organization Website¹⁶

FIRE CODE

The Hawaii State Fire Code is the 2012 NFPA 1, Uniform Fire Code. The state 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 North Kona CWPP is the chapter on the WUI, which is described in 2012 NFPA 1, Chapter 17.

Hard copies of the Hawai'i State Fire Code and the Hawai'i County Fire Code can be found at the County Clerk's Office.

HAZARD REDUCTION PRIORITIES NORTH KONA

PURPOSE AND METHODS

Public and agency participants during the CWPP planning process identified hazard reduction priorities for North Kona. 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 hazards through pro-active wildfire mitigation. HFRA guidelines were followed by including community hazard reduction priorities, hazardous fuels reductions, and recommendations to reduce structural ignitability.

STAKEHOLDER CONCERNS AND RECOMMENDED ACTIONS

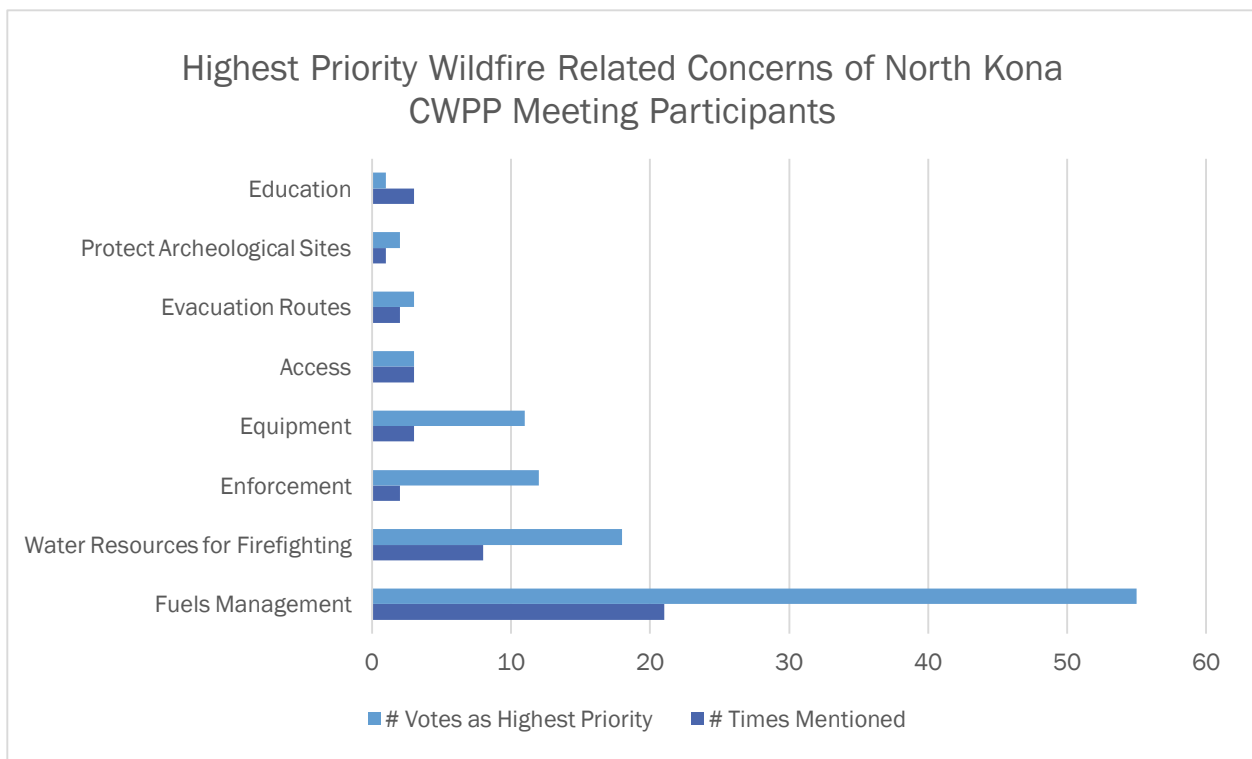


Figure 1. North Kona CWPP Participant Highest Wildfire-Related Priorities.

HWMO held four meetings for the general public and several meetings with fire response agencies and natural resource managers to collect input and record wildfire-related concerns and recommended actions. Public meetings were held in Pu‘u Anahulu, Kailua-Kona (2 meetings), and Kealakehe Elementary School. Additional input was solicited from the Big Island Wildfire Coordinating Group, decision makers, large landowners, and other stakeholders as noted in the Planning Process chapter of this document.

While North Kona 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. Concerns were recorded two ways: 1) number of times it was mentioned as a concern, and 2) number of overall votes it received once participants were asked to vote on what they believe are the highest priorities. Figure 1 displays both.

THREE CATEGORIES OF STAKEHOLDER CONCERNS AND RECOMMENDED ACTIONS

Public, agency, and decision maker input was extensive and has been organized to align with the categories used within the National Cohesive Wildland Fire Management Strategy.¹⁷ Refer to Appendix A for detailed public input statements per category.

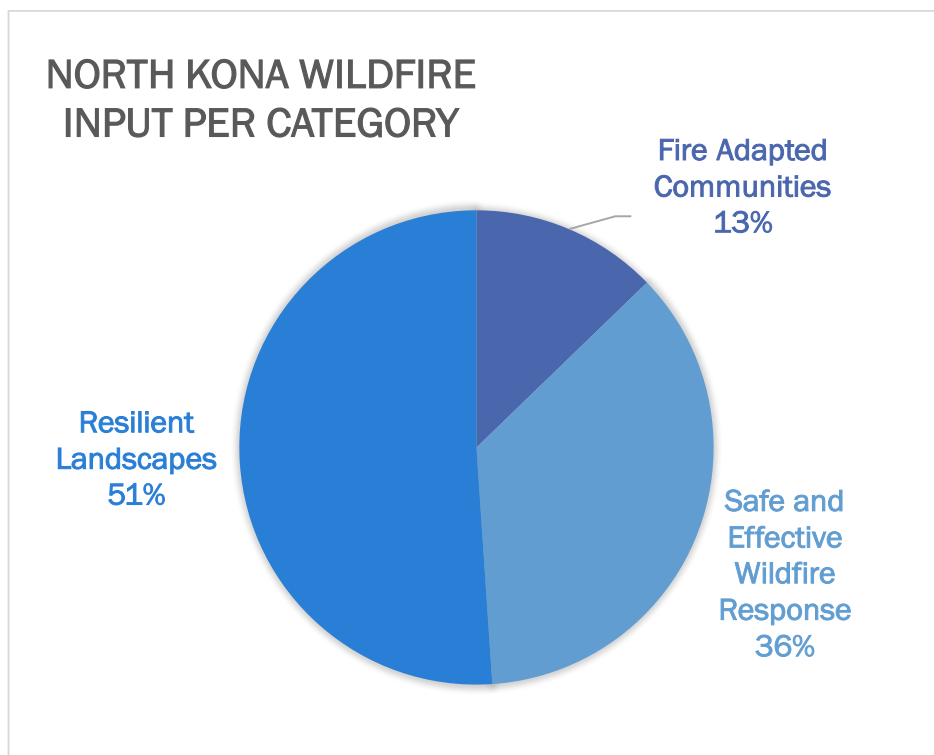


Figure 2. Community Concerns Organized by Cohesive Strategy Categories.

The National Cohesive Wildland Fire Management Strategy (subsequently referred to as Cohesive 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 North Kona are organized according to the following categories so that they fit into the national framework of priorities and funding opportunities:

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

Figure 2 indicates how much of the participant concerns for North Kona falls within each category.

FIRE-ADAPTED COMMUNITIES

13% of North Kona public input was related to the need to work toward increased fire greater awareness, readiness, prevention, and general fire adaptation within communities. Agency representatives have indicated that increasing community awareness and preparedness is a high priority for them, and would be much higher on the list than how the public-at-large prioritized it. For both groups, citizen engagement 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."¹⁸ 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 coexist with wildland fire."¹⁹

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. These are all aligned with the framework and objectives for Fire-Adapted Communities. Figure 4 depicts the roles and activities of all members of society toward becoming fire-adapted.

This CWPP was developed with a diversity of stakeholders with homes, businesses, personal interests, and jurisdictions in the North Kona 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 North Kona. These are the basic tenets of becoming fire-adapted. For the purposes of analyzing and presenting the North Kona 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 (For more information, see *Resilient Landscapes* and *Safe and Effective Wildfire Response* sections).

The input related to the human side of wildfire preparedness could be grouped into four categories:

- Developing and maintaining evacuation routes and opportunities for residents to practice evacuation protocols.
- Protecting archeological sites from damages caused by fire and firefighting efforts.
- Installing roadside signage regarding preventing wildfire ignitions.
- Creating improved opportunities for proper greenwaste disposal.

Figure 3 demonstrates the percentage of CWPP participant votes each topic received as being the highest priority.

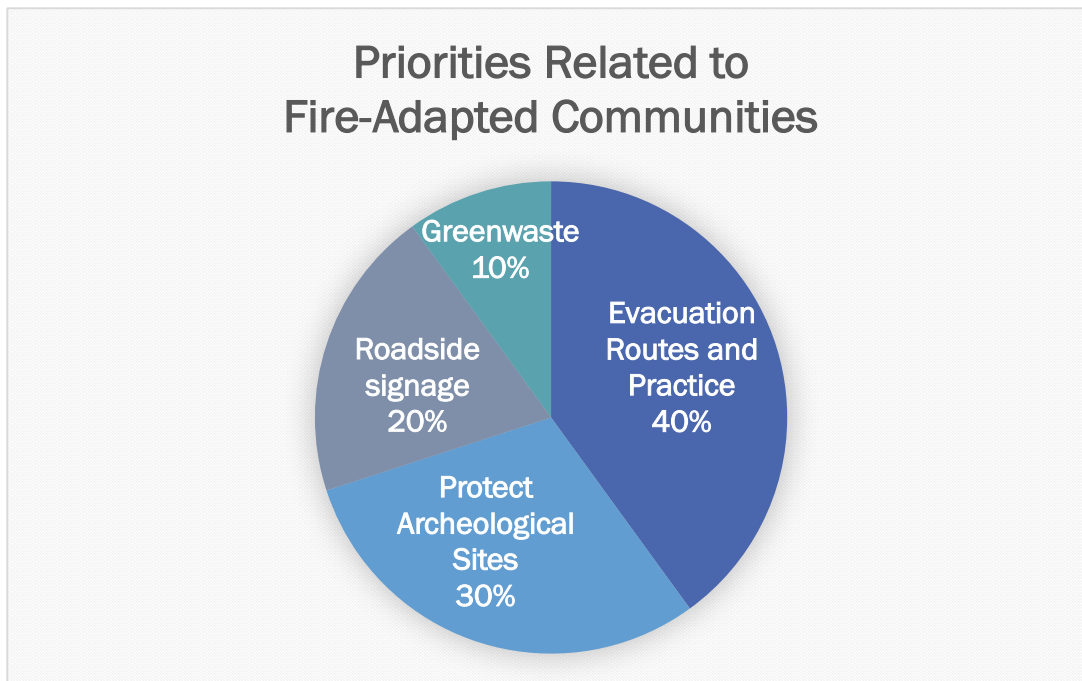


Figure 3. Community Concerns Related to the human side of wildfire preparedness and protection, as part of working toward Fire-Adapted Communities goals.

The national Fire-Adapted Communities effort has an informative website and set of informational materials related to becoming fire-adapted. The following infographic (Figure 4) provides an overview of the roles and actions various community members can take to improve fire protection in and around communities.



Figure 4. Fire-Adapted Communities Infographic.²⁰ 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.

RESILIENT LANDSCAPES

The Resilient Landscapes category focuses on all input related to restoring, protecting, or maintaining landscapes. 51% of all input for North Kona fell within the Resilient Landscapes category. Every priority provided by meeting participants in North Kona except for one pertains to vegetative fuels management. The non-vegetation management priority is for increased landscape restoration and protection.

Of all fuels management related concerns, maintenance of firebreaks and enforcement of brush abatement requirements were the highest priority concerns, followed by managing fuels on empty lots,

using grazing to reduce fuels, managing silver oak, and increasing DLNR capacity to manage fuels. Figure 5 depicts the public’s fuels management priorities.

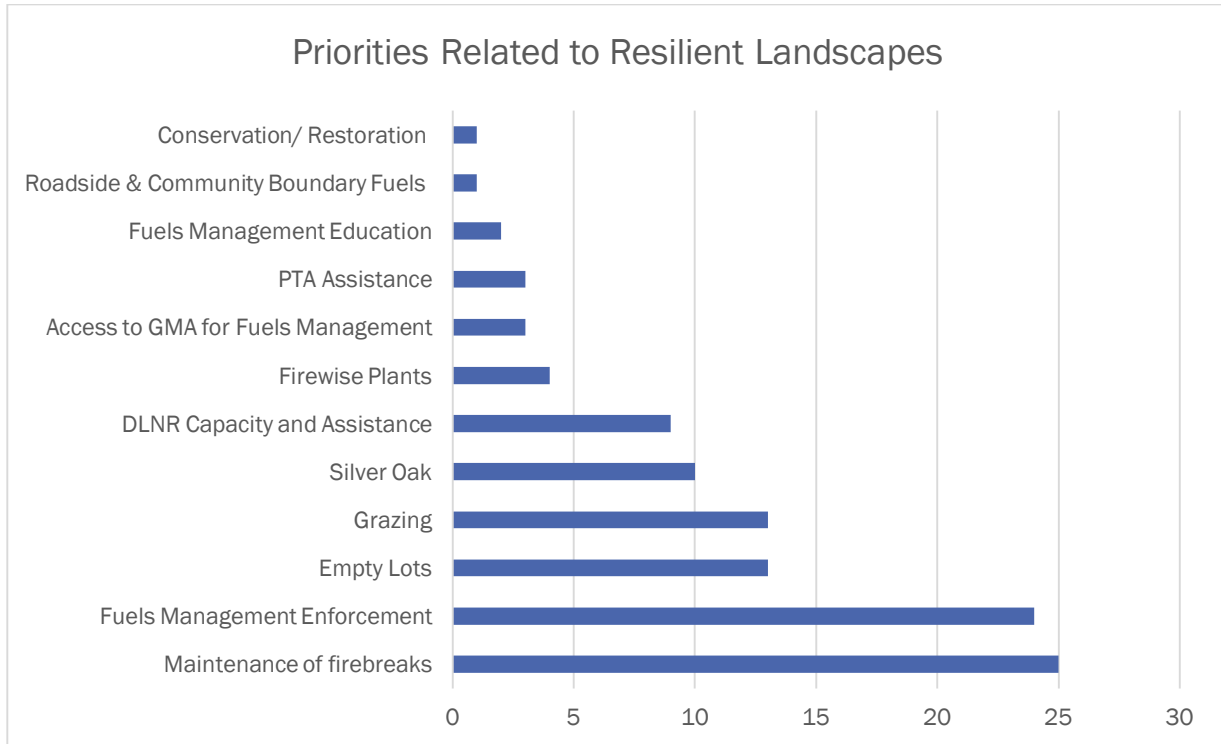


Figure 5. CWPP participant input related to restoring and maintaining landscapes to reduce wildfire threat/impact.

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 North Kona (and Hawai’i in general) are human-caused, ignition prevention largely is a matter of community outreach and education. 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. North Kona CWPP participants provided several concerns and priorities related to wildfire response, detailed in Figure 6.

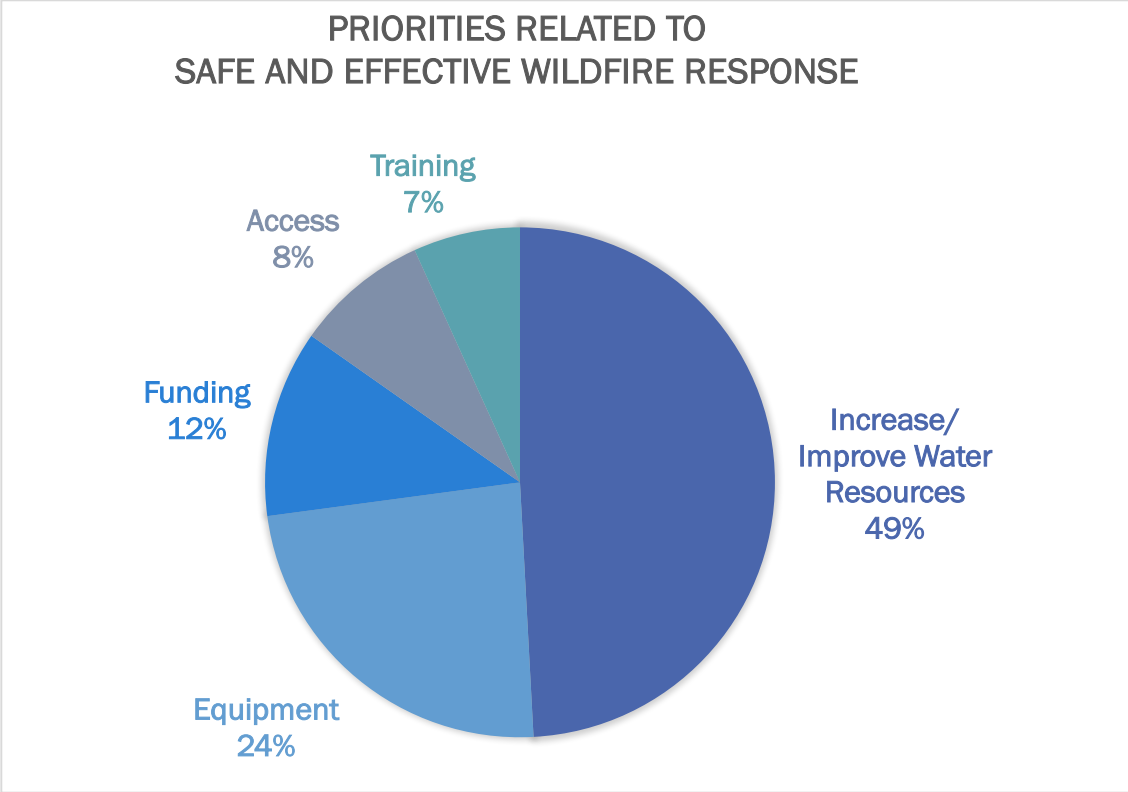


Figure 6. Public input related to safe and effective wildfire response.

North Kona priorities for improving wildfire response focused heavily (49% of all input) on increasing and improving water resources. Recommendations include installing helicopter diptanks for aerial suppression, improving pressurized water, inspecting and maintaining hydrants, mapping water resources for firefighters, and making water resources more affordable for grazing operations to aid in fuels reduction.

The next highest priorities include increasing firefighting equipment such as off-road brush trucks and increasing funding for water resource development and additional wildfire-specific equipment. Other priorities involve improving access for firefighters to get into mauka (upland) areas and for residents to evacuate safely and quickly. Training was the final priority of public meeting participants, with large landowners, land managers, and ranchers asking for training to assist with “back-burning” and incident command.

All public input statements are aggregated and summarized in Appendix A.

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 North Kona	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. **21, 22, 23**

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.

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.

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 8). 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” (Figure 8).
- Cut or mow annual grass down to a maximum height of 4 inches.



Figure 7. Defensible space zones around structures.²⁸

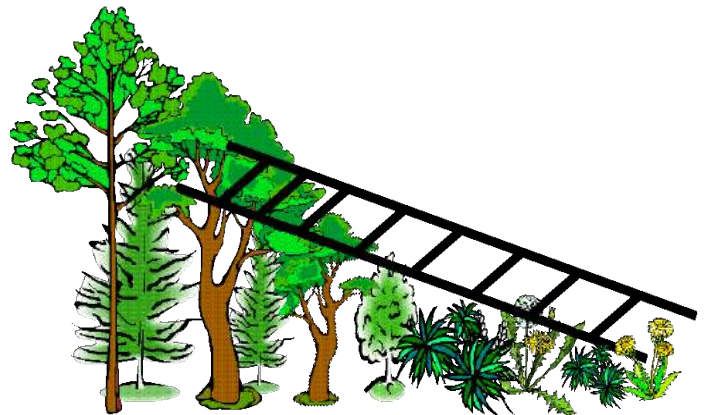


Figure 8. Ladder Fuels Diagram.¹ Ladder fuels form a pathway for ground fires to climb vegetation and become crown fires, which are much more difficult to suppress. It is important to limb low hanging branches and keep ground vegetation short so that vegetation is separated inhibiting fire from easily “climbing” up to canopy where wind is often stronger.

- 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 un-managed 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:

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



Figure 9. Covering vents with 1/8-inch or smaller metal mesh blocks embers from entering a home or structure.



Figure 10. Keep windows free of vegetation to reduce likelihood of heat-caused breakage that lets embers into your home.



Figure 11. Make sure your eaves are enclosed with non-combustible materials to prevent ember entry.



Figure 12. Rain gutters should have screens to keep leaf debris from accumulating. Maintain gutters to keep them clear and clean.

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.

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.



Figure 13. Wood fencing can act like a fire wick straight to a home. Use non-combustible materials for all fencing and yard structures.

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

NORTH KONA COMMUNITY WILDFIRE PROTECTION PLAN

The North Kona CWPP Action Plan follows the guidelines of HFRA, which includes developing an action plan along with an implementation and maintenance strategy.

The North Kona 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 and agency concerns and input served as the basis for the projects listed below and will continue to 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. The Big Island Wildfire Coordinating Group intends to regularly evaluate progress on projects. Additional projects can be attached as appendices.

NEAR-TERM ACTION PLAN

The following table details the projects that have been prioritized for the next five years.

Project	Anticipated Cost	When	Potential Lead
Install and maintain fire prevention signage throughout project area.	\$10,000/year	ASAP	DOT
Improve/increase roadside vegetation management.	TBD	ASAP	DOT
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
Develop wildfire prevention and drought awareness and preparedness materials.	Variable	In Initial Phases	HWMO
Launch wildfire and drought awareness campaign.	Variable	In Initial Phases	HWMO, HFD, DLNR-DOFAW
Host wildfire preparedness information and materials for residents and decision makers on website.	Variable	Ongoing	HWMO, HFD, DLNR-DOFAW
Utilize social media to promote wildfire awareness.	Variable	Ongoing	HWMO, HFD, 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.	\$100K -\$300K per diptank	Planning, Early Scoping	DLNR-DOFAW/Private Ranch
Maintain firebreaks/fuelbreaks in state forest reserves and private ranch parcels. Propose new fire breaks in needed areas, Associated EA/EIS.	\$50,000 Annually	Planning, Early Scoping	DLNR-DOFAW
Fuel reduction projects in state forest reserves.	Varies, part of broader workplan and set of expenses	Planning, Early Scoping	DLNR-DOFAW
Green waste removal and recycle programs.	Variable on area and frequency of pickup	ASAP	TBD
Work with large landowners to encourage access management.	TBD	ASAP	TBD, various
Forest health improvement thru vegetation thinning projects.	Varies, part of broader workplan and set of expenses	TBD	DLNR-DOFAW
Develop pre-fire mitigation and fire management plans for reserves and large landholdings.	TBD	TBD	HWMO/DLNR-DOFAW/TBD
Develop access and resource maps for firefighters.	TBD	ASAP	HWMO/DLNR-DOFAW/TBD
Fire Mitigation Plan and EA/EIS for Pu'u Wa'awa'a Forest Reserve.	TBD	ASAP	DLNR-DOFAW
Community Fire Mitigation Plan for Pu'u Anahulu (Pu'u Lani Ranch Subdivision) – perhaps MOU to allow community members to assist in vegetation removal around the subdivision.	TBD	ASAP	DLNR-DOFAW/HWMO /TBD
Grazing Management Plan (i.e. vegetation management plan) for Pu'u Wa'awa'a Forest Reserve & EA/EIS. Implement grazing to reduce fire fuel loads.	TBD	ASAP	DLNR-DOFAW
Plan for fuels reduction along Māmalahoa Highway – determine where responsibilities lie for HDOT and DLNR and how to cooperate on fuels management.	TBD	ASAP	HDOT/DLNR-DOFAW/HWMO
Research on post-fire restoration and best management practices for after a fire.	TBD	TBD	Extension/HETF/HWMO
Develop access and resource maps for firefighters for Pu'u Wa'awa'a Forest Reserve & Forest Bird Sanctuary.	TBD	TBD	DLNR-DOFAW/HWMO
Update the Fire Management Plan for Kaloko-Honokohau NHP.	Variable	Annually	NPS
Maintain Fuel Break on the south side of Kaloko-Honokohau NHP.	\$10-20,000	Annually	NPS

Maintain firebreaks, fuelbreaks, and roads in Pu'u Anahulu and Pu'u Wa'awa'a (approx. 60 miles).	\$50,000/year	Annually	DLNR-DOFAW
Improve water catchment and delivery in Pu'u Wa'awa'a.	\$1M	In Process with CIP funding	DLNR-DOFAW

Table 10. Near-Term Action Plan and Projects.

LONGER-TERM ACTION PLAN

In addition to projects that are ongoing or being initiated at the time of writing this CWPP, numerous other longer-term priority projects were proposed by participating agencies and organizations involved in the CWPP planning process. The Table 11 details the proposed longer term (5+ years) projects in no priority order. Projects are to be completed as funding, personnel, and opportunities become available to implement them.

Proposed Project	Anticipated Cost	Lead
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	TBD
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.	\$100K- \$300K per dip tank	TBD
Increase outreach to community associations.	Variable	HWMO, DLNR-DOFAW, HFD
Provide wildfire education for decision makers .	TBD	HWMO, DLNR-DOFAW, HFD
Seed collection and storage for post fire replanting.	ASAP	DLNR-DOFAW/Hawai'i Island Native Seed Bank? Lyon Arboretum?
Work with large landowners to encourage fuels management.	TBD	HWMO, DLNR-DOFAW, HFD
Work with partners and residents to garner support for increasing DLNR-DOFAW's budget for fire response.	TBD	HWMO, Public
Submit WUI proposals for projects in the CWPP area.	TBD	DLNR-DOFAW, HWMO, Private
Work with state and federal land-owner assistance programs to incorporate wildland fire concerns.	TBD	TBD, Possibly DLNR-DOFAW, HWMO
Work with large landowners to encourage access management.	TBD	TBD, various
Forest health improvement thru vegetation thinning projects.	Early scoping	DLNR-DOFAW

Fuel treatment mitigation along major roadways (treatment with foam gels, etc.)	TBD	DOT
Develop MOU with USFWS/DLNR-DOFAW to allow seed storage of T&E & SOC plant seeds at Lyon Arboretum/Hawai'i Island Seed Bank/others.	TBD	Entities involved in MOU
Research on what vegetation associates are the most fire prone – e.g. Should silver oak be allowed to stay to shade out grasses or removed?	TBD	UH Extension
Create a new fuel break on the north side of Kaloko-Honokohau NHP.	\$30-40,000	NPS

Table 11. *Proposed Future Projects.*

CWPP IMPLEMENTATION AND MAINTENANCE

PLAN IMPLEMENTATION AND MAINTENANCE

HFRA requires that HFD, Hawai'i County Civil Defense Agency, and DLNR-DOFAW all agree on the final contents of the North Kona 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 North Kona CWPP will rely heavily upon 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 North Kona 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 Big Island Wildfire Coordinating Group, will provide technical support, identify and coordinate funding when possible, and serve as a centralized resource for wildfire risk reduction efforts in North Kona. Together, representatives will identify sources of funding for projects, document the successes and lessons learned from those projects, and evaluate and update the CWPP as needed and as possible.

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 year to kickstart community involvement in implementing the actions identified in this plan. Additionally, HWMO will be working 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 North Kona 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 government representatives have a high level of interest in the protection of the North Kona area from wildfire, and have reviewed and support this CWPP. Contact information for principal government stakeholders is listed below.

Hawai'i Fire Department

Darren Rosario, Fire Chief
25 Aupuni Street, Suite 2501
Hilo, HI 96720



Civil Defense Agency, County of Hawai'i*

Emergency Management Administrator
920 Ululani Street
Hilo, HI 96720



* There is no Emergency Management Administrator in place at time of CWPP signing, (December 2016). Once hired, the new administrator will be apprised of this CWPP and invited to sign an appendix to communicate support, endorsement, and collaboration on CWPP implantation.

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



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 action plan projects, or for printed copies, please contact:



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65-1279 Kawaihae Rd. Suite 211
Kamuela, HI 96743
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¹² **Big Island Wildfire Coordinating Group Charter.** 2013. Contact a BIWCG member for a copy.

¹³ **County of Hawai'i Civil Defense Agency Website** <http://www.hawaiicounty.gov/civil-defense/>

¹⁴ **Hawai'i Disaster Preparedness: Get Ready Hawai'i, County of Hawai'i Webpage**

<http://www.honolulu.gov/getreadyhawaii/hazards/hazards-hawaii.html>

¹⁵ **County of Hawai'i CERT Program.** <http://www.hawaiicounty.gov/civil-defense-cert>

¹⁶ **Hawai'i Wildfire Management Organization Website.** [Hawaiiwildfire.org](http://hawaiiwildfire.org)

¹⁷ **National Cohesive Wildland Fire Management Strategy** <http://www.forestsandrangelands.gov/strategy/>

¹⁸ **Frequently Asked Questions – Fire-Adapted Communities.** USDA Forest Service, Fire and Aviation. 2014.

http://www.fs.fed.us/fire/prev_ed/fac/faqs.pdf

¹⁹ **National Wildfire Coordinating Group. 2014. Glossary of Wildland Terminology.** PMS 205.

<http://www.nwccg.gov/?q=filebrowser/download/1828>

²⁰ **Fire-Adapted Communities Infographic. Do you know your role?** <http://fireadaptednetwork.org/about/learn-about-wildfire-resilience/>

²¹ **Ready, Set, Go!** <http://www.wildlandfirersg.org>

²² **Hawai'i Wildfire Management Organization.** Ready, Set, Go! Personal Wildland Fire Action Guide- Hawai'i Edition. <http://www.hawaiiwildfire.org>

²³ **Firewise** <http://www.Firewise.org>

²³ **Ladder Fuels diagram.** <http://people.uwec.edu/jolhm/eh3/group9/wildfirehowfireworks.htm>

APPENDICES

Appendix A: North Kona Community Wildfire Protection Plan Participant Input

Appendix B: Wildfire Hazard Assessment Maps for North Kona

Appendix C: Hawai'i Fire Department 2016 Apparatus and Vehicle Inventory



Appendix A
 North Kona Community Wildfire Protection Plan
 Participant Input

<i>Input Related to Fire-Adapted Communities</i>	
<i>Concern</i>	<i>Recommended action</i>
Access and Evacuation	
Evacuation	Adequate evacuation routes (ingress/egress); identify public transportation (tour, school, Hele On buses); pre-fire plans for homes; make it mandatory for new residents to have RSG guides; wise development; where people are going to go - meeting place (have info. posted in communities)
Evacuation issues - be out of way of firefighters	Designated evacuation routes identified and practiced. What items do you prepare to take; emergency numbers, meeting place
Protect Archeological and Historical Sites	
Archaeological sites & burials on private & state lands protection	Mitigate fire risk to sites via firebreaks/grazing
Community Engagement and Education	
Evacuation education/plan/protocol/procedure; Traffic management	Training; Incident Command setup; property management person send an email blast; education of board members; all residents need to know evacuation plan - send out a notice & email blast/post info at mailboxes (evacuation, procedure, route, map); for newcomers and new subdivisions - include in homeowner manual wildfire issues and evacuation plan and fire prevention contacts)
Educate BICCE that green waste piles are a fire hazard	Phone call or inspection by FD
Roadside ignitions	Extinguisher requirement for cars; Signage; Roadside Call boxes to alert FD

Note: All input is transposed directly from participant meeting posters, and has been combined where appropriate but not otherwise filtered or reworded.

Input Related to Resilient Landscapes

<i>Concern</i>	<i>Recommended action</i>
Fuels Management	
Debris around homes	Clearing dead fuels; Pines I & II should meet together to discuss wildfire issues. Pines I has a Fire Committee
Empty lots and unmanaged fuels	Increase size/width of fire break; maintenance of empty lots; clear dead fuels (keawe); change fencing materials and home siding to hardy board (cement); know who adjacent property owners are & contact info.; expense (need law for all nearby properties (not just adjacent) and along roadways). Support legislation with penalties
Adjacent properties that have unmanaged fuels need penalties	Laws (10 points) - unmanaged fuels - properties to be cleared for safety at owners
Surrounded by state land with abundant weeds/grass	Change CC&Rs; Get state to manage veg.; Improve awareness - community newsletter, annual meeting (pinpoint areas to be managed by 3/28/15 - email blast); Insurance incentives; need HFD to tell people about fire threat; Clearing around homes; Firewise example homes to showcase
29 Undeveloped acres ringed by houses	Neighbors help keep down weeds; HOA consider grazing unmanaged veg.
Lots of hazardous brush next to homeowners	Weed abatement laws 50'-100'
Educate BICCE that green waste piles are a fire hazard.	Phone call or inspection by FD
Helicopter in weed whacking & control roadside & empty lot overgrowth.	Homeowners association/HWMO help fund weed whacking days to help out. Fences for livestock grazing.
Hale Koa and Buffel grass on 2 perimeters - Hualalai Rd. has lots of unmanaged vegetation /dry fuels - hale koa seeds helicopter and jump great distances	Firewise landscape & sprinklers turned on around community and near perimeter with fire; drought resistant plants; trim plants back to small shrubs; Use fire resistant plants in re-plantings.
Create access to GMA above Pu'u Lani to maintain firebreak & grass control	Work with state and Pu'u Lani homeowners Association
Ka'upulehu fire fuel needs to be controlled & maintained	Fund fence line or rebuild stonewall along fence line of highway to be able to graze up to area of concern
Advise State to manage fuel load & fire breaks at Game Mgmt. area of Pu'u Anahulu adjacent to Pu'u Lani	Graze it with cattle. Create fire breaks and maintain them.
Helicopter in weed whacking & control roadside & empty lot overgrowth.	Homeowners association/HWMO help fund weed whacking days to help out. Fences for livestock grazing.
Archaeological sites & burials on private & state lands protection	Firebreaks/Grazing
Adjacent property - unmanaged fuels	Increase size/width of fire break; maintenance of empty lots; clear dead fuels (keawe); change fencing materials and home siding to hardy board (cement); know who adjacent property owners are & contact info.; expense (need law for all nearby properties (not just adjacent) and along roadways). Support legislation with penalties
Silver oak removal debris - fuels	DLNR needs to fund permanent removal and control

Note: All input is transposed directly from participant meeting posters, and has been combined where appropriate but not otherwise filtered or reworded.

Fire break at Pu'u Lani Ranch	Needs maintenance (herbicide doesn't address fire issue)
Fountain grass	Reduce
Fire breaks along new Saddle road intersection with Hawaii Belt Rd.	Create and maintain firebreaks
Advise PTA/Federal Govt. to manage area mauka of Pu'u Anahulu/Pu'uwa'awa'a	Graze it with cattle. Create and maintain firebreaks.
Reduce Silver Oak population as funding allows	Herbicide funding as did at Pu'u wa'awaaa (cut down)
Silver oak removal debris - fuels	DLNR needs to fund permanent removal and control
Advise State to manage fuel load & fire breaks at Game Mgmt. area of Pu'uAnahulu adjacent to Pu'u Lani	Graze it with cattle. Create fire breaks and maintain them.
Hazardous Fuels	More firebreaks (property adjacent to Hualalai Elderly); Hina Lani and Ka'iminani trees need fuel treatments (industrial area)
Roadside ignitions	Clearance along roadsides and along property lines (undeveloped lands) to prevent ignition points (county, state, private landowners).
Natural Resource Protection and Restoration	
Continue natural resources restoration	Policy and funding. Give native trees to community members to plant

Note: All input is transposed directly from participant meeting posters, and has been combined where appropriate but not otherwise filtered or reworded.

Input Related to Safe and Effective Wildfire Response (Firefighting)

<i>Concern</i>	<i>Recommended action</i>
Access for Evacuation and Firefighting	
Response Time - people live in isolated places	Improve roads and evacuation planning and practice
Access to the Fire	Firebreak and access roads both mauka & makai (esp. along southern ridge)
Poor access to mauka fires	Develop and maintain emergency roads
Equipment	Firefighters need more all wheel drive vehicles
Road Access	4WD brush trucks needed (USFS program, CAF-CA training); need more engineers for trucks; Increase funding
Firefighter equipment and safety	Increase funding
More off road vehicles for FD	High capacity off-road vehicles
Funding for Water for Grazing to Reduce Fire Fuels	
Water availability to properly graze along the highway	Federal grants \$ for trough and fence lines
Training	
Evacuation education/plan/protocol/procedure. Traffic management	Training; Incident Command setup; property management person send an email blast; Educ. Of board members' All residents evacuation. Plan - send out a notice & email blast/post info at mailboxes (evacuation. procedure, route, map); For newcomers and new subdivisions - include in homeowner manual wildfire issues and evacuation plan and fire prevention contacts)
Wildland Fire Training for new recruits	Training for back burning; Captain Anae and sons help?
Water Resources for Fire Suppression and Mitigation	
Poor water access - Private water system - low capacity - very expensive	More dip tanks; Pu'u Wa'awa'a reservoir could be filled by Puu Lani who has a line to it; Fix stand pipe by guest house to resurrect filling station
Access to Water	Diptanks; Mandatory hose fittings to each home; partner with community water system for storage
Water limitations (small pumps)	Diptanks; separate water storage (non-potable); Ad foam to aid suppression
Hydrants	Hydrant markings; 'blue dot' system; keep them clear
water access, pressure	Have FD check hydrant status (Find out county hydrant maintenance schedule); Diptank within community (in park) for easy helicopter access
Water Supply	identify and map all swimming pools, ponds and other water resources (commercial & residential)
Water Access	Palani Ranch (1 million gallon tank). In isolated areas increase water access
Identify other affordable water resources	County water from Kaloko county well

Note: All input is transposed directly from participant meeting posters, and has been combined where appropriate but not otherwise filtered or reworded.

Water availability to properly graze along the highway

Federal grants \$ for trough and fence lines

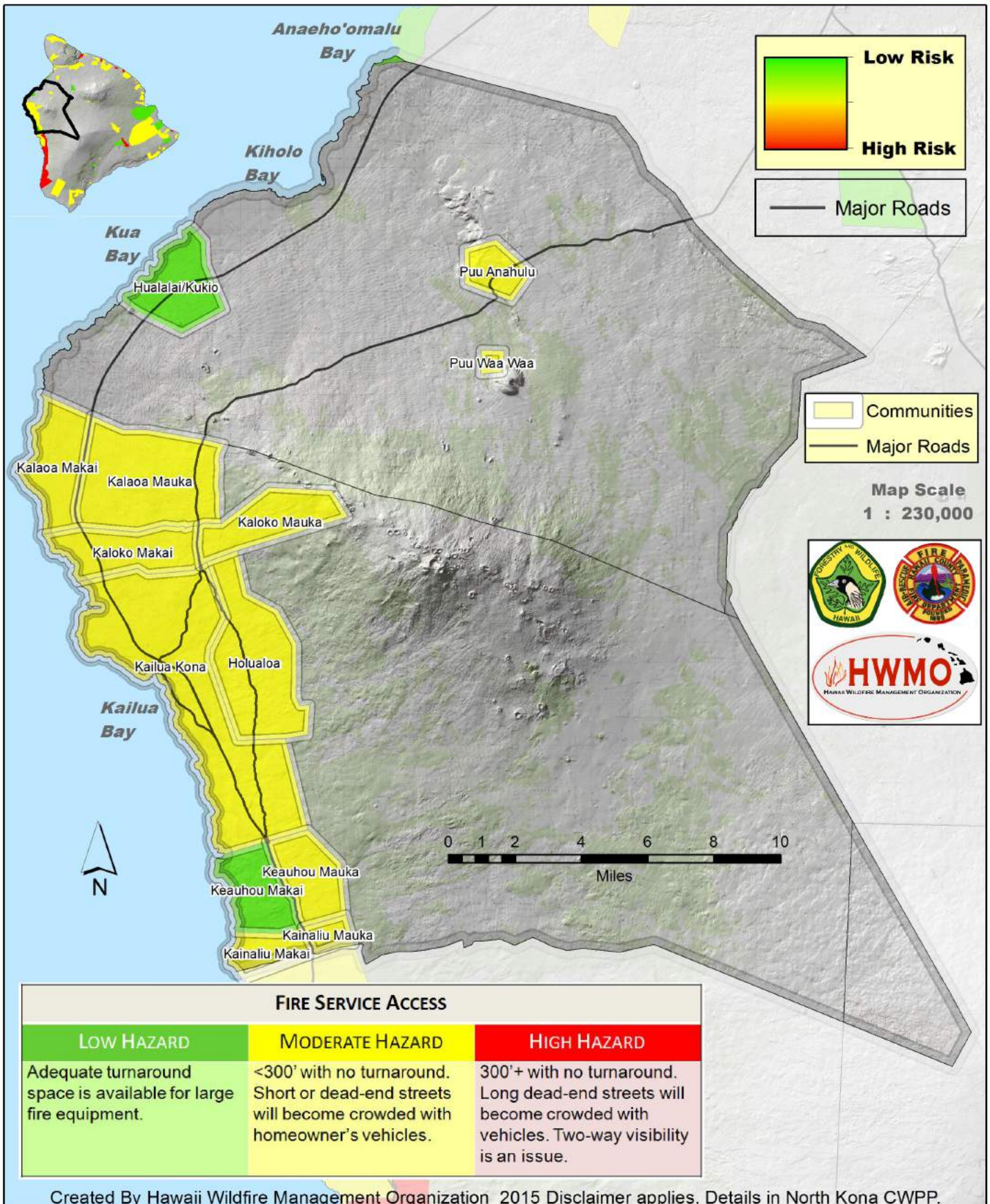
Appendix B
 North Kona Community Wildfire Protection Plan
 Wildfire Hazard Assessment Maps

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"> • 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 • Unmanaged, Untended, Undeveloped Lands
Vegetation Hazard Total	<ul style="list-style-type: none"> • Defensible Space: Fuels Reduction Around Homes & Structures • Fuel Loading • Fuel Structure & Arrangement • Proximity of Flammable Fuels Around Subdivision • Vegetation Within 300' Of Homes
Building Hazard Total	<ul style="list-style-type: none"> • Siding/Soffits • Roofing Assembly • Structural Ignitability • Under Skirting Around Decks, Lanais, Post & Pier Structures • Utilities Placement; Gas & Electric
Fire Environment Hazard Total	<ul style="list-style-type: none"> • Average Rainfall • Prevailing Wind Speeds & Direction • Slope • Topographic Features That Adversely Affect Wildland Fire Behavior • Seasonal or Periodic High Hazard Conditions • Ignition Risk
Fire Protection Hazard Total (high capacity and capability= low hazard)	<ul style="list-style-type: none"> • 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 • Wildland Firefighting Capacity of Initial Response Agency • Interagency Cooperation

SUBDIVISION HAZARD FOR DEVELOPED AREAS

Fire Service Access Hazard For Developed Areas

North Kona Community Wildfire Protection Plan

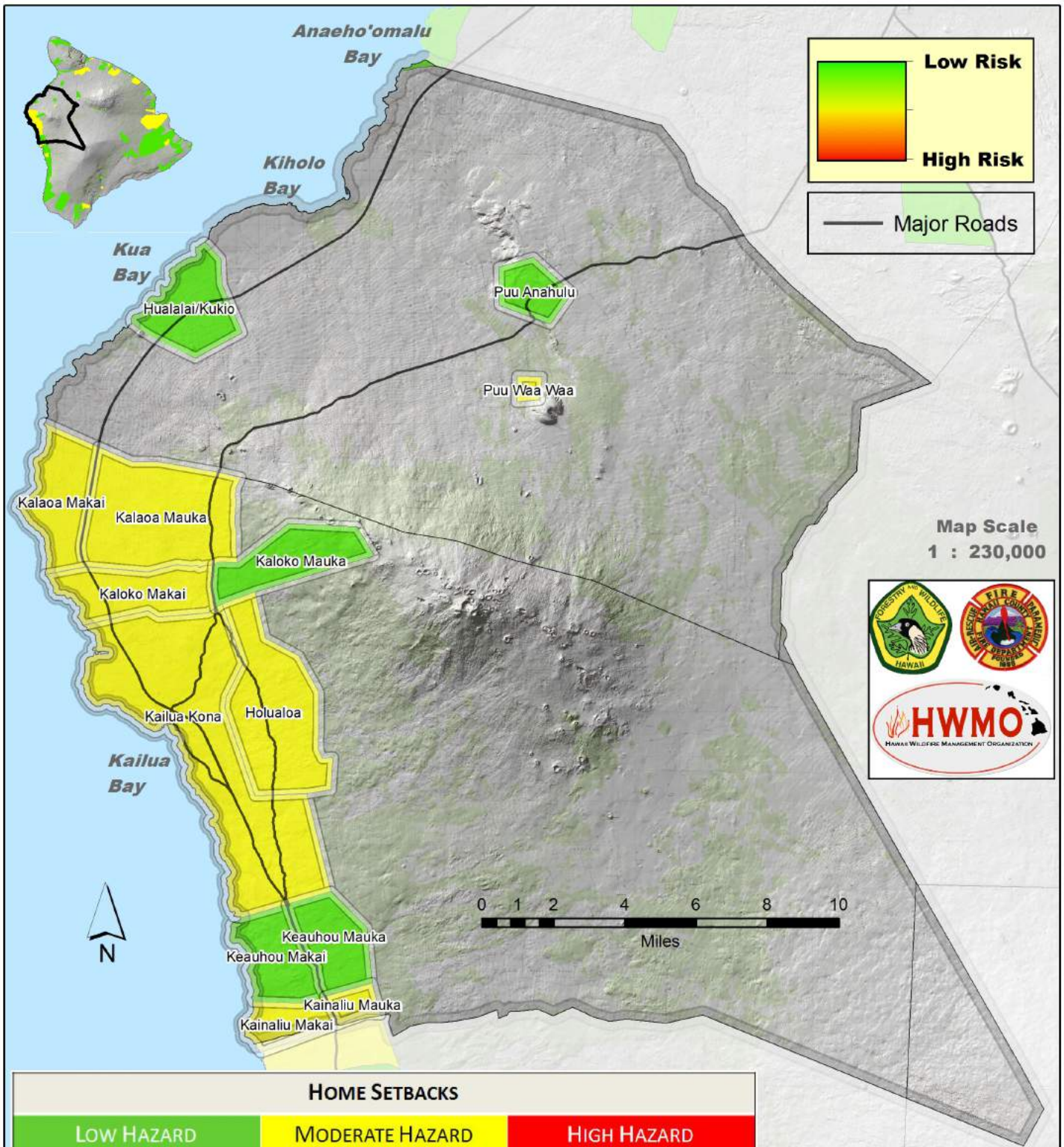


FIRE SERVICE ACCESS

LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
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.

Home Setbacks Hazard For Developed Areas

North Kona Community Wildfire Protection Plan



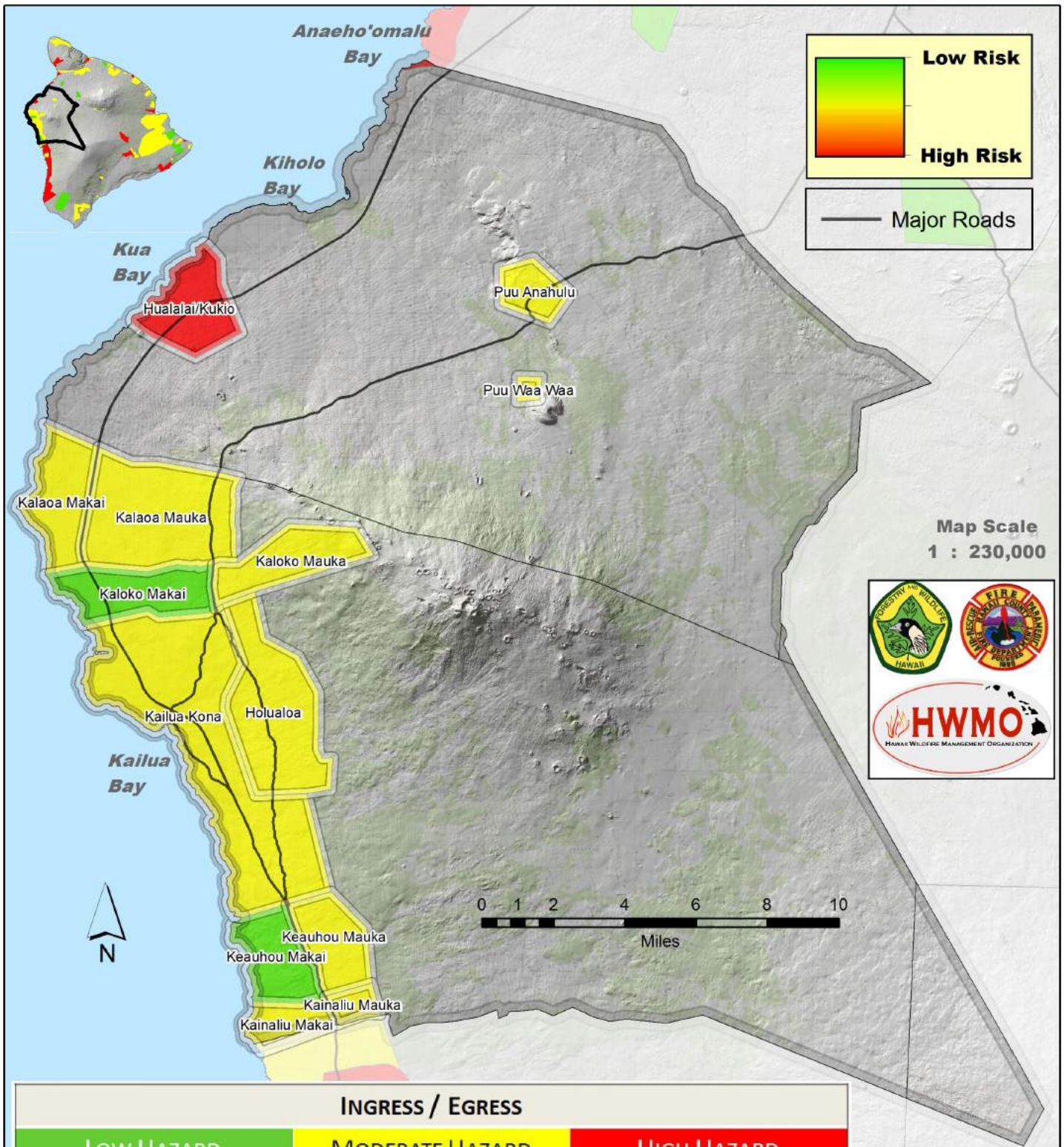
HOME SETBACKS

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.

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Ingress/ Egress Hazard For Developed Areas

North Kona Community Wildfire Protection Plan

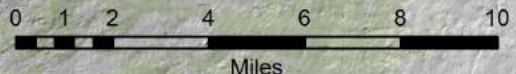


Low Risk

High Risk

Major Roads

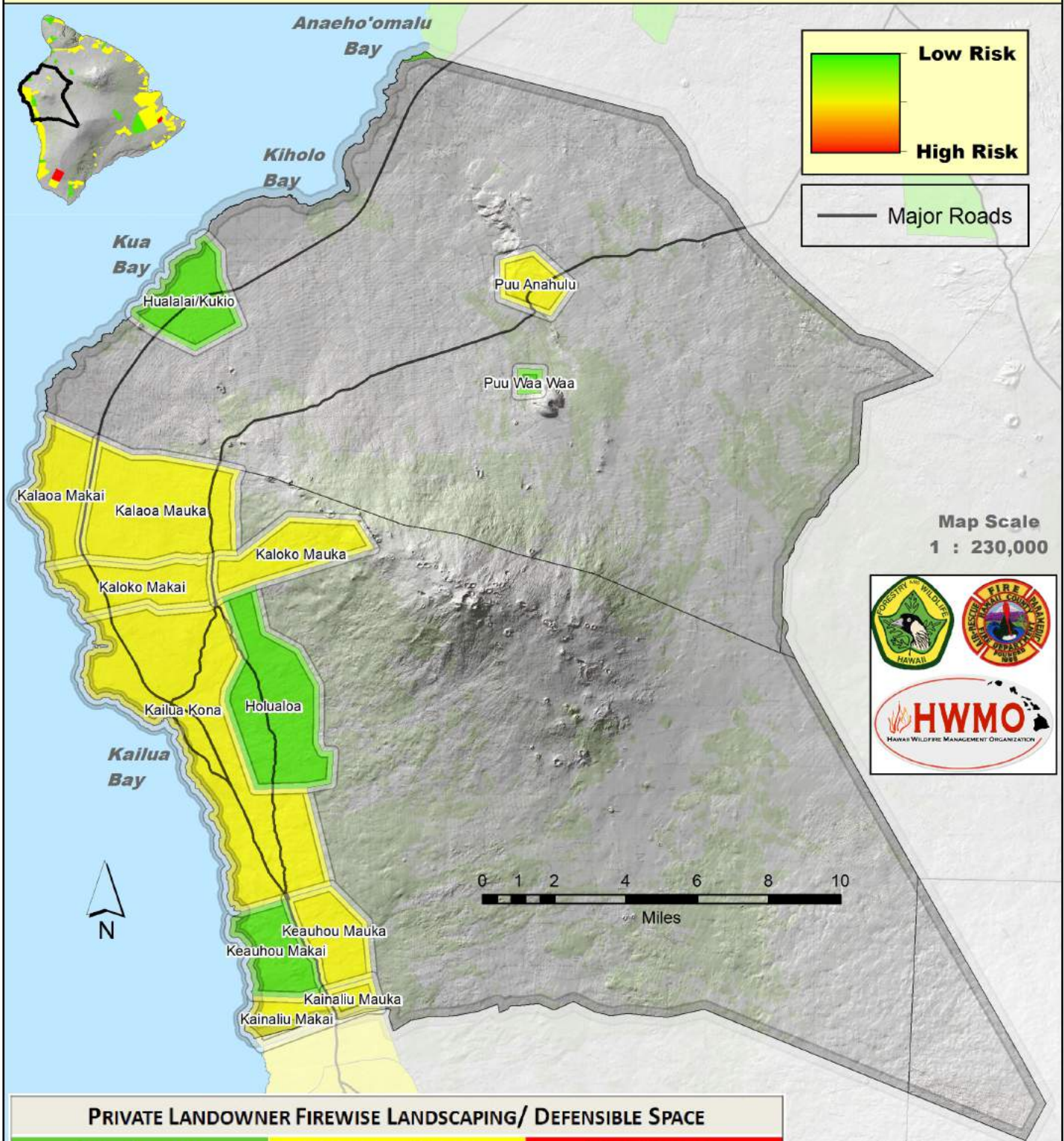
Map Scale
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INGRESS / EGRESS		
LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
Multiple entrances and exits are well equipped for fire trucks with turnarounds.	Limited access routes. Two ways in and two ways out. Moderate grades.	Narrow, dead end roads or one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

Private Landowner Firewise Landscaping/ Defensible Space Hazard For Developed Areas

North Kona Community Wildfire Protection Plan



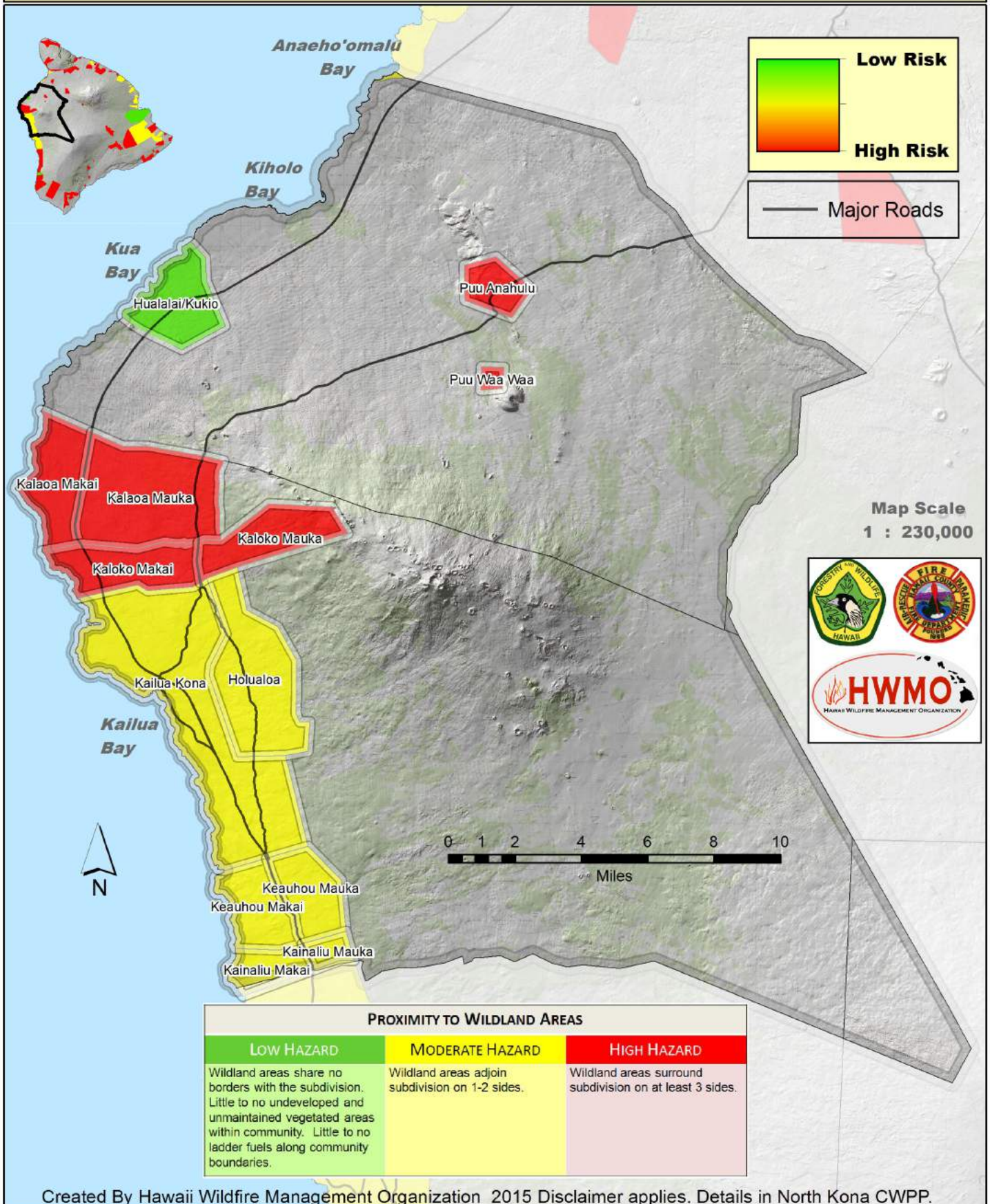
PRIVATE LANDOWNER FIREWISE LANDSCAPING/ DEFENSIBLE SPACE

LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
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

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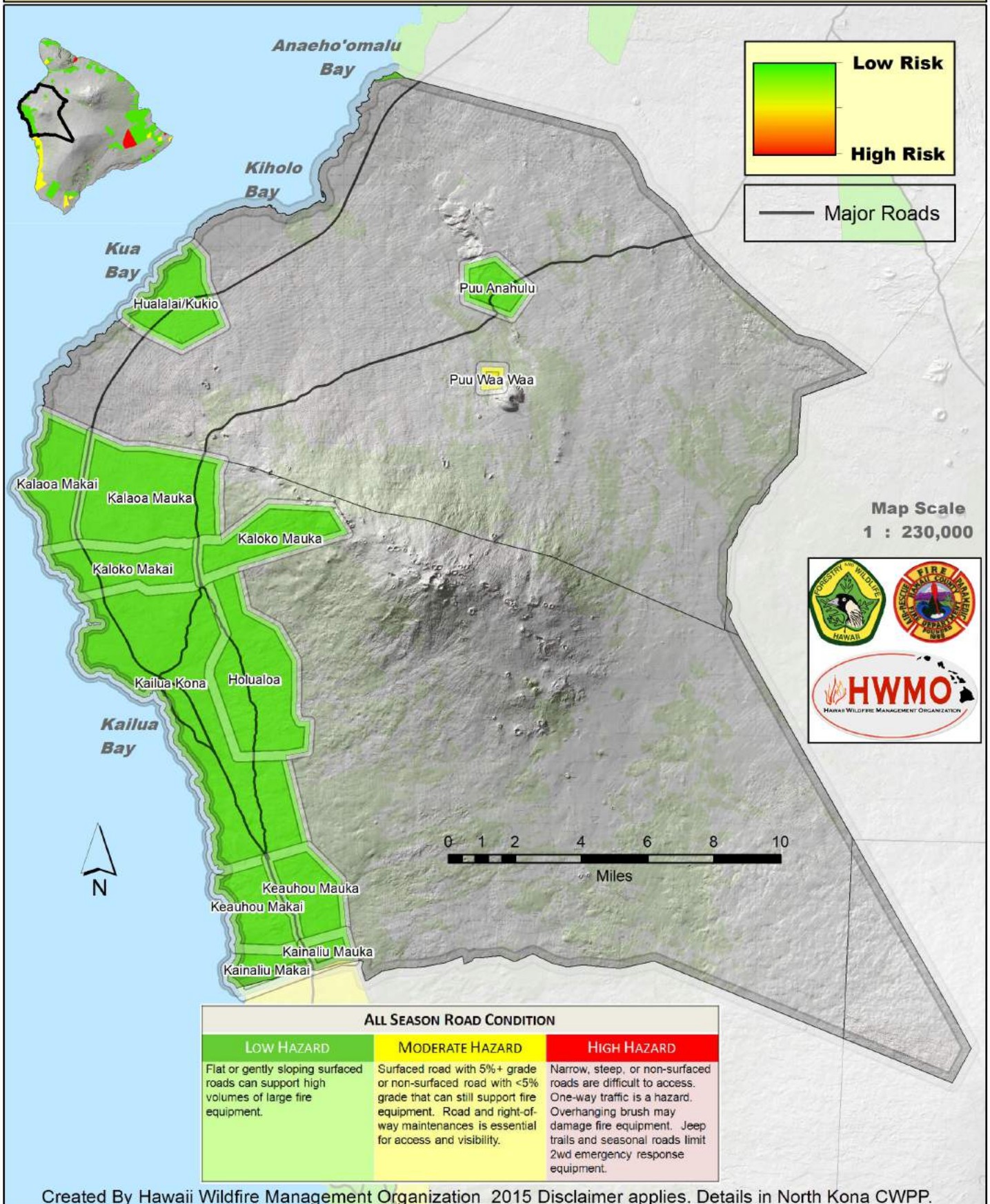
Proximity To Wildland Areas Hazard For Developed Areas

North Kona Community Wildfire Protection Plan



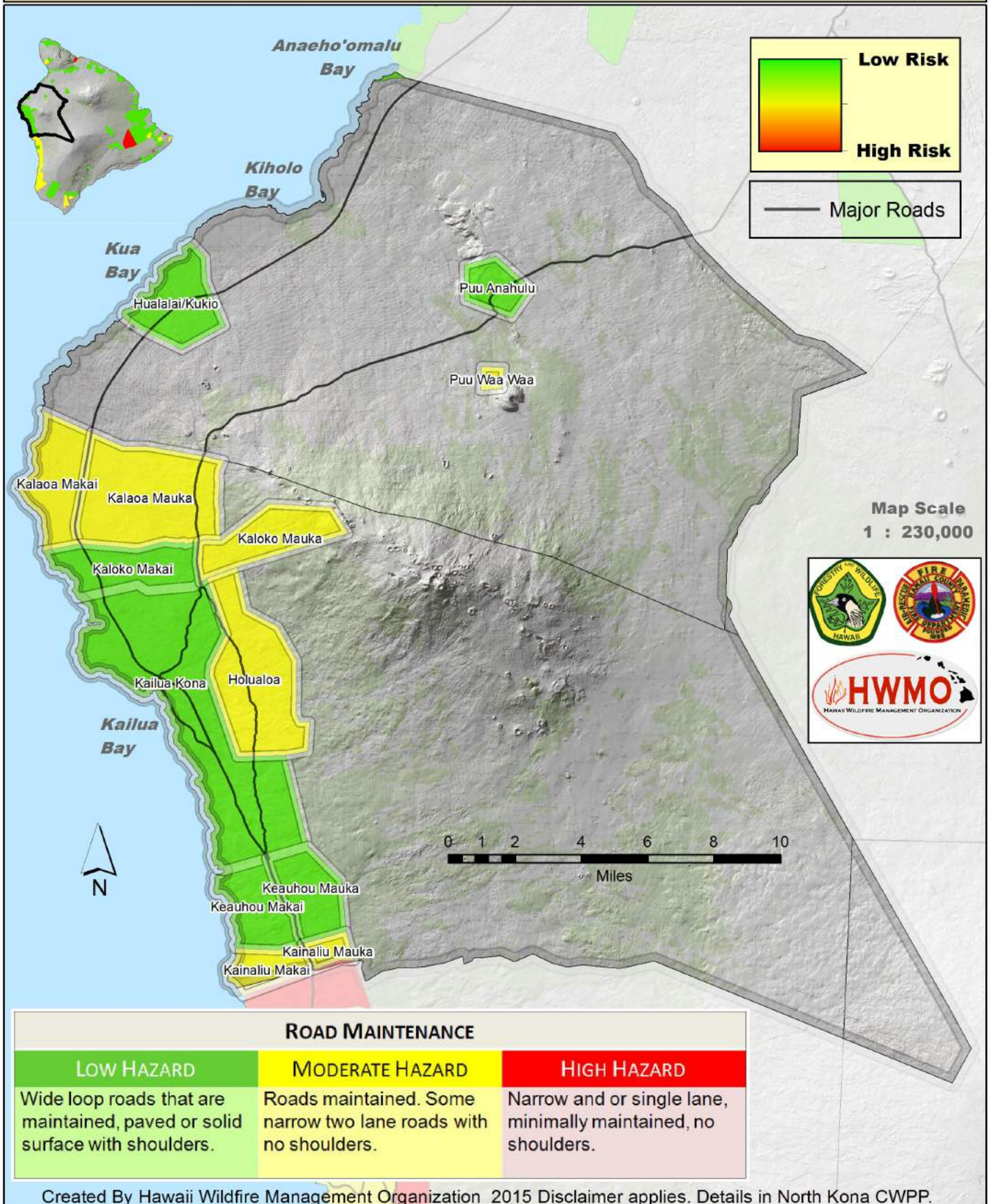
All Season Road Condition Hazard For Developed Areas

North Kona Community Wildfire Protection Plan



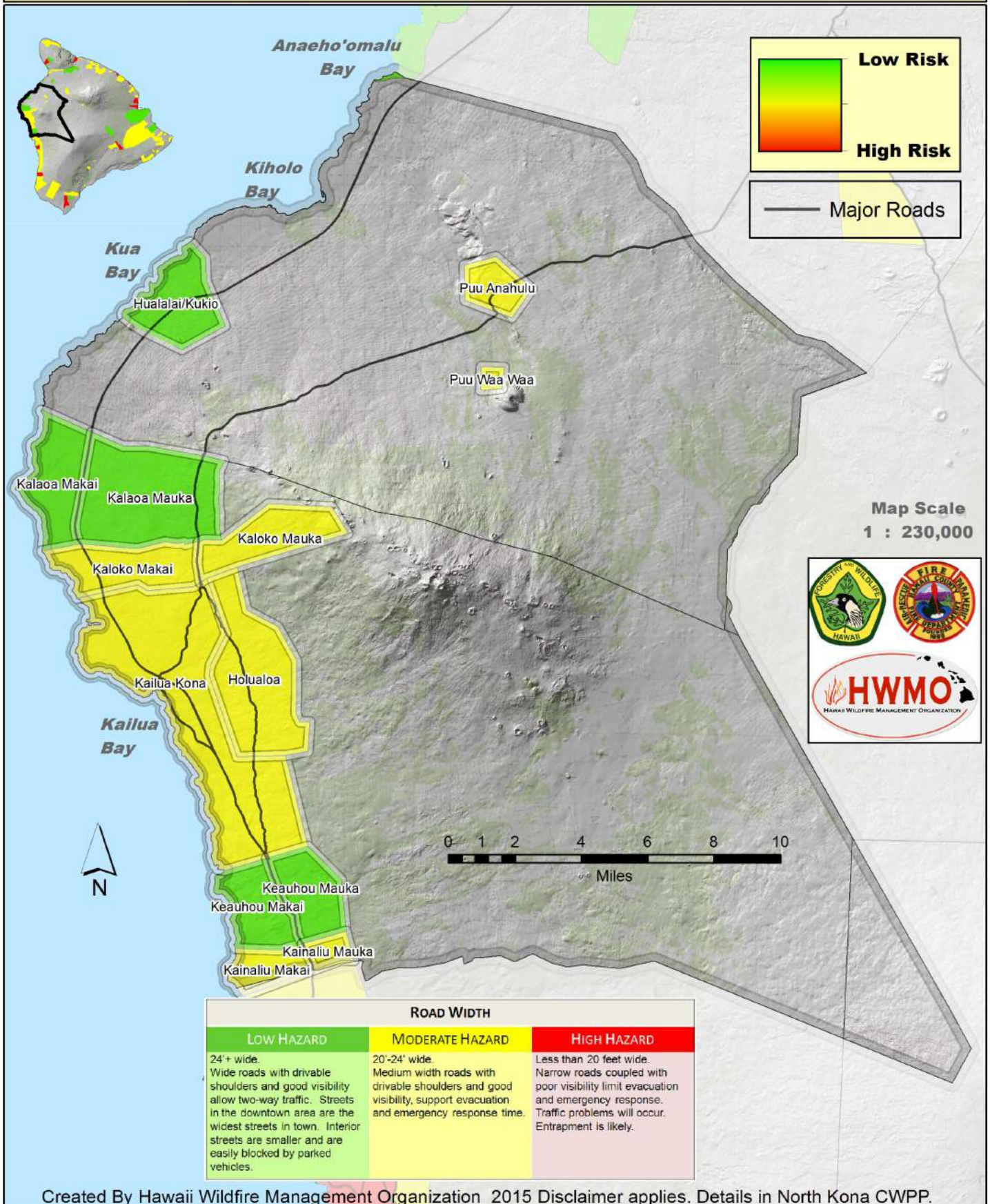
Road Maintenance Hazard For Developed Areas

North Kona Community Wildfire Protection Plan



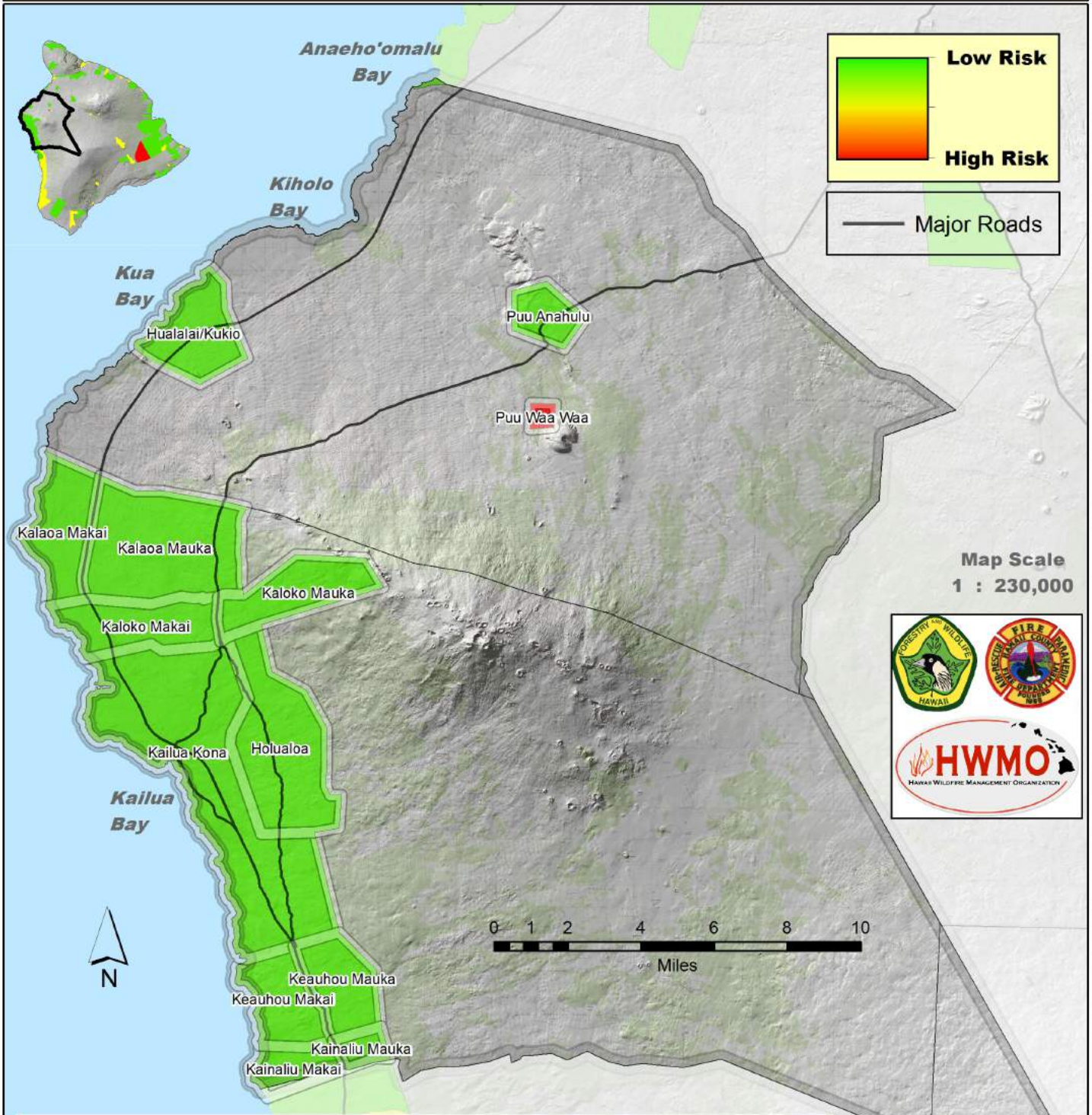
Road Width Hazard For Developed Areas

North Kona Community Wildfire Protection Plan



Street Signs Hazard For Developed Areas

North Kona Community Wildfire Protection Plan



Low Risk

High Risk

Major Roads

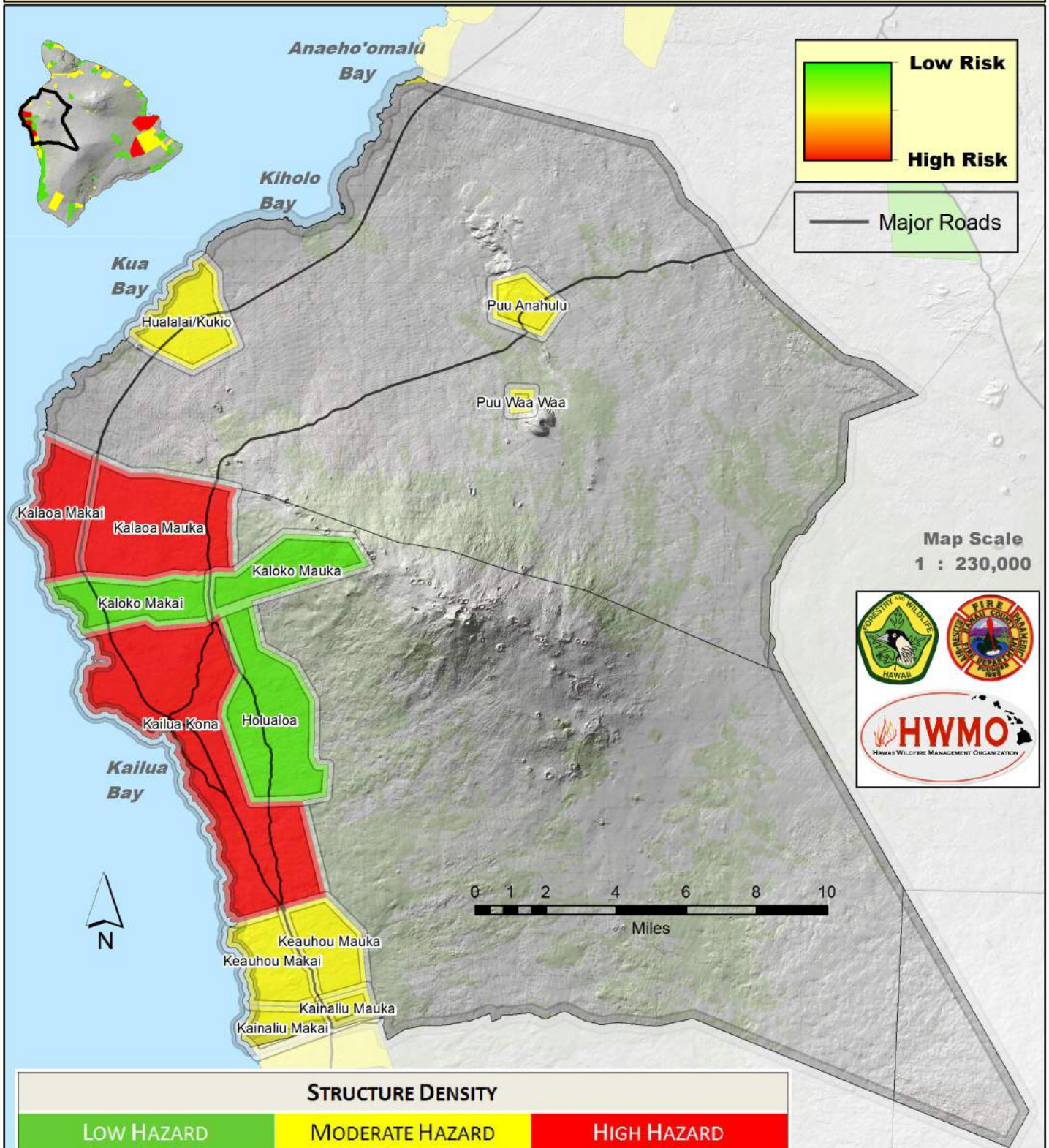
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STREET SIGNS		
LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
Present. Most are at least 4' in size and are reflectorized.	Present and reflectorized with some exceptions.	Not present.

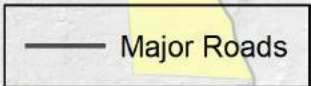
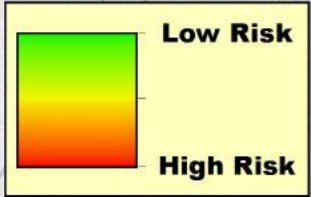
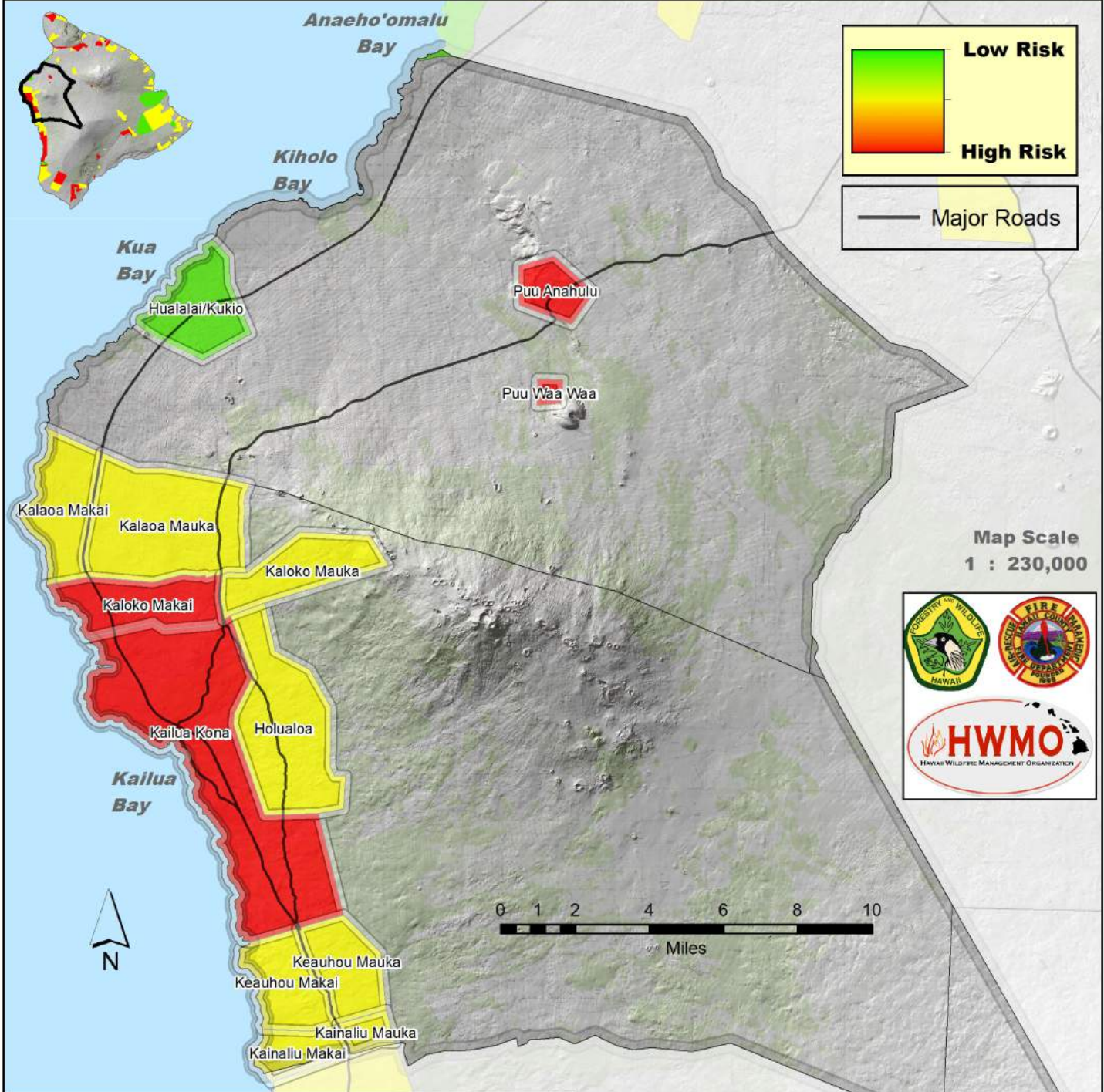
Structure Density Hazard For Developed Areas

North Kona Community Wildfire Protection Plan

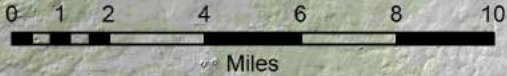


Unmanaged, Untended & Undeveloped Lands Hazard For Developed Areas

North Kona Community Wildfire Protection Plan



Map Scale
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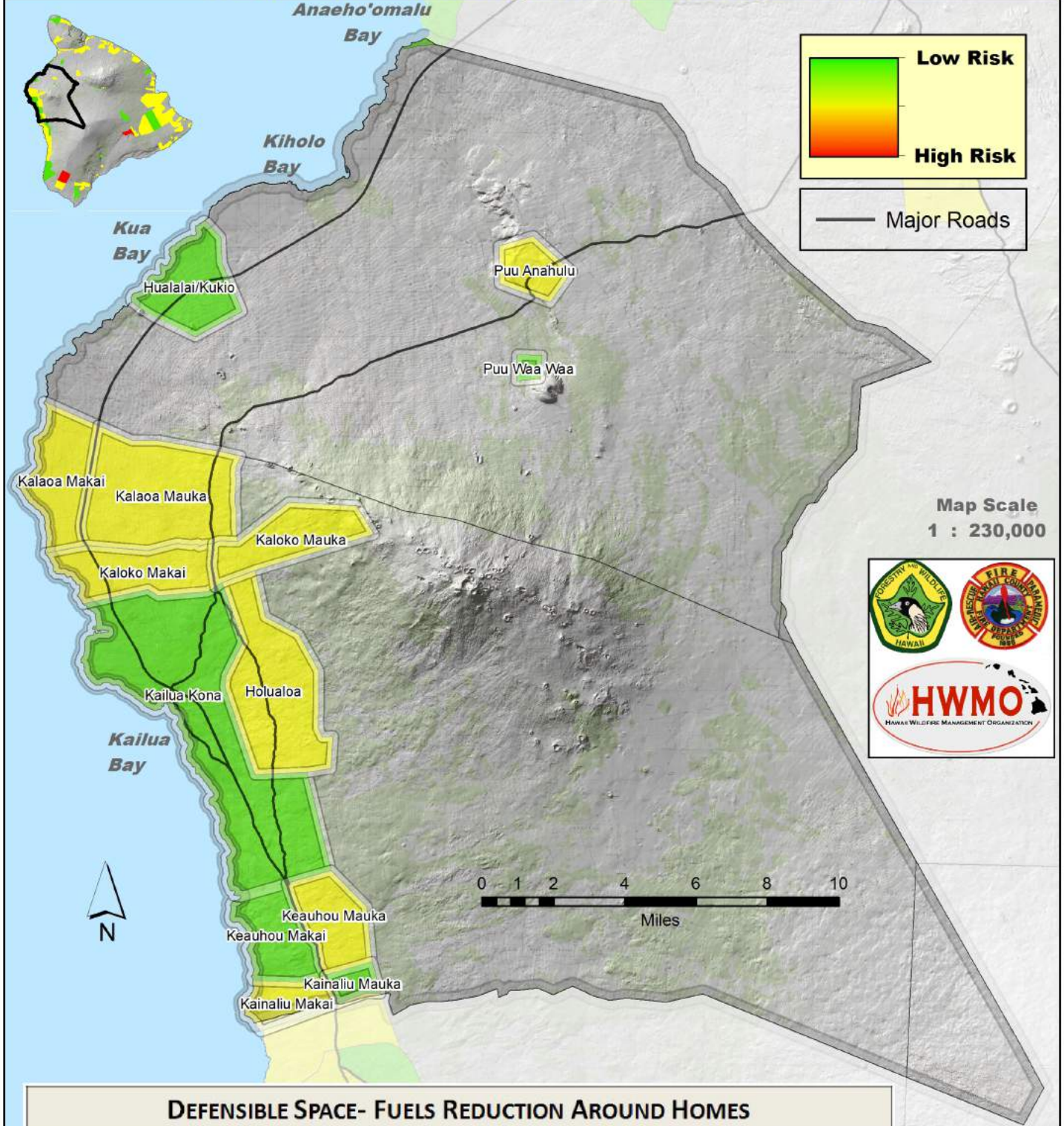
UNTENDED LANDS		
LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
<p>Few to no weedy vacant lots. Few to no undeveloped unmaintained vegetated areas or corridors between homes. Less than 10% of lots remain undeveloped and pose an additional wildfire hazard due to lack of maintenance and/or restricted access.</p>	<p>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.</p>	<p>Abundant unmanaged, 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</p>

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VEGETATION HAZARD FOR DEVELOPED AREAS

Defensible Space: Fuels Reduction Around Homes Hazard For Developed Areas

North Kona Community Wildfire Protection Plan

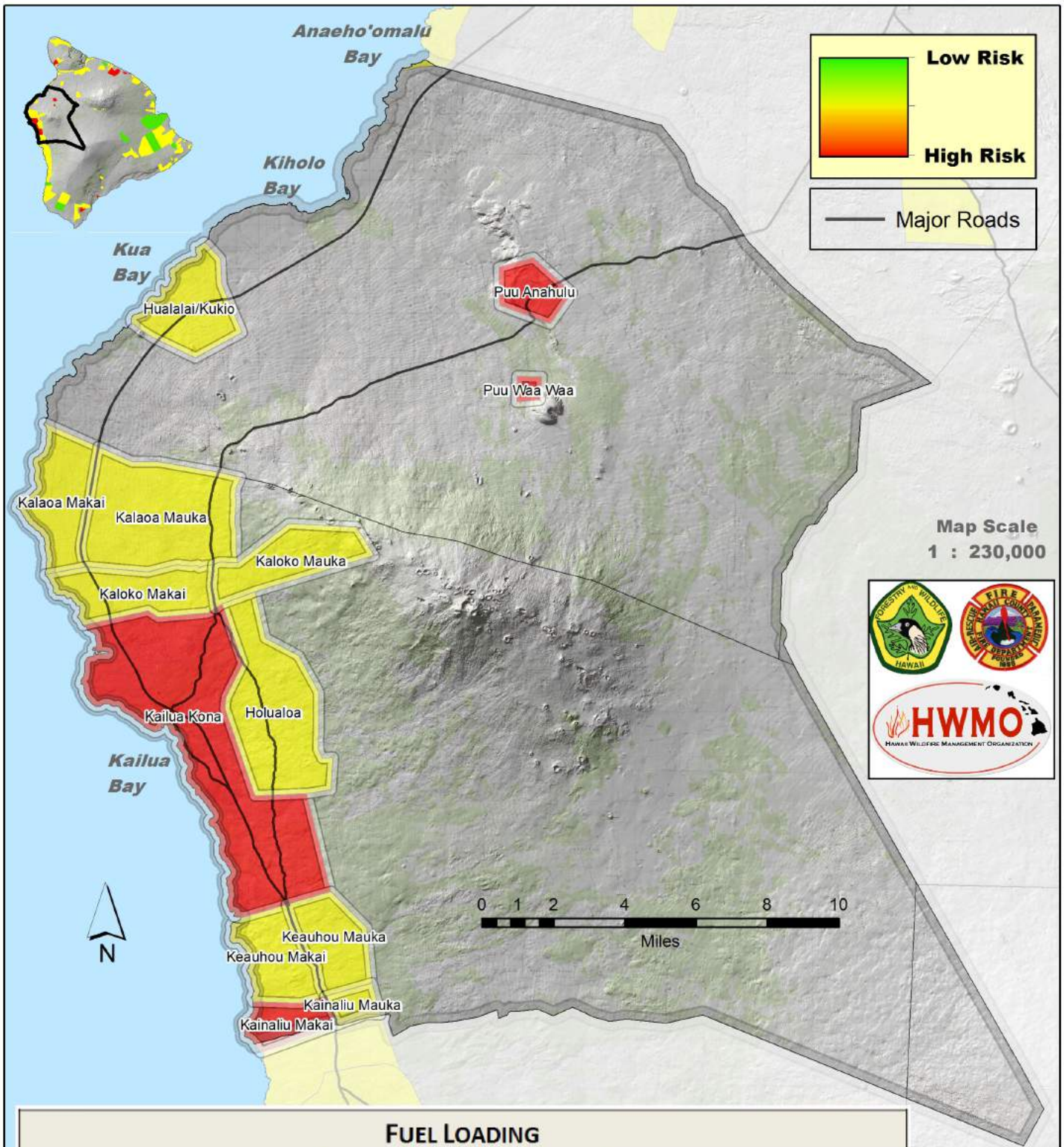


DEFENSIBLE SPACE- FUELS REDUCTION AROUND HOMES

LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
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.

Fuel Loading Hazard For Developed Areas

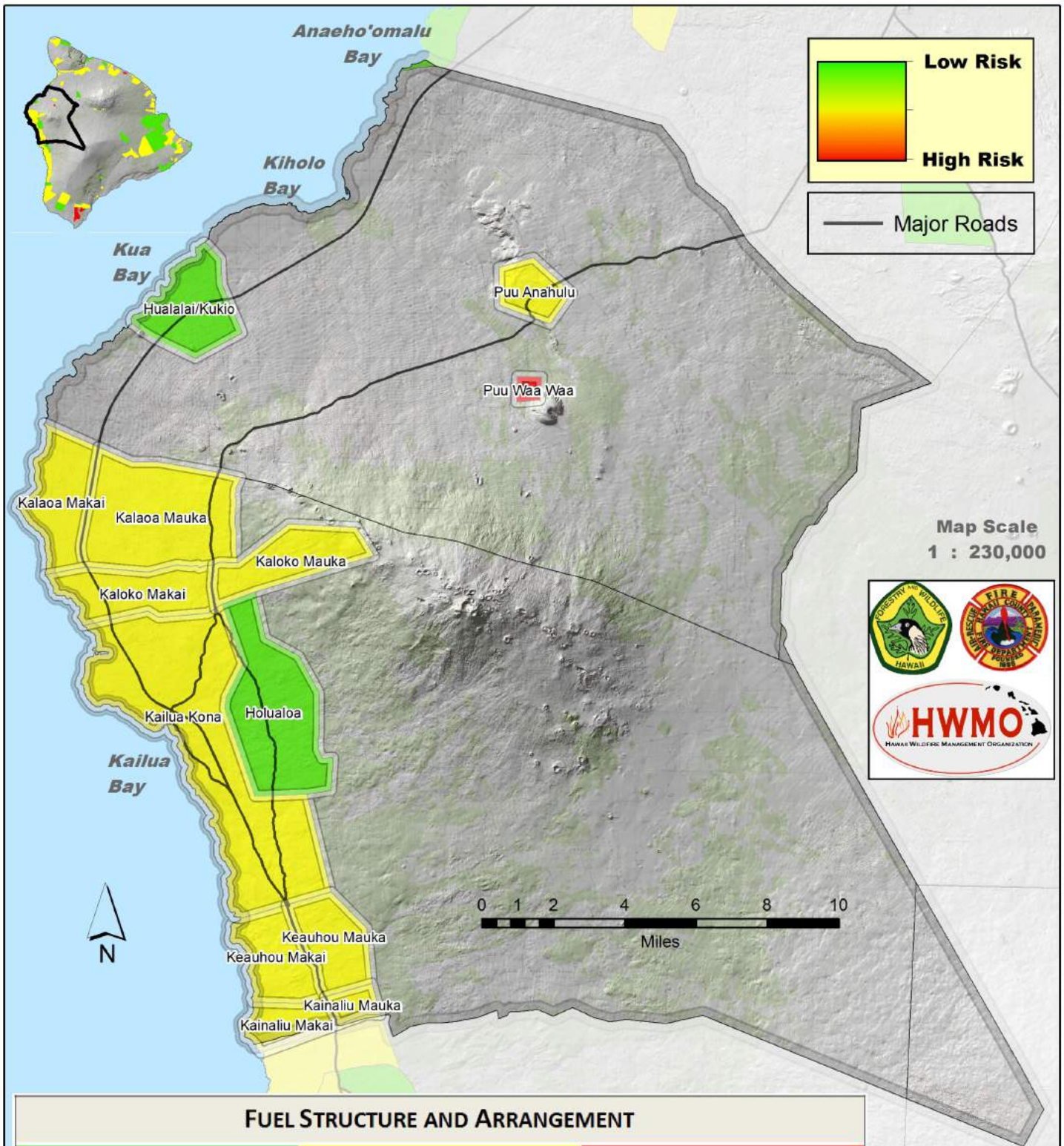
North Kona Community Wildfire Protection Plan



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

Fuel Structure & Arrangement Hazard For Developed Areas

North Kona Community Wildfire Protection Plan



Low Risk

High Risk

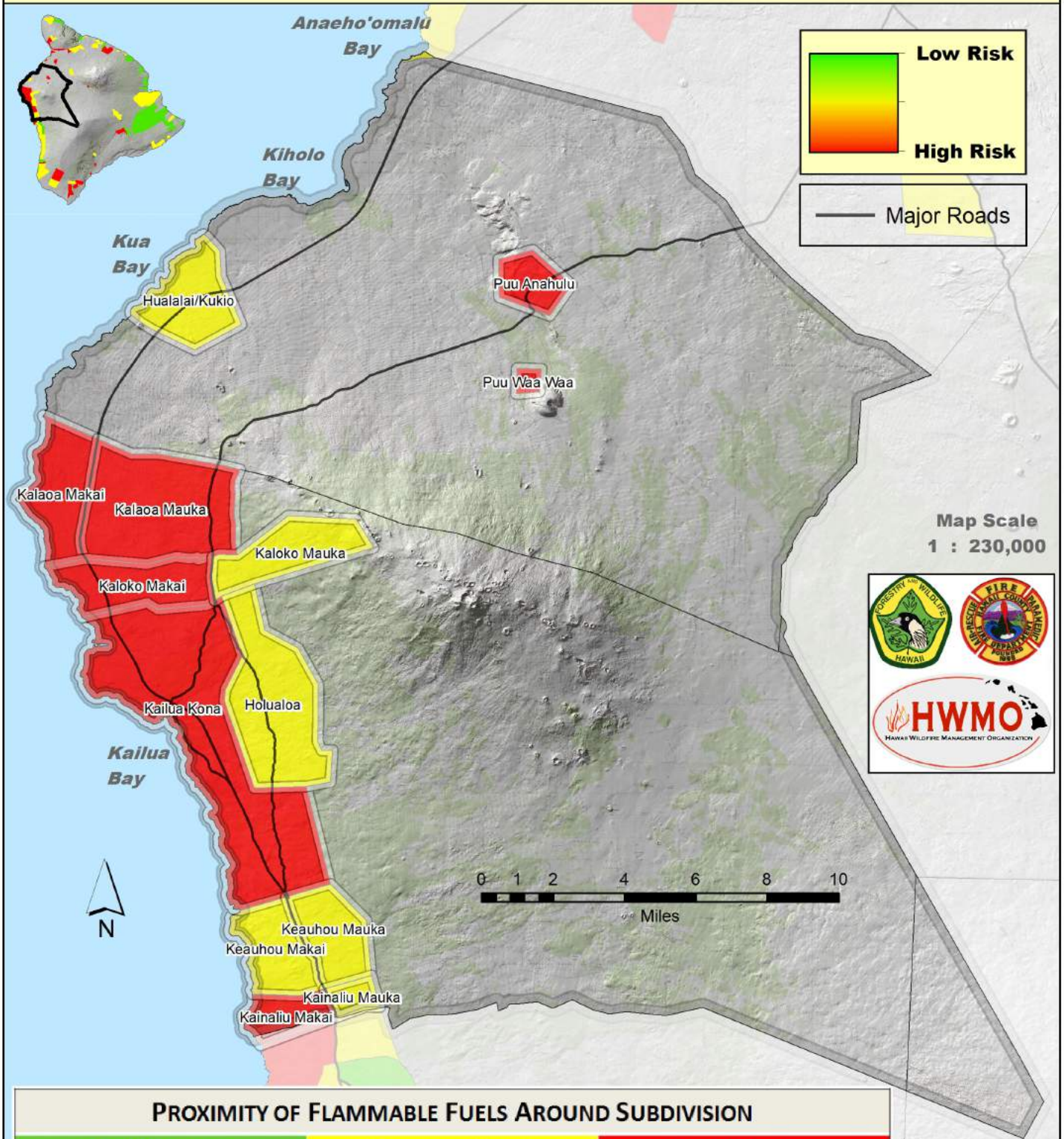
Major Roads



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.

Proximity Of Flammable Fuels Around Subdivision Hazard For Developed Areas

North Kona Community Wildfire Protection Plan



Low Risk

High Risk

Major Roads

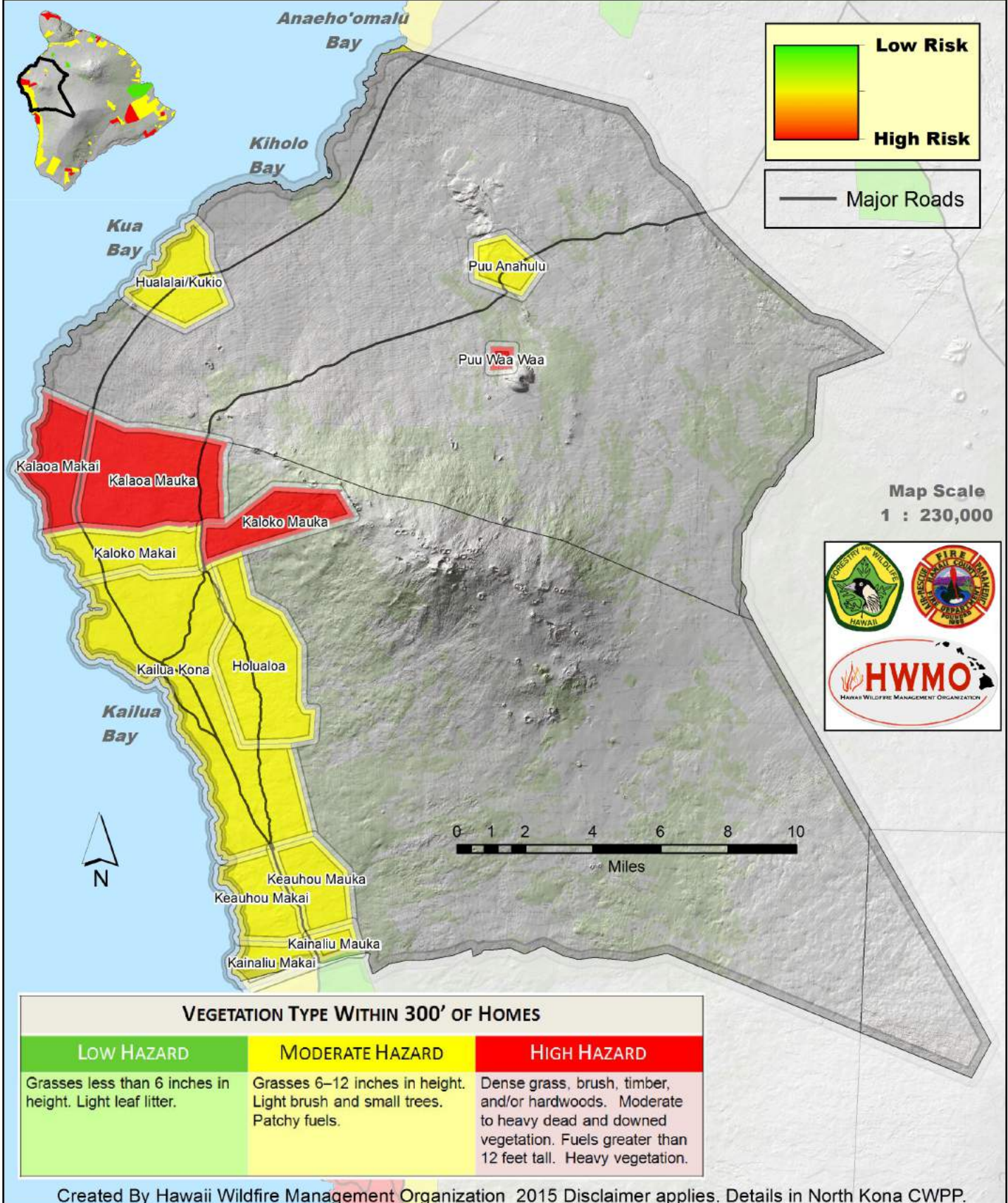
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PROXIMITY OF FLAMMABLE FUELS AROUND SUBDIVISION		
LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
Greater than 100'	40-100'	Less than 40'

Vegetation Type Within 300' Of Homes Hazard For Developed Areas

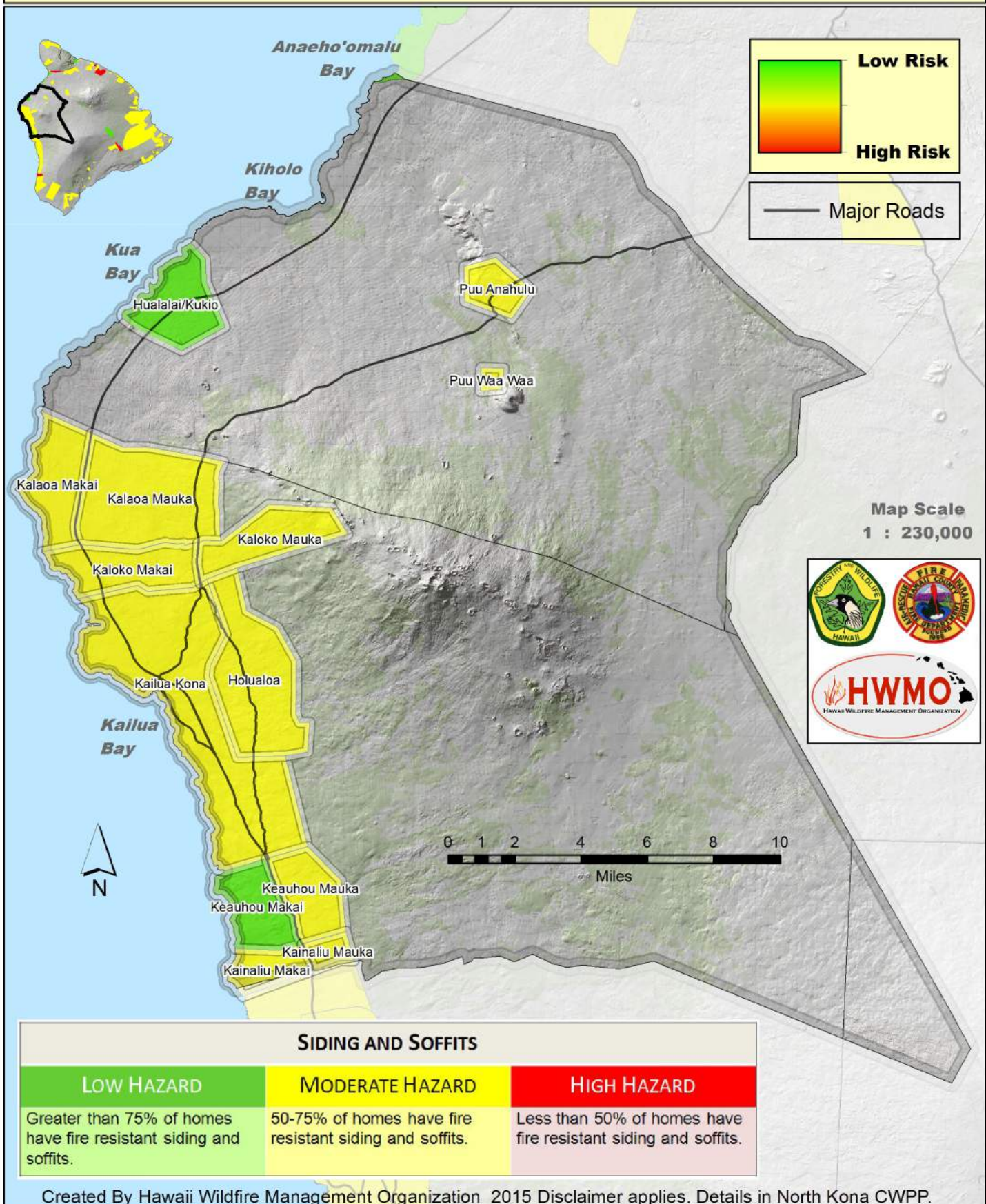
North Kona Community Wildfire Protection Plan



BUILDING HAZARD FOR DEVELOPED AREAS

Siding & Soffits Hazard For Developed Areas

North Kona Community Wildfire Protection Plan

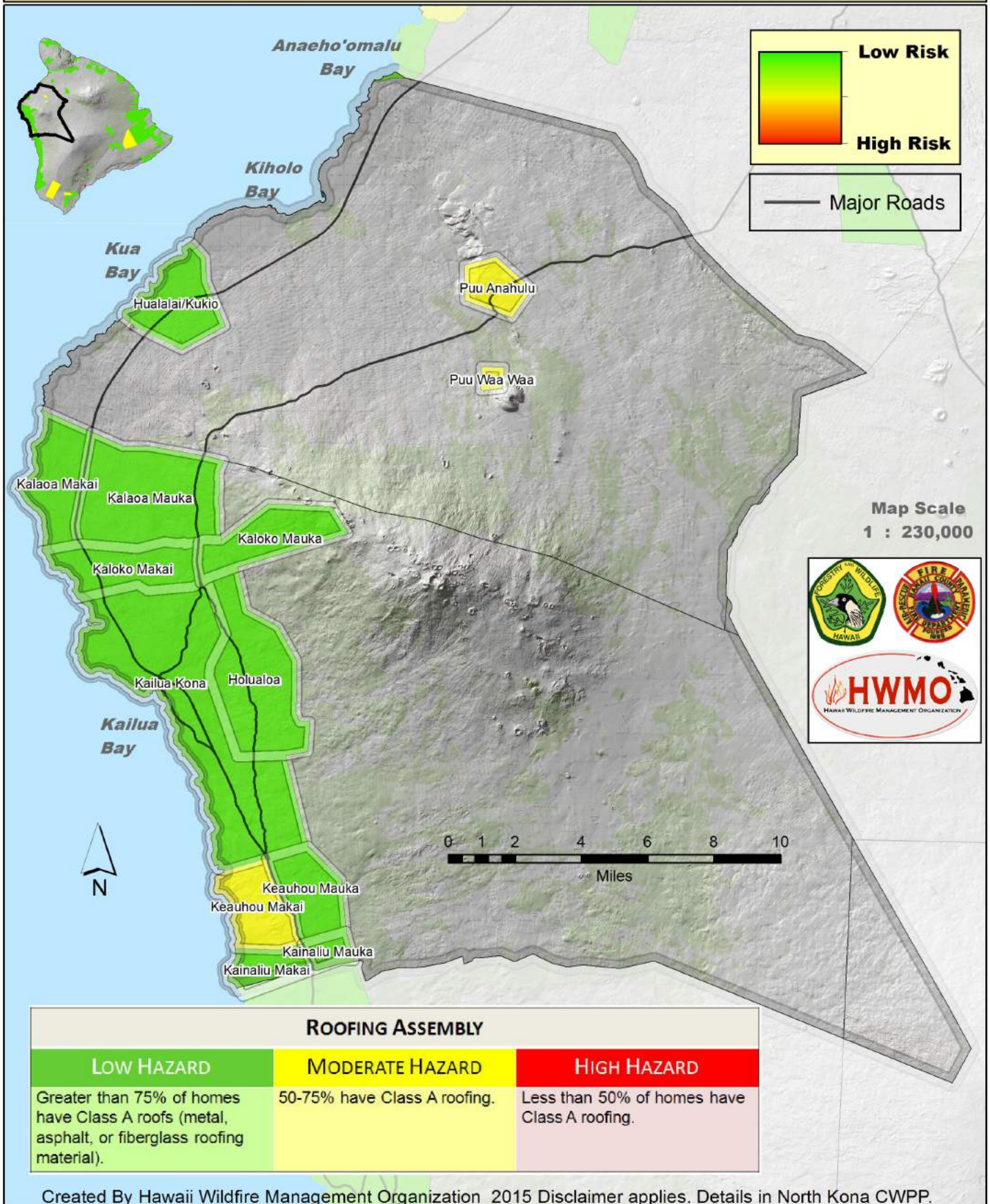


SIDING AND SOFFITS

LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
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.

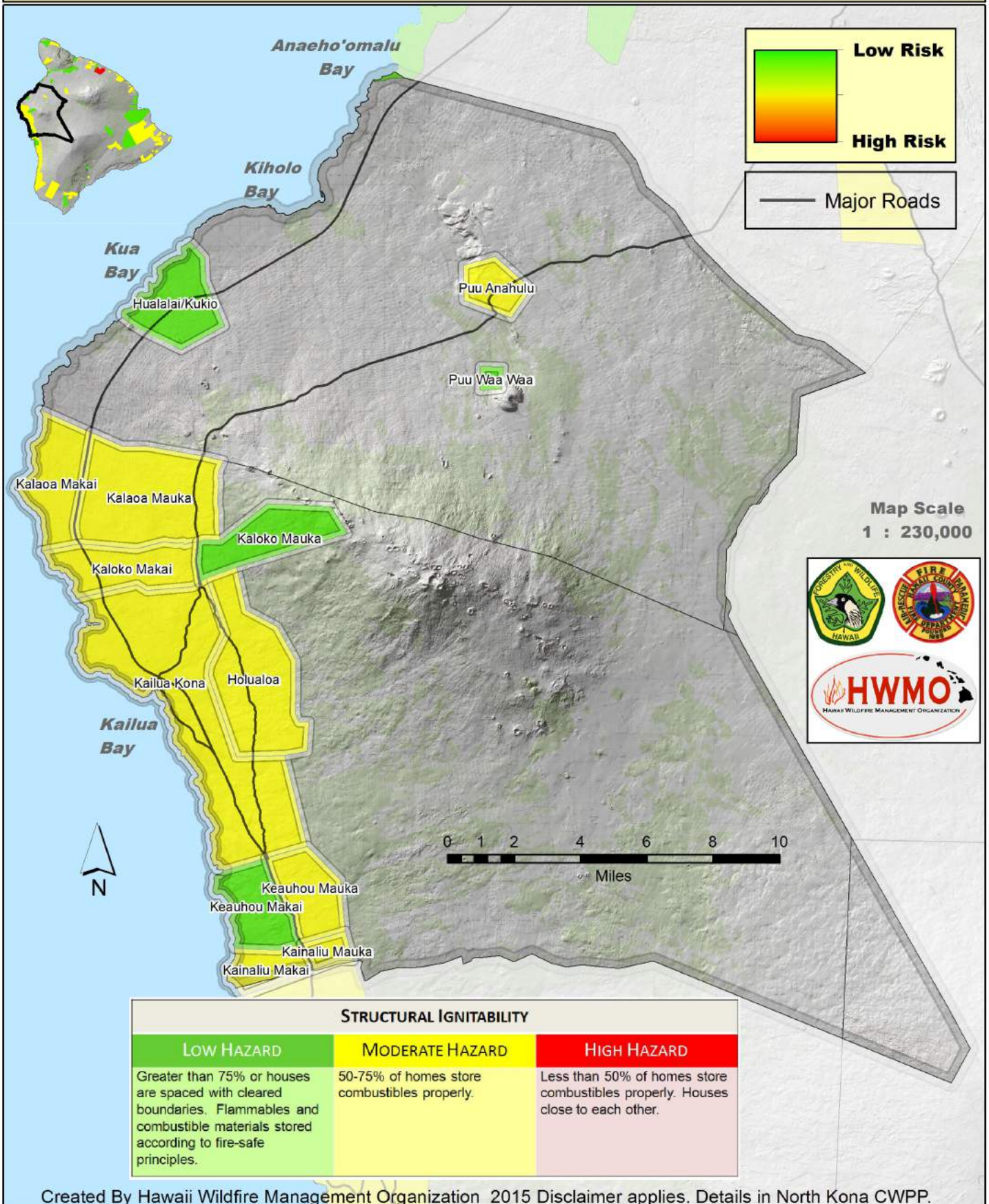
Roofing Assembly Hazard For Developed Areas

North Kona Community Wildfire Protection Plan



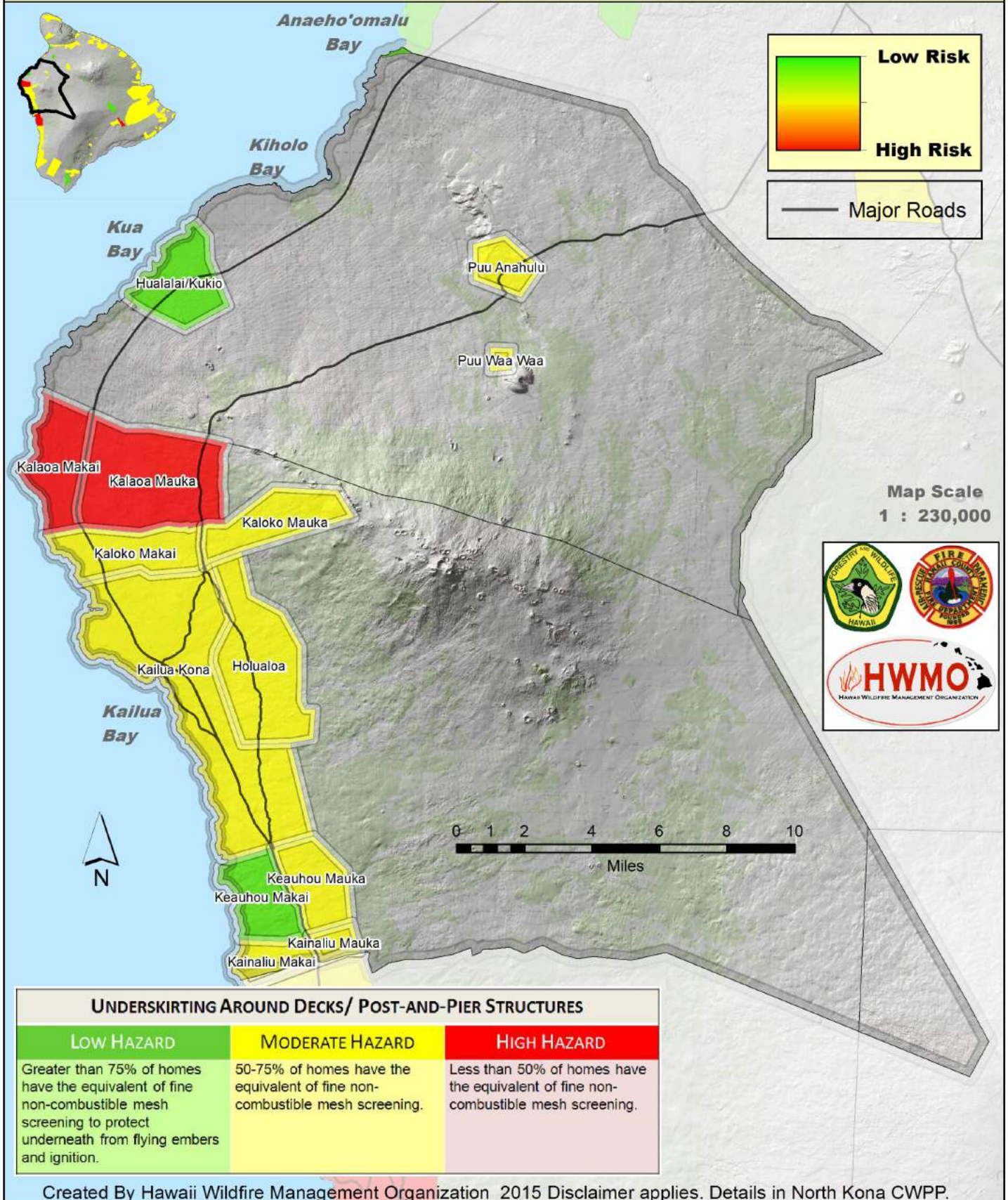
Structural Ignitability Hazard For Developed Areas

North Kona Community Wildfire Protection Plan



Underskirting Around Decks/ Post & Pier Structures Hazard For Developed Areas

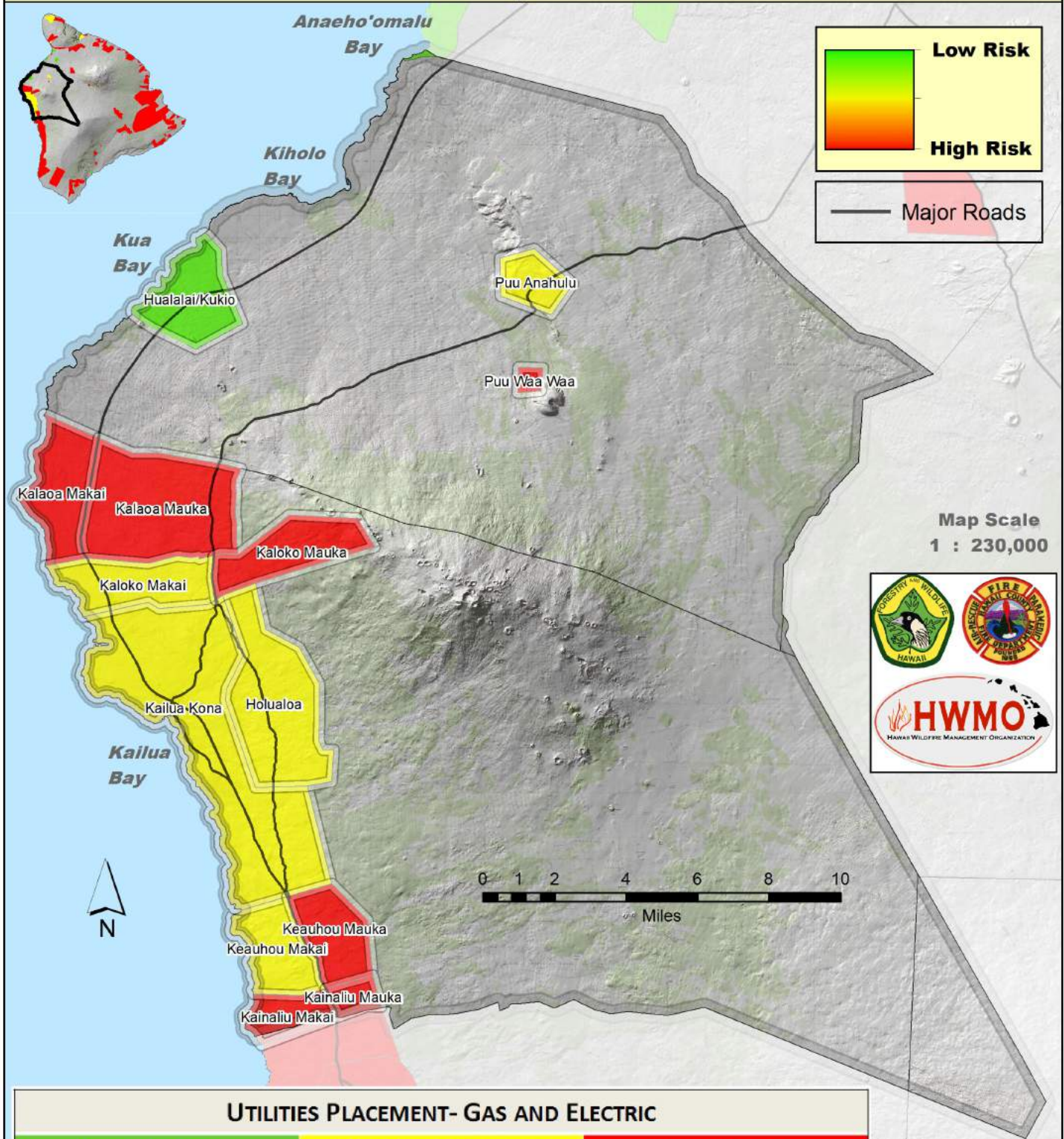
North Kona Community Wildfire Protection Plan



Utilities Placement: Gas & Electric

Hazard For Developed Areas

North Kona Community Wildfire Protection Plan



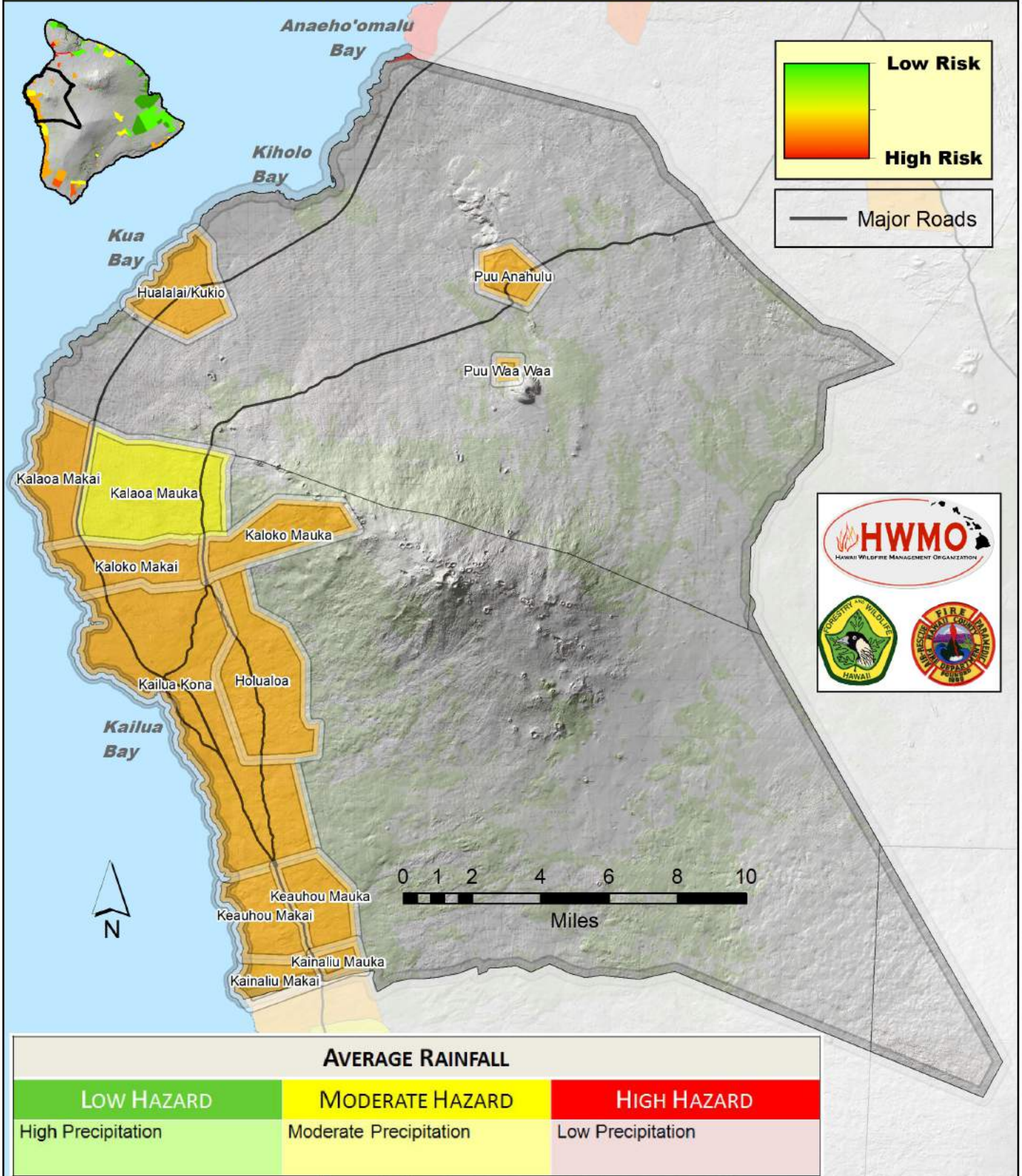
UTILITIES PLACEMENT- GAS AND ELECTRIC

LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
All underground or none.	One underground, one above ground.	Both above ground.

FIRE ENVIRONMENT HAZARD FOR DEVELOPED AREAS

Average Annual Rainfall Hazard For Developed Areas

North Kona Community Wildfire Protection Plan

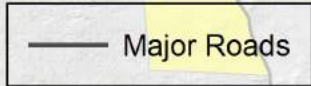
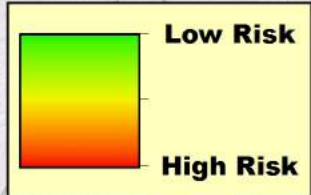
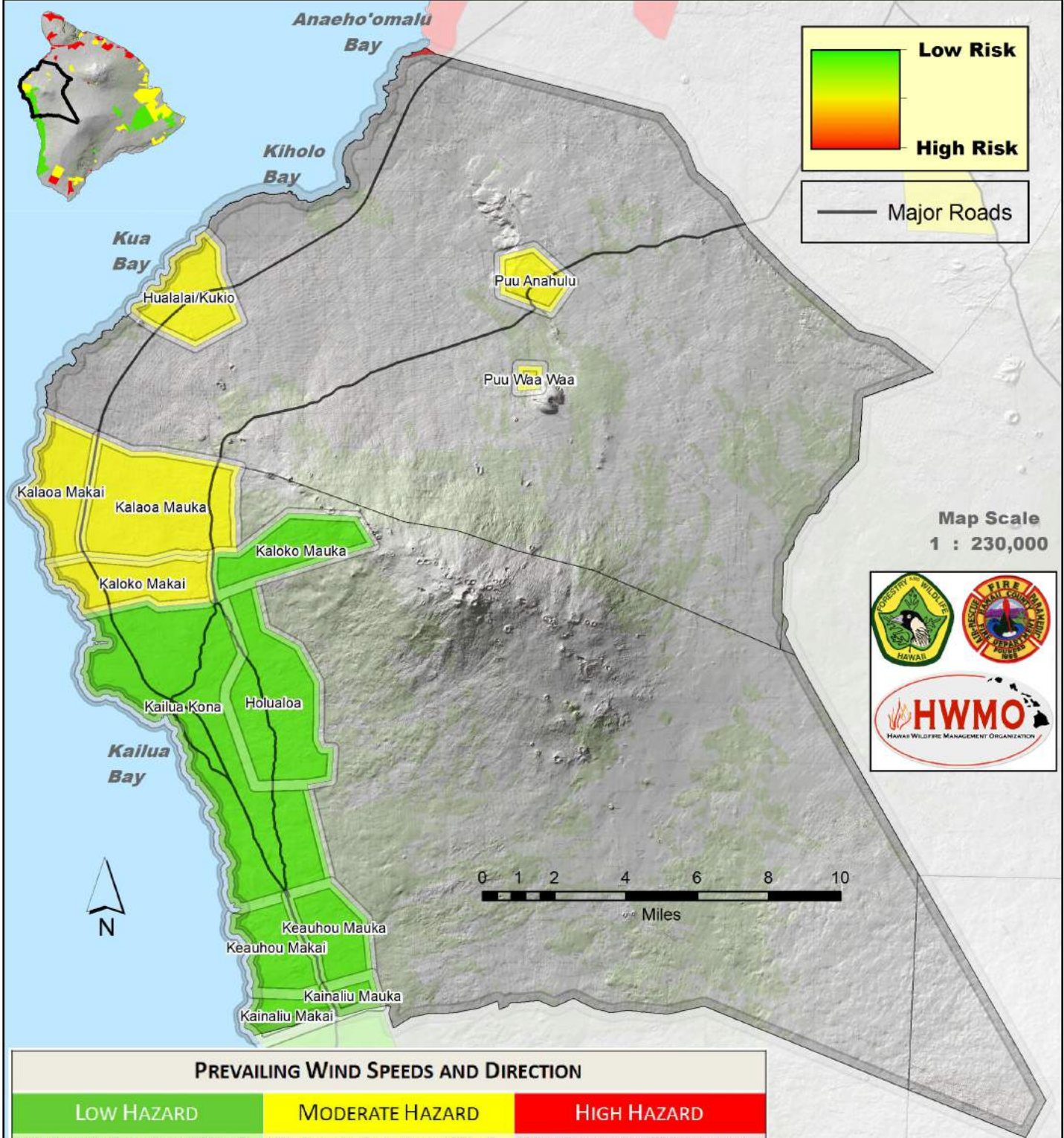


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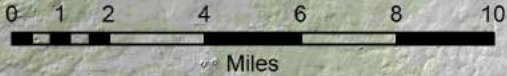
Map Scale
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Prevailing Wind Speeds & Direction Hazard For Developed Areas

North Kona Community Wildfire Protection Plan



Map Scale
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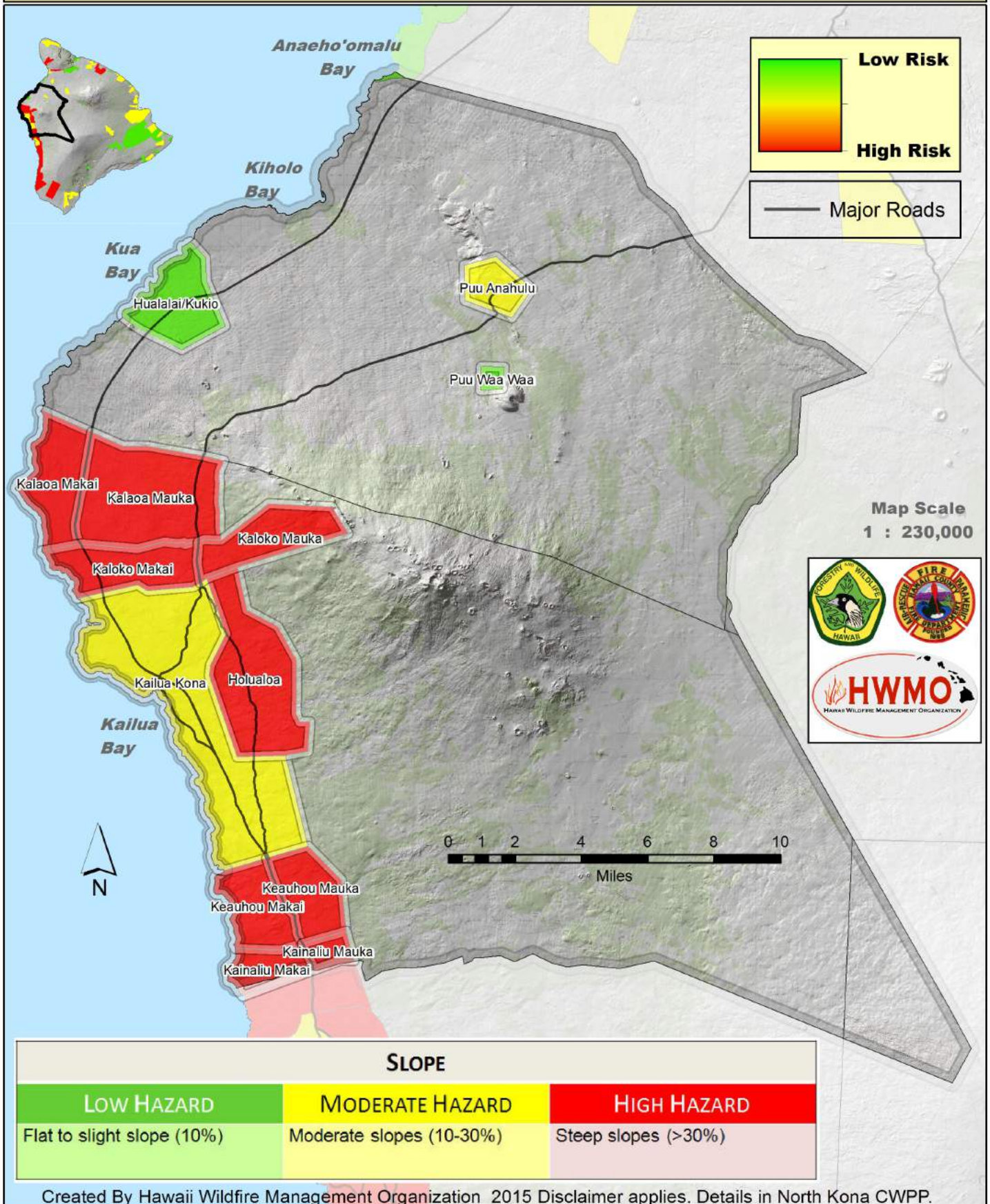
PREVAILING WIND SPEEDS AND DIRECTION

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.

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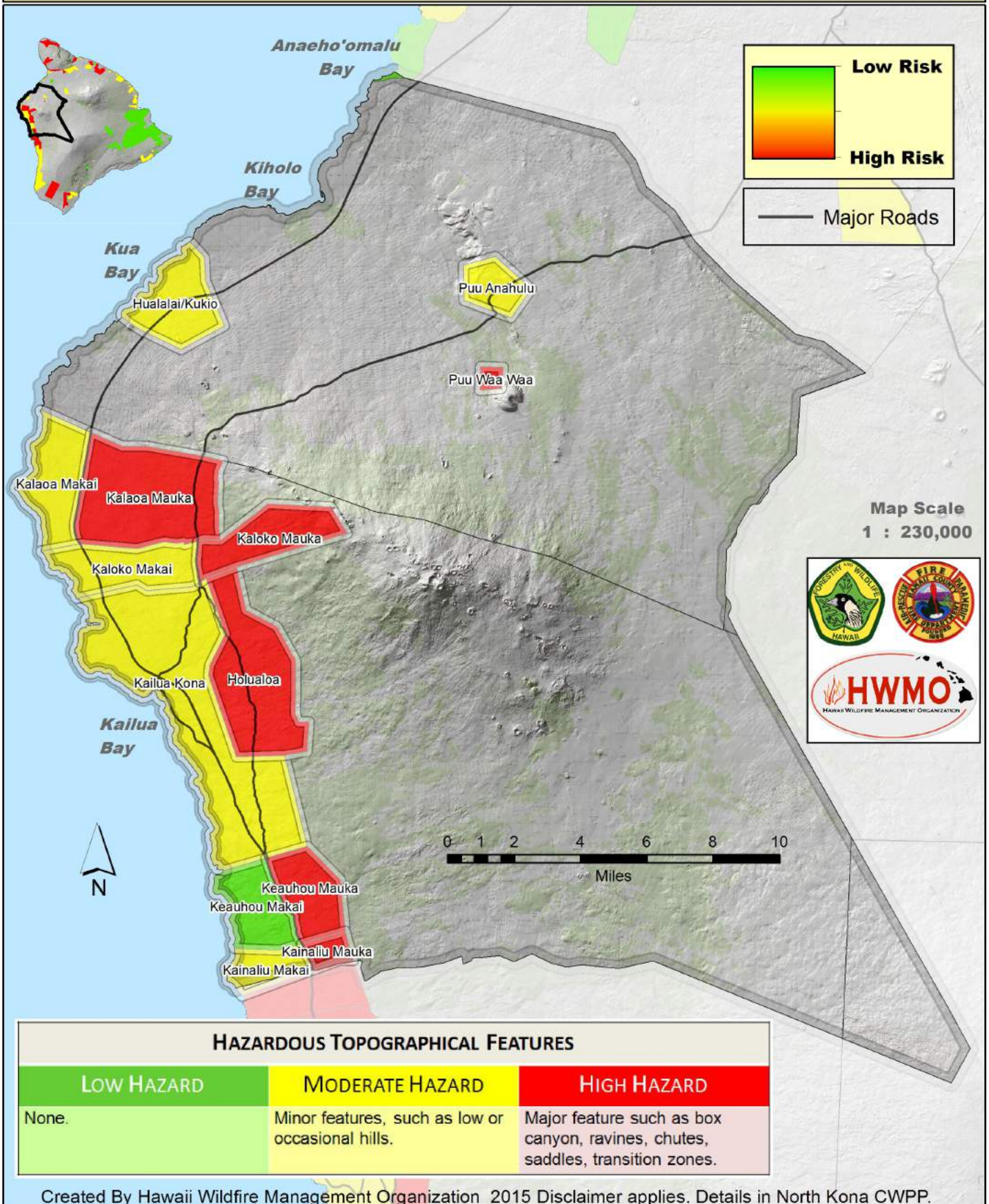
Slope Hazard For Developed Areas

North Kona Community Wildfire Protection Plan

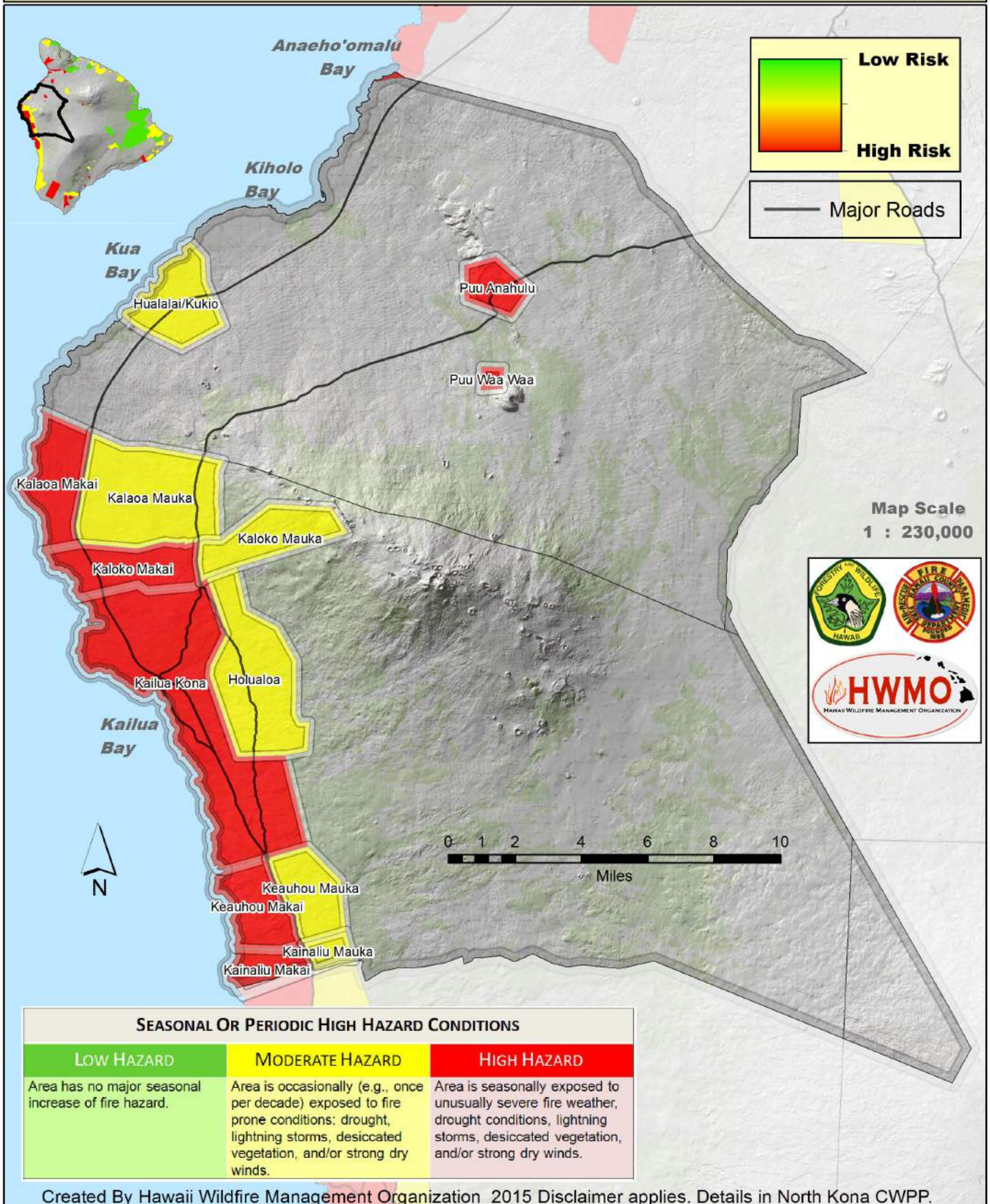


Topographical Features Hazard For Developed Areas

North Kona Community Wildfire Protection Plan

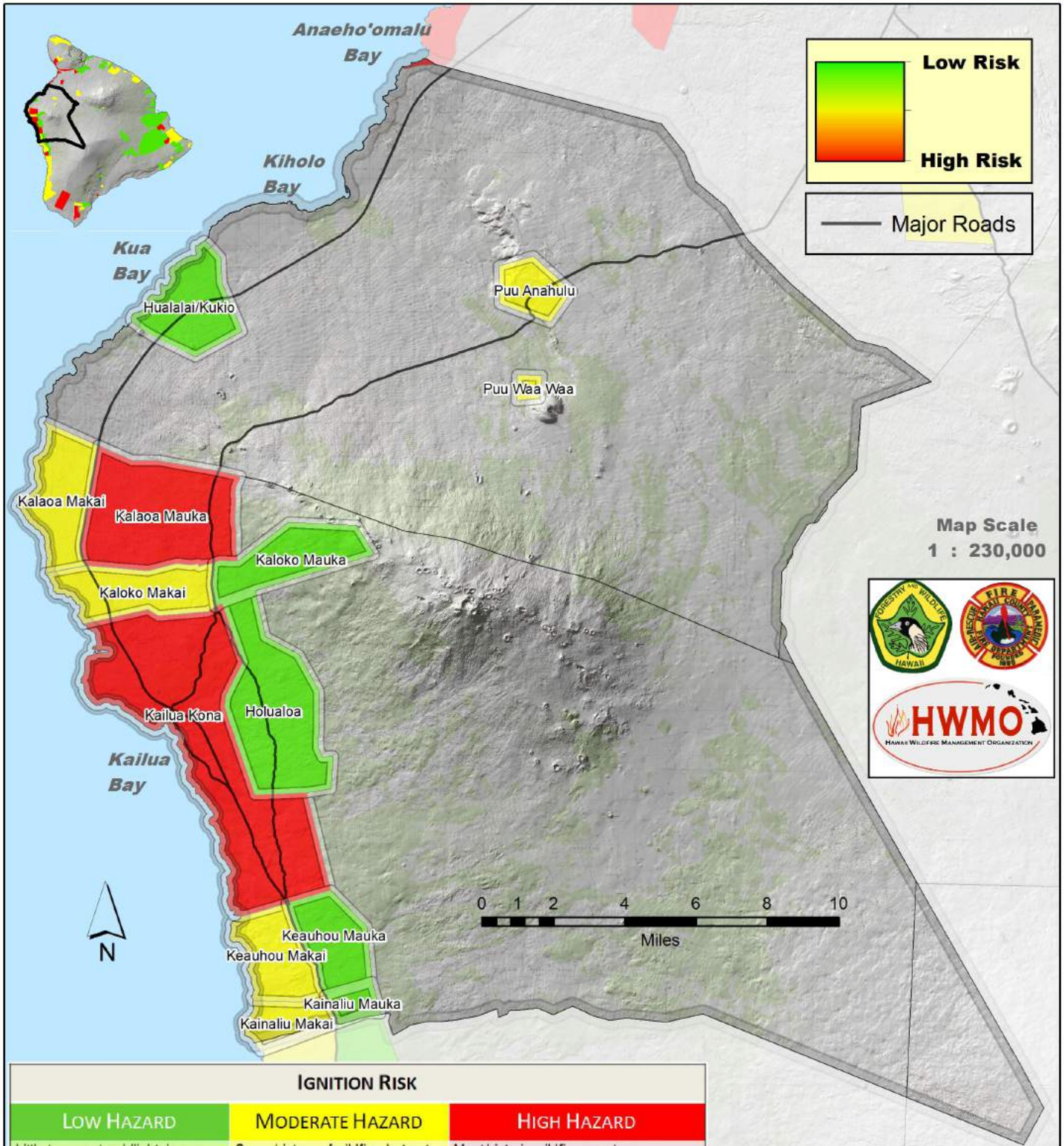


Seasonal Or Peroidic High Hazard Conditions For Developed Areas North Kona Community Wildfire Protection Plan



Ignition Risk: Hazard For Developed Areas

North Kona Community Wildfire Protection Plan



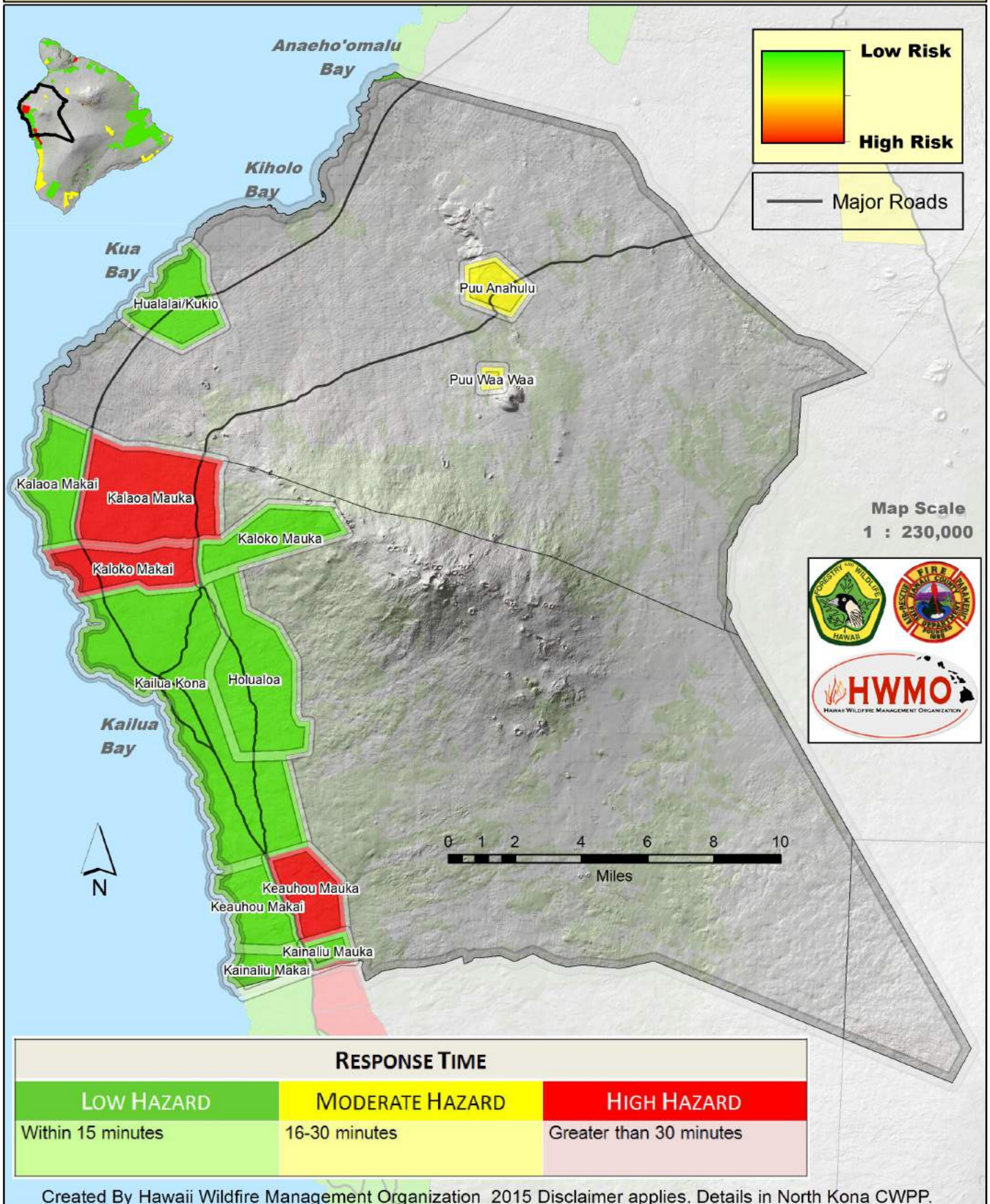
IGNITION RISK		
LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
<p>Little to no natural (lightning or lava) ignition risk. No history of arson. Wildland areas absent or distant from public and/or vehicular access.</p>	<p>Some history of wildfire, but not particularly fire prone area due to prevailing lack of fire prone conditions, weather, and vegetation type.</p>	<p>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.</p>

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FIRE PROTECTION HAZARD FOR DEVELOPED AREAS

Response Time Hazard For Developed Areas

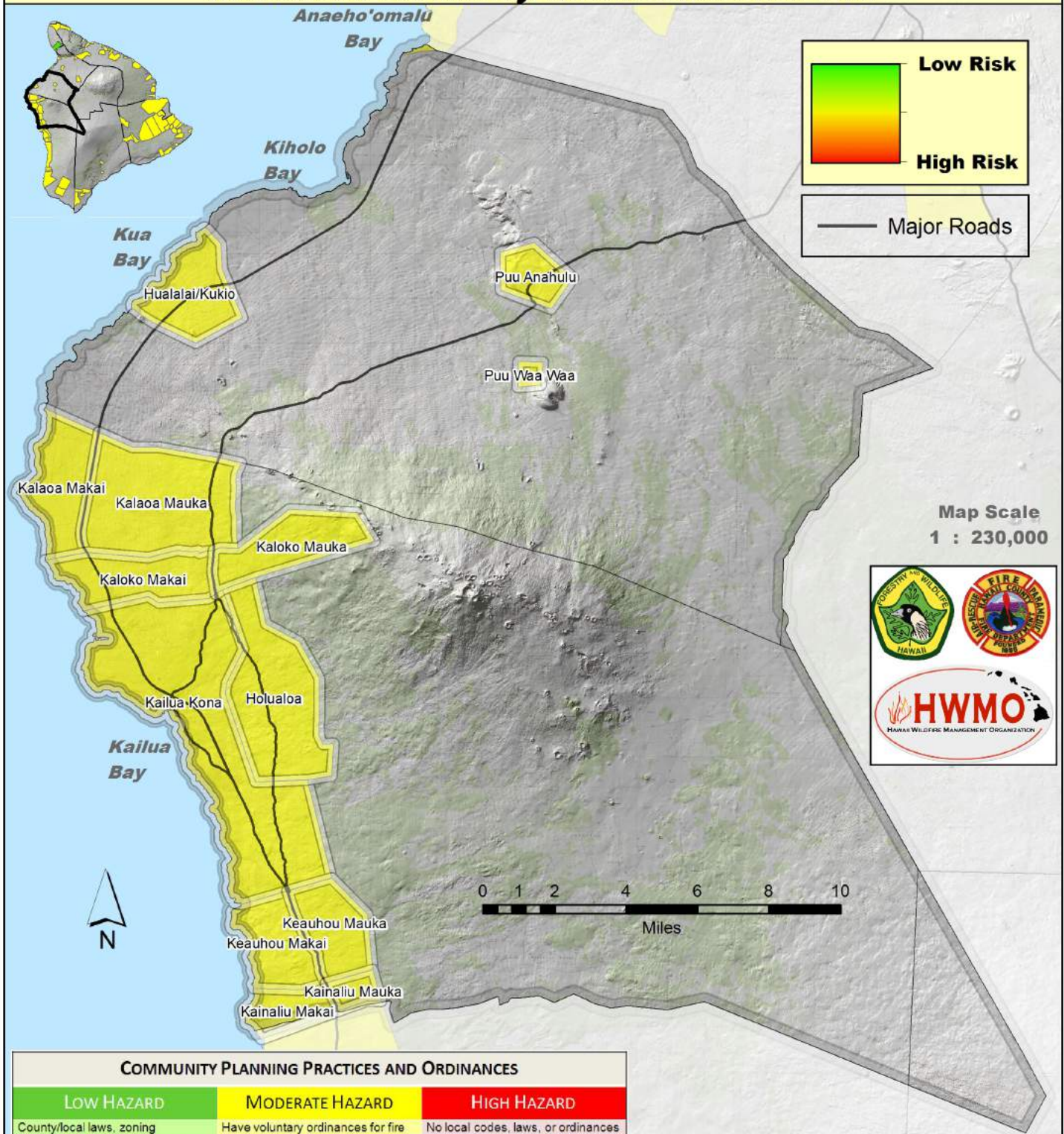
North Kona Community Wildfire Protection Plan



Community Planning Practices & Ordinances

Hazard For Developed Areas

North Kona Community Wildfire Protection Plan

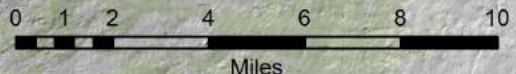


Low Risk

High Risk

— Major Roads

Map Scale
1 : 230,000



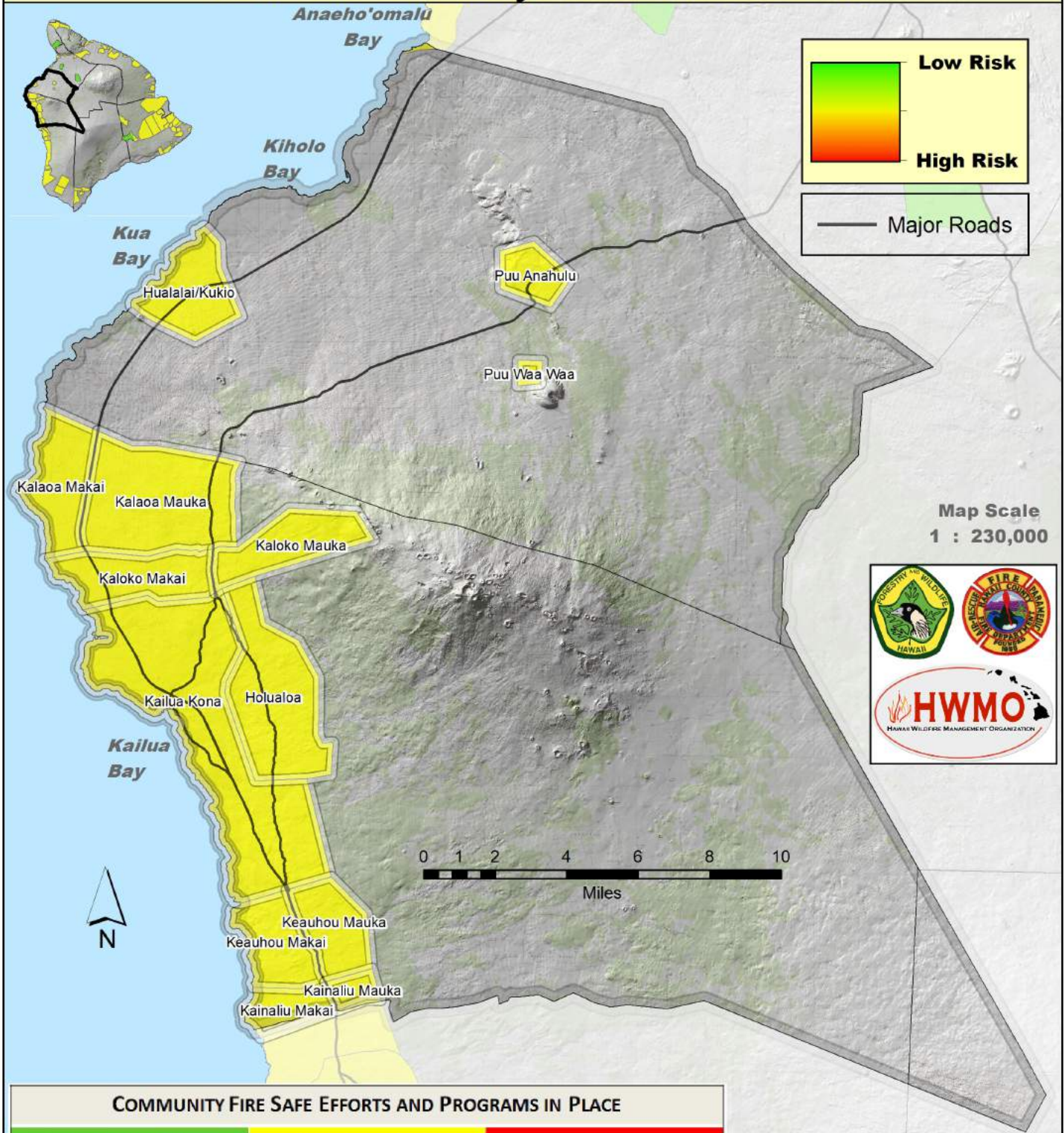
COMMUNITY PLANNING PRACTICES AND ORDINANCES

LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
<p>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.</p>	<p>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.</p>	<p>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.</p>

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

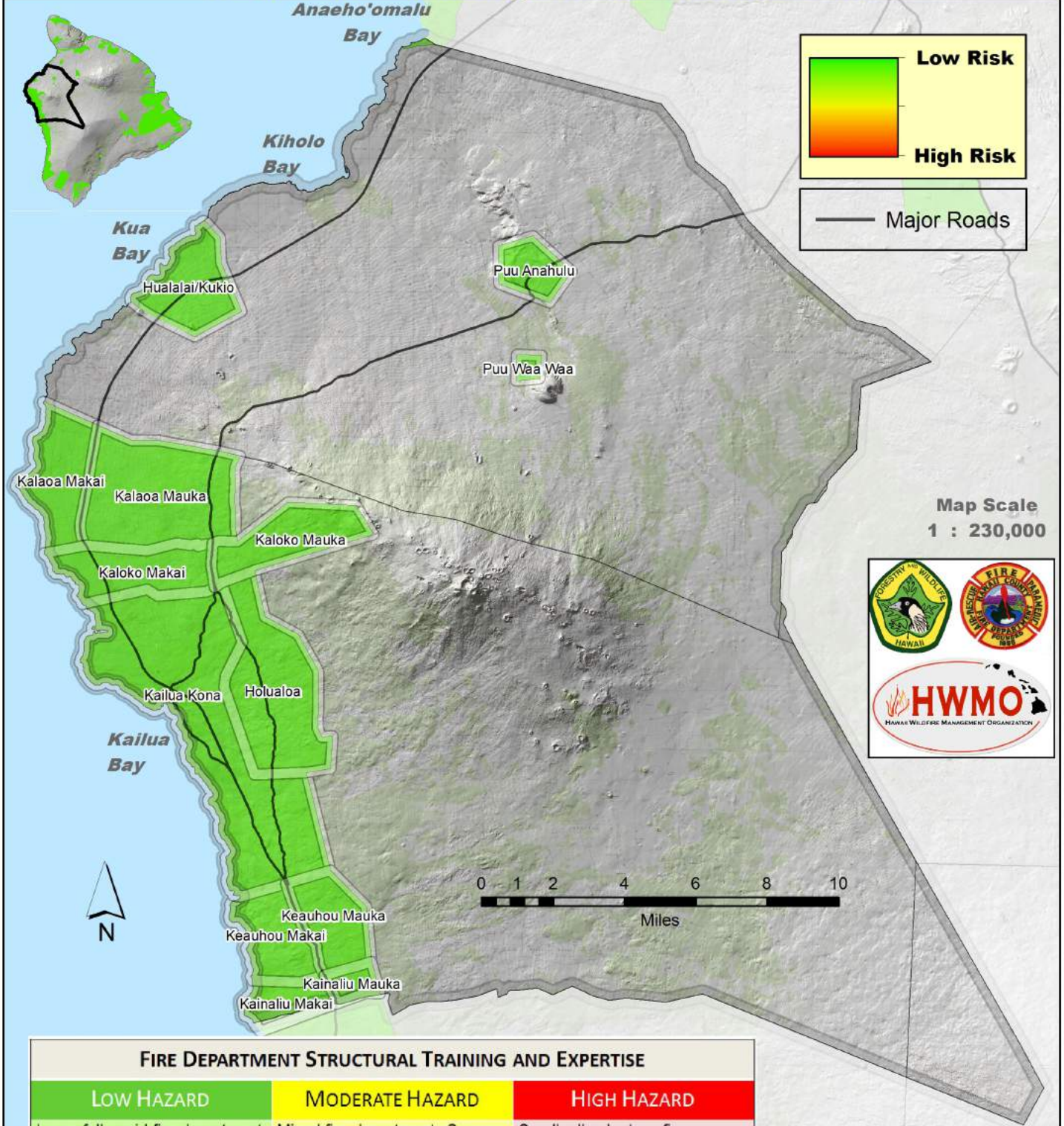
North Kona Community Wildfire Protection Plan



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.

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Fire Department Structural Training & Expertise Hazard For Developed Areas North Kona Community Wildfire Protection Plan

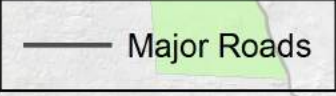
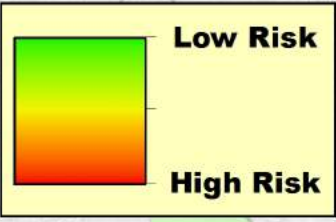
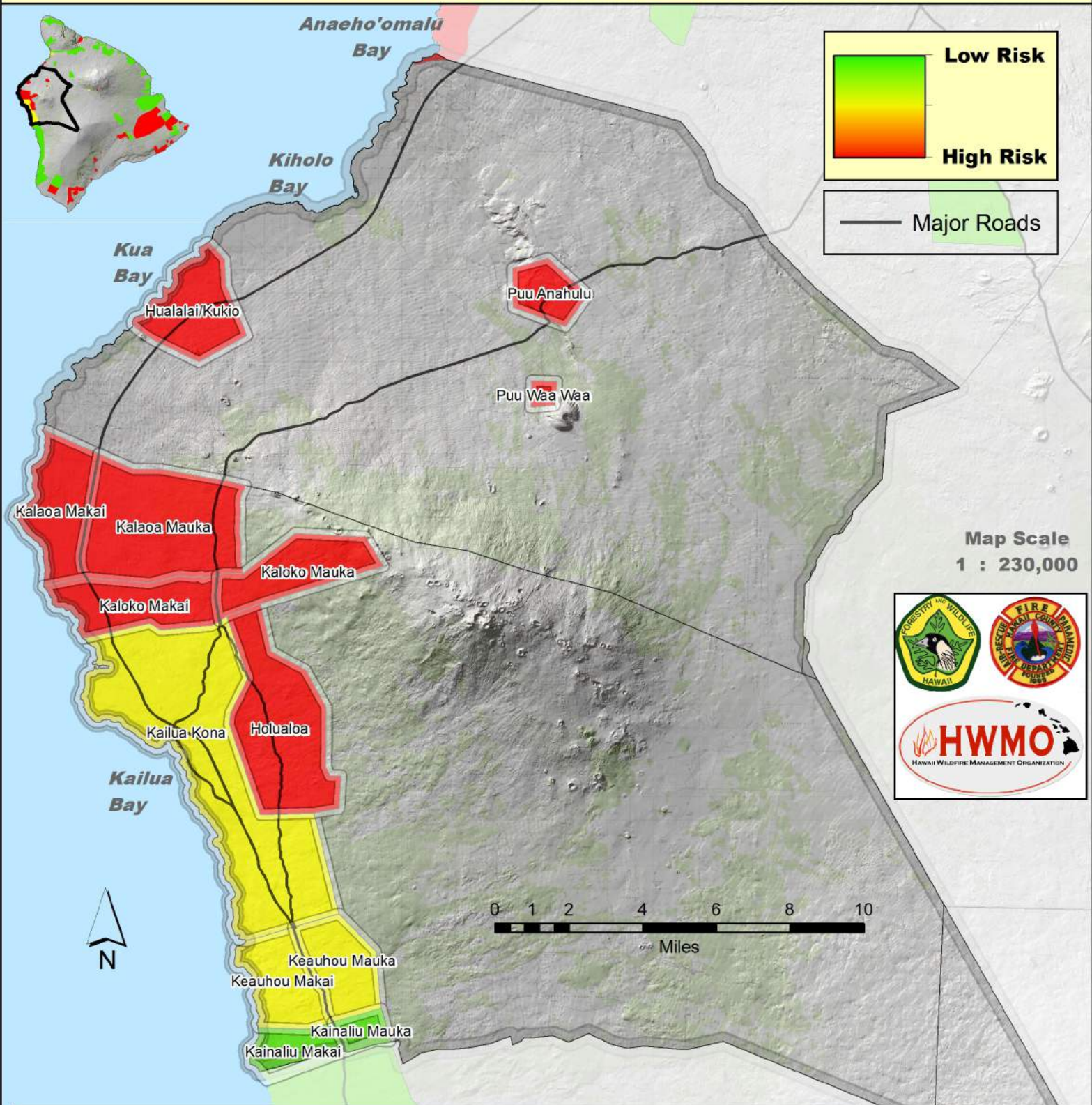


FIRE DEPARTMENT STRUCTURAL TRAINING AND EXPERTISE

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.

Citizen Or Local Emergency Operations Group Hazard For Developed Areas

North Kona Community Wildfire Protection Plan



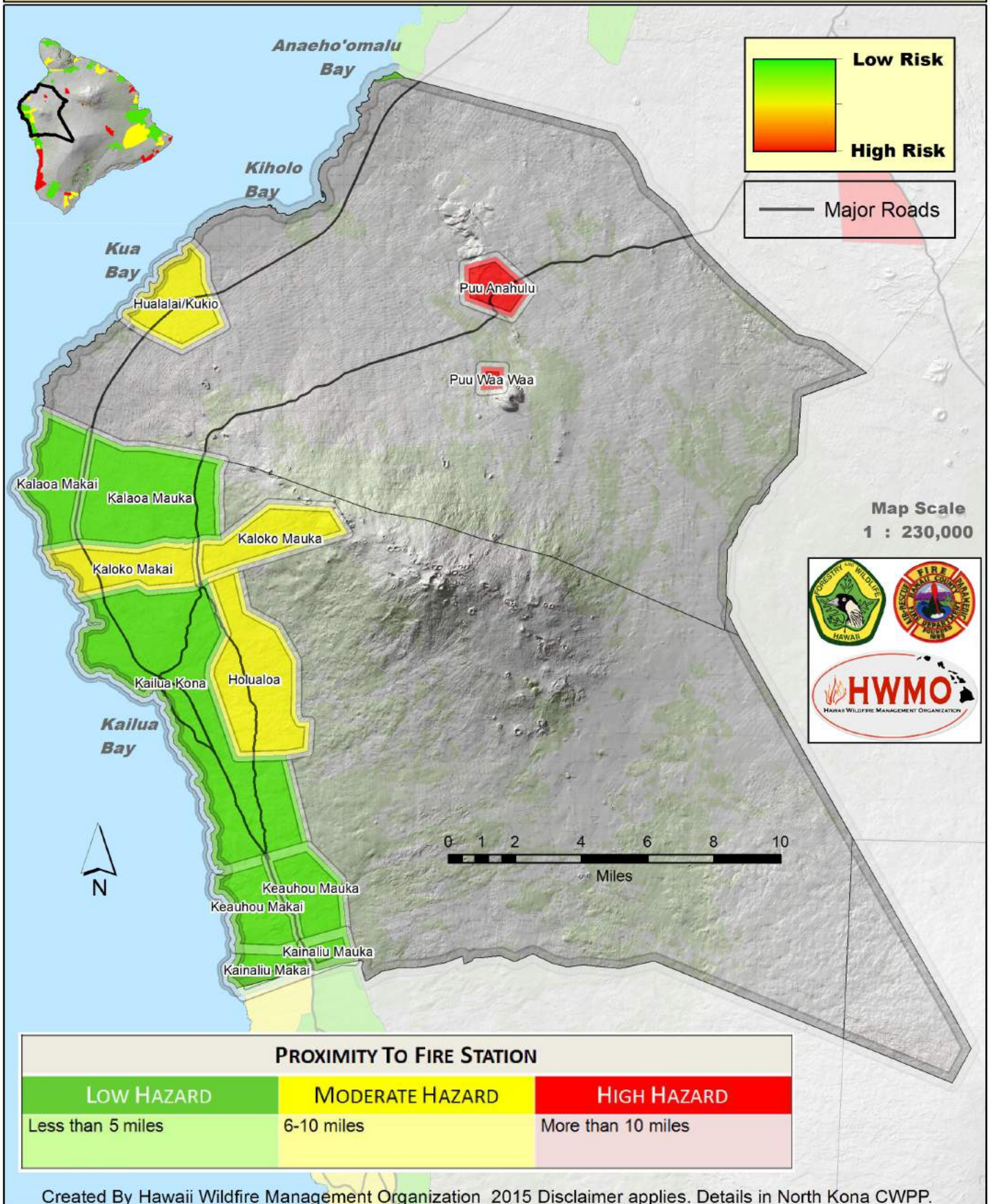
Map Scale
1 : 230,000



CITIZEN OR LOCAL EMERGENCY OPERATIONS GROUP		
LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
Active EOG or CERT. Evacuation plan in place.	Limited participation in EOG or similar. Have some form of evacuation process.	No effective activity or strategy in place.

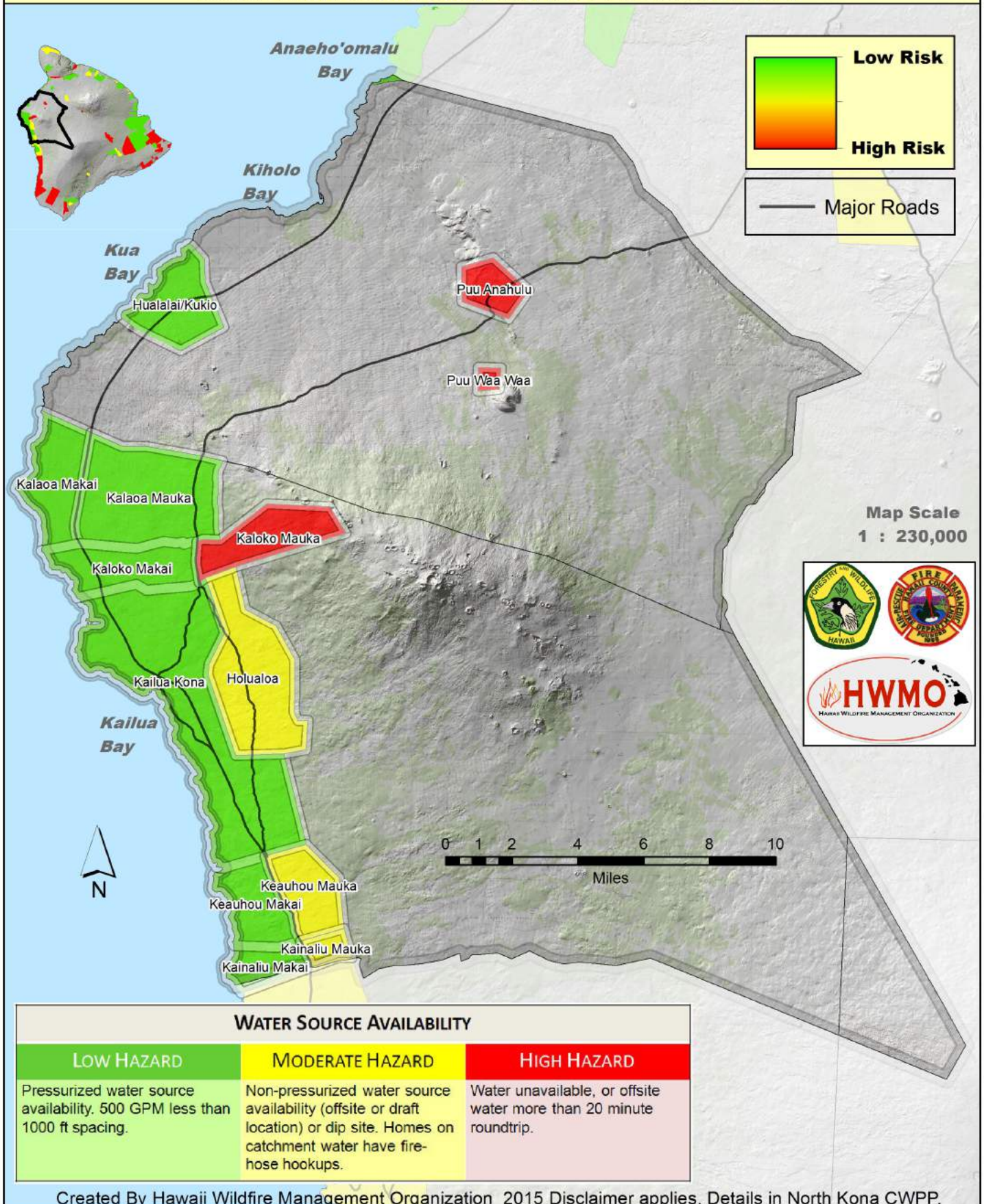
Proximity To Fire Station Hazard For Developed Areas

North Kona Community Wildfire Protection Plan



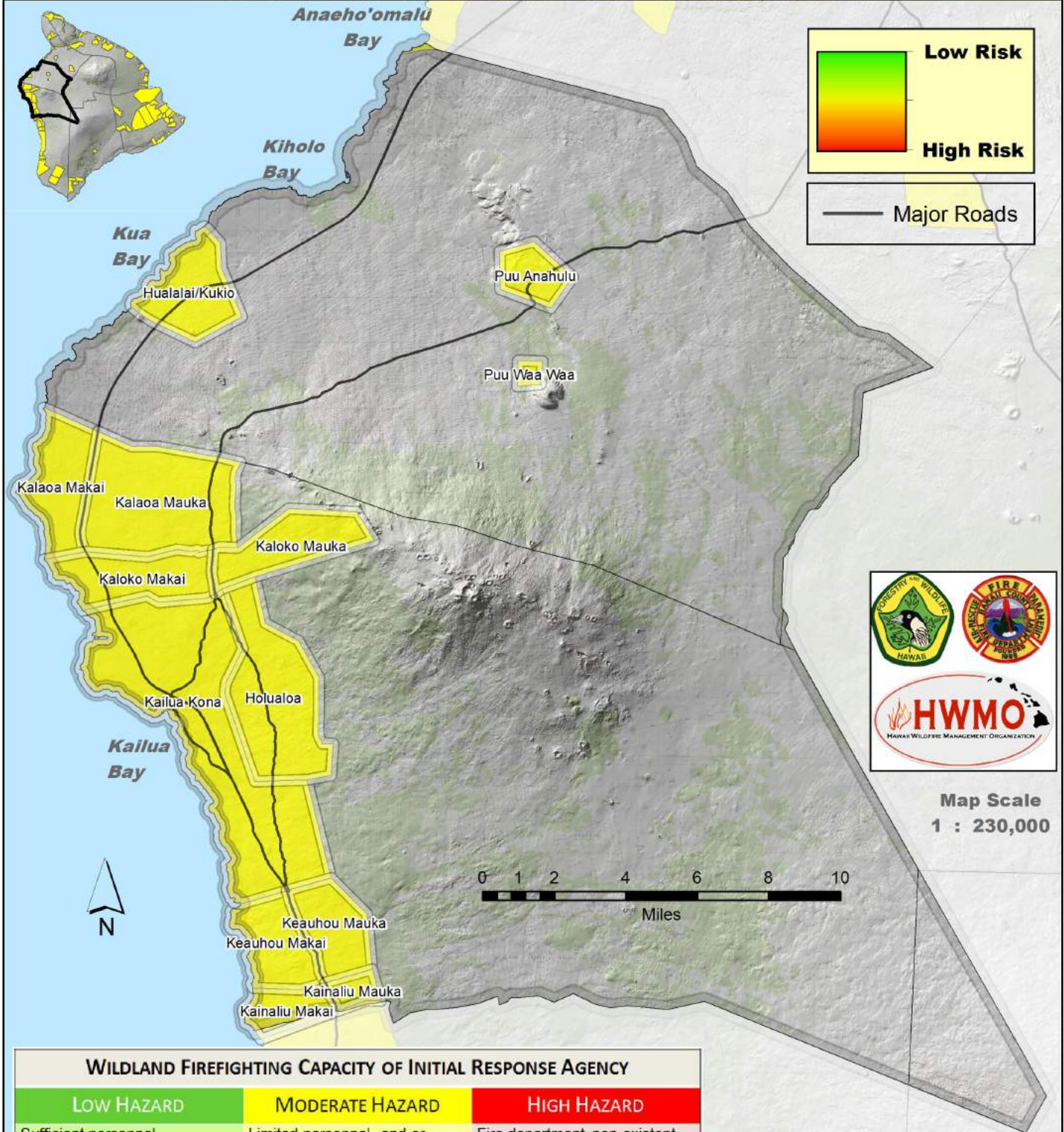
Water Source Availability Hazard For Developed Areas

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Wildland Firefighting Capacity Of Initial Response Agency Hazard For Developed Areas

North Kona Community Wildfire Protection Plan



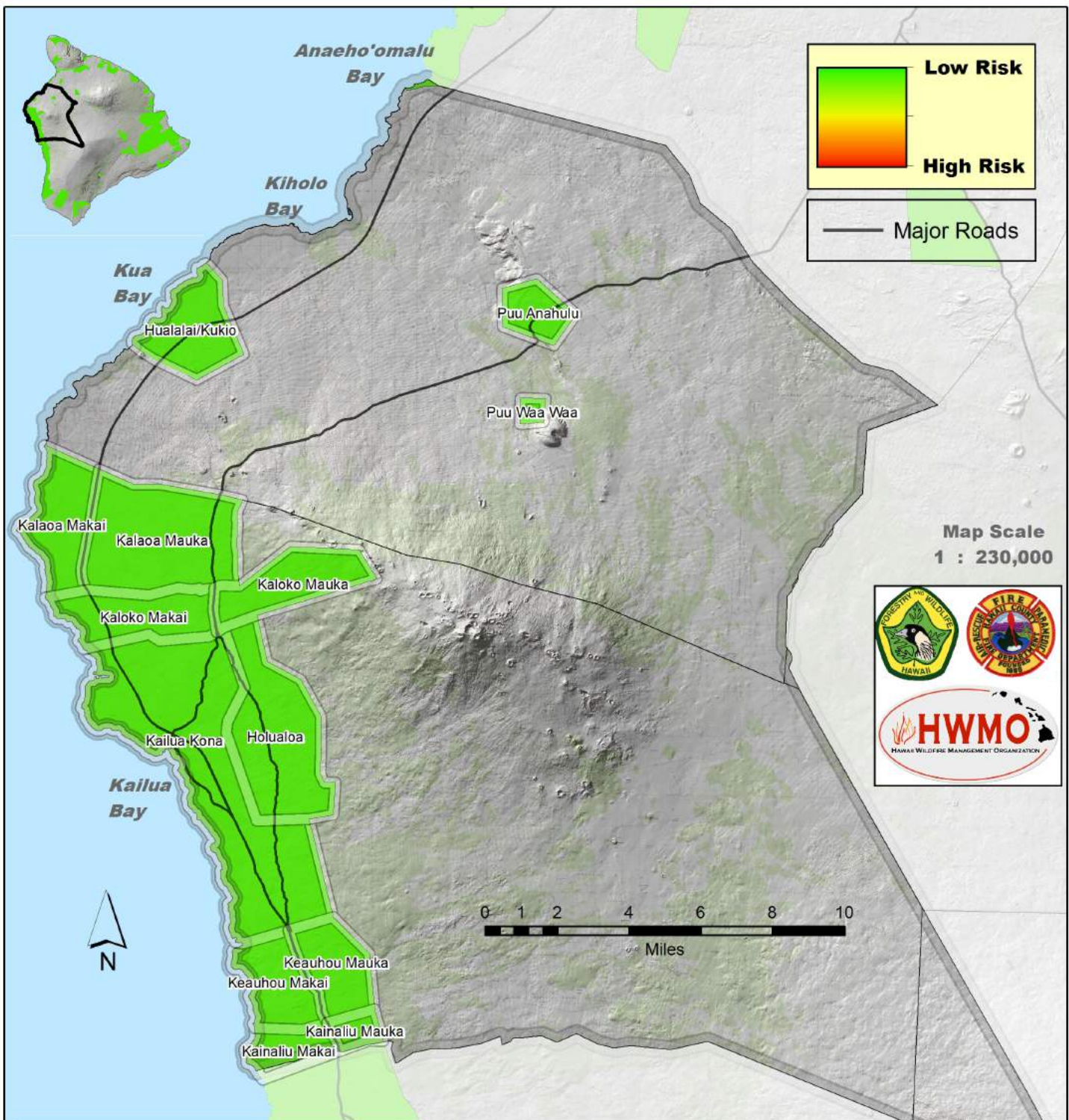
WILDLAND FIREFIGHTING CAPACITY OF INITIAL RESPONSE AGENCY

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.

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Interagency Cooperation Hazard For Developed Areas

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Low Risk

High Risk

— Major Roads

Map Scale
1 : 230,000



INTERAGENCY COOPERATION

LOW HAZARD	MODERATE HAZARD	HIGH HAZARD
Mutual aid agreements and resources available to deploy.	Mutual aid agreements but limited resource availability.	No mutual aid agreements.

Appendix C

Hawaii Fire Department
2016 Apparatus and Vehicle Inventory

Hawaii Fire Department: Apparatus Inventory- 2016

Station #	Location	Class 1 Pumper/ Engine	Brushtruck	Tanker
Station 1	Hilo	X		x
Station 2	Hilo (Waiakea)	X (plus ladder truck)		
Station 3	Hilo (Kawailani)	X		
Station 4	Hilo (Kaumana)	X (plus Hazmat apparatus)		
Station 5	Keaau	X	X	
Station 6	Captain Cook	X	X	
Station 7	Kailua	X		
Station 8	Honoka'a	X	X	
Station 9	Waimea	X		X
Station 10	Pahoa	X	X	X
Station 11	Pahala/ Naalehu	X	X	X
Station 12	Keauhou	X		
Station 14	South Kohala	X (plus ladder truck)		
Station 15	North Kohala	X		X
Station 16	Waikoloa	X		X
Station 17	Laupahoehoe	X	X	
Station 18	Hawaiian Paradise Park	X		
Station 19	Volcano	X		
Station 20	Hawaiian Ocean View Estates	X		
Station 21	Makalei (Kalaoa Mauka)	X (plus Hazmat apparatus)		