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F R O M: Gabe Johnson, Chair 
Agriculture, Diversification, Environment, and Public
Transportation Committee

SUBJECT: **TRANSMITTAL OF INFORMATIONAL DOCUMENT RELATING TO
RESILIENT LANDSCAPES AND SUSTAINABLE FUEL
MANAGEMENT** (ADEPT-1(9))

The attached informational document pertains to Item 1(9) on the
Committee's agenda.

adept:ltr:001(9)afile02:jgk

Attachment

Community Wildfire Protection Plan for Waihe'e, Hawaii

Sponsored by the Maui Coastal Land Trust
March 2007



Written by Denise Laitinen
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Appendix A: Hawaii Wildland Fire Risk and Hazard Severity Assessment Form (attached)

Appendix B: Updated Project List 2008-2009

Appendix C: Waihe'e Fire Fuels Map (Courtesy of Pacific Disaster Center)

Cover photo: View of Waihe'e Coastal Dunes and Wetlands Refuge. Photo courtesy of the Maui Coastal Land Trust.

Waihe'e Community Wildfire Protection Plan Mutual Agreement Page

The Community Wildfire Protection Plan (CWPP) developed for Waihe'e, Hawaii by the Maui Coastal Land Trust (MCLT):

- Was collaboratively developed. Interested parties and federal land management agencies managing land in the vicinity of Waihe'e have been consulted.
- This plan identifies and prioritizes areas for hazardous fuel reduction treatments and recommends the types and methods of treatment that will protect Waihe'e.
- This Plan recommends measures to reduce the ignitability of structures throughout the area addressed by the Plan.

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

Paul J. Conry
State Forester, Division of Forestry and Wildlife

Date

Carl Kaupalolo
Fire Chief, Maui County Fire Department

Date

Gen Iinuma, M.P.H.
Administrator, Maui County Civil Defense Agency

Date

Executive Summary:

The community of Waihe'e in Maui County on the island of Maui abuts the Waihe'e Coastal Dunes and Wetlands Refuge (Refuge), which is owned and managed by the Maui Coastal Land Trust (MCLT). The Refuge and the community is in a wildland urban interface (WUI) environment - that is where wildlands and houses meet. These interface areas pose the highest risk of loss of life and property due to wildland fire. The risk of wildland fire impacting homes in the WUI is determined by several factors, including the ignitability of fuels, structural ignitability, weather conditions, and topographical features, such as slope. Unlike other parts of the United States, wildfire is not a natural part of Hawaii's ecosystem. In Hawaii, wildfires destroy native plants, which impacts the watershed and the habitat of threatened and endangered native Hawaiian animals. Wildfires in Hawaii also cause soil erosion, which leads to runoff that negatively impacts ocean reefs.

The overwhelming majority of wildfires in the state of Hawaii are caused by arson or human error. Human error includes errant fireworks, rubbish, cooking, or agricultural fires that get out of control in the wildland-urban interface, as well as vehicle-caused wildfires.

Principal stakeholders who have an interest in protecting Waihe'e from wildfire include the Maui County Fire Department, Maui Coastal Land Trust, which sponsored this CWPP, as well as the State Division of Forestry and Wildlife, Natural Resource Conservation Service, Maui County Civil Defense Agency, and the Waihe'e Community Association. These decision makers were invited to participate in the development of this Plan.

An assessment determined that WUI areas in this community have a high risk of wildland fire, with the Refuge having a higher risk than Waihe'e Village. Wildland fires originating within the Waihe'e Coastal Dunes and Wetlands Refuge via human or natural causes have threatened the community of Waihe'e, which encompasses Waihe'e Village, Waihe'e Baseball Park, Waihe'e Elementary School, Waihe'e Beach Park, and Yagi subdivision. Conversely, wildfires caused by human error in Waihe'e could impact the Refuge. There has been an increase in development in the area with the Department of Hawaiian Home Lands building the fourth phase of Waiehu Kou subdivision adjacent to MCLT lands.

Meetings with community members and fire agency personnel identified several priority mitigation measures to reduce the wildfire risk in Waihe'e. These include: (1) creation of a secondary emergency egress road (offsite of MCLT property); (2) creation of a community green waste compost pile to reduce green waste dumping on MCLT land; (3) reduction of and continued maintenance of fuel load in Field 9 in the Refuge; (4) improvement and maintenance of Kalepa Gulch Access Road and the Dunes Access Road off Kahekili Highway; and (5) continued fire prevention education and outreach. Because the Waihe'e Coastal Dunes and Wetlands Refuge is recognized as the primary source for wildland fires, the majority of these recommendations are based on this property.

Maui County has been fortunate in controlling wildland fires in the community to date. However, one need only look at the community's fire history and fuel load to understand the wildfire risk. The mitigation measures outlined in this Plan will enable the community of Waihe'e to reduce its risk to wildfire and create more efficient fire-protection systems. The priority mitigation measures listed above identify pro-active projects the community and fire agencies can undertake to minimize losses from a major wildfire.

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Background:

Waihe'e is a small residential village along Maui's windward coast to the northwest of Wailuku, the county seat of Maui, and south of the remote village of Kahakuloa. Kahekili Highway is the only main through road in the community with homes, a school, two churches, and a county park on either side of the two-lane highway. There are roughly 60 to 65 structures in the community. The West Maui Mountains, including Waihe'e Valley and the state-owned West Maui Forest Reserve are on the north (mauka) side of Kahekili Highway with the Waihe'e Coastal Dunes and Wetlands Refuge on the south (makai) side. The Refuge stretches north to south from the ocean to the highway and east to west between Halewaiu Road and Waihe'e Point. Halewaiu Road runs north-south from Kahekili Highway to the ocean. On the lower portion of Halewaiu Road, directly across from the Refuge is Waiehu Golf Course. On the upper portion of Halewaiu Road there are homes buffering the Refuge. Across from these homes, on the other side of Halewaiu Road, a new Department of Hawaiian Home Lands subdivision, Waiehu Kou IV, is under construction. Waiehu Kou I, II, and III subdivisions lie just east of Waihe'e along Kahekili Highway adjacent to Waiehu Golf Course (outside the boundaries of this CWPP.) At the other end of the Refuge, near Waihe'e Point is the Yagi subdivision containing nearly a dozen homes.

The area lies within a tsunami inundation zone, and is susceptible to hurricanes and earthquakes, in addition to wildfires.

MCLT manages the 277-acre Waihe'e Coastal Dunes and Wetlands Refuge that lies adjacent to the Waihe'e community. MCLT acquired the Refuge in 2004, and the former Waihe'e Dairy is now part of the Refuge. The mission of the Maui Coastal Land Trust, a local 501(c)(3) non-profit conservation organization, is to preserve and protect Maui's coastal lands for the benefit of the natural environment, as well as for current and future generations.

The Refuge encompasses 24 acres of coastal, spring-fed wetlands; 103 acres of dune ecosystem; more than 7,000 feet of marine shoreline; and more than 8 acres of riparian habitat for the recovery of native birds and native vegetation. The wetlands contained within the Refuge are the third largest wetlands on the island of Maui.

The Refuge is rich in archaeological and cultural resources, including ancient Hawaiian fishing villages, multiple heiau, an inland fishpond (loko kalo i`a), and extensive burial sites. The archeological resources have only been partly delineated, but appear to be one of the most productive sites remaining on Maui. There are at least 85 known archeological sites on the Refuge.

There is also an abundance of wildlife in the area. In recent years, at least six endangered bird and insect species, including the Hawaiian Stilt (*Ae'o* or *Himantopus mexicanus knudseni*), Hawaiian Coot ('Alae Ke'oke'o or *Fulica Americana alai*), the Hawaiian Duck (*Koloa* or *Anas wyvilliana*), and the Blackburn Sphinx Moth (*Manduca blackburnii*) have been reported in the Refuge. The Hawaiian Coot, Stilt, and Sheerwater ('Ua'u kani) use the Refuge as a breeding area. Endangered plants, such as creeping Naupaka (*Scaevola coriacea*), have recently been reintroduced to the Refuge.

Waihe'e Reef, just offshore of the Refuge, is one of the longest and widest reefs on Maui, an extensive marine ecosystem that parallels the shoreline along the northeast side of the property. This system provided an excellent fishing site in ancient Hawaii and is still a favorite among local fishermen. Although the general public is not allowed vehicle access to the Refuge, MCLT allows area fisherman to walk onto the Refuge to fish.

There are state, county, and federal easements on all parts of the Refuge except the 26.98-acre section known as Ironwoods. Essentially, this means that MCLT has agreements with federal, state, and county entities promising there will never be future development on the land.

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A single-lane unpaved (dirt) road runs through the Refuge and in some portions it has vertical clearance of less than 15 feet. This road is accessible via Kahekili Highway at the Dunes Access Road, which has a locked gate, and via Kalepa Gulch Access Road off of the lower section of Halewaiu Road near the golf course, which also has a gate. The gate off Halewaiu Road is usually open during the day, providing access to a spot known as Roundtables and the entrance to the old Waihe'e Dairy site. The entrance to the Dairy is gated and locked at all times. MCLT staff, board members, and contractors have keys to the gates. The Kalepa Gulch Access Road leading to Roundtables and the old Dairy is frequently washed out and inaccessible. A September 2006 wildfire started in an open area of Guinea Grass between Roundtables and the Dairy off Kalepa Gulch Access Road, and came dangerously close to area homes.



MCLT staff unlocks the entrance gate to the Refuge at the Dunes Access Road off of Kahekili Highway.

The entrance from Kahekili Highway is a descending winding slope that leads to the Dairy site and then curves along the coast toward the wetlands and heiau, where the road is relatively flat. MCLT staff recently purchased a tractor that they use to mow the Dune Access Road on a regular basis to keep fuel load at a minimum and provide accessibility. MCLT staff also plan to spray the periphery of this access road on a regular basis to further reduce fire fuel load and to that end have purchased a 100-gallon spray unit.

There is also a one-lane unpaved road that runs behind the houses along the makai side of Kahekili Highway and the Refuge from Halewaiu Road to the sand dunes. This road serves as a fuel break between the homes and the area of the Refuge known as Field 9. MCLT staff mows the fuel break or contracts to have it mowed four times a year.



Left: the entrance to the fuel break that starts at Halewaiu Road and runs between the houses on the makai side of Kahekili Highway and Field 9 in the Refuge. Center: view of fuel break road. Right: rear view of houses along fuel break. Several properties have dense vegetation close to the houses.

Field 9 is a 26-acre section of the Refuge directly behind homes along the makai side of Kahekili Highway. It contains Guinea Grass (*Panicum maximum*) and other hazardous fuels, which were greater than five feet in height at the time the hazard assessment was conducted. Because of the dense fuel load and potential risk to area homes if a wildfire were to occur, MCLT applied for and received grant funding to mow Field 9. The field was mowed in October 2006 and fuel load growth in the area as of April 2007 was roughly two to three feet in height. MCLT may wish to consider using grazing animals in Field 9 as a cost-effective and efficient way to reduce fire fuel load in the area.

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Left: end of fuel break access road between Field 9 and Waihe'e homes. Note height of fuel load in Field 9. Center: a small pond is behind the last house on the fuel break. Right: fuel load in Field 9 and the sand dunes in the Refuge. Fire fuels include grasses and kiawe trees, known carriers of firebrands.

There are three structures on the Refuge, all of which are several decades old dating back to the Waihe'e Dairy era and built of combustible materials and non-combustible roofing. One of the buildings, located next to the wetlands, is believed to be of C.W. Dickey design and is slated to be restored as a cultural educational center for MCLT providing working, interpretive, and meeting areas, as well as a kitchen and restrooms for student groups. The former Waihe'e Dairy caretakers' home, near the remnants of the old Dairy site, is a wood-frame house with combustible siding. It is rundown from years of being unused and in dire need of renovation. A caretaker currently lives in the house and recently initiated some renovations, as well as clearing defensible space around the structure. MCLT plans to completely remodel the caretaker's home. The third structure, commonly known as the doctor's house, which is situated near the Dairy's caretaker home, is in such disrepair it is slated to be demolished.



The three structures on the Waihe'e Coastal Dunes and Wetlands Refuge. Left: the C.W. Dickey home to be remodeled as MCLT's new cultural education center. Center: the old Waihe'e Dairy caretaker's house slated for renovation. Right: structure known as the doctor's house, which is slated to be demolished.



Section of the Refuge next to Waihe'e Beach Park, known as Ironwoods

In recent years, Waihe'e Beach Park, which is adjacent to the Refuge, has become a haven for homeless people, many of whom camp in the area. The part of the Refuge next to Waihe'e Beach Park is referred to as the Ironwoods section as it contains a large stand of Ironwood trees. In previous decades this area was used to grow sugar cane but is now covered with Ironwood (*Casuarina Equisetifolia*) and Haole Koa trees (*Leucaena leucocephala*). Guinea Grass (*Panicum maximum*) is the prevalent vegetation under the Ironwood trees and the ground is covered with about two inches of pine needles. The pine needles inhibit some plant growth but not that of the Guinea Grass. Waiehu Golf Course personnel recently cleared haole koa trees on their property closest to MCLT land. However, abandoned cars and trash in the area are a potential fire hazard, since there is a history of people burning abandoned cars. In February 2005, MCLT staff cleared 26 abandoned cars and 14 tons of garbage from the Ironwoods area alone. Given the strong onshore winds in the area, if a campfire or other fire originating at the Beach Park got out of

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control, it could easily spread to the Refuge and neighboring homes. Conversely, roadside fires started along Kahekili Highway could impact the Refuge. There have been recent fires in the Refuge that came close to homes along Kahekili Highway. Fishermen burning bonfires with area driftwood are a concern because fishermen have unintentionally started at least one previous wildfire in the Refuge.



Left: a September 2006 wildfire that broke out on the Refuge was pushed toward Waihe'e homes by onshore winds. Center: Maui Fire Department personnel vehicles staged on the fuel break road between the Refuge and area homes to prevent flames from reaching the homes. Right: MFD personnel mop up the fire that burned more than two acres. The wildfire was caused by the arcing of an electrical line.

Fire History:

Maui County Fire Department is responsible for fire suppression in the district. The nearest fire station is in Wailuku, 4 miles away, and houses 2 apparatus a 1,500-gallon pumper and a recently acquired 300-gallon mini pumper with a CAPS system purchased specifically for handling wildfires in the Waihe'e/Kahakuloa district. Between January 2000 and October 31, 2006 there were 25 wildfires in Waihe'e. Of the 25 fires, 5 were intentional, 4 were unintentional, 1 is under investigation, and 15 were of undetermined cause. A total of 9 acres were burned. A 2-acre fire within the Refuge in September 2006 came dangerously close to several homes along the makai side of Kahekili Highway.

Stakeholders:

Stakeholders are individuals or groups who have a high level of interest in the protection of their assets from wildfire. The Refuge shares a half-mile of boundary with Waihe'e community homes in wildland-urban interface areas along Kahekili Highway, Wilipohaku Road, and Oki Place. When Waiehu Kou Phase IV is completed, the interface boundary will increase by another 1/4 to 1/2 mile. In addition to community members and the fire response agencies, those organizations with easements on the Refuge also have an interest in reducing the wildfire risk in Waihe'e. Contact information for principal stakeholders is listed below.

Federal:

National Resource Conservation Service (NRCS)

Ranae Ganske-Cerizo
210 Imi Kala St.
Wailuku, HI 96793
(808) 244-3100 X 107
ranae.Ganske@hi.usda.gov



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State:**Department of Land and Natural Resources: Division of Forestry and Wildlife**

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State Protection Forester
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Wayne.F.Ching@hawaii.gov

**County:****Maui County Fire Department**

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Maui County Department of Fire and Public Safety
200 Dairy Road
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**Maui County Civil Defense Agency**

Gen Iinuma, M.P.H.
Administrator
County of Maui Civil Defense Agency
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**Maui Coastal Land Trust**

Dale Bonar
Executive Director
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(808) 244-5263
dale@mauicoastallandtrust.org

**Base Map of Waihe'e:**

Figure 1 is a base map of the community of Waihe'e and adjacent landowners. The inhabited areas at potential risk to wildfire include Waihe'e Village, Waihe'e Baseball Park, Waihe'e Elementary School, Waihe'e Beach Park, and Yagi subdivision.

The areas containing critical human infrastructure i.e. houses, are along Kahekili Highway. Areas of community importance include: the Refuge, Waihe'e Elementary School, and St. Ann Church, and Waihe'e Protestant Church.

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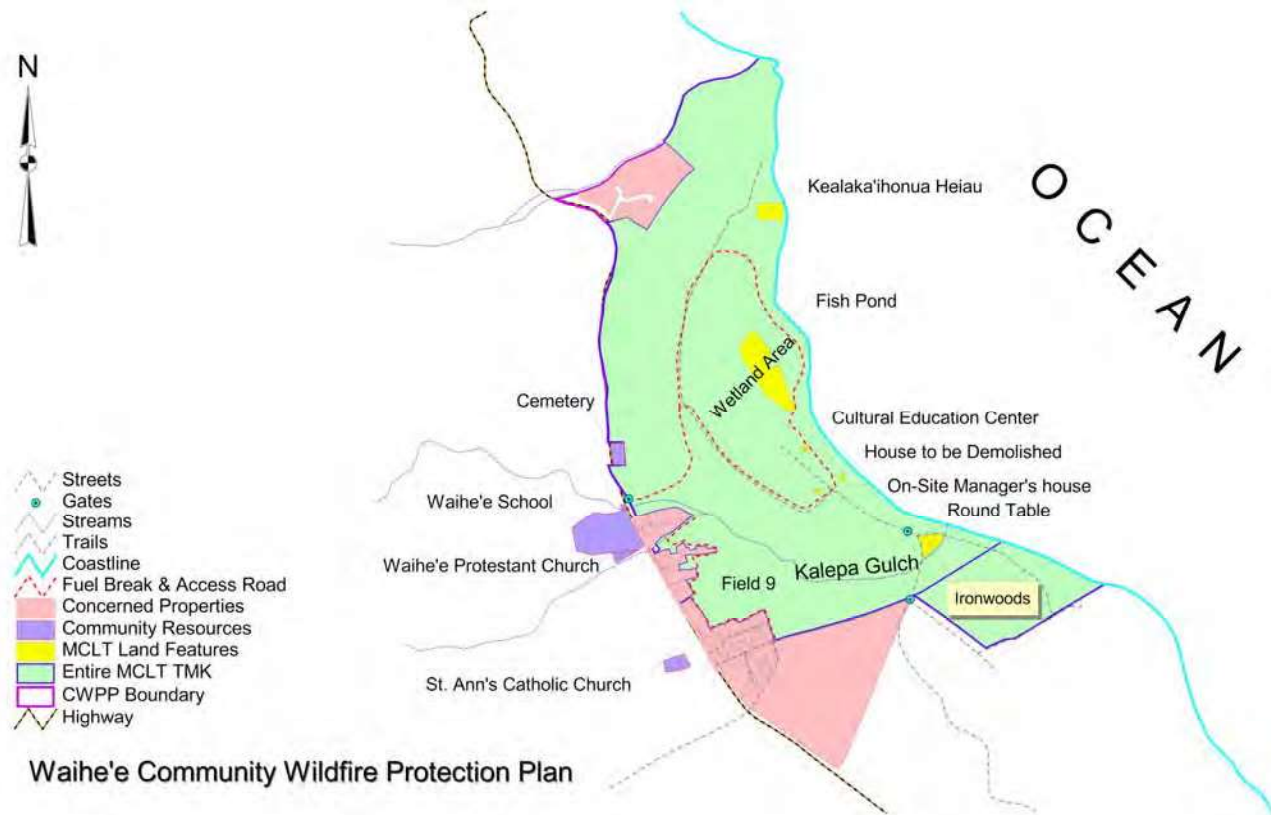


Figure 1: Area of consideration for the Waihe'e CWPP.

Fire Risk Assessment for Waihe'e:

The Waihe'e community is at sea level and is composed of Waihe'e Village, including Waihe'e Elementary School, Waihe'e Baseball Park, and the Refuge. There are no commercial districts within the Village. House lots along Kahekili Highway and the Yagi subdivision are between 8,000 to 12,000-square-feet with the average about 10,000-square-feet. Many of the structures are plantation-style homes that are several decades old. The majority of houses have noncombustible roofing and combustible (wood) siding. There is one road through the community, Kahekili Highway, which is greater than 24 feet in width with shoulders. Houses along Kahekili Highway have little to no slope. However, within the Refuge, there is a gently rising slope from the ocean to the Highway. The Refuge contains sand dunes, which reach heights of 200 feet, and run the length of the Refuge. On the makai side of the highway, the slope increases with the steep hills of the West Maui Mountains.

The community is connected to the county water system with fire hydrants spaced within 1,000-feet of each other on paved roads. There is a 2-1/2 inch water main across from Waihe'e Elementary School. MCLT recently installed a 2-inch above ground water line from Kahekili Highway to the old Dairy site. Water is accessible via a hose attachment at the caretaker's house. Road signage is metal and reflectorized, however house numbers vary in size and color. Utilities are above ground. There is an active community association in Waihe'e.

Given its rural location, there is a great deal of wildland urban interface in Waihe'e. The area receives an average of 20 inches of rainfall annually with winds from the northeast averaging 10 – 17 mph. The entire Refuge is protected wetlands and lowlands. Vegetation includes Haole Koa, Kiawe, and

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Ironwood trees, as well as Guinea grass and other grasses. Homes throughout Waihe'e contain mature vegetation, including trees, shrubs, and plants. The wildlands in the Refuge provide critical habitat for a number of endangered plant and animal species. There has been recent development in the area with the construction of Waiehu Kou IV to the east and additional homes being built in Yagi subdivision.

A Hawaii Wildland Fire Risk and Hazard Severity Assessment based on the Assessment in Appendix A of NFPA 1144, *Standard for Protection of Life and Property from Wildland Fire*, was conducted by the Hawaii Firewise Coordinator, Maui County Fire Department personnel, and MCLT staff on August 17, 2006 to identify the level of wildland fire risk of Waihe'e.

Using a pre-established point system, the Wildland Fire Risk and Hazard Severity Assessment is a tool used to determine the level of wildfire risk to a home or community. Points are given regarding overall terrain and location, road width, local area fire history, prevailing winds and seasonal weather, geographical contours, native vegetation, water availability, location of fire suppression resources, as well as the combustibility of building materials, including roof, siding, and attached items, such as decks, fencing, or an additional unit. The combined points in all these categories are added together and the overall risk is determined by whether the score falls in the low-, medium-, high-, or extreme-risk point range. Given the ignitability of individual structures and preponderance of fuels in close proximity to structures Waihe'e scored within the high-risk score range in the Assessment, a copy of which can be found in Appendix A.

Community Assets at Risk:

Assets at risk are valued resources that can be damaged or destroyed by wildfire. In addition to ensuring firefighter safety and protecting residents and visitors, the following assets warrant consideration in pre-incident planning: watersheds; forest reserves; wildlife; rare and endangered plants and animals; scenic, cultural, and archeological sites; and structures.

The following were identified as valued resources within the Waihe'e community that would be adversely affected by wildfire.

Commercial resources:

Waihe'e Elementary School, St. Ann Church, Waihe'e Protestant Church.

Historical resources:

Structures within the Waihe'e Coastal Dunes and Wetlands Refuge that are more than 50 years old. The State of Hawaii classifies buildings over 50 years old as historical structures in accordance with National Park Service Administrative Rule Chapter 6E.

Natural Resources:

Waihe'e Coastal Dunes and Wetlands Refuge, including the archeological sites, fishponds, and heiau contained within, as well as the native Hawaiian endangered plants and animals.

This Plan focuses on structures within the wildland urban interface in Waihe'e. Overgrown vegetation, structures with combustible building materials, and limited ingress into the Refuge all contribute to unsafe fire conditions.

The mix of flammable vegetation, including Kiawe trees is a concern since firebrands, consisting of burning embers and small burning matter, can travel up to a mile when strong winds are present. Kiawe trees are known carriers of firebrands. The grasses found within the Refuge are high-intensity fuels, which burn quickly and can rapidly spread fire to other fuels, such as Kiawe. The high fire hazard in this

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area is demonstrated by a history of wildfires in the region. Open lands filled with a mixture of flammable grasses and Kiawe trees border Waihe'e. While most homes have fire resistant roofing, a number of homes in Waihe'e have wood siding and lanais (decks), further enhancing the fire problem. House lots vary greatly in the degree of defensible space around the homes from little to no defensible space to more than 30 feet of clearance. Driveways tend to be less than 100 feet and most driveways are 12 feet wide with 15 feet of vertical clearance for emergency vehicle access. However, most driveways in the community do not have turnaround access for emergency vehicles. Some houses are built on concrete slab while others are of post and pier construction, with the houses about two feet off the ground.

Green waste dumping is an issue in Waihe'e, especially along the homes on the makai side of Kahekili Highway. A one-lane dirt road fuel break runs between the makai side homes and the Refuge. Residents will often carry their green waste to the Refuge and in fact, one resident was seen with a wheelbarrow full of green waste dumping the material on the Refuge while the wildfire hazard assessment was being conducted. Such dumping creates a fire hazard. Were a fire to break out in this area as it did in September 2006, the dried out piles of green waste would serve as additional fire fuel.



Green waste dumping is an issue in the Refuge. A Waihe'e resident was seen carting this wheelbarrow full of green waste from his home to the Refuge while the wildfire hazard assessment was being conducted.

Community Concerns for Waihe'e:

MCLT commissioned the CWPP because the organization is concerned about wildfire negatively impacting the Refuge and the community. Wildfires can potentially be caused by homeless people in the area; fisherman who walk onto the property; fires started by visitors; and the ignition potential of fire fuel load in Field 9. Multiple meetings with community members and fire agencies specifically on the CWPP process held in August 2006 identified the most pressing fire concerns in Waihe'e. These include in order of priority:

1. The need for a secondary access road on mauka side of Kahekili Highway for emergency egress in case of wildfire;
2. Green waste dumping;
3. Fuel load in Refuge areas closest to area homes;
4. Reduction of fuel load around individual properties, including structures on the Refuge;
5. Inaccessibility of Kalepa Gulch Access Road as it pertains to firefighting personnel; and
6. Public awareness of wildfire threat.

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Recommended Action for Waihe'e:

Multiple meetings with community members and fire agencies specifically on the CWPP process in August 2006 identified the most pressing fire concerns in Waihe'e. These include in order of priority:

1. Creation and maintenance of mauka secondary access road for emergency evacuation purposes.
2. Green waste dumping education and creation of community compost pile for local residents;
3. Reduction of fuel load in Field 9 and other interface areas closest to area homes;
4. Creation of defensible space around community homes, as well as around structures on Refuge;
5. Improvement and maintenance of Kalepa Gulch Access Road for firefighting apparatus access;
6. Continued public education of wildfire threat; and
7. Tear down and removal of dilapidated doctor's house in old Waihe'e Dairy section of Refuge on property as it is a fire hazard.

Based on the results of the community wildfire hazard risk assessment, the following mitigation measures were identified to reduce wildfire risk in Waihe'e. Because the Waihe'e Coastal Dunes and Wetlands Refuge is recognized as the primary source for wildland fires, the majority of these recommendations are based on this property. The community and fire agencies collaborated to prioritize mitigation efforts in the following order of importance:

1. Creation of secondary emergency access road;
2. Reduction of green waste dumping and creation of community compost pile;
3. Reduction of fire fuel load in Field 9 and other interface areas;
4. Creation of defensible space around community homes, as well as around structures on Refuge;
5. Improvement of Kalepa Gulch Access Road as well as the Dune Access Road off Kahekili Highway;
6. Continued fire prevention education and outreach; and
7. Removal of unrepairable structures on Refuge that pose a fire hazard.

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Based on the results of the community wildfire hazard risk assessment, priority ratings have been selected for Waihe'e and areas of community importance. The community recommendations for the type and method of treatment for the surrounding vegetation are listed in the following table.

Community, structure or area at risk	Type of Treatment	Method of Treatment	Overall Priority
Waihe'e Village	Mechanical	Creation of secondary emergency access road	Very High
Waihe'e Village / Refuge	Mechanical / Chemical / Hand Labor / Public Education	Reduction of green waste dumping on MCLT property by area residents	Very High
Waihe'e Village / Refuge	Mechanical / Chemical / Hand Labor	Reduction of fuel load in Field 9 and interface areas	High
Waihe'e Village / Refuge	Mechanical / Chemical / Hand Labor	Creation of defensible space around community homes, as well as structures on Refuge	High
Refuge	Mechanical / Chemical / Hand Labor	Improvement of Kalepa Gulch Access Road and Dune Access Road off Kahekili Highway	High
Waihe'e Village	Public Education and Outreach	Continued fire prevention education and outreach	High
Refuge	Mechanical	Removal of unrepairable structures on Refuge that pose a fire hazard.	High

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Community, federal agencies, and private landowners surrounding Waihe'e were invited to submit projects that provide protection and reduce wildland fire risk. The following table displays a list of projects based on recommendations from community and fire-related organizations. MCLT intends to assess the progress annually and invite agencies and landowners to submit projects that provide community protection.

Community, structure or area at risk	Project	Agency	Funding Needs	Timetable	Community Recommendation
Waihe'e Village	Creation of secondary emergency ingress/egress road	Maui County/ Others	Cooperative Funding	2007-2008	Yes
Waihe'e Village / Refuge	Reduction of green waste dumping on MCLT property by area residents	Private	Cooperative Funding (estimated costs \$14,000)	2007-2008	Yes
Waihe'e Village / Refuge	Reduction of fuel load in Field 9 and interface areas	Multiple agencies	Cooperative Funding (estimated costs \$14,000)	2007-2008	Yes
Waihe'e Village / Refuge	Creation of defensible space around community homes, as well as structures on Refuge	Private	Cooperative Funding	2007-2008	Yes
Refuge	Improvement of Kalepa Gulch Access Road, Dune Access Road	MCLT	Cooperative Funding (estimated costs \$15,000)	2007-2008	Yes
Waihe'e Village	Continued fire prevention education and outreach	Multiple agencies	Cooperative Funding	2007- 2008	Yes

Secondary emergency access road

With only one road running through the community, a secondary emergency access road is needed should Kahekili Highway be compromised during a wildfire or other disaster. According to long time area residents, there is an old cane road that runs on the mauka side of Kahekili Highway towards Waiehu that could be improved and utilized as an emergency evacuation route. MCLT does not own the land mauka of Kahekili Highway and the creation of such an access road is up to the discretion of the landowner.

In order to remain effective, the secondary emergency access road must also be maintained on a regular basis. Funding should be secured to ensure that the road is maintained (cleared of overgrown vegetation) at least twice a year. The organization that is determined to be responsible for the access road may want to consider the purchase of a chipper to remove vegetation on the access road.

Reduction of green waste dumping

Green waste dumping is a serious issue because the accumulated material can increase the risk of wildfire, as well as a wildfire's potential growth by providing fire fuel hidden from view. Many residents may be unaware that they are contributing to their community's fire risk by dumping green waste on the Refuge. An education campaign to increase the awareness of this fire risk, as well as the creation of a community compost pile where residents can take their green waste material will go a long way to resolving this issue. For examples of how communities in other states have developed effective green waste removal projects, please go to www.firewise.org.

Reduction of fuel load in Field 9 and other interface areas

Reducing vegetation in Field 9 and other interface areas in the Refuge will reduce the area's wildfire risk. MCLT has taken the initiative in this regard by applying for and receiving a grant to cover the cost of mowing the 26-acre Field 9. Mowing occurred in October 2006. Because Field 9 is one part of the Refuge that is closest to area homes along Kahekili Highway, it is imperative that this fuel load reduction be maintained on a regular basis. The use of grazing animals is a cost effective and efficient method of fuel load reduction used by other communities facing similar issues. MCLT may wish to consider the use of such grazing animals for fire fuel load reduction of Field 9.

Volunteers and MCLT staff have also cleared an additional 27 acres of brush in the wetlands area of the Refuge. MCLT plans to replant indigenous plant species in the recently cleared areas.

Creation of defensible space around community homes and Refuge structures

Creating defensible space around a home is a key component of being Firewise and greatly reduces the ignition potential of a house in the event of a wildfire. The section below on reducing structural ignitability details how homeowners can create defensible space.

Improvement of Kalepa Gulch Access Road

A potential fire in the lower area of the Refuge (near the homeless camp) would grow rapidly because Maui Fire Department would be unable to get apparatus onto the Refuge due to the inaccessibility of Kalepa Gulch Access Road, which is often washed out. The road should be improved and maintained so that it is accessible by Maui Fire Department apparatus and personnel. The Dune Access Road off Kahekili Highway can easily become overgrown with tall grasses, making the road hard to travail. Because the gate to this road and the access road at the dairy, on Kalepa Gulch Access Road, are always locked MCLT should also ensure on a regular basis (at least semi-annually) that Fire Department personnel on all shifts at the nearest fire station have copies of keys to the gates.

Continued fire prevention education

Fire agencies in Maui County have partnered with Firewise to promote community wildfire awareness in wildland urban interface communities. The objective is to increase overall awareness of fire hazard issues that affect residents within the wildland urban interface. While a Firewise coordinator has provided much needed outreach in the community, funding for such a position has been intermittent. Stable funding for an outreach coordinator should be developed to ensure consistent fire prevention outreach. With a new subdivision being built adjacent to the Refuge, it is crucial to continue a comprehensive fire education and outreach campaign to all area residents, including the Department of Hawaiian Home Lands. This program should consist of the following:

1. Continued development and coordination of community meetings and outreach events. Coordination with other community groups, such as the Waihe'e Community Association, local disaster preparedness committee and civic organizations, to provide wildland fire safety information on defensible space and Firewise building materials. Provide outreach at community events.

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2. Develop educational materials specific to community fire threat and continue outreach in local publications. Continued outreach is needed.
3. Development of fire prevention outreach materials, including TV and radio public service announcements, posters, and handouts.

Removal of unrepairable structures on Refuge that pose a fire hazard.

A dilapidated structure known as the doctor's house in the Dairy portion of the Refuge is slated to be torn down, however no date for demolition has been set. Given fuel load in the area and the fact that the house was constructed of combustible material, in its current condition the house is a potential fire hazard. It's recommended that the house be scheduled for demolition as soon as possible, (within MCLT's budget and schedule) and that all building debris be removed from the site.

Reduce Structural Ignitability:

As part of its fire prevention education efforts, Firewise provides recommendations to reduce structural ignitability. Individuals and the Waihe'e community can reduce structural ignitability throughout the community by taking the following measures.

- Create a buffer zone of defensible space around a property of at least 30 feet or to the property line if the house has less than 30 feet of yard. Remove flammable vegetation and combustible growth within 30 feet of the house.
- Prune tree limbs 6 – 10 feet above the ground.
- Space trees and shrubs ten feet apart in the yard.
- Make sure that plants closest to the house are low-lying. And whenever possible use native Hawaiian or succulent plants.
- Routinely remove dead leaves and other organic matter from the yard.
- Sweep and/or clean gutters, eaves, and roofs regularly to prevent the build-up of leaves and other matter.
- Use fire-resistant building materials for the roof, siding, and decks, such as metal, stucco, tile, brick, and cement.

Appendix A:

Hawaii Firewise Wildland Fire Risk & Hazard Severity Assessment Form

Assign a value to the most appropriate element in each category and add the point totals. This assessment was adapted from Appendix A of NFPA 1144, Standard for Protection of Life and Property from Wildland Fire.

When assessing a home or community, look at the overall terrain and site location, local area fire history, prevailing winds and seasonal weather (keep Kona wind conditions in mind), property contours, native vegetation, irrigation requirements, as well as the combustibility of roof, siding, and attached items, such as lanai, fencing, or an ohana unit.

Area Assessed: Waihee, Maui Hawaii

Assessment Conducted by: Denise Laitinen, Firewise Coordinator, B. C. Jeff Shaffer, Maui Fire Department

Element	Possible Points	Points Given	NOTES
A. Means of Access			
1. Ingress and egress			
a. Two or more roads in/out	0	0	In & out of the Reserve
b. One road in/out	7		
2. Road width			
a. Greater than 24 ft.	0		
b. Greater than 20 ft. but less than 24 ft.	2	2	
c. Less than 20 ft.	4		
3. Road condition			
a. Surfaced road, grade less than 5%	0		
b. Surfaced road, grade greater than 5%	2		
c. Non-surfaced road, grade less than 5%	2	2	
d. Non-surfaced road, grade greater than 5%	5		
4. Fire service access to community or home			
a. Driveway is less than 300 ft. with turnaround space for fire trucks	0		
b. Greater than 300 ft. with turnaround	2		
c. Less than 300 ft. with no turnaround	4	4	
d. Greater than 300 ft. with no turnaround	5		
5. Driveway is at least 12 ft. wide with 15-foot vertical clearance	0	0	
a. Driveway is <12 ft. wide with <15-ft. clearance	3		
6. Street signs			
a. Present (4 inches in size and reflectorized)	0		
b. Not present	5	5	Refuge roads have no signage
B. Vegetation			
1. Type of vegetation within 100 ft. of structure or to property line, whichever is closer			
a. Light: grasses less than 12 inches high	5		
b. Medium: light brush and small trees; guinea and fountain grass (high intensity fuel)	10	10	
c. Heavy: dense brush, timber, hardwoods	20		
d. Slash: timber harvesting or landscape residue, compost piles, etc	25		
2. Defensible space around the home/community			
Fuelbreaks			

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a. Trees are spaced 10 ft. apart, low flammability plants are low lying and carefully spaced. Ladder fuels have been removed.	0		
b. Fuel breaks exist: i.e. driveways, pools, gravel walkways, lawns within 30 ft. of structure	0		
c. Area around structure has no fuel breaks	3	3	Some do, some do not
Fuel Treatment (has homeowner created defensible space?)			
a. Vegetation 100 ft.+ from structure or to property line	1		
b. Vegetation 71-100 ft. from structure	3		
c. Vegetation 30-70 ft. from structure	5		
d. Vegetation 0-30 ft. from structure	7	7	
e. Vegetation has not been maintained	10		
C. Topography within 300 feet of structure			
1. Slope 0-9%	1	1	
2. Slope 10%-20%	4		
3. Slope 21%-30%	7		
4. Slope 31%-40%	8		
5. Slope greater than 41%	10		
D. Additional rating factors that may apply (highest total points = 20)			
1. Area has history of fire occurrence (arson, ag burning)	0-5	1	
2. Area subject to strong dry, winds	0-5	5	
3. Separation of adjacent structures that may contribute to fire spread (i.e. ohana unit within 30 ft.)	0-5	1	
4. Topographic features that adversely affect wildland fire behavior	0-5	2	
E. Roofing Assembly			
1. Class A roof (asphalt shingle, clay tile, metal)	0	0	
2. Class B roof (treated wood shake)	3		
3. Class C roof (wood shake)	15		
4. Nonrated or Debris on roof (leaves, needles, etc.)	25		
F. Building construction			
1. Materials (predominate)			
a. Fire-resistive siding, eaves, & lanai and/or fencing (stucco, masonry, stone)	0		
b. Fire resistive siding; combustible lanai and/or fencing	5		
c. Combustible siding, lanai and/or fencing	10	10	
2. Windows, skylights			
a. Window panes are small in size, double paned or tempered glass	0		
b. Windows are single pane, and/or large in size	3	3	
c. Skylights: tempered glass with metal framing	0		
d. Skylights: plastic with vinyl framing	2		
3. Building setback relative to 30% slope			
a. Structure is more than 30 ft. away from slope	1	1	
b. Structure is less than 30 ft. from slope	5		
4. Eaves, soffits, exposed openings into structure			
a. Wire mesh no bigger than 1/8" on vents, chimneys, exposed areas under house	0		

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b. Vents, chimneys, and/or space under house is large enough for embers to enter	3	3	
G. Available Fire Protection			
1. Water Source Available			
a. Pressurized water source availability			
Hydrants (500 gpm) are <1,000 feet apart	0	0	
Hydrants (250 gpm) are 1,000 ft. apart	1		
b. Non-pressurized water source availability (catchment)			
More than 250 gpm continuous for 2 hours	3	3	
Less than 250 gpm continuous for 2 hours	5		
c. Water unavailable			
	10		
3. Organized Response Resources			
a. Fire station is 5 or less miles from structure			
	1	1	
b. Fire station is more than 5 miles from structure			
	3		
H. Placement of Gas and Electric Utilities			
1. Both utilities are underground			
	0		
2. One utility is underground, one aboveground			
	3		
3. Both are above ground			
	5	5	
I. Structure Triage: In the event of a wildfire, this structure (check the one that most applies)			
1. Needs little or no protection			
2. Needs some protection			
3. Can not be saved			

Total points:**69**

Totals for Home or Subdivision: (total for all above points)

Hazard Assessment:

1. Low Hazard 0-37
2. Moderate Hazard 38-67

Total Points:

3. High Hazard 68-110
4. Extreme Hazard 111+

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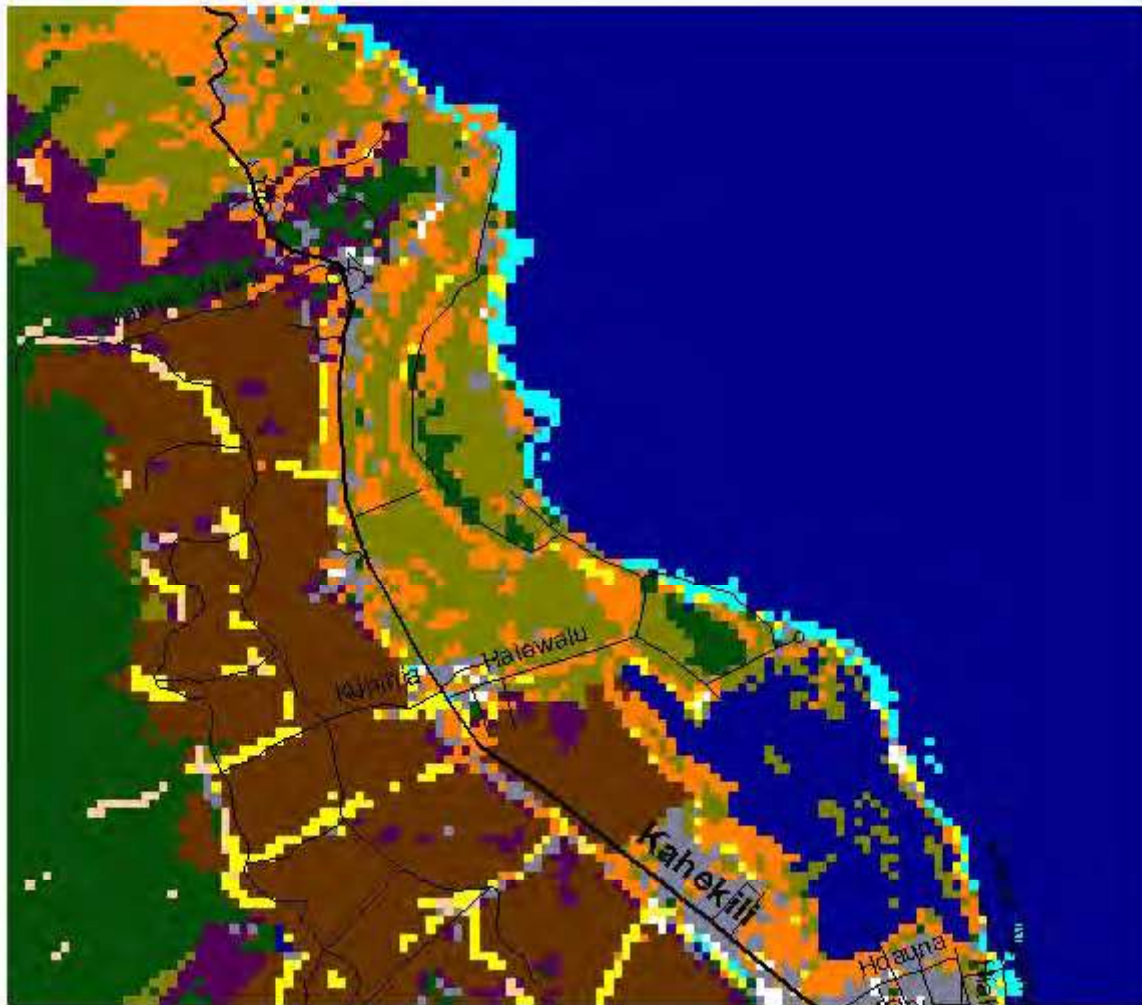
Appendix B:**Updated Project List 2009-2010**

Agencies and private landowners surrounding Waihe'e were invited to submit projects that provide wildfire protection and reduce risk. The following table displays a list of recommended projects.

Community, structure or area at risk	Project	Agency / landowner	Funding Needs	Timetable	Community recommendation
Waihe'e Village	Creation / maintenance of secondary emergency access road	MCLT/ Maui County/ Others	Cooperative Funding	2009-2010	Yes
Waihe'e Village / Refuge	Reduction of green waste dumping on MCLT property by area residents	Private	Cooperative Funding (estimated costs \$1,200)	2009-2010	Yes
Waihe'e Village / Refuge	Reduction of fuel load in Field 9 and interface areas	Multiple agencies	Cooperative Funding (estimated costs \$2,000)	2009-2010	Yes
Waihe'e Village / Refuge	Creation of defensible space around community homes, as well as structures on Refuge	Private	Cooperative Funding	2009-2010	Yes
Refuge	Improvement of Kalepa Gulch Access Road and Dune Access Road	MCLT	Cooperative Funding (estimated maintenance costs \$5,000)	2009-2010	Yes
Waihe'e Village	Continued fire prevention education and outreach	Multiple agencies	Cooperative Funding	2009-2010	Yes

Appendix C:

Waihe'e Fire Fuels Map



20m Fuels Map

	Background		Scrub/Shrub
	Unclassified		Palustrine Forested Wetland
	High Intensity Developed		Palustrine Scrub/Shrub Wetland
	Low Intensity Developed		Palustrine Emergent Wetland
	Cultivated Land		Estuarine Forested Wetland
	Grassland		Unconsolidated Shore
	Evergreen Forest		Bare Land
			Water

Map courtesy of Pacific Disaster Center