Issue 3: Wildfire

Overview

Native ecosystems in Hawaii are not adaptive to wildfire. Except in active volcanic areas, fire is not a part of the natural life cycle of native Hawaiian ecosystems, and only a few native species are able to regenerate after fire.[1] Two-thirds of Hawaii's threatened and endangered species are in fire hazard areas. Wildfires in Hawaii place communities at risk, destroy irreplaceable cultural resources, cost taxpayers money, negatively impact drinking water supplies and human health, increase soil erosion, impact near shore and marine resources, and destroy native species and native ecosystems.

Wildfires like this one on Maui are occurring with increasing frequency due in large part to the introduction of non-native fire-adapted grass species. They threaten human lives and property, impact watershed function, destroy habitat for native species and contribute to non-point source pollution. Photocredit Pacific Disaster Center.

Brief History of Fire Management in Hawaii

Historically, the Division of Forestry and Wildlife (DOFAW) relied on a system of district fire wardens to help suppress wildfires in rural settings. Many plantation and ranch personnel across the Islands served as fire wardens, creating an effective network of partners who responded to

wildland fires with manpower and equipment, extinguishing the blazes in a timely fashion. However, these partnerships began to diminish in the 1980's with the decline of ranching and plantation agriculture.

As the number of fire wardens decreased and the state's population increased, particularly in rural areas, the need for mutual aid between agencies became increasingly important. County fire departments improved their capabilities by increasing the number of stations and personnel. Mutual Aid Agreements (MAA) with DOFAW and Federal land management agencies, such as the National Park Service, and the U.S. military were strengthened. These MAA's are now the cornerstones of DOFAW's Fire Management Program. With the number of wildfires increasing and funding levels diminishing, these Mutual Aid Agreements are crucial to providing rapid multi-agency response to wildfires. Mutual Aid Agreements with Hawaii's four county fire departments, and other statewide fire response agencies, ensure coordinated efforts in successfully suppressing wildfires.

Division of Forestry & Wildlife Fire Management Program

The State's Fire Management Program is part of the Watershed Protection and Management Section of DOFAW. The principle function of the Watershed Protection and Management Section is to ensure viable water yields by institutionalizing statewide protection and enhancement of Hawaii's forested watersheds commensurate with their social, economic and environmental values. The mission of the Fire Management Program is to provide fire protection of State Forest Reserves, public hunting areas, wildlife and plant sanctuaries, and Natural Area Reserves.

DOFAW's Fire Management Program continues to be at the forefront of wildfire and all other risk-management training throughout the state, despite the fact that DOFAW personnel are primarily natural resource managers and not full-time wildland firefighters. Approximately 90% of DOFAW's personnel have received basic training in Incident Command System (ICS) and approximately 50% are specifically trained in command and general staff positions within ICS. DOFAW's Fire Management Program also provides training to other fire response agencies statewide, including county fire departments and the National Park Service.

In the event of a wildfire, DOFAW personnel are mobilized often with the assistance of county and federal partners. In the event of a large fire, DOFAW staff can be called from neighboring islands to assist in suppression efforts.

Benefits

In mainland/fire adapted ecosystems, fire plays a vital role in forest successional patterns and other ecological functions; however in Hawaii and many Pacific islands this is not part of or positive for the native ecosystems.

Trends

Causes of Fires

An overwhelming majority of wildfires in the state of Hawaii are caused by arson or human error. Human error includes errant fireworks, trash, cooking accidents, vehicle-caused wildfires, and agricultural fires that get out of control in the wildland-urban interface. The Wildland Urban Interface (WUI) is the zone where structures and other human development meet and intermingle with underdeveloped wildland or vegetative fuels. Human error combined with the spread of non-native invasive fire-adapted grasses, shrubs, and trees, has led to an increase in wildfires across the islands. The leeward portions of the main Hawaiian Islands, which typically receive less rain than other parts of the islands, are particularly susceptible to wildfires and have experienced an increase in the number and severity of wildfires.

Wildfire & Fuel Loading Cycle

Wildfires are increasing in areas where non-native fire-adapted grasses, shrubs and trees are increasing in range and abundance. Fountain grass (*Pennisetum setaceumis*) is perhaps the best example of this cycle. Introduced to Hawaii as an ornamental plant nearly a century ago, Fountain grass is rapidly spreading throughout the islands. During a wildfire, most of the aboveground portion of the grass is burned, including a highly flammable seed head. The seeds are dispersed by windy conditions that occur during wildfires. Fountain grass roots, which can easily withstand fire, quickly regenerate during Hawaii's rainy winter season. The ash from the fire nourishes the existing Fountain grass rhizomes and provides nutrients for the newly sprouting seeds. Thus, the range of Fountain grass spreads into native habitats preventing native species regeneration.

Threats & Harmful Effects of Wildfire in Hawaii

Table 3.1. Wildfire Threats & National Themes

Wildfire Threats	National Themes
Wildfires threaten homes and lives.	2.1, 3.3
Wildfires destroy native Hawaiian plants and forests and deprive native animals of their habitat.	1.1, 1.2, 2.2
Wildfires cause soil erosion that pollutes and impacts the ocean and reefs.	3.1, 3.5
Wildfires increase the spread of invasive plants that are highly flammable.	2.1, 2.2
Wildfires impact the health of Hawaii's watersheds.	3.1

Threats to Communities and the Wildland Urban Interface (WUI)

In 2005, DOFAW began identifying Communities at Risk from wildfire (CAR's) in the WUI on a statewide basis.[2] Criteria used to identify CAR's include current vegetation type, climate regimes, and fire history. The threat of wildfire in the WUI is of great concern in Hawaii. Map 3.1 depicts the Communities at Risk (CAR's) and the WUI. The WUI for Hawaii is currently defined as areas identified as a one-mile buffer around any CAR's designated as High Risk, Medium Risk or Low Risk.. Vast tracts of land, once used and maintained for agricultural purposes, are now fallow and are used for cattle grazing or developed for residential housing. Today, where there was previously little or no wildfire risk, now there is an increased incidence with more people living in close proximity to wildland areas. Wildfires can also start in these residential areas and spread to the wildland, putting threatened and endangered plant and animal species at risk.

Threats to Native Biodiversity

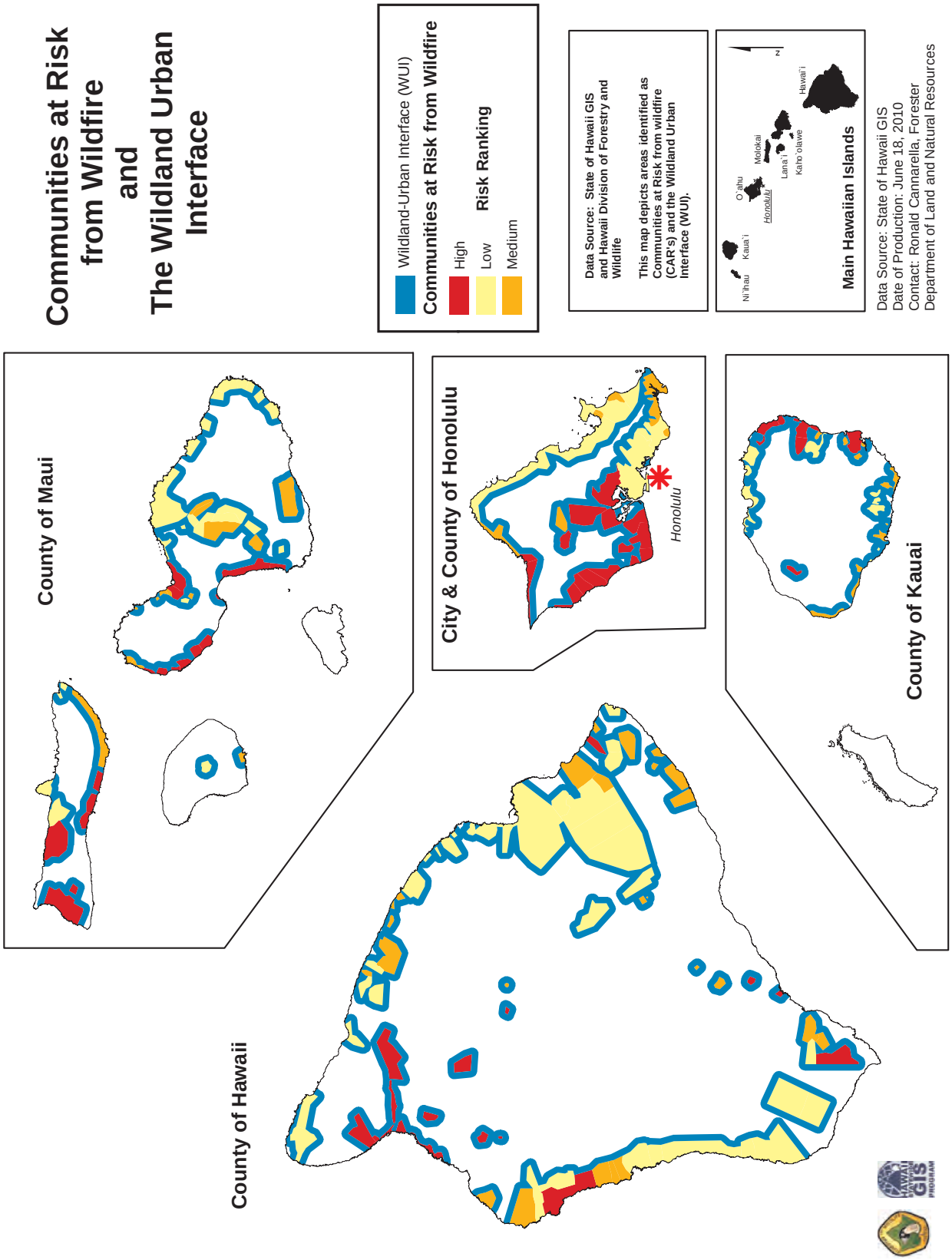
The State of Hawaii is the most geographically isolated island chain on earth, home to plants and animals found nowhere else in the world. Approximately 90 percent of Hawaii's 10,000 native species are endemic, which makes them even less capable of regenerating populations after large-scale fires.[3] Wildfires in Hawaii have caused many native plants to go extinct, and some have such narrow ranges that even if seed stock were still available, the necessary habitat many not be. According to local biologists, many native plant and animal species are only a wildfire away from extinction.[4]

Impacts to Watersheds & Groundwater

Virtually all of Hawaii's public water systems are supplied by artesian wells, which rely on groundwater aquifers. Wildfires destroy vegetation in watersheds, and diminish capacity to absorb rainfall and fog drip that replenishes groundwater resources. Watersheds on all islands are subject to frequent tropical downpours and these brief but intense events can quickly cause erosion and landslides in areas impacted by wildfire. Without vegetation that is resilient to fire and/or does not carry heavy fuel loads, terrestrial plants & animals, fresh & marine water species, and the quality of streams and wetland ecosystems will diminish and their capacity to function properly will degrade.

Soil Erosion & Coral Reef Impacts

Wildfires destroy vegetation in Hawaii's coastal watersheds. Frequent tropical downpours cause soil erosion in fire-damaged areas, leading to increased sediment deposits in the near shore zone. This sedimentation damages coral reef ecosystems that are vital economic, cultural, and subsistence resources for local residents. For example, between 1988 and 1998, the island of Molokai experienced three wildfires that damaged more than 10,000 acres on the island. All three wildfires took place on mountain slopes where run off is channeled directly to the longest



Map 3.1 Communities at Risk from Wildfire and the Wildland Urban Interface.

continuous reef in the United States. In addition to deteriorating the health of the reef, the soil erosion and sedimentation caused stress on local food supplies which impacted residents that rely on near shore fishing for sustenance.

Spread of Invasive Fire-adapted Species

The dry, dense biomass of fire-adapted non-native grass species is an easily combustible fuel that carries fire quickly over large areas, particularly in windy conditions. As wildfires destroy native plants, soil moisture is reduced, making it more difficult for native plants (in sub-surface seed banks) to germinate and re-colonize these 'arid' areas. This wildfire/invasive plant cycle perpetuates opportunistic grasses.

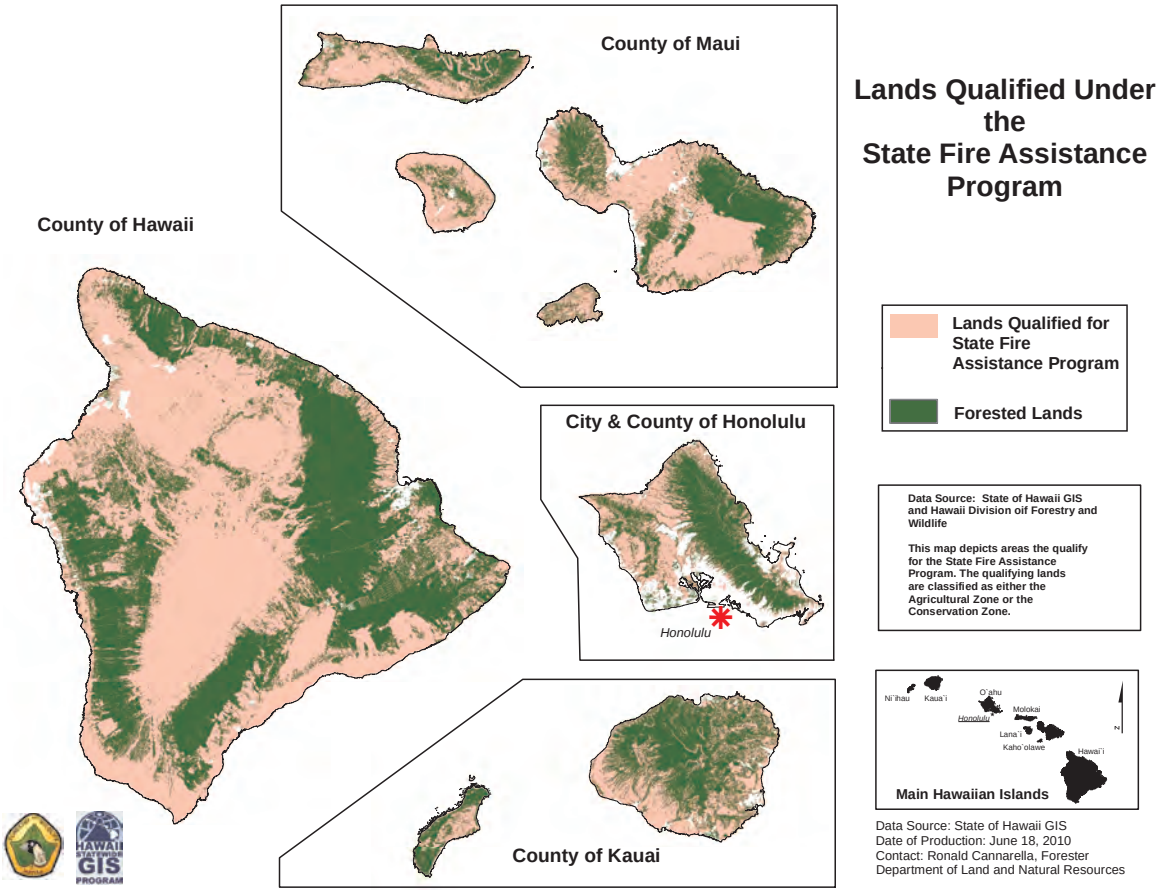
Climate Change

Changes in climatic conditions could cause more negative impacts such as the fire/grass cycle described above, and have serious impacts on the coast zones due to sea level rise. Some modeling research has been conducted to predict these scenarios but still more is needed. It is important to factor in fire as a possible ramification of upland land use changes, such as been done in some areas in South Kona. Upland land use practices, for example deforestation to support cattle grazing above 4000 feet, can have dramatic affects on lowland area water quantity and quality and native plant animal habitat needs.

Present Conditions

The Hawaiian Islands are approximately 4.1 million acres in size. Of this land, 48% is zoned Conservation, 47% Agriculture, and 5% is zoned Urban. Combined, the Conservation and Agriculture zones constitute approximately 3.3 million acres. Map 3.2 depicts these lands. This represents the area qualified under the State Fire Assistance Program, as well as many other landowner assistance programs (*See Appendix C Forestry Related Assistance Programs*).

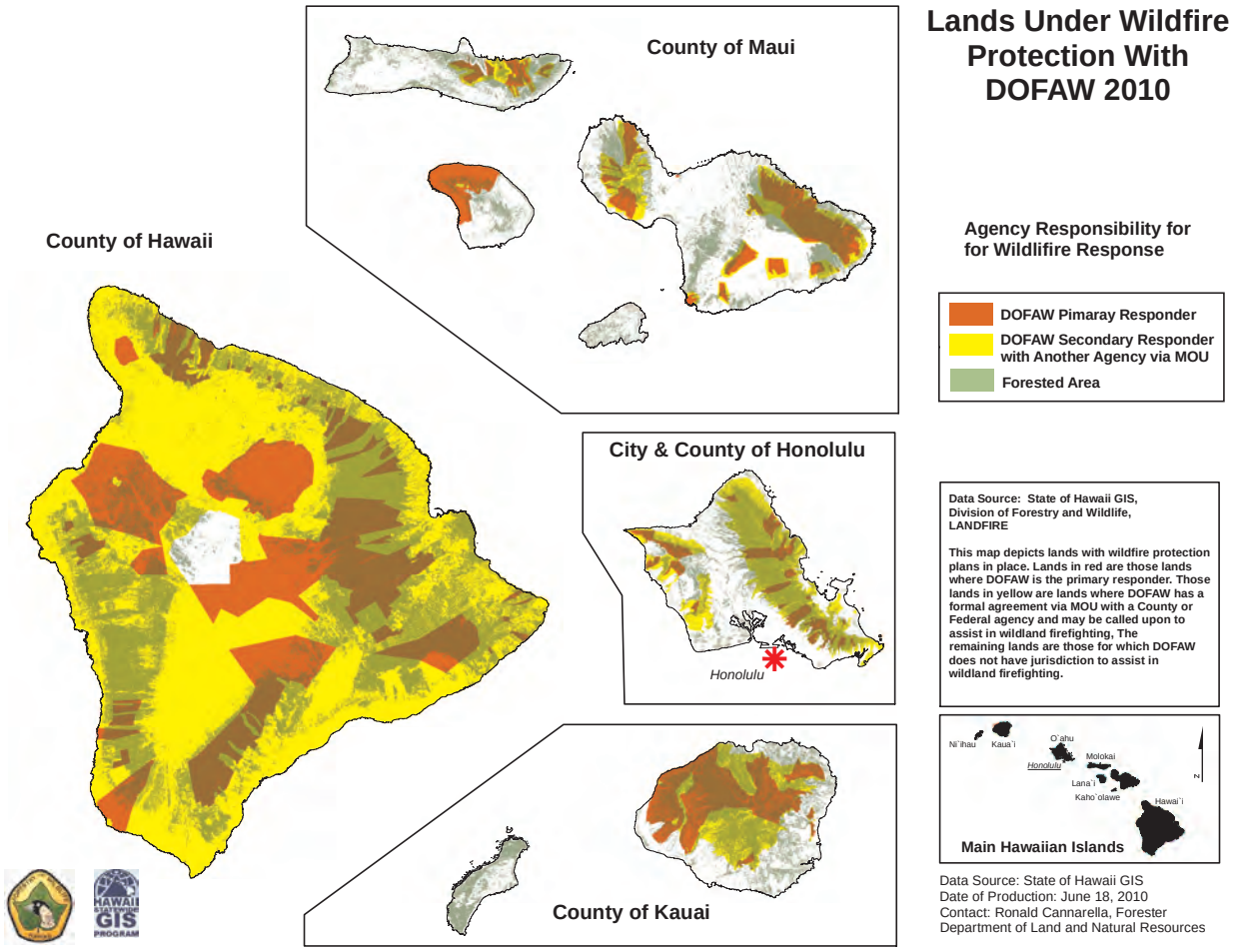
Fire Response Zones: DOFAW has established formal agreements with all county and federal land management agencies for responding to wildland fires. DOFAW is the primary response agency for 3,360,000 acres of combined cooperative zones (81% of the State). Map 3.3 depicts areas where DOFAW is the designated first responder, areas where DOFAW may assist federal and county agencies according to the terms of the agreements with those agencies, and areas where no formal agreement exists and are generally out of the DOFAW's jurisdiction. DOFAW is authorized to respond to fires in extraordinary circumstances in areas without formal agreements only under specific conditions. For example, extreme threats to public safety, local resources are fully committed, and extreme fire behavior. In addition, the request for DOFAW's assistance must go through the appropriate channels before DOFAW can respond. For example, if state resources are available.



Map 3.2 Lands which qualify for the State Fire Assistance Program.

Funding: State and federal budget constraints on funding fire pre-suppression and suppression activities impact the response time needed for effective suppression efforts. DOFAW depends heavily on the Federal Excess Personal Property program for fire equipment. This is supplemented by State Fire Assistance grants to purchase slip-on units, communication equipment, and personal protective equipment. The funds also provide for all-risk management training, including ICS. The Volunteer Fire Assistance Program plays a key component in engaging the county fire departments in providing continued fire protection to rural communities. Funds from this program supplement the county's efforts in equipping, training, and organizing their personnel to meet agency policy and objectives in rural community fire protection. Federal Emergency Management Agency (FEMA) Fire Management Assistance Grants provide financial support when firefighting resources are critically low due to budgetary or personnel constraints.

Establishment of a Land Fire Protection Law*:* A Firefighter's Contingency Fund was established by Hawaii State Law HRS Chapter 1-85, the Land Fire Protection Law. The funds provided under this law are used for fire prevention, preparedness, and suppression activities.



Map 3.3 Lands Under Wildfire Protection by DOFAW and other federal and county agencies.

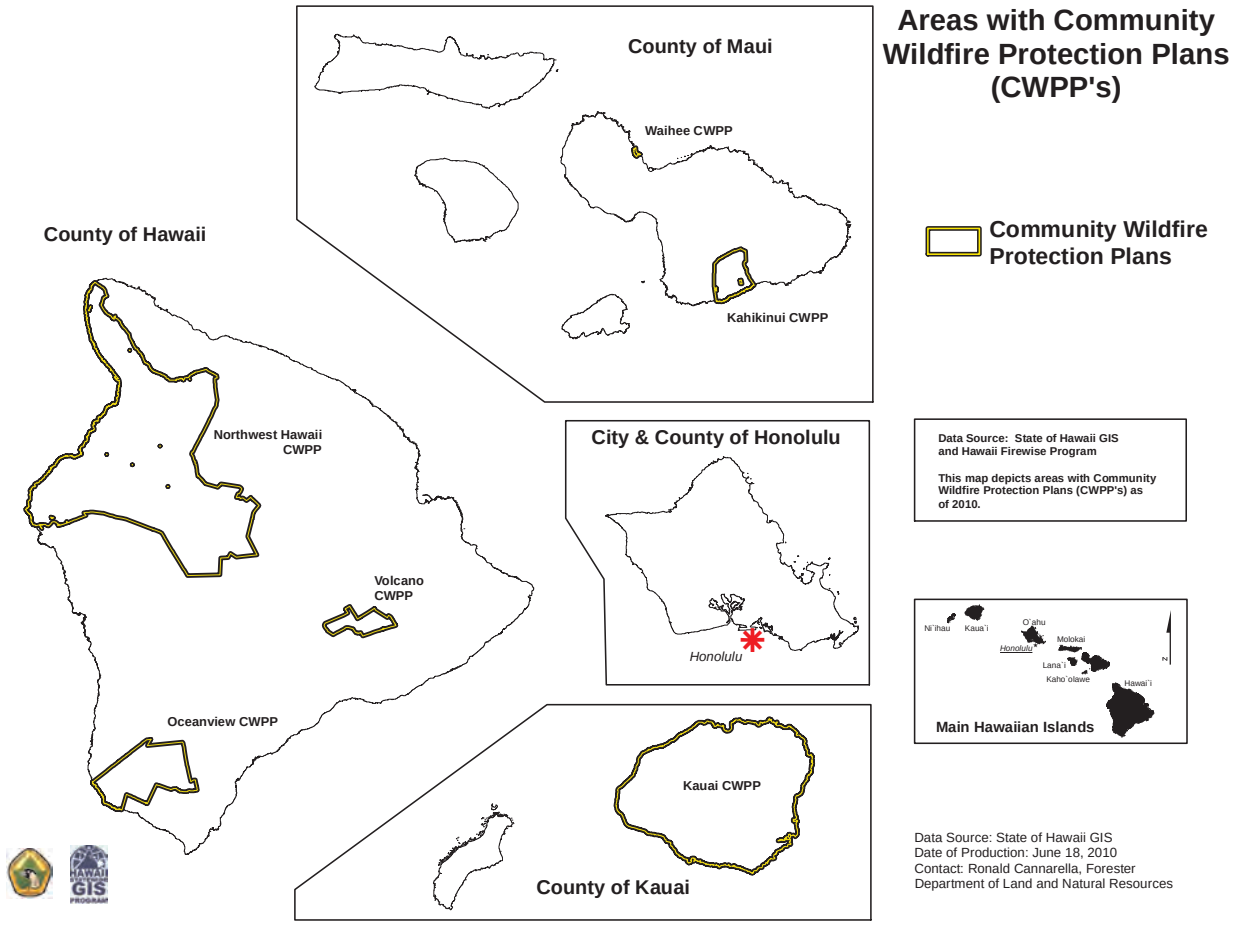
The Land Fire Protection Law, provides the authority for DOFAW to "...take measures for the prevention, control, and extinguishment of forest fires on state owned lands within forest reserves, public hunting areas, wildlife and plant sanctuaries and natural area reserves; and shall cooperate with established fire control agencies from the counties and the Federal Government in developing plans and programs and mutual aid agreements for assistance for the prevention, control, and extinguishment of forest, grassland brush fires, and watershed lands not within the department's fire protection responsibilities described above."[5]

Community Wildfire Protection Plans

The requirement for developing Community Wildfire Protection Plans (CWPP) was a result of the Healthy Forest Restoration Act of 2003 (HFRA). Wildfires within wildland urban interface pose a tremendous risk to life, property, and infrastructure. Recognizing this risk, the National Fire Plan and the Ten-Year Comprehensive Strategy for Reducing Wildland Fire Risks to Communities and the Environment, made it a priority to work collaboratively with communities

to reduce their wildfire risks. The Healthy Forest Restoration Act provided statutory incentives for federal agencies, such as the U.S. Forest Service and the Bureau of Land Management, to implement fuel mitigation projects deemed a priority by a community. CWPP's allow community members to prioritize fuel mitigation projects.

Currently, six areas on three of the main Hawaiian Islands have Community Wildfire Protection Plans. See Map 3.4.



Map 3.4 Areas with Community Wildfire Protection Plans.

Community Wildfire Protection Plans offer multiple benefits including:

- Provide a comprehensive look at the wildfire problems facing a community
- Identify a community's wildfire risk
- Prioritize fuel mitigation projects and
- Are required for a community to be eligible for Federal National Fire Plan grant funding

CWPP stakeholders vary by island and community; however, each CWPP includes participation from the County Fire Department, DOFAW, and the Civil Defense Agency. Other agencies that participate in the CWPP process include: the National Park Service, the U.S Army, Natural

Resource Conservation Service, the U.S. Fish & Wildlife Service, and the Department of Hawaiian Home Lands. While the communities in Hawaii with CWPP's differ dramatically, they also hare similar concerns and recommended actions, some of which are described below.

Recommended actions include:

- Improvement of roads within residential areas. Creation and/or improvement of secondary emergency access roads in residential areas where necessary.
- Creation and maintenance of a buffer zone / fuel break around residential zone and/or subdivision.
- Increased utilization of current reservoirs and/or installation of pre-staged static water tanks. Development of wells or damming of narrow gulches to increase water reservoir resources.
- Creation of dedicated landing zones for helicopters for fire suppression purposes. Creation of a contingency fund to hire private government-certified helicopters during wildfires.
- Implementation of pre-incident planning meetings between community members and county Fire Department officials to make fire officials aware of sensitive ecological areas.
- Fuel load reduction along highways, especially in summer months. Reduction of excessive fuel loads around individual properties.
- Community newsletter articles to increase fire-prevention awareness among homesteaders. Coordination and implementation of at least one fire prevention awareness event per year.
- Identification of evacuation route roads within subdivisions. Installation of metal reflection signs showing evacuation routes within the residential areas.
- Development of a Community Emergency Operation Plan. Development to include identification of ham radio operator points of contact, training in ham radios, and purchase of equipment.
- Community Emergency Response Training (CERT) for community members.
- Creation of community compost pile for local residents and development of a green-waste dumping education program.
- Implementation of community chipping days to encourage fuel load mitigation and green waste recycling.
- Increased use of fire-resistant building materials in new residential development.
- Implementation of Firewise Communities guidelines in the planning process of new residential developments, (i.e., create fuel-breaks and plan for multiple means of ingress/ egress).
- Increased radio communications between federal, state, and county fire response agencies.

There are no CWPP's in development at this time and no CWPP's have been officially finalized on Oahu, the island with the highest population. With the current economic climate, it is becoming more difficult for groups and agencies to find funding for CWPP's. This is unfortunate because there are community groups in high-risk areas that want to initiate wildfire mitigation projects but are unable to receive grant funding because they do not have a CWPP. Several

communities on Oahu and in South Maui are examples of this problem. South Maui, including Wailea, Kihei, and Maalaea, are in high-risk fire hazard areas that have a history of wildfires that cause damage to homes, disrupt traffic, and negatively impact the community.

Firewise Hawaii Program

DOFAW engages homeowners who live in Wildland Urban Interface areas via the Hawaii Firewise Communities program, which has been very active statewide since 2002. This program was borne out of the national Firewise Communities program, which is designed to encourage homeowners, community leaders, and others to take actions to protect people, property, and natural resources from the risk of wildfires - before a wildfire starts. This approach emphasizes community responsibility for planning a safe community, as well as effective emergency response, and individual responsibility for safer home design, construction, landscaping, and maintenance. Several communities have applied for and received Federal National Fire Plan funding for fuel reduction projects. Kohala By The Sea, a community on the leeward side of Hawaii Island received National Fire Plan grants, achieving national Firewise Communities USA recognition status for six consecutive years. The national Firewise Communities organization, http://www.firewise.org, serves as a valuable resource for information about reducing the threat of wildfires in rural communities

Priority Areas for Wildfire:

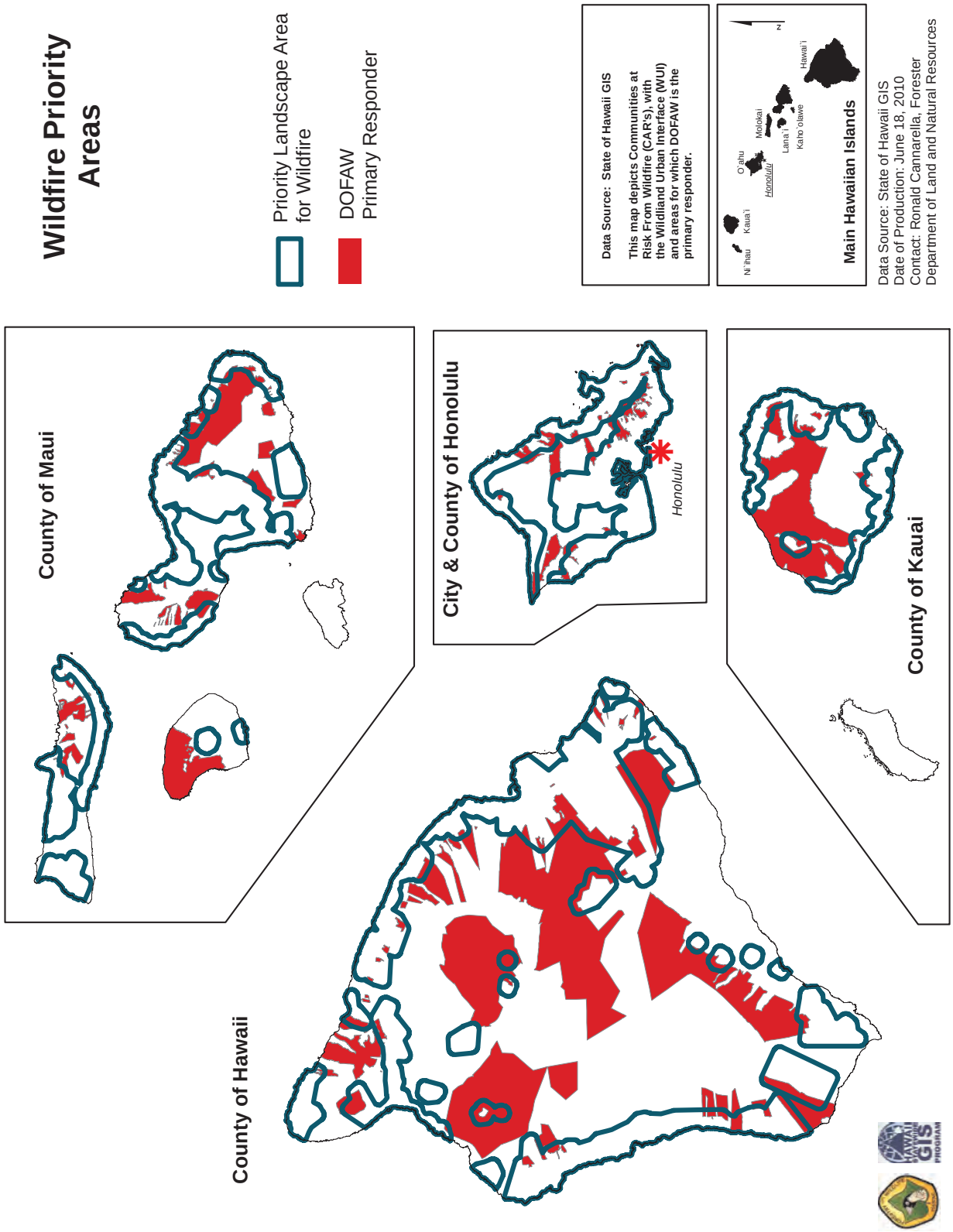
Wildfire Priority Landscapes consist of any land that include

- Communities at Risk from Wildfire and the WUI
- Lands where DOFAW is the primary responder

Please refer to Map 3.5 for the map of DOFAW's Priority Landscape Areas for Wildfire

Data and Opportunity Gaps

- Modeling for climate change potential impacts on fire adapted invasive species.
- More imagery is needed at a fine scale to ascertain the movement and rates of recruitment of many invasive species.
- Clearly more concise and irrefutable information is needed to inform the public at-large as well as decision makers (funding and policy).



Map 3.5 Wildfire Priority Areas.

Unlike ecosystems and forests in most of the continental states, Hawaii's ecosystems are not adapted to wildfire. Except in active volcanic areas, fire is not a part of the natural life cycle of native Hawaiian ecosystems, and only a few native species are able to regenerate after a fire. Wildfires in Hawaii place communities at risk, destroy irreplaceable cultural landmarks, native species, and complex ecosystems linking the mountains to the sea.

Wildfire							
Long Term Strategy	**Priority Landscape Area(s)**	**Secondary Issues Addressed**	**Program Areas that Contribute**	**Key Stakeholders**	**Resources Available/required**	**Measure of Success**	**Supports National Objective**
1) Reduce the impacts of wildfires on native ecosystems and watersheds	forest reserves, public hunting areas, wildlife and plant sanctuaries and natural area reserves	Reduced erosion; coral reef health improved	Cooperative Fire Assistance, Forest Stewardship, Environmental Quality Incentive Program (EQIP), Forest Health	State Civil Defense; County Civil Defense; County Fire Departments; Volunteer Fire Departments; National Park Service; U.S. Forest Service; U.S. Army Garrison Hawaii; U.S. Fish & Wildlife Service	Dept. Firefighter Contingency Fund; State Fire Assistance; Volunteer Fire Assistance: Wildland Urban Interface competitive grants	Number of acres protected; Number of homes & structures protected; Number of populations of T&E species protected	1.2 2.1 2.2 3.1 3.3 3.5
2) Reduce the impacts of wildfires on communities and threatened rare habitats near them.	Communities at Risk from Wildfire and the Wildland Urban Interface	Stronger message to private landowners about Fire-wise practices	Cooperative Fire Assistance, Forest Stewardship, EQIP	HI Wildfire Mgmt. Organization; County Fire Departments; Community Associations; County Civil Defense	State Fire Assistance; Wildland Urban Interface competitive grants	Number of homes protected; increase acres of dryland forests; reduced acres of invasive grasses and fire that cycle together	2.1 2.2 3.3 3.6

Section References

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1 Gon, Sam quoted in Naomi Sodetani, "Be Fire-Smart Wildfires Threaten Island Ecology, Economy", The Nature Conservancy http://www.nature.org/wherewework/northamerica/states/hawaii/projectprofiles/art21976.html. (accessed February 2010).

[2] SILVIS Lab, Forest & w\Wildfire Ecology University of Wisconsin - Madison. , "The Wildland-Urban Interface", Northern Research Station, the Pacific Northwest Forest Inventory and Analysis Program, and the Northern Global Change Program of the USDA Forest Service under the National Fire Plan. http://silvis.forest.wisc.edu/projects/WUI_Main.asp (accessed February 2010).

[3] Gagne and Cudahy, (1999) quoted in LaRosa, Anne Marie, et.al. "Chapter 11: Fire and Nonnative Invasive Plants in the Hawaiian Islands Bioregion." In Wildland Fire in Ecosystems: Fire and Nonnative Invasive Plants. Gen. Tech. Rep. Rmrs-Gtr-42, 6, 225-242. Ogden: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

[4] Gon, Sam quoted in Naomi Sodetani, "Be Fire-Smart Wildfires Threaten Island Ecology, Economy", The Nature Conservancy http://www.nature.org/wherewework/northamerica/states/hawaii/projectprofiles/art21976.html. (accessed February 2010).

[5] Land Fire Protection Law Chapter 185, Hawaii Revised Statutes, C185hrs ", http://hawaii.gov/dlnr/dofaw/forestry/forest-and-wildland-fire/c185hrs (accessed March 2010).