

Technical Appendices

Hawaiï Statewide Assessment of Forest Conditions and Trends: 2010

An Assessment of the State of Our 'Aina

Department of Land and Natural Resources
Division of Forestry and Wildlife
Honolulu, Hawaiï
June 18, 2010

Paul J Conry, State Forester
Prepared by Ronald Cannarella, Forester



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Appendix A

Stakeholder Involvement Process

Appendix A: Stakeholder Involvement Process Contents

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State Forest Stewardship Coordinating Committee. Meetings held for consultation concerning SWARS were held on 9/3/09, 10/20/09, 3/19/10. Details regarding topic and actions can be found in Table A1. The SFSCC is a combination of members that are Federal, Non-Profit, County Agencies, Private Landowners, and others. This Committee meets desired make up of both the State of Hawaii Forest Stewardship Program, as well as the Federal Forest Stewardship Program. Additionally, this Committee is also the Forest Legacy Program oversight Committee. In such a small state, it is not possible to maintain members from all of the recommended National Forest Stewardship Committee members types; nor to the State and Federal committee types exactly overlap. For those reasons, currently there is no Farm Service Agency (FSA) member on the SFSCC. However, seats on this Committee become available annually (staggered rotations every year), and the FSA will be consulted about their interest to become a member on the SFSCC in the future.

State Wildlife Agency. The Division of Forestry and Wildlife is also the State Wildlife Agency. DOFAW wildlife staff were actively engaged in the preparation of Hawaii SWARS. Details regarding topic and actions can be found in Table A1

State Technical Committee. Meetings held for consultation concerning SWARS were held between the Administrator of the NRCS Regional Office and his staff, and the State Forester and his staff January 31, 2010 in preparation for upcoming STAC meetings and new requirements. Informational Meetings with SWARS staff and the STAC took place on Jan 10, 2009, Oct 28, 2009 and January 27, 2010. A final draft copy of the SWARS will be provided to the STAC via NRCS staff. Details regarding topic and actions can be found in Table A1.

Applicable Federal Land Management Agencies and Tribes: DOFAW staff worked with various Federal Land Management Agencies, both on a personal level (for forest birds, for example) and on various committees such as the Ocean Resources Management Plan Working Group. NRCS in particular has been extremely helpful and engaged in SWARS, as has the Board of Health and EPA on water quality issues. We work with the military on a variety of projects, and our Watershed Partnerships have played a key roll in keeping all of their partners engaged. We have benefited greatly by the work of Hawaii Volcanoes National Park in identifying trends in wildfire. The Bureau of Land Management does not have a presence in Hawaii and they do not manage any land in the state. We are very grateful to the staff at the Papahānaumokuākea Marine National Monument, although there area of jurisdiction is out of the scope of this document. We have coordinated as best we could with the Office of Hawaiian Affairs (OHA), which is a State Agency which officially represents Native Hawaiian interests. Native Hawaiians are not officially recognized by the Federal Government, and so do not

have the legal status of the Native American Indian tribes on the mainland and Alaska. The OHA has been undergoing a fundamental internal reorganization for the past 6 months, and from day to day positions are being eliminated or redescribed, and people are assigned different positions within OHA at a moment's notice. At all stages of the development of SWARS representatives of OHA have been involved to the extent that their other responsibilities permitted.

It should be noted that in Hawaii, individuals and organizations working in the field of forestry and natural resource management are a relatively small but very close-knit community. On a small island, we all wear many hats, and interact professionally and socially on a daily basis. We are colleagues, neighbors and friends. The entire natural resource community has been very engaged in Hawaii SWARS from the beginning by providing data, reports, advice and support. Table B1 provides only a snapshot of the stakeholder involvement process as documented in meeting minutes, presentations and formal consultations. It does not capture the essence of how we work in Hawaii; the countless potluck dinners, lunch meetings, field trips and after-conference informal sessions where SWARS has been a central topic of discussion for two years.

Much of our federal agency involvement has taken place on several committees in addition to the State Forest Stewardship Coordinating Committees, and the State Technical Advisory Committee: one is the Hawaii Conservation Alliance (HCA), another is the Ocean Resources Management Plan (ORMP) Working Group, another is the Kaulunani Urban and Community Forestry Committee. Members' names and affiliations are to be found at the end of this appendix, pages A-51–A-58.

The lead agency for both the Federal Forest Legacy and the Forest Stewardship Programs in Hawaii is DLNR/DOFAW. These are actually the same Committee entitled the State Forest Stewardship Advisory Committee; also known as the State Forest Stewardship Coordinating Committee. See A-52.

There are a wealth of plans that have been prepared by other State, Federal, County Agencies, such as the island Boards of Water Supply and the Watershed Partnerships. It is our intent to complement and support all approved State, Federal, Local and Watershed Partnership Plans; and to support their ongoing activities wherever we have jurisdiction and the resources.

General Stakeholder Involvement

Hawaii approached Stakeholder Involvement using a multi-tiered method. The process included written and internet surveys, a two day Summit; multiple meetings with key partners and specific individuals engaged to develop assessments and strategies. Three questionnaires were prepared and distributed to solicit input on critical issues to be assessed in our SWARS. The three survey instruments and analyses can be found in Appendix A Pages A-12 – A-50.

The process began by examining the Oklahoma process[i] and survey[ii] (A-3), which provided a roadmap what eventually became a Hawaii specific issues survey. On August 14, 2009 by engaging attendees at the Hawaii Conservation

Conference (A-12). On September 3, 2009, the Forest Stewardship Committee provided their comments (A-27), and general DOFAW staff and other members of the public contributed this survey via the internet (A-36).

Other tiers in Hawaii's stakeholder involvement process were worked on simultaneously. One was the development of an Urban and Community Forestry Summit held in November of 2009 (A-55 – A-57). We cast a very broad net to identify potential participants. As such, we united many partners that work on the fringes of the urban and community forest, but not necessarily together. For example, professionals and representatives from watershed partnerships, planners, invasive species, forest health, the nature conservancy, coastal zone management, botanical gardens, arborists, wildfire, NGO's and education specialists. While the intention of the summit was to inform Urban & Community Forestry issues and professionals, the ramifications were much broader and this summit linked partners for other critical issues in Hawaii; such as the coastal zone and watershed groups. At the same time lead Ron Cannarella and other SWARS team members engaged the participation of organizations and individuals and presented the SWARS project at events and meetings (TABLE A1). In addition, we invited experts internally from the DOFAW staff, as well as externally from government and non-government organizations to contribute to, review and critique draft chapters, maps & concepts. Many of these individuals are also listed in A3 and in the Acknowledgements at the beginning of this document.

Finally, the draft Hawaii SWARS was submitted to the State Board of the Department of Land & Natural Resources on May 13, 2010 for approval in concept. A draft was sent to the US Forest Service Region 5 on June 1, 2010 for a five day review. The Hawaii SWARS project and all of its elements and processes has been posted on our website www.hawaiistateassessment.info since August 2009. This has enabled the entire Hawaii SWARS development process to remain transparent and has provided stakeholders and the general public the opportunity to comment at anytime in the process. Additionally, a plethora of supporting documentation that was used to inform and educate SWARS staff and readers, can be found on this website.

[i] Dept. of Agriculture, Oklahoma Forestry Services. Management Protection, "Oklahoma Forest Assessment/Resource Strategy Planning Process"
<http://www.forestry.ok.gov/Websites/forestry/Images/Assessment%20and%20Strategy,%20Planning%20Process.pdf> (accessed June 2009).

[ii] Dept. of Agriculture, Food and Forestry Oklahoma Forestry Services, Management Protection,, "Forest Resource Assessment and Strategy Plan, Survey for Public Input"
<http://www.forestry.ok.gov/Websites/forestry/Images/Survey.pdf>.

Table 1 Stakeholder Participation: Local & Pacific Region Stakeholder and Partner involvement in H SWARS

DATE	Stakeholder, Agency, Organization or Committee	Event	Action
May 4, 2007	Partner/Stakeholder	US Tropical Island collaboration	A White Paper was developed that outlined the important US Tropical Island issues that are important to incorporate into the S&PF Redesign. The purpose of this paper was to highlight the critical issues that islands need funding for but that often are not defined as eligible due to narrow mainland descriptions.
January 31, 2008	STAC	State Forester Meets with Director of Natural Resources Conservation Service	Scope SWARS, How to Involve STAC
April 9, 2008	ORMP	Ocean Resources Management Plan Working Group	Watershed Issues and Coordination
April 9, 2008	Partner/Stakeholder	Ocean Resources Management Planning Policy Group meeting	Consultant revealed their priority watersheds project as required by the EPA Non-Point Source Pollution Program.
August 1, 2008	Stakeholder	Hawaii Conservation Conference	Introducing Requirement, Deadline and Scope for SWARS. Requested January 6, 2009 participation and data.
August 28, 2008	Students/University of Hawaii	Engaged UH College of Natural Resources and hired Kelly Hartman as student intern for GIS	Kelly Hartmen did a significant amount of the early GIS work that defined the Urban Forestry realm in Hawaii.
January 10, 2009	STAC	Meeting & Video Conference Call	Discussed what SWARS is, how it will affect all US related islands and shared technical support on how to go about developing this document.
March 18, 2009	Partner/Stakeholder	Kaulunani Urban & Community Forestry Council Meeting	Introduced the SWARS concept and requested involvement/Sub-committee establishment.
April 22, 2009	Urban & Community Forestry Advisory Committee & State of Hawaii staff	UCF Council Meeting	Discussed where the Urban Forestry realm is located and how we want to map it.
April 28, 2009	Partner/Stakeholder	Pre-Urban Summit Meeting	Discussed logistical issue related to the Summit, including narrowing of UCF SWARS topics.

Table 1 Stakeholder Participation: Local & Pacific Region Stakeholder and Partner involvement in HI SWARS

DATE	Stakeholder, Agency, Organization or Committee	Event	Action
May 4, 2009	Pacific Island Committee	Sheri Mann, Michelle Jones and Ronald Cannarella attended this meeting on behalf of State of Hawaii	Engaged all Region 5 Program managers, our island partners. NRCS adm TNC and the Micronesian challenge and Regional Forester. SWARS was the dominant topic at this meeting
May 14, 2009	Students/University	Professor Jim Henry and students	Interviewed DOFAW staff about history of forestry in Hawaii
June 6, 2009	Public Service	Hawaiistateassessment.info	This website was created to facilitate info exchange and serve as document repository for all HI SWARS documents. It was also used as a permanent free web location that the public could access.
July 10, 2009	Urban & Community Forestry Advisory Committee & State of Hawaii staff	UCF Council Meeting	Further discussion of SWARS Urban Realm mapping and definition.
July 28, 2009	Partner/Stakeholder throughout the State	Hawaii Conservation Conference	Seminar on Hawaii SWARS. Distributed Critical Issue Identification Survey.
August 13, 2009	ORMP	Ocean Resources Management Plan Working Group	Watershed Issues and Coordination
August 13, 2009	Various professional agencies	ORMP Working Group	Offered input on overall SWARS Issue topics and offered professional assistance in the development of the document.
August 26, 2009	Partner/Stakeholder	Pacific Island Network: Global Climate Change Workshop	This 2 day meeting discussed scientific based climate change issues in the Pacific. This was a strong addition to the SWARS Climate Change Chapter.
September 3, 2009	Forest Stewardship/Legacy Committee	Quarterly Meeting	Develop Critical Issue Identification Survey and Validation of Issues.
October 1, 2009	Partner/Stakeholder	Landscape Industry Council of Hawaii	Journal Article on Hawaii SWARS with UCF focus
October 20, 2009	Forest Stewardship/Legacy Committee	Quarterly Meeting	Discussed how to prioritize areas for conservation of biodiversity

Table 1 Stakeholder Participation: Local & Pacific Region Stakeholder and Partner involvement in HI SWARS

DATE	Stakeholder, Agency, Organization or Committee	Event	Action
October 22, 2009	Partner/Stakeholder	The Nature Conservancy	Provided Data and Technical Assistance in mapping biodiversity
October 28, 2009	STAC	State Technical Committee Meeting & Video Conference Call	Multi-jurisdictional committee with members across the Pacific discussing landowner assistance Farm Bill programs, SWARS, and ways to collaborate more affectively. Ron Cannarella gave a presentation on HI SWARS.
November 4, 2009	Partner/Stakeholder	Urban & Community Forest Summit	Included Pacific Islands and representatives from around Hawaii to discuss all Urban Forestry issues. Included much discussion regarding the primary SWARS UCF topics.
November 16, 2009	Partner/Stakeholder	Pacific Island Climate Change Cooperative Meeting	Steering Committee formation meeting. Discussed the various members we wanted involved, funding options, and targeted goals.
November 17, 2009	Conference	National SWARS Meeting	Ron Cannarella, Colleen Carroll & Miranda Smith attended this National SWARS meeting to learn all about SWARS.
December 3, 2009	ORMP	Ocean Resources Management Plan Working Group	Watershed Issues and Coordination
January 7, 2010	ORMP	Ocean Resources Management Plan Working Group	Climate Change Issues
January 11, 2010		SWARS Webinar	Received input on how to organize SWARS engage the entities necessary for inclusion.
January 22, 2010	Partner/Stakeholder	Hawaii Land Trusts Collaboration Meeting	Hawaii Land Trusts Collaboration Meeting
January 23, 2010	Partner/Stakeholder	State-wide Land Trust Meeting	Discussed details about the State-wide Land Trust merger. Many questions were asked about how SWARS will be organized and access to future funding tied to SWARS.
January 27, 2010	STAC	STAC-Pacific-Wide Meeting organized by NRCS using PeaceSat technology at UH	All islands were represented with the exception of American Samoa and Yap.

Table 1 Stakeholder Participation: Local & Pacific Region Stakeholder and Partner involvement in H SWARS

DATE	Stakeholder, Agency, Organization or Committee	Event	Action
February 2, 2010	Partner/Stakeholder	Urban & Community Forestry GIS Mapping Session	Detailed effort to consolidate and finalize all Urban related data defining Urban Forestry realm.
February 2, 2010	Consultation with Forest Service	Multi-State Chapter	Discussed this chapter with Katie Friday (IPIF) and Sandy Macias (Region 5)
February 3, 2010	ORMP	Ocean Resources Management Plan Working Group	Climate Change Issues
February 1, 2010	US Fish & Wildlife Refuge System	Meeting with Heads of Agencies	A meeting among various DOFAW and USF&WS Refuge System took place outlining the overall importance of SWARS and how it could impact future funding in the state. McCandless Ranch was also discussed as a possible collaborative acquisition.
February 8, 2010	Partner/Stakeholder	Met with Hector Valenzuela and Maxine Burkett	Set Work Plan for Climate Change Chapter Development
February 16, 2010	Partner/Stakeholder	Urban Realm Mapping Meeting	SWARS Urban Realm mapping discussions.
February 17, 2010	State Agency	Hawaii Tourism Authority	Scoped Recreation and Tourism Issue
February 17, 2010	Partner/Stakeholder	Draft Forest Products & Carbon Sequestration Chapter	E-mailed the draft Forest Products & Carbon Sequestration Chapter to targeted foresters in Hawaii and Region 5.
February 18, 2010	Stakeholder/Forest Stewardship Committee Members	Bill Cowren, Kip Dunbar & Margarita Hopkins review of SWARS Chapters	These Committee members provided various input on many SWARS Chapters that were posted to the HI SWARS website.
February 19, 2010	Partner/Stakeholder	Pacific Island Climate Change Cooperative Meeting	Further refined the scope and location of 7 new positions in Hawaii related to Climate Change mitigation and policy development. Discussed how SWARS planning process can impact where these positions are located and what they focus on.
March 8, 2010	Partner/Stakeholder	Pacific Island Committee Meeting	Present current status of SWARS and collaborate on multiregional issues, gain input from R5 staff.

Table 1 Stakeholder Participation: Local & Pacific Region Stakeholder and Partner involvement in H SWARS

DATE	Stakeholder, Agency, Organization or Committee	Event	Action
March 9, 2010	Forest Stewardship/Legacy Sub-Committee for SWARS Review	SWARS Forest Products & Carbon Sequestration	Reviewed an early version of this Chapter
March 10, 2010	Partner/Stakeholder	Began Working with Maxine Burkett and Chip Fletcher on Climate Change/Sea Level Rise	Collaboration with Hawaii Conservation Alliance and ORMP Working Group for Climate Change
March 11, 2010	Consultation with Forest Service	Discussed the SWARS progress and technical issues with Laurie Tippin and Jim Pena (Region 5).	Clarification of Requirements for final SWARS
March 19, 2010	Forest Stewardship/Legacy Committee	Quarterly Meeting	Presentation on current status of SWARS and solicit input. Provided individual chapters for review. Gave the Committee the FSP SWARS Survey.
March 25, 2010	January 25, 1900	ORMP Working Group began working with Zena Grecni on Climate Change	Integration of all available information on climate change into Assessment and development of Strategies
March 25, 2010	Partner/Stakeholder	Ocean Resources Management Plan Working Group	Meeting of ORMP Climate Change subcommittee to refine Climate Change Assessment and Strategy
April 1, 2010	Partner/Stakeholder	ORMP Working Group Finalized working session on Climate Change	Hawaii Conservation Alliance Director and US Fish & Wildlife Service PICCC Presentation on Climate Change Initiative in the Pacific Region
April 13, 2010	Partner/Stakeholder	California, Nevada, Hawaii CNF Annual Fire Conference	Stakeholder input from Foresters State-wide and one on one time with LANDFIRE developers that delivered a tremendous amount of new GIS data for SWARS. Attended by Ron Cannarella, Colleen Carroll and Wayne Ching.
May 6, 2010	Partner/Stakeholder	ORMP Working Group focus on climate change legal instruments	Finalization of Climate Change Strategies
May 13, 2010	State Natural Resources Agency	Board of the Department of Land & Natural Resources	Approval in concept of the Hawaii SWARS & general approval of the draft to date.

Table 1 Stakeholder Participation: Local & Pacific Region Stakeholder and Partner involvement in HAWAIIAN SWARS

DATE	Stakeholder, Agency, Organization or Committee	Event	Action
May 13, 2010	Stakeholder/Public	Hawaii Department of Land and Natural Resources Board Meeting	Briefed the BLNR on the SWARS concept and received their official support of the detailed subjects and methodologies. Authorized Paul Conroy to be the final authority approval.
September 4, 2009	Department of Defence - Army, Office of Hawaiian Affairs, US Fish & Wildlife Refuge Service, TNC, TPL and most Land Trusts in the State	Land Acquisition Video Conference Call	Discussions about strategic priority areas among Land Trusts, County, State, DOD, OHA, Refuges and other agencies. Discuss the possibility of all Land Trusts in Hawaii merging. Discussed how we can get strategic land area acquisitions mapped and into SWARS. Ask for review of draft located on the SWARS website
September 23, 2009	Partner/Stakeholder	Hawaii CPO/HIGIC Conference	Presented SWARS and, discussed with county planning officials and other GIS specialists. Received latest GIS data and all CWPP's.
December 10, 2009	TNC, DOFAW, USGS, UH	Biodiversity Mapping Team, Sam Gon, TNC; Ron Cannarella, DOFAW; & Jim Jacobi, UH;	Biodiversity Chapter Priority Landscape Map development.
January 23, 2010	All Land Trusts in the State, Office of Hawaiian Affairs & State of Hawaii DOFAW	Strategic Planning for Land Acquisition for Conservation Purposes Meeting	All Land Trusts & Non-Profits in the State that do land acquisition for conservation, as well as some agency funders, were present to discuss the possibility of merging all land trusts. Also discussed were ideas on how to target strategic areas for land acquisitions. SWARS strategic planning concepts were discussed.
February 8, 2010	Partner/Stakeholder	Jeff Burgett US Fish & Wildlife	Introduced USFWS Climate Change Initiative to DOFAW staff

Table 1 Stakeholder Participation: Local & Pacific Region Stakeholder and Partner involvement in H
SWARS

DATE	Stakeholder, Agency, Organization or Committee	Event	Action
April 19, 2010	Farm Services Agency & NRCS	Conservation Reserve Enhancement Program Training (CREP)	& Collaborative discussion on available programs and how to integrate them better in the future. SWARS was discussed at length with FSA and NRCS and each were invited to visit the HI Website to review any and all of the latest SWARS and provide comment.
April 10, 2010	Pat Conant, Hawaii Department of Agriculture	SWARS Forest Health Chapter	Reviewer for Forest Health Chapter.
April 10, 2010	Lloyd Lloope, United States Geologic Survey - Biological Resources Committee	SWARS Forest Health Chapter	Reviewer for Forest Health Chapter.
April 10, 2010	Teya Penniman, Maui Invasive Species Committee	SWARS Forest Health Chapter	Reviewer for Forest Health Chapter.
April 10, 2010	Mary Steiner, Executive Director The Honolulu Outdoor Circle	SWARS UCF Chapter	Reviewer for Urban & Community Forests Chapter.
May 13, 2010	Zena Grecni, law intern under supervision of Maxine Burkett, Director of the Institute for Climate Change Adaptation and , Professor of Law	SWARS Climate Change Chapter	Compiled All Stakeholder Input and Finalized Climate Change Chapter and Strategy
May 21, 2010	Same as above including: US FWS & Landfire	Final consultation with DOFAW wildlife staff, USGS BRD and TNC on Conservation of Biodiversity Priority Areas	Completed Biodiversity Layer based on LANDFIRE Data for Hawaii

Table 1 Stakeholder Participation: Local & Pacific Region Stakeholder and Partner involvement in H
SWARS

DATE	Stakeholder, Agency, Organization or Committee	Event	Action
May 25, 2010	US Fish & Wildlife Refuge System, NRCS, Watershed Partnerships, private landowners	McCanless Ranch Field trip	Spent the day on the McCandless Ranch discussing the various landowner assistance programs that are available and how SWARS priority areas are important for future agency-wide conservation efforts in Hawaii.

Kaulunani Urban and Community Forestry Program

Urban Forestry Critical Issues

Survey Results
Hawai`i Conservation Conference
*Statewide Assessment and
Resource Strategy Symposium*

Colleen Carroll, Ed.D.
Teresa Trueman-Madriaga

August 14, 2009

Kaulunani is a program of the DLNR Division of Forestry and Wildlife and the USDA Forest Service

Hawaii Urban Forestry Questionnaire

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Hawaii Urban Forestry Questionnaire - Hawaii Conservation Conference Statewide Assessment & Resource Strategy Symposium July 29, 2009

OVERVIEW

An integral component of the Statewide Assessment & Resource Strategy, SWARS, is to solicit public input on the critical issues in our forests. The Urban and Community Forestry Team created a simple six question form for distribution to participants at the Hawaii Conservation Conference - SWARS session on July 29, 2009. Our goals were two-fold (1) to gain input and validation on the critical issues in the urban forest of Hawaii and (2) to trial the survey format and questions. The survey is being modified and will be available via the web for public input.

The SWARS session was well attended with nearly 175 people from the conservation community. Sixty-two surveys were handed out and 37 were completed. While the data set is small the surveys yielded rich information and are representative of the professional conservation community in Hawaii.

Background

Regarding background we wanted to know where participants live as well as their affiliation. Knowing where respondents live is of great importance in the Hawaiian Islands as the geography, rainfall, economic and other conditions vary widely across the state. We found that the majority of the participants live on Oahu, most in Honolulu and Kaneohe with a small representation from the Big Island. The majority of the respondents are forestry professionals or representatives from the conservation sector. This is a professional group with in-depth knowledge of the Hawaii Conservation issues.

Next steps

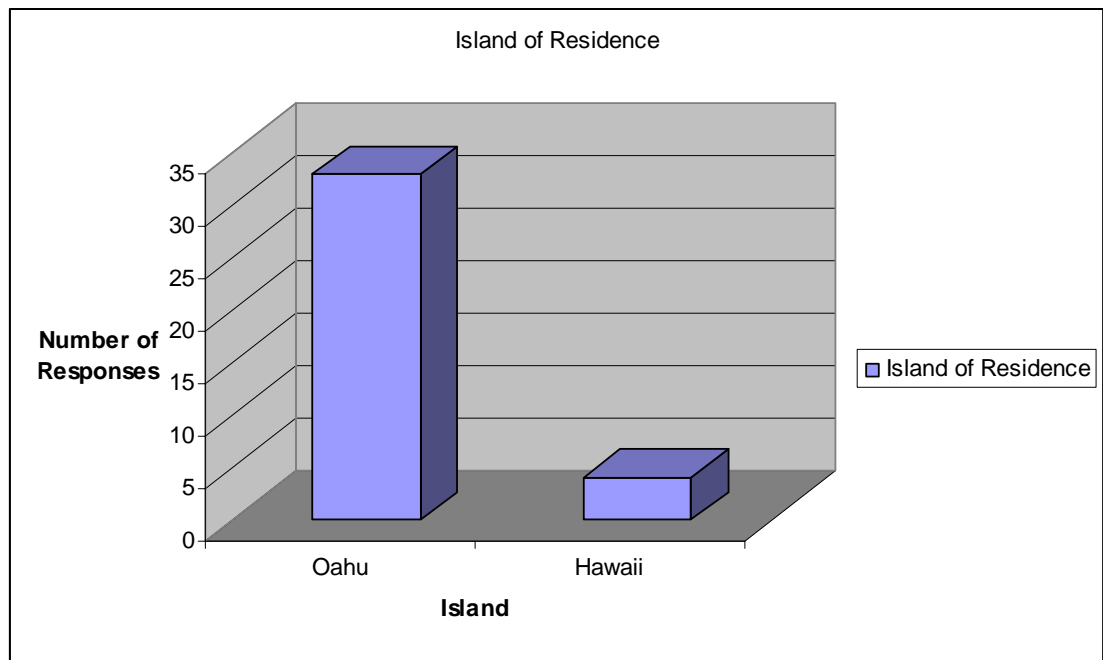
The survey has been modified slightly and revised for the internet. It will be available at the Kaulunani site www.kaulunani.org/survey as well as www.hawaiiassessment.info.

Hawaii Urban Forestry Questionnaire - Hawaii Conservation Conference Statewide Assessment & Resource Strategy Symposium July 29, 2009

SURVEY RESULTS

QUESTION ONE:

Please tell us your city and island of residence.



The majority, 33 of the participants live on Oahu. Most in Honolulu (11) and Kaneohe (7). The Hawaii island residents were primarily from Hilo (3 of 4).

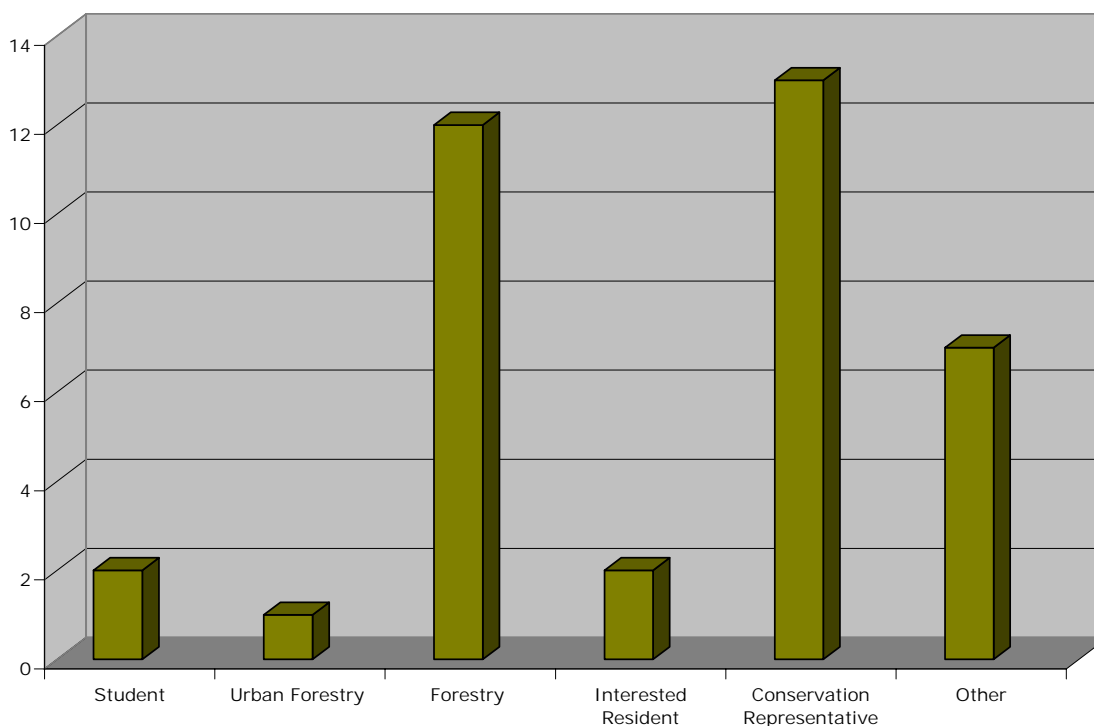
Hawaii Urban Forestry Questionnaire - Hawaii Conservation Conference Statewide Assessment & Resource Strategy Symposium July 29, 2009

QUESTION TWO:

Circle the title that best describes you.

- Student
- Interested Resident
- Urban forestry Professional
- Conservation Representative
- Forestry Professional
- Other _____

Professional Affiliation

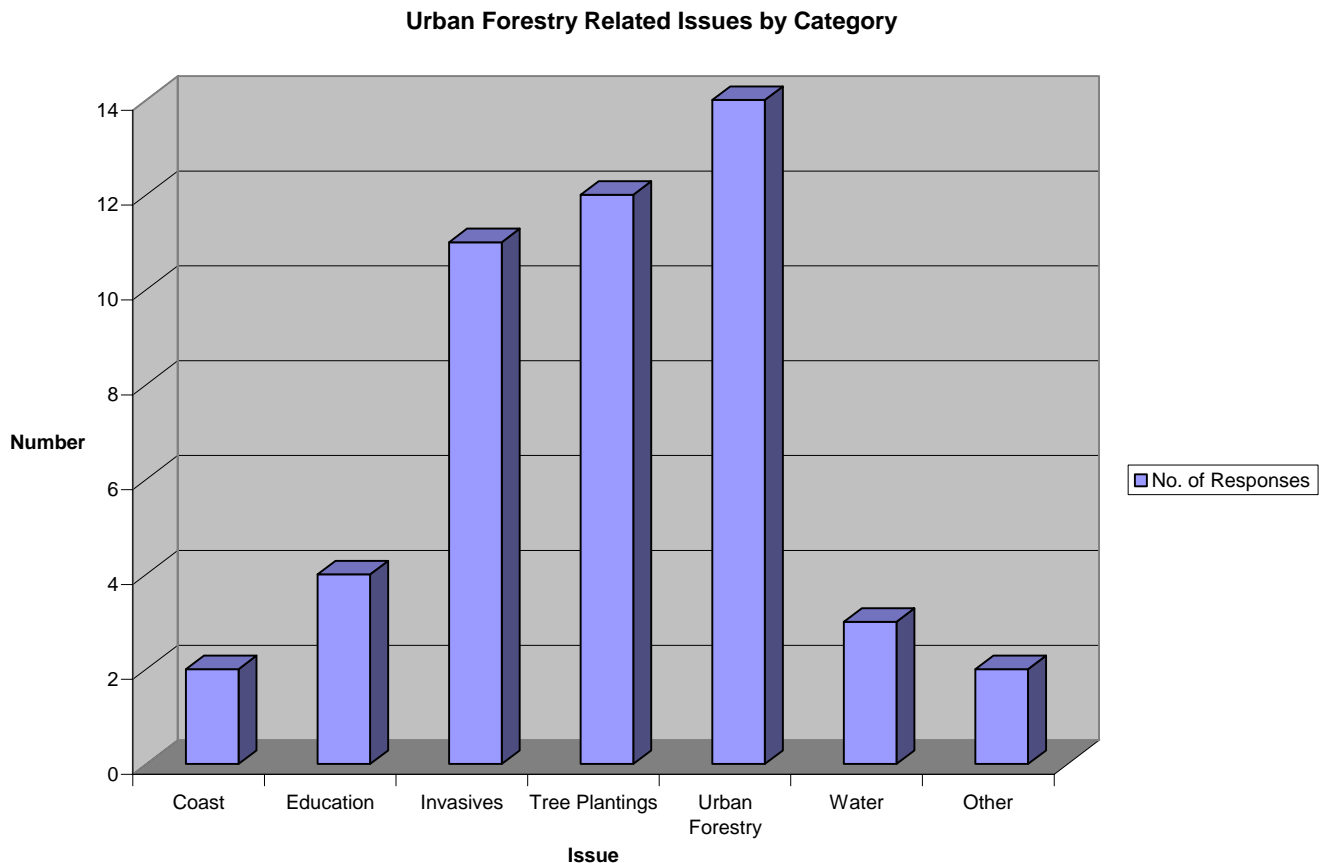


The majority of participants were either forestry professionals (12) or conservation representatives (13). Several additional titles were added: Professor, educator, botanist, nonprofit, watershed planner, wildlife biologist, landscape architect, and environmental consultant.

Hawaii Urban Forestry Questionnaire - Hawaii Conservation Conference Statewide Assessment & Resource Strategy Symposium July 29, 2009

QUESTION THREE:

Thinking in terms of where you live, what is the most important urban forestry-related issue that needs to be addressed? (This question was modeled after the Oklahoma Survey.)



RESPONSES:

A. COASTAL & NEAR SHORE RESOURCES

- Coastal & lowland forest impacts due to population pressure.
- Urban affects on near shore resources.

B. EDUCATION

- Education of inhabitants on value of conservation practices.
- In my neighborhood the urban forest in the back valley is ...- mainly ornamentals - increasing home owner education on urban forests would help.
- Education.
- Educating the general public about the use of native plants in the landscape.

Hawaii Urban Forestry Questionnaire - Hawaii Conservation Conference Statewide Assessment & Resource Strategy Symposium July 29, 2009

C. INVASIVES

- Release (or potential release) of invasive species into upland forests.
- Invasives
- Weed spread of landscape plants
- Wildland/Urban interface and threats
- Forest Interface - threats of invasive tree species
- Invasive Species
- Invasive trees
- Selection replacement of tree plantings with known invasive characters.
- Replacing invasive trees with natives - almost NO NATIVE urban trees in Kaneohe!
- Prevention of invasive species/pathogens
- Invasive species

D. TREE PLANTINGS - (FOCUS ON NATIVE SPECIES)

- I'd love to see more native trees represented in our urban forest - most people don't know what native trees even look like.
- Plant more trees & more appropriate trees (e.g. natives and not invasives).
- Plant more resilient natives.
- Native species
- Planting
- In Kaneohe there are very few trees planted in urban area!
- Need more native plants in our urban area!
- Educating the general public about the use of native plants in the landscape.
- Replacing invasive trees with natives - almost NO NATIVE urban trees in Kaneohe!
- Large tree replacement planning.
- More natives & endangered plants need to be planted in urban areas.
- Would love to see more native/Polynesian-introduced trees in public areas. It would also be great to plant fruit trees too!

E. URBAN FOREST MANAGEMENT

- Appropriate street trees
- Very few urban forestry plantings in Kahaluu, & ones that are in Kahaluu are not always well maintained. Lots of room to work on Ahupua`a scale, especially in Waihele.
- Biodiversity of urban forestry
- Urban Tree Health & large tree replacement planning.
- Green Space Management
- Maintenance & care of existing urban trees.
- More desired plantings. Less weeds and uncared for plots of land.
- Keeping trees well maintained (pruned).
- Vegetation management in expanding suburbs - bulldozing Albizia in Puna, urbanization in Hamakua.
- Manoa Falls trail system - management & clean-up
- Ag lands

Hawaii Urban Forestry Questionnaire - Hawaii Conservation Conference Statewide Assessment & Resource Strategy Symposium July 29, 2009

- Benefits & costs of forest conservation projects
- Shade
- Erosion control.

F. WATER

- Water shed Management
- Landscape retrofit to maximize water retention, filtration & infiltration.
- Stream quality, watershed, mauka forestry

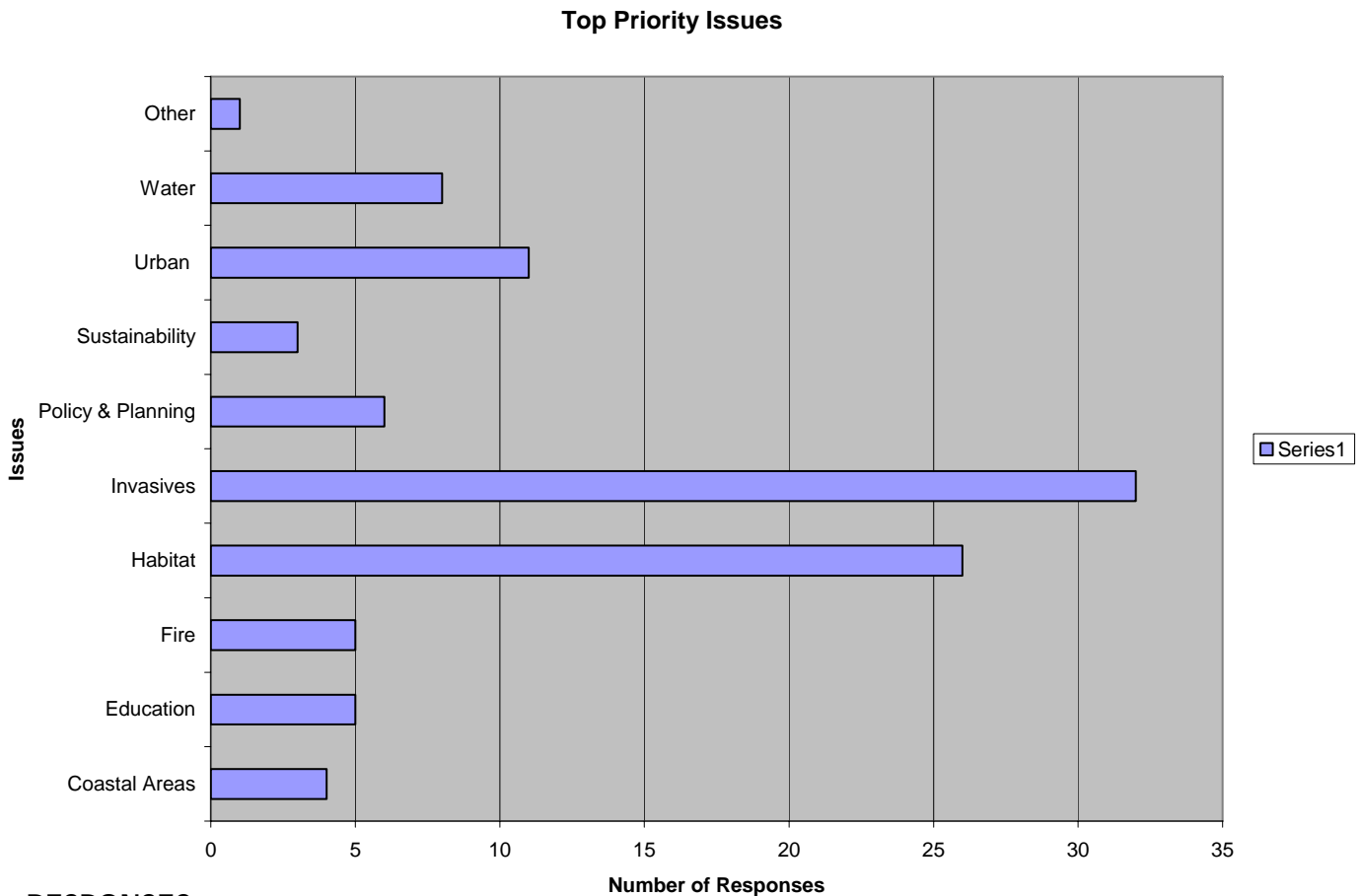
G. OTHER

- Increased fire severity resulting from fire fuels.
- Studies to distinguish conservation that increase welfare from those that waste resources.

Hawaii Urban Forestry Questionnaire - Hawaii Conservation Conference Statewide Assessment & Resource Strategy Symposium July 29, 2009

QUESTION FOUR:

Thinking of Hawai`i as a whole, what are the top three forestry issues that need to be addressed? (This question was modeled after the Oklahoma Survey.)



RESPONSES:

COASTAL

- Affects on near shore resources
- Coastal & lowland forest impacts due to population pressure
- Increased sediment discharge to nearshore reef resulting from slumping/slides
- Near shore management

EDUCATION

- Perception of value by people
- I think the community sees a forest & doesn't understand the problems- if it is green & pretty so all is ok
- Education of public
- Public support for work in invasive species & habitat loss
- Public awareness of native species their value

Hawaii Urban Forestry Questionnaire - Hawaii Conservation Conference Statewide Assessment & Resource Strategy Symposium July 29, 2009

FIRE

- Fire potential
- Fire
- Fire suppression
- Fire minimization at urban/forest boundary
- Fire prevention/management

HABITAT

- Habitat Alteration/ loss
- Habitat modifying species in native forest
- Restoration & protection
- Native Forest (mesic)
- Forestry understory sustainment
- Protection of rare species
- Ecosystem management
- Maintaining native forest
- Habitat for native trees/TES flora & fauna
- Restoration of native ecosystems
- Beauty of native forest & trails (recreation)
- Conservation of existing forest resources
- Restoration of degraded forest resources
- Sustainable production & management of forest resources
- Loss of native species
- Native plant restoration
- Field work
- Habitat loss
- Protection of endemic species
- Balancing rare forest management & hunting program
- Restoration & protection
- Maintaining natural species forests
- Native species protection
- Diversity of forests
- Biodiversity
- Habitat loss

INVASIVE

- Invasive species
- Invasive species
- Invasive fauna
- Release or potential release of invasive spp. into upland forests
- Invasives
- Ungulate elimination
- Invasive species

Hawaii Urban Forestry Questionnaire - Hawaii Conservation Conference Statewide Assessment & Resource Strategy Symposium July 29, 2009

- Incipient weed control
- Habitat modifying species in native forest
- Invasive species control
- Invasive species encroachment diminishing water recharge capacity
- Potential for invasive invertebrates attack/killing forest sp.
- Addressing invasives
- Invasive species
- Containment/control of invasive species
- Increase in alien weeds
- Increase in alien game animals
- Invasive species removal
- Stopping introduction & spread of invasives
- Invasive flora & fauna
- Invasives removal
- Invasive species
- Invasives
- Invasive species
- Removal of feral ungulates & invasive species
- Stop invasive imports
- Native vs. invasive plants
- Invasive species
- Invasive species prevention/mitigation
- Invasive species
- Invasive species
- Invasive species

POLICY & PLANNING

- Land use zoning to protect upland forests
- More transparency regarding how limited funds get spent managing natural areas
- Sufficient funding for conservation \$\$
- Creating effective & efficient management tactics
- Sustainability science
- Promotion of natives & endangered plants in city planning

SUSTAINABILITY

- Forest management for carbon sequestration & biofuel production
- Sustainable building materials grown in Hawaii cuts carbon footprint
- Development of a forest industry

URBAN

- Urban/forest interface problems
- Development
- Addressing green in urban areas - reduce cars, protect, etc.
- Requiring/including planting space in new developments

Hawaii Urban Forestry Questionnaire - Hawaii Conservation Conference Statewide Assessment & Resource Strategy Symposium July 29, 2009

- Recreation/exercise parks/pathways for urban forestry in Hawaii
- Expanding development
- Negative human impact
- Stopping north shore development "turtle bay"
- Fire minimization at urban/forest boundary
- More natives need to be planted in urban areas
- Promotion of natives & endangered plants in city planning

WATER

- Water
- Water quality
- Watershed
- Invasive species encroachment diminishing water recharge capacity
- Management of upland forest to preserve watershed values
- Watershed & aquifer
- Watershed
- Water

OTHER

- Erosion control

Hawaii Urban Forestry Questionnaire - Hawaii Conservation Conference Statewide Assessment & Resource Strategy Symposium July 29, 2009

QUESTION FIVE:

Please rank these issues according to priority 1-5. (1 being the highest). Add any other issues you think are important.

Watershed	For example: clean water, stream repair
Coastal Areas	For example: erosion, tourism, climate change
Urban Forestry	For example: role of trees in healthy urban environment
Cultural Issues	For example: ethnobotany, native plant conservation
Sustainability	For example: food security, open lands, growth

Priorities Identified in the Survey:

Priority One	Watershed
Priority Two	Sustainability
Priority Three	Coastal
Priority Four	Cultural
Priority Five	Urban Forestry

Additional Comments:

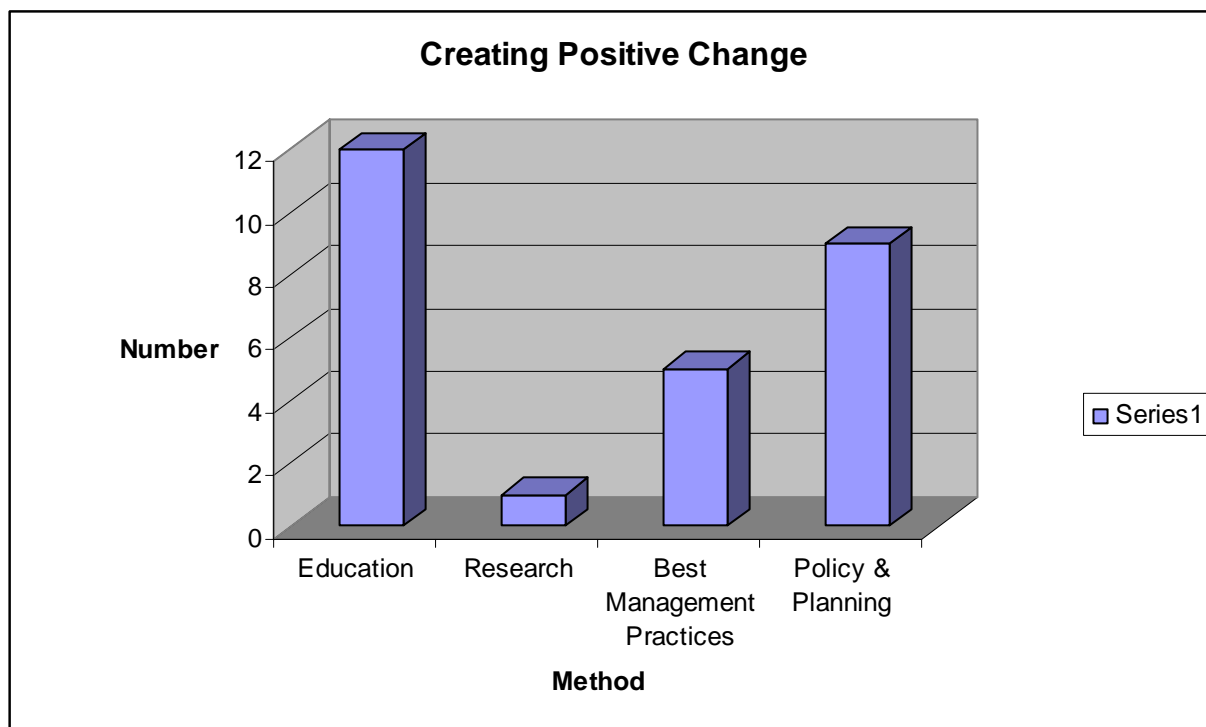
- Natural resource conservation issues
- Near shore reefs
- Conservation
- Production ecology
- All are important - hard to rank
- The first four will help resolve sustainability

Hawaii Urban Forestry Questionnaire - Hawaii Conservation Conference Statewide Assessment & Resource Strategy Symposium July 29, 2009

QUESTION SIX:

What method do you think offers the best strategy for creating positive change?
Education, Research, Best Management Practices, Policy and Planning.

Strategy	Number of Responses
Education	12
Research	1
Best Management Practices	5
Policy & Planning	9



Hawai`i Urban Forestry Questionnaire - Critical Issues

Please take a few moments to share your ideas about the most important issues in Hawaii's forests.

1. Please tell us a little about yourself. Where do you live?

City/Town and Island _____

2. Circle the title that best describes you.

Student

Interested resident

Urban forestry professional

Conservation representative

Forestry professional

Other _____

3. Thinking in terms of where you live, what is the most important urban forestry-related issue that needs to be addressed?

4. Thinking of Hawai`i as a whole, what are the top three forestry issues that need to be addressed?

5. Please rank these issues according to priority 1-5. (1 being the highest) Add any other issues you think are important.

___ Watershed

(ex. Clean water, stream repair)

___ Coastal areas

(ex. Erosion, tourism, climate change)

___ Urban Forestry

(ex. role of trees in healthy urban environment)

___ Cultural Issues

(ex. Ethnobotany, native plant conservation)

___ Sustainability

(ex. Food security, open lands, growth)

Other

6. What method do you think offers the best strategy for creating positive change?

___ Education

___ Best Management Practices

___ Research

___ Policy and Planning

Please fill out the contact information below. (Optional)

Name _____ Email/Phone _____

Thank you for your input!

Forest Stewardship Program Advisory Committee

Forest Related Critical Issues

Survey Results
Forest Stewardship Committee
Meeting September 3, 2009

*Statewide Assessment and
Forest Resource Strategy
(SWARS) Development*

Colleen Carroll, Ed.D.
Sheri S. Mann

State of Hawaii Division of Forestry and Wildlife and the USDA Forest Service

Forest Related Critical Issues Survey Results

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Overview

The below responses are from the HI Forest Stewardship Advisory Committee, a 13 person advisory group representing natural resource professionals and/or private landowner involved or interested in natural resource conservation and sustainable forest product management.

1) Where do you live?

City/Town_____Island_____

Hawaii	3
Oahu	6
Molokai	1

(10 of 12 responded)

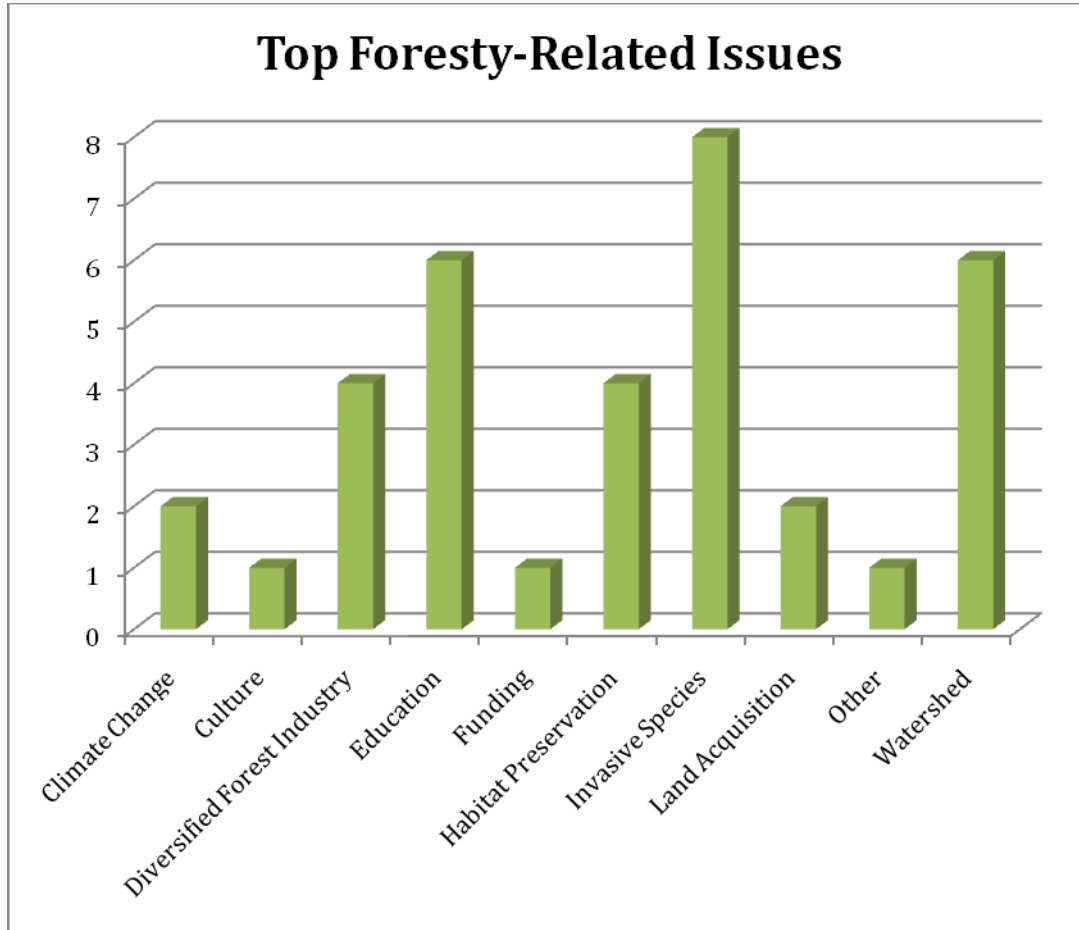
2) Write in the title that best describes you:

Director of Conservation, TNC
Endangered Species, Executive Secretary, NARS Commission
Natural Area Reserves Planner
Forestry & Wildlife Manager
Government Conservation Program Administrator
PIA NRCS Forest Ecologist
Economic Development Specialist - Agricultural Economist
Forester (2)
Practitioner
Private Landowner, Conservationist
(11 responses out of 12)

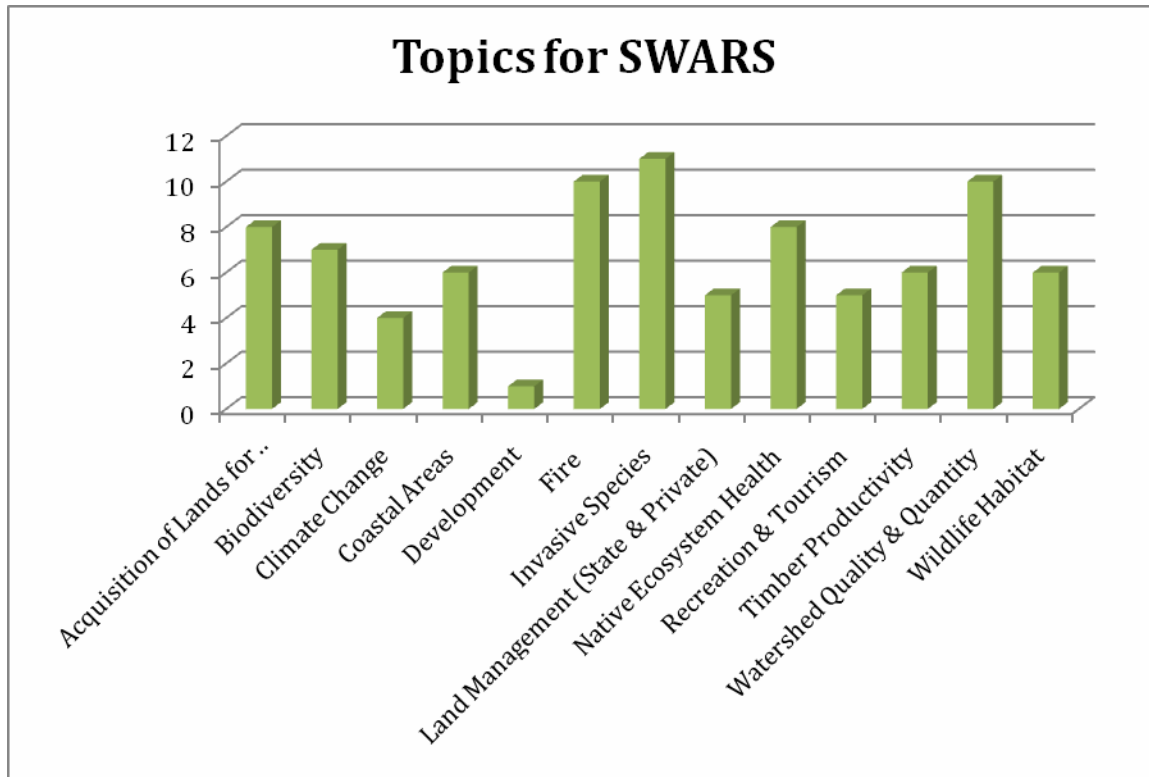
3) Do you serve on any special committees or advisory boards? Please list:

Big Island - Resource, Conservation & Development - Ag Committee
Burial Council
Hawaii Association of Watershed Partnerships
Hawaii Community College Forest Team Advisory Council
Hawaii Community Forestry Council
Molokai General Hospital
Queen Emma Land
Queens' Health System
State Forest Stewardship Committee **7**
Water Commissioner - Selection Committee to Advise the Governor
Watershed Grant Review
The Wildlife Society - Hawaii Chapter

4) What do you see as the top three forestry-related issues that need to be addressed?



5) Which of the following topics do you think are important enough to include in the Statewide Assessment and Resource Strategy (SWARS)? Please Check up to eight (8).



6) What do you see as the biggest opportunities that the Hawaiian forestry community needs to take advantage of in the next five years?

- Biofuels
- Developing a Diversified Forest Products Industry
- Education
- Funding
- Habitat Preservation
- Invasive Species
- Land Acquisition
- Watershed

7) Please take a careful look at the following list. These items have been selected as priority issues in our Hawaiian forests.

Timber Productivity	Wildlife Habitat
Native Ecosystem Health	Watershed Quality & Quantity
Biodiversity	Recreation & Tourism
Fire	Acquisition of Lands for Conservation Purposes
Invasive Species	Land Management (State & Private)
Climate Change	Development
Coastal Areas	

7a) Should any of the Issues above be dropped or modified? Please comment:

Acquisition of Lands for Conservation Purposes

- this is a tool not an issue

Biodiversity

- merge with wildlife habitat

Coastal Areas

- What is the issue? Access? Poor water quality? Reef Health?

- merge with climate change

Development

- Ag development? Urban Development?

-Where what how does this fit in? What does this mean?

- Merge with acquisition

Fire

-pre-suppression planning links to native species suppression

Land Management

- Explain

- overly broad - do you mean funding for?

Native ecosystem health

-goes hand in hand with land management

Timber Productivity

- change to forest products

Wildlife Habitat

- define a separate category for native animals vs. game animals

- needs to be a separate category for non-native habitat (game management)

- merge with biodiversity*

7b) Are we missing any Issue Themes or Sub-Issues? Please list other issues here:

Agriculture

Aquaculture

Cultural Practices

Cultural – native Hawaiian and others

Development of Healthy Forest Industry in Hawaii

Development of Bioenergy industry using forest products in Hawaii

Education – related issues

Education

Forest Industry Development

Land Access (access to forest land)

Historical Uses

Hunting

Sustainable & economically viable forestry industry

Technical Support

-(one stop shop) – many times implementation is impeded by Federal & State & County
regs that [exclude] all but the wealthy.

Urban & Community Forestry

Urban Forestry

Forest Related Critical Issues in Hawaii Survey

Thank you for taking the time to complete this questionnaire. We would like your input on critical issues in the Hawaiian Forests.

1) On what Island do you live?

City/Town_____Island_____

2) Circle one (1) title that best describes you:

Director, Non profit
Forestry Practitioner
Educator
Interested Resident
Student

Conservation Specialist
Forestry Administration
Private Landowner
Other:

3) Do you serve on any Committees or Boards?

4) What do you see as the top three forestry-related issues that need to be addressed?

5) Which of the following topics do you think are important enough to include in the Statewide Assessment and Resource Strategy (SWARS)? Please Check up to eight (8).

Native Ecosystem Health
Watershed
Historic uses
Fire
Culture
Habitat

Coastal Zone
Invasive Species
Land Acquisition for Conservation
Purposes

Biodiversity & Native Wildlife
Development & Urbanization
Sustainability
Climate Change
Recreation & Tourism
Education
Diversified Forest Products
Industry
Other

6) What do you see as the biggest opportunities that the Hawaiian forestry community needs to take advantage of in the next five years?

7) Take a look at the following list. These items have been selected as priority issues in Hawaii.

Native Ecosystem Health	Invasive Species
Watershed Quality & Quantity	Wildlife Habitat
Climate Change	Biodiversity
Coastal Areas Development	Recreation & Tourism
Fire	Lands Acquisition for Conservation Purposes

7a) Should any of these issues be dropped or modified?

7b) Are we missing any issues or sub-themes? If so, please list those.

Thank you for participating! Please provide any comments or suggestions and return your survey to Sheri S. Mann - sheri.s.mann@hawaii.gov or fax: 808-587-0160.

Hawai`i Urban and Community Forestry Summit

November 4-5, 2009

Critical Issues in the Urban Forest

Internet Survey Results *Statewide Assessment and Resource Strategy (SWARS)*

Colleen Carroll, Ed.D.
Teresa Trueman-Madriaga

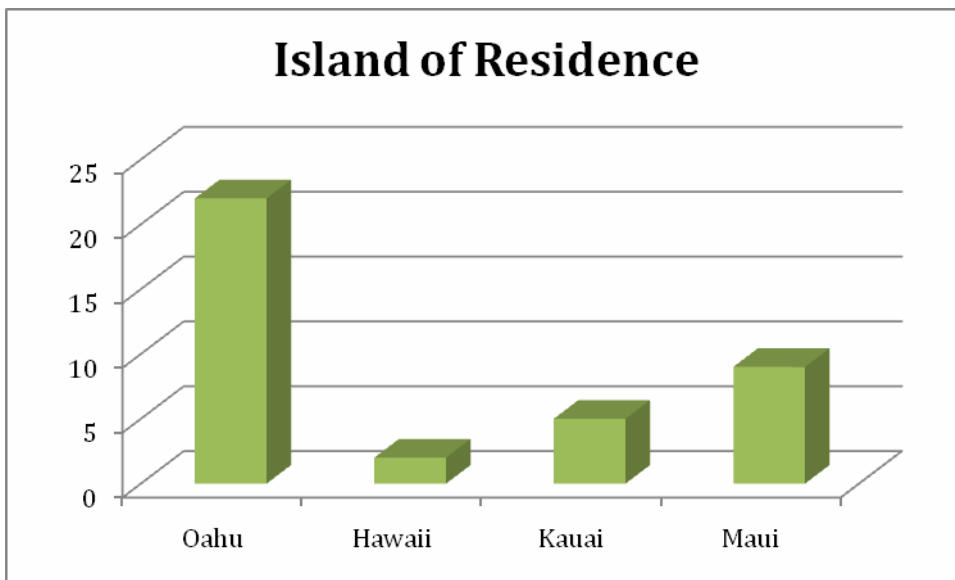
Kaulunani is a program of the DLNR Division of Forestry and Wildlife and the USDA Forest Service

Critical Issues in the Urban Forest

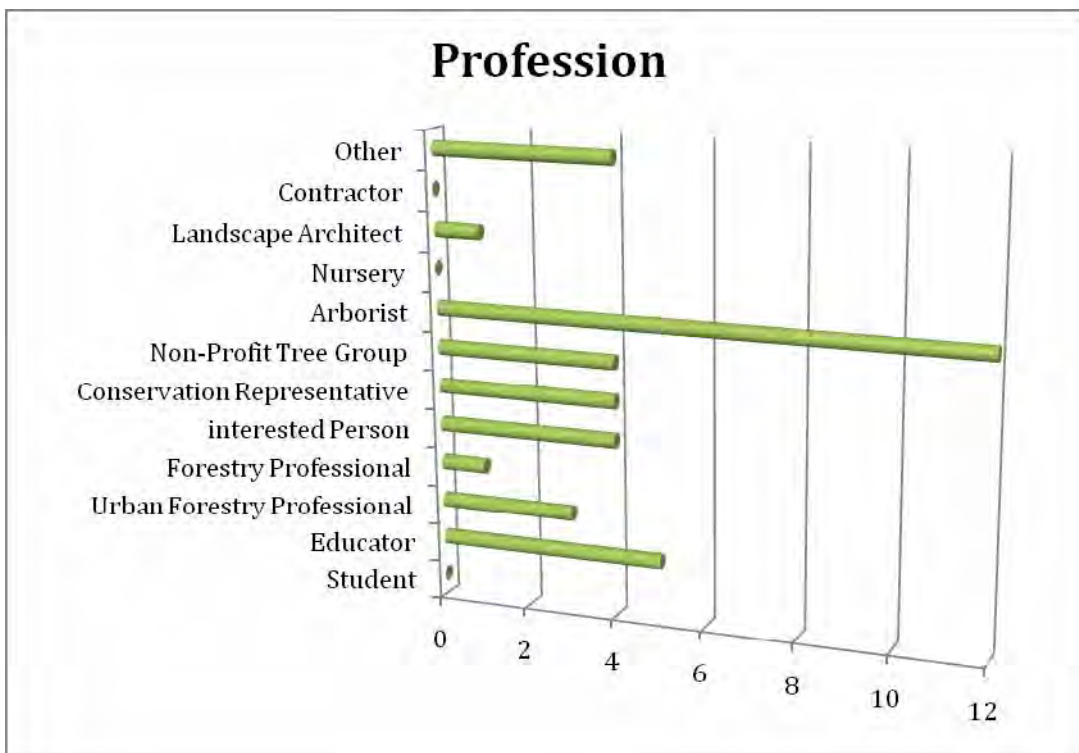
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Q1. All respondents are Hawaii residents; the majority (22 of 38) are from Oahu.

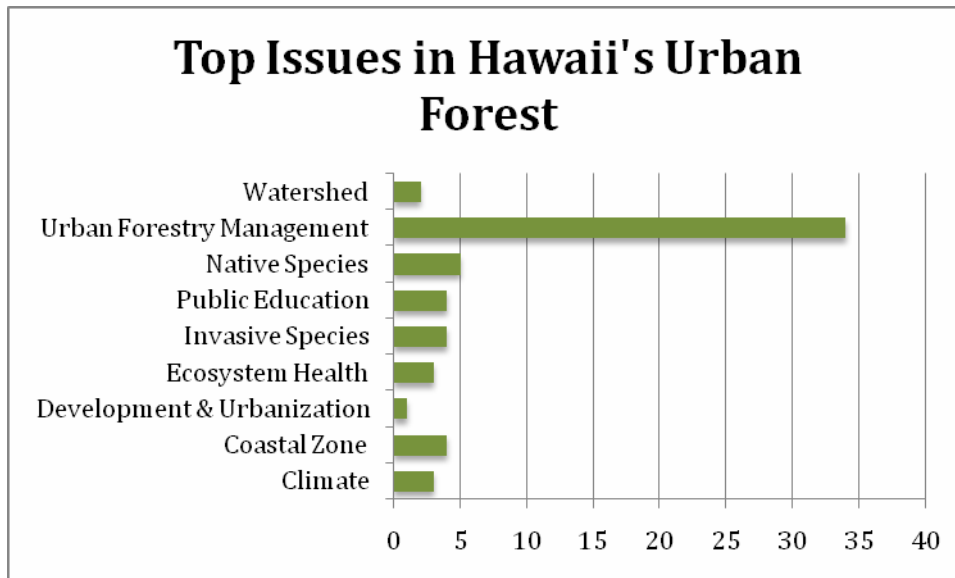


2. Professional Affiliation. Of thirty-eight respondents nearly one-third (12) are arborists. Other professions represented include non-profit tree groups, education, conservation specialists, foresters and landscape architects.



Q3. Thinking in terms of where you live what is the most important urban forestry issue that needs to be addressed?

Native plants, research, food, climate, coastal zone, invasives and sustainability are mentioned in some of the responses. Overall, participants selected Urban Forestry Management as the top priority issue. Comment about the urban forest range from tree care, professional training and education to policy, planting for shade, heat reduction, and planning for establishment of larger and healthier urban trees.



Q3. ALL RESPONSES

Climate

- 1) Impact on climate.
- 2) Reduction in permeable, heat absorbing surfaces and an increase in urban forest canopy.
- 3) Promoting the value of planting (non-invasive) trees for energy savings, improved air quality, minimize heat retention, etc.

Coastal Zone

- 1) Water retention on land (sediment/pollution-laden runoff reduction).
- 2) Impermeable surfaces and storm water run off into streams and oceans.
- 3) Install more trees along the beachfronts.
- 4) Protection of shoreline trees from erosion and beach hazards.

Development & Urbanization

- 1) Too much development causing the state to be more urbanized. If this keeps happening, we'll lose the natural beauty that makes Hawai'i what it is.

Ecosystem Health

- 1) Fragile eco-system.
- 2) Loss of native habitat.
- 3) Conservation.

Invasive Species

- 1) Propagation and maintenance of our diverse forest with respect to thoughtful elimination of invasive species and an eye on sustainable practices regarding food production.
- 2) Invasive species.
- 3) Promoting the value of planting (non-invasive) trees for energy savings, improved air quality, minimize heat retention, etc.
- 4) We need to inform the public regarding the importance of growing native trees and other plants that are not invasive.

Public Education

- 1) Public awareness of the value and care of trees, like dumping charcoal at the trunk
- 2) Understanding the value and importance of our native forest as so many people are moving here and just bulldozing down our forests.
- 3) Information about native Hawaiian plants and trees.
- 4) We need to inform the public regarding the importance of growing native trees and other plants that are not invasive.

Native Species

- 1) Loss of native habitat.
- 2) Lack of native species. Non natives have displaced native species and most people can't recognize a native species tree, plant or shrub.
- 3) Information about native Hawaiian plants and trees.
- 4) Use of native plants in communities.
- 5) Using native plants in urban settings.

Urban Forestry Management

- 1) Larger tree planting spaces to accommodate the growing of larger trees. We need more soil volume for tree roots to grow without impacting with hardscapes and utility lines.
- 2) Development policies that will permit street trees to be planted. The higher the densities and tighter the front yard frontage the less the chance to plant any street trees.
- 3) Reduction in permeable, heat absorbing surfaces and an increase in urban forest canopy.
- 4) Decreasing tree density in urban environment.

Internet Survey Results 4

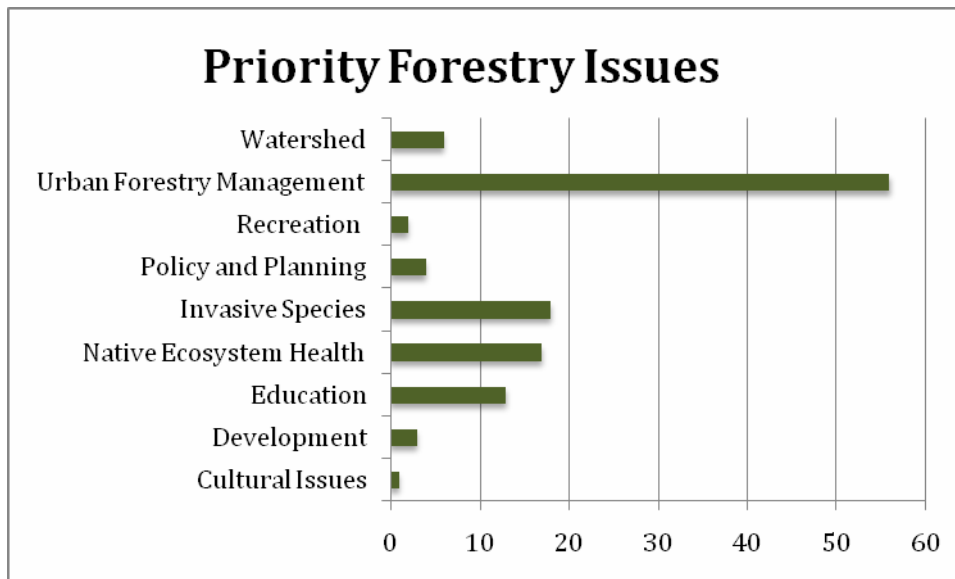
- 5) Proper care of existing trees through training of public and private workers.
- 6) Tree Care, mortality of trees due to string trimmers is incredibly high! This causes the most mortality to newly planted trees that I have noticed over the years.
- 7) Tree care according to BMPs.
- 8) Need to assess the urban tree canopy - what there is and what is needed.
- 9) Growing the urban forest to increase infiltration and help restore the hydrologic cycle in general.
- 10) Development and clear cutting of trees without concern for erosion, shade, cultural, historical or other values.
- 11) Improper care and maintenance of trees.
- 12) Parks in dire need of trees and beautification.
- 13) Incorporating trees and shade into the hardscape.
- 14) More tree plantings, and better care of existing trees.
- 15) Proper long-term maintenance of our street trees.
- 16) Maui County: Lack of urban forests. Improper tree care.
- 17) Green space and cost effective landscaping.
- 18) Tree mutilation (topping, liontailing, other methods of growth suppression).
- 19) Town of Wailuku: Serious lack of street trees/urban forests.
- 20) General lack trees in public places.
- 21) I have been working on the coconut Heart Rot for the 10 past years:
www.coconutprotectors.com so for me it is the most important issue.
- 22) Planting more trees.
- 23) Correct pruning of Trees
- 24) Public awareness of the value and care of trees, like dumping charcoal at the trunk.
- 25) Proper maintenance and absolute replanting.
- 26) How to get more low maintenance street trees in our neighborhoods within adequate planting spaces.
- 27) Right tree in the right place.
- 28) Urban forestry management.
- 29) Care and maintenance of public city trees.
- 30) Design parameters in existence for public parking lots and street trees do not support the establishment of healthy trees, and are general unenforced so that many trees die in the first few years and are not replaced.
- 31) The urban forest has not been established or supported.
- 32) Public Education--on the value and importance of trees, and what it takes to take of them.
- 33) Promoting the value of planting (non-invasive) trees for energy savings, improved air quality, minimize heat retention, etc.
- 34) Preservation and expansion of population of mature trees; protection of shoreline trees from erosion and beach hazards

Watershed

- 1) Growing the urban forest to increase infiltration and help restore the hydrologic cycle in general.
- 2) Water retention on land (sediment/pollution-laden runoff reduction).

Q4. Thinking of Hawaii as a whole, what are the top three forestry issues that need to be addressed?

Urban forestry management remains the top issue. Invasive species, Native Ecosystem Health, and Education are ranked secondary in importance.



Q4. ALL RESPONSES

Cultural Issues

- 1) Cultural issues.

Development

- 1) Impact of development.
- 2) Overdevelopment causing less & less forestry.
- 3) How to reclaim degraded lands.

Education

- 1) Understand how urban relates to other forestry issues.
- 2) Educating the public on the value and benefits of trees to them personally and as a community.
- 3) Educating the public on benefits of trees.
- 4) Professional and homeowner education about trees and tree care.
- 5) Education on the benefits of trees maintenance.
- 6) Education.

Internet Survey Results 6

- 7) Creating a program to get Arborists into classrooms to teach young people about the importance of trees in their environment and how to chose and care for those trees.
- 8) Education of the value of our forest.
- 9) Education for the public on tree care.
- 10) More education on proper maintenance and best practices by the industry.
- 11) Public education.
- 12) Train those people who actually take care of the urban forest on best mgmt practices.
- 13) Create awareness of planting native plants in Urban Environment.

Native Ecosystem Health

- 1) Loss of habitat and forest diversity.
- 2) Loss of native habitat.
- 3) Preserving native forests.
- 4) Re-forestation as needed.
- 5) Reforestation and replanting of native species throughout the entire ahupuaa - summit to sea.
- 6) Restore ecosystems to promote soil retention.
- 7) Restore ecosystems to attract native insects and birds.
- 8) Importance of our native forests.
- 9) Reforestation.
- 10) Conservation of native forests.
- 11) Degraded forest restoration.
- 12) Native plants and animals declining.
- 13) Enhancement and protection of native species
- 14) Extinction of endemic species.
- 15) Forest conservation.
- 16) Saving native forests.
- 17) Using native, drought tolerant species in landscaping.

Invasive Species

- 1) Invasive Species.
- 2) Invasive species (particularly pests for which our urban forest has no defense).
- 3) Removing invasive species.
- 4) Preventing introduction of invasive species.
- 5) Invasive species growing in the under-stories of the rain forest.
- 6) Some invasive species are worse than others - Schinus is my enemy.
- 7) Reducing reliance on invasive species and imported planting stock which may harbor pests.
- 8) Invasive species.
- 9) Maintenance of healthy watersheds by removing invasive species.
- 10) Invasive species control.
- 11) Invasive Species - over the past few years there have been some significant mortality due to newly introduced invasive species that have turned out to

Internet Survey Results 7

- be pests that cause mortality, e.g. Erythrina gall wasp, Ohia Rust on Rose apples, banana bunchy top, etc.
- 12) Better awareness of invasiveness of current and future forestry plantings (urban or plantation); agreement to use non-invasive alternatives.
 - 13) Need to implement the best available biosecurity protection measures to keep out new invasive insects and diseases that could decimate urban and natural forests.
 - 14) Restrict the entry of known invasive plants that are proven invasive elsewhere.
 - 15) If you are asking about forestry (and not urban forestry) prevention and curtailment of invasives.
 - 16) Invasive species.
 - 17) Removing Invasive species.
 - 18) How to encourage native plant growing and discourage the use of invasive species.

Policy and Planning

- 1) Policy and Planning related to the urban forest.
- 2) Development policies of both the City and State governments regarding urbanization and Urban Forest issues.
- 3) Getting the State to recognize that the Landscape Industry (including the Urban Forest) is a part of and in fact the larger part of the Agricultural industry in the state.
- 4) Consistency in statewide regulation and priorities.

Recreation

- 1) Keeping the hiking trails open. Trees fall over the trails, and stay for years.
- 2) Lack of hunting access for residents.

Urban Forestry Management

- 1) Preserving existing large trees.
- 2) Inventory of trees
- 3) Assessment of the canopy.
- 4) Tree care according to BMPs.
- 5) Increase tree canopy cover as appropriate through selection of right tree for the site and proper structured and cultivated trees from nursery.
- 6) Policy and Planning related to the urban forest.
- 7) Proper pruning and tree care.
- 8) More Tree planting.
- 9) Better tree care of existing trees.
- 10) Professional and homeowner education about trees and tree care.
- 11) Education on the benefits of trees maintenance.
- 12) Right tree/right place.
- 13) Proper pruning.
- 14) Cost effective tree choices.
- 15) Tree removal for construction purpose.

Internet Survey Results 8

- 16) Monocultures (too many trees planted from a limited plant palette - monkey pods, rainbow showers, etc.)
- 17) Improper pruning.
- 18) Dangerous tree conditions.
- 19) Coconut heart rot.
- 20) Ohia Rust.
- 21) Risk assessment.
- 22) More street trees.
- 23) More trees planted replacing removed trees.
- 24) Strict standards for maintenance by State, County, HECO
- 25) Low maintenance street trees.
- 26) Creating street tree planting spaces with adequate root space for long-term growth.
- 27) Creating a program to get Arborists into classrooms to teach young people about the importance of trees in their environment and how to choose and care for those trees.
- 28) Reforestation and replanting of native species throughout the entire ahupuaa - summit to sea.
- 29) Increasing canopy cover, esp. in low-income areas.
- 30) Diversifying species-use.
- 31) More and larger street trees.
- 32) Larger planting spaces will be required either as an easement or outright grant to the city/county.
- 33) More parking lot tree shade - percent of shade produced and maintained as opposed to number of trees based on number of parking stalls.
- 34) Tree canopies will need to be maintained and not be cut to resemble lollipops.
- 35) Streets and parking lots with a variety of trees to avoid a monoculture.
- 36) Lack of communication from within.
- 37) Care and maintenance of public city trees.
- 38) Education for the public on tree care.
- 39) Having arborists on construction sites while working to protect trees.
- 40) Lack of support for urban forests.
- 41) More education on proper maintenance and best practices by the industry.
- 42) Public education.
- 43) Train those people who actually take care of the urban forest on best mgmt practices.
- 44) Plant/replant more trees--right tree, right place.
- 45) Development policies of both the City and State governments regarding urbanization and Urban Forest issues.
- 46) Managing urban forests.
- 47) Propagation of indigenous trees.
- 48) Getting the State to recognize that the Landscape Industry (including the Urban Forest) is a part of and in fact the larger part of the Agricultural industry in the state.
- 49) Management / maintenance of the existing urban forest.

Internet Survey Results 9

- 50) Proper Tree Care - string trimmer mortality.
- 51) Topping of trees and bad pruning causes structural defects that impact the longevity of tree life in the future.
- 52) Tree Planting Areas allocated for tree growth - most times there is not adequate planting area for tree roots to grow without damaging the hardscape, sidewalk, curbs, street pavement, parking lot pavement, underground utilities, etc. These trees are unable to reach their mature size and age due to the need to repair the hardscape and causing the tree to be unstable due to severe root pruning and mechanical damage.
- 53) Maintaining and expanding Urban Forest canopy.
- 54) Preservation of Historic Trees.
- 55) Create awareness of planting native plants in Urban Environment.
- 56) How to make it possible for private growers to make a living growing trees.

Watershed

- 1) Erosion water quality.
- 2) Protection of watershed and coastal areas.
- 3) Water resource management.
- 4) Water management.
- 5) Misuse, or not using R-1 water, not allowing residential R-1 use for irrigation.
- 6) Maintenance of healthy watersheds by removing invasive species.

Q5. The Kaulunani Council identified sustainability, Urban Forestry Management, Coastal Zones, Culture and Watershed as critical issues. Summit participants were asked to rank these five issues following according to priority. The following charts illustrate those choices.

Top priority remains Urban Forestry Management.

Ranking	Issue
Top Priority	Urban Forestry Management
Second	Sustainability
Third	Watershed
Fourth	Coastal
Fifth	Culture

Q6 Please list any other issues you think are important.

Development & Urbanization

- Too much development equals less of the land we love. Responsible hunters can assist in managing evasive species, help with planting native fauna, assist with data collection, clean up rubbish & maintain trails & access roads. They will do this for free! Also take a look at deep water fish trapping & surround netting- those two methods of fishing are unmonitored yet have the greatest impact on fish depletion.

Education

- Education
- Community education (public and private) on the value of trees beyond aesthetics. This is something where the government is in the best position to lead by example, but in many instances, they are the worst offenders.
- public education
- More volunteer projects to be organized.
- Environmental education

Internet Survey Results 11

- We should be doing all we can to discourage improper tree care such as heading or lion tailing. Public education holds the most promise. Most folks wouldn't pay money if they knew they weren't getting proper practices and economics would drive out the hackers.
- "Education about Native trees that are appropriate for the urban environment.
- Education of the community regarding proper caretaking of existing trees in urban environment.
- Should be an effort to identify more exceptional trees on state land and create a campaign for land owners."
- Ensuring that there is signage on existing Exceptional Trees.

Invasive species

- Invasive species, none of the above will work if we continue to allow invasive species to take over our forests

Native Plantings

- Resort, public and urban areas should be restored to native species landscaping

Policy & Planning

- Development of policy and planning strategies related to the urban forest and sustainability.
- Overbuilding: single family homes are being replaced with larger duplexes or multigenerational homes that take up entire lots without any greenspace (this is probably a zoning issue)
- Maui County includes 3 populated islands. We need more manpower on the county level to cover that ground and maintain our urban forests.

Sustainability

- Education, collaboration and networking are the themes we need to promote that will help ensure a sustainable mindset and provide for a strong environmental future.
- Develop an urban forest foundation that will maintain a quality of life through the inevitable changes the future will bring.
- Options for biofuel production in Hawaii.

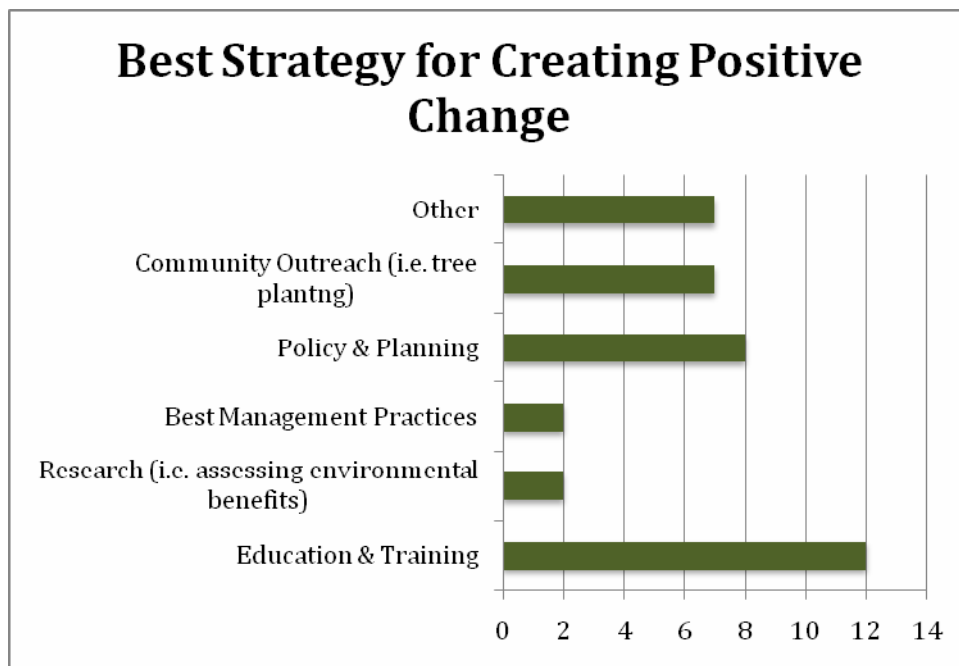
Urban Forest Management

- Development and implementation of an urban forest master plan
- Enforcement of BMPs for tree selection, care and maintenance Recognition of the need to remove trees as they age and become structurally weak and the importance of replacement of trees according to Right Tree/Right Place standards
- Pest and disease control

Internet Survey Results 12

- The watershed area has federal, state, and county working on. Coastal area management has the state and county working on. The cultural issues is low in importance because you cannot plant just native trees. There are too few of them appropriate for the urban forest. Planting them in watersheds is appropriate. Sustainability, what does this mean? Biofuels? The urban forest has county personnel working on but there needs to be larger planting spaces, better tree care, more parking lot shade, and better maintenance. County and State personnel often butcher trees. Tree contractors do not always do a good job either. They need "Standards for Tree Care". The urban forest needs the greatest attention right now.
- Efficient production of appropriate local nursery stock.
- Forestry methods for large scale growing of native and other useful non-invasive plants.

- **Q7. What method do you think offers the best strategy for creating positive change?**



Responses (Other)

- Community Outreach, encouraging political action.
- Education and Training should lead to all the others.
- All of these things are required components
- Community outreach with education/training
- All of the above
- Action plan on specific problems
- Development and strong enforcement of BMP standards and practices

United States Department of Agriculture



Natural Resources Conservation Service
P. O. Box 50004
Honolulu, Hawaii 96850
(808) 541-2600

Pacific Islands Area State Technical Committee Meeting

January 27, 2010

1:00 – 3:30 PM (Hawaii), 12:00 – 2:30 PM (American Samoa),

January 28, 2010

8:00 – 10:30 AM (Palau), 9:00 – 11:30 AM (Guam & CNMI), 10:00 AM – 12:30 PM (FSM)

AGENDA

1:00-1:15	Welcome and Introductions	Lawrence Yamamoto
1:15- 1:20	State Technical Committee Meeting Schedule	Dennis Kimberlin
1:20-1:30	FY 2010 Farm Bill Program Status Update	Dennis Kimberlin
1:30-2:00	PIA Update/Discussion on Assessment of Forest Conditions, Resource Strategies and Multi-State Regional Issues	Bart Lawrence/ Ron Cannarella
2:00-2:15	Procedures for Setting the Geographic Area Rate Caps (GARC) For WRP and GRP	Michael Whitt
2:15-2:30	PIA Program Fund Allocation and Process Review for FY 2010	Dennis Kimberlin
2:30-2:45	New PIA Invasive Species Policy	Tony Ingersoll
2:45-3:00	Land Eligibility and Ranking for WRP Applications	Mike Whitt
3:00-3:20	Program Outreach	Ben Schmidt/ Bart Lawrence
3:20-3:30	Discussion and Closing Remarks	Lawrence Yamamoto

<u>PEACESAT Video Conferencing Sites:</u>	<u>Contact Person</u>	<u>Phone#</u>
American Samoa – LBJ Hospital	Ray Tulafona	(684) 633-4049
CNMI – Marianas High School	Reynaldo Susalin	(670) 237-3039
Guam – University of Guam (UOG)	Bruce Best	(691) 735-2621/2620
Palau – Palau Department of Education or NEMO	Edwel Onrung	(680)488-2570
Pohnpei – College of Micronesia (COM)	Luciano Mathias	(691) 320-2480
Big Island – Kona – Kona Hospital	Jean Kadooka	(808) 322-4429
Big Island – Hilo – UH at Hilo	David Scott	(808) 974-7573
Kauai – Samuel Mahelona Memorial Hospital (SMMH)	Valerie	(808) 823-4112
Maui – Maui Community College (MCC)	Mike Albert	(808) 281-3171
Molokai – Molokai Mental Health Office	Tiffany	(808) 553-3691
Oahu – UH TIPG 2424 Maile Way, Saunders Bldg Rm 713	Kekoa Hayashi	(808) 956-6668

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Hawaii Forest Stewardship Advisory Committee

April 2009

Michael Tulang CHAIRPERSON Term End: 2010 <i>Big Island</i>	Soil & Water Conservation Districts
Betsy Gagne ex-officio <i>Oahu</i>	DLNR DOFAW NARS Commission
Bill Cowern Term End: 2010 <i>Kauai</i>	Forest products industry
Craig Rowland Term End: 2011 <i>Oahu</i>	U.S. Fish & Wildlife Service*
David Clausnitzer Term End: 2012 <i>Big Island</i>	USDA Natural Resource Conservation Service*
J.B. Friday Term End: 2011 <i>Big Island</i>	Cooperative Extension Service, Extension Forester
John Henshaw Term End: 2012 <i>Oahu</i>	Conservation organization
Katie Friday Term End: 2010 <i>Big Island</i>	USDA Forest Service*
Kip Dunbar Term End: 2012 <i>Molokai</i>	Private forest landowner
Laura Brezinsky Term End: 2011 <i>Big Island</i>	Private forest landowner / Hawaii Community College
Lea Hong Term End: 2010 <i>Oahu</i>	Land-trust organization
Margarita 'DayDay' Hopkins Term End: 2011 <i>Big Island</i>	County Government
Tanya Rubenstein Term End: 2012 <i>Big Island</i>	Watershed Partnerships

Highlighted members are new. Hawaii Forest Stewardship Program Manager, Sheri S. Mann, DLNR DOFAW 1151 Punchbowl St, Rm 325 Honolulu, HI 96813 Ph: 587- 4172 Fax: 587-0160 Cell: 721-6092 Sheri.S.Mann@hawaii.gov. * Federal members

Hawaii Conservation Alliance Partners

2010 Executive Committee

University of Hawaii at Manoa
Center for Conservation Research and Training

Ken Kaneshiro (Executive Chair), Rob Cowie

U.S. Department of Agriculture
Forest Service

Christian Giardina (2010 Chair), Susan Cordell

U.S. Department of Agriculture
Natural Resources Conservation Service

Greg Koob (2009 Chair), Larry Yamamoto

National Park Service

Frank Hayes, Melia Lane-Kamahele

Department of Land and Natural Resources
Division of Aquatic Resources

Petra MacGowan

Department of Land and Natural Resources
Division of Forestry and Wildlife

Paul Conry, Randall Kennedy

Kamehameha Schools

Ulalia Woodside, Namaka Whitehead

National Oceanic and Atmospheric Administration
National Marine Fisheries Service, Pacific Islands Regional Office

Michael Tosatto, Gerry Davis

National Oceanic and Atmospheric Administration

Office of National Marine Sanctuaries

Allen Tom, 'Aulani Wilhelm

The Nature Conservancy

Sam Gon III, John Henshaw

Office of Hawaiian Affairs

Kevin Chang, Carol Ho'omanawanui

U.S. Army Garrison Hawaii Natural Resource Program

Michelle Mansker

U.S. Fish and Wildlife Service
Ecological Services

Loyal Mehrhoff, Steve Miller

U.S. Fish and Wildlife Service
National Wildlife Refuge Complex

Barry Stieglitz

U.S. Geological Survey
Biological Resources Discipline

Gordon Tribble, Jim Jacobi

National Tropical Botanical Garden

Chipper Wichman

Hawaii Urban & Community Forestry Advisory Council

Names	6/3/10	
Sheri Mann Division of Forestry and Wildlife		
Jackie Ralya UCF Volunteer Coordinator		
Teresa Trueman-Madriaga UCF Coordinator		
Roxanne Adams University of Hawai'i		
Bail, Lisa Goodsill Anderson Quinn & Stifel		
Bornhorst, Heidi HawaiiScapes		
Eckert, Kevin Arbor Global LLC		
Friday, Katie Institute of Pacific Island Forestry		
Kraus, Michael Tree Works, Inc.		
Andy Kaufman University of Hawai'i		
Joel Kurokawa American Society of Landscape Architects – Hawai'i Chapter		
Nishek, Lelan Kauai Nursery & Landscaping		
Sakoda, David County of Maui		
Steiner, Mary The Outdoor Circle		
Macias, Sandy USDA Forest Service		
Paul Conry Administrator, DOFAW		

A		B		C		D	E	F
Hawaii Urban Forestry Summit Invite List								
1	2	3	4	5	6	7	8	9
Last Name	First Name	Company	RSVP Y/N	Verbal Y/N				
Adams	Roxanne	University of Hawai'i		1				
Aiu	Imai	Kauai Department of Planning						
Bail	Lisa	Kaulunani	1					
Bogle	Bob		1					facilitator
Bornhorst	Heidi	HawaiiScapes	1					
Benavente	Nerissa	DLNR - CNMI		1				
Cannarella	Ron	Division of Forestry & Wildlife		1				
Carroll	Colleen	NatureTalks	1					
Ching	Patrick	Directorate of Public Works, USAG, HI		1				
Ching	Tony	Dept of Planning & Permitting						
Conry	Paul	Division of Forestry & Wildlife		1				
DeSilva	Kaulani	Hawaiian Electric Company, Inc.	1					
Eckert	Kevin	Arbor Global LLC	1					chocolate
Elevitch	Craig	Agroforestry Net	1					
Foley	MaryLou	Waikiki Aquarium						
Friday	Katie	Institute of Pacific Island Forestry	1					
Gagne	Betsy	Dofaw		1				will help
Gon	Sam	The Nature Conservancy	1					
Gonzalez	Edgardo	Forest Service Bureau, DNER Puerto Rico	1					
Guerrero	Victor	DLNR - CNMI		1				
Hart	Jordan	Maui County Arborist Advisory Committee	1					
Hauff	Robert	Division of Forestry & Wildlife		1				
Henshaw	John	The Nature Conservancy						
Hulbert	Dudley	Aloha Arborist Association		1				
Jones	Michelle	Division of Forestry & Wildlife						
Kanahele	Pualani Kana'ole	The Kana'ole Foundation	0					
Kaufman	Andrew	University of Hawai'i, Tropical Plant and Soil Sciences	1					

	A	B	C	D	E	F
30	Kiang	Sue		1		facilitator
31	Koike	Terri	Division of Urban Forestry	1		
32	Kraus	Michael	Tree Works Inc.	1		
33	Kurokawa	Brad	Ki Concepts LLC	1		speaker
34	Kurokawa	Joel	Ki Concepts LLC	1		facilitator
35	Kuulei-Birnie	Kim		1		food allergies
36	Kwan	Carol	Aloha Arborist Association	1		
37	Lemmo	Samuel	Office of Conservation and Coastal Lands			
38	Lum	Richard		1		facilitator
39	Macias	Sandy	USDA Forest Service	0		
40	Mann	Sheri	Division of Forestry & Wildlife	1		day 2 only
41	Martin	Christy	CGAPS	1		
42	Mastroianni	Susi	Maui Association of Landscape Professionals	1		
43	Murata	Masatomo	Murata Landscape Architect	1		
44	Nakamoto	Dustin	Hawaiian Electric Company, Inc.			
45	Nishek	Lelan	Kauai Nursery & Landscaping	1		
46	Nutt	Terry	Maui County Arborist Advisory Committee	1		
47	Oka	Stan	Division of Urban Forestry	1		
48	Ralya	Jackie	Division of Forestry & Wildlife	1		
49	Ready	Boyd	Landscape Industry Council of Hawaii			
50	Rollman	Keith	C&C of Honolulu	1		speaker
51	Sakoda	David	County of Maui	1		
52	Singeo	Winifred	Honolulu Botanical Gardens			
53	Slay	Hudson	Department of Health			
54	Smith	Miranda	Koolau Watershed Partnership	1		speaker
55	Spooner	Deanna	Hawaii Conservation Alliance			
56	Steiner	Mary	The Outdoor Circle	1		
57	Trueman-Madriaga	Teresa	Division of Forestry & Wildlife	1		
58	Usagawa	Barry	Board of Water Supply		1	

	A	B	C	D	E	F
59	Wanger	Jolie	University of Hawai'i, School of Ocean & Earth Science and	1		Speaker
60	Whalen	John	Plan Pacific, Inc.	1		
61	Burney	David	National Tropical Botanical Garden			
62	Wung	Matthew E.K.	US Department of Agriculture			
63				34	10	
64		Total RSVPs				44

Board of Hawaii Department of Land and Natural Resources

The Board of Land and Natural Resources (BLNR), is composed of seven members, one from land district and two at large, and the Chairperson, the executive head of the Department. Members are nominated and, with the consent of the Senate, appointed by the Governor for a 4-year term. No more than three members of the board may be from the same political party. Any member having any interest, direct or indirect, in any matter before the board must disqualify him/herself from voting on or participating in the discussion of the matter. The BLNR convenes twice monthly to review and take action on department submittals, including land leases and Conservation District Use Applications (CDUAs). Testimony from the public on program actions, development plans, permit applications, and all other BLNR actions are accepted and heard at this time. For further information about the BLNR, please refer to the Hawai'i Revised Statutes, Chapter 171-4. Inquiries regarding board submittals can be directed to the Land Board Secretary at (808) 587-0404 or in writing to P.O. Box 621, Honolulu, Hawai'i 96809.

Laura H. Thielen

Chairperson

Robert Pacheco

Hawai'i Member (Term: 7/01/07 - 6/30/10)

Ron Agor

Kaua'i Member (Term: 7/01/08 - 6/30/12)

Jerry Edlao

Maui Member (Term: 7/01/09 - 6/30/13)

Dr. Samuel M. Gon III

Member-At-Large (Term: 7/01/09 - 6/30/13)

David Goode

Member at Large (Term: 5/01/09 - 6/30/10)

John Morgan

O`ahu Member (Term: 7/01/09 - 6/30/13)

Appendix B

Plans & Methodologies Incorporated and Referenced

Appendix B: Plans & Methodologies Incorporated and Referenced

- 1) Community Wildfire Protection Plans (CWPP's) See Appendix D
- 2) Comprehensive Wildlife Conservation Strategy (CWCS)
- 3) Forest Legacy Amended Assessment of Needs (AON) Hawaii
- 4) Statewide Comprehensive Outdoor Recreation Plan (SCORP)
- 5) Spatial Analysis Project (SAP)
- 6) Forest Stewardship Program National Standards and Guidelines
- 7) Hawaii Ocean Resources Management Plan (ORMP)
- 8) Kaulunani 2005--2009 Strategic Plan
- 9) Hawaii Tourism Authority Natural Resources Assessment Report
- 10) Gap Analysis of Hawaii: February 2006 Final Report
- 11) Hawaii Watershed Summit 2009 Summary Report and Methodology for Watershed Prioritization
- 12) Methodology Report for Development of Conditions of Native Biodiversity GIS Layer

1) Community Wildfire Protection Plans (CWPP's)

Six areas on three of the main Hawaiian Islands have Community Wildfire Protection Plans (CWPP's). All six areas are in the wildland urban interface and have experienced large wildfires that threatened communities and homes. Areas with CWPP's are Kahikinui and Waihee on the island of Maui; Kauai County (the entire island); Ocean View and Volcano on the island of Hawaii and the Northwest portion of Hawaii island encompassing 451,086 acres across 13 communities from North Kohala to North Kona. The plans were summarized by their author, Denise Laitinen, for the Wildfire Assessment and are included in full as APPENDIX D.

2) Comprehensive Wildlife Conservation Strategy (CWCS) Mitchell, C., Christine Ogura, DW. Meadows, A. Kane, L. Strommer, S. Fretz, D. Leonard and A. McClung (2005). Hawaii's Comprehensive Wildlife Conservation Strategy (CWCS). Honolulu, Department of Land and Natural Resources: 722 pp. <http://www.state.hi.us/dlnr/dofaw/cwcs/index.html>

Hawaii's Comprehensive Wildlife Comprehensive Strategy was used to build the foundation for the Conservation of Biodiversity Assessment and linked to Strategies. Lead author and wildlife specialist, Christine Ogura recommended key chapters for integration into the Assessment. As the CWCS plan is five years old, data on current populations, trends, threats, and habitats was updated and integrated by DOFAW staff and other Hawaii experts in conservation of biodiversity.

3) Forest Legacy Amended Assessment of Needs (AON) Hawaii. State of Hawaii Department of Land and Natural Resources Division of Forestry (2004). Forest Legacy Amended Assessment of Needs Hawaii. Honolulu: 98pp. Incorporated as per the checkbox on the "Checklist for Statewide Forest Resources Assessment and Strategies" the previously approved AON remains unchanged and is incorporated by reference.

The Hawaii Forest Legacy Program is a Federal program that provides states with acquisition funds that target forest lands as identified in the [Hawaii Forest Legacy Program Assessment of Needs \(AON\)](http://hawaii.gov/dlnr/dofaw/forestry/hflp) hawaii.gov/dlnr/dofaw/forestry/hflp and contribute to overall program goals:



1. Protect Hawaii's unique and fragile environmental resources
2. Encourage the protection of rare and/or endangered species
3. Promote the preservation of aesthetic beauty in Hawaii
4. Preserve watershed health and protect the sustainable yield of fresh water
5. Protect working forests as economic assets for the state and counties of Hawaii
6. Protect traditional and cultural forest practices and resources
7. Protect recreational forest practices

4) Statewide Comprehensive Outdoor Recreation Plan (SCORP) 2008 Update State of Hawaii, Department of Land and Natural Resources (2009). Hawaii State. Honolulu.

The Hawaii State Comprehensive Outdoor Recreation Plan (SCORP), updated in 2008, provided much of the baseline data used in the Recreation and Tourism Assessment. Quantifiable information relating to economics of recreation and tourism, numbers of visitors to parks and natural areas and trends, for example, contributed to the assessment data. In addition, the five key priorities developed in the SCORP were integrated into the Recreation and Tourism strategies.

5) Spatial Analysis Project (SAP) Conry, P. J., Sheri S. Mann, Ronald J. Cannarella, Yoshiko Akashi (2008). Hawaii Spatial Analysis Project. Honolulu, Hawaii Department of Land and Natural Resources, Division of Forestry and Wildlife: 46 pp.

<http://www.fs.fed.us/na/sap/products/hi.shtml>

SAP has provided the Department of Land and Natural Resources/Division of Forestry and Wildlife (DOFAW) a unique opportunity to collect and adapt disparate data sources into a cohesive data set for doing land suitability analysis. DOFAW is undertaking a review of their internal land management guidelines based on the methodology developed by SAP. We will commence the development of our State Assessment as required in the 2008 Farm Bill, again basing our methodology on SAP. DOFAW staff are being trained in the use of ArcGIS and the Spatial Analyst extension so that they can utilize the models created during our SAP.

6) Forest Stewardship Program National Standards and Guidelines USDA Forest Service, State and Private Forestry, Cooperative Forestry (2005). 10 pp.

www.fs.fed.us/spf/coop/library/fsp_standards&guidelines.pdf

The purpose of the Forest Stewardship Program is to encourage the long-term stewardship of nonindustrial private forest lands, by assisting the owners of such lands to more actively manage their forest and related resources. The Forest Stewardship Program provides assistance to owners of forest land and other lands where good stewardship, including agroforestry applications, will enhance and sustain the long term productivity of multiple forest resources. Special attention is given to landowners in important forest resource areas and those new to, or in the early stages of managing their land in a way that embodies multi-resource stewardship principles. The program provides landowners with the professional planning and technical assistance they need to keep their land in a productive and healthy condition. The planning assistance offered through the Forest Stewardship Program may also provide landowners with enhanced access to other USDA conservation programs and/or forest certification programs. The Hawaii Forest Stewardship Handbook is included at the end of this appendix in its entirety.

7) Hawaii Ocean Resources Management Plan (ORMP) Hawaii Office of Planning, Coastal Zone Management Program (2006). 77 pp.

The underpinnings and guiding perspectives of the Hawaii Ocean Resources Management Plan were integrated throughout the Assessment. In particular the concept of a landscape approach to conservation that connects land and sea; promoting collaboration and stewardship; and adopting a 21st century application of the traditional *ahupuaa* concepts. The Hawaii Ocean Resources Management Plan calls for a change in our approach to natural and cultural management stating that our current sector-based approach is not adequate to address the complex challenges we face now and will face in the future, despite the ongoing and substantive efforts of government agencies, nongovernmental organizations, private sector, communities, and individuals.

8) Kaulamuni 2005--2009 Strategic Plan Kaulamuni (2009) Hawaii's Urban and

Community Forestry Program :. T. Trueman-Madriaga, Jackie Ralya. Honolulu: 16 pp.

The Urban and Community Forestry (UCF) Strategic Plan was the starting point for the Assessment and Strategy. The UCF Council's participation was important in the development of the goals in the Strategic Plan and they also initiated the UCF portion of the Statewide Assessment and Strategy. While the former Strategic Plan focused on funding, communications, education and urban forestry management, the current Strategy addresses far more complicated and pressing issues. Tropical urban forests have a critical role to play in island communities and should be considered as part of the green infrastructure. The UCF 2010 Strategy is focused on assessing the urban forest canopy, developing a tropical urban and community forestry research plan, mapping the urban forest, developing urban forestry management plans, using new technologies to educate the community about the value of trees, and working with key partners on urban forestry demonstration tree planting projects.

E malama i ka ulula'au -Care for the forest

9) Hawaii Tourism Authority Natural Resources Assessment Report. State of Hawaii, Hawaii Tourism Authority, PBR Hawaii and Associates, (2003). Honolulu. 2010: 274pp.

The Hawaii Tourism Authority Natural Resources Assessment Report provided baseline documentation used in the Assessment of Recreation and Tourism. The report delivers statistics on use and conditions of natural areas, public and private and identifies 23 sites (of 110 analyzed) for in-depth restoration and renovation. Data from this study is also integrated into the strategies for Recreation and Tourism.

10) A Gap Analysis of Hawaii: February 2006 Final Report.

A Geographic Approach to Planning for Biological Diversity. D. S. M. Gon III. Honolulu, University of Hawaii/ Research Corporation of the University of Hawaii: 487. The U.S. Department of the Interior, U. S. G. S. (2006).

11) Hawaii Watershed Summit 2009 Summary Report and Methodology for Watershed Prioritization. Prepared by Marine and Coastal Solutions International, Kamuela, HI for the State of Hawaii, Office of Planning, Coastal Zone Management Program (2009) Honolulu (2010) 64 pp. The Watershed Summit brought together Cabinet level State Agency Directors and Federal Agency partners to review the Watershed Prioritization Process pursuant to National Oceanic and Atmospheric Administration.

12) Methodology Report for Development of Conditions of Native Biodiversity GIS Layer. This layer was produced by a team of ecologists and GIS analysts to assist in the development of Hawaii's Statewide Assessment of Forest Conditions and Resource Strategy, 2010. Honolulu, Hawaii, April 2010. 6 pp.

State of Hawaii

Forest Stewardship

Handbook

Department of Land and Natural Resources
Division of Forestry and Wildlife (DOFAW)
1151 Punchbowl Street, Room 325
Honolulu, Hawaii 96813
(808) 587-4172

<http://www.state.hi.us/dlnr/dofaw/hfsp/index.html>

February 2007



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6.....	Maintenance Requirements
6.....	Management Practices
7.....	Invasive Species Protocols
11.....	Project Proposal Form – Step One
14.....	Management Plan Format

Appendices:

- A. Criteria for Potential Natural Area Reserve
- B. Archeological/Cultural Surveys, Grading Permits/Soil Conservation Plans
- C. Environmental Assessments and Safe Harbor Agreements
- D. Conservation District Use Application
- E. Endangered Species
- F. Current Cost-Share Rates
- G. Rates Used for In-Kind Services for Matching Funds
- H. Forest Stewardship Management Plan Signature Page
- I. Useful Web Sites

State Contacts:

FOREST STEWARDSHIP PROGRAM COORDINATOR

DOFAW Cooperative Resource Management Forester – Sheri S. Mann

1151 Punchbowl St., Room 325

Honolulu, HI 96813

808-587-4172

sheri.s.mann@hawaii.gov

SERVICE FORESTERS

DOFAW Branch Offices:

Hawaii Island

19 E. Kawili St.

Hilo, HI 96720

808-974-4221

Maui County

54 South High St.

Wailuku, HI 96793

808-984-8100

Kauai

3060 Eiwa St.

Lihue, HI 96766

808-274-3433

Oahu

2135 Makiki Hts. Dr.

Honolulu, HI 96822

973-9778

State Tree Nursery

66-1220A Lalamilo Rd.

Kamuela, HI

808-887-6061

Forest Stewardship Website:

<http://www.state.hi.us/dlnr/dofaw/hfsp/index.html>

Division of Forestry & Wildlife Website:

www.dofaw.org

Program Overview

The Hawaii Forest Stewardship Program (FSP) provides technical advice and financial assistance on a cost-share basis to promote the stewardship, enhancement, conservation and restoration of Hawaii's forests. The FSP focuses on the following objectives: timber productivity, native ecosystem health and biodiversity, watershed quality, wildlife habitat and recreation.

The State program began in 1991 through the passage of Act 327 of the Hawaii Legislature. The Federal Forest Stewardship Program provides administrative support. The Forest Stewardship Advisory Committee advises the Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW), which administers the program. The Committee reviews proposals and management plans, recommending those deserving of funding to the State Forester and the Board of Land and Natural Resources for approval. Committee members represent federal and state agencies, professional foresters and resource consultants, conservation organizations, land trust organizations and private landowners. Assistance with the process can be requested from DOFAW staff.

After acceptance in the program and completion of a contract, completion of approved practices is reimbursed at 50% of the allowable cost. The program can also assist with the cost of developing a full management plan, which must cover a period of at least 10 years (the cost share portion of the plan). The term of the contract can vary from an additional 10 or 20 years following the completion of cost-shared management practices to ensure plantings and/or practices are maintained. Participants may only wish to just develop a management plan.

Applicant Eligibility

To be eligible for the FSP, applicants must:

- Own at least 5 contiguous acres of forested or formerly forested land

OR

- Have a lease for a minimum of 10 years on at least 5 contiguous acres of forested or formerly forested land

AND

- Intend to **actively manage at least 5 acres** to enhance forest resource values for *both* private and public benefit

Individuals, joint owners, private groups, associations, leaseholders, or corporations are eligible. Lands that qualify as potential natural area reserves are not eligible (see Appendix A).

Contract Length

FSP contracts generally require a maintenance period beyond the first ten (10) years of cost-share between the landowner and the State. However, the Program allows eligible applicants whose objectives do not include commercial timber production to enter into contracts with term length ranging from 10 to 30 years, including the cost-share period. For applicants interested in commercial timber production, contract term lengths must be at least 30 years and include a payback provision as described in the "*Payback Provision and Taxes*" section below.

Proposal Deadlines

The FSP Coordinator accepts proposals and developing management plans on a rolling basis, which are compiled and reviewed prior to evaluation by the FSP Advisory Committee on a quarterly basis. The Committee generally meets on **February 1st, May 1st, August 1st, and November 1st** of each year. These dates change from time to time so we recommend calling to confirm meeting dates and proposal deadline dates. It is highly recommended that the FSP Coordinator is contacted before submitting a proposal and that a draft is submitted before the due date. By resolving any issues in advance, you will increase your chance of success.

Program Procedures – For Proposals and Plan Development

1. **Submit a proposal** by the quarterly deadlines to the FSP Coordinator. Follow the format on page 11. Proposals are accepted, rejected, or revisions are requested. Once accepted, the cost-share amount for development of the management plan is negotiated.
2. **Develop and submit a management plan** covering at least 10 years of management practices according to the format on page 14. We recommend you seek the assistance of a resource management consultant, a forester, or someone with expertise in management plan development unless you are professionally qualified. Plans must include a letter from the State Historic Preservation Division verifying there are no archeological, burial or historic sites on the property (see Appendix B). Management plans may be approved or the Stewardship committee may request revisions or additional details. Reimbursement for the negotiated cost-share amount for the development of the management plan is made upon execution of the contract.
3. **IF NECESSARY - Other documents may be required: Environmental Assessments** (including a cultural impact assessment) are required if the management plan includes the establishment of timber with the intent of eventual harvesting or the construction of fences (see Appendix C). **Archeological surveys** may be required where there is strong evidence to suggest the existence of archeological or historic resources (see Appendix B). **Grading Permits or Soil Conservation Plans** may be required (Appendix B). If the project is within the conservation district, a **Conservation District Use Permit** may be required (Appendix D). If you plan to collect, propagate or plant **threatened and endangered species** contact the State Botanist at (808) 587-0165.
4. **Arrange a Site Visit** by a DOFAW Service Forester (page 2) to verify practices and cost-share estimates.
5. **Obtain approval from the Board of Land and Natural Resources.** DOFAW submits documents detailing FSP proposals and management plans to the board recommending approval. The Board may approve, deny or request that adjustments be made to management plans and contract agreements to reflect current priorities or budget concerns. If approved, the contract starts on the date of final approval. If you begin your project before all parties sign and prior to State authorized execution of the contract, you will not be reimbursed for expenses incurred before the contract date. You will receive a Forest Stewardship recognition sign to post on your project property.

6. Submit documents required to complete a contract with the State. For approved management plans, DOFAW staff prepares a contract, which you review, sign with a notary, and mail back for the State to sign and finalize. Prospective FSP grant recipients must also submit a W-9 Form (assigns a state procurement number). If your contract is more than \$25,000 total, you will also need Federal and State tax clearances, a General Excise Tax Number, and evaluation forms that we will provide you. All contracts must follow the State's general conditions, whereas special conditions are somewhat negotiable.

7. Sharing the cost (cost-share) of Forestry Practices. Approved practices can be found on page 6.

8. Submit semi-annual progress reports, invoices, and cost documentation to DOFAW in the formats provided when your contract is approved. A Service Forester will then visit the project site to verify practice completion and discuss progress or problems. After the site visit, DOFAW will mail a reimbursement payment for completed management practices. Information contained in reports may be shared with the public. See page 7 for information on revisions to plans.

Please note it takes at least 9-12 months from when a proposal is submitted to contract execution should the proposal be approved. Cost share funds will not be dispersed until the contract is fully executed and initial management practices have been completed and are ready for inspection.

General Management Objectives Eligible for Cost-share Assistance

- Forest Stewardship management plan development
- Growth and management of forests for non industrial timber and other forest products
- Native species restoration
- Agroforestry (the forestry component only)
- Windbreaks (to protect forestry project areas)
- Watershed, riparian, and/or wetland protection and improvement
- Forest recreation enhancement
- Native wildlife habitat enhancement
- Native forest conservation

Orchards, agriculture and landscaping are NOT eligible objectives

Cost-sharing and Allowable Rates

You will receive up to a 50% cost-share reimbursement for your management practice expenses, which generally must be within the allowable rates listed in Appendix F. You can include "in-kind" services (non-cash) such as labor costs, your own materials, and the use of your own equipment as part of your 50% cost-share or match (see Appendix G for details).

Allowable reimbursements are subject to a variety of factors including project scale, type, actual project costs, and the anticipated availability of program funding. The FSP Coordinator may allow exceptions to the listed cost-share rates if the requested amounts are justifiable. To date, projects requesting more than \$75,000 per year have not been approved.

Pay-back Provisions and Taxes

If landowners/lessees sell or transfer all or part of the stewardship managed property during the term of the approved contract agreement, they are required to pay back to the state all of the cost-share funds received in the past three years (or the portion of funding that corresponds to a pro-rated share of that portion of the managed property that is sold or transferred). *The landowner/lessee or contractor would not be required to reimburse the State for the cost-share assistance received if the new landowner contractually agrees to assume responsibility for the term remaining on the Forest Stewardship contract agreement.*

Cost-share reimbursement payments are considered as income and are thus normally subject to state and local taxes. However, depending upon your management activities, payments may be exempt from taxes. A guide to federal income tax regulations affecting private forests, and other resources are available on line at: <http://www.fs.fed.us/spf/coop/programs/loa/tax>. In addition, you may be eligible for real property tax reductions or incentives because of your commitment to long-term forest management. For more information, contact your county tax office.

If the proposed stewardship plan includes an objective for commercial timber production, you will be required to pay back to the State a percentage of the funding assistance that is received through the program with each future commercial timber harvests as set forth in the contract. This pay back is typically 5 to 10 percent of total grant funding received, but the amount is negotiable. A payback provision will be included as a special condition of the contract, stipulating that this provision will survive the term length of the contract.

Maintenance Requirements

Participants are required to maintain cost-shared improvements for at least ten years following installation. “Maintain” means the improvements will not be willfully removed or destroyed and routine maintenance will assure that under normal conditions the improvements will serve the purpose intended. Details are given under each relevant management practice description below.

Management Practices Eligible for Cost-share Assistance

1. Forest Stewardship Management Plan Development

All projects must have a plan before they can be approved for cost sharing. Please use the format detailed in this handbook. A professional forest resource consultant or a qualified applicant can write plans. FSP staff work with applicants to cover as much of the costs of the plan development as possible depending on current funding sources.

Revisions: Your plan may be reviewed and revised in the future if deemed necessary. Amendments are subject to approval by DOFAW, the Board of Land and Natural Resources, and the Attorney General’s office. Significant amendments may require that a new contract agreement be drawn up and approved. Keep in mind that this requires additional time and paper work, usually resulting in project delays. Any new non-native species added to your management plan or project site must be reviewed and approved.

2. Site Preparation

All planting projects will require reducing or removing vegetation so seedlings can survive. Heavy or light equipment or hand-labor may be cost-shared if you:

- Follow elevation contours when using heavy soil-moving equipment.
- Do not use equipment in Streamside Management Zones
- Follow Best Management Practices to minimize erosion. See the guide at http://www.state.hi.us/dlnr/dofaw/pubs/BMPs_bestmanagement.pdf

You may need to improve the soil condition for seedling growth or natural regeneration by using tilling and sub-soiling where soil is compacted or where there are hardpans. We highly recommend having the soil tested prior to augmentation. Scarification can be used to promote the regeneration of *Acacia koa* in some places where it once existed. Maximum allowable costs can vary depending on the density of existing vegetation, soil conditions, presence of a hardpan, and the steepness of the slope.

3. Fencing

If seedlings and young trees need protection from feral and/or domestic animals, such as pigs, sheep, deer, cattle, horses and humans, fences and other tree protection measures may be cost-shared. Fence cost-share limits depend on the type of fencing necessary for the site and follow the Natural Resource Conservation Service cost limits and specifications:

General Fence Types

Barbed wire, posts in soil	\$2.50/foot
Barbed wire, posts in rock	\$5.50/foot
Woven wire, posts in soil	\$4.00/foot
Woven wire, posts in rock	\$7.00/foot
Electric, posts in soil	\$2.00/foot
Electric, posts in rock	\$5.00/foot

Contact the FSP Coordinator concerning rates for game proof fences.

Other Tree Protection Practices: Feral pig, cat, rat and mongoose control can be cost-shared. Buffer zones surrounding restoration areas are also eligible for protection. Fences **MUST** be maintained for at least ten years following installation in a manner that preserves their intended function, such as protecting seedlings from feral or grazing animals.

4. Fertilization/Soil Amendments

Fertilizers and soil amendments may be organic or inorganic. Soil tests and professional recommendation rates for each species are required to cost-share fertilizers. The University of Hawaii's Agricultural Diagnostic Services Center does soil, water and tissue testing. See http://www2.ctahr.hawaii.edu/adsc/downloads/price_list.pdf for more information. Soil amendments to improve the structure and fertility of the soil immediately surrounding the seedling root zone can also be cost-shared, including hydrating polymers.

All amendments must be used in accordance with registered uses, directions on labels, and all other applicable federal, state and local policies. Consider possible induced deficiencies of nutrients due to excessive levels of other nutrients and the effect of soil pH on the availability of plant nutrients. Do not apply inorganic fertilizers near to streams or wetlands where polluted runoff might enter water. Fertilizer applications are generally eligible for cost-share assistance

for a period of up to four years subsequent to the seedling planting date. The highest cost-share limit is applicable only where soil depletion is extreme and is justified by soil tests and recommendations.

5. Seedling Acquisition

You must consider the current and former plant communities at your site when choosing species. Seedlings should be purchased from local growers who use genetically diverse seeds or stock from as close to your planting location and/or habitat as possible. DOFAW operates a nursery that produces a limited selection of species. Contact your local DOFAW Branch Office to place orders see page 2. It is advised to order plant stock well in advance (three to four months for most species) to get the quantity & species that you desire for your planting date. Use smaller container stock such as dibble tube, airblock, or root-trainer, as opposed to larger, potted stock to reduce site preparation and planting cost, however this may vary depending on the species you select. Seedlings should be of good condition, adequate size and "hardened off" before planting. Seedlings that have been in containers for too long may not be healthy. A detailed species list is required in the management plan. Fruit trees are not eligible.

Projects that include invasive species will not be funded unless there is an overriding environmental justification for their use. The following procedures will be used to judge whether a non-native species is considered invasive and is approved or disapproved:

1. No species on the state 'Noxious Weed List' will be funded. See page 11 of the state rules: <http://www.hawaiiag.org/hdoa/adminrules/AR-68.pdf>
2. Non-native species proposed for planting must be listed in new FSP management plans or submitted as revisions of previously approved management plans. If the landowner is aware that the species may be considered invasive the plan should include a justification of the use of the species. New management plans and associated species lists are always reviewed by the FSP Committee.
3. You can search for the invasiveness status of particular species at the Weed Risk Assessment website: http://www.botany.hawaii.edu/faculty/daehler/WRA/full_table.asp
4. DOFAW FSP staff will gather information and recommendations about non-native species from DOFAW Branch staff and the Weed Risk Assessment scores; if there is no clear consensus, further information will be sought from invasive species experts.
5. For new non-native species added to revised management plans: If the information in step #4 clearly indicates that the species is not invasive, it will be approved by FSP staff without waiting for a FSP Committee meeting. If the information in step #3 indicates that the species may be invasive, the species may not be approved until reviewed by the FSP Committee.
6. If the FSP Committee disagrees about whether to consider the species, the final decision will be made by the DOFAW Invasive Species Coordinator.

These guidelines follow Federal Executive Order #13112, quoted below. In applying the Executive Order to the Hawaii FSP, (a) successful justifications for the use of invasive species will emphasize environmental benefits rather than economic benefits, and (b) new introductions of potentially invasive species carry a high risk of harm and will not be funded. Generally speaking, if there is a lack of information or clear understanding about how the species has or will affect Hawaiian ecosystems, the species in question will not be funded.

Federal Executive Order #13112 directs that [Federal] agencies "not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United

States or elsewhere unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions.”

6. Planting

Seedlings are usually planted at the beginning of the wet season. Clear all weeds and competing vegetation from around newly planted seedlings at the time of planting to an area of at least 3 feet in diameter. Where dibble stock is used, soil is of good structure, and there is adequate rainfall, the planting holes only need to be big enough to accommodate the small dibble. Where larger planting stock is used, holes must be large enough to accommodate freely hanging roots, or root balls. Roots should never be bent or crowded. Where long droughts may threaten seedling survival, larger holes can serve as water storage reservoirs, greatly increasing seedling survival rates. Holes dug through sod or untilled ground should be at least 16 inches square. Do not place the plant so deep into the hole that the stem is buried. Mix soil amendments or additives with soil before planting holes are filled to improve growing environment and soil water holding capacity. Avoid glazing sides of planting holes with digging tools, especially augers, in wet clay. Plantings for native forest restoration and tree plantations should be maintained to assure the survival of a majority of the trees planted.

7. Irrigation

Use mulch where feasible to help maintain soil moisture (see next section). Irrigation systems should be used only in areas where rainfall is not dependable, to enhance seedling survival and growth during early development. Irrigation should not be used to maintain trees as they become mature. Where feasible please use drip irrigation. Please see a free publication at <http://www.ctahr.hawaii.edu/oc/freepubs/pdf/L-2.pdf> for assistance in designing irrigation systems. Cost-share assistance is available for system installation only. System maintenance and repairs are the responsibility of the applicant. Irrigation is only eligible for cost-share assistance for a period of up to four years following the seedling planting date. Allowable cost-share rates are for drip irrigation only. For catchment systems and ponds please provide three quotes or contact the FSP Coordinator for allowable cost-share rates. Irrigation systems should be maintained until the plants can survive on their own through a normal dry season.

8. Weed Control and Mulching

Use organic mulch at least 2” thick where feasible to help control weeds after planting. Keep mulch away from plant stems where it can cause rot. Mulch consists of plant residues or other suitable manufactured materials. Use higher planting densities and/or ground covers to shade out weeds. Eliminate or control weeds with herbicides, mechanically or by hand. Use control measures designed specifically for the particular weed species. Minimize adverse environmental impacts when applying herbicides. (Don’t spray when it’s windy, use the lowest rate of the least toxic alternative possible.) Apply chemicals in accordance with registered uses, directions on labels, and all other applicable federal, state and local policies. Establishment and maintenance of non-invasive ground covers and native understory plants can be cost-shared where there is a tree component in the plan. Buffer zones surrounding planting areas are also eligible for weed control cost-sharing to help stop the spread of weeds before they get to the planted area. Weed control should continue into the 10-year maintenance period to assure tree survival and normal growth. In restoration areas, weeded areas should not be planted with non-natives when at all possible.

9. Special Areas Practices: Stream Bank Revegetation, Fire Prevention, etc.

Highly erodible, very steep and/or inaccessible sites may require more intensive methods to establish permanent vegetation, including trees, shrubs, ground covers, and grasses. This includes stream bank areas. Sites that are prone to fire danger or are in need of fire prevention or mitigation measures may be allowable for cost-shared rates. In addition to the practices listed above, the following can be employed in these areas:

- Erosion control matting and/or other erosion control materials such as coir logs or rocks.
- Labor-intensive methods of hand-clearing undesirable vegetation
- Terracing, water diversions, or other grading. *Additional permits will be required.*
- More expensive plants in larger containers
- Other materials as necessary

The applicant must obtain 3 written quotes for the proposed work and/or consult with the FSP Coordinator to determine the allowable cost-share. Due to limited funds, this option may not always be available. Management plans should cover maintenance for 10 years.

10. Trail Construction

Cost-sharing is available for trails in forest areas to enhance their recreational value, and to provide for public access, educational opportunities, and fire protection. Do not eliminate key trees that have scenic value, provide shade, reduce erosion and runoff, provide unique habitat for wildlife, or that add to the aesthetic value of the area. Develop trail grades suited for the intended purposes, consider the topography, and avoid exceeding 10 percent slopes. Wherever possible, trail width should remain between 2 and 4 feet. Cut and fill slopes must be stable. Plans must include provisions for erosion control. Revegetate as soon as practical following trail construction. Design bridges with professional assistance (see Recreation at <http://www.dofaw.net/> for guidance). Try to place directional and warning signs, handrails, bridges and culverts as dictated by the site and intended use. Include provisions for maintaining all wearing surfaces, signs and drainage structures for ten years following installation.

11. Non-Commercial Thinning

Where stands of trees are overstocked or over topped by less desirable trees, thinning can increase the growth, health and the future value of desired trees. Consider which species will be favored after thinning and if weeds will take over with more sunlight available? Chose cull (non desirable) trees with the assistance of a professional forester if possible. Plan for slash (biomass waste) disposal after thinning. Determine the best season and method for thinning.

Project Proposal Form – Step One

In order to receive cost-share assistance for the project, you must send us a project proposal. If the Forest Stewardship Committee approves this proposal, you will be invited to develop a full management plan. Once this plan is approved and a long-term contract is developed and executed, you will be eligible to receive cost-share assistance for the cost of developing the management plan. The proposal should be submitted via e-mail to the Forest FSP Coordinator via e-mail or CD to DOFAW/Forest Stewardship Program 1151 Punchbowl St., Room 325, Honolulu, HI 96813.

Applicant and Property Information (add on separate paper if necessary)

Name:

Address:

Email:

Phone:

Fax:

Tax Map Key number and property acreage:

Landowner name:

Lessee name:

State and County Zone designation:

Acres of proposed stewardship management area:

Description of the project property or the land area to be managed

Driving directions from the nearest highway:

Existing vegetation (a paragraph, emphasizing native and/or invasive species present):

Existing wildlife: (a paragraph, emphasizing native and/or invasive species present):

Land Use for the entire property (Place an “X” under all that apply):

	Pasture	Crop land	Sugar cane	Range land	Forest grazed	Forest non-grazed	Other
Historic							
Current							
Proposed							

Maps

- 1) Please attach a topographic map showing the area. See topozone.com and/or other appropriate maps (soils, roads, etc).
- 2) If possible, provide a rough sketch of your project area and where the practices will be applied.

Forest management objectives - Please check all objectives that apply to the project:

- Growth and management of forests for timber and other forest products
- Native species restoration and habitat improvement
- Agroforestry (forestry component)
- Windbreaks (to protect forestry project areas)
- Watershed, Riparian, and/or Wetland Protection and Improvement
- Forest Recreation Enhancement

Proposed practices and species selection

Please check all practices that apply to your project:

- Management Plan (required)
- Site Preparation
- Fencing
- Other Tree Protection
- Fertilization/Soil Amendments
- Seedling Acquisition
- Planting
- Weed Control/Mulching
- Irrigation
- Intensive Revegetation and Special Areas
- Trail Construction
- Non-commercial thinning

Attach a draft list of species you propose to plant. Please see page 8 concerning invasive species.

Provide the name of the vendor or location you intend to use for seed or planting stock.

Public benefit - Please check all public benefits that apply to the project:

- Economic diversification/employment (commercial timber production of a significant scale)
- Native ecosystem and biodiversity restoration
- Watershed improvement/protection
- Native wildlife habitat enhancement
- Other ecosystem services
- Provision of educational, recreational or ecotourism opportunities

Organizations that will be involved in the project

Briefly list and describe partnerships with other resource management agencies and organizations. If you will use grants or cost-sharing from other programs to provide your part of the 50% match, please state what funds you expect they will provide.

Estimated costs

This table can help you get a rough idea of how much your project will cost.

Example: If you prepare 10 acres for planting (site prep) at a cost of \$800/acre (done only once per acre) then the actual total cost will be \$8,000. FSP will pay \$400/acre (50% of the actual cost, within the cost-share limits) or a total of \$4,000. You will be responsible for \$400/acre of labor and/or equipment, which can be in-kind (not cash, your own labor and equipment) or actual cash you pay someone from your own money or other funding sources.

Practice Component	Acres	Cost/Acre (Or plan)	Frequency or # of acres	Actual Total Cost	Estimated Landowner Cost – Share Approx 50%	Estimated FSP Cost-Share Approx 50%
Management Plan	1 plan				Negotiable	
Site Preparation						
Weed Control and Mulching						
Seedling Acquisition						
Planting						
Fencing						
Other Tree Protection						
Irrigation						
Intensive Reveg/Special Areas					Negotiable	
Trail Construction						
Non-commercial thinning						
TOTALS						

Other Information

You may add any photos or other details to this application you think will help us understand the project.

[End of Proposal Form]

***Either you will be invited to complete a full management plan,
asked to provide more information for a secondary review, or not invited
to complete a full management plan.***

Forest Stewardship Management Plan Format

After the proposal is accepted, you will develop a detailed and comprehensive Forest Stewardship Management Plan which requires the services of a professional forester or resource management consultant unless you are professionally qualified to write your own. Some of the consultants working in Hawaii are listed on the Hawaii Forest Industry Association website: <http://www.hawaii-forest.org/index.html>. The management plan must meet standards set by the national and state guidelines and follow the plan format below.

Plan preparation costs generally range from \$1,500 to \$5,000 depending on the complexity of the plan. The cost-share amount provided by the FSP is negotiated with the coordinator after the proposal is accepted. The cost-share is payable upon receipt of the final management plan, the contract is executed, and a receipt from the consultant's invoice has been received. **All cost-share funds are paid on a reimbursement basis.**

I. Cover Sheet

- Applicant and property information (same as proposal)
 - Name
 - Address
 - Email
 - Phone
 - Fax
 - TMK number:
 - State and County Zoning
 - Total property acreage
 - Acres of proposed stewardship management area
- Consultant's name, title, address, email, fax and phone number
- Date the plan was completed

II. Signature Page (*Appendix H*) with signatures of the applicant, consultant, & State Forester.

III. Introduction

- Description of the property and specific management objectives from the proposal
- A detailed map or diagram showing which practices and/or species will be in different project areas
- A brief history of land uses and a description of present conditions

IV. Land and Resource Description

- Existing vegetation/cover types
- Existing forest health and function including disease problems and fire threat
- Soils and their condition, general slope and aspect
- Water resources and their condition
- Timber resources
- Wetland resources
- Significant historic and cultural resources. State whether an archeological survey has been done. If so, provide a summary.
- Existing wildlife – please provide a list
- Threatened and endangered species existing on property
- Existing recreational and aesthetic values

V. Management Objectives and Practices

Describe the specific management objectives of the project. The following are eligible for cost sharing:

- Growth and management of forests for timber and other forest products
- Native species restoration and habitat improvement
- Agroforestry (forestry component)
- Windbreaks (to protect forestry project areas)
- Watershed, Riparian, and/or Wetland Protection and Improvement
- Forest Recreation Enhancement

Describe specifically how you intend to implement and maintain (for at least 10 years after installation) the following practices in order to achieve your desired forest resource management objectives. A detailed list of all species you will plant must be included. Please review the discussion of invasive species under “Seedling acquisition”. Any changes to this list at any time after the contract is executed must be approved by the FSP Coordinator. Please see pages 8 & 9 of this handbook for details.

- Site preparation
- Weed control and mulching
- Seedling acquisition
- Planting
- Fencing
- Other tree protection
- Irrigation
- Fertilization and soil amendments
- Intensive revegetation and special areas
- Trail Construction
- Non-Commercial thinning

VI. Practice Implementation Schedule

Clearly list, in a table, all specific practices, by year, total acreage, projected cost per acre, total cost, state cost-share and your cost-share according to the above. Cover a period of at least 10 years even if there is no cost-share in some of those years. Cost projections can vary widely depending on your site and should be based on relevant, real data and not simply estimated using the allowable cost-share rates provided. It may be that your share of project expense projections will exceed the state’s share in cases where real cost estimates turn out to be higher than 50% of the allowable cost-share rate for a particular management practice.

SAMPLE Implementation Schedule Year 1 (use the same format for each consecutive year)

Practice Component	Units	Cost/Unit	Total Cost	Applicant Share	FSP Share
Management Plan	1 plan	\$4,000	\$4,000	\$1,000	\$3,000
Site Preparation	4 acres	\$1,000	\$4,000	\$2,000	\$2,000
Weed Control and Mulching	4 acres	\$400 max. allowed=\$300	\$1,600	\$1,000	\$600
Seedling Acquisition	1000	\$4.00	\$4,000	\$2,000	\$2,000
Planting	4 acres	\$300	\$1,200	\$600	\$600
TOTALS			\$14,800	\$6,600	\$8,200

VII. Budget Summary

The budget lists your projected cost-share, state share and total project costs per year for the length of the project. Cost-share amounts requested for each management practice to be applied should not exceed the cost-share rates listed in Appendix A unless you have your justification approved by the FSP Coordinator. If you are receiving other private or public funding, please create columns for each source. Please use this format:

SAMPLE BUDGET SUMMARY

YEAR	Total Budget	Landowner Share	State Share	Other funding source
2007	\$38,717	\$22,177	\$16,540	
2008	\$24,882	\$12,462	\$12,420	
2009	\$25,844	\$13,274	\$12,570	
2010	\$19,660	\$15,260	\$4,400	
2011	\$23,060	\$17,910	\$5,150	
2012	\$23,060	\$17,910	\$5,150	
2013	\$23,060	\$17,910	\$5,150	
2014	\$14,750	\$11,275	\$3,475	
2015	\$14,750	\$11,275	\$3,475	
2016	\$5,250	\$3,740	\$1,510	
TOTALS	\$213,033	\$143,193	\$69,840	\$0

Year one (1) begins upon contract execution, therefore the years listed in this table need to reflect delays in contract development and may eventually be changed.

Economic Analysis for Commercial Timber Projects

If the management objectives include commercial timber production, the plan must include some basic economic analysis such as a net present value or internal rate of return calculation. You should roughly estimate projected cost and income flows, and consider their sensitivity to changes in economic factors such as price and risks. While it may be impossible to accurately predict financial returns over time or provide precise data on silvicultural systems, it is recommended that you consider possible outcomes in consultation with a qualified resource economist or extension forester. A good resource is “Financial Analysis for Tree Farming in Hawaii” is available at <http://www2.ctahr.hawaii.edu/oc/freepubs/pdf/RM-9.pdf>. A downloadable model spreadsheet is available on line at http://www2.ctahr.hawaii.edu/oc/freepubs/spreads/RM-9_forest_econ_calc.xls.

VIII. Required Maps

All maps must be of at least a 1:24000 scale and include the following:

- Legend and North arrow
- Property boundary
- Existing and proposed roads
- Watercourses

- **Location Map:** Illustrates where the project property/site is on the island and in relation

to towns, major topographic features etc. (same as Pre-proposal)

- **Topographic Map** with property and project boundaries clearly marked. (same as Pre-proposal)
- **Project/Site Map:** Gives the location, orientation and layout of all management practices and other activities on the project property to clearly illustrate what is being done where, in relation to the topography, watercourses and other significant natural and cultural features of the site. The map must also illustrate the layout and orientation of any proposed tree plantings such as windbreaks, forestry plantings, and restoration areas.
- **Photographs of Project Site** clearly showing existing site conditions and vegetation for each proposed project area. Aerial photographs are not required but can be included.

IX. Monitoring activities- Please describe any monitoring to do done and who will do it.

X. Other Attachments if Available (not required)

- Existing forest stand inventories
- Maps: USGS, vegetation, roads/trails/soils, topography, archeological sites
- Sources of assistance and information, bibliography

Any required permits and environmental assessments must be approved and included when the plan is submitted to the Board of Land and Natural Resources for approval.

Best Management Practices (BMP's)

All Forest Stewardship Program participants must adhere to current DOFAW *Best Management Practices* that are relevant to the project:

http://www.state.hi.us/dlnr/dofaw/pubs/BMPs_bestmanagement.pdf.

Distribution/use of approved Forest Stewardship Management Plans and Use of Information:

The following information will be available as required by the Freedom of Information Act: name, address, project location, and funding provided. One of the objectives of the FSP is to generate useful information for landowners throughout Hawaii, who may also be considering forest management as a land use alternative. During the course of the project, you will be asked to share your experiences and knowledge, to contribute to the development of data and information sources for others. Once you are enrolled in the FSP your approved management plan will be made available for copy and distribution to the general public upon request. You are thus advised to delete any information that you consider to be proprietary, prior to submitting the management plan to the Forest Stewardship Advisory Committee. You can present relevant proprietary information to the Committee separate from the management plan. As required by the Freedom of Information Act, your name, project location, and funding is available, but will not be actively publicized. Although approved Forest Stewardship Management Plans are available for distribution to the general public, they should be used by potential applicants for informational purposes only. Any management plans that appear to plagiarize previously approved plans will not be accepted.

Criteria for Potential Natural Area Reserves

If you are wondering if your site can be considered a “potential natural area preserve” please review these criteria. Contact the FSP Coordinator for more information concerning other programs that may apply. The following criteria are adopted as important guides for the Natural Area Reserves Commission in selecting areas for the Natural Area Reserves System. *However, the Commission shall exercise its prerogative of judgment with regard to these criteria and other criteria in selecting and recommending areas to be included in the Natural Area Reserves System.*

Representativeness: Each selected Natural Area shall be representative of one or more major, natural, relatively unmodified ecosystems, geologic or physiographic features, or habitats containing endangered species of fauna or flora. The description of a proposed area shall include details of the features that make the area distinctive, unique, significant, or representative. The term representative as applied to ecosystems shall be interpreted in relation to macroclimatic zonation to ensure a balanced geographic distribution of natural areas as representative ecosystems.

Scientific Value: Each Natural Area shall have significant potential for scientific study, for teaching, for preservation of distinctive biota or other natural features, or for preserving natural genetic material. The description of a proposed area shall include details of the scientific attributes of the area.

Administrative: Each Natural Area shall be identifiable on maps and on the ground. It should be reasonably protectable from pests and from physical damage and, legally, from encroachment. Access to the area should be in conformance with the nature and purpose of the area. Utilities, communication facilities, and other right of way developments should be avoided as much as possible. Administrative or management factors should be detailed in the description of each proposed area.

Size of Areas: Each Natural Area shall be large enough, but no larger than necessary, to accomplish the particular purpose of establishing that Natural Area. A desired size is that which will provide essentially unmodified conditions in the interior portion. The cost and feasibility of protecting the area will have a bearing on the size. Some areas may be less than an acre while others may exceed 10,000 acres, where a special need is demonstrated.

Number of Areas: As many as possible of the major terrestrial and aquatic plant and animal communities and distinctive geologic features on each island should be represented in the Natural Area Reserves System. However, the Natural Area Reserves System shall not include unnecessary duplications of ecosystems or geologic features already protected in Federal Wildlife Refuges, National Parks, or private conservation groups.

Ownership: Natural Areas shall be composed of lands owned or legally controlled by the State in perpetuity. Privately owned areas desired for the Natural Area Reserves System may be obtained by gift, devise, purchase, or eminent domain as specified in the Act. Federal lands shall not be designated as Natural Areas under Act 139.

Appendix B.

Archeological and Historic Sites

As part of creating a management plan, please submit a letter asking that the State Historic Preservation Division verify that for the TMK of the proposed project area there are no archeological, burial or historic sites present. Send to:

Administrator
State Historical Preservation Division (SHPD)
601 Kamokila Blvd. #555
Kapolei, HI 96707

If you believe there may be such sites present on the project property then you must also submit a letter to the same address telling them of your plans and notating the possible sites. SHPD will review your plans to determine whether an archeological inventory survey must be done. If so, permitted archeologists in the state are listed on the SHPD website:

<http://www.hawaii.gov/dlnr/hpd/archcon.htm>

For more information see: <http://www.hawaii.gov/dlnr/hpd/hpgreeting.htm>.

Grading Permits and Soil Conservation Plans

Grading, stockpiling, grubbing, and trenching may require permits for soil disturbing work. A Special Management Area permit is required if the planned work is in the Special Management Area, this is mostly work near the coastal areas and is tied to Coastal Zone Management program requirements. **Each county is responsible for issuing this permit.** In some cases, an approved soil conservation plan may be acceptable. Contact NRCS or your local Soil and Water Conservation District for more information or see <http://www.hi.nrcs.usda.gov/>.

For more information on County Grading regulations and permits see:

O'ahu http://www.co.honolulu.hi.us/refs/roh/14a10_19.htm
Section 14-14 for ordinances
http://www.honoluludpp.org/download/permits/permitlistings.asp?p_TypeID=4
for applications and information

Hawai'i http://www.hawaii-county.com/directory/dir_pubworks.htm
East Hi: (808) 961-8321 or **West Hi:** (808) 327-3520

Maui <http://ordlink.com/codes/maui/index.htm>
or call 270-7242.

Kauai <http://www.kauai.gov/Default.aspx?tabid=133>
(look under Forms, Applications, and Instructions)

Environmental Assessments (EA)

Plans that include the establishment of timber with the intent of eventual harvesting must be accompanied by an Environmental Assessment (EA), including a cultural impact assessment. The FSP Coordinator can provide you with samples of stewardship plans that have been prepared to meet the EA requirements. Contacting the local community and the cultural assessment should be included within the scope of work and fees paid for the forestry professional who agrees to write the management plan. Please note that all Stewardship Plan EAs that have been submitted to date have had a Finding of No Significant Impact and therefore were not required to submit a full Environmental Impact Statement.

If you are planning to use stewardship funds to establish timber that may be harvested then you should familiarize yourself with the information in a helpful guidebook from the Office of Environmental Quality Control, available on the web at:
<http://www.state.hi.us/health/oeqc/publications/guidebook.pdf>

From the guidebook:

“An EA is an informational document prepared by the proposing agency or the private applicant and used to evaluate the possible environmental effects of a proposed action. The environmental assessment must give a detailed description of the proposed action or project and evaluate direct, indirect and cumulative impacts. The document must consider alternatives to the proposed project and describe any measures proposed to minimize potential impacts. The public has 30 days to review and comment on a draft environmental assessment. After the draft environmental assessment has been finalized and public comments responded to, the agency proposing or approving the action reviews the final assessment and determines if any “significant” environmental impacts are anticipated.

If the agency determines that the project will not have a significant environmental impact, it issues a finding of no significant impact (FONSI). This determination allows the project to proceed without further study. Within 30 days of the notice of this finding, the public may challenge an agency’s determination by filing suit in circuit court. If the agency determines that the action may have a significant impact, a more detailed environmental impact statement (EIS) be prepared. An EIS preparation notice is then issued and undergoes an additional 30-day comment period to define the scope of the draft EIS. Publication of an EIS preparation notice initiates a 60 day period during which an aggrieved party may challenge the determination in court.”

Safe Harbor Agreements

Environmental Defense and the U.S. Fish and Wildlife Service encourage private landowners to restore and maintain habitat for endangered species without fear of incurring additional regulatory restrictions through initiation of Safe Harbor Agreements. More can be found at <http://www.environmentaldefense.org/article.cfm?ContentID=136> or by contacting Bill Standley at DLNR/DOFAW 1151 Punchbowl St., Rm. 325 Honolulu, HI 96813 Telephone (808) 587-4171 Fax (808) 587-0160 Email: William.G.Standley@hawaii.gov

Conservation District Use Permit

State Land Use Law established the State Land Use Commission (LUC) in 1961, and granted the LUC the power to zone all lands in the State into three districts: Agriculture, Conservation, and Urban (the Rural District was added in 1963). DLNR was given jurisdiction over the Conservation District, formulated subzones and regulates land uses and activities therein.

The Conservation District has five subzones: Protective, Limited, Resource, General and Special. Omitting the Special subzone, the four subzones are arranged in a hierarchy of environmental sensitivity, ranging from the most environmentally sensitive (Protective) to the least sensitive (General); the Special subzone is applied in special cases specifically to allow a unique land use on a specific site. Subzone maps for each island are available on the web:
<http://www.hawaii.gov/dlnr/occl/>.

These subzones define a set of "identified land uses" which may be allowed by discretionary permit. The Office of Conservation and Coastal Lands (OCCL) can only accept a permit application for an identified land use listed under the particular subzone covering the subject property. Most of the identified land uses require a discretionary permit or some sort of approval from the DLNR or BLNR. Major permits are required for land uses, which have the greatest potential impact, and an environmental assessment and/or an EIS is required (and may also require a Public Hearing); minor permits are required for land uses which may have fewer impacts, decision making is delegated to the Board Chairperson (and may not require a Public Hearing) or to the OCCL for other minor uses.

Conservation District Use Application forms and contact information is available on the web at:
<http://www.hawaii.gov/dlnr/occl/documents.php>.

Appendix E.

Threatened and Endangered Species

If you plan to process, collect, propagate, out-plant or sell threatened or endangered species as part of your Forest Stewardship project please contact Hawaii State Botanist for instructions and permits at 587-0165.

Allowable Cost-Share Rates

When you create your project budget, the following are the total low to high amounts that the State will reimburse for each practice. If you think your costs will be higher than the allowed rates you will need to justify these rates to the FSP Coordinator. This may require documentation such as quotations from existing companies that provide the services or materials. Rates range from Low to High and will depend on the circumstances of each project. In your management plan you will need to justify the use of the high rates or rates for practices that have no rates established. Based on Committee and State approval, your contract will set the rates for your particular project.

Practice	Unit	State Share Low	State Share High
Management Plan	per plan	\$1,500	\$5,200
Site Preparation	per acre	\$400	\$1,000
Fencing (types listed under practices)	per foot	\$2.50	\$7.00
Other Tree Protection	per acre	*	*
Fertilization/Soil Amendments	per acre/year	\$100	\$350
Seedling Acquisition	per seedling	\$0.50	\$5.00
Planting	per acre	\$150	\$500
Irrigation (low=drip, high=other)	per foot	\$0.50	*
Weed Control and Mulching	per acre	\$100	\$300
Ground Cover Establishment	per acre	\$800	\$1,400
Maintenance of ground covers	per acre	\$100	\$300
Trail Construction	per foot	\$2	\$4
Non-Commercial Thinning	per acre	\$100	\$300
Intensive Revegetation & Special Areas		*	*

*The applicant must obtain at least 3 written quotes for the proposed work and/or consult with the FSP Coordinator to determine the allowable cost-share.

Allowable In-Kind Rates

In-Kind means non-cash contributions to the project. When calculating your 50% required contribution to the project, you should use these rates to determine labor and equipment cost estimates. If you want to use higher rates, please provide justification (quotes) in your plan and/or contact the FSP Coordinator.

Hourly Rates for In-kind Contributions		
<i>Labor costs include fringe</i>		Current
General Hand Labor	per hour	\$21
Specialized Hand Labor	per hour	\$27
Line Posts	each	\$18
Corner Posts	each	\$20
Equipment with Operator		
1/2 and 3/4 ton truck	per hour	\$35
1 ton truck	per hour	\$40
1 1/2 ton truck	per hour	\$45
2 ton truck	per hour	\$50
2 1/2 ton truck	per hour	\$55
5 ton truck	per hour	\$65
20 ton tandem dump truck	per hour	\$85
12 ton tandem dump truck	per hour	\$75
2 and 4 wheel drive tractor	per hour	\$60
2 wheel drive tractor >40 hp	per hour	\$70
D-2 or TD6 w/ attachments	per hour	\$75
D-4 or TD9 w/ attachments	per hour	\$105
D-6 or TD14 w/ attachments	per hour	\$120
D-7 or TD18 w/ attachments	per hour	\$150
D-8 or TD20 with attachments	per hour	\$180
D-9 or TD25 w/ attachments	per hour	\$225
Back-hoe	per hour	\$85
Loader	per hour	\$100
Compressor	per hour	\$25
Power saw	per hour	\$25
Power post hole digger	per hour	\$35
Power sprayer	per hour	\$30
Bobcat	per hour	\$65
Manlift	per hour	\$35
Mulcher	per hour	\$25

Forest Stewardship Plan Signature Page

Professional Resource Consultant Certification: I have prepared (revised) this Forest Stewardship Plan. Resource Professionals have been consulted and/or provided input as appropriate during the preparation of this plan.

Prepared by:

Professional Resource Consultant's Signature/ Date

Professional Resource Consultant's Name

Applicant Certification: I have reviewed this Forest Stewardship Plan and hereby certify that I concur with the recommendations contained within. I agree that resource management activities implemented on the lands described shall be done so in a manner consistent with the practices recommended herein.

Prepared for:

Applicant's Signature/ Date

Applicant's Name

State Forester's Approval: This plan meets the criteria established for Forest Stewardship Plans by Hawaii's Forest Stewardship Advisory Committee. The practices recommended in the plan are eligible for funding according to state of Hawaii Forest Stewardship Program guidelines and administrative rules.

Approved by:

State Forester's Signature/ Date

State Forester's Name

Appendix I.

Useful Web Sites

- Archeological Consultants <http://www.hawaii.gov/dlnr/hpd/archcon.htm>
- Best Management Practices http://www.state.hi.us/dlnr/dofaw/pubs/BMPs_bestmanagement.pdf
- Conservation District
Use Application <http://www.hawaii.gov/dlnr/occl/documents.php>.
- Economics <http://www2.ctahr.hawaii.edu/oc/freepubs/pdf/RM-9.pdf>
http://www2.ctahr.hawaii.edu/oc/freepubs/spreads/RM-9_forest_econ_calc.xls
- Environmental Assessments <http://www.state.hi.us/health/oeqc/publications/guidebook.pdf>
- Forestry Consultants <http://www.hawaii-forest.org/index.html>
- Forestry in Hawaii (general) <http://www.ctahr.hawaii.edu/forestry/>
- MAPS-
- Tax Maps
 - Hawaii County <http://www.hawaii-county.com/maps/tmk/zone.htm>
 - Maui County <http://www.mauipropertytax.com/>
 - Kauai County <http://www.kauai.gov/default.aspx?tabid=433>
 - Oahu <http://gis.hicentral.com/website/parcelzoning/viewer.htm>
 - Topographic Maps <http://www.topozone.com>
 - Soil Maps <http://www.ctahr.hawaii.edu/soilsurvey/soils.htm>
- Natural Resources
Conservation Service <http://www.hi.nrcs.usda.gov/>
- Soil Tests from UH http://www2.ctahr.hawaii.edu/adsc/downloads/price_list.pdf
- State Historic Preservation <http://www.hawaii.gov/dlnr/hpd/hpgreeting.htm>
- Taxes (Federal Income) <http://www.fs.fed.us/spf/coop/programs/loa/tax>
- US Fish & Wildlife
Service Programs <http://pacificislands.fws.gov>
- WEEDS-
- Noxious Weed List <http://www.hawaiiag.org/hdoa/adminrules/AR-68.pdf>
 - Weed Risk Assessment http://www.botany.hawaii.edu/faculty/daehler/WRA/full_table.asp

Hawaii Watershed Prioritization Process

**Prepared by:
John Pipan**

for

**Marine and Coastal Solutions International
P.O. Box 6882
Kamuela, Hawaii 96743**

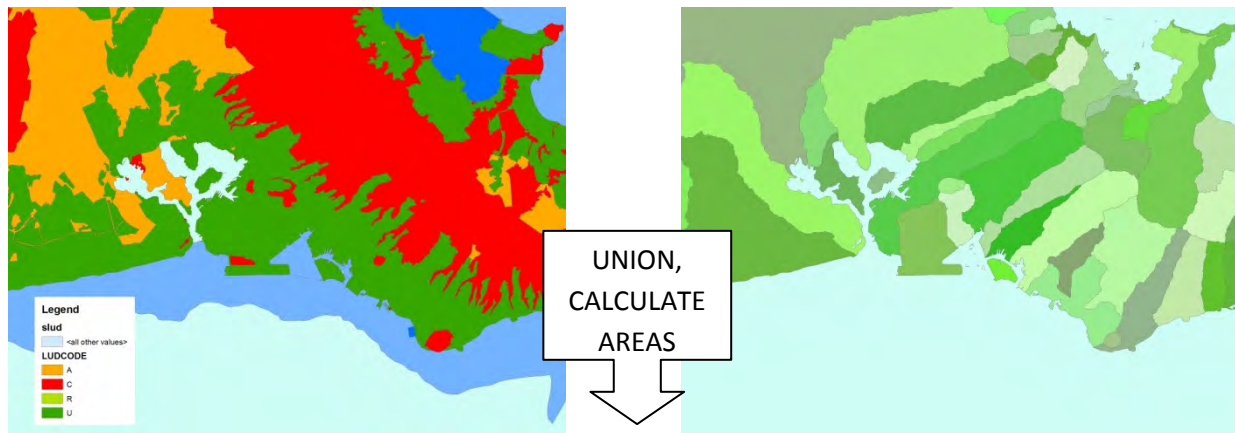
A report of the Hawaii Office of Planning, Coastal Zone Management Program, pursuant to National Oceanic and Atmospheric Administration Award No. NA06NOS4190159, funded in part by the Coastal Zone Management Act of 1972, as amended, administered by the Office of Ocean and Coastal Resource Management, National Ocean Service, National Oceanic and Atmospheric Administration, United States Department of Commerce. The views expressed herein are those of the author(s) and do not necessarily reflect the views of NOAA or any of its sub-agencies.

Hawaii Watershed Prioritization Process

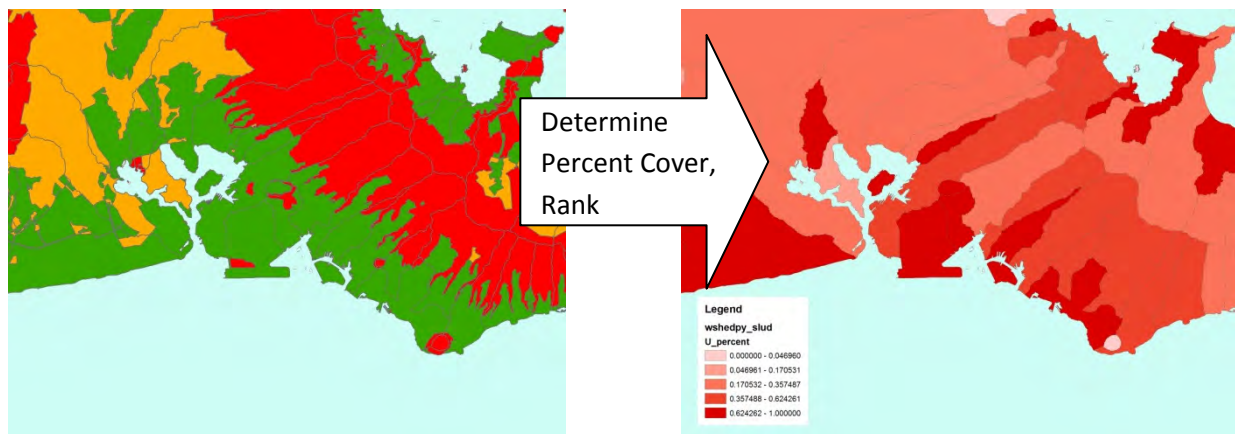
Introduction

In order to prioritize watershed planning efforts statewide a GIS was compiled. GIS systems are instrumental in facilitating the quantitative assessment of landscape influences on aquatic ecosystems and watershed scale studies of water quality. GIS tools allow comparison and processing of many different spatial information layers. Watershed land cover has been shown to be strongly correlated to water quality, especially nutrients (ref). Non-parametric statistical methods were employed to allow direct comparison of different layers with different units and distributions. Similar normalized rank approaches have been used to set restoration priorities in a TMDL context (Stringfellow, 2008).

Schematic illustration of processing steps



Above are representations of source layers for State Land Use District and Watershed areas. In ArcGIS the layers are joined with the command UNION and resulting areas determined with command CALCULATE AREAS.



With State Land Use Districts divided into Watershed Units (left), percent cover and rank of any SLUD classification can be computed.

Hawaii Watershed Prioritization Process

Criteria development

Since the source data layers representing the different criteria were of several different forms, the criteria had to be developed individually. Using the ArcGIS Spatial Analysis toolbox function 'Union', layers of one type (LUPAG, CCAP, etc.) were divided along watershed boundaries. The Calculate Areas function was then used to determine the area of each new polygon. The resulting attributes associated with each polygon (including data from both Union-ed files) were read into Excel for further processing. Pivot tables were used to summarize polygon areas with different attributes (eg. land covers) for each watershed in the state. The percent cover (area x / total wshed area) of areas in any given class could then be easily calculated.

Since each criterion has different units and different distributions a statistical technique known as rank normalization was used to compare criteria equally. Watersheds were compared to all others for the property of interest and ranked from 1 to 580 essentially ordering watersheds from worst (1) to best (580). All watersheds with 0 or N/A values were assigned the maximum 580 ranking to eliminate bias among minimum values. All ranks were divided by the maximum rank of 580 to generate a score from 0 to 1 (0 to 100%). Similar to a score on an exam, watersheds with lower score are considered more threatened or susceptible and higher priority.

There are currently four broad classes of criteria; stressors, sensitive areas, assets, and indicators. Within each class of criteria more and better source data will serve to improve the utility of the watershed prioritization model. These data, once available, can be easily incorporated into the model.

Stressors are properties of a watershed that could potentially lead to impairment. Watershed geology, hydrology, land cover and human land use are some factors that contribute to a watershed's susceptibility to disturbance. Stressors fell into three main categories: urban, agriculture, and soil. Layers were averaged within the three categories of stressors, then the three categories were averaged to produce the stressor score.

- Urban areas may negatively impact watershed health by altering hydrology, disturbing soil and introducing pollutants
 - The State Land Use District (SLUD) criterion was derived from 2006 State Land Use Commission maps. Watersheds were ranked by percent Urban classified land cover. Watersheds with greater urban percent cover were ranked higher (scored lower).
 - Watersheds were ranked by change in percent cover of Urban classified land. Watersheds with greater increase in urban classified land were ranked higher (scored lower).
 - Coastal Change Analysis Program land cover data (NOAA 2001). Watersheds with greater High Intensity Developed percent cover were ranked higher (scored lower).
 - Coastal Change Analysis Program land cover data (NOAA 2001). Watersheds with greater Low Intensity Developed percent cover were ranked higher (scored lower).
- Soils – Land lacking vegetative cover or having soils particularly sensitive to disturbance may negatively impact watershed health.

Hawaii Watershed Prioritization Process

- The HEL (Highly Erodible Land) criterion was derived from NRCS soil survey data SSURGO database. Watersheds were ranked by their percent land area covered by HEL classified soils.
- Coastal Change Analysis Program land cover data (NOAA 2001). Watersheds with greater Bare Ground percent cover were ranked higher (scored lower).
- Agriculture – Land in agricultural production may negatively impact watershed health by disturbing soil and introducing excess nutrients from fertilizer.
 - The State Land Use District (SLUD) criterion was derived from 2006 State Land Use Commission maps. Watersheds were ranked by percent Agricultural classified land cover. Watersheds with greater agricultural percent cover were ranked higher (scored lower).
 - Coastal Change Analysis Program land cover data (NOAA 2001). Watersheds with greater Cultivated percent cover were ranked higher (scored lower).
 - The Agricultural Lands of Importance to the State of Hawaii criterion (ALISH) was compiled from 1977 DOA and SCS maps. Watersheds were ranked by Important Agricultural Land percent cover. Watersheds with greater percent cover of IAL were ranked higher (scored lower).

Sensitive Areas are areas likely to be harmed by impaired watershed discharge. Recreation areas, MLCDS, and coral reef are all susceptible to watershed disturbance.

- Class AA marine Waters (presence/absence 0/1). Watersheds draining to class AA coastal water were assigned a score of 0.2 while watersheds draining to class A were assigned 0.8 (mean +/- 1 standard deviation).
- Coastal Reserves (presence/absence 0/1) was derived from various sources depicting areas with various reserves, preserves, parks, etc.. Watersheds with reserve areas within 500 m of the coastline were assigned a score of 0.2 while those without were assigned 0.8 (mean +/- 1 standard deviation).
- Coral Cover was derived from NOAA benthic habitat maps (2007). Watersheds with areas of coral cover within 500m of the coastline were assigned a score of 0.2 while those without were assigned 0.8 (mean +/- 1 standard deviation).

Watershed Assets are properties which would serve to protect a watershed from disturbance. Conservation areas may promote watershed health by managing land for conservation and restricting development.

- The State Land Use District (SLUD) criterion was derived from 2006 State Land Use Commission maps. Watersheds were ranked by percent Conservation classified land cover. Watersheds with greater conservation percent cover were ranked lower (scored higher).
- The State Land Use District change (SLUD) criterion was derived by comparing land use district percent cover between a) 1995 and 2000 data sets, and b) 2000 and 2006 data sets. Watersheds were ranked by change in percent cover of Conservation classified

Hawaii Watershed Prioritization Process

land. Watersheds with greater decrease in conservation classified land were ranked higher (scored lower).

- Mauka Reserves was derived from various sources depicting areas with various reserves, preserves, parks, etc.. Watersheds with greater percent cover in reserve land scored ranked lower (scored higher)

Indicators show those watersheds that are already recognized in need of restoration.

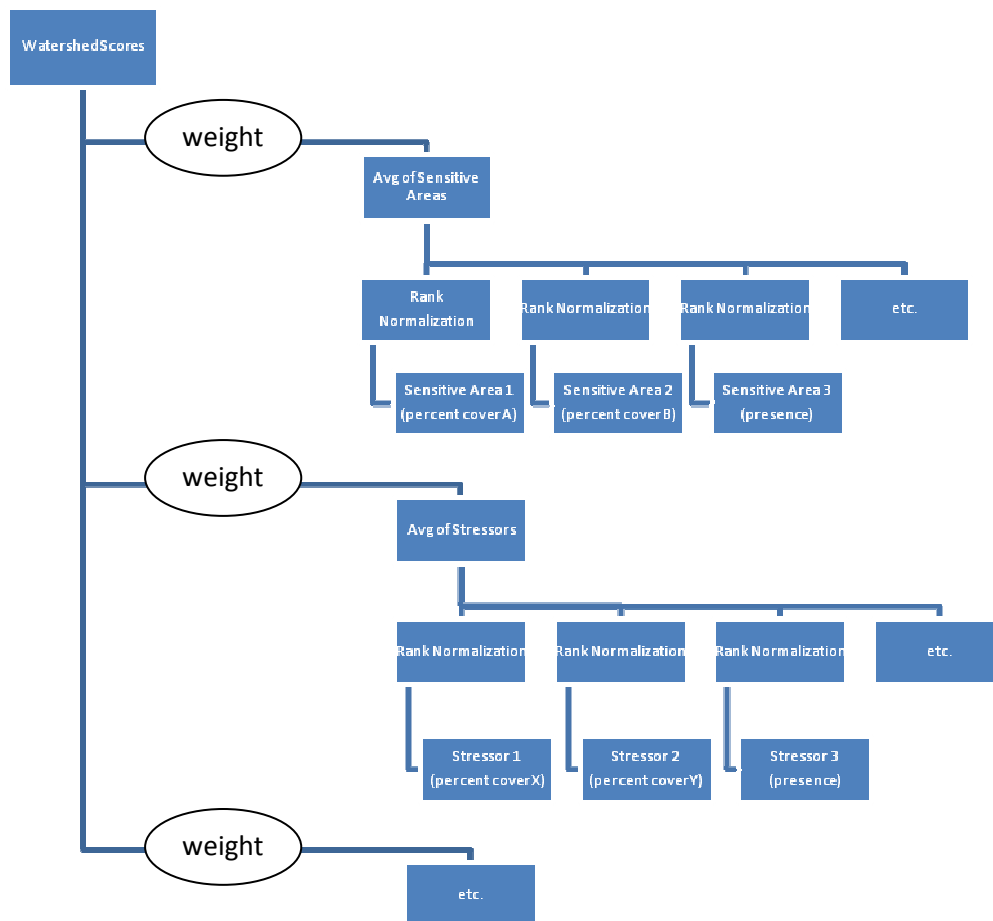
- 303(d) streams 2006 list (presence/absence 0/1). Watersheds containing streams on 303(d) list were assigned 0.2 while watersheds without 303(d) streams were assigned 0.8 (mean +/- 1 standard deviation).
- M. Kido Watershed Health Index (rescaled published index values). Kido's WHI developed a correlation between watershed land cover and the quality of stream habitat for native aquatic species. Higher WHI scores represent watersheds with better aquatic resources.

The DOH list of priority watersheds and Watershed Partnerships was included but not averaged into the total score to compare currently identified areas of priority to the total score prioritization (see following section). Watersheds on the DOH list were assigned 0, while those not on the list were assigned 1.

Several more criteria could be useful but due to time constraints were not included in this draft.

- Potential for build out (SLUD – CCAP) urban and cultivated land covers
- Streams with aquatic resources
- Potentially Highly Erodible Land
- 04 and 06 marine 303(d) impaired waters

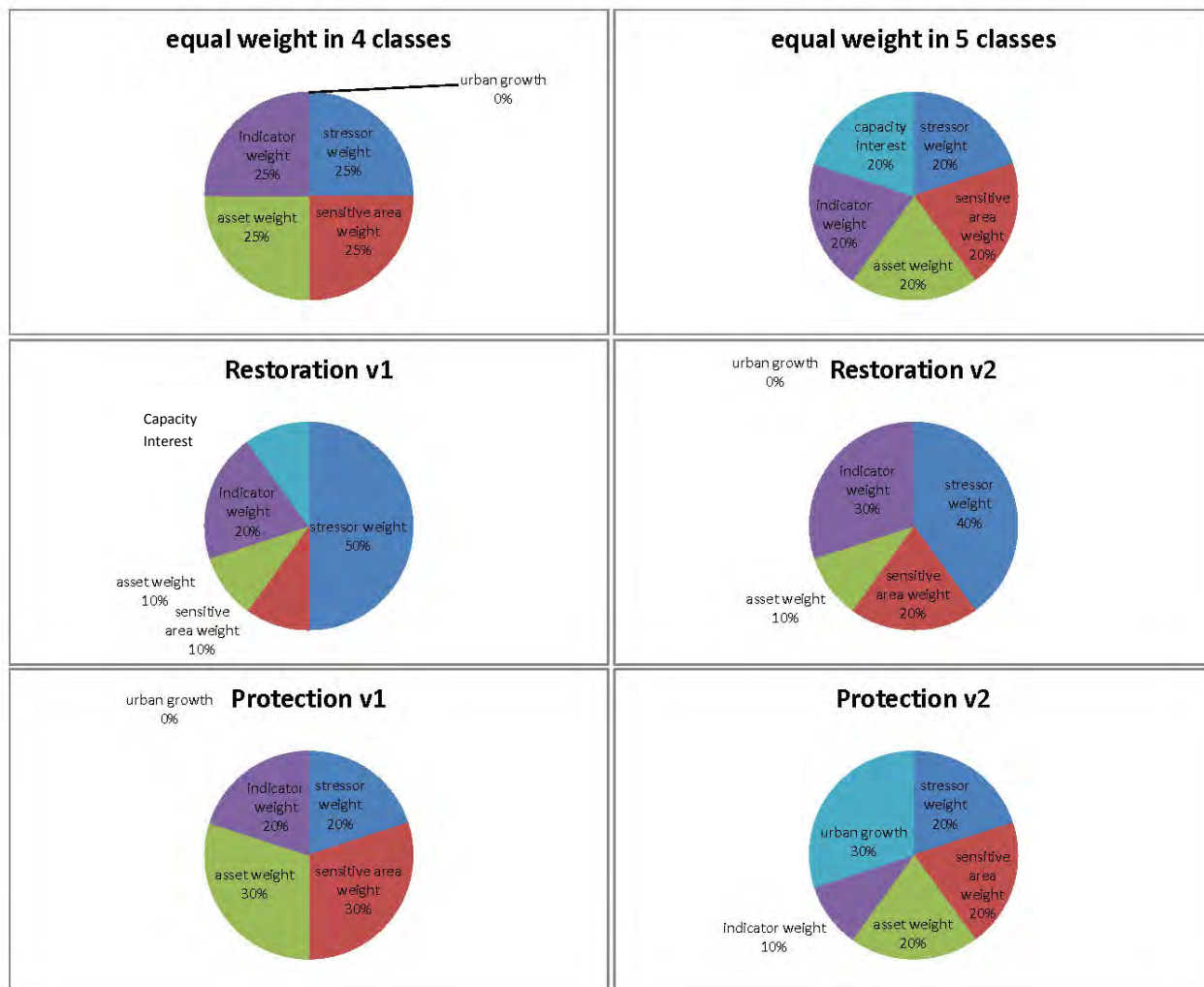
Hawaii Watershed Prioritization Process



Results

Several scenarios were evaluated to test the sensitivity of the model to weighting the inputs. The charts shown below depict the different weight scenarios evaluated. There was no effect on the total ranks of incorporating a capacity / interest score derived from the DOH priority watersheds and watersheds belonging to a watershed partnership. Other scenarios weighted stressors or sensitive areas more heavily to develop composite scores reflecting restoration or protection priorities. An urban growth layer was also included in one scenario outside of the other classes. The Urban growth was derived later in the development process from various maps produced by each county depicting areas planned for urban growth. Watersheds with planned urban expansion areas were assigned 0.2 while those not planned for urban expansion were assigned 0.8 (mean +/- 1 standard deviation).

Hawaii Watershed Prioritization Process



The table below shows watersheds identified in the top 66 (containing the top 50 listed from the restoration 2 scenario) in each weight scenario and in two previous versions of the prioritization process using different layers and grouping methods. On the far right column in the table is the sum of the number of times a watershed appears in the top 50 in the weight scenarios excluding those termed protection. Correlation analyses were performed on the weight scenarios. The Restoration V2 scenario showed the greatest correlation with the other scenarios and with the sum of the different scenarios. The Protection V2 scenario showed less correlation and represents a more independent scenario depicting potential future stressors. Restoration and protection lists based on the Restoration V2 and Protection V2 scenario follow, showing the top 50 watersheds in each. 23 watersheds identified on the restoration list were also identified on the protection list. Of the 77 listed watersheds 52 are DOH priority watersheds and 35 belong to a Watershed Partnership.

Hawaii Watershed Prioritization Process

ISLAND	WUNAME	Scores_1	Scores_2	Scores_3	equal_2_5_4	equal_2_0_5	Restorat_ion	Restorat_ion_2	Protecti_ion	Protecti_ion_2	Restorat_ion_sum
Kauai	Manoa	1	1	1	1	1	1	1	1	0	7
Kauai	Nawiliwili	1	1	1	1	1	1	1	1	0	7
Kauai	Waikomo	1	1	1	1	1	1	1	1	1	7
Kauai	Mahaulepu	1	1	1	1	1	1	1	1	0	7
Maui	Iao	1	1	1	1	1	1	1	1	0	7
Oahu	Anahulu	1	1	1	1	1	1	1	1	0	7
Oahu	Kahana	1	1	1	1	1	1	1	1	1	7
Oahu	Waiahole	1	1	1	1	1	1	1	1	0	7
Oahu	Kaalaea	1	1	1	1	1	1	1	1	1	7
Oahu	Kawainui	1	1	1	1	1	1	1	1	1	7
Oahu	Heeia	1	1	1	1	1	1	1	1	1	7
Hawaii	Wainia	0	1	1	1	1	1	1	0	0	6
Hawaii	Kapehu	1	0	1	1	1	1	1	1	0	6
Kauai	Kawailoa	0	1	1	1	1	1	1	1	0	6
Kauai	Wahiawa	0	1	1	1	1	1	1	1	1	6
Kauai	Puali	1	1	1	0	0	1	1	0	1	5
Lanai	Palimano	0	1	1	1	1	1	1	1	1	6
Maui	Maliko	0	1	1	1	1	1	1	0	1	6
Maui	Waiehu	0	1	1	1	1	1	1	1	1	6
Oahu	Kalunawaikaala	0	1	1	1	1	1	1	1	1	6
Oahu	Paukaui	1	1	1	0	0	1	1	0	0	5
Oahu	Kahaluu segment	1	0	1	1	1	1	1	0	0	6
Oahu	Keahala	1	0	1	1	1	1	1	1	1	6
Oahu	Kaneohe	1	0	1	1	1	1	1	1	1	6
Oahu	Ala Wai	1	0	1	1	1	1	1	1	1	6
Kauai	Kauapea	0	1	0	1	1	1	1	1	1	5
Maui	Honokowai	0	1	0	1	1	1	1	0	1	5
Maui	Waihee	0	0	1	1	1	1	1	1	0	5
Molokai	Waialua	1	0	1	1	1	0	1	0	0	5
Oahu	Waikane	0	0	1	1	1	1	1	0	0	5
Oahu	Kawa	1	0	1	0	0	1	1	0	0	4
Oahu	Kaelepulu	1	0	1	0	0	1	1	0	0	4
Hawaii	Keahole	0	1	1	1	1	0	0	0	1	4
Kauai	Kilauea	1	0	0	1	1	0	1	0	0	4
Kauai	Hanalei	0	0	1	1	1	0	1	1	0	4
Kauai	Hanamaulu	1	0	0	0	0	1	1	0	1	3
Kauai	Huleia	0	0	0	1	1	1	1	0	1	4
Kauai	Aepo	1	1	1	0	0	0	0	0	0	3
Maui	Kahana	0	1	0	0	0	1	1	0	1	3
Maui	Waikapu	0	0	0	1	1	1	1	0	1	4
Maui	Wailea	0	1	1	1	1	0	0	1	1	4
Molokai	Kaunala	1	1	1	0	0	0	0	1	0	3
Oahu	Waimalu	1	0	1	0	0	0	1	0	0	3
Oahu	Kahawainui	0	0	0	1	1	1	1	1	0	4
Oahu	Keamanea	1	1	1	0	0	0	0	0	0	3
Oahu	Punaluu	0	0	0	1	1	1	1	1	1	4
Oahu	Poamoho	1	1	1	0	0	0	0	0	0	3
Oahu	Waikele	1	0	0	0	0	1	1	0	0	3
Oahu	Kalauao	0	0	0	1	1	1	1	0	0	4
Oahu	Waimanalo	1	0	0	0	0	1	1	0	0	3
Oahu	Nuuanu	0	0	0	1	1	1	1	1	0	4
Oahu	Portlock	0	0	0	1	1	1	1	1	1	4
Hawaii	Hapahapai	0	1	1	0	0	0	0	0	0	2
Hawaii	Waikoloa/Waiulaula	0	1	1	0	0	0	0	0	1	2
Hawaii	Alia	0	1	0	0	0	1	0	1	0	2
Hawaii	Papaikou	0	1	0	0	0	1	0	0	0	2
Hawaii	Kealakekua	0	1	1	0	0	0	0	0	0	2
Kauai	Limahuli	0	0	0	1	1	0	1	0	0	3
Kauai	Lawai	1	0	0	0	0	1	0	0	0	2
Lanai	Naha	0	1	1	0	0	0	0	1	0	2
Molokai	Kolo	0	1	1	0	0	0	0	0	0	2
Oahu	Loko Ea	0	1	1	0	0	0	0	0	0	2
Oahu	Kawaihapai	0	1	1	0	0	0	0	0	0	2
Oahu	Kaaawa	0	0	0	0	0	1	1	0	0	2
Oahu	Waiawa	0	0	0	0	0	1	1	0	0	2
Oahu	Halawa	0	0	0	0	0	1	1	0	0	2

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ISLAND	WUNAME	Restoration	Protection
Oahu	Kahana	0.249	0.401
Oahu	Ala Wai	0.252	0.406
Maui	Waiehu	0.282	0.318
Oahu	Kawainui	0.285	0.442
Maui	Iao	0.286	0.349
Oahu	Heeia	0.289	0.315
Oahu	Waiahole	0.312	
Oahu	Kaneohe	0.315	0.450
Oahu	Nuuanu	0.327	
Maui	Waikapu	0.345	0.388
Kauai	Waikomo	0.345	0.458
Oahu	Kealahala	0.346	0.328
Kauai	Kawailoa	0.351	
Kauai	Mahaulepu	0.353	
Kauai	Hanamaulu	0.356	0.413
Kauai	Nawiliwili	0.358	0.384
Oahu	Anahulu	0.360	
Kauai	Manoa	0.367	
Oahu	Kawa	0.368	
Lanai	Paliamano	0.369	0.390
Oahu	Kahaluu seg	0.372	
Maui	Maliko	0.377	0.378
Kauai	Huleia	0.382	0.377
Kauai	Wahiawa	0.384	0.345
Oahu	Kaalaea	0.385	
Maui	Honokowai	0.386	0.374
Oahu	Kaelepulu	0.392	
Oahu	Waikane	0.393	
Maui	Waihee	0.395	
Oahu	Kalunawaikaala	0.396	0.430
Oahu	Portlock	0.397	0.425
Oahu	Kalauao	0.401	
Kauai	Kilauea	0.402	
Maui	Kahana	0.406	0.459
Molokai	Waialua	0.409	
Hawaii	Wainaia	0.409	
Hawaii	Kapehu	0.410	
Oahu	Kahawainui	0.410	
Kauai	Limahuli	0.411	

ISLAND	WUNAME	Restoration	Protection
Oahu	Halawa	0.411	
Oahu	Paukauila	0.411	
Kauai	Hanalei	0.415	
Oahu	Waikele	0.416	
Oahu	Punaluu	0.417	0.463
Kauai	Kauapea	0.417	0.462
Kauai	Puali	0.419	0.422
Oahu	Waiawa	0.423	
Oahu	Waimanalo	0.426	
Oahu	Kaaawa	0.428	
Oahu	Waimalu	0.432	
Maui	Wailea		0.323
Hawaii	Keahole		0.343
Maui	Pohakea		0.344
Kauai	Wailua		0.346
Hawaii	Kauna		0.350
Maui	Mooloa		0.353
Hawaii	Lapakahi		0.373
Kauai	Lihue Airport		0.378
Hawaii	Waiaha		0.386
Hawaii	Wainaku		0.391
Hawaii	Kawaihae		0.392
Maui	Waiakoa		0.395
Hawaii	Pohakuloa		0.400
Maui	Wahikuli		0.407
Hawaii	Kaahakini		0.408
Hawaii	Kiholo		0.415
Hawaii	Waikoloa/Waiulaula		0.417
Hawaii	Wailoa		0.429
Hawaii	Honokohau		0.444
Maui	Kahoma		0.452
Maui	Kanaio		0.453
Maui	Kalialinui		0.455
Lanai	Kaumalapau		0.456
Oahu	Hanauma		0.458
Oahu	Makua		0.459
Oahu	Oio		0.464
Molokai	Kamalo		0.464

Hawaii Watershed Prioritization Process

References

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METHODOLOGY FOR DEVELOPMENT OF THE “CONDITIONS OF NATIVE ECOSYSTEMS 2010” GIS LAYER

April 10, 2010

PRELOGUE: The Division of Forestry and Wildlife is extremely grateful to LANDFIRE, The Nature Conservancy of Hawaii, The University of Hawaii and the US Geological Survey for their dedication and assistance in developing this data layer specifically for use in developing Hawaii’s Statewide Assessment of Forest Conditions and Resource Strategy, 2010. When the Clayer that the team developed was reviewed by DOFAW staff, it was decided to rename the classes that were originally developed by the mapping team. For Hawaii SWARS, we used this map as a base layer with new class names as per the table below. Our Priority Areas for Issue 6: Conservation of Native Biodiversity are all areas that are listed as Critical Habitat by the U.S. Fish & Wildlife Service and/or areas identified as Essential Habitat for the recovery of Forest Birds and Waterbirds.

Table 1: Original GIS Data Categories and Renamed Data Categories for Hawaii SWARS

Original Class Name	SWARS Class Name
High Priority Maintenance	Intact Native Ecosystems, Highest Biodiversity
Secondary Maintenance	Intact Native Ecosystems, High Biodiversity
Enhancement	Threatened Native Ecosystems
High Priority Restoration	Rapidly Degrading Ecosystems
Localized Restoration	Degraded Ecosystems
Limited Opportunities	Native Ecosystems No Longer Exist

Approach

1. Habitat quality, species richness, and biodiversity uniqueness were identified as important factors for prioritizing areas for conservation.
2. Data sources were identified for each of these factors for as many terrestrial biodiversity components as possible.
3. Breakpoints were identified within each dataset.
4. Categories were created using various combinations of these datasets and breakpoints to set priorities for the large landscapes in which conservation action can be undertaken in Hawai‘i.
5. Geoprocessing techniques carefully coded, stacked, joined, and decoded the data into biodiversity management categories.
6. Alternative data sources used to test resulting biodiversity management categories.

Data Layers

Geospatial datasets were found for upland plants, coastal plants, forest birds, and waterbirds to reflect as many aspects of their habitat quality, biological richness, and biodiversity uniqueness. Coastal seabird distributions only include point data and montane seabird distributions are still being developed. Upland and coastal plant data include some populations of montane and coastal seabirds. Statewide invertebrate data was incomplete and not included in this analysis. Important areas for single island endemics and

lineages were mostly identified already by included data layers. Descriptions of the datasets used and alternative datasets considered are listed in the following table 2.

Table 2. Description of data sources used and considered, biodiversity type, factors and data type for plants and birds.

Data Source and notes	Biodiversity Type	Factor	Data Type
Habqual combo¹ Native-dominance of forests is a direct indicator of forest health. Developed areas are low quality areas for native biodiversity. <i>Alternative Data Sources:</i> Hawaii Biodiversity Mapping Program rare plant points were not incorporated into habqual combo development as rare point density map because each dot represented many plants or a single plant. Couldn't make accurate density estimates. Also did not use rare plant pts due to incompleteness in Pohakuloa and Kohala, and lack of availability of Army data.	Upland plants, Forest Birds	Habitat quality	Raster 30m cell
Price et al. 2007 predicted plant richness (totdiv)² Stacked plant ranges of 331 plant species show areas that support more plants than others. Plant range models are based on climatic moisture, elevation maxs and mins, tolerance of young substrate, and regional presence. Data lacking for Kaho'olawe, Lana'i, & West Molokai. This map is adapted for this project.	Upland plants	Richness	Raster 100m cell
Price et al. 2007 formerly widespread plant ranges (rarehp)² The 92 modeled plants with the largest % reduction in their predicted range had their ranges stacked to show concentrations of these downtrodden species. This map is adapted for this project.	Upland plants	Uniqueness	Raster 100m cell
TNC coastal veg distribution³, based on Warshauer et al 2008⁴ Occurrences along the coastline show areas with significant concentrations of coastal vegetation. Richness from Warshauer et al 2008 and viability data from TNC 2008 included.	Coastal plants	Habitat quality, Richness	Polyline
Gorresen et al. 2009 forest bird ranges⁵ Stacked forest bird range maps show areas important to many forest bird spp. <i>Alternative Data Sources:</i> HIGAP bird ranges and forest bird recovery ranges are based on older data, and do not reflect current biodiversity distributions.	Forest Birds	Richness	Polygon
FWS Hawaiian waterbird habitat⁶ Wetlands important for the recovery of the Hawaiian moorhen, Hawaiian stilt, Hawaiian coot, and Hawaiian duck are categorized as core and supporting, following USFWS and DLNR designations.	Waterbirds	Habitat quality	Polygon

Creating Categories

Biodiversity Management Priorities have three main groupings.

¹ Jon Price's habqual based on HIGAP, modified with higher resolution developed areas from LANDFIRE Existing Vegetation Type (EVT) and intensive agriculture areas derived from the State of Hawai'i's alum_n83 shp file. This modified habitat quality layer has many conservation applications.

² Price, J.P., S.M. Gon III, J.D. Jacobi, and D. Matsuwaki. 2007. Mapping plant species ranges in the Hawaiian Islands: developing a methodology and associated GIS layers. HCSU Technical Report 008.

³ The Nature Conservancy. 2008. Hawaii Ecoregional Assessment: Coastal Addendum of Anchialine Pools, Coastal Seabird Nests, and Coastal Vegetation.

⁴ Warshauer, F.R., J.D. Jacobi, and J.P. Price 2008. Native coastal flora and plant communities in Hawai'i: Their composition, distribution, and status. Hawai'i Cooperative Studies Unit Technical Report HCSU-xxx. University of Hawai'i at Hilo.

⁵ Gorresen, P. M., R. J. Camp, M. H. Reynolds, T. K. Pratt, and B. L. Woodworth. 2009. Status and trends of native Hawaiian songbirds. Pp. 108-136 in Conservation biology of Hawaiian forest birds: Implications for island avifauna (T. K. Pratt, C. T. Atkinson, P. C. Banko, J. D. Jacobi, and B. L. Woodworth, eds.). Yale University Press, New Haven, CT.

⁶ U.S. Fish and Wildlife Service 2005. Draft Revised Recovery Plan for Hawaiian Waterbirds, Second Draft of Second Revision. U.S. Fish and Wildlife Service. Portland, OR, USA.

1. Maintenance – high priority maintenance, secondary maintenance, or enhancement
2. Restoration – high priority restoration or localized restoration
3. Limited Opportunities

These main groupings indicate the type of conservation activities needed to steward the natural resources and are based on habitat quality. The categories within the groupings show classification based on richness and uniqueness. Each category is comprised of various combinations of plant and bird data split at specific breakpoints as shown in the following table 3. Details on how these categories were geoprocesed are described in the next section.

Table 3. Plant and bird components of biodiversity management categories.

	Plants, upland	Plants, coastal	Forest birds	Waterbirds
High Priority Maintenance	Native-dominated & >100 plant spp	--	--	--
Secondary Maintenance	Native-dominated & ≤100 plant spp	Good or Very Good viability	--	Core wetlands
Enhancement	Native-dominated & can support 35+ formerly widespread plants	--	--	--
High Priority Restoration	Non-native dominated areas in proximity to native-dominated areas	--	≥3 spp forest birds for Molokai & O'ahu	--
Localized Restoration	Other non-native dominated	Fair viability	--	Supporting wetlands
Limited Opportunities	Developed areas or intensive agriculture	--	--	--

Stacking data layers and assigning categories

The following geoprocessing steps were used to formulate the final product.

1. Prepare raster data stacked to produce rasters with island extent (not stacked statewide because forest bird thresholds differ between islands). When reclassifying each dataset, use codes with different powers of 10 (e.g., 1, 10, 100, 1000, etc.) so you can decode it easily later.
 - a. Confirm that each island's habitat quality (hq) raster are 30 m cells and is coded high hq = 3000, medium hq = 2000, and low hq = 1000.
 - b. Reclassify formerly widespread plant species range (rarehp) as 35-92 spp = 300, and <35 spp = 0). This raster has a statewide extent. The 35 spp threshold was determined using the top quantile breaks to determine 3 classes. This would be the top third with the most % reduction of range of the 92 formerly widespread plants selected by Jon Price. The 92 plants may have been the top quarter with the most % reduction of range of all modeled plants. We identified the current ranges of the top 1/12th plants with the most % reduction of range of all mapped plants.
 - c. Reclassify forest bird ranges as 3 bird spp = 30 and <3 spp = 0. This raster has a statewide extent and is generally drawn so may include some areas that are not as important for forest bird conservation. On Maui, Kaua'i, and Hawai'i Island, 4 spp forest bird were picked as the minimum threshold for bird ranges, and at close inspection most of the areas fell within high habitat quality areas; those areas that did not were generally due to inaccuracies in the data. On O'ahu and Molokai, a lower threshold, 3 spp forest birds, was picked for bird ranges because Oahu has lost so much bird habitat that a filter to only protect areas supporting 4 spp would identify too little remaining habitat to conserve. Ni'ihau, Lana'i, and Kaho'olawe did not have any identified forest bird areas by Gorresen et al. 2009.
 - d. Reclassify totaldiv as >100 plant spp = 1; ≤ 100 spp = 0. The 100 plant spp threshold was picked because it includes most of the important forest bird habitats. It excludes the very dry and very low elevation areas (some of which is picked up in the Enhance category), as well as the high elevation areas. This raster has a statewide extent.
 - e. Identify RESTORATION HIGH PRIORITY areas in proximity to hq = 3000 using a circular focal mean function with radius = 33 cells (~1km). Use display threshold = 2100. See ArcGIS help for formula. Reclassify resulting raster, hqprox, where at least 10% of the area within 1 km is high quality habitat = 10,000; all other data = 0. This raster has a statewide extent.
2. Stack rasters by island using the raster calculator (e.g., $ma_bmp1 = [hqprox] + [ma_hq_combo] + [rarehp100] + [forestbirdsp7] + [totaldiv2]$).
3. Make an excel table to join to resulting rasters in order to designate categories, as shown in the following snapshot. Directions are below.

	B	C	D	E	F	G
1	HQPROX	HQCOMBO	RAREHP	FBRICH	TOTDIV	CATEGORY
2	10000	3000	300	30	1	ENHANCEMENT
3	10000	3000	300	30	0	ENHANCEMENT
4	10000	3000	300	0	1	ENHANCEMENT
5	10000	3000	300	0	0	ENHANCEMENT
6	10000	3000	0	30	1	HIGH PRIORITY MAINTENANCE
7	10000	3000	0	30	0	SECONDARY MAINTENANCE
8	10000	3000	0	0	1	HIGH PRIORITY MAINTENANCE
9	10000	3000	0	0	0	SECONDARY MAINTENANCE
10	10000	2000	300	30	1	HIGH PRIORITY RESTORATION
11	10000	2000	300	30	0	HIGH PRIORITY RESTORATION
12	10000	2000	300	0	1	HIGH PRIORITY RESTORATION
13	10000	2000	300	0	0	HIGH PRIORITY RESTORATION
14	10000	2000	0	30	1	HIGH PRIORITY RESTORATION
15	10000	2000	0	30	0	HIGH PRIORITY RESTORATION
16	10000	2000	0	0	1	HIGH PRIORITY RESTORATION
17	10000	2000	0	0	0	HIGH PRIORITY RESTORATION
18	10000	1000	300	30	1	LIMITED OPPORTUNITY
19	10000	1000	300	30	0	LIMITED OPPORTUNITY
20	10000	1000	300	0	1	LIMITED OPPORTUNITY
21	10000	1000	300	0	0	LIMITED OPPORTUNITY
22	10000	1000	0	0	1	LIMITED OPPORTUNITY
23	10000	1000	0	0	0	LIMITED OPPORTUNITY

- a. Create the following fields JOIN, HQPROX, HQCOMBO, RAREHP, FBRICH, TOTALDIV, & CATEGORY, on 2 tabs, one for Oahu & Molokai and another for the other islands.
- b. Populate the table with all possible combinations of the various datasources' codes. It helps to write in each field's comments what the codes mean. Not all combinations you identify will exist in the raster. See step 5 below to identify combinations that you may miss.
- c. In the JOIN field, sum code values across all datasource fields.
- d. Fill out the CATEGORY field using the following rules for the decoded values.
 - i. If hqcombo = 3000 and rarehp = 300, category = ENHANCEMENT
 - ii. If hqcombo = 3000 and rare hp = 0, and totaldiv = 1, category = HIGH PRIORITY MAINTENANCE
 - iii. If hqcombo = 3000, rarehp = 0, and totaldiv = 0, category = SECONDARY MAINTENANCE
 - iv. If hqprox = 10000 and hqcombo = 2000, category = HIGH PRIORITY RESTORATION
 - v. If hqprox = 0 and hqcombo = 2000, category = LOCALIZED RESTORATION
 - vi. If hqcombo = 1000, category = LIMITED OPPORTUNITY
 - vii. For O'ahu or Molokai, if hqprox = 0, hqcombo = 2000 and fbrich = 30, category = HIGH PRIORITY RESTORATION
 - viii. For O'ahu or Molokai, if hqprox = 0, hqcombo = 2000 and fbrich = 0, category = LOCALIZED RESTORATION
- e. Save workbook and export 2 tables as values only into 2nd excel workbook. The join won't work if there are any cell comments, formulas, or extraneous formatting of the spreadsheet.

4. Join stacked raster to exported table via CODE field.

5. Visually check the raster's attribute table to see if there are any blank rows that did not join, indicating combinations you failed to populate the table with, or unusual extents of the data sources. Once you find the missing values, manually add them to both exported tables, if due to oversight in populating the table. Otherwise ignore blanks.
6. Apply symbology to joined rasters using the CATEGORY field.
 - a. Enhancement = blue
 - b. High Priority Maintenance = dark green
 - c. Secondary Maintenance = light green
 - d. High Priority Restoration = bright yellow
 - e. Localized Restoration = light yellow
 - f. Limited Opportunities = grey
7. Prepare and overlay other polygon data onto stacked raster in ArcGIS for final map.
 - a. Waterbirds Core = Secondary Maintenance
 - b. Waterbirds Supporting = Localized Restoration
 - c. Coastal Veg Good & Very Good Viability = Secondary Maintenance
 - d. Coastal Veg Fair Viability = Localized Restoration
8. Group stacked raster and polygons. Export a layer for the group for easy sharing (and to minimize risk of using the raster without the polygons).

RESULTS

Table 4. Area of each biodiversity management category.

Categories	Area	% of All Lands
High Priority Maintenance	72,092 acres	18.3%
Secondary Maintenance	90,036 acres	22.9%
Enhancement	10,638 acres	2.7%
High Priority Restoration	48,645 acres	12.3%
Localized Restoration	96,801 acres	24.6%
Limited Opportunities	75,691 acres	19.2%

Appendix C

Forestry Related Assistance Programs

Land Acquisition for Conservation Purposes and Forestry Related Programs

Overview

As diverse as its unique flora, the State of Hawaii has an active community interested in land acquisition for conservation purposes. During the process of acquiring land or a conservation easement, it is common to partner with any number of entities such as Cities, Counties, State Departments, the Federal Government and/or non-profit partners. (*See below*). It is also common to utilize one or more funding sources, as well as utilize Landowner Assistance Forestry Related Programs for long term management of these lands. Some management focuses on conservation while other on sustainable forest products. See below for a fairly comprehensive list of assistance programs in Hawaii.

The entities that make up the Partners each has a mission, specific goals and foci all based on differing criteria and benefits associated with any given land acquisition such as:

- % Forest Canopy and/or Forest Products
- Agriculture Zoned
- Coastal Areas
- Designated Wildlife Habitat
- % Threatened and Endangered
- Culturally Sensitive
- Historic or Archeologically Important
- Open Space and/or Scenic Beauty
- Recreation Opportunities or Public Access
- Watershed, Waterway and/or Water Quality Protection
- Coral Reef Protection
- Highly Threatened Lands or Buffer Zones

This purpose of this Appendix is to provide a list of the prominent land acquisition entities in Hawaii including any plans or priorities. Also included are key issues that impact successful conservation of land. The intent is not to provide an exhaustive list of all issues, species, available data, or research gaps in Hawaii.

Benefits

Acquiring land for conservation purposes can provide a myriad of benefits both to the seller, the buyer, and to the community at large by protecting land from potential future threats. Some of the important benefits that intact ecosystems provide are watershed protection (aquifer recharge & water quality), habitat for native plants and animals, open space access for the community & future generations, forest products and more.

Trends & Opportunities

Many understand the value of strategically targeting specific areas and/or ecosystems for acquisition due to their rarity or imminent threat. While shared actions according to common strategic goals are of interest, other factors can and do impact how decisions are made. Some of these factors are: differences in prioritizing criteria, funding equity/representation among the islands, political influences, incompatible funding timelines and terminology, management

capacity, and others. It is very important that existing and future entities interested in acquisition for conservation purposes understand missions, goals, and methods of others in order to capitalize on partnerships and opportunities to pool funding. It is also important to collaborate on the development of strategic acquisition lists, lobbying special interest groups, staying abreast of future funding opportunities, and continually listening to and communicating with the public.

In November 2007, the Department of Lands and Natural Resources (DLNR) Division of Forestry & Wildlife prepared a Legislative Report entitled “Requesting DLNR to Conduct an Analysis of Incentives to Promote Landowner Protection of Important Mauka Lands”. This report outlines a number of strategies the State can strive to engage in and they are as follows:

- 1) Landowner Assistance Programs (see below)
 - Remove restrictive disincentives
 - Develop a ‘one-stop shop’ interactive website with all assistance programs
 - Revise the Forest Stewardship Program to equal favorable incentives in the State Natural Area Preserve Program (NAPP)
 - Improve the structure and deliverability of the Native Forest Dedication Program currently only found on the Big Island.
- 2) Actively Promote the use of Conservation Easements
 - Model conservation tax credit programs for Hawaii
 - Develop and enact a conservation tax credit
- 3) Real Property Taxes
 - Counties should consider adopting a modified property tax valuation that rewards landowners for maintaining land uses that provide ecosystem Services.
- 4) Quantifying and Mapping Ecosystem Services
 - Support the development of new methods for monitoring biodiversity ecosystem services in Hawaii that have consistent and timely information about trends and changes in the landscape.
- 5) Payment for Ecosystem Services – Possible Pilot Projects in Hawaii
 - Launch landowner demonstration projects that focus on selling ecosystem Services and developing business strategies to make conservation economically attractive.
 - Explore diversified funding sources to pay for ecosystem services, including launching a Hawaii Fund for Conservation.
- 6) Other Market-Based Funding Mechanisms
 - Conservation Development
 - Transferable Development Rights
 - Certification, Eco-labeling, and Niche Markets
 - Ecotourism
 - Conservation Banking

A number of the above have been considered to one degree or another, but clearly more efforts are needed to increase incentives for private landowners to engage in the conservation of land.

Threats

Conversion of forests to non-forest uses can cause deleterious impacts to the function of ecosystems and the benefits that many gain from them. The once plentiful Dryland forests are now the most threatened of all forest types in Hawaii. Many plants, animals and arthropods are

dependent on the unique forests that house them. With population increases comes forest conversion, temperature increases, fragmentation, and loss of ecosystem function. While the acquisition of land provides an immediate halt to forest conversion, it is only a tool that is successful when strategically used in conjunction with a number of other public incentives and continued resource restoration.

Key Issues

- 1) What are top priority forest areas in Hawaii in need of conservation through land acquisition? Need to develop a plan and criteria for identifying priority landscapes in Hawaii by identify each organizations mission or priority landscapes. Where do priorities for conservation overlap?
- 2) Application Deadlines - Several attendees discussed the idea of streamlining application deadlines and perhaps requirements so that the overall process in Hawaii is easier. If two agencies have the same due date is this helpful or an impediment to applicants. Are there ways to make the process more compatible?
- 3) Ranking of Projects - There was some discussion about how projects are ranked and how to make these systems more accessible for inter-agency collaboration. Currently NARS and Legacy are identifying key points that overlap in the application and scoring process to make their programs more compatible.
- 4) Describe Future Plans and Goals
Legacy has plans to amend the 2004 Assessment of Needs so that agriculture lands can be considered. NRCS has a new Healthy Forest Reserve Program.
- 5) Outreach, increase applicants - Create a website that links all of these organizations and clearly describes the timelines and application process for each agency or program.
- 6) Interagency Collaboration - Establish working groups to focus on some of the above issues, for example working out the details on the application process. Establish a regular schedule for meetings such as the Sept. 4, 2009 video conference.

Land Acquisition and Restoration Entities, Plans & Priorities and Programs

1. County Plans & Priorities

County of Hawaii

Hawaii County General Plan. Provides the legal basis for all subdivision, zoning and related ordinances for the County of Hawaii. It contains Historic, Natural Beauty, Natural Resources, Recreation, Land Use sections and several relevant maps and tables.

<http://co.hawaii.hi.us/la/gp/toc.html>

Community Development Plans (CDP). In conformance with the General Plan requirements, Steering Committees are formed to provide guidance and input throughout the CDP process.

<http://www.hcrc.info/community-planning/community-development-plans>

Public Access, Open Space, and Natural Resources Preservation Commission - This Commission develops two prioritized lists of lands for potential acquisition funding from the Public Access, Open Space, and Natural Resources Preservation Fund. It ranks potential county acquisitions and possible partnerships with the State or nonprofit organizations.
<http://www.co.hawaii.hi.us/finance/ponc.htm>

County of Maui

Maui County General Plan - The principal tool for the county in evaluating public and private projects and their impacts on land use, the economy, environment, infrastructure, and cultural resources. It contains Population, Land use, the Environment and Cultural Resources sections.
<http://www.co.maui.hi.us/index.asp?nid=421>

Open Space, Natural Resources, Cultural Resources, and Scenic Views Preservation Fund - no associated planning or prioritizing. Grants from this fund are considered by the Budget and Finance Committee and awarded by the County Council.
<http://www.co.maui.hi.us/index.asp?nid=592>

Community plans - Nine community plans have been adopted by the Maui County Council. These plans establish the goals, objectives, policies, and implementing actions for each district, and include revised land use designations. <http://www.co.maui.hi.us/index.asp?nid=423>

The Shoreline Access Points Study lists specific parcels that have value as shoreline access points in a spreadsheet format and is available on the Maui County website at:
http://www.mauicounty.gov/departments/Planning/czmp/Shoreline_access_pts.htm

The Pali to Puamana Parkway Project aims to realign the Honoapiilani Highway mauka-ward to reduce shoreline erosion and preserve park and open space areas along the corresponding section of the West Maui shoreline. The final plan will include intended acquisitions of parks and open space. <http://www.mauicoastallandtrust.org/parkway.php>

County of Kauai

Kauai General Plan - A document that contains policies to guide the future physical development of the county and guides land regulation amendments and the review of specific zoning amendment and development applications. Includes Park Site needs, Land use maps, and Heritage maps.
<http://www.kauai.gov/Government/Departments/PlanningDepartment/TheKauaiGeneralPlan/tabid/130/Default.aspx>

Public Access, Open Space, and Natural Resources Preservation Commission - This Commission develops an annual list of recommended priorities of lands or property entitlements to be acquired or for the funding of projects directly related to the act, and to incorporate a countywide community input process into development of this annual list.

<http://www.kauai.gov/Government/BoardsandCommissions/OpenSpaceCommission/tabid/294/Default.aspx>

City and County of Honolulu

Oahu General Plan - Guides long-term development in the City and County of Honolulu. Contains Culture and Recreation, Natural Environment sections.

<http://www.honolulu.gov/planning/OahuGenPlan.asp>

Sustainable Communities Plans - The eight Sustainable Communities Plans provide conceptual, long-range visions and policies to guide the land use and infrastructure decisions for each region. Several of these community plans are scheduled for revision in late 2006.

<http://honolulu.gov/planning/DevSustCommPlans.asp>

Special Area and Neighborhood Master Plans - These plans allow for the identification of the function, organization, and character of specific neighborhoods within a region's Development or Sustainable Communities plan. <http://www.honolulu.gov/Planning/SpecAreaNeighbor.asp>

Clean Water and Natural Lands Commission - This commission has developed criteria for prioritizing annual project applications for land acquisition grants from the Clean Water and Natural Lands Fund. <http://www.honolulu.gov/council/cbc/cwnl.htm>

2. State Plans, Priorities &/or Programs (organized by agency)

Department of Land and Natural Resources

Coastal Erosion Management Plan (COEMAP). COEMAP seeks to improve the current erosion management in Hawaii. Land acquisition is listed as one of the tools for accomplishing this goal. Available at <http://www.hawaii.gov/dlnr/occl/files/coemap.pdf>

Conservation Reserve Enhancement Program (CREP). This is a federal-state partnership to encourage conservation and environmentally sound practices on degraded croplands, marginal pasture lands and/or riparian areas. The goals are to reduce sediment and runoff, increase coral reef health and marine diversity in near shore environments, improve endangered species habitats, reforestation of native riparian buffers and declining habitats and reduction and control of invasive species.

Comprehensive Wildlife Conservation Strategy & Maps. In order to be eligible for federal State Wildlife Grants (SWF), states must prepare a Comprehensive Wildlife Conservation Strategy (CWCS). The SWF program provides federal funds for the development and implementation of programs that benefit native wildlife and their habitat. The CWCS includes information on the distribution and abundance of species of greatest conservation need, descriptions of the location and condition of key habitats for the identified species. Available at <http://www.state.hi.us/dlnr/dofaw/cwcs/index.html>

Forest Legacy Program, Assessment of Needs. Amended in 2004. DLNR & US Forest Service - This document assesses Hawaii's forested natural resources and land use trends and outlines priority areas eligible for this Program. Includes Scoring Criteria. Available at: <http://hawaii.gov/dlnr/dofaw/forestry/hflp>

Hawaii Forest Bird Recovery Plan, DLNR & USFWS. Revised in 2006, this plan provides individual species accounts and actions needed Statewide for the recovery of 21 taxa of forest birds in Hawaii. In some cases the plan identifies specific land parcels where a particular recovery action is needed. Available at http://ecos.fws.gov/docs/recovery_plans/2006/060922a.pdf

Hawaii Forest Stewardship Program Five-Year Program Plan (2001-2006). This plan contains information on the Forest Stewardship Program goals and direction, as well as State forest resources, management goals and mechanisms of interest or available through the State Forest Stewardship Program. Available at <http://hawaii.gov/dlnr/dofaw/forestry/fsp>

Hawaii State Priority Plan. This plan for the Forest Land Enhancement Program contains information on State forest resources and management goals and mechanisms. Available at <http://www.state.hi.us/dlnr/dofaw/hfsp/>

(unofficial) **Historic Preserves Program Plan.** In 1993, the Historic Preservation Division completed a detailed plan for a preserves program. Files available at the DLNR, Historic Preservation Division.

Historic Preservation Library, Bibliography Database. Records of federal, state, and local development plans, permit applications, and land use approvals. Where historic properties were thought to be probable, inventory surveys were conducted. Available through the bibliography database at the Historic Preservation Library

State Historic Preservation Plan. This plan is updated through 2001 and was created to provide a vision for historic preservation within the State. It serves as a guide for effective decision making, for coordinating historic preservation activities within Hawaii, and for communicating statewide historic preservation goals, policies and objectives. Available at <http://www.hawaii.gov/dlnr/hpd/presplan.htm>

State of Hawaii Comprehensive Outdoor Recreation Plan (SCORP). Updated in 2008, the Hawaii SCORP provides the technical basis and planning assumptions for making decisions on State and County programs, County plans, and land use amendments. An update is required every five years for the state to qualify to receive federal Land and Water Conservation Fund (LWCF) grant funds to expand outdoor recreation opportunities statewide. Available at <http://hawaii.gov/dlnr/scorp>

Water Resource Protection Plan. Commission on Water Resource Management (CWRM). The objective of the WRPP is to protect and sustain ground- and surface-water resources, watersheds, and natural stream environments statewide. The plan is a comprehensive study of

occurrence, sustainability, conservation, augmentation, and other resource management measures. Available at <http://www.hawaii.gov/dlnr/cwrp/planning/wrpp.htm>

Department of Agriculture

Agricultural Lands of Importance to the State of Hawaii (ALISH). Maps available on the State of Hawaii Office of Planning GIS website. Available at <http://hawaii.gov/dbedt/gis/miscmaps.htm>

Agricultural Water Use and Development Plan. The first two phases of the AWUDP were completed in 2003 and 2004, respectively, and focus on the rehabilitation needs of 10 state and private irrigation systems, estimated existing water demands, and identified projected diversified agricultural water needs through 2024. The AWUDP Phase 3 update is currently underway, and will focus on refining estimates of current and future water demands, including assessment of prime agricultural lands and GIS mapping of major agricultural water systems. Available at <http://www.hawaii.gov/dlnr/cwrp/planning/awudp.htm>

Incentives for Important Agricultural Lands, Preliminary Report. Act 183, SLH 2005, provides for lands to be classified as important agricultural lands either through declaratory ruling or through a county mapping process. This report provides some information about the designation process and the incentives being proposed by HDOA to encourage the protection of agricultural lands. Updates and report available at <http://hawaii.gov/hdoa/Info/ial/important-agricultural-lands-update>

Department of Business, Economic Development, and Tourism

Coastal and Estuarine Land Conservation Plan. Hawaii Coastal Zone Management Program within the Office of Planning. This plan guides local participation in the federal Coastal and Estuarine Land Conservation Program, which enables states to permanently protect coastal and estuarine lands by providing matching funds for community-based projects to acquire interests in property from willing sellers. Available at http://www.geography.hawaii.edu/projects/celcp/hawaii_plan.html

Important Agricultural / Rural Lands Reform. The Office of Planning (OIP) has several power point presentations posted on OIP's vision for rural and agricultural development for the State of Hawaii. Land acquisition is mentioned as a tool for accomplishing OIP's goals. Available on the LUC website: http://luc.state.hi.us/project_ial.htm

Maps Depicting Patterns of Human Settlement and Agricultural Lands. Available on the LUC website: http://luc.state.hi.us/pattern_maps.htm

The Hawaii State Plan. (Office of Planning). Chapter 226, Hawaii Revised Statutes, establishes a statewide planning system that provides a framework for the implementation of State Plan policies, including State functional plans and guidance on county general plans. The State Plan sets out broad policies and priority guidelines in the areas of the economy, physical resources &

environment, and sociocultural development. Twelve State Functional Plans further define the State plan in twelve policy areas. Many of these policy areas relate to land acquisition: agriculture, conservation lands, historic preservation, recreation, water resources. The State Functional Plans were last updated in 1989 and 1991.

The Hawaii 2050 Sustainability Plan. (Office of the Auditor). Through Act 8, SLH 2005, the Legislature created the Hawai'i 2050 Sustainability Task Force to review the existing State Plan and address the planning needs of Hawaii with a view to year 2050. According to the Hawaii 2050 Sustainability Task Force Report, "the Hawai'i State Plan, the State's Quality Growth Policy, and the State Functional Plans have now been generally recognized as no longer meeting the 21st century needs of State, county, and private agencies facing multiple issues of sustainability." The Office of the Auditor is now in the process of creating the Hawai'i 2050 Sustainability Plan, with the first draft planned for community review in July 2007. Available at <http://www.hawaii2050.org/>

The University of Hawaii

Coastal Imagery. University of Hawaii Coastal Geology Group. Shoreline imagery and information is available for each of the main Hawaiian Islands.

Soils of Hawaii, University of Hawaii CTAHR. Descriptions of the soil orders found in the Hawaiian Islands with maps of the soil order locations on each island. Available at: <http://www2.ctahr.hawaii.edu/oc/freepubs/pdf/SCM-20.pdf>

Forage Environment / Vegetative Zones of Hawaii, University of Hawaii CTAHR. Maps based on a 1942 description of the various plant zones on the major Hawaiian Islands; these maps are deemed relevant as a basic indicator of foraging zones. Available at: <http://www.ctahr.hawaii.edu/ctahr2001/InfoCenter/Forages/environment.html>

Office of Hawaiian Affairs (OHA)

Mission: OHA shall protect and preserve Hawaii lands and their cultural significance by:

- Bridging the ancient use of lands with future land use patterns
- Advocating for land use and transaction practices and regulations congruent with the Hawaiian Sense of Place.
- Creating financially viable Property Involvements.

OHA has a number of programs that are outlined in their 2010-2016 Strategic Plan

<http://www.oha.org/stratplan/>. Their REAL ESTATE VISION, MISSION, AND STRATEGY can be found at

http://www.oha.org/index.php?option=com_content&task=view&id=834&Itemid=121

3. Land Trusts, Non-Profits & Joint Ventures. As of June 2010 it is expected that the majority of Land Trusts in the State of Hawaii will merge into one entity named the Hawaii Conservancy. If/When this is complete, it will likely be a high priority to define strategic lands for conservation acquisition. The State looks forward to playing a role in this type of future thinking strategic planning.

Hawaii Island Land Trust (HILT). Hawai'i Island Land Trust (HILT) facilitates the protection of environmentally-sensitive lands (watersheds, floodplains, native habitat), open space, agricultural and ranching lands, cultural sites, and historically significant areas that are important for present and future generations. This includes coastal lands, wetlands, pasture lands, mountain lands and forest lands. We serve only the Island of Hawai'i. Available at <http://www.hawaiilandtrust.org/>

Kauai Public Land Trust (KPLT). Working with others to use land conservation tools to preserve Kauai's places of the heart. Property under consideration by the Kauai Public Land Trust must meet one or more specific criteria for acquisition: Scenic Value & Open Space - is of unique scenic value and is visible to the public; or its development would impair the scenic character of the local landscape or it would threaten scenic view planes. Significant Natural Habitat - in a relatively natural state and large enough to adequately protect the resource; it contains rare, endangered, threatened or other native species. Historical & Archaeological Significance - represents a significant cultural or historic resource, which may be damaged or lost without protection, and is capable of being maintained in perpetuity. Public Recreation & Education - accessible to the general public; is an attractive or educational resource, or is valuable for recreational use. Productive Farmland - zoned for agriculture and is rated as prime ag land. Available at <http://www.kauaipubliclandtrust.org/About.htm>

Maui Coastal Land Trust (MCLT). MCLT operates in the County of Maui and has qualifying criteria for lands it seeks to protect. These criteria include: the property is located in Maui County, protects and preserves coastal areas of Maui, the protection of coastal lands be consistent with the Maui County General Plan, acquisition would protect coastal lands under threat from either existing or foreseeable development within the county, and protection of this property aids sound land use planning, promotes land conservation and encourages careful stewardship of coastal lands. Available at <http://www.mauicoastallandtrust.org/index.html>

Pacific Coast Joint Venture (PCJV). The mission of the Hawaii Wetland Joint Venture (HWJV) is to protect, restore, increase and enhance all types of wetlands, riparian habitat and associated uplands throughout the Hawaiian Islands through partnerships for the benefit of birds, other wildlife, people and the Hawaiian culture. Conservation strategies include: securement (acquisition, easements, agreements), restoration, enhancement, management and stewardship of private lands, monitoring, evaluation and research, communication and education. Available at <http://www.pcjv.org/hawaii/>

The Nature Conservancy (TNC) - Hawaiian High Islands Ecoregion Plan - web-based biodiversity conservation planning document by the Nature Conservancy of Hawaii and other partner organizations. TNC's goal is to bring active, protective management to representative, viable, native ecological systems and species of the Hawaiian Archipelago, and to thereby sustain the greatest possible complement of native Hawaiian biodiversity into the future. Working with partners, threats will be abated, health of terrestrial and freshwater ecological systems will be restored and maintained, and the unique biodiversity of the islands will be carried forward as an irreplaceable asset, meeting human needs and fulfilling ecosystem functions that serve all life in the islands. <http://www.hawaiiecoregionplan.info/introduction.html>

The Trust for Public Land (TPL) - TPL is nation-wide with a regional office in Hawaii and has five Conservation Initiatives including: **Parks for People** - TPL works in cities and suburbs across America to ensure that everyone, in particular every child, enjoys close-to-home access to a park, playground, or natural area. **Working Lands** - TPL protects farms, ranches, and forests that support land-based livelihoods and rural ways of life. **Natural Lands** - TPL conserves places of natural beauty that preserve wilderness for our children's children to explore and that support other species with whom we share the planet. **Heritage Lands** - TPL protects places of historic and cultural importance that keep us in touch with the past and who we are as a people. **Land & Water** - TPL preserves lands that protect clean water and the natural beauty of our coasts and waterways. Available at http://www.tpl.org/tier2_kad.cfm?folder_id=3149

Molokai Land Trust (MLT). The mission is to protect and restore the land, natural and cultural resources of Moloka'i, and to perpetuate the unique Native Hawaiian traditions and character of the islands for the benefit of the future generations of all Moloka'i, particularly Native Hawaiians. Values of MLT - Although there are many important principles that guide our work, the MLT emphasizes the following values as core to our efforts: Moloka'i Nui A Hina: reverence and love for Moloka'i's people and the land. Moloka'i Pule O'o: strength in mission through prayer, training and education Moloka'i Aina Momona: promotion and practicing of sustainable land use practices. Moloka'i No Ka Heke: remaining true to core Hawaiian values while embracing new technologies and ideas. William Haase, Executive Director (808)553-5626.

**Federal and State of Hawai'i Incentive Programs
For Land Management on Private Lands**
April 20, 2010

- This chart is intended to facilitate comparison of programs and provide contact information. It is neither complete nor authoritative.
- Some programs provide funding to both State and Private lands.
- Most cost-share programs **reimburse** landowners for a portion of their costs; payments are limited by (a) % or ratio of payment to match, (b) standard rates (caps) for eligible practices or (c) annual or project total maximums.
- Most programs have guidelines for what can qualify as the "match" for the cost-share. Funding from one program usually cannot match funding from another unless one program is non-Federal and the other is Federal.
- Generally, Federal and state cost-share payments need to be reported in tax returns and may or may not be taxable; search for "Cost-Share" in www.timbertax.org or www.timbertax.org/publications/aghandbook/aghandbook.asp

Program name & Administering Agency	Purpose of Program	Eligibility Criteria	Incentives and/or Cost Share Levels	Time-Frame	Other Requirements	Contact
State of HI Forest Stewardship Program (FSP) <i>Division of Forestry & Wildlife (DOFAW)</i>	Complete range of forest management activities, including: conservation, restoration, timber production, and plan development.	Private and privately leased "non-industrial forest landowners" (10-year minimum contract); minimum 5 contiguous acres in the FSP project.	50% cost-share, limited to \$75,000/year.	10 years of cost-sharing with a post 10 or more year maintenance period. Minimum 30-year contract if involves timber production.	Pre-proposal and land management plan required; payback provisions may be required for timber harvest. Onus on grantee to obtain any necessary permits, including EA's or CDUP's.	Sheri S. Mann (808) 587-4172 sheris.mann@hawaii.gov www.state.hi.us/dlnr/dofaw/hfsp
Urban & Community Forestry - locally known as "Kaulunani" <i>DOFAW USDA Forest Service (FS) funds</i>	Tree-planting in urban and community settings; educational programs; technical tree-care programs; Arbor Day activities.	Public or private lands with public access. No personal landscaping allowed.	Up to 50% cost-share. \$10,000/year is standard amount but exceptions are made for special projects.	Usually 1 year.	Must be a non-profit, tree advocacy or civic group, educational institution, and/or local or state government agency	Teresa Trueman-Madriaga (808) 672-3383 ttm@hawaii.rr.com www.state.hi.us/dlnr/dofaw/kaulunani
Watershed Partnership Program <i>DOFAW</i>	Cooperative projects that benefit on-the-ground activities protecting land for watershed conservation and implementing existing management plans negotiated under the Partnerships.	Landowner must inter into a MOU or agreement adopting the exiting management plan scope.	No mandatory cost-share requirement, but leveraging funds is encouraged.	Year-to-year as funds are available.	EA may be necessary. Onus on grantee to obtain any necessary permits. Reporting necessary.	Lisa Ferentinos (808) 587-0058 Lisa.ferentinos@hawaii.gov www.state.hi.us/dlnr/dofaw/vppp

Conservation Reserve Enhancement Program (CREP)	A federal-state natural resources conservation program that addresses state and nationally significant agricultural related environmental concerns. Participants remove cropland and marginal pastureland from agricultural production and convert the land to native grasses, trees and other vegetation.	Land must be physically and legally capable of being agriculturally productive. AGI limitation as defined by the Farm Bill does apply, however a case-by-case exemption is available for environmentally significant lands	<ul style="list-style-type: none"> Annual rental payment ranging from \$43 to \$225/acre/yr. Plus State bonus \$17/acre/year. 50% cost-share for practices and mid-contract management. SIP up to \$100/acre. PIP additional 40% reimbursable payment for select practices. 	5 year enrollment period to sign-up 15,000 acres in Hawaii. Participants are required to enter into 15 year contracts with the State of Hawaii and USDA	http://hawaii.gov/dlnr/dofaw/forestry/crep	<p>Irene Sprecher, DLNR-DOFAW (808) 587-4167 Melissa.Sprecher@hawaii.gov http://hawaii.gov/dlnr/dofaw/forestry/crep</p> <p>Connie Laumann, USDA-Farm Service Agency (808) 441-2704 ext. 145 Connie.Laumann@hi.usda.gov</p> <p>Mike Whitt, USDA-NRCS (808) 541-2600 ext. 153 Michael.Whit@hi.usda.gov</p>
North American Wetland Conservation Act (NAWCA)	preserving and/or restoring wetland ecosystems that contribute to waterfowl habitat recovery	CE or Fee title	50/50 match	Up to \$75,000 a year – apps due late Oct. Up to \$1m apps due Feb?		<p>Jane Rubey - State Coordinator Hawaii Wetland Joint Venture 808-217-6658 Rubey@pcjv.org</p>
Partners for Fish & Wildlife US F&WS	(1) Restore natural habitats and provide long-term benefits to threatened and endangered species; or (2) satisfy the needs of wildlife populations on National Wildlife Refuges	Private lands and Hawaiian Homelands	Up to 50% cost-share; technical assistance also provided	10-year minimum commitment	Projects cannot be used to fulfill mitigation requirements Onus on grantee to obtain any necessary permits.	<p>Benton Pang (808) 792-9443 http://naeficislands.fws.gov/org/orshe_partners.html http://partners.fws.gov/pdfs/05partnersgrants.gov.pdf</p>
Safe Harbor Agreements US F&WS & DOFAW	Proactive natural resource management to benefit endangered and threatened species.	Private and public lands	Provides regulatory assurances that future property-use restrictions will not be imposed	5-15 year commitment	Activities must meet "net conservation benefit" criteria for species	<p>Chris Mullen (808) 792-9400 http://enlangered.fws.gov/recovery/harborqae.pdf</p> <p>DOFAW – Julie Kolomyski 587-4149</p>
Coastal Program US F&WS VIA DOFAW	Focused efforts in bays, estuaries and watersheds around the U.S. coastlines. The purpose is to conserve fish and wildlife and their habitats to support healthy coastal ecosystems.	Provides funding for 22 high-priority coastal ecosystems. See website for a list of those.	Generally 3 to 1 match.		Projects cannot be used to fulfill mitigation requirements or for land purchase, but funds are available to facilitate purchase i.e. appraisals & due diligence needs. Subject to Yellow Book appraisal and review.	<p>Michael Whitt 808-541-2600 x153 www.fws.gov/coastal/CoastalProgram/ http://ecos.fws.gov/coastal_grants/viewContent.do?viewPage=home</p>
Wildlife Habitat Incentives Program (WHIP) USDA Natural Resource Conservation Service (NRCS)	Restoration of unique native habitats, especially for threatened and endangered plant and animal species; priority habitats for Hawaii include native forests.	Private or leased land; state and county lands also eligible	Up to 75% cost share Up to 100% cost-share	5-10 year contract 15-year contract	Primary goal may not be commercial production. Onus on grantee to obtain any necessary permits.	<p>Gwendolyn S. Gilbert Phone: (808) 541-2600 Ext. 122 Email: gwen.gilbert@hi.usda.gov</p> <p>Michael Whitt 808-541-2600 x153</p>

Conservation Grants Innovation Grants (NRCS)	To stimulate the development and adoption of innovative conservation approaches and technologies.	Applicants must be a federally recognized Indian Tribe, State, or local unit of government, non-governmental organization, or individual. Must meet EQIP eligibility standards.	50/50 match; 25% of which can come from in-kind contributions.		http://www.ance.usda.gov/programs/equip/	Michael Whitt 808-541-2600 x153 michael.whitt@hi.usda.gov National Program : Gregorio Cruz Gregorio.cruz@wdc.usda.gov
Conservation Stewardship Program (NRCS)						Michael Whitt 808-541-2600 x153 michael.whitt@hi.usda.gov
Environmental Quality Incentives Program (EQIP) NRCS	Provides a voluntary conservation program for farmers and ranchers that promote agricultural production and environmental quality as compatible national goals.	Private or State owned land 5-10+ year lease: cropland, rangeland, pasture, forest, other farm or ranch land	Up to 75% cost-share	Up to 10 years	Applicants must be persons actively engaged in livestock or agricultural [or forest] production Onus on grantee to obtain any necessary permits.	Denise Wiedenheft (808) 541-2600 Ext. 106 Denise.wiedenheft@hi.usda.gov
Clean Water Act Section 319 Grants for Dept of Health administers funds via EPA	State Non-Point Source Agencies. Projects focused on reducing non-point source pollution.	State, private, communities, cities, counties, non-profits, etc.	50/50 cost-share	Generally 24 to 36 months	Priorities vary annually i.e. Could be specific watersheds or streams, etc. Onus on grantee to obtain any necessary permits.	Hudson Slay (808) 586-4436 www.epa.gov/owow/nps/cwact.html
Targeted Watershed Grants EPA	Urban Watershed Capacity Building engages communities to foster an increased connection, understanding, and ownership of their waters.	Must: (1) establish and manage a competitive urban watershed subaward program; and (2) provide urban watershed technical services to subawardees.	75/25 cost-share	Up to 3 years.	States, local governments, public and private nonprofit institutions/organizations & U.S. territories are eligible. Up to \$600,000 per grant. Subgrants are allowed.	http://www.epa.gov/iwg
Doris Duke Foundation / Wildlife Conservation Society	Bring nonprofit conservation organizations and state wildlife agencies together for small but essential projects that address what states have identified as their top conservation priorities					DDF: Douglas Meyer 202-329-3299 (www.ddcf.org) environment@bernuthconsulting.com WCS: Darren Long at 406-556-7203 or dlong@wcs.org
Hawaii Tourism Authority						

Acronyms: EA – Environmental Assessment, CDUP – Conservation District Use Permit, EPA – Environmental Protection Agency

**Federal and State of Hawai'i
Land Acquisition Programs**

Program Name & Administering Agency	Purpose of Program	Eligibility Criteria	Incentives and/or Cost Share Levels	Time-Frame	Other Requirements	Contact
Forest Legacy Program <i>DOFAW via FS funds</i>	Preclude conversion of forestland to non-forest uses.	Private landowner that is a willing seller, currently 75% forested and threatened by development or fragmentation; must fall within designated "Forest Legacy Areas".	Federal funds available to purchase up to 75% of market value of a conservation easement or fee simple acquisition. Carries potential tax benefits.	Applications Due August 20 th Acquisitions Permanent	Subject to competitive prioritization at state, regional, and national levels. Requires FSP Plan; may require EA and CDUP. Subject to Yellow Book standard appraisal and review.	Sheri S. Mann (808) 587-4172 Sheri.s.mann@hawaii.gov www.state.hi.us/dlnr/dofaw/legacy
Recovery Land Acquisition <i>F&WS</i> Via DOFAW	Acquisition of fee title or conservation easement for protecting habitats essential for recovery of listed species before development or other land use changes impair or destroy key habitat values.	Private land willing seller in support of approved species recovery plans.	75% cost-share	Applications Due Acquisitions are Permanent	Subject to Yellow Book standard appraisal and review. Regionally competitive.	Craig Rowland (808)-792-9450 Craig_rowland@fws.gov www.fws.gov/ondangered/grants/section6FY2006/RF/P.pdf
National Coastal Wetland Conservation Grant Program <i>F&WS</i>	Provides matching grants to States for acquisition, restoration, management or enhancement of coastal wetlands.	Projects are selected based on ranking factors: 1. Consistent with the National Wetlands Priority Conservation Plan; 2. Located in States with dedicated land acquisition programs; and 3. Located in maritime forests on coastal barrier islands.	Program fact sheet – http://ecos.fws.gov/docs/coastal_gra/ms/web/pdf/1135.pdf		Additional ranking include credit to projects benefiting threatened and endangered species; promote partnerships, and support conservation & recovery. Program will not provide grants to support planning, research, monitoring, or construction or repair of structures for recreational purposes.	Chris Swenson (808) 792-9458 http://ecos.fws.gov/coastal_grants/viewContent.do?viewPage=home
Habitat Conservation Plan (HCP) Land Acquisition <i>F&WS</i> Via DOFAW	Acquisition of land that have important benefits for ecosystems that support listed, proposed and candidate species.	Land must be associated with approved HCPs.	25% of estimated project cost; or 10% when two or more States or Territories implement a joint project	Permanent	Nationally Competitive. Subject to Yellow Book appraisal and review.	Heather Hollis Heather_hollis@fws.gov

<p>Army Compatible Use Buffers Program Formerly: Private Lands Initiative Program <i>US Army</i></p>	<p>Available for NGO or state/local agency to purchase a portion of land (titles or conservation easements). Helps the Army meet Endangered Species Recovery Act and prevention of future T&E species listings. Offers landowners an opportunity to establish long-term conservation and wildlife practices and protection by restoring, and enhancing wetlands on private property.</p>	<p>Private landowner that is a willing seller near Army lands. Another source of funds should be identified because this program does not provide funds for an entire purchase.</p>	<p>Possible reduced land taxes.</p>	<p>Permanent</p>	<p>Army may use the land for low-impact training.</p>	<p>John Housein (410) 436-6465 John.housein@us.army.mil Hawaii contact: alvin.char@us.army.mil http://aec.army.mil/usaec/inatural/natural03a.html</p>
<p>Wetlands Reserve Program <i>NRCS</i></p>	<p>Participants voluntarily limit future use of the land while retaining the right to conduct common grazing practices: produce hay, mow, or harvest for seed production; conduct fire rehabilitation; and construct firebreaks and fences.</p>	<p>Minimum of 40 contiguous acres. There is no maximum acreage. Private landowners only.</p>	<p>Provides technical and financial support to help landowners with their wetland restoration efforts.</p>			<p>Michael Whitt (808) 541-2600 Ext. 153 michael.whitt@hi.usda.gov</p>
<p>Grassland Reserve Program <i>NRCS</i></p>	<p>Participants voluntarily limit future use of the land while retaining the right to conduct common grazing practices: produce hay, mow, or harvest for seed production; conduct fire rehabilitation; and construct firebreaks and fences.</p>	<p>This is a conservation easement in perpetuity. Easement payments for this option equal the fair market value, less the grazing value of the land encumbered by the easement. These values will be determined using an appraisal process.</p>	<p>10 - 30 year agreements</p>	<p>Required to follow a conservation plan developed by NRCS and the participant to preserve the integrity of the grassland. If restoration is determined necessary by NRCS, a restoration agreement will be incorporated within the rental agreement or easement</p>		<p>Michael Whitt (808) 541-2600 Ext. 153 michael.whitt@hi.usda.gov</p>
<p>Farm and Ranchland Protection Program <i>NRCS</i></p>	<p>Purchase easements or other interests in land from landowners to keep productive farm and ranchland in agricultural uses.</p>	<p>Must be part of a pending offer from a State, tribe, or local farmland protection program; be privately owned; and have surrounding parcels of land that can support long-term agricultural production. Must have a conservation plan for highly erodible land.</p>	<p>Up to 50% cost-share. Possible reduced land taxes.</p>	<p>Permanent</p>	<p>Subject to Yellow Book standard appraisal and review; must be large enough to sustain agricultural production; be accessible to markets for what the land produces; have adequate infrastructure and agricultural support services.</p>	<p>Michael Whitt (808) 541-2600 Ext. 153 michael.whitt@hi.usda.gov</p>
<p>Coastal and Estuarine Land Conservation Program <i>National Oceanic and Atmospheric Administration (NOAA)</i></p>	<p>Protects coastal and estuarine lands considered important for their ecological, conservation, recreational, historical or aesthetic values.</p>	<p>Coastal states with approved coastal zone management plans or National Estuarine Research Reserves are eligible for CELCP.</p>	<p>Provides states and local governments with matching funds to purchase significant coastal and estuarine lands, or conservation easements on such lands from willing sellers.</p>	<p>Lands purchased are protected in perpetuity.</p>	<p>Title must be held by appropriate state agency.</p>	<p>Doug Tom (808) 587-2820 dtom@dbedt.hawaii.gov http://coastalmanagement.noaa.gov/land/welcome.html</p>

State of HI Legacy Land Conservation Fund DOFAW	Provides for the acquisition of lands, including easements.	Lands for watershed and habitat protection, parks, coastal area, natural areas, agricultural production, cultural or historical sites, recreation and public hunting	County agency or nonprofit land conservation organization grant recipients must provide match funds of at least 25% of the total project costs.	Permanent	Intended for state agencies, counties, and non-profit land conservation organizations seeking funding to acquire property.	Molly Schmidt (808) 586-0921 Molly.e.schmidt@hawaii.gov www.hawaii.gov/dlwr/dofaw/ http://www.dofaw.org/
Pacific Coast Joint venture						Hawaii Branch Coordinator - Jean Rudy 808-217-6658 rubby@pcjv.org www.pcjv.org/home/
National Fish & Wildlife Foundation / Walmart "Acres for America"						http://www.nfwf.org/AM/Template.cfm?Section=Charter_Prospectus_List&Template=/PageDisplay.cfm&PageID=32&ContentID=11974
CLEAN WATER AND NATURAL LANDS FUND County Programs						www.co.honolulu.hi.us/Council/cwml.htm lbowman@honolulu.gov
Natural Areas Partnership Program (NAPP) DOFAW	Protection, restoration and enhancement of significant native resources or geological features	Private landowner who is a willing seller with intact native Hawaiian ecosystems, essential habitat for endangered species, and areas within the protective (P) subzone of the Conservation District; applicant may be cooperating entity managing such lands.	Up to 67% cost-share. Possible reduced land taxes.	Permanent dedication through transfer of fee title or conservation easement.	Development of long-range agreements and management plans; requires EA. Onus on grantee to obtain any necessary permits.	Randy Kennedy (808) 587-0054 randall.w.kennedy@hawaii.gov www.state.hi.us/dlwr/dofaw/napp

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**Federal and State of Hawai'i
Tax Related Incentive Programs**

Program Name & Administering Agency	Purpose of Program	Eligibility Criteria	Incentives and/or Cost Share Levels	Time-Frame	Other Requirements	Contact
Endangered Species Tax Deduction <i>US. Fish & Wildlife Service</i>	Federal Tax deductions for practices that conserve/protect T&E species.	Must have a T&E spp. in the area and there must be an approved recovery plan for it. See www.nmfs.noaa.gov/pr/recovery/plans.htm			The amount of the deduction cannot exceed 25 percent of the taxpayer's gross income from farming.	http://www.fws.gov/Endangered/ See Ch. 5 under Conservation Expenses in http://www.irs.gov/pub/irs-pdf/p225.pdf
Tree Farm Designation <i>DLNR - DOFAW</i>	Sustained production of forest products in quantity sufficient to establish a business	Private property or minimum 20 year lease	"Right to Harvest" law applies. Land will be taxed based on Agriculture zoning.		Management Plan approved by DLNR Board.	Michael Constantinides (808) 587-4186 www.capitol.hawaii.gov/hrcurrent/Vol03_Ch0121-0200D/HRS0186/HRS_0186-0002.htm
Federal income taxes <i>Internal Revenue Service</i>	Planting for timber production Timber sales	Private enterprises Private enterprises	Deduction or amortization of planting costs - up to approximately \$10,000 Long-term capital gains treatment	Amortize over 7 years Timber held over 1 year	Must establish basis	www.irs.fed.us/r8/spf/coop/taxation/ www.timbertax.org/
Property tax treatment <i>City & County of Honolulu</i>	Tree Farming	Private Property or minimum 20-year lease; minimum 10 acres	Agricultural Property Tax Reduction (1-5% of fair market value, depending upon length of dedication)	1, 5 or 10-year dedications	HRS 186 Tree Farm Designation (see above)	Real Property Assessment Division (808) 527-5510 or 5539 www.co.honolulu.hi.us/rpa/chapter8.pdf Scroll down to page 24 in pdf - "Section 8-7.3 -Dedication of Lands for Agricultural Use"
Agricultural Property Tax Reduction	Commercial tree farms	Private property or lease; minimum 5 years acceptable previous agricultural land use; agricultural condominiums not eligible	Tax assessment 50% of fair market value	20-year dedication; 10-year dedications might be allowed for short-rotation tree farms.	Tree farm management plan and other information.	Real Property Assessment Division (808) 241-6222 http://www.kauai.gov/realproperty
Agricultural Property Tax Exemption <i>Kauai County</i>	Tree farms	Private property or lease; minimum 10 acres; land in urban district not eligible	\$1000/parcel/year with a 10 year dedication and \$500/parcel/year with a 20 year dedication.	Harvesting must take place 6-25 years after planting		
Agricultural tax rates <i>Hawai'i County</i>	Commercial tree farming ("Fast Rotation Forestry" and "Slow Rotation Forestry")	Private property	Agricultural Property Tax Reduction; rates based on crop and productivity	Depends on dedication and time frame		Real Property Tax Division - Appraiser (808) 961-8354 www.hawaiipropertytax.com Click "Forms & Instructions," then "Miscellaneous," then "Agricultural Use" links

<p>Native Forest Dedication <i>Hawaii County (Kauai County was removed from this program in 1999)</i></p>	<p>Preservation, restoration, and conservation of native forest (defined as at least 25% tree cover and 60% cover of native forest species)</p>	<p>Private property or lease of at least 20 yrs, minimum 3 acres</p>	<p>Low tax assessments, same as for pasture</p>	<p>20 year agreement to use land as native forest</p>	<p>Forest management plan; written affidavit from recognized forestry professional that restoration plan is likely to succeed within the designated time period</p>	<p>Mike McCall, Wes Takai (808) 961-8260 www.hawaiipropertytax.com Click "Forms & Instructions," then "Miscellaneous," then "Native Forest Dedication"</p>
<p>Property tax treatment <i>Maui County</i></p>	<p>Tree farms (not specifically addressed in Code, but could be considered "crop")</p>	<p>Private property or lease; minimum 5 years' acceptable previous agricultural land use</p>	<p>Tax assessment 50% of fair market value</p>	<p>20-year dedication; 10-year dedications might be allowed for short-rotation tree farms</p>	<p>Petition Director of Finance</p>	<p>Real Property Tax Division (808) 270-7297 http://ordlink.com/codes/maui/index.htm Scroll down to "Article 7. Valuations, then click "3,48,350 Dedicated Lands" links</p>

Adapted from original document March 2005

Authors:

Sheri Mann, Hawaii'i Dept. Lands & Natural Resources, Division of Forestry and Wildlife (DOFAW)
Katie Friday, United States Department of Agriculture, Forest Service (USDA FS)
Steve Smith, Forestry Management Consultants – Hawaii'i

Appendix D

Hawaii Community Wildfire Protection Plans (CWPP's)

Community Wildfire Protection Plan for Kahikinui, Island of Maui, Hawaii

Sponsored by the Department of Hawaiian Home Lands
September 2008



DEPARTMENT OF HAWAIIAN HOME LANDS



Written by Denise Laitinen
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September 2008

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Appendix A: Hawaii Wildland Fire Risk and Hazard Severity Assessment Form

Appendix B: Project List 2010-2012

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Appendix D: Maps of Fire Assets and Protection Areas & Possible Fuels Buffer

Appendix E: Potential Grant Resources

This Community Wildfire Protection Plan was made possible with the assistance of the Department of Hawaiian Home Lands. The author would like to extend a sincere mahalo nui loa to the following people and agencies for their assistance: Todd Gray and Mike Robinson of the Department of Hawaiian Home Lands; Maui County Fire Department; Hawaii State Division of Forestry and Wildlife; Maui County Civil Defense; Patrick V. Kirch, Professor of Anthropology and Integrative Biology, University of California, Berkeley; and the residents of Kahikinui and members of KOOK, particularly Chad Newman. A very special mahalo nui loa to Cheyenne Perry for researching and creating the GIS maps used in this project.

Cover photo: View of 2003 Kahikinui wildfire. Photo courtesy of the Maui County Fire Department.

Kahikinui Community Wildfire Protection Plan

Kahikinui Community Wildfire Protection Plan
September 2008

**Kahikinui Community Wildfire Protection Plan
Mutual Agreement Page**

The Community Wildfire Protection Plan (CWPP) developed for Kahikinui, Maui, by the Department of Hawaiian Home Lands:

- Was collaboratively developed. Interested parties and federal land management agencies managing land in the vicinity of Kahikinui 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 Kahikinui.
- 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

10/16/08
Date



Jeff Murray
Fire Chief, Maui County Fire Department

10/20/2008
Date



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

10/28/2008
Date

Linda Chinn
Administrator, Land Management Division
Department of Hawaiian Home Lands

Date

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Executive Summary:

The community of Kahikinui in Maui County, on the leeward side of the Island of Maui, is under the jurisdiction of the Department of Hawaiian Home Lands (DHHL). Kahikinui is in a wildland urban interface (WUI) environment - that is where wild lands 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 can impact the watershed and the habitat of threatened and endangered native Hawaiian animals. Wildfires in Hawaii can also cause soil erosion, which has the potential to cause runoff that negatively impacts ocean reefs.

The overwhelming majority of wildfires in the state of Hawaii, and Kahikinui in particular, 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 Kahikinui from wildfire include the Maui County Fire Department, Department of Hawaiian Home Lands, which sponsored this CWPP, as well as the State Division of Forestry and Wildlife (DOFAW), Maui County Civil Defense Agency, Kahikinui Game Land Management Ohana (KGLMO), Living Indigenous Forest Ecosystems (LIFE), and the residents themselves who are members of Ka 'Ohana O Kahikinui (KOOK). These stakeholders were invited to participate in the development of this Plan.

A wildfire risk hazard assessment determined that the WUI areas in this community have a high risk of wildland fire. In recent years wildland fires in the area have threatened the 104 house lots of Kahikinui.

Meetings with community members and fire agency personnel identified 12 priority mitigation measures that can reduce the wildfire risk in Kahikinui, as well as improve community safety. These include: (1) improvement (i.e. grading and paving) of the main access road in the residential village, as well as improvement of the Jeep trail as a secondary emergency egress; (2) creation of a grazing buffer zone around the residential zone; (3) creation of static water resources, such as reservoirs and dip tanks, for fire suppression purposes; (4) creation of dedicated helicopter landing zones and creation of a contingency fund for helicopter use during wildfires; (5) the need to save nearby dryland forests; (6) reduction of fuel load along Piilani Highway; (7) reduction of fuel load around lessee homes; (8) identifying evacuation routes within the residential village; (9) increasing wildfire risk awareness among hunters; (10) developing a Community Emergency Operation Plan; (11) forming a Community Emergency Response Training (CERT) team and undergo training; and (12) renting/purchasing heavy equipment for fuel reduction projects.

Background:

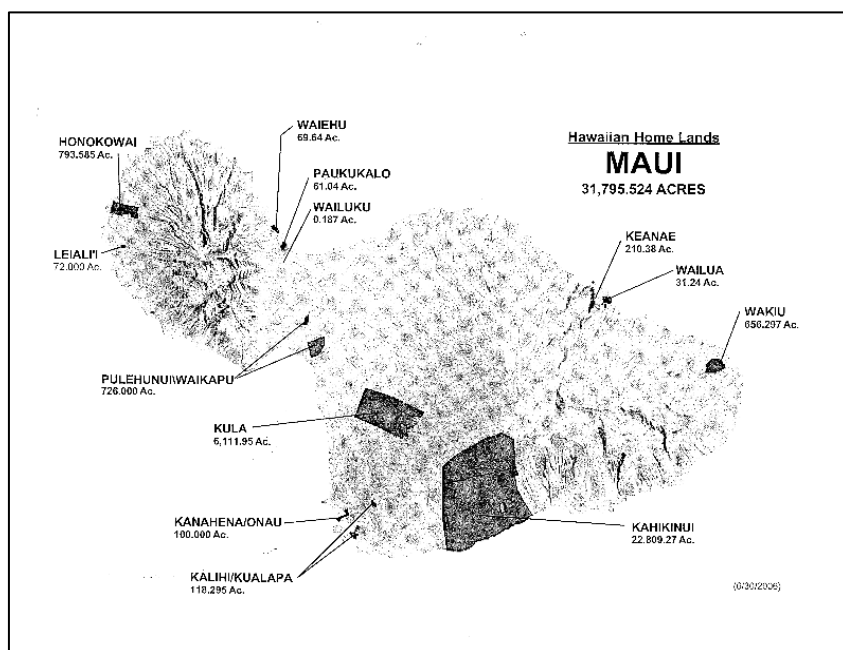
Kahikinui is located on the slopes of Haleakala on the leeward side of the Island of Maui. An arid, remote area, Kahikinui is more than a community. Historically, it encompassed an entire moku composed of several ahupua'a, a land division within Hawaiian culture extending from the ocean to the mountaintop.

For centuries the uplands of this region were a vast dryland forest, home to a sizable Native Hawaiian population in the pre-contact era. However, within the last two hundred years, particularly after the Great Mahele (land division) of 1848-1852, the area was deforested and became sparsely populated. Prior to the Great Mahele, the land was under the jurisdiction of Lot Kamehameha, who turned it over to

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the Hawaiian government after 1852, the government in turn leased a great deal of the land to neighboring ranches.

After the annexation of Hawaii, Congress created *The Hawaiian Homes Commission Act of 1920* as a land trust. The purpose of the Act was the rehabilitation of native Hawaiians, those individuals of not less than one-half Hawaiian blood. The program offered 99-year leases for residential, agricultural, and pastoral homesteads on the islands of Kauai, Oahu, Maui, Molokai, and the island of Hawaii. When Hawaii became the 50th state in the U.S., one of the conditions of statehood was that the State of Hawaii would administer this program. [*Hawaiian Homes Commission Act of 1920*, www.capitol.hawaii.gov] The mission of DHHL is to manage the Hawaiian Home Lands trust effectively and to develop and deliver land to native Hawaiians [*DHHL 2007 Annual Report*, <http://hawaii.gov/dhhl/publications/annual-report>]. DHHL partners with others towards developing self-sufficient and healthy communities.



DHHL's 15 land holdings on Maui total 31,795 acres, of which the Kahikinui ahupua'a is the largest encompassing 22,809 acres.

The area for this CWPP encompasses the entire 22,809-acre Kahikinui ahupua'a from the forest reserve at the 10,000-foot elevation to sea level (mauka to makai). This CWPP encompasses only Kahikinui Hawaiian Home Lands TMK No.'s (2) 1-9-1:003, 007, 008 & 011. DHHL owns the entire moku with the exception of three kuleana parcels: two of which are at Lualailua and the other is at Manawainui. See Figure 1 for detail.

The area was used as ranch land for most of the 20th century. Little has changed at the beginning of the 21st century.

Figure 1: At nearly 22,809 acres, Kahikinui is the largest of DHHL's 15 land holdings on Maui and the only one to include an entire ahupua'a.

Since 1999, leases have been awarded to those willing to live in this remote area with the premise of eventually creating a self-sufficient community. To that end, a community group, Ka Ohana O Kahikinui (KOOK) a non-profit 501(c) corporation, was created. KOOK's purpose is to "develop, implement, and maintain a community-based land and natural resource management program; the documentation and registration of all historical and archeological sites in Kahikinui; the restoration and maintenance of those archeological sites determined to have cultural significance; and to develop self-sufficiency through subsistence homesteading." There are 104 subdivided lots in the residential area of the ahupua'a and although approximately 75 leases have been awarded, only nine families live in Kahikinui.

Infrastructure:

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Kahikinui is one of the few places on Maui that has not been touched by development or urbanization. Residents of Kahikinui have no running water and must haul water by personal truck or use limited catchment water. There are no fire hydrants within the residential area.

There are no energy utilities in the community with residents relying on generator and solar power. However, Sandwich Isles Communications Inc. installed underground phone cables that provide phone service to residents.



Left: gated front entrance to Kahikinui residential area from Piilani Highway. Right: the Hana-bound direction of Piilani Highway.

Piilani Highway (Route 31), a 20-foot wide two-lane paved highway, runs east to west at the 1,200-foot elevation dividing the ahupua'a into mauka (mountain side) and makai (ocean side) sections.

The main road from the highway to the residential village is a gated single-lane dirt road less than 14 feet in width that is accessible only by four-wheel drive vehicles. A portion of the main entrance road is paved and the side roads are unpaved. Standard fire trucks can not access the area due to the



Left: side road within Kahikinui residential area. A portion of the main entrance road is paved and the side roads are unpaved. Right: main access road for the residents of Kahikinui. The road is so rugged it takes an hour to drive four miles from the house at the top of the residential area down to the highway. Rough road conditions have been an issue during past wildfire evacuations.

rough terrain. The road is so rugged that it takes an hour to travel four miles from the entrance of the community to the house at the highest elevation. The road is frequently washed out during periods of heavy rain making it difficult to travel. Residents periodically hold community workdays to cement pave the roughest sections of the road in spans of 50-100 feet long. There are four side roads stemming

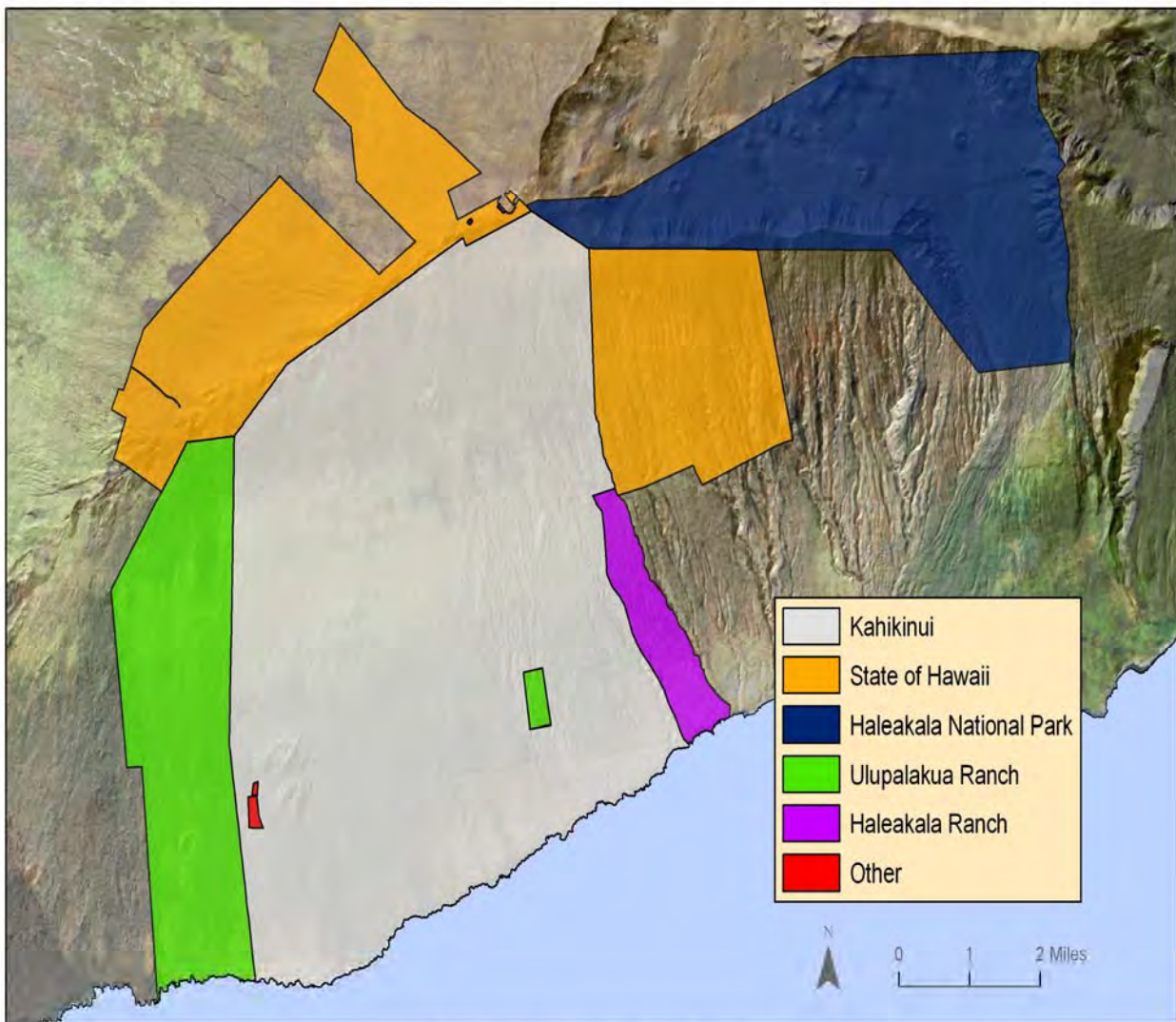
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from the main road, all of which are unmarked dirt roads. An unpaved single-lane Jeep trail runs westward and down along the west portion of the ahupua'a.

Upslope of the residential area, the forest tree line begins at the 5,000-foot elevation and continues up to the boundary of the ahupua'a at the 10,00-foot elevation. Adjacent landowners include Haleakala National Park, the State of Hawaii, Ulupalakua Ranch, and Haleakala Ranch. Figure 2 below illustrates landowner boundaries.

Figure 2: four major landowners neighbor Kahikinui Hawaiian Home Lands. Three kuleana parcels lie

Kahikinui and Adjacent Landowners



Prepared for the Department of Hawaiian Home Lands by: C. Perry, February 2008
Data Sources: <http://www.state.hi.us/dbedt/gis/index.html> and <http://hawaii.wr.usgs.gov/maui/data.html>

Vegetation:

Kahikinui was once a vast expanse of dryland forest before being turned into grazing lands. Today, pockets remain of native Hawaiian koa and sandalwood trees. In fact, areas of Kahikinui are home to some of the best remnant dryland forest on island (Medeiros 1996). Efforts are underway by multiple

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groups, such as Living Indigenous Forest Ecosystems (LIFE), to reforest sections of the ahupua'a during community workdays. Reforesting the land, especially at upper elevations, will enable trees to comb moisture from the clouds and bring much needed water to the area.

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Above: 'Oha wai, a tall tree with curved flowers, is one of the endangered plants located in Kahikinui. East Maui is one of only two places in the world where this plant is found. Photo credit: Clyde Imada for Hawaii's Biological Survey, Bishop Museum.

Kahikinui is also home to several endangered plants and animals, some of which are found nowhere else in the world. The southern slopes of Haleakala are the only place on Maui that 'Oha wai (*Clermontia lindseyana*) trees are found and one of two places in the world where it grows (the slopes of Mauna Kea on Hawaii Island being the other location). This tall tree relies on the native Hawaiian bird 'i'iwi for pollination.

The Blackburn's hawk moth (*Manduca blackburni*), which was once found on several Hawaiian Islands, is now found only on Maui in coastal and dry areas, including Kahikinui. The plants ko'oko'olau (*Bidens micrantha kalealaha*), asplenium-leaved diellia (*Diellia erecta*), the shrubs (*Neraudia sericea*) and Wawae'iole (*Phlegmariurus manni*), and the Lanai sandalwood tree (*Santalum freycinetianum var. lanaiense*) are other endangered native Hawaiian plants found in Kahikinui.

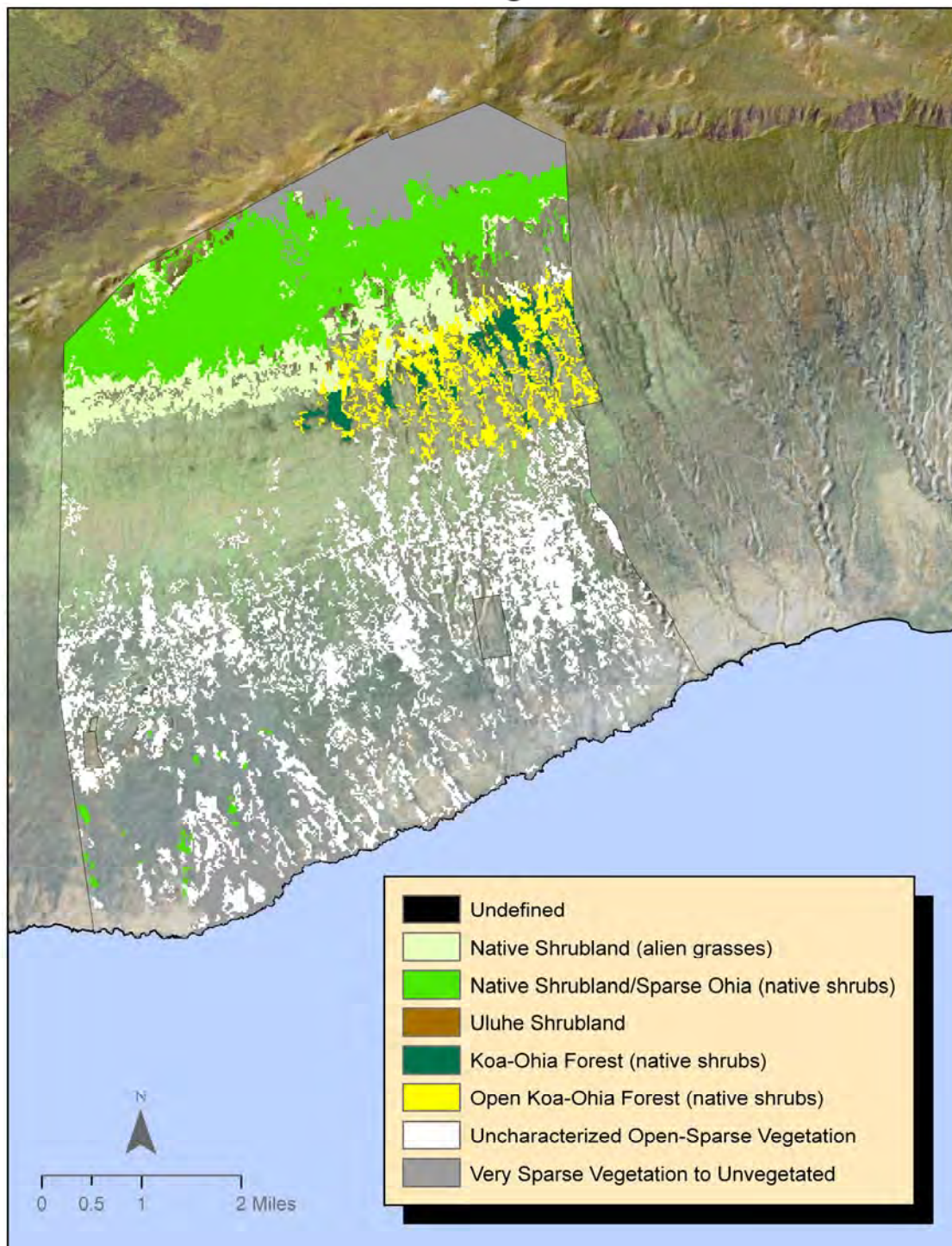
Native vegetation in Kahikinui consists of open grasslands and pockets of dryland forest (see Figure 3). There are sizable expanses within Kahikinui covered in thick grasses or duff that dry out in the summer months. Invasive grasses and shrubs can be found throughout the ahupua'a (see Figure 4). Although the amount of gorse (*Ulex europaeus*) has increased in recent years, community members are taking a proactive stance to reduce it with periodic gorse removal projects. A known fire hazard (Amme 1983), gorse is an invasive shrub, dense in thickness that grows 3 to 10 feet in size.

Vegetation along the highway includes kiawe (*Prosopis pallida*) and a variety of grasses. Considered an invasive plant, kiawe grows as a moderately sized shrub and tree. Used as firewood, kiawe has a long burn time. Since there are no road shoulders, vegetation often grows right up to the road. Piilani Highway is the only road connecting the east end of Hana and the entire eastern slope of Haleakala with the rest of the island. Tourists often use this road to travel to Hana and are unfamiliar with wildfire risks to the region. It's possible for roadside fires to be started by catalytic converters and mufflers from cars and motorcycles.

With the exception of the highway corridor, the general public is not granted access to Kahikinui. Nor is camping allowed within the ahupua'a. Only hunting groups with licenses from DHHL are allowed access to hunt in the forest reserve. The nonprofit group Kahikinui Game Land Management Ohana (KGLMO) has a license to hunt in the forest reserve. KGLMO is more than a hunting club with many of its members performing hours of community service restoring trails in the community.

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Kahikinui Native Vegetation



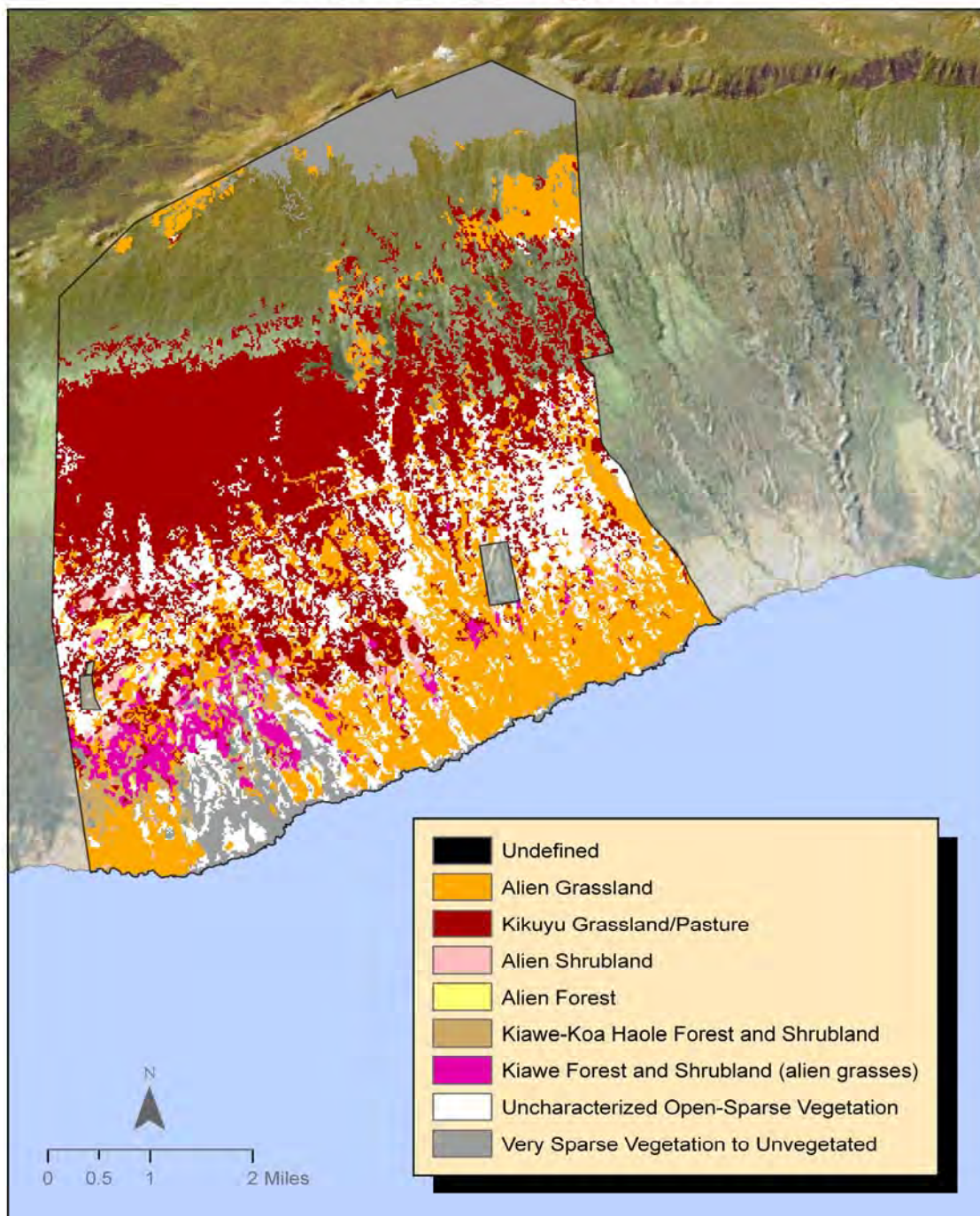
Prepared for the Department of Hawaiian Home Lands by: C. Perry, February 2008

Data Sources: <http://hawaii.gov/dbedt/gis/>, <http://hawaii.wr.usgs.gov/maui/data.html> and http://hbmp.hawaii.edu/Public_data/HIGAP/

Figure 3: the dark green areas denote native ohia and koa forests while lime green areas represent native shrub land and alien grasses. Gold areas denote native shrubland with sparse ohia while grey areas depict very sparse vegetation.

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Kahikinui Introduced Vegetation



Prepared for the Department of Hawaiian Home Lands by: C. Perry, February 2008

Data Sources: <http://hawaii.gov/dbedt/gis/>, <http://hawaii.wr.usgs.gov/maui/data.html> and http://hbmp.hawaii.edu/Public_data/HIGAP/

Figure 4: there are a variety of invasive grasses and shrubs found throughout Kahikinui. Red areas depict alien forests, while yellow depicts alien grasslands and orange highlights alien shrubs. White areas have uncharacterized sparse vegetation, while grey areas have little or no vegetation.

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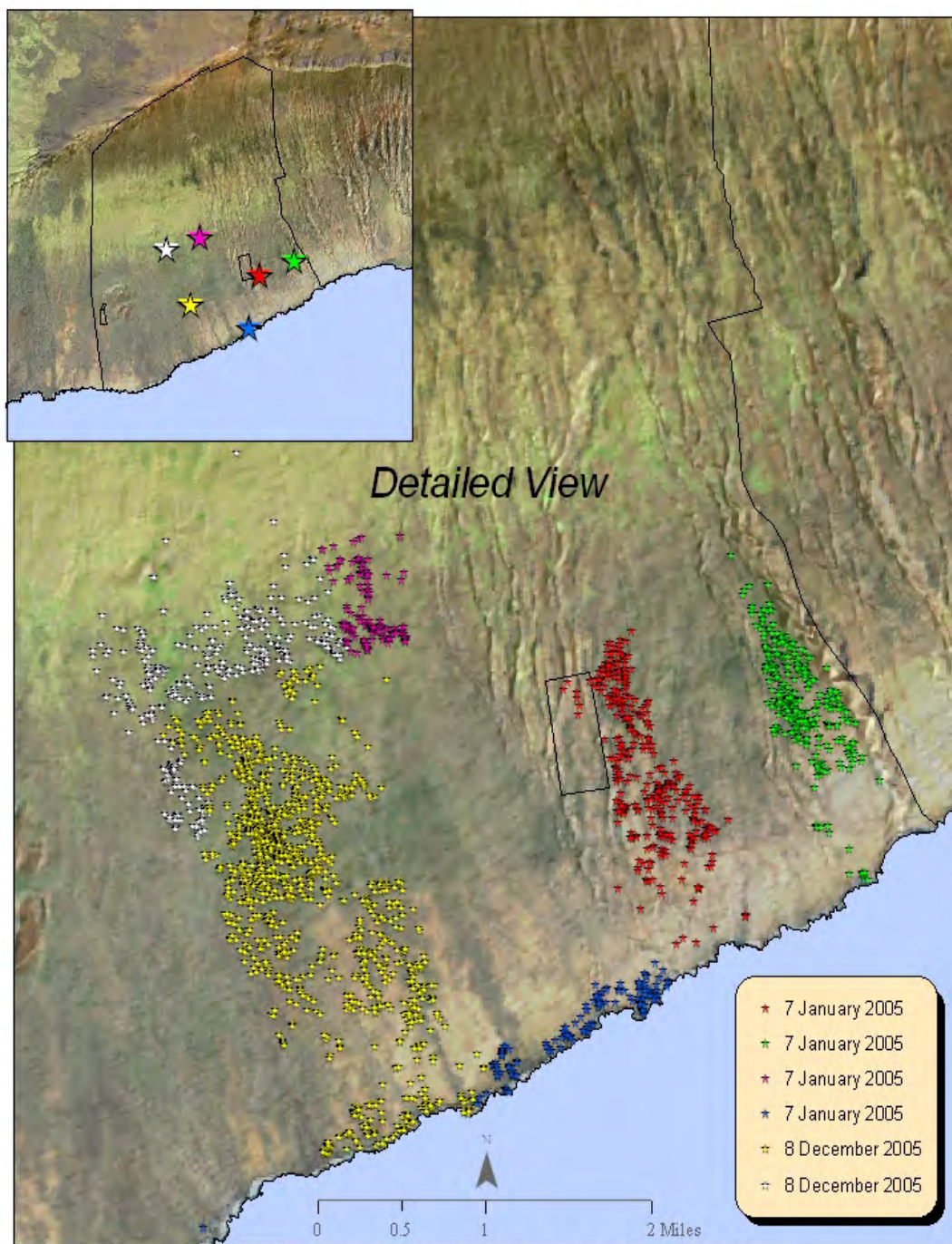
Archeology:

In addition to endangered plant life, there are thousands of archeological sites within the Kahikinui ahupua'a, including 26 heiau (sacred temples.) With its isolated and rugged location, Kahikinui is one of the few, if not the only place in Hawaii where the archeological landscape is still relatively untouched. Archeologists from around the country study Kahikinui for its rich archeological history. Remnants of dwellings and temples dating to the twelfth century have been documented in the ahupua'a and it is estimated there were roughly 8,000 Hawaiians living in the community in the 1700s.

The importance of this archeological treasure trove cannot be overstated. Nowhere else on Maui is an entire ahupua'a in relatively pristine archeological condition. While the community recognizes that preservation of life is foremost during wildfires, the use of dozers and other heavy equipment is a concern in fire suppression because many archeological sites are in close proximity to roadsides. Any future mitigation projects within the ahupua'a will need to keep archeological preservation in mind. Figure 5 shows just some of the recently documented archeological locations.

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Archaeological Surveys



Prepared for The Department of Hawaiian Home Lands by: C. Perry, February 2008
Data Sources: Professor Patrick Kirch of the Oceanic Archaeology Laboratory, University of California, Berkeley,
<http://hawaii.gov/obedt/gis/>; and <http://hawaii.wr.usgs.gov/maui/data.html>

Fig

inset map shows clusters of sites. For example: the red star signifies 359 sites in the Mehamenui portion; the yellow star represents 1,418 sites in Kipapa; the green star denotes 351 sites at Manawainui; the purple star denotes 146 sites at Nakeohu; the blue star represents 166 sites at Nakeohu; and the white star represents 419 sites at Kipapa.

s. The

Fire History:

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Maui County Fire Department is responsible for fire suppression in the district. The nearest fire station is in Kula, 19 miles away (a nearly 45-minute drive) and houses two apparatus: a pumper with a 750-gallon tank capacity and a utility truck (Chevy Blazer). There are reported to be five reservoir ponds in Kahikinui (condition unknown) that have the potential to hold approximately one million gallons of water when full.

According to Maui County Fire Department data, between January 2000 and December 2006 17 wildfires in Kahikinui burned more than 7,500 acres. Of these blazes, 14 were of undetermined cause, 2 were caused negligently, and 1 was unintentional.

Given the area's arid conditions, rough terrain, and strong winds, wildfires in Kahikinui can grow rapidly. In September 2006 four separate roadside fires were reported at 11 p.m. on a Saturday night. The fires quickly spread and became one large fire. By Monday the wildfire had grown to 5,500 acres, requiring the suppression efforts of three helicopters and 60 firefighters. The blaze forced the closure of Piilani Highway between Ulupalakua and Oheo Gulch and came dangerously close to several homes.

A 2,500-acre fire in July 2003 burned for more than a month in inaccessible terrain and could only be suppressed with the use of helicopters.

In the 2006 fire, residents self-evacuated before police notified them they had to leave. Residents in the lower portion of Kahikinui were able to evacuate, but a resident in the upper portion of Kahikinui had to be evacuated by helicopter because flames had blocked the main entrance road as he tried to escape.

In terms of natural or man-made disasters, wildfires are the most frequent threat to Kahikinui. Given the rugged location, wildfires can spread quickly, burning thousands of acres and threatening area homes. In contrast, tsunamis would have little impact on the community since residents are upland, and while the region is susceptible to hurricanes and earthquakes, these events occur quite rarely. However, flash floods are an issue in the area as they wash out sections of the main road in the residential area.

Stakeholders:

Stakeholders are individuals or groups who have a high level of interest in the protection of their assets from wildfire. The residential portion of Kahikinui encompasses 1,340 acres and lies within a wildland urban interface zone. In addition to community members and fire response agencies, landowners that border Kahikinui, such as Haleakala National Park, Ulupalakua Ranch, Haleakala Ranch, and the State of Hawaii have an interest in reducing the wildfire risk in Kahikinui. Contact information for principal stakeholders is listed below.

Federal:

Haleakala National Park / Hawaii Volcanoes National Park

Joe Molhoek, Pacific Island Fire Management Officer

P.O. Box 52

HNP, HI 96718

(808) 985-6042

Joe_Molhoek@nps.gov

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State:

Department of Hawaiian Home Lands

Linda Chinn, Administrator, Land Management Division
P.O. Box 1879
Honolulu, HI 96805
(808) 620-9450

Department of Hawaiian Home Lands

Maui District Office
655 Kaunualii Street, Suite 1
Wailuku, HI 96793
(808) 760-5120

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

Wayne Ching, State Protection Forester
1151 Punchbowl Street, Room 325
Honolulu, HI 96813
(808) 587-4173

Wayne.F.Ching@hawaii.gov

County:

Maui County Department of Fire and Public Safety

Fire Chief Jeff Murray
200 Dairy Road
Kahului, HI 96732
(808) 270-7561
Jeff.Murray@co.maui.hi.us

Maui County Civil Defense Agency

Gen Iinuma, M.P.H., Administrator
200 High Street, 1st Floor
Wailuku, HI 96793
(808) 270-7285
gen.iinuma@co.maui.hi.us

Community:

Ka 'Ohana O Kahikinui (KOOK)

'Aimoku Pali Sr., KOOK Board President
P.O. Box 1132
Kula, HI 96790
(808) 760-3028

Additional Stakeholders:

Haleakala Ranch

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Greg Friel
529 Kealaloa Avenue
Makawao, HI 96768
(808) 572-1500

Kahikinui Game Land Management Ohana (KGLMO)

Kawika Davidson, KGLMO President
685 Akaku Street
Wailuku, HI 96793
(808) 269-0699

Leeward Haleakala Watershed Restoration Partnership

Art Medeiros, Ph.D., Coordinator
P.O. Box 652
Makawao, HI 96768
auwahi@yahoo.com

Living Indigenous Forest Ecosystems (LIFE)

Walter Kanamu
President
27 Ho'ehaili Way
Wailuku, HI 96793
(808) 760-8224

Sandwich Isles Communications Inc.

Rodney Kaulupali, General Manager
1001 Bishop Street, Pauahi Tower, 27th floor
Honolulu, HI 96813
(808) 524-8400

Ulupalakua Ranch

Sumner Erdman
HC 1 Box 901
Kula, HI 96790
(808) 878-1202

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Base Map of Kahikinui:

The areas containing critical human infrastructure i.e. houses, are in the residential area of the ahupua'a. Areas of community importance include: The Kahikinui House, Hale Pili, Hale Malama, Sandwich Isles Communications Center, various archeological sites, and native forests. Figure 6 depicts the boundary of the community.

Kahikinui, Maui

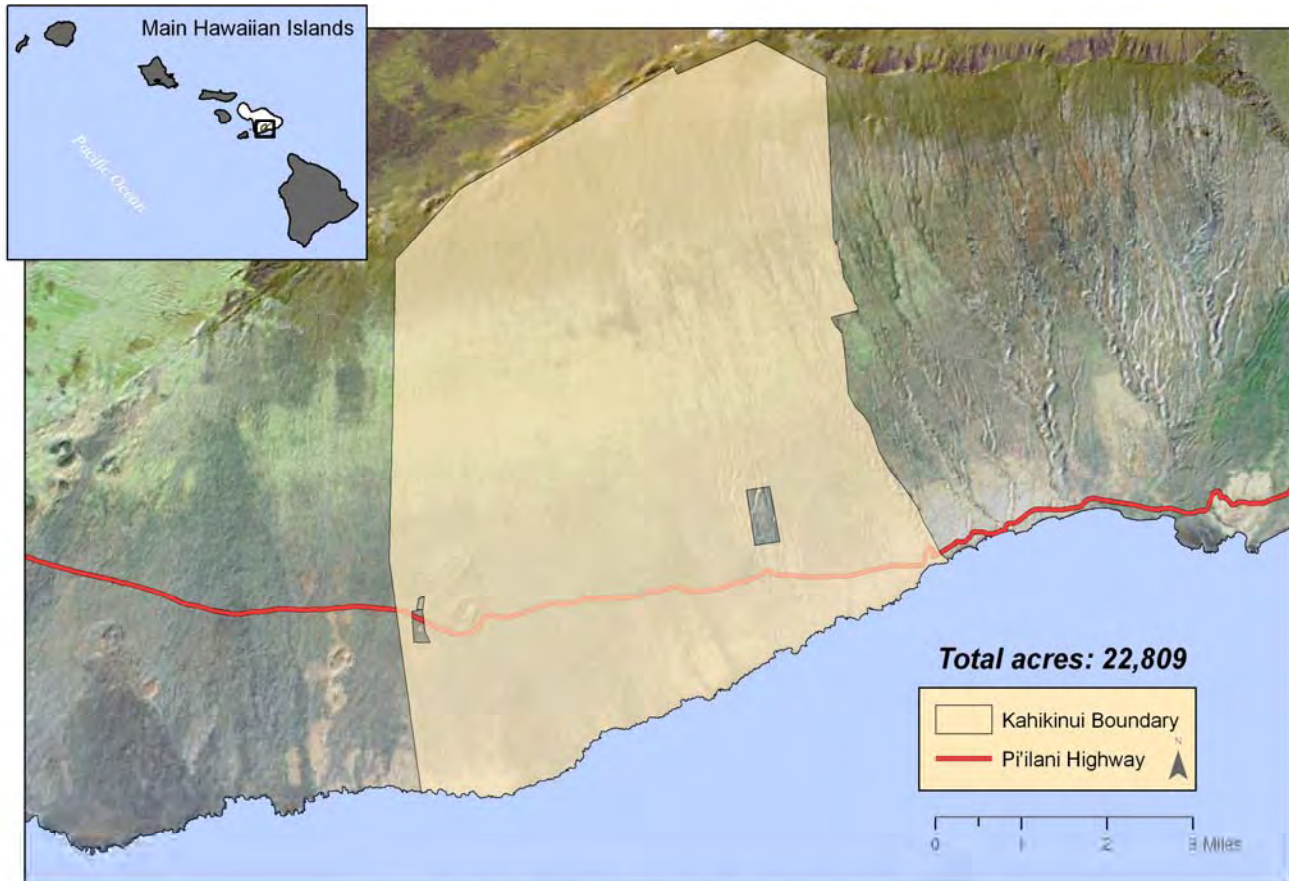


Figure 6: area of consideration for the Kahikinui CWPP.

Fire Risk Assessment for Kahikinui:

The Kahikinui community encompasses an entire ahupua'a from sea level to an elevation of 10,000 feet. There are no commercial districts within the community. The residential area of Kahikinui is composed of 104 house lots spread out across approximately 1,340 acres ranging from the 1,200- to 4,200-foot elevation on the mauka side of the highway. Lots vary between 10 and 17 acres. Of the 104 house lots, 75 leases have been awarded and 9 families live in Kahikinui. There are 25 structures within the residential village, including the Sandwich Isles Communications Center (a windowless structure serving as an equipment substation) and an outdoor pavilion made of stone pillars and a metal roof that serves as the community center.

The Hale Pili, a three-walled meeting area with a metal roof on the makai side of the highway; Hale Malama, a structure for community use; and the historic Kahikinui House round out the additional structures in the CWPP project area. There are no schools, commercial businesses, industrial facilities,

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gas stations, or other facilities within the area. St. Ynez church, abandoned in the 1860s, is not in use today.

Structures within the Kahikinui residential village are composed of post and pier or concrete slab construction. While some houses have non-combustible siding, the majority of houses have



Left and right: houses within the residential area of Kahikinui. Some are post and pier construction while others are built on a concrete slab. The majority of homes have at least 30 feet of defensible space around the house.

noncombustible roofing and combustible (wood) siding. Since the entire ahupua'a is on the side of a volcanic mountain, the residential village is by definition on a slope with hilly areas and gulches throughout the ahupua'a. Rugged hills and steep ravines are a concern because they can channel fire within the community. Some structures are within 30 feet of steep slope, and while slope in some areas can be as steep as 20-30%, most houses are built on a flat area within the lot. The majority of the homes have at least 30 feet of defensible space, although some structures have vegetation growing within 30 feet of the structure.

Lot numbers are visible on the front gates of driveways making them easily identifiable in case of an emergency. Driveways for house lots average more than 300 feet long and driveway entrances tend to be paved with cement for only the first 20-50 feet. Some house lots have locked metal gates at the driveway entrances. Locked gates have the potential to hinder first responders from accessing the property in times of emergencies. However most emergency vehicles would be unable to enter individual house lots, as the main road is only accessible by four-wheel drive vehicles.

There are vast open grasslands as far as the eye can see in Kahikinui that harken from the days when the land was used for ranching. Wild cattle, goats, and pigs can be found in the forested area of the ahupua'a above the house lots and are actively managed by licensed groups, such as KGLMO. There is no organized grazing within the residential area although grazing occurs outside the residential area. Neighboring Ulupalakua and Haleakala Ranches conduct grazing to the east and west of the ahupua'a respectively.



Rolling hillsides spread as far as the eye can see in Kahikinui. The open lands are filled with native and invasive shrubs and grasses.

There is no county water system and therefore no fire hydrant system in Kahikinui. Residents rely on catchment water and haul their own water for drinking and household purposes. Residents can usually only haul about 200 gallons of water at a time given the rough terrain and weight of the water. Five inactive reservoirs are within the ahupua'a and have the potential to be improved and

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used for fire suppression purposes. There are also no energy utilities in the community, with residents relying on generators and solar power for electricity.

Given its dry and isolated location, there is a great deal of wildland urban interface in Kahikinui. The area receives an average of 15 inches of rainfall annually and is buffeted by strong winds that shear around Haleakala. Vegetation includes koa and sandalwood trees found in the upper forest, as well as iliahi and wilwili trees. There is an abundance of native and invasive shrubs and grasses in the area, including scrub kiawe, kikuyu grass, lantana, and gorse. Homes throughout the Kahikinui residential area contain mature vegetation, including trees, shrubs, and plants. Some homesteaders have planted dozens of native koa trees around their property.

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 and the past president of KOOK on November 27, 2007 to identify the level of wildland fire risk of Kahikinui. The Firewise Coordinator and Maui Fire Department personnel also conducted a wildfire hazard assessment in July 2003.

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 assigned regarding overall terrain and location, road width, local 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 rugged terrain, strong winds, lack of water, difficulty in traversing egress routes, and preponderance of high-intensity burning vegetative fuels in close proximity to structures, Kahikinui scored in the high-risk range of the Wildland Fire Risk and Hazard Severity Assessment, a copy of which can be found in Appendix A.



Maui Fire Department personnel from Kula station and a Kahikinui resident survey the land during a wildfire hazard assessment in July 2003.

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

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 Kahikinui community that would be adversely affected by wildfire.

Commercial resources:

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- Sandwich Isles Communications Center

Historical resources:

- The Kahikinui House and the ruins of St. Ynez church are historical resources. 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:

- Kahikinui is home to thousands of archeological sites, including 26 documented heiau.
- Native Hawaiian endangered animals found in Kahikinui include the Blackburn's hawk moth (*Manduca blackburni*), which is found only on Maui in coastal and dry areas. Native Hawaiian owls are known to have nesting spots in upper elevations of the ahupua'a.
- Endangered native plants found in the ahupua'a include ko'oko'olau (*Bidens micrantha kalealaha*), mint (*Phyllostegia mollis*), asplenium-leaved diellia (*Diellia erecta*), shrubs such as Wawae'iole (*Phlegmariurus mannii*), and the Lanai sandalwood tree (*Santalum freycinetianum var. lanaiense*). Kahikinui is one of two places in the world where the tree 'Oha wai (*Clermontia lindseyana*) can be found.
- Remnant forests of sandalwood, koa, and iliahi trees are considered by the community to be both an economic and natural resource. Members of the Leeward Haleakala Watershed Restoration Partnership are working on mapping the GPS coordinates of these natural resources. While the location of such natural resources may be known to residents and Ulupalakua Ranch employees, (and therefore known to need protection during a wildfire), responding Maui County firefighters may not know the locations of these important resources.

Economic resources

- Cattle: both wild and those grazed by neighboring ranches, when managed properly, can be considered an economic resource.

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 Kahikinui are high-intensity fuels, which burn quickly and can rapidly spread fire to other fuels, such as kiawe. The high-fire hazard in this area is demonstrated by a history of large wildfires in the region. Open lands filled with a mixture of flammable grasses and kiawe trees encompass Kahikinui. While most homes have fire resistant roofing, a number of homes in the Kahikinui residential village have wood siding and lanais (decks), further enhancing the fire problem.

Previous mitigation efforts undertaken in Kahikinui

Kahikinui residents and KOOK members are well aware of the wildfire risk to their community and in recent years have been taking steps to reduce that risk.

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In August 2003 the community held a multi-agency meeting to explore the idea of developing a fire plan for the community. Meeting attendees included representatives from the Maui County Fire Department, Hawaii State Division of Forestry and Wildlife (DOFAW), Department of Hawaiian Home Lands, Ulupalakua Ranch, and Haleakala National Park.

Firewise presentations were made to the KOOK Board of Directors, as well as the general community in the Fall 2003. A Firewise workshop was held for Kahikinui residents in December 2003. Seven residents attended, as well as personnel from Maui County Fire Department and DOFAW.

In April 2004 a community workday was held during which fuel load reduction (brush clearing) occurred along the main road, as well as along cement areas of interior roads within the community. During the same event a buffer zone of defensible space was created around Hale Pili on Piilani Highway. Eighteen lessees participated in this workday.

KOOK members have been in discussions with the County of Maui Department of Public Works Highways base yard to assist in roadside brush cutting, particularly between mile markers 22 and 26.

The Maui DOFAW office donated two three-foot by four-foot reflectorized Smokey Bear signs to KOOK to increase awareness of the wildfire hazard in the community, particularly to tourists driving through the area. One of these signs is posted at the 21 mile marker and the other is posted at the main entrance to the Kahikinui residential village.

In the past, KOOK members have applied for DHHL grant funding to create an emergency contingency fund for helicopter support from private helicopter companies in the event of a wildfire. Given Kahikinui's remote location and topography, as well as the size of recent wildfires, it is strongly recommended that such a contingency fund be established. Helicopters provide crucial initial response to wildfires in isolated areas and their use in tactical operations can prevent small fires from becoming large dangerous conflagrations. Should KOOK get the funding for such a fund, the Maui County Fire Department and the selected helicopter company would need to establish a Memorandum of Agreement (MOA) with the understanding that this contingency fund would only be used for fire suppression in Kahikinui.

Community Concerns for Kahikinui:

DHHL commissioned the CWPP because the agency is concerned about wildfire negatively impacting the community. Wildfires can potentially be caused by human error along the highway, i.e. tossed cigarettes, errant fireworks, and catalytic converters of cars parked in dry grasses. Wildfires can damage structures, as well as negatively impact the watershed, degrade native forests and wildlife habitat, and destroy cultural and historic areas. Multiple meetings with community members and fire

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agencies specifically on this CWPP held in November and December 2007 identified the most pressing wildfire concerns in Kahikinui. These include in order of priority:

1. Need to improve main access road within community, as well as improve the Jeep trail for use as a secondary emergency egress and fire break road.
2. Need for a buffer zone around the residential village.
3. Need of additional water resources for fire suppression.
4. Need for dedicated landing zones for helicopters for fire suppression purposes.
5. Need to save dryland forests.
6. Need for buffer zones along Piilani Highway, cutting grass back 10-20 feet from roadsides.
7. Need for continuing public education: remind residents to create and maintain 30-100 feet of defensible space around their home.
8. Identify evacuation routes.
9. Need for campfire protection measures.
10. Need for development of a Community Emergency Operation Plan.
- 10a. Need for a Community Evacuation Plan.
11. Residents want to become better prepared to deal with emergencies.
- 11a. Need for better communications among residents during emergencies, i.e. use of ham radios.
12. Need for equipment/machinery to use in fuel mitigation projects, such as a chipper; a truck to haul the chipper to Kahikinui; a tractor mower (one of the lessees has volunteered use of his tractor); and a low boy to haul tractor from Wailuku to Kahikinui.

Recommended Action for Kahikinui:

Multiple meetings with community members and fire agencies specifically on the CWPP process in November 2007 identified the most pressing fire concerns in Kahikinui. These include in order of priority:

1. Improvement of, i.e. paving, main entrance road in residential village. Improvement of Jeep access trail as a secondary means of emergency egress.
2. Creation and maintenance of a buffer zone / fuel break around entire 1,340-acre residential settlement.

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A fuel break of such size would require tremendous man-hours and maintenance. It is therefore recommended that KOOK consider partnering with a neighboring ranch to graze a buffer zone around the residential settlement.

- 2a. Creation and maintenance of a fuel break along fence line being installed by Art Medeiros of the Leeward Haleakala Watershed Restoration Partnership.
3. Increase utilization of current reservoirs and/or installation of dip tanks. These water resources could be fed by seasonal rains from nearby gulches and/or runoff from the Communications Center.
 - 3a. Developing wells or damming narrow gulches are other possibly means of increasing water reservoir resources.
 - 3b. Installation of a fog catcher to catch water in the upper forest area.
4. Creation of dedicated landing zones for helicopters for fire suppression purposes.
- 4a. Creation of a contingency fund to hire private government-certified helicopters during wildfires.
5. To save dryland forests during wildfires, KOOK members are encouraged to meet with Maui County Fire Department officials for pre-incident planning meetings to make fire officials aware of sensitive ecological areas.
6. Work with Maui County Department of Public Works to ensure Piilani Highway roadsides are mowed, particularly in the dry summer months. (Maui County Fire Department Chief said he would contact DPW and make this request.) When KOOK members conduct community workdays clearing roadside brush, it should be cleared a minimum of 10-20 feet.
7. Reduction of fuel load around individual properties. Increase awareness among homesteaders of the need to create defensible space with Firewise tips in community newsletter. Hold a fire prevention awareness event at least once a year.
8. Install metal reflectorized signs showing evacuation routes within the residential village.
9. Increase awareness among hunters of risk of wildfires from guns and/or campfires through informational sessions and outreach with KGLMO members.
10. Develop a Community Emergency Operation Plan. This would include identifying points of contact for ham radio operators, as well as learning how to use ham radios and the purchase of the equipment. [KOOK members may wish to contact the Ocean View Disaster Preparedness Committee in Hawaiian Ocean View Estates (HOVE) on the Island of Hawaii who instituted a similar plan utilizing block captains and ham radio operators for their community.]
11. Community Emergency Response Training (CERT) is recommended for KOOK members.
 - 11a. Build a fire tower lookout on Lot #75. Such a fire tower would require staffing by a predetermined agency or group and the securing of funding for such staff.
12. KOOK may want to look into the feasibility of using grant funding to rent a chipper and tractor mower during periodic community workdays.

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

Community at risk	Type of Treatment	Method of Treatment	Overall Priority
Kahikinui	Mechanical	Improvement of main access road. Improvement of Jeep trail as a secondary emergency egress.	Very High
	Mechanical / Grazing	Buffer zone around residential village.	Very High
	Mechanical	Need for additional water resources.	Very High
	Mechanical	Creation of dedicated helicopter landing zones.	High
	Hand Labor	Save dryland forest.	High
	Mechanical / Chemical / Hand Labor	Creation/maintenance buffer zone along Piilani Highway.	High
	Hand Labor / Chemical	Creation of defensible space around community homes.	High
	Education	Identify evacuation routes with signage.	Medium
	Public Education and Outreach	Need for campfire protection measures.	Medium
	Public Education and Outreach	Develop a Community Emergency Operation Plan.	Medium
	Public Education and Outreach	Community CERT training.	Medium
	Mechanical	Need for equipment/machinery to use in fuel mitigation projects.	Medium

Community, federal agencies, and private landowners surrounding Kahikinui 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.

Community, structure or area at risk	Project	Agency	Funding Needs	Timetable	Community Recommendation
Kahikinui	Improvement of main access road. Improvement of Jeep trail as a secondary emergency egress.	DHHL/ Others	Cooperative & Grant Funding Estimated cost: \$4 million DHHL intends to budget \$100,000 annually for Kahikinui road improvement. Total estimated cost of road improvement is \$4 million.	2008-2011	Yes
	Grazing of buffer zone around residential village.	KOOK / neighbor ranches	Cooperative Funding Estimated cost: _____) NRCS can do cost	2008-2010	Yes

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			sharing of creating fuel breaks. (Contact Neil Fujiharata, NRCS)		
	Need for improving current reservoirs and installing additional water resources.	Multiple agencies	Cooperative & Grant Funding Estimated cost: \$20,000 per dip tank	2008-2010	Yes
	Creation of dedicated helicopter landing zones.	DHHL / KOOK / Private	Cooperative & Grant Funding Estimated cost: \$	2008-2010	Yes
	Creation of buffer zone along Piilani Highway	Maui County / KOOK	County / Grant Funding Estimated cost: \$	2008-2010	Yes
	Creation of defensible space around community homes	KOOK	Individual Estimated cost: \$ minimal	2008-2010	Yes
	Identify and clearly mark evacuation routes with metal reflectorized signage.	DHHL / KOOK	Cooperative & Grant Funding Estimated cost: \$	2008-2010	Yes
	Need for campfire protection measures.	KOOK / KGLMO	Estimated cost: \$	2008-2010	Yes
	Develop a Community Emergency Operation Plan. Purchase ham radios; build and staff fire tower.	DHHL / KOOK / private	Grant Funding Estimated cost of radios: \$ Estimated cost of building fire tower: \$	2008-2010	Yes
	Community CERT training.		Free to community members	2008-2010	Yes
	Need for equipment/machinery to use in fuel mitigation projects.	KOOK / private	Grant Funding Estimated cost: \$	2008-2010	Yes

Reduce Structural Ignitability:

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

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- Create a buffer zone of defensible space around a property of at least 30 to 100 feet. 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.

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Appendix A:

Please see below the Hawaii Wildland Fire Risk and Hazard Severity Assessment Form conducted for Kahikinui, Hawaii.

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: Kahikinui, Maui Hawaii
Assessment Conducted by: Denise Laitinen, Firewise Coordinator 11/27/07

Element	Possible Points	Points Given	NOTES
A. Means of Access			
1. Ingress and egress			
a. Two or more roads in/out	0		
b. One road in/out	7	7	
2. Road width			
a. Greater than 24 ft.	0		
b. Greater than 20 ft. but less than 24 ft.	2		
c. Less than 20 ft.	4	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		
d. Non-surfaced road, grade greater than 5%	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	2	
c. Less than 300 ft. with no turnaround	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	
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			
a. Trees are spaced 10 ft. apart, low flammability plants are low lying and	0		

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carefully spaced. Ladder fuels have been removed.			
b. Fuel breaks exist: i.e. driveways, pools, gravel walkways, lawns within 30 ft. of structure	0	0	varies
c. Area around structure has no fuel breaks	3		
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	varies
e. Vegetation has not been maintained	10		
C. Topography within 300 feet of structure			
1. Slope 0-9%	1		
2. Slope 10%-20%	4		
3. Slope 21%-30%	7	7	varies
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	4	
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	0	
4. Topographic features that adversely affect wildland fire behavior	0-5	4	
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		
b. Vents, chimneys, and/or space under house is large enough for embers to enter	3	3	

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G. Available Fire Protection			
1. Water Source Available			
a. Pressurized water source availability			
Hydrants (500 gpm) are <1,000 feet apart	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		
Less than 250 gpm continuous for 2 hours	5		
c. Water unavailable	10	10	
3. Organized Response Resources			
a. Fire station is 5 or less miles from structure	1		
b. Fire station is more than 5 miles from structure	3	3	
H. Placement of Gas and Electric Utilities			
1. Both utilities are underground	0		
2. One utility is underground, one aboveground	3	3	Phone underground
3. Both are above ground	5		

Total points: 93

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

Hazard Assessment:	Total Points:
1. Low Hazard 0-37	3. High Hazard 68-110
2. Moderate Hazard 38-67	4. Extreme Hazard 111+

Appendix B: Project List 2010-2012

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

Community or area at risk	Project	Agency	Funding Needs	Timetable	Community Recommendation?
Kahikinui	Improvement of main access road. Improvement of Jeep trail as a secondary emergency egress.	Others	Cooperative & Grant Funding Estimated cost: \$4 million DHHL intends to budget \$100,000 annually for Kahikinui road improvement. Total estimated cost of road improvement is \$4 million.	2008-2011+	Yes
	Maintenance grazing	DHHL /	Cooperative Funding	2010-	Yes

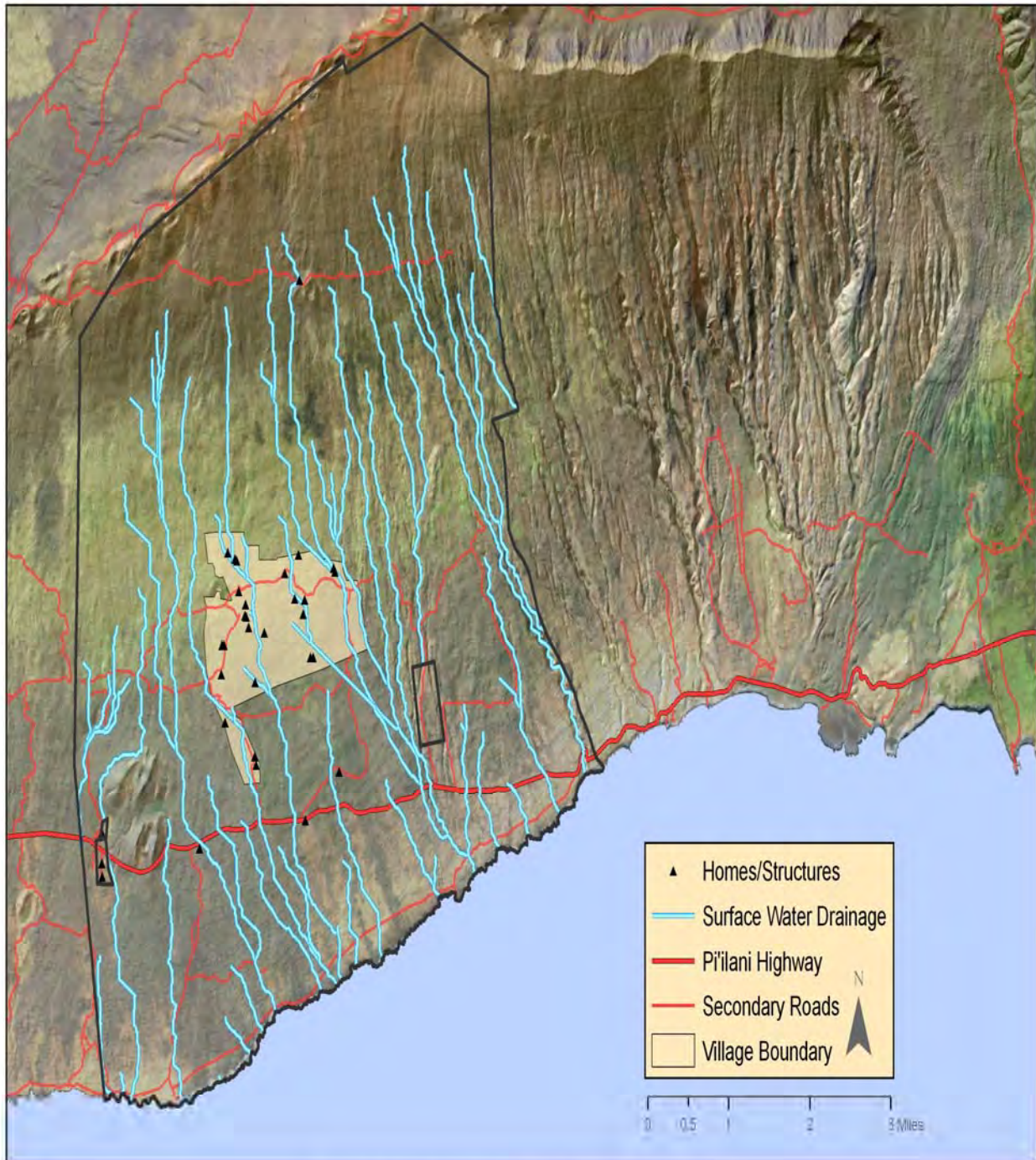
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	of buffer zone around residential village.	KOOK / neighbor ranches	Estimated cost: _____) NRCS can do cost sharing of creating fuel breaks. (Contact Neil Fujiharata, NRCS)	2012+	
	Need for additional water resources. Maintenance of water sources.	Multiple agencies	Cooperative & Grant Funding Estimated cost: \$20,000 per dip tank	2010-2012+	Yes
	Maintenance of dedicated helicopter landing zones.	KOOK / Private	Cooperative & Grant Funding Estimated cost: \$	2010-2012+	Yes
	Maintenance of buffer zone along Piilani Highway.	Maui County / KOOK	County / Grant Funding Estimated cost: \$	2010-2012+	Yes
	Maintenance of defensible space around homes.	KOOK	Estimated cost: \$	2010-2012+	Yes
	Campfire safety awareness program.	KOOK / KGLMO	Estimated cost: \$	2010-2012+	Yes
	Maintenance of Community Emergency Operation Plan. Maintenance of ham radios, fire tower.	KOOK / private	Grant Funding Estimated cost of radios: \$ Estimated cost of fire tower: \$	2010-2012+	Yes
	Refresher of Community CERT training.		Free to community members	2010-2012	Yes
	Maintenance of equipment/ machinery for fuel mitigation projects.	KOOK / private	Grant Funding Estimated cost: \$	2010-2012	Yes

Appendix C: Kahikinui Surface Water Drainage & Watershed Boundaries Maps

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Kahikinui Surface Water Drainage

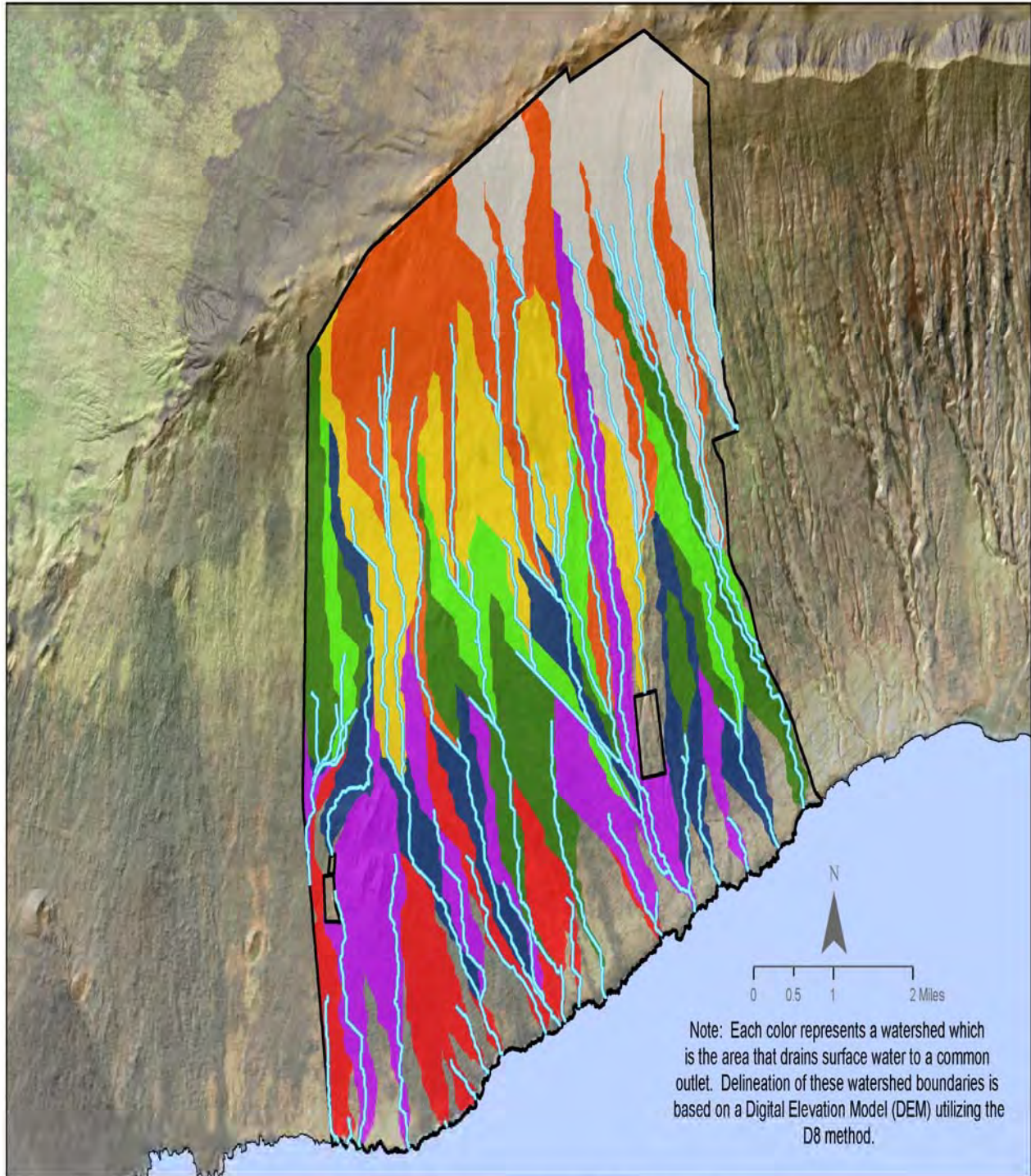


Prepared for the Department of Hawaiian Home Lands by: C. Perry, February 2008

Data Sources: <http://hawaii.gov/dbedt/gis/>, <http://hawaii.wr.usgs.gov/maui/data.html> and DEM: USGS National Elevation Dataset (NED)

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Kahikinui Watershed Boundaries



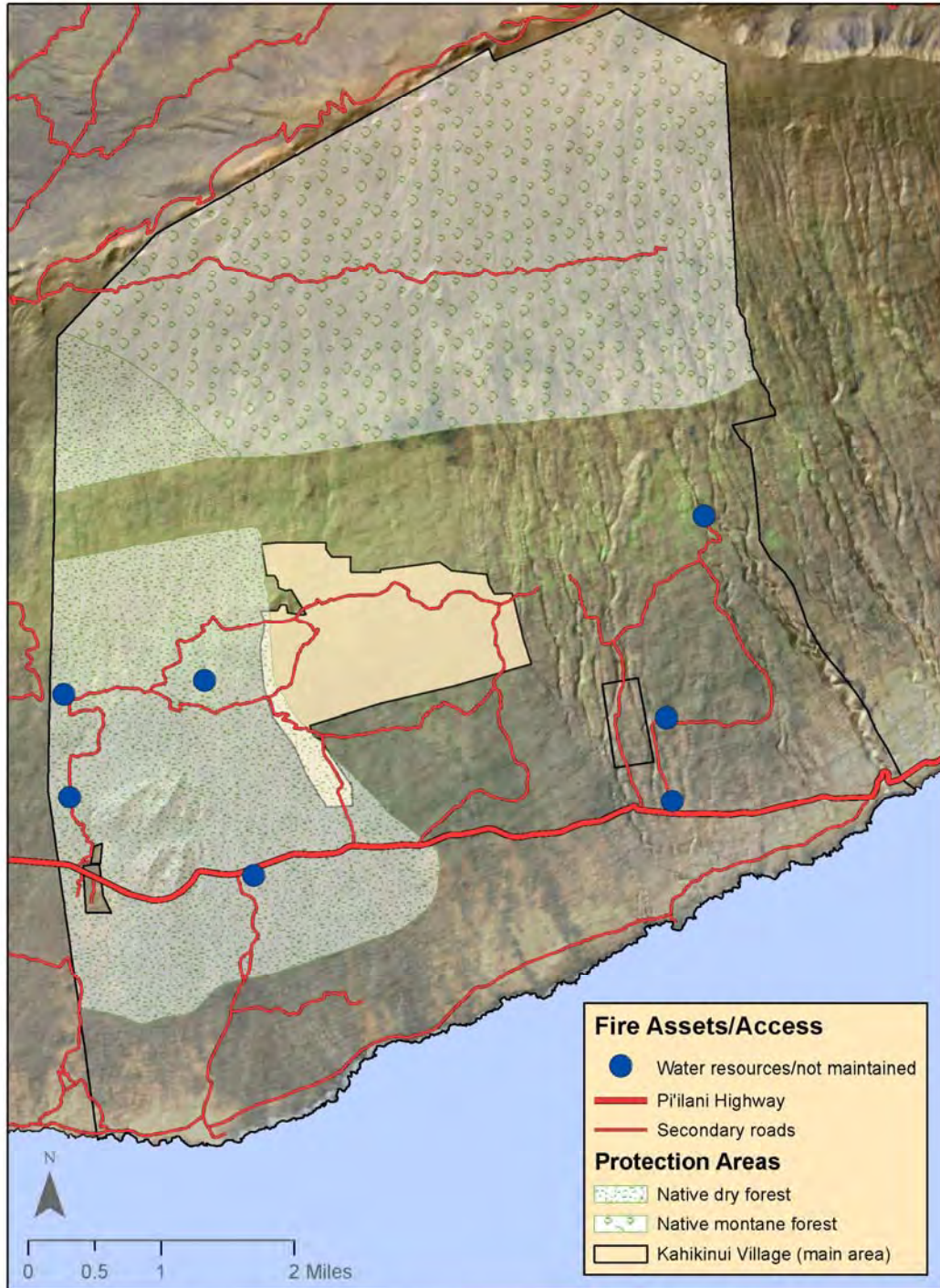
Prepared for the Department of Hawaiian Home Lands by: C. Perry, February 2008

Data Sources: <http://hawaii.gov/dbedt/gis/>, <http://hawaii.wr.usgs.gov/maui/data.html> and DEM: USGS National Elevation Dataset (NED)

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Appendix D: Maps of Fire Assets and Protection Areas & Possible Fuels Buffer

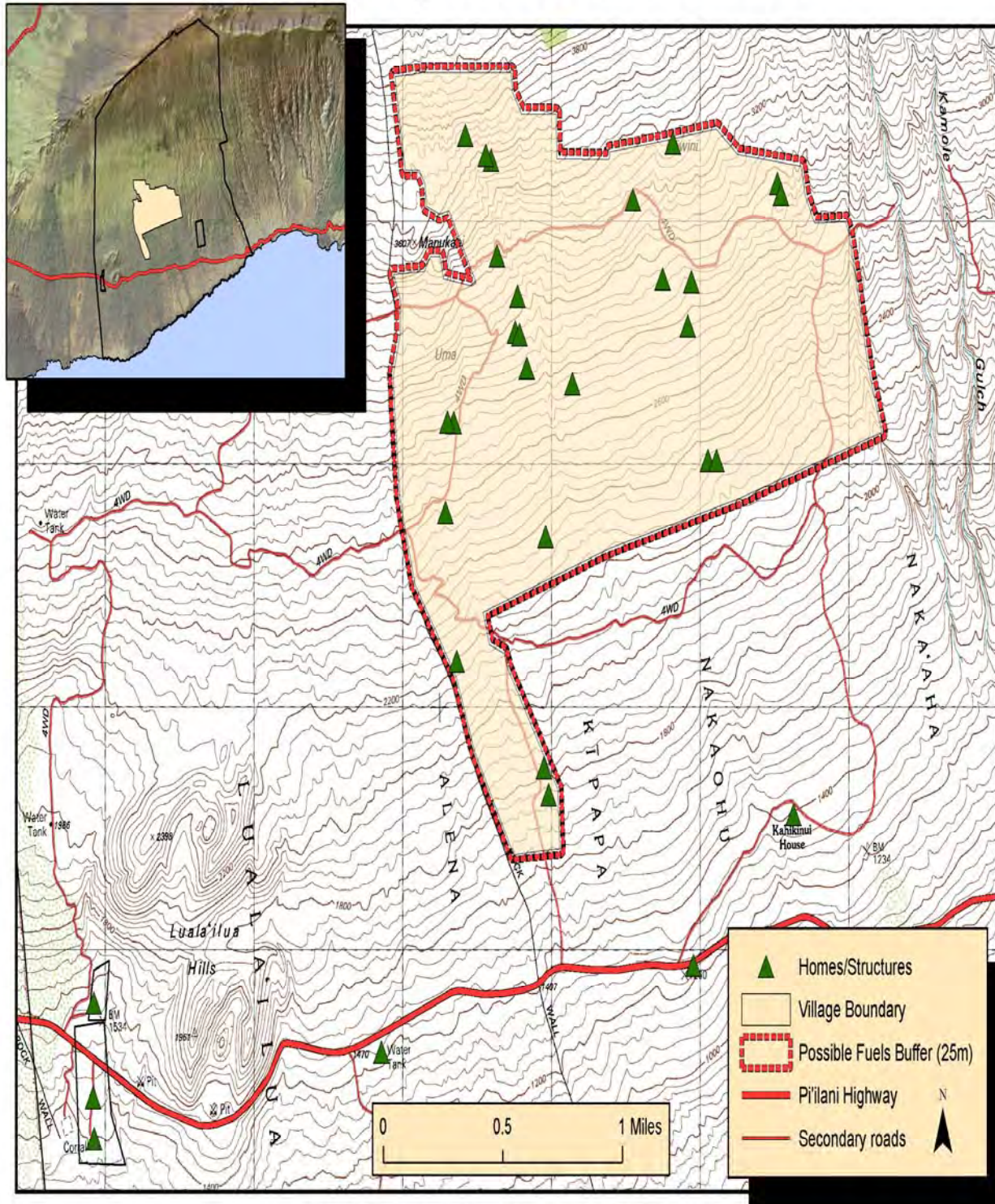
Fire Assets/Access and Protection Areas



Prepared for the Department of Hawaiian Home Lands by: C. Perry, February 2008

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Kahikinui Village and Possible Fuels Buffer



Prepared for the Department of Hawaiian Home Lands by: C. Perry, February 2008

Data Sources: <http://www.state.hi.us/dbed/gis/index.html> and <http://hawaii.wr.usgs.gov/maui/data.html>

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Appendix E: List of Potential Grant Resources

Below is a list of potential grant sources to help fund mitigation projects described within this CWPP. The list is by no means exhaustive and community groups seeking potential grant funding should research additional grant-funding sources available to them.

Grant Program	Deadline	Contact Information	Matching Funds Required?
<p>State Fire Assistance Grants. Funds target hazard mitigation in the wildland urban interface for mitigating risks of hazardous fire conditions through hazardous fuels reduction, information and education, and homeowner and community defensible space treatments.</p>	<p>September 11, 2008 for 2009-2010 competitive funding</p>	<p>Division of Forestry and Wildlife Attn: Wayne Ching, 1151 Punchbowl St., Rm. # 325 Honolulu, HI 96813 (808) 587-4173 Fax: (808) 587-0160 http://www.state.hi.us/dlnr/dofaw/fmp/wui0809.htm</p>	<p>Yes: 50/50 match</p>
<p>FM Global Prevention Grants Through their new Fire Prevention Grant Program, fire departments, national, state, regional, local and community organizations can apply for funding to support a wide array of fire prevention, preparedness and control efforts, including:</p> <ul style="list-style-type: none"> • Pre-fire planning for commercial, industrial and institutional facilities • Fire and arson prevention and investigation • Fire prevention education and training programs 	<p>Awarded quarterly.</p>	<p>www.fmglobal.com/page.aspx?id=01060200 or email: firepreventiongrants@fmglobal.com</p>	<p>No</p>
<p>Department of Homeland Security (DHS) DHS grants include: Citizen Corps is the Department of Homeland Security's grassroots initiative that encourages citizens to play a role in hometown security through personal preparedness and coordinated by over 1,200 local Citizen Corps Council nationwide. Grant funding supports Citizen Corps Councils in efforts to engage citizens in personal preparedness, exercises, ongoing volunteer programs, and surge capacity response, in order to better prepare citizens to be fully aware, trained, and practiced on how to prevent, protect/mitigate, prepare for, and respond to all threats and hazards. This program provides funding on a formula basis to all 56 states and territories. Other Homeland Security Grant Programs include:</p>		<p>www.dhs.gov/xgovt/grants/index.shtm</p> <p>MG Robert Lee Adjutant General 3949 Diamond Head Rd. Honolulu, HI 96816-4495 808-733-4246 www.scd.state.hi.us</p>	

**Kahikinui Community Wildfire Protection Plan
September 2008**

<ul style="list-style-type: none"> • Infrastructure Protection Program • Regional Catastrophic Preparedness Grant Program 			
<p>Rural Fire Assistance Grants (RFA) The Dept. of the Interior receives an appropriated budget each year for a rural fire assistance (RFA) grant program. This funding enhances the fire protection capabilities of rural and volunteer fire departments through training, equipment purchases, and fire prevention work on a cost-shared basis. This program is primarily for rural departments serving populations under 10,000 that have responsibilities to provide mutual aid to Dept. of Interior lands (e.g., Tribal, National Parks etc.) The DOI assistance program targets rural and volunteer fire departments that routinely help fight fire on or near DOI lands. One of these four agencies administers those lands: Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), U.S. Fish and Wildlife Service (FWS) and the National Park Service (NPS).</p>	<p>Varies by state</p>	<p>Hawaii Volcanoes National Park Joe Molhoek Pacific Island Fire Mgmt. Officer PO Box 52, HNP, HI 96718 (808) 985-6042 Joe_Molhoek@nps.gov</p>	<p>The maximum award is \$20,000. This year RFA grants will require 90/10 cost-share.</p>

Community Wildfire Protection Plan for Kauai, Hawaii

Sponsored by the Kauai Fire Department
June 2009



Written by Denise Laitinen
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June 2009

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Appendix A: Fire Model of Ignition Component of Fuels and Fire Model Spread Component of Fuels

Appendix B: Places of Importance to the People of Kauai

Appendix C: List of Grant Resources

This Community Wildfire Protection Plan was made possible with the assistance of the Kauai Fire Department. The author would like to extend a sincere mahalo nui loa to the following people and agencies for their assistance: Chief Robert Westerman and Captain David Bukoski of the Kauai Fire Department, Roland Licono of the Department of Hawaiian Home Lands, and Kawika Smith of Hawaii State Division of Forestry and Wildlife. A very special mahalo nui loa to Francisco Garcia of Kauai Fire Department for his fire data assistance and Garrett Johnson of Kauai County GIS for researching and creating the GIS maps used in this project. Unless otherwise noted, all photographs courtesy of Denise Laitinen.

Cover photo: View of August 2005 Wailua wildfire. Photo courtesy of Kauai Fire Department.

June 2009

Kauai Community Wildfire Protection Plan Mutual Agreement Page

The Community Wildfire Protection Plan (CWPP) developed for the Island of Kauai, Hawaii by the Kauai Fire Department:

Was collaboratively developed. Interested parties and federal land management agencies managing land on Kauai Island 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 Kauai.

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
Administrator, Division of Forestry and Wildlife

Date

Robert Westerman
Fire Chief, Kauai Fire Department

Date

Mark Marshall
Administrator, Kauai County Civil Defense Agency

Date

Executive Summary:

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June 2009

Covering roughly 622 square miles, the Island of Kauai is the smallest of the four main Hawaiian Islands in terms of geographical size, as well as population with more than 63,000 inhabitants. Yet it has the highest concentration of endangered and threatened native Hawaiian plants and animals in the state.

Dominated by the sugar cane industry for more than a century, today on Kauai acre upon acre of once active agricultural land now lies fallow or is subject to residential development. With the exception of small industrial and commercial zones, virtually the entire Island of Kauai is in a wildland urban interface (WUI) environment—that is the line area or zone where

structures and other human development meet or intermingle with undeveloped wildland or vegetative fuel. These interface areas pose the highest risk of loss of life and property due to wildland fire.



Satellite map of Kauai. The island is 33 miles long and 25 miles wide although the bulk of the island's interior is inaccessible. Image courtesy of Kauai Fire Department.

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 can impact the watershed and the habitat of threatened and endangered native Hawaiian animals. Wildfires in Hawaii can also cause soil erosion, which has the potential to cause runoff that can negatively impact ocean reefs.

The overwhelming majority of wildfires in the state of Hawaii, and Kauai in particular, are caused by human error. Human error includes errant fireworks, rubbish, cooking, and agricultural fires, as well as vehicle-caused wildfires.

Principal stakeholders who have an interest in protecting Kauai from wildfire include the Kauai Fire Department, the State Division of Forestry and Wildlife (DOFAW), Kauai County Civil Defense Agency, Department of Hawaiian Home Lands (DHHL), U.S. Fish & Wildlife Service (USFWS), large landowners and farmers, such as Grove Farm and Kauai Coffee Company, as well as residents themselves. These stakeholders were invited to participate in the development of this Plan.

A wildfire risk hazard assessment determined that the WUI areas around the island have a high risk of wildland fire. Since 2000, roughly 30% of all fires that occur annually on Kauai are wildfires. These wildfires have closed major highways, and threatened homes.

This CWPP encompasses the entire island of Kauai. Community meetings were held in June 2008 in Kapa'a, Waimea, and Lihue. Interagency fire service meetings were held between June 2008 and June 2009. Meetings with community members and fire agency personnel identified 12 priority mitigation measures that can reduce the wildfire risk on Kauai, as well as improve community safety. These include: 1) Installing and maintaining firebreaks along the Wailua Corridor; 2) Reducing fuel load along the Wailua Corridor; 3) Implementing grazing practices in Anahola and increasing grazing around the perimeter of Wailua Homesteads; 4) Maintaining and increasing the use of current reservoirs around the island; 5) Continuing general public fire prevention education, such as the need for defensible space particularly in Kokee, Anahola, Wailua, Hanamaulu, Koloa, Waimea, and Kapa'a; 6) Implementing community chipping days to encourage fuel load mitigation and green waste recycling; 7) Increasing the use of fire-resistant building materials in new residential development; 8)

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Implementing Firewise recommendations in the planning process, such as multiple means of ingress/egress and fuel-breaks around all new residential subdivisions; 9) Creating secondary emergency access roads in residential areas where necessary; 10) improving communication between state, federal, and county agencies during wildfires; 11) purchasing a refurbished light-response brush truck to be staged in Kokee; and 12) installation of fire hydrants or stand pipes in Kokee.

Background:

Kauai is a place of extremes. The oldest (and northernmost) of the main Hawaiian Islands, Kauai is home to one of the wettest places on earth—the 5,148-foot Mt. Wai'ale'ale, which receives 460 inches of rain a year. A mere 15 miles away on the leeward coast, Kekaha receives only 20 inches of rain annually and experience strong trade winds.

Because the central interior of Kauai is home to steep inaccessible mountains, including Mt. Wai'ale'ale, Kawaikini, (5,243 feet), and the Na Pali coast (17 miles long with 4,000-foot cliffs), residential, commercial, industrial, and agricultural activities are found along the perimeter of the island. Due to the rugged 17-mile long Na Pali coastline, which encompasses 6,175 acres on northwest side of the island and is inaccessible to vehicles, there are no roads around the entire island. Rather the route around the island is one of a horseshoe shape ending at either end of the Na Pali Coast.

In addition to being shaped by geographic features, Kauai's economic history has also shaped the landscape of the island. Driving around the perimeter of the island on the one main highway (known as Kuhio Highway on the east side and Kaumuali'i Highway on the west), one encounters vast expanses of open land juxtaposed with small towns where the homes are sited in close proximity to each other.

Slope around the island varies by geography, although the overall terrain in the region naturally slopes from the mountains down to the sea. Gulches, as well as hills several hundred feet in elevation, dot the countryside. Because Kauai is the oldest of the main Hawaiian islands, rain has eroded mountains to steep cliffs, especially in the island's center. Some subdivisions, such as Hanapepe Residence Lots in Hanapepe and Wailua Riverview Estates in Wailua, have steep ridges bordering their community. Others, such as Lawai have gulches running through their communities.

Vegetation zones vary between grasslands, mixed forest, high-intensity developed, scrub/shrub, bare land, estuarine shrub/scrub, and low-intensity developed, among others. Communities and subdivisions on Kauai are often separated by vast expanses of open grasslands containing high-intensity burning fire fuels, including grasses and shrubs. Many of the grasses, such as molasses grass (*Melinis minutiflora*) and bear

grass (*Schizachyrium condensatum*), are fire-adapted and increase wildfire potential in the areas they invade.

The sugar cane industry, which shaped the residential, agricultural, and

economic face of Kauai for 125 years, has died out in the past 20 years. Gay and Robinson Inc., the last sugar producer on the island, announced in September 2008 that it was ceasing sugar cane operations on Kauai after 119 years.



Above left and right: Former sugar cane fields lie fallow across the island. Overgrown with grasses, these area pose a wildfire risk to the communities they surround.

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Lands that were once maintained for sugar cane production now lie fallow or have been sold and turned into residential developments. Many of these fallow fields are overgrown with vegetation and surround existing and/or new subdivisions.



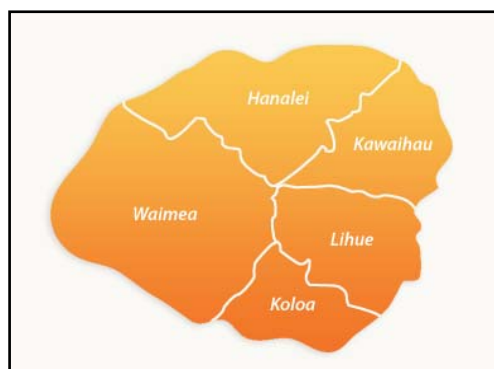
Above: Recent residential development in Poipu. More than 4,000 residential units are planned for Poipu, which has a current population of 1,000 permanent residents.

The increase in residential development has led to an interesting juxtaposition: decades-old plantation neighborhoods with modest homes built on small lots are now adjacent to “gentleman farms”—large lots with even larger homes. Many of these newer homes, particularly in areas such as Poipu and Hanalei, are vacation rentals or second homes that are not occupied on a regular basis.

New development combined with year-round balmy weather and spectacular scenery has led to an increase in Kauai’s population. In 2006, the last year for which data is available, an estimated 63,004 people lived on Kauai, an increase of 7 percent from the 2000 Census count of 58,463 residents.

There are five districts on Kauai: Waimea, including the town of Waimea, Hanapepe, Kekaha, and Kokee State Park; Koloa, encompassing Koloa and Poipu; Lihue, including Lihue and Hanamaulu; Kawaihau, encompassing the towns of Kapa’a, Wailua, Kealia, and Anahola; and Hanalei, which includes the towns of Princeville, Kilauea, Ha’ena, and Hanalei.

Although the town of Lihue (on the southeast coast) is the government seat of the island and home to the island’s main airport and retail centers, it is not the most populous. The largest town population-wise is Kapa’a, six miles to the north of Lihue. About 10,000 people call Kapa’a home. Many of Kapa’a’s residents must drive along Kuhio Highway, known as the Wailua Corridor, to travel between Lihue and Kapa’a for work and shopping. Lihue is the second largest town on Kauai (5,900 residents). Other populated areas include Hanamaulu (3,500 residents) and Wailua Homesteads (4,500 residents). Further up the coast from Kapa’a on the east side, Anahola has roughly 2,250 residents. On the southwest side of the island, Kalaheo has an estimated 4,100 residents. Former plantation towns on the southwest side, such as Hanapepe (2,500 residents), Koloa (1,800 residents), and Waimea (1,800 residents) have smaller populations. Poipu, with its concentration of resorts and vacation rentals, has an estimated year-round population of 1,000.



Map showing the 5 districts of Kauai. Map courtesy of: <http://www.hawaiiis.com>.

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Figure 1 shows the population density of Kauai. Population densities center around towns such as Kapa'a and Lihue.

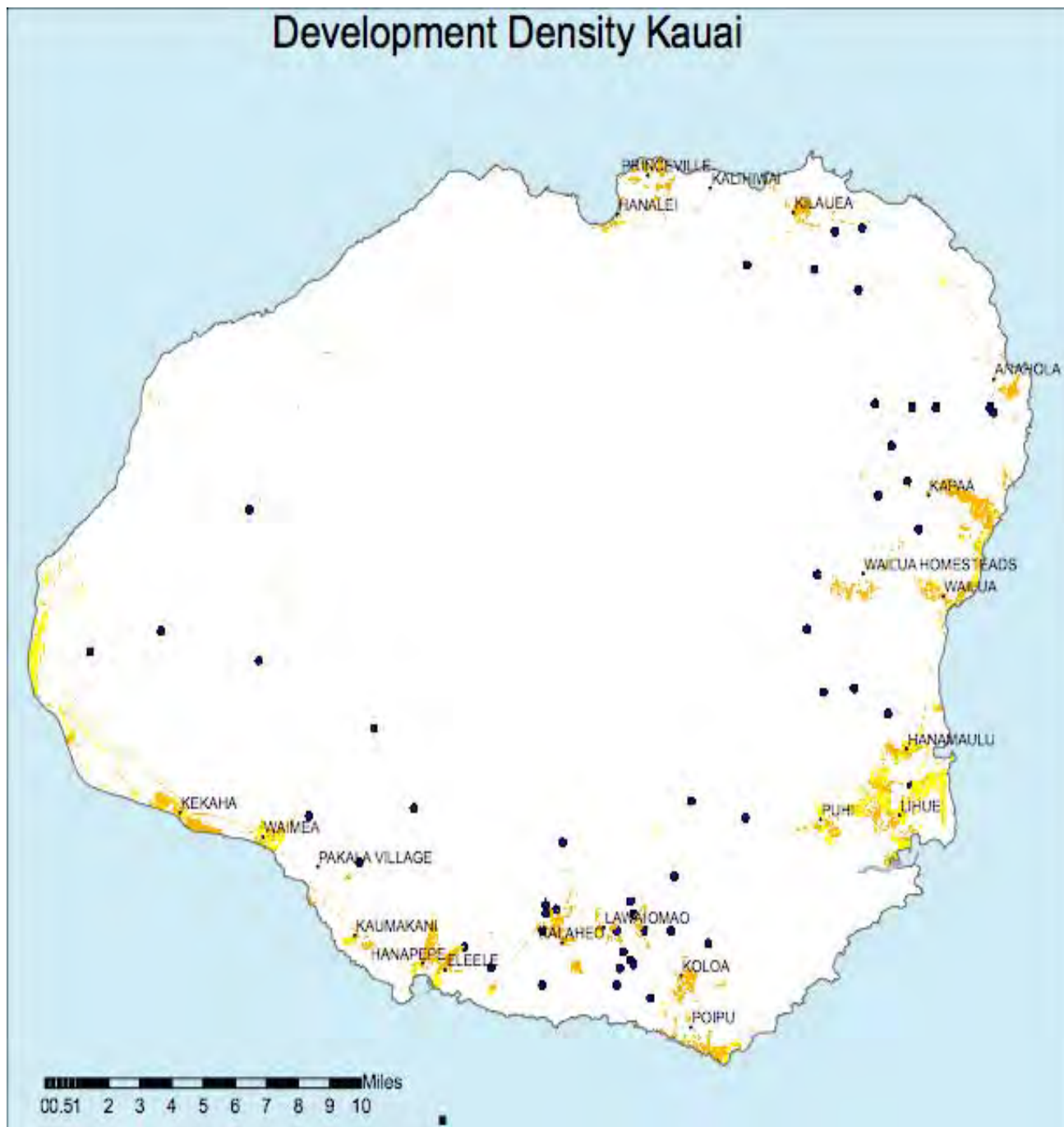


Figure 1: Map illustrating the population density of Kauai. Light yellow represents high-density developed areas while dark yellow represents low-density developed areas. The dots represent dams. Map courtesy of Kauai County GIS.

Figure 2 depicts the largest landowners on Kauai. The State of Hawaii is the largest landholder. Other large landowners include Alexander & Baldwin (including Kauai Coffee Company), Grove Farm, and the Department of Hawaiian Home Lands (DHHL), among others. Although depicted as state land, DHHL owns 20,000 acres on Kauai. Their land holdings include 15,000 acres in the Waimea district, 5,000 in Anahola, and 400 acres in Wailua.

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Figure 2: Map showing major landowners on Kauai. White areas represent Hawaii State government lands; grey: Grove Farm; dark green: the Robinson Family; purple: Alexander & Baldwin; light green: Visionary LLC; medium blue: W.H. Rice; orange: Kamehameha schools; dark orange: Bette Midler; yellow: Princeville Development; dark blue: Cornerstone Hawaii. Fire station locations are also shown. Map courtesy of Kauai County GIS.

One of the largest private landowners on island is Grove Farm Kauai with 40,000 acres. Its holdings include the former sugar mill lands of Koloa Mill and Lihue Plantation.

As sugar cane production ceased in the mid-1990s in eastern Kauai, a majority of former Grove Farm sugar lands were leased for cattle ranching, tree farming, and the growing of diversified agricultural

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crops such as corn, bananas, and taro. It also built residential developments, including the Puakea subdivision in Lihue, pictured below.

Grove Farm is concerned about the threat of wildfires on its property and stringently requires that all lessees maintain the leased property and the roads therein. According to Mike Tresler, senior vice-president of Grove Farm, the company has evicted lessees who have allowed brush to become overgrown or who have not maintained the roads. In some instances, Grove Farm has brought in cattle ranchers to graze areas when vegetation became overgrown or grew too close to utility poles.



Left: entrance sign to Puako section of the Puakea subdivision in Lihue. Right: typical house in Puako subdivision. Built on former sugar cane lands, Puako was recently developed by Grove Farm Kauai, which has diversified its holdings since the demise of the sugar cane industry.

Despite the demise of the sugar cane industry, agriculture is still a vital part of Kauai's economy. Seed corn, grown primarily in West Kauai and exported to the U.S. mainland, is the island's number one crop in terms of economic value. Other important crops include guava, taro, and coffee. In fact, the largest coffee estate in the U.S. is found on Kauai. Located on the southwest side of the island, Kauai Coffee Company grows 3.5 million pounds of coffee annually (60% of the state's total coffee production) on 3,400 acres. Kauai Coffee Company allows small-scale ranchers to graze in gulches around their property.

Small livestock operations operate around the island raising poultry and hogs for local consumption. Cattle are also raised on Kauai for beef export to the U.S. mainland.

Aside from agriculture, the island's main industry is tourism. Kauai is rich in natural beauty with its steep mountain cliffs, white sand beaches, native forests, and cascading waterfalls. There are numerous state and county parks around the island, including Kokee State Park, Wailua River State Park, and Na Pali Coast State Park. Kokee State Park and Wailua River State Park are situated within the island's wildland urban interface.

While there are no national parks on Kauai, the island is home to the national headquarters of the National Tropical Botanical Gardens (NTBG). The NTBG preserves, conserves, and perpetuates biological resources, such as rare and native Hawaiian plants, as well as cultural and historical resources. Its holding on Kauai include a series of gardens, such as the McBryde Garden and Allerton Garden in Lawai Valley on the south side and the nearly 1,000-acre Limahuli Garden and Preserve on the north shore in Limahuli Valley in Ha'ena. The gardens in Ha'ena and Lawai Valleys contain archeological resources while McBryde Garden is home to the largest ex situ collection of native Hawaiian flora in existence. NTBG also manages the Breadfruit Institute, which with 120 varieties makes it the largest collection of breadfruit in the world.

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There are also three national wildlife refuges on Kauai, including Hanalei National Wildlife Refuge, Huleia National Wildlife Refuge, and Kilauea National Wildlife Refuge, all of which are managed by the U.S. Fish and Wildlife Service (USFWS).

Encompassing 917 acres in Hanalei Valley on Kauai's north shore, the Hanalei National Wildlife Refuge was established under the Endangered Species Act to conserve five endangered water birds that rely on the Hanalei Valley for nesting and feeding habitat: the koloa (Hawaiian duck), 'alae ke'oke'o (Hawaiian coot), 'alae'ula (Hawaiian moorhen), ae'o (Hawaiian stilt), and nene (Hawaiian goose). Twenty-seven additional species of native Hawaiian birds and 18 nonnative bird species also use the Refuge.



View of taro fields in Hanalei. While the taro fields are quite lush, the surrounding hillsides are prone to wildfires. Due to the rugged terrain, unattended campfires in this area can spread quickly. Photo credit: tripadvisor.com

Hanalei Valley is surrounded by steep hillsides. Taro farming has been an important crop in Hanalei Valley for 1,000 years. Nearly two-thirds of the state's six million pounds of taro is grown in Hanalei. Given the large amounts of water required for taro farming and an annual average rainfall of 62 inches, the risk of wildfire is minimal in the Hanalei Valley area. However, wildfires can and do occur in the surrounding hillsides. Although the area is generally high in moisture, vegetation can dry out in the summer months and during periods of drought, lead to increased wildfire risk.

In August 2008, 50 acres burned in a remote area of Hanakapiai Valley closing the Kalalau Trail, a popular hiking trail. Kauai Fire Department personnel rescued 28 day-hikers via Hanakapiai Beach during the wildfire. The beach is only accessible by the Kalalau Trail or by boat. The blaze may have started by a campfire. Unattended campfires in the Hanakapiai

Valley are of concern to officials because of the rugged terrain.

Down the coast from Hanalei Valley, Kilauea Point National Wildlife Refuge juts out into the ocean on Kauai's north shore. The 203-acre refuge encompasses Crater Hill, Makolea Point, as well as the 106-year-old Kilauea Lighthouse, which is on the National Register of Historic Places. The sea cliffs provide nesting areas for native Hawaiian seabirds, including the endangered nene, as well as native Hawaiian plants. Wildfires have occurred in the area in recent years, including one fire started by discarded smoking materials just outside

the entrance to the Refuge in 2000.

Located on the southwest side of the island by the Menehune Fish Pond, the 241-acre Huleia National Refuge is a flat valley along the Huleia River bordered by a steep wooded hillside. Thirty-one species of birds can be found here. A registered National Historic Landmark, the USFWS purchased the land from Grove Farm in 1973 to provide wetlands for endangered Hawaiian water birds that rely on the Huleia River Valley for nesting and feeding habitat.



Above: view of Kilauea Lighthouse. Photo credit: tripadvisor.com

Both Hanalei and Huleia Refuges are in river valleys surrounded by steep wooded hillsides. Both Refuges are closed to the public to protect the endangered birds and their habitat. Since the Refuges are private, the threat of human-caused wildfires is reduced. However, it is possible that wildfires that

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start beyond the borders of the refuges, can have a debilitating effect. To address this concern, the USFWS has developed fire plans for all three Kauai refuges.

In addition to agriculture and tourism, the military also has a presence on Kauai. The U.S. Navy's Pacific Missile Range Facility (PMRF) at Barking Sands on the western shore past Waimea, is one of the largest employers on the island. Covering nearly 2,385 acres, PMRF is the biggest testing and training missile facility of its kind in the world. PMRF has its own fire department, and there is an established Memorandum of Understanding (MOU) between the County of Kauai and PMRF for assistance in wildland firefighting. PMRF has contract helicopter services which can assist, for a fee, on large wildland and forest fires.

PMRF is surrounded by 6,000 acres of former sugar cane lands. PMRF is undertaking an Agriculture Preservation Initiative working with the State and County to ensure that the lands remain designated for agricultural use.

Infrastructure:

Kauai has well-established infrastructure. The vast majority of roads in subdivisions and municipalities around the island observed during the wildfire hazard assessment are paved. A main highway, Kuhio Highway (Highway 560) on the east side and Kaunuaui'i Highway (Highway 50) on the west, runs along the perimeter of the island up to the inaccessible Na Pali coastline.



Above: Roadway in Wailua. Collector roads, such as this one, are required to be at least 56 feet wide in accordance with Kauai County Code.

The County and State maintain the roads. Major roadways on Kauai are greater than 24 feet in width. In fact, Section 9-2.3 of the Kauai County Code, *General Standards for Streets*, mandates that major undivided thoroughfares be at least 80 feet in width while divided thoroughfares be at least 88 feet. Major streets are to be 60 feet wide, collector streets are required to be 56 feet wide, minor streets 44 feet wide, and dead-end streets must be 40 feet wide. Dead end streets longer than 150 feet are required to have room for fire department apparatus to turn around. Private subdivisions must adhere to this code as well.

Property owners on Kauai are required to be connected to the County water system and homes are not allowed to have catchment systems.

All areas of Kauai are on the electric grid. Utilities are above-ground in older neighborhoods and subdivisions. The Kauai Planning Department is responsible for requiring utilities to be placed underground in new residential developments.

Vegetation:

The vast majority of land on Kauai is classified as conservation or agricultural. Figure 3 illustrates state land use zoning on Kauai.

Kauai has more native Hawaiian endangered and threatened plants than any other major Hawaiian island. Ninety-five of the 97 native Hawaiian plant species listed as threatened or endangered as designated under the *U.S. Endangered Species Act* are found on Kauai. [www.fws.gov/pacificislands/publications/listingplants.pdf] This is more than three times the number of endangered and threatened plants found on any other Hawaiian island.



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In September 2008, the U.S. Secretary of the Interior issued a proposal planning to add 48 additional plants, animal, and insect species found only on Kauai to the federal endangered species list. The proposal also recommended adding 27,674 acres as designated critical habitat for the 48

Kolea is a threatened shrub found only in the forests of Kauai. Photo © M. LeGrande.

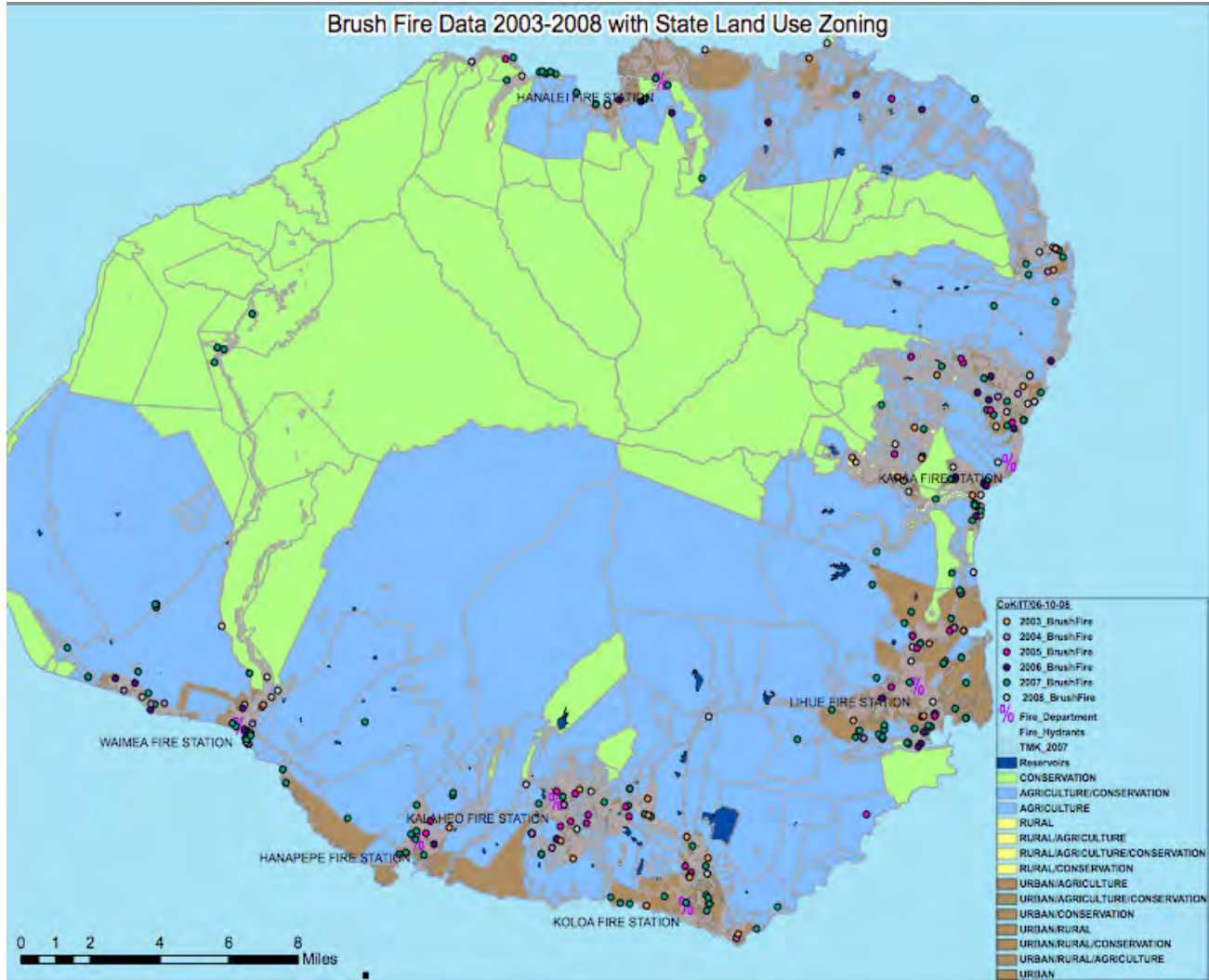


Figure 3: Land use zoning on Kauai The green, blue, and brown areas represent conservation, agriculture, and urban land classifications respectively. Yellow areas are classified as rural. The past five years of wildfire data are also indicated. Map courtesy of Kauai GIS.

species. All but 1,646 of the proposed 27,674 acres are already designated as critical habitat for other species. There is roughly 52,500 acres of critical habitat designated on Kauai. Figure 4 illustrates the location of the critical habitats in relation to recent wildfires.

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In 2008, Alexander & Baldwin entered into a 10-year agreement with The Nature Conservancy to manage over 7,000 acres in Wainiha Valley extending into Alakai Swamp and Mt. Wai'ale'ale. This extensive management will help protect the 127 species of rare plants and native forest birds. Some of the endangered plants on Kauai are so rare that there are less than 100 known plants still in existence. Indeed, it is believed that there are only seven mature 'Olulu (*Brighamia insignis*) plants

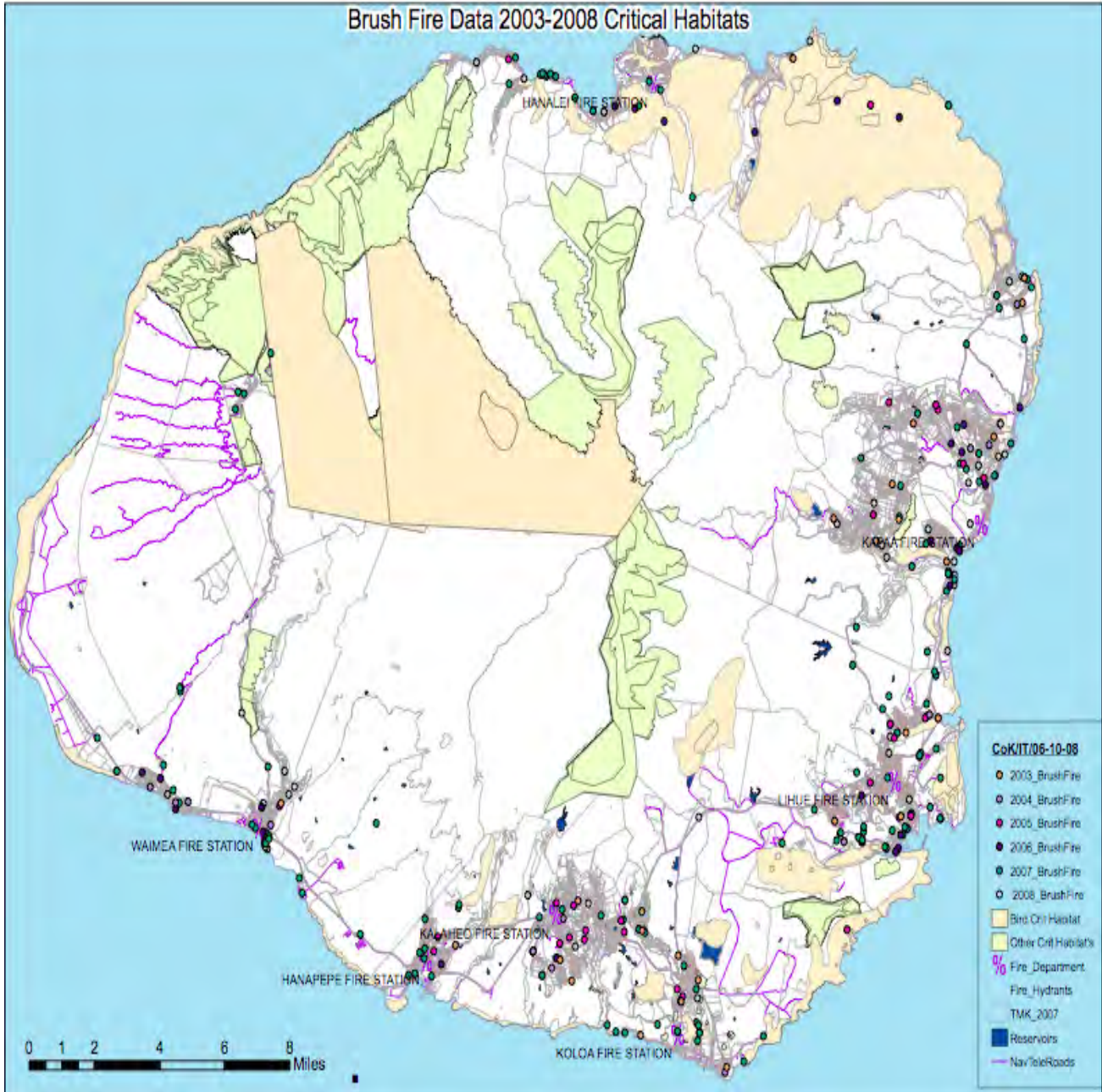


Figure 4: Map depicts areas designated as critical habitats for plants and animals on Kauai, as well as the location of wildfires in recent years. Areas highlighted in peach are bird habitats and those cream in color are other critical habitats. Map courtesy of Kauai County GIS.

remaining in the wild—all found in two locations on Kauai.

Kuawawaenuhu (*Alsinidendron lychnoides*) a small flowering plant is found in only three valleys on Kauai with each population having about 10-20 plants.

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More prevalent than the previous two mentioned plants, Kōlea (*Myrsine linearifolia*) is a perennial shrub that can reach 26 feet in height. It can be found in eight locations around Kauai, with the largest number of shrubs found in Kalalau Valley.

Kōlea alone contains 57 rare or endangered plant species. Many plants and animals depend on this unique ecosystem for subsistence. State forestry officials maintain 15 plant enclosures. In addition, they maintain the Kōlea Rare Plant Facility, where they propagate more than two dozen rare and endangered

plant species. Given Kōlea's remote location, wildfires have the potential to cause tremendous harm to the native forest ecosystem.

'Ōlulu plant. Once found on all four major Hawaiian islands, today it's estimated there are only 7 plants in the wild – all found on Kauai. Photo courtesy of Arkive: © Bill Coster.



Above left: The Kauai Cave Wolf Spider, an endangered native Hawaiian animal, relies on the endangered Kauai Cave Amphipod for food. Above right: The Hawaiian Hoary Bat is considered Hawaii's only native land mammal. Photo credit: www.earthsendangered.com.

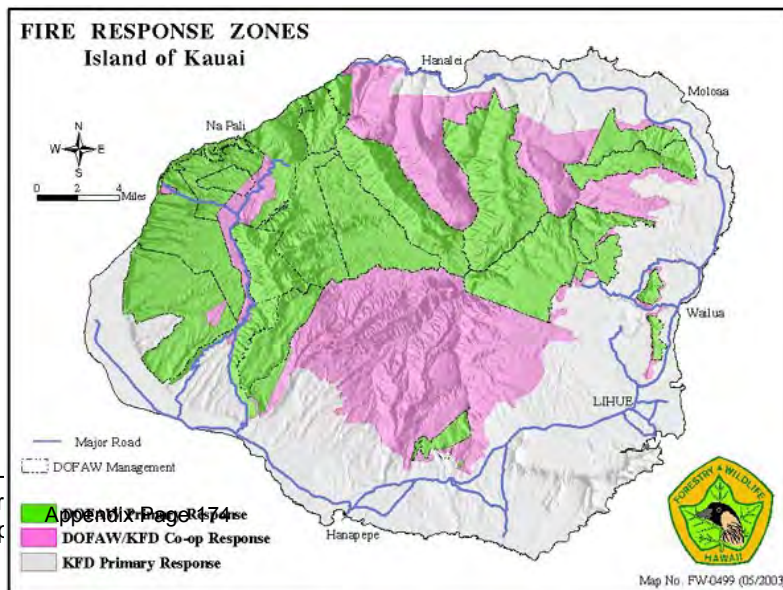
There are also several species of native Hawaiian animals that can be negatively impacted by wildfire. The akepa (*Loxops coccineus*), a small honeycreeper found in forests above 3,000 feet, eats primarily spiders and insects. The Kauai Cave Wolf Spider (*Adelocosa anops*) or Pe'e Pe'e Maka 'Ōle is an endangered animal whose main food source is another endangered animal, the Kauai Cave Amphipod (*Spelaeorchestia koloana*). The Hawaiian Hoary Bat (*Lasiurus cinereus semotus*) is considered to be Hawaii's only native land mammal. The hoary bat roosts in trees in forests and open pastures making it susceptible to wildfires.



Marine life found in coastal waters can also be impacted by wildfires. Soil erosion caused by wildfires can lead to runoff, which can eventually end up in the ocean. The resulting sedimentation in the ocean and

on coral can negatively impact reefs and local traditional practices for gathering food from the ocean.

Fire Department Resources:
The Kauai Fire Department (KFD) is the primary responder to all wildfires. Existing mutual aid agreements between KFD and other fire agencies



Wildfires on Kauai can lead to soil erosion and runoff impacting the reefs and marine mammals. Left photo: Jeffrey L. Cooper © 2007.

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allow for cooperative responses on fires of mutual concern.

KFD has mutual aid agreements with PMRF, Lihue Airport Crash Fire/Rescue Department and DOFAW. KFD receives grant funding from DOFAW of which the funds can be utilized to organize, train, and equip KFD fire personnel.

A total of 125 personnel staff 7 fire stations around Kauai, with 32-37 firefighters on duty across the island at any given time. An eighth fire station planned for Kealia is scheduled to be built in 2011.

Figure 6 shows station wildfire response data per fire station. Between 2003 and 2008 Station #2 (Kapa'a) responded to the most wildfires—170, while station #3 (Lihue) responded to 127 wildfires.

Figure 5: Fire response map for the island of Kauai shows the areas of responsibility for the different fire fighting agencies on island. KFD is the primary responder to all fires. Fire Resource Map courtesy of DOFAW.



Above: Various apparatus of the Kauai Fire Department. Photo credit: left and right pictures DHHL Ronald Licona, center picture KFD.

Left: Poipu fire station. Photo credit: Denise Laitinen. Right: PMRF helicopter providing water drops during an Anahola wildfire. Photo credit: DHHL Ronald Licona.



KFD has 21 apparatus and 14 light trucks, including 11 engines, 7 with slip-on 300-gallon units, 4 tankers, 3 mini-pumpers, 2 Hummers, 2 rescue trucks, and 2 hazardous material vehicles, including an incident command vehicle.

DOFAW has 23 personnel trained for wildland firefighting on Kauai. Their wildland firefighting equipment includes 3 water tenders, a 400-gallon slip-on unit for initial response, two 100-gallon slip-on units for ATVs for initial response, two water pumps, one backhoe, two dozers, one grader, and two portable 1,500-gallon dip tanks. The heavy equipment, (i.e. both dozers, grader, and backhoe) is based in Kokee with the remainder kept at the Lihue base yard.

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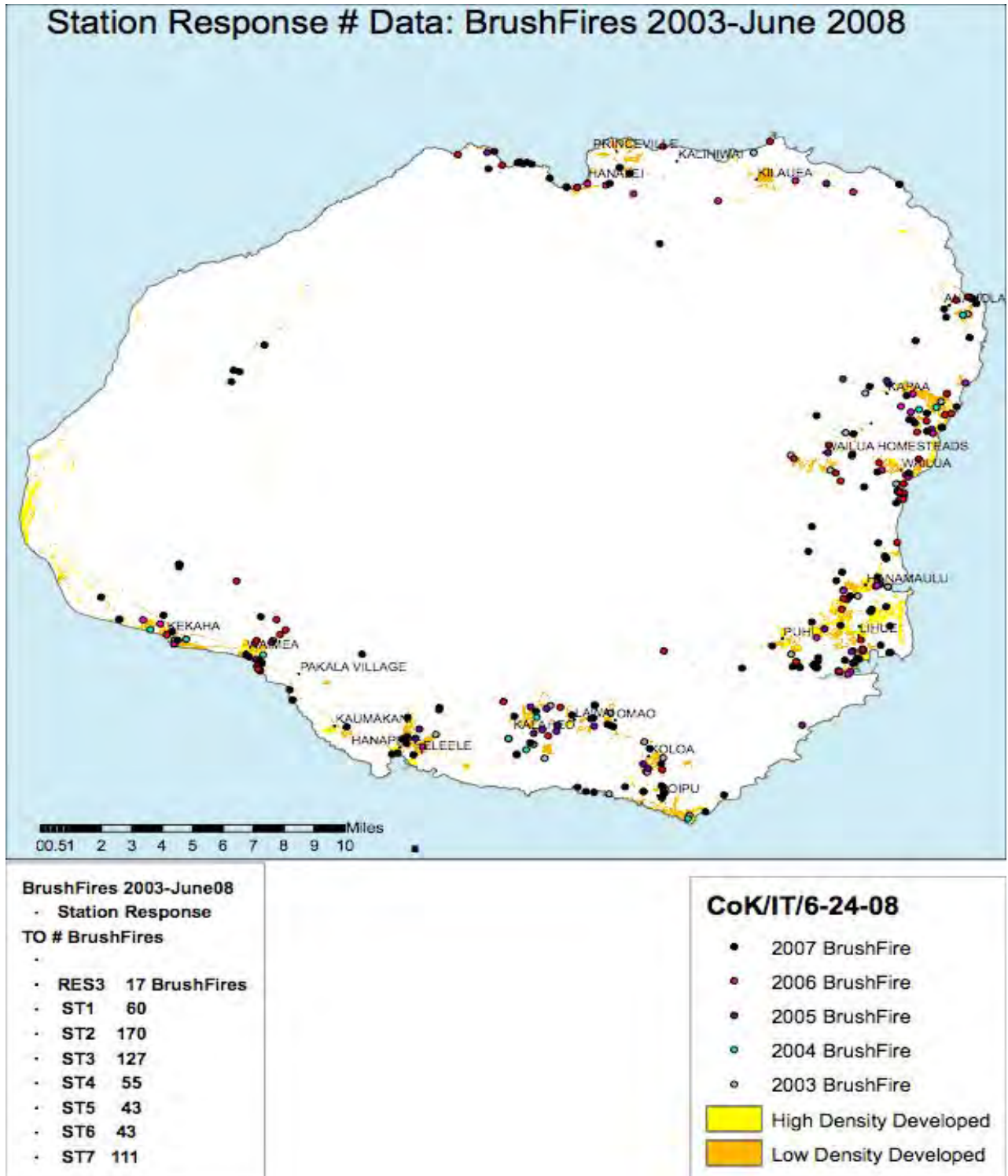


Figure 6: Map illustrating wildfires on Kauai between 2003-2008 and the number of responses per station. Map courtesy of Kauai County GIS.

The most common injury complaints by firefighters in the course of suppressing wildfires on Kauai are dehydration and exhaustion. While not a serious injury on its own, exhaustion can lead to motor skills impairment and slower response to changing conditions. Heart related problems and vehicle accidents

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are the two leading causes of line of duty deaths for firefighters nationwide. The more wildfires a community experiences, the higher the probability of one of these situations occurring.

Wildfires on Kauai have been responsible for one death. Since Kauai Fire Department does not have its own rescue helicopter, it contracts with an outside company, Inter-Island Helicopters, for assistance to suppress wildfires. On Christmas Day 2005, a helicopter pilot was killed when his aircraft crashed while conducting water drops on a Hanamaulu wildfire.

Fire History:

Between January 2000 and September 2008 there were 837 wildfires on Kauai¹. Annual wildfire totals range from a low of 61 wildfires in 2004 to a high of 134 wildfires in 2007, see Table 1.

Wildland, brush, and grass fires tend to spike from May through September with the highest numbers in the summer months of July and August.

¹ [wildfire totals include three categories of fire data collected by KFD: brush or grass fires; forest or wildland fires; and grass fires.]

Table 1: Kauai Fires 2000-2008 per KFD

Year	Number of wildfires [Brush, grass, forest, and wildland fires]	Total # of fires	Percentage of wildfires to total # of fires
2000	101	264	38%
2001	102	262	39%
2002	80	256	31%
2003	103	282	36%
2004	61	207	29%
2005	98	283	35%
2006	76	281	27%
2007	134	336	40%
2008	82	237	34%
Totals:	837	2,408	34 percent

Of note is the large number of wildfires, as well as overall increase of the total number of fires, during 2007. One possible reason for the higher than normal number of wildfires is the higher than normal rain levels the preceding winter, which in turn led to increased levels of fuel load in the wildland urban interface.

Of the 837 wildfires, 45 were larger than 10 acres in size listed in Table 2. Four of the five largest wildfires since 2000 have all occurred in the Kawaihau district. The largest wildfire was a 640-acre blaze in 2003 in Kealia. The second and third largest wildfires both occurred in Wailua: a 2005 fire burned 500 acres and a 2007 blaze burned 300 acres. 2005 also saw the fourth largest wildfire break out in Anahola and burn 270 acres. The fifth largest wildfire burned 200 acres in Hanamaulu in 2006.

A review of the frequency of wildfires shows that Kawaihau and Lihue districts also have the most number of wildfires. Figure 7 shows wildfires per town for the last eight years. Lihue town has the highest number of wildfires—91 since 2000. Anahola came in second with 89 wildfires while nearby Wailua had 83 fires. The remaining top 5 towns, Waimea and Kapa'a, are closely matched: Waimea had 69 wildfires while Kapa'a had 68 fires. Koloa had a surprisingly large number of wildfires: 56. The most frequent cause of the largest wildfires is "other cause" or "undetermined".

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Lihue, Anahola, Wailua, Waimea, Kapa'a, and Koloa are all towns surrounded by large tracts of open lands. Maps depicting the ignition component of fuels and the spread component of these fuels can be found in Appendix A.

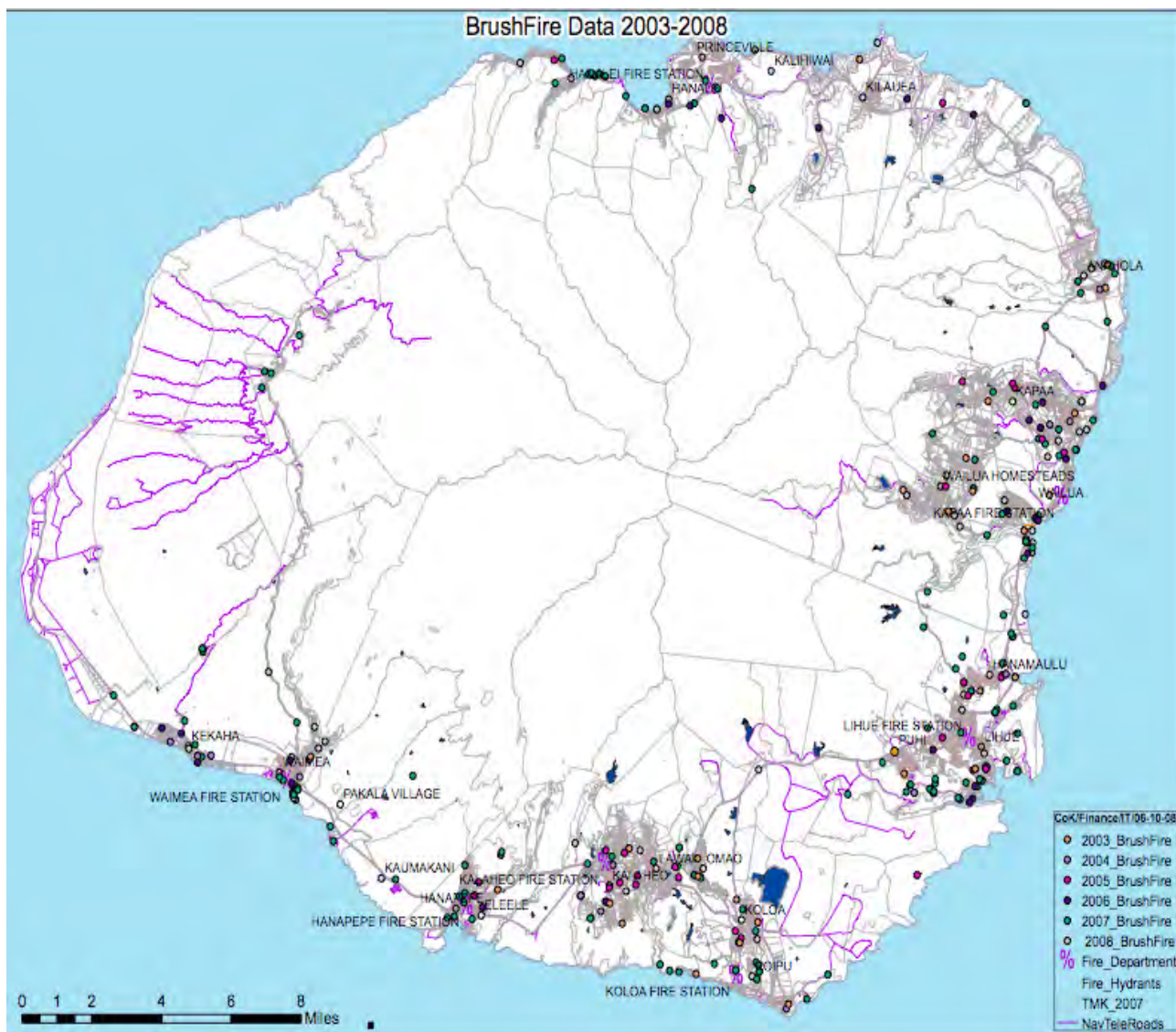


Figure 7: Map illustrating wildfires on Kauai from 2003 to 2008 and fire station locations. Map courtesy of Kauai County GIS.

Table 2: Wildfires Larger than 10 acres on Kauai 2000-2008

(Items in bold represent wildfires larger than 200 acres in size.)

	Date	City	Fire Cause	Acreage burned
1.	3/19/00	Kokee	Undetermined	10

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2.	5/7/00	Kealia	Incendiary	12
3.	6/10/00	Kilauea	Other Cause	10
4.	8/6/00	Koloa	Undetermined	40
5.	8/8/00	Puhi	Debris, vegetation burning	10
6.	9/3/00	Puhi	Undetermined	10
7.	9/26/00	Kealia	Equipment	60
8.	5/11/01	Koloa	Smoking	12
9.	5/14/01	Moloaa	Undetermined	10
10.	6/23/01	Anahola	Other Cause	40
11.	9/3/01	Kealia	Other Cause	100
12.	11/25/01	Kealia	Other Cause	105
13.	10/14/02	Koloa	Debris, vegetation burning	20
14.	1/17/03	Lihue	Debris, vegetation burning	10
15.	3/5/03	Waimea	Open/outdoor fire	10
16.	5/26/03	Poipu	Undetermined	12
17.	7/19/03	Kealia	Other Cause	640
18.	8/19/03	Lihue	Incendiary	10
19.	9/9/03	Mana	Equipment	40
20.	2/14/04	Anahola	Incendiary	10
21.	7/2/04	Kokee	Incendiary	20
22.	7/6/04	Anahola	Other Cause	20
23.	7/20/04	Anahola	Undetermined	10
24.	7/25/04	Anahola	Undetermined	30
25.	6/3/05	Niumalu	Undetermined	50
26.	6/15/05	Waimea	Undetermined	80
27.	6/15/05	Anahola	Misuse of fire	270
28.	7/7/05	Princeville	Undetermined	10
29.	8/21/05	Wailua	Undetermined	500
30.	1/3/06	Hanamaulu	Undetermined	200
31.	1/5/06	Lihue	Undetermined	50
32.	7/18/06	Poipu	Undetermined	15
33.	3/31/07	Wainiha	Other Cause	30
34.	6/20/07	Wailua	Undetermined	40
35.	6/30/07	Wailua	Undetermined	300
36.	7/5/07	Hanamaulu	Undetermined	80
37.	7/5/07	Kapa'a	Undetermined	30
38.	7/8/07	Puhi	Undetermined	30
39.	7/9/07	Lihue	Undetermined	10
40.	7/17/07	Pakala	Debris, vegetation burning	30
41.	7/26/07	Niumalu	Undetermined	75
42.	9/5/07	Hanapepe	Open/outdoor fire	10
43.	9/12/07	Hanamaulu	Other Cause	10
44.	9/12/07	Lihue	Undetermined	10
45.	10/15/07	Poipu	Undetermined	200

Table 3: Wildfires per town 2000-2008

Town	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Anahola	4	16	6	7	19	8	14	8	7	89
Anini	0	0		1	0	0	0	1	1	3
Ele'ele	2	1	3	5	0	1	2	2	1	17

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Haena	1	1	3	1	0	2	3	1	2	14
Hanalei	1	1	3	1	1	0	3	5	1	16
Hanamaulu	3	4	2	6	2	3	4	5	5	34
Hanapepe	4	3	3	3	1	6	6	7	4	37
Hanapepe Heights	2	0	0	0	0	0	0	2	0	4
Huleia Valley	0	0	1	0	0	0	2	0	0	3
Kalaheo	7	8	6	3	7	11	3	5	3	53
Kalihiwai	1	0	0	0	0	0	1	0	0	2
Kapaa	3	8	6	6	8	11	8	9	9	68
Kapahi	1	3	0	0	0	3	1	0	0	8
Kapaia	1	1	1	1	0	2	2	5	0	13
Kauai County	0	0	0	0	0	0	0	0	1	1
Kaumakani	1	1	1	1	0	1	0	1	2	8
Kawelo	0	0	0	0	0	0	0	0	0	0
Kealia	8	4	1	2	1	2	1	2	3	24
Kekaha	0	3	3	6	5	4	8	6	1	36
Kilauea	7	4	3	4	1	2	3	0	3	27
Kipu	4	0	0	1	0	0	0	0	0	5
Kokee	2	1	1	3	1	2	1	5	5	21
Koloa	19	7	6	4	1	7	1	7	4	56
Koolau	0	0	0	1	0	0	0	0	0	1
Lawai	1	2	4	0	0	1	0	4	0	12
Lihue	14	10	6	11	4	10	10	21	5	91
Lumahai	2	0	5	2	1	0	1	6	0	17
Makaweli & Makaweli Valley	0	2	0	1	0	0	0	0	0	3
Mana	0	0	0	4	0	1	1	1	1	8
Moloaa	1	1	1	2	0	1	3	1	2	12
Na Pali Coast	0	0	0	0	0	1	0	0	0	1
Nawiliwili	2	1	1	0	2	3	1	4	3	17
Niumalu	0	0	0	3	3	3	3	4	2	18
Numila	2	0	0	1	0	1	0	0	0	4
Omao	5	4	3	2	0	1	0	2	1	18
Pakala	0	0	0	1	0	0	0	3	0	4
Poipu	4	3	4	10	2	0	4	10	1	38
Polihale	0	0	0	0	0	1	0	0	0	1
Port Allen	0	0	1	0	1	0	0	0	0	2
Princeville	2	1	2	1	1	1	0	1	0	9
Puhi	7	1	5	4	2	2	0	7	1	29
Wailua	5	11	9	13	2	10	8	12	13	83
Waimea	5	7	3	5	7	12	5	8	17	69
Wainiha	0	0	1	1	0	0	1	1	1	5
Waipouli	0	0	1	0	0	0	0	0	1	2
TOTALS:	121	109	96	116	72	113	100	156	100	983

DOFAW maintains separate wildfire data and their wildfire totals vary from those kept by KFD because they only respond to wildfires on state land. Wildfires responded to by both agencies may be counted in each agency's respective statistics.

According to DOFAW data, their personnel have responded to 19 wildfires since 2000. Of those, 11 wildfires were larger than a half-acre in size and 8 fires were smaller than a quarter-acre. The two largest wildfires were both in Kalepa: a 310-acre blaze in 2005 and a 220-acre fire in 2007. A 2003

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wildfire burned 50 acres in Kekaha. Table 4 lists wildfires reported by DOFAW since 2000 with the three largest fires in bold. Table 4 also shows the response zone (refer to Figure 5).

Nine fires occurred in Kokee State Park. Puu Ka Pele Forest Reserve had 5 fires, 3 occurred in Kalepa, and one each in the Na Pali Forest Reserve and Kekaha.

Although fire cause is not included in DOFAW fire reports, they do record the type of fuel burned. The most commonly burned fuels are: koa, eucalyptus, and haole koa. Guinea and molasses grass, java plum, silk oak, pine trees, and waiawi were other vegetation types that burned during fires. Figure 8 illustrates the locations of wildfires responded to by DOFAW staff.

Table 4: Kauai wildfires from 2000-2008 per DOFAW

	Date	Location	Acreage burned	Response zone (green, pink or white)
1.	8/1-3/07	Kalalau Valley, Na Pali Forest Reserve	1	green
2.	7/24-26/07	Puu Ka Pele Forest Reserve	1	pink
3.	6/30-7/3/07	Kalepa	220	N/A
4.	5/4-06/07	Kalepa	12	N/A
5.	2007	Kokee State Park – Makai Hunter Check Station	.1	pink
6.	2007	Kokee State Park, Polihale Ridge Rd.	.1	pink
7.	2007	Kokee State Park – Halemanu Rd.	.25	pink
8.	6/10-11/06	Puu Ka Pele Forest Reserve – Pua Lua Reservoir	.2	pink
9.	8/21-26/05	Kalepa Forest Reserve	310	white/green
10.	9/15-16/05	Kokee State Park – Kukui Trail	.1	pink
11.	3/8-9/04	Kokee State Park – Faye Rd.	.1	pink
12.	9/9-10/03	Niu Ridge, Kekaha Game Management Area	50	white
13.	6/30-7/1/03	Kokee State Park	.50 ace	green
14.	6/25/03	Kokee State Park	.20 acre	green
15.	3/21-23/03	Makaha Ridge Puu Ka Pele Forest Reserve	2	green
16.	6/17-19/02	Kokee State Park	.5	green
17.	10/21-23/01	Puu Ka Pele Forest Reserve	<.1	green
18.	3/19-4/4/00	Makaha, Puu Ka Pele Forest reserve	5	green
19.	3/13/00	Kokee State Park	.1	pink

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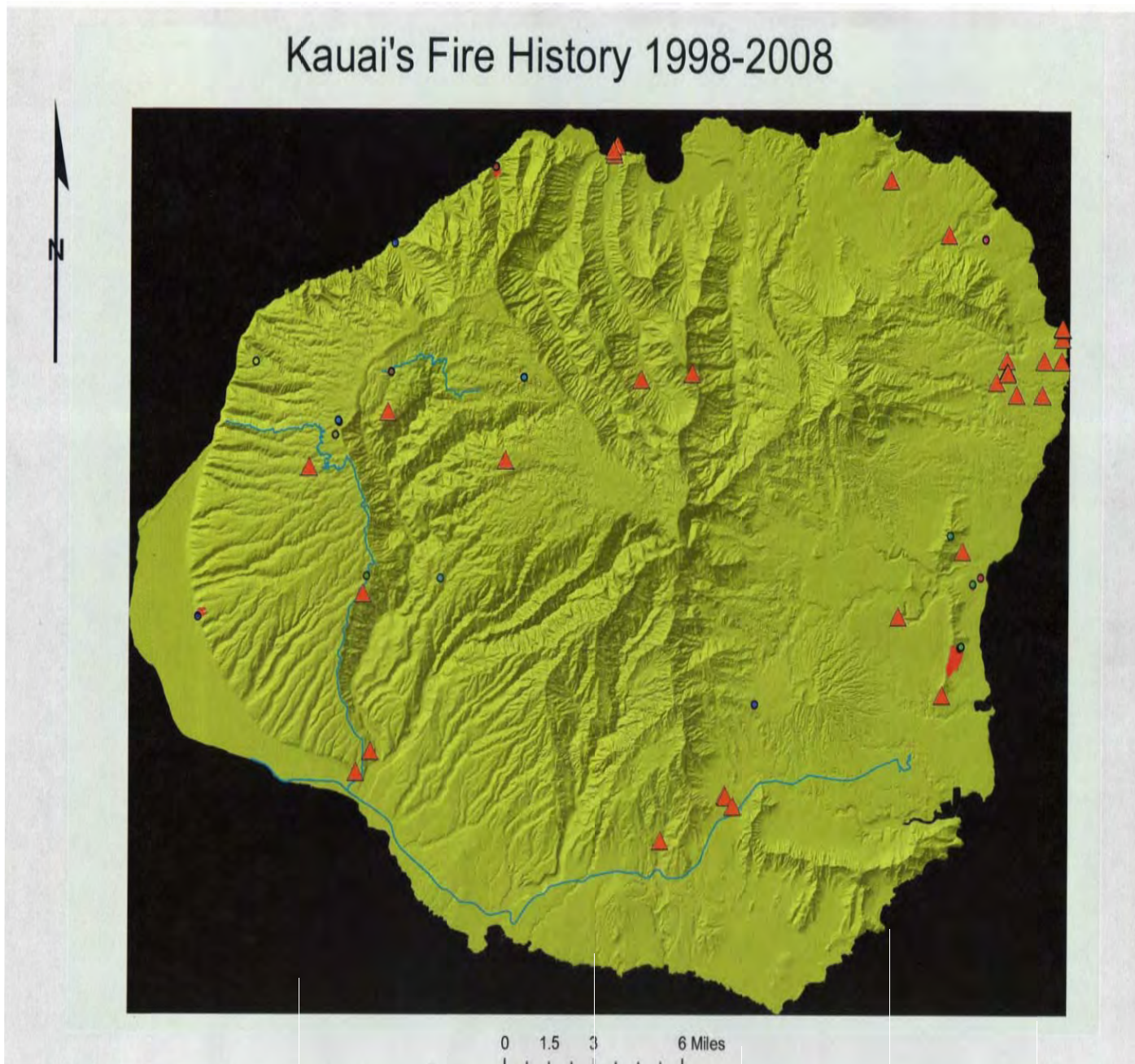


Figure 8: Map illustrating the location of wildfires responded to by DOFAW staff. Map courtesy of DOFAW.

As the charts above illustrated, Lihue, Anahola, Kapa'a/Wailua, Waimea, and Koloa have the highest wildfire occurrences on Kauai. These wildfires have threatened homes and residents, closed major highways to traffic, and strained fire response agencies resources. Although the official cause of the majority of wildfires is undetermined, anecdotal evidence suggest that the majority of wildfires are human-caused.

Human-caused fires are particularly troublesome because they can be prevented. Kauai fire officials described an event in the late 1990s during which witnesses on a boat at sea saw a suspect set fires in Kokee at night. The witnesses saw headlights coming down the mountain, saw the vehicle stop and

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shortly thereafter, a fire was observed. The car travelled down the mountain stopping periodically, and at every stop flames erupted. They quickly contacted the authorities, however the suspect reached the main highway and fled before he could be apprehended.

Because the wildfires were spotted quickly, they were extinguished before they could grow out of control. Given the late hour and remote location, these remote area fires could have spread quickly with serious consequences.

In 2008 a lost hiker set a signal fire along the fence line of a native plant enclosure. The hiker was rescued by helicopter, but not before several species of plants were burned. The fire burned five acres.

Arson and human-caused wildfires are also a concern in Anahola, because on several occasions they have come dangerously close to homes. In 2001 there were three wildfires in Anahola greater than 40 acres in size, all juvenile arson related. The juveniles responsible for setting the wildfires were eventually apprehended by the police.

A September 2001 fire in Anahola, which started in an abandoned vehicle on Kealia Road, burned 100 acres. Soon after, in November 2001, another wildfire scorched 105 acres in Anahola, threatening several homes.



Above left and right: A June 15, 2005 wildfire burned 270 acres and came dangerously close to homes in Anahola. Photo credit: Kauai Fire Department.

Large wildfires are an issue because they take fire department resources away from other parts of the island. According to fire officials, at one point during the suppression of the November 2001 Anahola fire, there were no firefighters at Kapa'a, Koloa, Kalaheo, and Waimea fire stations.

"When several engine companies are taken out of their home districts to suppress fires in Anahola, large areas of the island are left without adequate or timely fire, rescue, and emergency medical protection," Battalion Chief Bob Kaden said in media reports on the fire. (*The Garden Island Newspaper*, November 27, 2001.)

Fire resources and personnel were strained yet again on June 15, 2005 when wildfires erupted at opposite ends of the island within hours of each other.

A blaze broke out around noon on June 15, 2005 off of Waimea Canyon Road, burning 80 acres. A few hours later another wildfire started in Anahola. The Anahola fire, which burned 270 acres, came close to several homes. Media reports described tall guinea grass in close proximity to many homes in the Anahola area.

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On January 5, 2006, three wildfires were intentionally set by youth within a two-hour period in the early morning hours in Anahola and burned approximately 3 acres. According to press reports, the blaze came within 100 feet of several homes.

On the same day a 50-acre wildfire off Ahukini Road near the Lihue airport threatened 300 rental cars in an inventory overflow lot. Fortunately, fire department personnel were able to knock down the blaze before it reached the rental cars and the gasoline stored in the gas tanks. Tall guinea grass reportedly surrounded the parking area.



Above left: An August 2005 wildfire in Wailua burned 500 acres. The cause of the blaze, the second largest on the island in the past 10 years, was undetermined. Fires of this magnitude strain resources and personnel across the island. Photo credit: Kauai Fire Department.
Above right: Helicopter suppression of an Anahola wildfire. Photo credit: Roland Licon, DHHL.

While fire crews were dealing with the Anahola and Ahukini Road wildfires, another blaze broke out in Hanamaulu under the Kapule Highway Bridge. Although this fire was small in size—fire report data list it under an acre in size—the additional strain on fire department resources and personnel was a burden.

On June 30, 2007, four fires occurred in one day in Hanapepe, Hanalei, Lihue, and Wailua. While the wildfires in Hanapepe, Lihue, and Hanalei were small (an acre or smaller), the Wailua fire burned 300 acres in just a few hours. According to press reports, this fire was less than a mile from a wildfire that had burned 40 acres the preceding week.

Wildfires in the Wailua area are of special concern because they can shut down Kuhio Highway, known as the Wailua Corridor, the main roadway connecting the west and east sides of the island. Kapa'a is the largest residential town on the island with commercial and residential traffic dependent on traveling between Lihue and Kapa'a.

When the Wailua Corridor is closed to traffic due to wildfire, as has happened several times in the past, it has a tremendous impact on residents and tourists alike. When wildfires cause the closure of Kuhio Highway it disrupts the transportation of goods and services around the island, prevents residents from traveling to and from work, and prevents visitors from reaching their departing flights at the airport. Perhaps most importantly, Kuhio Highway closures can prevent people from reaching the emergency room of the island's largest medical facility, Wilcox Memorial Hospital in Lihue.

Another wildfire concern on Kauai is the illegal dumping of trash and cars, particularly in Anahola.

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Abandoned vehicles can still contain gasoline and flammable liquids, and compounds in the vehicle frame, upholstery, and tires can become toxic when burned. During a 2004 wildfire hazard assessment of Anahola, Kauai Fire Department personnel estimated there may be over 100 abandoned vehicles in the open fields surrounding Anahola. When driving the perimeter of the open fields these vehicles are hard to see in the dense overgrown brush, thus posing a hidden danger. Removing the cars is problematic because they are considered hazardous materials and require Environmental Protection Agency (EPA) oversight. According to DHHL personnel, during a July 2004 wildfire in Anahola, several abandoned cars caught fire and explosions could be heard when the car tires exploded.



Above left and right: abandoned cars discovered after a wildfire in Anahola. The vehicles pose a serious threat to fire crews battling blazes. Photo credit: Roland Licona, DHHL.

Dumped trash can also pose problems when wildfires break out. The trash itself can contain a host of unknown hazards, including chemical and/or biological matter that can impact the health of responding fire crews and area residents. The sheer physical size and/or location of the trash is also a concern as it has hindered firefighters from responding to at least one fire.

During an April 2005 wildfire near the Anahola Kahala Point Coast Guard light beacon responding fire crews needed to move household appliances from the access road in order for apparatus to reach the fire. One apparatus suffered a flat tire responding to the fire. The combination of large quantities of abandoned vehicles and illegally dumped trash plus large amounts of overgrown brush and a high rate of fire occurrence, make Anahola especially vulnerable when wildfires erupt.



Above left: Discarded rubbish is an issue in Anahola where it has hindered firefighters' ability to reach wildfires. Above right: Discarded rubbish and appliances litter a fire scene at a June 20, 2001 fire. Photo credit: Roland Licona, DHHL.

Stakeholders:

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Stakeholders are individuals or groups who have a high level of interest in the protection of their assets from wildfire. In addition to community members and federal, state, and county fire response agencies, major landowners have an interest in reducing the wildfire risk on Kauai. Contact information for principal stakeholders is listed below.

Federal:

U.S. Fish & Wildlife Service

Shannon Smith, Refuge Manager
Kaua'i National Wildlife Refuge Complex
P.O. Box 1128, Kilauea, HI 96754
(808) 828-1413
Shannon_smith@fws.gov

U.S. Navy Pacific Missile Range Facility (PMRF)

Barking Sands Fire Department

Robert Cecconi, Fire Chief
P.O. Box 399, Kekaha, HI 96752
(808) 335-4867
robert.cecconi@navy.mil

State:

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

Wayne Ching, State Protection Forester
1151 Punchbowl St., Rm. #325, Honolulu, HI 96813
(808) 587-4173
Wayne.F.Ching@hawaii.gov

Department of Hawaiian Home Lands

Roland Licon, Kauai District Supervisor
3060 Eiwa St., Rm. #203, Lihue, HI 96766
(808) 274-3132
Roland.e.licon@hawaii.gov

County:

Kauai County Fire Department

Robert Westerman, Fire Chief
3083 Akahi St., Lihue, HI 96766
(808) 241-4982
rwesterman@kauai.gov

Kauai County Civil Defense Agency

Mark Marshall, Administrator
3990 Kaana St., #100, Lihue, HI 96766
(808) 241-1800
mmarshall@kauai.gov

Kauai Planning Department

Bryan Mamacay, Planner
4444 Rice St., Rm. #473, Lihue, HI 96766

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(808) 241-6677
bmamaclay@kauai.gov

Community:

Grove Farm Kauai

Mike Tresler, Senior Vice President
3-1850 Kaunualii Highway, Lihue, HI 96766-7069
(808) 245-3678
mtresler@grovesfarm.com

Kauai Coffee

Greg Williams
P.O. Box 530, Kalaheo, HI 96741
(808) 335-0052
gwilliams@kauaicoffee.com

Garden Isle RC&D

Laurie Ho, Coordinator
Garden Isle Resource Conservation and Development Council (RC&D)
3083 Akahi St., #204, Lihue, HI 96766
(808) 246-0091
Laurie.Ho@hi.usda.gov

Forestry Management Consultants-Hawaii

Stephen E. Smith
P.O. Box 351, Lawai, HI 96765-0351
(808) 332-5200
forestry@hawaiiintel.net

Hui O Laka, Kokee Natural History Museum

Marsha Erickson / Michelle Hoohano
P.O. Box 100, Kekaha, HI 96752
(808) 335-9975
Kokeemuseum@earthlink.net

Kokee State Park Advisory Council

Canen Ho`okano, Chair
ku_nahau@msn.com
kokeeadvisory@gmail.com
www.kokeeadvisory.org

Bill Cowern

P.O. Box 649, Lawai, HI 96765
treefarm@halekua.com

Base Map of Kauai:

Figure 9 shows a base map for the island of Kauai. Towns, major highways, and major tourist destination areas, such as the Poipu resort area and the Coconut Coast near Kapa'a are shown. State parks and forest reserves are illustrated in shades of pink and red.

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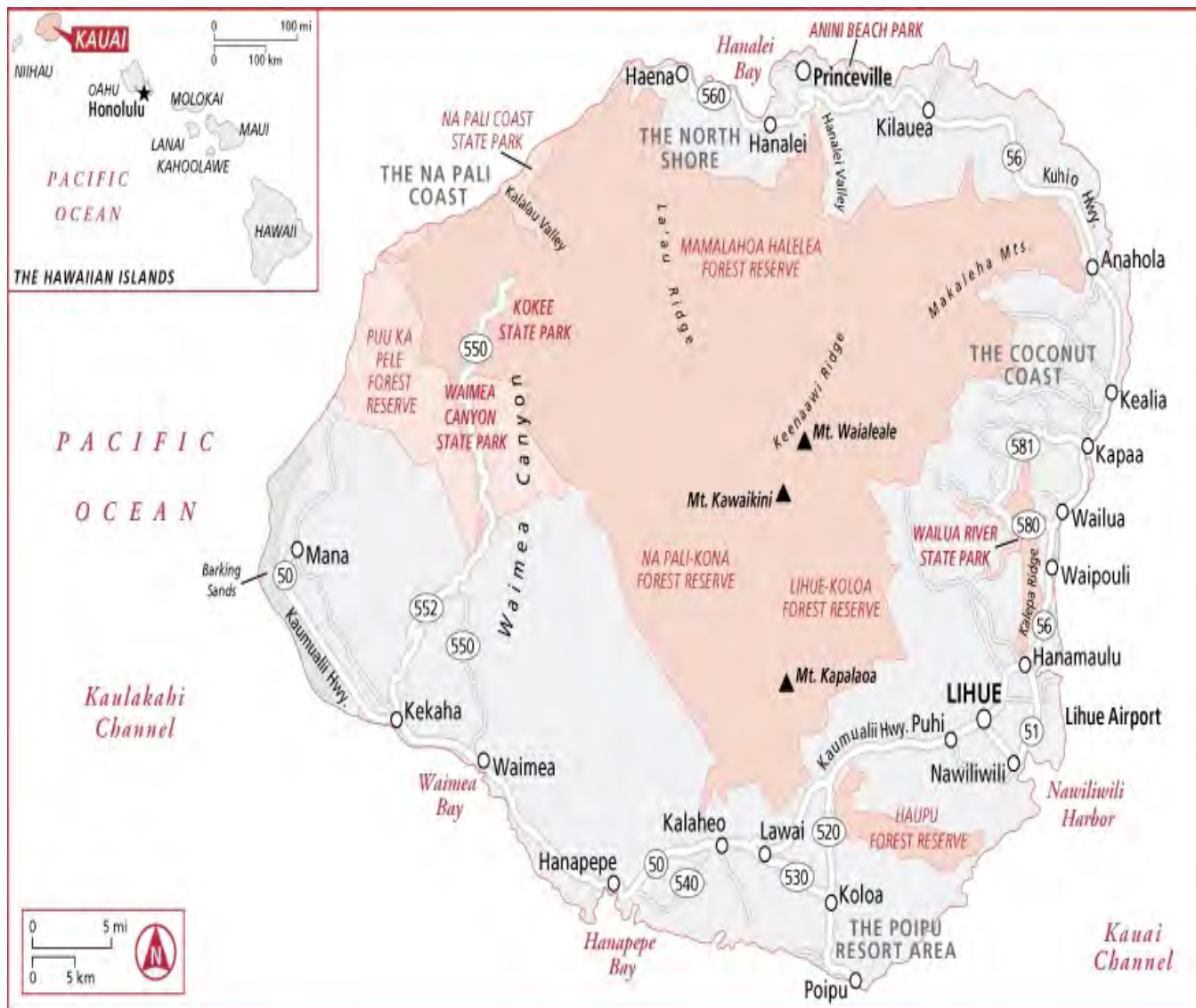


Figure 9: Base map of Kauai, showing the locations of towns, forest reserves, and highways. Map credit: frommers.com

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Fire Risk Assessment for Kauai:

A wildfire hazard assessment was conducted to identify the level of wildfire risk for communities on Kauai. The Hawaii Wildland Fire Risk and Hazard Severity Assessment was used for this CWPP, which is based on the Assessment in Appendix A of NFPA 1144, *Standard for Protection of Life and Property from Wildland Fire*.

Using a pre-established point system, the Hawaii 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 the roof, siding, and attached items, such as decks, fencing, or an 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, preponderance of open tracts of land full of overgrown fire fuels in close proximity to structures and communities, lack of water in reservoirs, and high rate of human-caused fires, the communities on Kauai scored in the high-hazard range in the wildfire hazard assessment.

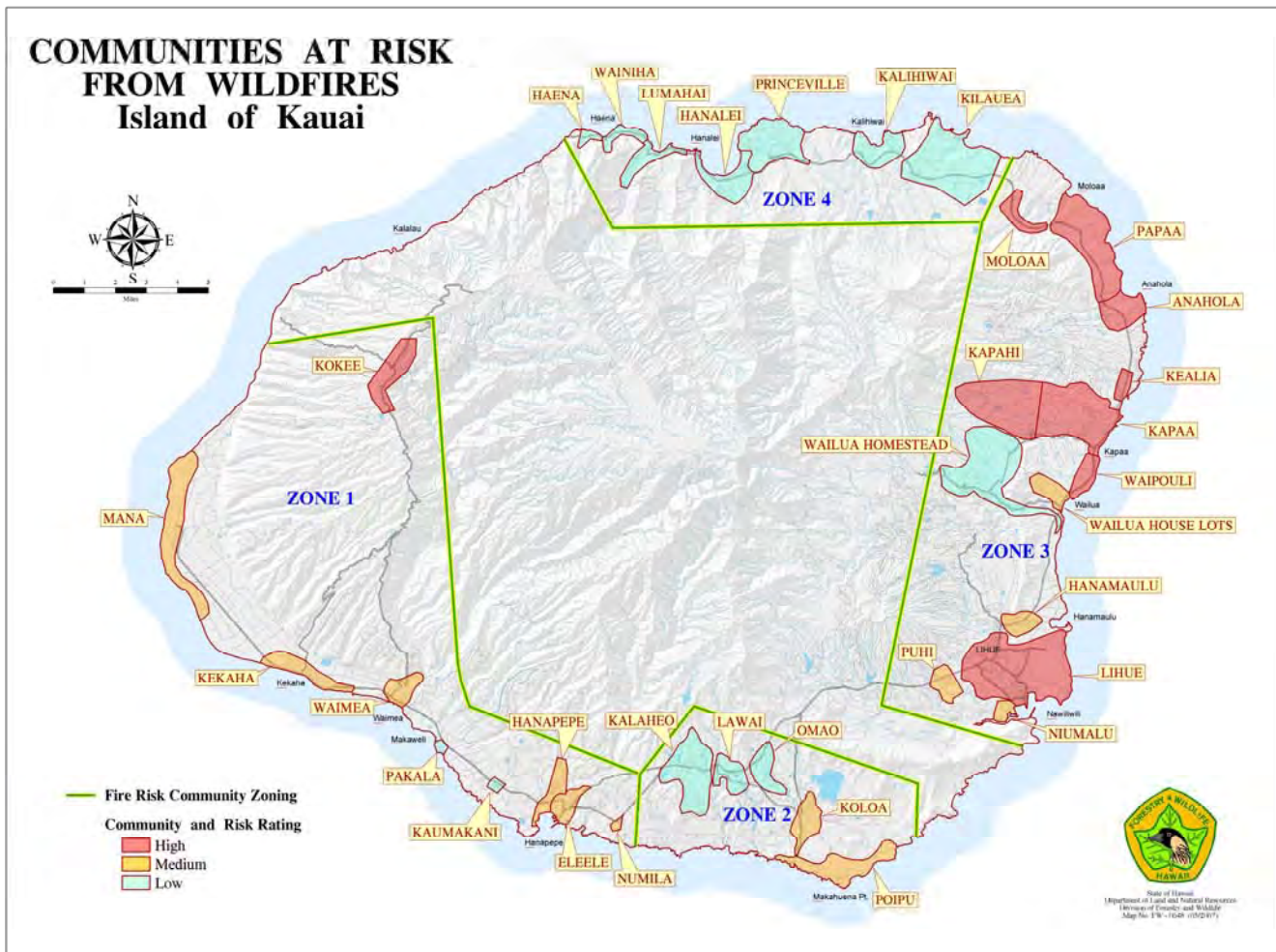


Figure 10: Kauai DOFAW staff created the above map illustrating communities at risk from wildfires based on the 2001 Federal Register: "Urban Wildland Interface Communities Within the Vicinity of Federal Lands That Are at High Risk From Wildfire," (Volume 66, Number 160). Map courtesy of DOFAW.

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While the island as a whole shares certain common characteristics, the communities within it vary tremendously and deserve separate description in terms of slope, size, and water availability. Figure 10 illustrates the communities at risk from wildfires around Kauai. The island is broken down by district with descriptions provided below.

Common characteristics around the island:

With the exception of the higher elevations, such as Kokee which are cooler, most of Kauai experiences year round warm weather with temperatures ranging from the mid-60s to high-80s. Relative humidity is usually above 50 percent year round. Rainfall tends to be evenly spread out throughout the year with the least amount of rainfall occurring in the summer months.

In 2008, Kauai experienced lower than normal rainfall. Mt. Wai'ale'ale received only 352 inches of rain, 83% of its normal level. Reduced rainfalls result in a higher-than-normal risk of wildfires, especially in the dry summer months.

Streets are paved and more than 20 feet wide (see Infrastructure). With the exception of extremely rural and remote areas, such as Kokee, roads are well marked with metal reflectorized signs.

Four percent of the island's land classified as urban has been developed although there is growth in non-urban lands. Kauai's Comprehensive Zoning Ordinance stipulates that no building can be taller than 55 feet (4 stories). Minimum setbacks to property lines are generally allowed for residential construction. The Comprehensive Zoning Ordinance requires a setback of 10 feet from the front of a property, 5 feet or one-half the wall height from the side, and 10 feet from the rear.

While there is no one housing standard for the entire island, the older plantation towns around Kauai (Kalaheo, Koloa, Kekaha, Kapa'a, Hanamaulu, Lawai, and Waimea to name a few) tend to share similar characteristics. The neighborhoods have homes on small lots (10,000-12,000 square feet.) Houses tend to be single story, with metal or other Class A type roofing and combustible siding, have small louvered windows, and are of post and pier or concrete construction. Driveways are short (less than 100 feet) and paved with little or no turn around space for fire apparatus. Driveways are usually 10-12 feet wide with 15 feet vertical clearance. Ornamental vegetation around yards is well established and the maintenance of such vegetation varies greatly depending on the homeowner. Utilities are above ground.

In older neighborhoods fire hydrants tend to be 1,000 feet apart or have a standpipe connected to a 3-inch pipeline. Agriculturally zoned subdivisions are also allowed to have stand pipes. However, new subdivisions are required to have one fire hydrant every 300 feet with an 8-inch line per Kauai Department of Water Supply standards.

It is important to note that in recent years the reservoirs around Kauai have been allowed to run dry. In March 2006 the Kaloko Dam (an earthen dam) near Kilauea breached and the resulting mudflow destroyed homes, closed the highway, and severely impacted the island as a whole. Seven fatalities also occurred. State and federal agencies conducted assessments of all dams and reservoirs on Kauai after the Kaloko dam break. Some reservoir owners voluntarily drained their reservoirs while others were allowed to run dry. While dam safety is an important issue, officials would be wise to address the consequences of allowing these dams to remain dry.

Hanalei District

Hanalei district on Kauai's north shore encompasses the towns of Hanalei, Princeville, Wainiha, Kilauea, Moloa'a, and Ha'ena, and



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small neighborhoods in between.

Cultural, natural, and historical resources in this district include the Kilauea Point National Wildlife Refuge and Lighthouse, Na Pali Coast, Kalalau Trail, Makana Peak, Maniniholo Dry Cave, Waikanaaloa and Waikapalae Wet Caves, and the Waioli Mission House.

The district is home to Kula High and Intermediate school, three elementary schools, one middle school, and smaller private schools.

View of Hanalei Bay. Photo credit:
tripadvisor.com

The Robinson Family, Kamehameha Schools, Alexander & Baldwin, Department of Hawaiian Home Lands, and Princeville Corporation are some of the larger landholders in the district.

There is one fire station in the district, adjacent to the Princeville Shopping Center. Nearby is Princeville airport that serves as a hub for helicopter tour companies. There is a steep drop in elevation between Princeville and Hanalei town. A one-lane bridge across Hanalei River at the bottom of this ridge is the only means of access to Hanalei and Ha'ena.

There are gently rolling hills in the area surrounded by steep mountain ridges. The land slopes from the mountains to the ocean. Normal trade winds blow from the east-northeast averaging 5 – 15 mph.

Kuhio Highway, a two-lane paved major highway maintained by the State Department of Transportation, is the only major road connecting Kauai's north / northeast shore with the rest of the island. Kuhio Highway dead-ends at Ke'e Beach at the base of the Na Pali coastline. Residential and commercial development tends to be on the makai (ocean) side of the highway, with smaller amounts of residential and agricultural development on the mauka (mountain) side of the highway.

Along the coastal areas of Hanalei, Princeville, and Anini lot sizes are small (usually less than an acre). Residential areas mauka of the highway tend to be larger in size. There are several horse ranches and public riding stables in the district and some property owners have livestock, including horses, sheep, and/or goats. There are several active commercial agricultural operations in the district, which are well irrigated. However, a great deal of former agricultural lands are being developed with large up-scale homes that do not practice any agriculture.



Hanalei church. Photo credit:
www.tripadvisor.com

High-end residential development around the luxury resorts in Princeville is in sharp contrast to the more modest homes found in surrounding towns. As of June 2009, real estate listings for single family homes in the Hanalei district range from \$400,000 - \$20,000,000+. Vacation home rentals are prevalent in the area, especially in Hanalei, Princeville, and Anini.

Although there is a strong anti-development sentiment in the Hanalei district, in recent years several subdivisions have been built on former agricultural land. These newer subdivisions tend to have house lots larger than an acre (often 5 – 10 acres) with well-maintained landscaping. Driveways are typically paved, at least 12 feet wide with 15 feet vertical clearance, are often more than 300 feet long, and are usually gated. The majority of homes have Class A (non-combustible) roofing and wood siding.

Roads are paved and greater than 20 feet in width. There are several subdivisions in the district (Princeville Ag lots, Seawind Farms in Moloa'a, Kilauea Ag subdivision, and others) that has only one

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means of egress and ingress. Utilities are aboveground in older neighborhoods and underground in newer ones. Side streets in the district are paved and marked with metal reflectorized signs.

Additional development is planned for Hanalei district. Princeville Corporation's master plan calls for conservation and residential development for the hundreds of acres of undeveloped land it owns on the north shore. However, this residential development is low-density and requires residents to utilize cattle grazing as a means of fuel reduction. In Hanalei, they plan to expand the taro field. There is also a plan to dedicate 8 - 12 acres as a wetland preserve.

The main plan also calls for an agricultural subdivision east of the highway between the existing gates of Princeville and Anini Vista, past the Prince Clubhouse and Spa. This latest subdivision will have 17 lots ranging from 10-30 acres each. Lot owners will be required to devote one-half to one-third of their land to cattle grazing.

Kawaihau District

The Kawaihau district comprises the towns of Kealia, Waiopouli, Wailua, Anahola, and Kapa'a. Natural and cultural resources include Nounou Mountain ridge commonly called Sleeping Giant, Opaekaa Falls, Keahua Forestry Arboretum, the Fern Grotto, and Wailua Falls. As the only navigable river in Hawaii, Wailua River is a popular kayaking location for tourists and locals alike. And as one of the first areas on Kauai inhabited by migrating Polynesians thousands of years ago, the Wailua River Valley is rich in archeological sites as well.



View of coastline in Kapa'a, which is often referred to as the Coconut Coast.

Schools in the Kawaihau district include Kapa'a Educational Complex; Kapa'a High, Intermediate, and Elementary Schools; Kamehameha School campus; and private schools.

There is one fire station in the district, in Kapa'a.

The largest landowner by far in this area is the State of Hawaii. Cornerstone Hawaii, Grove Farm, Bette Midler, and the Department of Hawaiian Home Lands are also large landowners.

There are gently rolling hills in the area surrounded by steep mountain ridges. The land slopes from the mountains to the ocean.

Downtown Kapa'a. Shops on the makai side of the street are a few hundred feet of the ocean. Behind the businesses on the mauka side of the street are large empty fields filled with overgrown brush.



There are large open fields of overgrown brush in Wailua and Kapa'a. In several areas, this brush continues up hillsides to

homes. The brush also comes close to the roadsides. Normal trade winds blow from the east-northeast averaging 5 – 15 mph.

Kuhio Highway, a two-lane paved major highway maintained by the State Department of Transportation, is the only major road connecting Kauai's east shore with the rest of the island. A section of the highway is three lanes wide in front of the prison and golf course. Commercial development tends to be along the highway, with residential and agricultural development on the mauka (mountain) side and inland of the highway.

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Overgrown grass and kiawe along the mauka side of the Wailua Corridor between Wailua and Lihue.

On the makai side of the Wailua Corridor there are hotels and a golf course while the mauka side is vast open fields of overgrown brush. The island's only prison is directly across from the golf course on the mauka side of the highway. Surrounded by fields of brush, the prison has come close to evacuating inmates during previous wildfires.

DHHL manages 5,000 acres of land in Anahola, 3,000 of which are used for grazing. They also manage the 71-acre Pi'ilani Mai Ke Kai subdivision, which contains 172 houses with lots averaging 10,000 square feet. Houses within Pi'ilani Mai Ke Kai are typically single story with Class A roofing and combustible siding. Driveways are short – less than 100 feet and unpaved. Several homes are within 30 feet of overgrown brush. Slope in Anahola averages 0 – 20 percent and the average annual rainfall is 45 inches. During the summer the community receives about 2 inches of rain a month.

According to DHHL officials, a 500,000-gallon water tank was built in Anahola in 1999. There is also a 150,000-gallon tank, which is interconnected to a second 500,000-gallon gravity-fed water tank in the farm area that can be used only in the event of an emergency.

DHHL is acutely aware of the wildfire risk in Anahola and the threat it poses to homestead lot owners. In 2001, Anahola experienced 16 wildfires, far more than another other town on Kauai that year. As a result, DHHL and Kauai Fire Department staff met and discussed fire prevention efforts in light of the fires affecting Anahola. In March 2002, the Fire Chief sent a letter to the Hawaiian Homes Commission regarding the department's concerns about wildfires in Anahola. The letter also contained mitigation suggestions, including the need to provide access to gated lands; maintaining access roads; clearing roadsides; preventing the dumping of trash and green waste; as clearing defensible space around structures. Some progress was made, however, a great deal more work needs to be done.



Smoke from a backyard fire can be seen from the Wailua Bypass Road.

In 2004, Anahola once again experienced more wildfires when 19 fires occurred. As a result, KFD staff called DHHL regarding the levels of thick brush surrounding the community. In response, DHHL applied for and received a \$50,000 FEMA grant to mow and maintain fuel breaks around the community. DHHL is currently in the process of implementing that grant.

DHHL also owns 400 acres in Wailua on the mauka side of the highway, which is slated for development. Plans call for 700 homestead lots for native Hawaiians, a school, community center, parks, and infrastructure improvements. DHHL plans for commercial development on the makai side of

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the highway are currently on hold.

There are several small-scale farming and livestock operations in the district.

While homes in this district are generally built on flat land, the communities themselves are built in and atop river valleys and foothills with steep ridges. Homes in subdivisions at the top of valleys, such as Wailua Riverview Estates and Kapa'a Heights tend to be entirely owner-occupied. Roads are paved, with metal road signs. While the occasional wood shake roof is seen, the majority of houses have Class A roofing with wood siding. Several homes are made of concrete block. Almost all driveways are paved and less than 100 feet long with no turn around space for fire apparatus. As of June 2009, real estate listings for single family homes in the Kawaihau district range from \$375,000 to \$2,500,000.



Left: View of homes on Kawaihau Road in Kawaihau, adjacent to Kapa'a. Open field of overgrown brush lay mauka of downtown Kapa'a. The brush grows up the hillsides to the homes. Center and right: View of Wailua Valley homes. Some homes have large amounts of vegetation around them, while other lot owners conduct small-scale grazing.

Houses vary in level of defensible space. However, those homes closest to undeveloped areas have kiawe and overgrown grasses growing in close proximity.

There are several resorts and hotels in Kapa'a. This side of the island is often called the Coconut Coast. Condominiums and vacation rentals are prevalent along the coast. In recent years development has focused on catering to the tourism industry with the building of time-shares, condominiums, and vacation homes.

Another proposed development for the district is the 2,021-acre Kealanani Project north of the Kealia River and mauka of the highway. Plans call for 190 agricultural lots ranging from 3 – 100 acres. One hundred low-income house and lot packages will be developed at a later date. Lots will have separate domestic and agricultural water systems with domestic water coming from onsite wells and agricultural water coming from old sugar irrigation system. Unlike other recent upscale development on agricultural land, Kealanani developers are mandating that property owners use their land for agricultural purposes. Tea and cacao are the main crops to be grown in these lots although property owners can choose alternate crops if they wish.

Lihue District

Encompassing the towns of Lihue, Hanamaulu, Puhi, and Nawiliwili, Lihue District is home to the island's governmental and commercial seat. Lihue district is also home to several natural and cultural resources, including the Grove Farm Homestead Museum, Huleia National Wildlife Refuge, the Menehune Fishpond, Nawiliwili Harbor, and Lydgate State Park.

Schools in the area include the main campus of Kauai Community College in Puhi, Kauai High School and Intermediate School, a middle school, two elementary schools, and several private schools.

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Kauai's only hospital, main shipping port, and airport are all in Lihue. There is one fire station for the district, in central Lihue.

Major landowners include Grove Farm, Visionary LLC, and W.H. Rice.

There are gently rolling hills in the area surrounded by steep mountain ridges and river valleys. The land slopes from the mountains to the ocean. There are large open fields of overgrown brush in Hanamaulu and Kapaia. In several areas, this brush continues up hillsides to homes. The brush also comes close to the roadsides. Normal trade winds blow from the east-northeast averaging 5 – 15 mph. Average annual rainfall in district varies from 49 inches in Hanamaulu to 58 inches in Puhi.

In Lihue, Kuhio Highway connects with Kapule Highway and Kaunali'i Highway. In Hanamaulu, Kuhio Highway veers mauka and runs inland to upper Lihue while Kapule Highway runs parallel with the coast closer to shore and airport. Kapule Highway runs a little over four miles and changes to Nawiliwili Road in Nawiliwili. Kuhio Highway is the main road through downtown Lihue and changes to Kaunali'i Highway at Rice Street.



Left: A ball field in a Hanamaulu neighborhood. The ballpark is surrounded by dense overgrown kiawe. The tall trees are the vegetation separating the ball field from neighborhood houses. Center: the house next to the ball field. Although the lot is small, there is a great deal of overgrown vegetation between the house and the ballpark. Right: dead end street on Wailua side of Hanamaulu. Overgrown grasses and kiawe borders the neighborhood.

Commercial development tends to be along the highways, with residential and agricultural development on the mauka (mountain) side and inland of the highway.

Unlike the resort towns of Poipu, Princeville, and Kapa'a the majority of homes are owner-occupied although some in Nawiliwili are used as vacation rentals. As of June 2009, real estate listings for single family homes in the Lihue district range from \$343,000 - \$768,000.

Subdivisions are built on or next to former agricultural lands. Homes in Lihue Town Tract Camp, Lihue and Hanamaulu Homes, Hanamaulu are typical district subdivisions in that houses are single or double story built on 10,000-12,000 square-foot lots. It's common for house lots to be separated by concrete or metal fences. Driveways are short, usually less than 50 feet, and paved with 15-foot vertical clearance. In Hanamaulu the side streets tend to be narrow with cars parking along both sides of the street. On the Wailua side of Hanamaulu Homes, the side streets dead end with no turn around space for fire apparatus. These dead end streets have dense overgrown brush within 30 feet of homes at the end of the street. Similarly, Lihue Town Tract Camp has vast open fallow fields around the subdivision.

Homes vary between post and pier and concrete slab construction. Some homes have wood siding while others are made of concrete block. Almost all the homes have Class A roofing. Homes vary in levels of defensible space.

Homes in Puhi, such as Hokulei Estates are similar to those described above, while homes on rural streets, such as those near the Menehune Fishpond and in Niumalu are larger in size with larger lots.

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Puakea Golf Course surrounds most of the Puakea subdivision in Lihue developed by Grove Farm, although there are some parts where overgrown grasses and brush come within 100 feet of homes. Beyond the golf course is acres of open fields. Because Puakea is a new subdivision, the vegetation on individual lots is not yet fully grown in.

Roads are paved and greater than 20 feet in width. Utilities are aboveground in older neighborhoods and underground in newer ones. Side streets in the district are paved and marked with metal reflectorized signs.

Koloa

Koloa District on Kauai's south shore includes the towns of Omao, Kalaheo, Lawai, Koloa and Poipu. Koloa is the oldest sugar plantation town in the state, while nearby Poipu's beaches and resorts make it one of the top tourist destinations on Kauai. The Spouting Horn in nearby Lawai, as well as the renowned National Tropical Botanical Gardens are just some of the natural and cultural resources in the area.

The area includes Kalaheo School and two private schools. The district is served by fire stations in Poipu and Kalaheo.



Typical plantation-style house found on Kauai. This house is in Koloa.



Spouting Horn in Lawai is a popular tourist destination on Kauai.

Alexander & Baldwin and Grove Farm are two of the largest landowners in the district.

The area surrounding Koloa and Poipu is mostly flat with slope ranging from 0-10 percent, while Kalaheo and Lawai tend to be steeper with slope ranging upwards of 20 percent. Koloa averages about 65 inches of rain annually while Poipu receives an average of 44 inches. Normal trade winds blow from the east-northeast averaging 5 – 15 mph.

Poipu and Koloa are accessible by two roads off of Kaunualii Highway: Maluhia Road and Koloa Road. The tree tunnel, a well-known landmark on Kauai, runs along the first mile of Maluhia Road from the Highway. Both Maluhia Road and Koloa Road are two-lane paved major streets. There are a couple ranches and vast fallow cane fields along Maluhia Road. Some of the former cane lands are slated for development, such as the proposed Poipu Aina Estates that are planned within sight of the Poipu sugar mill.

There is ranching and residential development along Koloa Road. Some lots along Koloa Road are 10-12,000 square feet, while others are much larger.

Commercial development is centralized in downtown Koloa and a few shopping centers in Poipu.



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Because Koloa is one of the oldest towns on the island, (it dates back to 1835) houses tend to be small, single-story, and close together. Like other plantation towns, it is common for houses to be separated by concrete or metal fences. Driveways are short, usually less than 50 feet, and paved with 15-foot vertical clearance. Homes vary between post and pier and concrete slab construction. Some homes have wood siding while others are made of concrete block. Almost all the homes have Class A roofing. Homes vary in levels of defensible space, although many homes seen during the wildfire hazard assessment had vegetation growing next to or actually up on the house. As of June 2009, real estate listings for single family homes in the Koloa district range from \$685,000 - \$1,700,000 with the higher end homes found in Poipu.

Above: Fallow cane fields are being developed into upscale housing developments in Koloa and Poipu. From Maluhia Road a realtor's flag can be seen waving in the foreground to promote sales in Poipu Aina Estates with the defunct sugar mill in the background.

Homes in Koloa, Lawai, and Kalaheo have above ground utilities, hydrants and setbacks. Newer homes in Poipu have underground utilities. Road signage is metal and reflectorized, however house



Above left and center: Built in 1835, old Koloa town contains retail shops, a post office, churches, and a community center. Right: A new subdivision Koloa Creekside Estates, is being built a few hundred feet down the street from the red wood building featured in the left and center pictures.

numbers vary in size and color.

More recently homes have been built further away from historic Koloa center. These homes are on slightly larger lots and tend to be larger in size and often two stories in height. The immediate area around the home may be cleared but they often have overgrown fields filled with kiawe and brush within 50-100 feet of the house.



Above left: Homes on the outskirts of historic Koloa center. These newer homes have defensible space within 30 feet of the house but are surrounded by open fields of overgrown brush. Center and right: The same house as seen from the front and side. The front entrance and sides have 30 feet of defensible space but beyond that there is thick overgrown grasses and kiawe trees.

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Condominiums, time-shares, and vacation rental homes are the predominant housing in Poipu. Lot sizes become smaller as you get closer to the ocean. Since most properties are vacation rentals, they tend to be maintained by landscaping services so vegetation rarely becomes overgrown.



Above left: Former sugar cane fields around Poipu are slated for development and ground breaking has already occurred in several subdivisions. Above right: subdivision in Kalaheo built mauka of the highway.

Neighborhoods in Lawai and Kalaheo along Koloa Road and the highway more closely resemble the plantation towns of Hanamaulu and Wailua than the resort area of Poipu. However, homes along the coastline in Poipu and parts of Lawai tend to be upscale vacation rentals. It was observed during the wildland hazard assessment that the majority of these vacation rentals homes

have wood shake roofs. Although directly on the ocean, these homes are across the street from open fields of overgrown grasses. While these wood shake roofs pose a threat due to the overgrown grasses, this area, Kukuiula is slated for development and groundbreaking is evident. It is anticipated that when Kukuiula is developed the lack of fuel load will reduce the fire risk of the wood shake roofs.

A substantial amount of development is planned for the Koloa district, primarily in Poipu. Although the current year round population of Poipu is 1,000 people, more than 4,000 residential units are proposed for former agricultural lands. Plans call for resorts, time-shares, condominiums, and single-family residences.

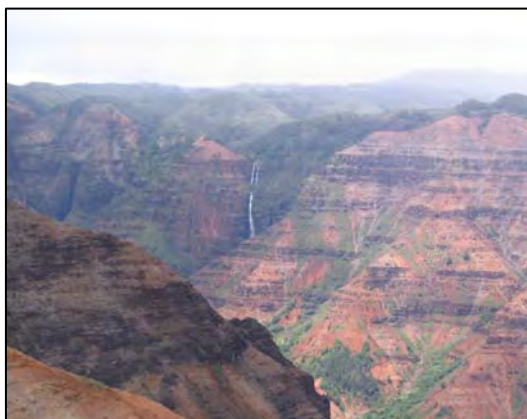
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Waimea District

The Waimea District covers the west side of Kauai, including the towns of Kekaha, Port Allen, Waimea, Kokee, Hanapepe, and Ele'ele. These communities are primarily agricultural although tourism also contributes to the local economy.

One of Kauai's most well known and most-visited sites – Waimea Canyon (also known as the Grand Canyon of the Pacific) is on the west side. Additional cultural, historical, and natural resources include Kokee State Park and the breathtaking Kalalau Lookout, Russian Fort Elizabeth, Hanapepe Valley Lookout, the Salt Pond, and the 17-mile-long Polihale beach, the longest beach in Hawaii.

Hanapepe averages about 30 inches of rain annually. Further up the coast, Kekaha and Waimea average 20 and 21 inches of rainfall a year respectively. During the summer months Kekaha and Waimea may see only a half-inch of rain a month.



Frequently referred to as the “Grand Canyon of the West”, Waimea Canyon is one of Kauai's most well known scenic vistas. A mile wide, 10 miles long, and more than 3,500 feet deep Waimea Canyon offers spectacular views of its canyons and waterfalls.



Above left: View of Hanapepe town and surrounding agricultural land from the scenic overlook on Kaumuali'i Highway. The canyon in the forefront is Hanapepe River. Above right: View of Waimea town from Waimea Canyon Drive.

The district experiences typical 10-15 mph trade winds from the east/northeast, although winds can gust much higher in Kekaha.

Kauai Coffee Company, Pioneer Seed Company, the U.S. Navy's Pacific Missile Range Facility at Barking Sands, and Syngenta are all major employers in Waimea District. Kekaha Sugar Mill, which for generations influenced all aspects of life in West Kauai, including development, banking, transportation, housing and utilities closed in 2000. The town is still struggling since the mill's closing.

The State of Hawaii, DHHL, and the Robinson Family are the largest landowners in the district. DHHL owns 15,000 acres in this district almost all of which is agricultural or conservation land. However, a 49-lot subdivision was recently developed on 20 acres in Kekaha. In 2005, DHHL awarded 40 homestead leases with most lessees native Hawaiians from the nearby island of Niihau.

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Kaumuali'i Highway, a paved two-lane highway maintained by the State Department of Transportation, is the one and only major thoroughfare connecting west side towns with the rest of the island. The highway ends in Mana but a smaller road continues to Polihale State Park where the road ends at the base of the Na Pali coastline. Residential developments have been built on the mauka and makai side of the highway.

The district is home to Waimea High School, Ele'ele Elementary, Island School, Kekaha School, St. Teresa's School, and Waimea Canyon School. Kauai Community College and the University of Hawaii also have satellite offices in the Waimea district. Waimea is also home to a Veteran's Hospital, West Kauai Medical Center, and the West Kauai Technology and Visitor Center. There are commercial areas in Waimea, Ele'ele, and Port Allen.

In recent years Hanapepe town, established along the banks of the Koula River, has marketed itself as an artistic center, although many of the storefronts along Hanapepe Road have remained vacant since the demise of the sugar cane industry.



Above left: plantation home in Makaweli. Note the wood shake roof and vegetation within 10 feet of the home. Above center and right: View of houses above Hanapepe town. Note the dense dried vegetation on the hillside.

Waimea district has two fire stations: one in Waimea and another in Hanapepe.

As former sugar plantations towns, neighborhoods in Kekaha, Waimea, Hanapepe, and Ele'ele, all tend to be in densely developed areas, composed of 8,000 – 12,000 square-foot lots with modest homes. House types vary between post and pier construction and concrete slab. Homes tend to be single-story with small louvered windows, Class A roofing and wood siding, although some homes are made of concrete block. There were several homes in Hanapepe Residence Lots and Hanapepe Heights that had wood shake roofs. A smattering of newer homes are two-stories high.

Driveways are 10-12 feet wide with 15-foot vertical clearance. Driveways in these neighborhoods are also paved and less than 100 feet in length with no turnaround space for fire apparatus. House numbers are displayed on mailboxes or the sides of houses. The communities have above ground utilities, paved roads, hydrants, and setbacks.

These neighborhoods are surrounded by open areas, either agricultural or former sugar cane lands.

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Although there are several vacation rentals in Waimea and Kekaha, the majority of homes in the Waimea district are owner-occupied. As of June 2009, real estate listings for single family homes in the Waimea district range from \$495,000-\$1,900,000.

For the most part, homes have defensible space because the lots are small. However, a visual inspection of neighborhoods throughout the district found homes with vegetation growing within 10 feet of the structure, sometimes abutting the house.



Above left: typical home in Kekaha. On the other side of the street is overgrown brush that extends for several acres (Center photo). Above right: View of Hanapepe Residence Lots in Hanapepe.

Waimea and Kekaha neighborhoods tend to have at least two means of ingress and egress except for the homes along the bottom of Waimea Canyon Drive. Hanapepe Residence Lots in Hanapepe only have one means of ingress/egress (Moi Road). There are gulleys on either side of Moi Road with kiawe and grasses coming up to the roadside.

At the 3,600-foot-elevation above Waimea, Kokee is home to Kokee State Park, Kokee Museum, Waimea State Park, NASA Tracking Station, Kokee Air Force Station, Kalalau Lookout, YWCA Camp Slogett, Kokee Methodist Camp, a Boy Scout Camp, Kokee Hongwanji, and Camp Hale Koa. Kokee State Park is 15 miles from Waimea and it takes the fire department about 30-45 minutes to respond due to the windy steep roads in the area.



From sea level, two roads can access Kokee, Kokee Road in Kekaha, and Waimea Canyon Drive in Waimea. However the two roads merge just before the 7 mile-marker, about halfway up the mountain, with the two-lane windy and narrow Waimea Canyon Drive as the only means of ingress/egress for Kokee. Side roads are unpaved, steep, have no signage, and many require four-wheel drive to navigate.

Above left: cabin in Kokee. The majority of cabins are owned by the State of Hawaii and leased to those who submit an application. Some cabins are inhabited year round, while others are used as vacation homes. Above right: cabin in Kokee. The cabin has wood shingles and the wood shake roof is covered in dried pine needles.

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Above left: cabin in Kokee. The cabin is built on a slope with dried vegetation gathering under the wooden lanai. Overgrown grass and unpruned trees dot the property. Above right: The remains of a Kokee cabin destroyed in an April 2005 fire. Because the nearest fire station is at the bottom of Waimea Canyon (a 30+ minute drive), the cabin was completely involved by the time fire personnel arrived on scene. Fortunately, the fire did not spread to the nearby woods.



In addition to being home to the largest concentration of rare and endangered native Hawaiian plants on Kauai. Kokee is also home to more than 90 cabins on state land that are leased. Some of these leases have been in the same family for generations.

The cabins in Kokee tend to be on flat land, with some built into the hillsides. While some cabins have metal roofs, several have wood shake roofs, wood siding, and dense vegetation close to the structure. Most driveways are unpaved and vary in length (some are less than 50 feet while a few are longer than 300 feet) with limited turnaround space for fire apparatus. House numbers are nonexistent, although some have signs with the cabin name. Utilities are above ground.

Unattended campfires pose a fire threat in Kokee. Response time from Waimea fire station is at least 45 minutes. This is problematic for a response that is needed to keep the fire from rapidly spreading. Dead and down trees and branches from the 1992 Hurricane Iniki have contributed to the concentrated fuel load.

Lack of water resources is also an issue. Aerial water drops is one of the most effective tools in fire suppression given the rough terrain. Water resources are limited in the Waimea district.

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; scenic, cultural, and archeological sites; ranchlands; and structures.

The following were identified as valued resources within Kauai that would be adversely affected by wildfire.

Commercial / community resources:

Resorts, shopping centers, schools, community centers, churches, restaurants, industrial parks, and retail establishments.

Natural / Cultural Resources:

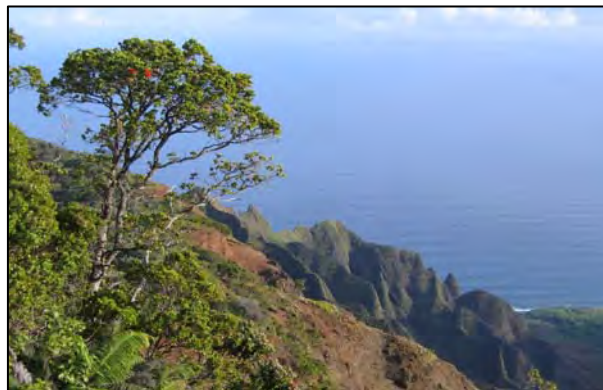
Kauai Community Wildfire Protection Plan
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National Tropical Botanical Gardens, Kilauea Lighthouse and National Wildlife Refuge, Huleia National Wildlife Refuge, Bell Stone, Alakai Swamp, Tree Tunnel (Koloa), Waikanaloo Wet Cave, Russian Fort Elizabeth, Waimea Canyon, county parks and beaches including Polihale Beach State Park, Kokee State Park, Lydgate State Park, and Wailua River Valley, as well as rare and endangered plants and animals, and cultural and archeological features.

These resources are critical for a number of reasons. Not only are the natural resources home to rare and endangered native Hawaiian plants and animals, they are also attracting thousands of tourists a year to Kauai.

In 2006, the Kauai Open Space Commission catalogued places of importance to the people of Kauai. This list was developed during the public-input process of the Public Access, Open Space, and Natural Resources Management Fund Commission (Open Space Commission).

While this list identifies many places around Kauai dear to its residents for cultural, historic, religious, natural, and other reasons it is by no means definitive – it simply reflects the data collected at that time. Some areas are listed more than once for specific areas within that locale.



Above: View from Kalalau lookout, one of the places listed as important to the people of Kauai.

Not all areas on the list are in the wildland urban interface. However, it is of interest to note that the first 32 places on the list are in Kapa'a, Kauai's largest residential town situated in the heart of the wildland urban interface. Nearly one third of the list, are in Anahola, a town with the second highest rate of wildfire incidents on the island. Below is a list of the top ten places on the list; the full list can be found in Appendix B.

Places of Importance to the People of Kauai

Number	Quad Map	Site Name
1	Kapaa	Nukolii
2	Kapaa	Kalepa Point
3	Kapaa	Kalepa Forest Reserve
4	Kapaa	Wailua River Valley
5	Kapaa	Opaekaa Falls
6	Kapaa	Wailua River Valley
7	Kapaa	Wailua River Valley
8	Kapaa	Wailua River Valley
9	Kapaa	Wailua River Valley
10	Kapaa	Wailua River Valley

Community Concerns for Kauai:

Community meetings specifically on the CWPP process held in June 2008 through June 2009 with community members and fire agencies identified the most pressing fire concerns on Kauai. They include, in order of priority:

1. Fuel load reduction along Wailua Corridor;
2. Fuel load reduction surrounding communities, such as Anahola and Wailua Homesteads;
3. Fuel load reduction along roadsides, in community open areas, and individual homes;
4. Complete lack and/or low level of water in reservoirs around Kauai;
5. Lack of public awareness of the wildfire threat on Kauai. Need to educate current and future residents about wildfire risks in the community;
6. Green waste recycling to prevent illegal dumping;
 - 6a. Reduce amount of illegally dumped trash in Anahola;
7. Develop regional and local planning and development standards that require communities' and subdivision designs to consider and/or mitigate fire risk;
8. Structures' design, materials, placement, and landscaping that promotes or does not mitigate fire risk;
9. Additional evacuation routes from communities that only have one means of ingress/egress; and.
10. Increase/integrate communication equipment between state, federal, and county agencies.
11. Additional fire apparatus staged in Kokee for quick response.
12. Additional water resources in Kokee, such as fire hydrants or stand pipes.

CWPP Recommendations:

Feedback from community members and fire service agencies during the CWPP process led to 12 recommendations listed below.

1. Installing and maintaining firebreaks along the Wailua Corridor.
2. Fuel load reduction along the Wailua Corridor.
3. Implementing grazing practices in Anahola and increasing grazing around the perimeter of Wailua Homesteads.
4. Maintaining and increasing the use of current reservoirs around the island.
5. Continued public education on fire prevention issues, such as creating defensible space particularly in Kokee, Anahola, Wailua, Hanamaulu, Koloa, Waimea, and Kapa'a.
6. Implement community chipping days to encourage fuel load mitigation and green waste recycling.
7. Increased use of fire-resistant building materials in new residential development.
8. Implementation of Firewise recommendations in the planning process, such as fuel-breaks around all new residential subdivisions and multiple means on ingress/egress.
9. Creation of secondary emergency access roads in residential areas where necessary.
10. Integrate and increase radio communications between federal, state, and county fire response agencies. May require purchasing additional radios for Public Works and other county departments to use during wildfire suppression.

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11. Purchase of refurbished light-response brush truck to be staged in Kokee.
12. Installation of fire hydrants or stand pipes in Kokee.

Recommended Action for Kauai:

Given its importance as a vital transportation link between two of the most populated areas on the island, the Wailua Corridor is an area that is extremely vulnerable to wildfires. The closure of the road during wildfires has a tremendous negative impact on the Kapa'a community and the island as a whole. Constructing and maintaining fuel breaks along the Corridor can possibly slow the spread of wildfires when they occur.

Reducing the fuel load along the Wailua corridor will also help reduce the potential spread of wildfires in the area. The vast majority of land around the Wailua Corridor is former agricultural land primarily owned by the State of Hawaii and other large landowners. Large landowners will need to address community concerns when implementing fire breaks near communities

With its high rate of wildfires, vast tracts of open lands, and large piles of dumped trash and abandoned vehicles, the Anahola area is a concern to fire officials. During interagency meetings as part of the CWPP process, DHHL officials indicated they were amenable to grazing around Hawaiian homesteads in Anahola. Issues facing ranchers wanting to graze in the Anahola include insurance, lack of water resources, and length of stay for animals in fields (need to make it effective to pay for fencing.)

Limited grazing has been done around Wailua Homesteads in the past. Grant funding would help expand the size of the area being grazed, as well as the frequency of the grazing. This will go a long way toward reducing the fuel load around the Wailua Homesteads community.

Kauai Fire Chief Westerman would like to see current reservoirs maintained and used rather than installing dip tanks around the island. Many reservoirs are being allowed to go dry because land is no longer being farmed.

Continued public education about wildfire prevention is crucial. During the development of this CWPP, the author frequently asked Kauai residents how many wildfires they thought occurred annually on the island. No one ever answered more than 12 wildfires a year even though there were 82 wildfires on Kauai in 2008 and 134 fires in 2007.

Given the steady influx of residents from other parts of the U.S. who are unfamiliar with the fire regime of Hawaii, it is important to constantly remind people of the wildfire threats in their community. Chief Westerman noted that the increase in "gentlemen's farms" come with their own wildfire hazards, pointing out that gentleman farmers in Kilauea own 8-10 acres with wooden structures on their farms.

Public education on wildfire safety education could also include an awareness campaign about the hazards of illegal trash dumping. Abandoned cars and trash piles are an issue in Anahola. However, it was noted during the CWPP process that trash (boxes, cars, etc.) are left behind by tenant farmers on A&B land.

Communities around Kauai could benefit from communal chipping programs and green waste recycling.

An island-wide chipping program was suggested by members of the Kauai Planning Commission during the development of the CWPP. It was suggested that such a program be implemented by the

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Kauai Fire Department and other County agencies (Environmental Management) to benefit those communities wanting to reduce their fuel load.

Another recommendation of this CWPP is to increase the use of fire-resistant building materials in new residential development. The Kauai Planning Department is responsible for regulations regarding residential development on Kauai. The County as a whole can mandate that fire-resistant building materials be used in all new residential construction. Homeowner associations in individual communities can also require the use of fire-resistant building materials through their CC&Rs (Codes, Covenants and Restrictions). At least four homeowner associations in communities on the west side of Hawaii Island have adopted Firewise construction recommendations as part of their CC&Rs.

Given the rapid rate of development Kauai has recently experienced, the Kauai Planning Department may want to explore the possibility of implementing Firewise recommendations in the planning process, such as fuel breaks around all new residential subdivisions. The creation of secondary emergency access roads in existing residential areas and/or planning multiple means on ingress/egress in new residential subdivisions is also recommended.

When large-scale wildfires occur on Kauai, multiple state and county agencies respond. However, not all the agencies may be able to communicate with each other. Kauai Department of Public Works are frequently called in to assist with heavy equipment during wildfires but their staff have little or no wildland fire training and are often do not have radios. During a June 2009 wildland interagency meeting, the lack of standardized radio communications (all responding agencies being able to communicate via radios on the same frequency) was cited as a concern. Ensuring that all responding agencies have the proper radio equipment and are versed in using it properly will help minimize the potential risk inherent in lack of communication during a fire.

Given Kokee's remote location and high preponderance of threatened and endangered plants and animals, quick response to wildfires is vital. However, the nearest fire station is more than 15 miles away in Waimea and with the windy uphill roads it takes nearly 45 minutes for fire crews to respond. There are no fire hydrants in Kokee. The Kokee Advisory Council would like to explore the possibility of purchasing a light-response brush truck and install fire hydrants or stand pipes in the area to facilitate faster fire response.

Based on the results of the community risk assessment, priority ratings have been selected for Kauai 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
Wailua	Mechanical / Chemical	Installing and maintaining fuel breaks along Wailua Corridor	Very High
Wailua	Mechanical / Chemical	Fuel load reduction	Very High

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	/ Hand Labor	along Wailua Corridor	
Island-wide	Mechanical/Chemical/ Hand Labor	Reduction of fuel load along roadsides, community open areas, and individual homes	High
Anahola, Wailua, Koloa, Princeville	Animal	Grazing	High
Island-wide	Mechanical / Political	Maintaining and increasing use of current reservoirs	High
Island-wide	Public Education and Outreach	Continued fire prevention education and outreach, including arson prevention education	High
Island-wide	Mechanical	Implement community chipping days to encourage fuel load reduction	High
Island-wide	Planning / Political	Increase use of fire- resistant building materials in new residential development. Incorporation of fuel breaks and multiple means of ingress/egress in all new residential development.	Medium
Island-wide	Mechanical	Creation of secondary emergency ingress/ egress roads in existing neighborhoods where necessary.	Medium
Island-wide	Mechanical / Political	Increase effective integrated radio communication between state and county fire suppression agencies.	Medium
Kokee	Mechanical	Purchase a brush truck to be staged in Kokee for fast response to wildfires.	Medium
Kokee	Mechanical	Install fire hydrants/stand pipes in Kokee.	Medium

Community organizations, federal agencies, and private landowners around Kauai were invited to submit projects that provide protection and reduce wildfire risk. The following table displays a list of projects based on recommendations from community and/or fire-related organizations.

Community, structure, or area at risk	Project	Agency	Funding Needs	Timetable	Community Recommendation
Wailua	Installing and maintaining fuel	Multiple agencies:	Cooperative Funding	2009 - 2014	Yes

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	breaks along Wailua Corridor	state and county	\$500,000		
Wailua	Fuel load reduction along Wailua Corridor	Multiple Agencies: county	Cooperative Funding \$500,000	2009 - 20014	Yes
Island-wide	Reduction of fuel load along roadsides, community open areas, and individual homes	Multiple Agencies: state, county, and private	Cooperative Funding \$850,000	2009 - 2014	Yes
Anahola, Wailua Homesteads, Koloa, Princeville	Grazing around subdivision perimeters to reduce fuel load	Multiple Agencies: state, county, and private	Cooperative Funding \$200,000	2009 - 2014	Yes
Island-wide	Maintain and increase use of current reservoirs	Multiple Agencies: county and state	Cooperative Funding \$	2009 - 2014	Yes
Island-wide	Continued fire prevention education and outreach, including arson prevention education	Multiple agencies: federal, state, county, and private	Cooperative Funding \$45,000	2009 - 2014	Yes
Island-wide	Implement community chipping days to encourage fuel load reduction	Multiple agencies: state, county, and private	Cooperative Funding \$175,000	2009 - 2014	Yes
Island-wide	Creation of development standards and community planning that requires the mitigation of wildfire risks	Multiple Agencies: county and state	Cooperative Funding \$150,000 for outreach, any needed impact studies and education	2009 - 2014	Yes
Island-wide	Creation of secondary emergency ingress/egress roads	Multiple Agencies: state, county, and private	Cooperative Funding \$750,000 if environmental assessments required	2009 - 2014	Yes
Island-wide	Increased effective integrated radio communication between state and county fire suppression agencies	Multiple agencies	Cooperative Funding \$80,000	2009 - 20013	Yes
Kokee	Purchase a brush truck to be staged in Kokee for fast	Multiple agencies	Cooperative Funding \$75,000	2009-2013	Yes

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	response to wildfires.				
Kokee	Install fire hydrants/stand pipes in Kokee.	Multiple agencies	Cooperative Funding \$250,000	2009-2014	Yes

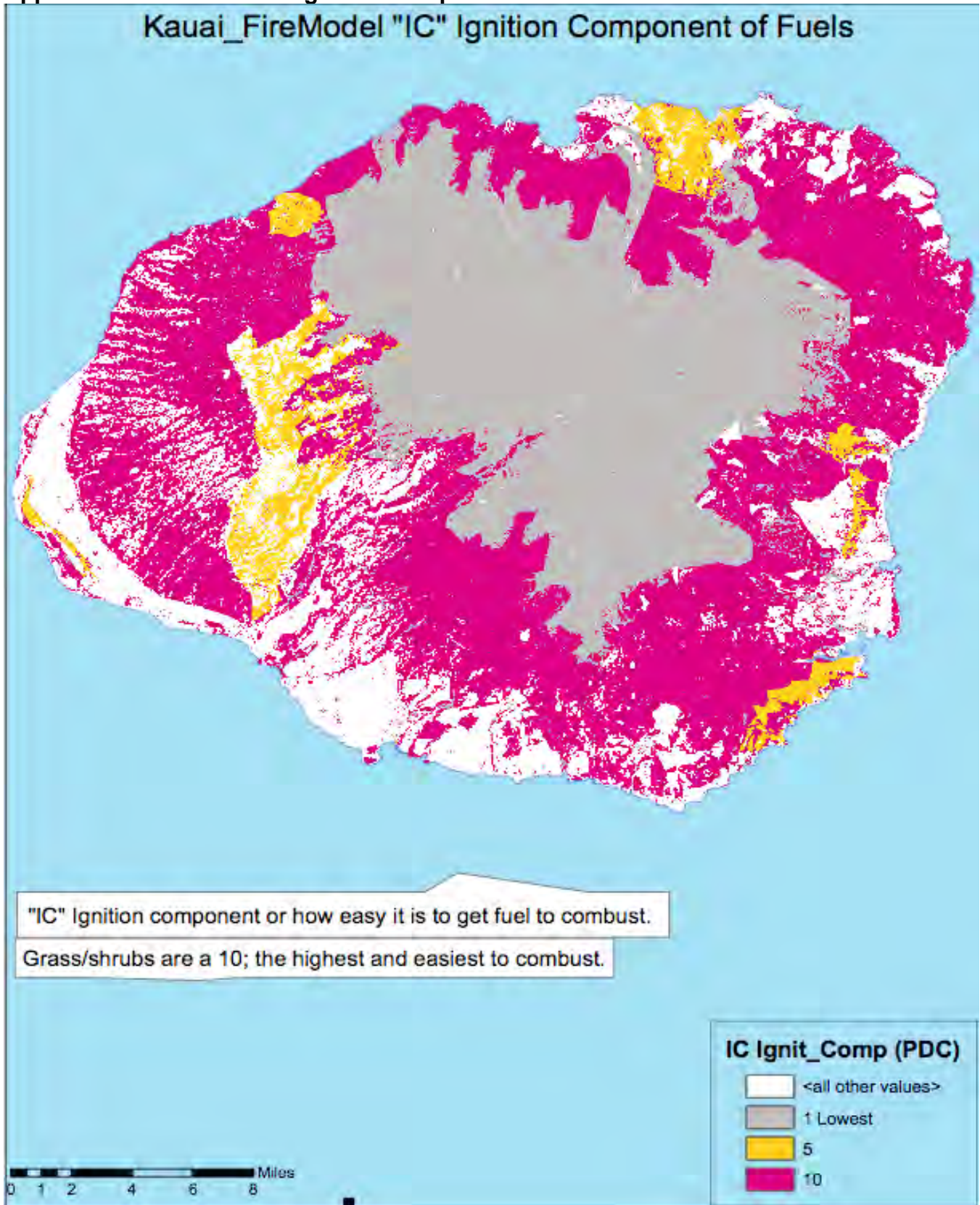
Reduce Structural Ignitability:

As part of its fire prevention education efforts, Firewise Communities Hawaii provides recommendations to reduce structural ignitability. Individuals and community groups around Kauai can reduce structural ignitability throughout the county 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. Wherever 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.

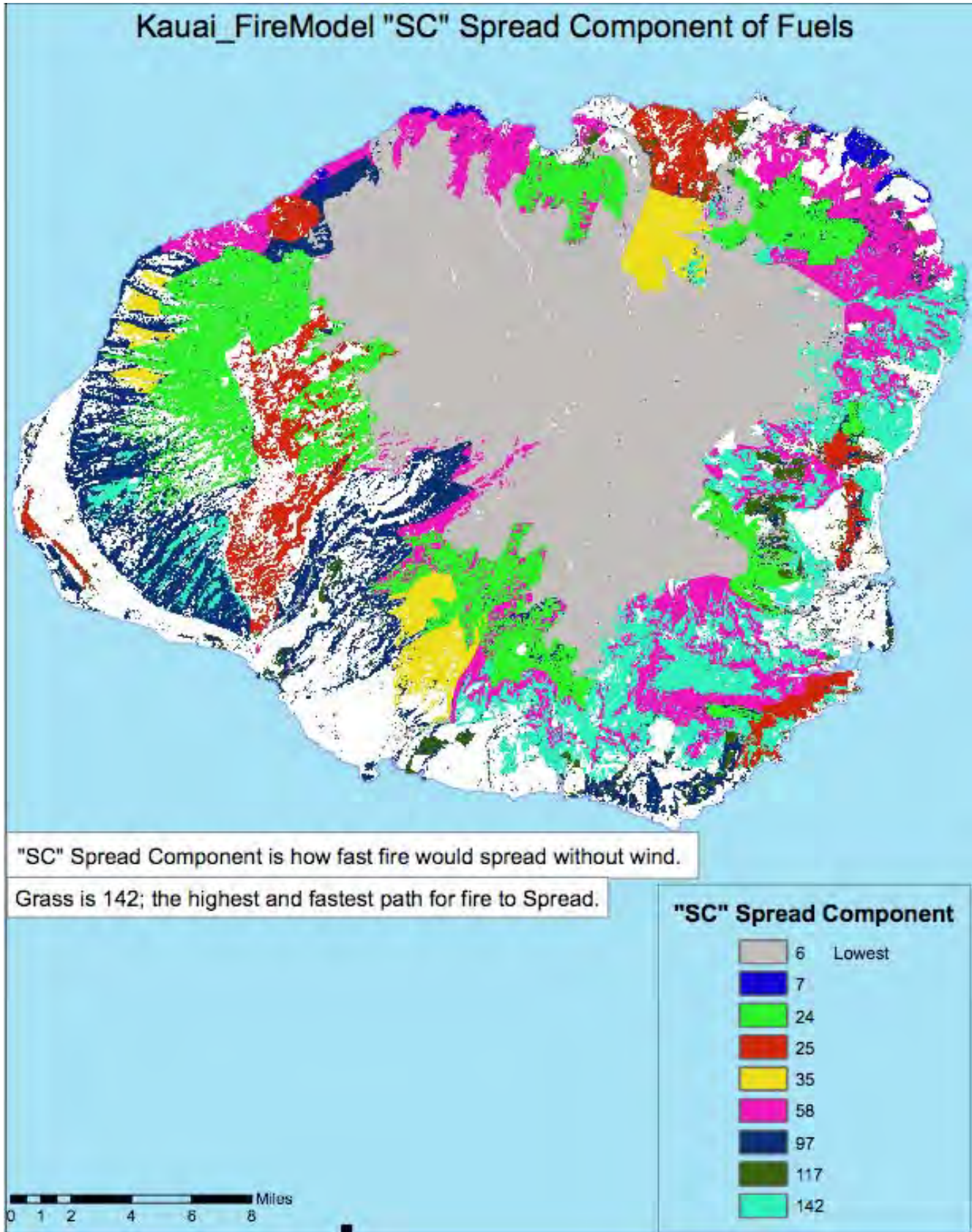
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Appendix A: Fire Model of Ignition Component of Fuels



Map courtesy of Kauai County GIS.

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Map courtesy of Kauai County GIS.

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Appendix B:

Places of Importance to the People of Kauai

Number	Quad Map	Site Name
1	Kapaa	Nukolii
2	Kapaa	Kalepa Point
3	Kapaa	Kalepa Forest Reserve
4	Kapaa	Wailua River Valley
5	Kapaa	Opaekaa Falls
6	Kapaa	Wailua River Valley
7	Kapaa	Wailua River Valley
8	Kapaa	Wailua River Valley
9	Kapaa	Wailua River Valley
10	Kapaa	Wailua River Valley
11	Kapaa	Wailua River Valley
12	Kapaa	Opaekaa Falls
13	Kapaa	Opaekaa Falls
14	Kapaa	Wailua River Valley
15	Kapaa	Wailua River Valley
16	Kapaa	Wailua River Valley
17	Kapaa	Nounou/Sleeping Giant
18	Kapaa	Nounou/Sleeping Giant
19	Kapaa	Waipouli Beach
20	Kapaa	Waipouli Beach
21	Kapaa	Waipouli Beach
22	Kapaa	Waipouli Beach
23	Kapaa	Waipouli Mauka
24	Kapaa	Kapaa Beach Park
25	Kapaa	Kapaa Cemetary
26	Kapaa	Kapaa Homesteads
27	Kapaa	Upper Kapahi Reservoir
28	Kapaa	Kahuna Road
29	Kapaa	Hoopii Falls
30	Kapaa	Hoopii Falls
31	Kapaa	Kealia Coast
32	Kapaa	Waipouli Mauka
33	Hanapepe	Numila Makai
34	Hanapepe	Puolo Point
35	Hanapepe	Puolo Point
36	Hanapepe	Puolo Point
37	Hanapepe	Puolo Point
38	Hanapepe	Puolo Point
39	Hanapepe	Paakahi Point
40	Hanapepe	Salt Pond Beach Park
41	Hanapepe	Salt Pond Beach Park
42	Hanapepe	Hanapepe River Valley
43	Hanapepe	Hanapepe River Valley
44	Hanapepe	Makaweli Mauka
45	Hanapepe	Kaumakani Makai

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46	Hanapepe	Makaweli Landing
47	Hanapepe	Makaweli Landing
48	Hanapepe	Makaweli Landing
49	Hanapepe	Waimea River Valley
50	Koloa	Mahaulepu
51	Koloa	Mahaulepu
52	Koloa	Makawehi
53	Koloa	Koloa Mill
54	Koloa	Kaneiolouma
55	Koloa	Kaneiolouma
56	Koloa	Poipu Beach Park
57	Koloa	Waiohai Beach
58	Koloa	Kipu
59	Koloa	Haupu
60	Koloa	Haupu
61	Koloa	Haupu
62	Koloa	Waita Reservoir
63	Koloa	Waita Reservoir
64	Koloa	Waita Reservoir
65	Koloa	Waita Reservoir
66	Koloa	Kukuiula
67	Koloa	Kahili
68	Koloa	Kahili
69	Koloa	Kahili
70	Koloa	Haupu
71	Koloa	Haupu
72	Koloa	Kahili
73	Koloa	Lawai Mauka
74	Koloa	Lawai Mauka
75	Koloa	Lawai Mauka
76	Koloa	Lawai Mauka
77	Koloa	Lawai Mauka
78	Koloa	Lawai Homestead
79	Koloa	Lawai Homestead
80	Koloa	Lawai Homestead
81	Koloa	Lawai Kai
82	Koloa	Na Pali
83	Koloa	Wahiawa Bog
84	Koloa	Alexander Reservoir
85	Koloa	Alexander Reservoir
86	Koloa	Alexander Reservoir
87	Koloa	Alexander Reservoir
88	Koloa	Kalaheo Mauka
89	Koloa	Kalaheo Mauka
90	Lihue	Ahukini
91	Lihue	Nawiliwili
92	Lihue	Menehune Fishpond
93	Lihue	Menehune Fishpond
94	Lihue	Menehune Fishpond

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95	Lihue	Kipu Falls
96	Lihue	Kipu Falls
97	Lihue	Haupu
98	Lihue	Haupu
99	Lihue	Kipu Kai
100	Lihue	Kipu Kai
101	Lihue	Kipu Kai
102	Lihue	Mahaulepu
103	Lihue	Mahaulepu
104	Lihue	Mahaulepu
105	Haena	Kokee
106	Haena	Na Pali State Park
107	Haena	Hanakapiai
108	Haena	Wainiha Mauka
109	Haena	Wainiha Mauka
110	Haena	Haena State Park
111	Haena	Haena State Park
112	Haena	Haena State Park
113	Haena	Haena State Park
114	Haena	Haena Park
115	Haena	Haena Mauka
116	Haena	Haena Point
117	Haena	Haena Point
118	Haena	Haena Point
119	Haena	Haena Point
120	Haena	Kepuhi Point
121	Haena	Kepuhi Point
122	Haena	Kepuhi Point
123	Haena	Wainiha
124	Kekaha	Niu Ridge
125	Kekaha	Niu Ridge
126	Kekaha	PMRF
127	Kekaha	PMRF
128	Kekaha	PMRF
129	Kekaha	PMRF
130	Kekaha	PMRF
131	Kekaha	PMRF
132	Kekaha	PMRF
133	Kekaha	PMRF
134	Kekaha	PMRF
135	Kekaha	PMRF
136	Kekaha	PMRF
137	Makaha Point	PMRF
138	Makaha Point	PMRF
139	Makaha Point	PMRF
140	Makaha Point	Makaha Ridge
141	Makaha Point	Milolii
142	Makaha Point	Milolii
143	Makaha Point	Milolii

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144	Makaha Point	Milolii
145	Makaha Point	PMRF
146	Makaha Point	Kokee
147	Waimea Canyon	Kokee
148	Waimea Canyon	Kokee
149	Waimea Canyon	Kokee
150	Waimea Canyon	Kokee
151	Waialeale	Waialeale
152	Waialeale	Waialeale
153	Waialeale	Waialeale
154	Waialeale	Waialeale
155	Waialeale	Waialeale
156	Waialeale	Waialeale
157	Waialeale	Waialeale
158	Waialeale	Waialeale
159	Waialeale	Waialeale
160	Waialeale	Waialeale
161	Waialeale	Kilohana Crater
162	Eastern Kauai	Kealia Spaulding Monument
163	Eastern Kauai	Kalihiwai River Basin
164	Anahola	Kauapea
165	Anahola	Kilauea Stream
166	Anahola	Waiakalua Makai
167	Hanalei	Wainiha
168	Hanalei	Lumahai
169	Hanalei	Princeville Makai
170	Hanalei	Pinceville Makai
171	Hanalei	Black Pot
172	Hanalei	Black Pot
173	Hanalei	Hanalei River
174	Hanalei	Hanalei River
175	Hanalei	Waioli Stream
176	Hanalei	Waioli Stream
177	Hanalei	Princeville Makai
178	Hanalei	Princeville Makai
179	Hanalei	Princeville Makai
180	Hanalei	Princeville Makai
181	Hanalei	Princeville Makai
182	Hanalei	Anini Beach
183	Hanalei	Princeville Makai
184	Hanalei	Anini Beach
185	Hanalei	Hanalei River
186	Hanalei	Kilauea Point
187	Hanalei	Hanalei Homestead
188	Hanalei	Hanalei River
189	Hanalei	Princeville Mauka
190	Hanalei	Kalihiwai River Basin
191	Hanalei	Kalihiwai River Basin
192	Hanalei	Kalihikai Mauka

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193	Hanalei	Kalihikai Mauka
194	Hanalei	Anini Beach
195	Hanalei	Kalihiwai Bay
196	Hanalei	Kalihiwai Bay
197	Hanalei	Kauapea
198	Hanalei	Puukumu Stream
199	Hanalei	Puukumu Stream
200	Hanalei	Puukumu Stream
201	Hanalei	Kalihiwai Reservoir
202	Hanalei	Kalihiwai River Basin
203	Hanalei	Kalihiwai River Basin
204	Hanalei	Kalihiwai River Basin
205	Hanalei	Kalihiwai River Basin
206	Hanalei	Moloaa Forest Reseve
207	Anahola	Anahola Bay
208	Anahola	Anahola Mauka
209	Anahola	Anahola Mauka
210	Anahola	Anahola Mauka
211	Anahola	Anahola Mauka
212	Anahola	Kamalomaloo
213	Anahola	Kealia Spaulding Monument
214	Anahola	Kealia Mauka
215	Anahola	Kealia Mauka
216	Anahola	Kealia Mauka
217	Anahola	Kealia Mauka
218	Anahola	Papaa Bay
219	Anahola	Papaa Bay
220	Anahola	Papaa Bay
221	Anahola	Papaa Bay
222	Anahola	Papaa Bay
223	Anahola	Papaa Bay
224	Anahola	Papaa Bay
225	Anahola	Papaa Mauka
226	Anahola	Papaa Mauka
227	Anahola	Papaa Mauka
228	Anahola	Aliomanu Mauka
229	Anahola	Aliomanu Mauka
230	Anahola	Anahola Mauka
231	Anahola	Aliomanu Mauka
232	Anahola	Moloaa Bay
233	Anahola	Moloaa Bay
234	Anahola	Moloaa Bay
235	Anahola	Moloaa Bay
236	Anahola	Moloaa Bay
237	Anahola	Moloaa Bay
238	Anahola	Moloaa Bay
239	Anahola	Moloaa Bay
240	Anahola	Moloaa Bay
241	Anahola	Waiakalua Mauka

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242	Anahola	Pilaa Beach
243	Anahola	Pilaa Beach
244	Anahola	Pilaa Beach
245	Anahola	Pilaa Beach
246	Anahola	Waipake
247	Anahola	Waiakalua Reservoir
248	Anahola	Waiakalua Reservoir
249	Anahola	Waiakalua Reservoir
250	Anahola	Waiakalua Reservoir
251	Anahola	Pilaa Mauka
252	Anahola	Pilaa Mauka
253	Anahola	Pilaa Mauka
254	Anahola	Kaloko Reservoir
255	Anahola	Pilaa Mauka
256	Anahola	Pilaa Mauka
257	Anahola	Pilaa Mauka
258	Anahola	Pilaa Mauka
259	Anahola	Kaloko Reservoir
260	Anahola	Puukaele Reservoir
261	Anahola	Puukaele Reservoir
262	Anahola	Kaloko Reservoir
263	Anahola	Kaloko Reservoir
264	Anahola	Kaloko Reservoir
265	Anahola	Kilauea Bay
266	Anahola	Kilauea Bay
267	Anahola	Kilauea Bay
268	Anahola	Kilauea Falls
269	Anahola	Kilauea Falls
270	Anahola	Kilauea Falls
271	Anahola	Kilauea Falls
272	Anahola	Kilauea Falls
273	Anahola	Kilauea Falls
274	Anahola	Kilauea Makai
275	Anahola	Kilauea Mauka
276	Anahola	Kilauea Mauka
277	Anahola	Kilauea Mauka
278	Anahola	Kilauea Mauka
279	Anahola	Kilauea Mauka
280	Anahola	Kilauea Mauka
281	Anahola	Kilauea Mauka
282	Anahola	Kauapea
283	Anahola	Kauapea
284	Anahola	Kauapea
285	Anahola	Mokuaeae Isle
286	Anahola	Kauapea
287	Anahola	Kauapea
288	Anahola	Kauapea
289	Anahola	Kilauea Point
290	Anahola	Kauapea

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291	Anahola	Kauapea
292	Anahola	Kauapea
293	Anahola	Kauapea
294	Anahola	Kauapea
295	Anahola	Kauapea
295	Anahola	Kauapea
297	Anahola	Kauapea
298	Anahola	Kauapea
299	Anahola	Kilauea Makai
300	Anahola	Kauapea
301	Anahola	Kauapea

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Appendix C:

List of Potential Grant Resources

Below is a list of potential grant sources to help fund mitigation projects described within this CWPP. The list below is by no means exhaustive and potential community groups should also research grant-funding sources available to them.

Grant Program	Deadline	Contact Information	Matching Funds Required?
<p>State Fire Assistance Grants. Funds target hazard mitigation in the Wildland Urban Interface for mitigating risks of hazardous fire conditions through hazardous fuels reduction, information and education, and homeowner and community defensible space treatments.</p>	<p>August 28, 2009 for 2010-2011 competitive funding</p>	<p>Division of Forestry and Wildlife Attn: Wayne Ching, 1151 Punchbowl St., Rm. # 325 Honolulu, HI 96813 (808) 587-4173 Fax: (808) 587-0160 www.dofaw.net</p>	<p>Yes: 50/50 match</p>
<p>FM Global Prevention Grants Through their new Fire Prevention Grant Program, fire departments, national, state, regional, local and community organizations can apply for funding to support a wide array of fire prevention, preparedness and control efforts, including:</p> <ul style="list-style-type: none"> • Pre-fire planning for commercial, industrial and institutional facilities • Fire and arson prevention and investigation • Fire prevention education and training programs 	<p>Awarded quarterly</p>	<p>www.fmglobal.com or email: firepreventiongrants@fmglobal.com</p>	<p>No</p>
<p>Department of Homeland Security (DHS) • Citizen Corps is the Department of Homeland Security's grassroots initiative that encourages citizens to play a role in hometown security through personal preparedness. Grant funding supports Citizen Corps Councils in efforts to engage citizens in personal preparedness, exercises, ongoing volunteer programs, and surge capacity response, in order to better prepare citizens to be fully aware, trained, and practiced on how to prevent, protect/mitigate, prepare for, and respond to all threats and hazards. This program provides funding on a formula basis to all 56 states and territories. Other Homeland Security Grant Programs include:</p> <ul style="list-style-type: none"> • Infrastructure Protection Program • Regional Catastrophic Preparedness 		<p>www.dhs.gov/xgovt/grants/index.shtm MG Robert Lee Adjutant General 3949 Diamond Head Rd. Honolulu, HI 96816-4495 808-733-4246 www.scd.state.hi.us</p>	

Kauai County Community Wildfire Protection Plan
September 2008

Grant Program			
<p>Hawaii Tourism Authority (HTA) Natural Resources Program In 2002, HTA established the Natural Resources Advisory Group to develop the Natural Resources Program. A Natural Resources Assessment was conducted including an inventory and assessment of natural resource areas around the state. Since 2005 HTA has awarded funds to those projects identified as priorities in the Assessment and to community-based natural resource projects.</p>		<p>Hawaii Tourism Authority 1801 Kalakaua Avenue Honolulu, HI 96815 (808) 973-2255</p>	
<p>Rural Fire Assistance Grants (RFA) The Dept. of the Interior receives an appropriated budget each year for a rural fire assistance (RFA) grant program. This funding enhances the fire protection capabilities of rural and volunteer fire departments through training, equipment purchases, and fire prevention work on a cost-shared basis. This program is primarily for rural departments serving populations under 10,000 that have responsibilities to provide mutual aid to Dept. of Interior lands (e.g., Tribal, National Parks etc.) The DOI assistance program targets rural and volunteer fire departments that routinely help fight fire on or near DOI lands. One of these four agencies administers those lands: Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), U.S. Fish and Wildlife Service (FWS) and the National Park Service (NPS).</p>	<p>Varies by state</p>	<p>Hawaii Volcanoes National Park Joe Molhoek Pacific Island Fire Mgmt. Officer PO Box 52, HNP, HI 96718 (808) 985-6042 Joe_Molhoek@nps.gov</p>	<p>The maximum award is \$20,000. RFA grants may require 90/10 cost-share.</p>

Community Wildfire Protection Plan for Northwest Hawaii Island

Sponsored by the Hawaii Wildfire Management Organization
a 501(c)(3) nonprofit organization

With generous support from the Fire Management Program of the Hawaii State Department of Land and
Natural Resources, Division of Forestry and Wildlife



July 2007
Written by Denise Laitinen
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Appendix A: Maps of Native Hawaiian Bird Species and Forest Bird Ranges in West Hawaii

Appendix B: Fire History Graphs

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Cover image: Northwest Hawaii CWPP boundary map, courtesy of the Hawaii Wildfire Management Organization. All photos in CWPP courtesy of Denise Laitinen unless otherwise noted.

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Northwest Hawaii Community Wildfire Protection Plan Mutual Agreement Page

The Community Wildfire Protection Plan (CWPP) developed for Northwest Hawaii by the Hawaii Wildfire Management Organization (HWMO):

- Was collaboratively developed. Interested parties and federal land management agencies managing land in the vicinity of Northwest Hawaii 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 Northwest Hawaii.
- This Plan 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:

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

Date

Darryl Oliveira
Fire Chief, Hawaii Fire Department

Date

Troy Kindred
Administrator, Hawaii County Civil Defense

Date

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Executive Summary:

The leeward or west side of Hawaii Island with its arid weather conditions and sprawling grasslands, interspersed with housing development is a wildland urban interface (WUI). The wildland/urban interface (WUI) is any area where wildlands abut houses or a development. This interface area poses the highest risk of loss of life and property due to wildland fire. The risk of wildland fire impacting structures in the WUI is determined by several factors, including the ignitability of fuels, structural ignitability, weather conditions, and topographical features, such as slope.

Unlike the contiguous United States, wildfire is not a natural part of Hawaii's ecosystem. In Hawaii, wildfires destroy native ecosystems, which impacts watersheds and traditional cultural activities. Wildfires have also caused the demise of or have fragmented the habitats that support native flora and fauna, many of which are listed as endangered or threatened. Sixty-five percent (65%) of Hawaii Island's dryland forest ecosystems have been lost primarily due to wildfire carried by invasive grasses. Consequently, Hawaii's dryland habitats are mere remnants of what was once referred to as the most diverse dryland ecosystem in the state. Wildfires in Hawaii also cause soil erosion, which negatively impacts our ocean reefs. Exposed soils pose a significant health hazard as well when the loose particulates are picked up in the wind and carried to populated areas.

The overwhelming majority of wildfires in Hawaii are caused by arson or human error. Human error includes errant fireworks, burning 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 Northwest Hawaii from wildfire include Hawaii Wildfire Management Organization, which sponsored this CWPP, Hawaii Fire Department, Hawaii County Civil Defense, Department of Land and Natural Resources Division of Forestry and Wildlife, Department of Hawaiian Home Lands, the U.S Army, the U.S. Fish and Wildlife Service, and large landowners. These decision makers were invited to participate in the development of this Plan.

A wildfire hazard assessment determined that WUI areas in Northwest Hawaii communities have a high risk of wildfire. Wildland fires occur frequently throughout Northwest Hawaii, threatening area residents. The largest wildfire in state history was in Northwest Hawaii in 1969 and burned more than 47,000 acres and a 2005 wildfire that burned 25,000 acres forced the evacuation of thousands of people. The continued invasion of non-native plant species, which are considered high-intensity burning fuels, increases the wildfire risk within Westside communities. Grazing traditionally assisted in reducing fuel loads and wildfire risk. However, due to a variety of circumstances, grazing has been reduced or eliminated in many areas, which has contributed to the accelerated wildfire risk in areas that were previously less prone to wildfire. The lack of reliable water resources for both ground and helicopter fire suppression crews have also compromised the rapid response to these disasters and have contributed to the increased fire spread. Communities vary in their access of water, with some communities relying on private water systems or catchment water basins, with others accessing county water.

Meetings with community members and fire agency personnel identified a variety of mitigation measures to reduce the chance of fires starting in Northwest Hawaii, as well as to attempt to minimize the impact of a wildfire. These measures include: 1) installation of pre-staged static water and helicopter dip tanks; 2) acquisition of adequate resources for first responders, including off-road tankers; 3) reduction of fuel loads and/or appropriate conversion of fuels along road sides, in community open areas, and individual homes; 4) adoption of development standards and community planning that requires the mitigation of wildfire risks; 5) creation of secondary emergency access roads and emergency egress signage within subdivisions; 6) development of emergency staging areas within

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communities; 7) reduction and/or control of invasive species that possess inherent fire or ignition properties; 8) continued fire prevention education, including arson prevention; and 9) integration of communication equipment to increase effective firefighting response.

While homes and structures have been lost to wildfire in the past, Hawaii County has been fortunate in controlling wildland fires in and around communities. To date, there has been no loss of life contributed to wildfire disasters. However, the existing wildfire risk is severe given the fire history, rapid development of the region, and the increasing fire fuel load. The mitigation measures outlined in this CWPP will enable Northwest Hawaii communities to reduce their risk to wildfire and create a more efficient fire-protection plan. The mitigation measures listed above identify pro-active projects that communities and fire agencies can undertake to minimize losses from a major wildland fire.

Background:

This CWPP covers a broad expanse (451,086 acres) of the leeward side of Hawaii Island. Figure 1 depicts the Base Map of the Northwest Hawaii CWPP. The area included in this CWPP extends from Kohala (intersection of Akoni Pule Highway and Old Coast Guard Road) south to Hina Lina subdivision in Kailua-Kona and from sea level in the west, eastward to Kohala Mountain Road in Kohala, Pu'u Kapu in Waimea, Waiki'i, and the extensive state land holdings east of Mamalahoa Highway between Saddle Road and Kamehameha School land holdings. Covering an expanse from sea level to the 8,800-foot elevation, this CWPP encompasses the base of Mauna Loa, the world's largest volcano. The inhabited areas at potential risk to wildland fire include Kohala Ranch, Kohala by the Sea, Kohala Estates, Kawaihae, Kawaihae Village, Puako, Waimea, Pu'u Kapu, Waiki'i, Pu'uanahulu, Pu'u Wa'a Wa'a Waikoloa, Kona Palisades, Kealakehe, and Hina Lani, as well as vast areas of state and federal lands, and open grasslands.



Figure 1: The Northwest Hawaii CWPP area of consideration is outlined in yellow and covers more than 451,086 acres.

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There are five main roads in West Hawaii: Queen Kaahumanu Highway, Mamalahoa Highway, Akoni Pule Highway, Waikoloa Road, and Kohala Mountain Road. Queen Kaahumanu Highway (Route 19) runs north-south along the coast from Kona to Kawaihae as does Mamalahoa Highway (Route 190), which also runs north-south, upslope and parallel to Queen Kaahumanu Highway at an elevation ranging from 1,000 – 2,000 feet. In Kawaihae, Queen Kaahumanu Highway continues north as Akoni Pule Highway (Route 270), while Route 19 veers to the east – upslope to Waimea along Kawaihae Road. Kohala Mountain Road also runs north-south from Waimea to Hawi and is roughly parallel to Akoni Pule Highway at a higher elevation. Waikoloa Road runs east-west, connecting Queen Kaahumanu Highway and Mamalahoa Highway and is the primary access to the Waikoloa community. These five roads provide access to all the communities covered by this CWPP.

Within Northwest Hawaii there are several communities, including, from north to south, Kawaihae, Waimea, Puako, Pu'uanahulu, and Waikoloa. Communities covered by this CWPP vary in size from 100 single-family home subdivisions to more than 2,700 dwellings with single-family homes, condominiums, retail outlets, schools, historical sites, recreational areas, and commercial facilities. Some of the subdivisions in the coverage area are: Waiki'i, Puakea Ranch, Kohala by the Sea, Kohala Ranch, Kohala Estates, Kawaihae Village, Pu'u Kapu, Pu'u Lani Ranch Estates, Kona Palisades, Kealakehe, and Hina Lani Estates. In addition, there are several internationally known world-class resorts that draw thousands of visitors from around the world.

Within the CWPP boundary, county fire stations are located in Waimea, Puako, and Waikoloa with volunteer fire stations in Pu'uanahulu, Kohala Estates, Waiki'i, and Kona Palisades. A fire station in Kapa'au, while outside the boundary of the CWPP, is responsible for the northern most area included in the CWPP. Each county station has four personnel on duty and is manned 24 hours a day. Volunteer fire stations rely on volunteer personnel.

The Waikoloa county fire station houses a Type 1 engine, ambulance, and hazardous materials vehicle with no firefighting capability, as well as battalion chief quarters for West Hawaii. The South Kohala fire station, located on the Kohala Coast between Waikoloa and Puako, houses a Type 1 engine, 750-gallon tanker, ambulance, and a Type 3 helicopter. The Waimea fire station, near downtown Waimea, houses a Type 1 engine, a 750-gallon tanker, and an ambulance.

In addition to the communities and subdivisions, large landowners within the CWPP coverage area include Parker Ranch, Department of Hawaiian Home Lands, the State of Hawaii, Queen Emma Land Corporation, and Kamehameha Schools. The majority of Queen Emma land within the CWPP boundary area is leased to Parker Ranch for grazing. Figure 2 below illustrates the various large landowners within the Northwest Hawaii CWPP boundary.

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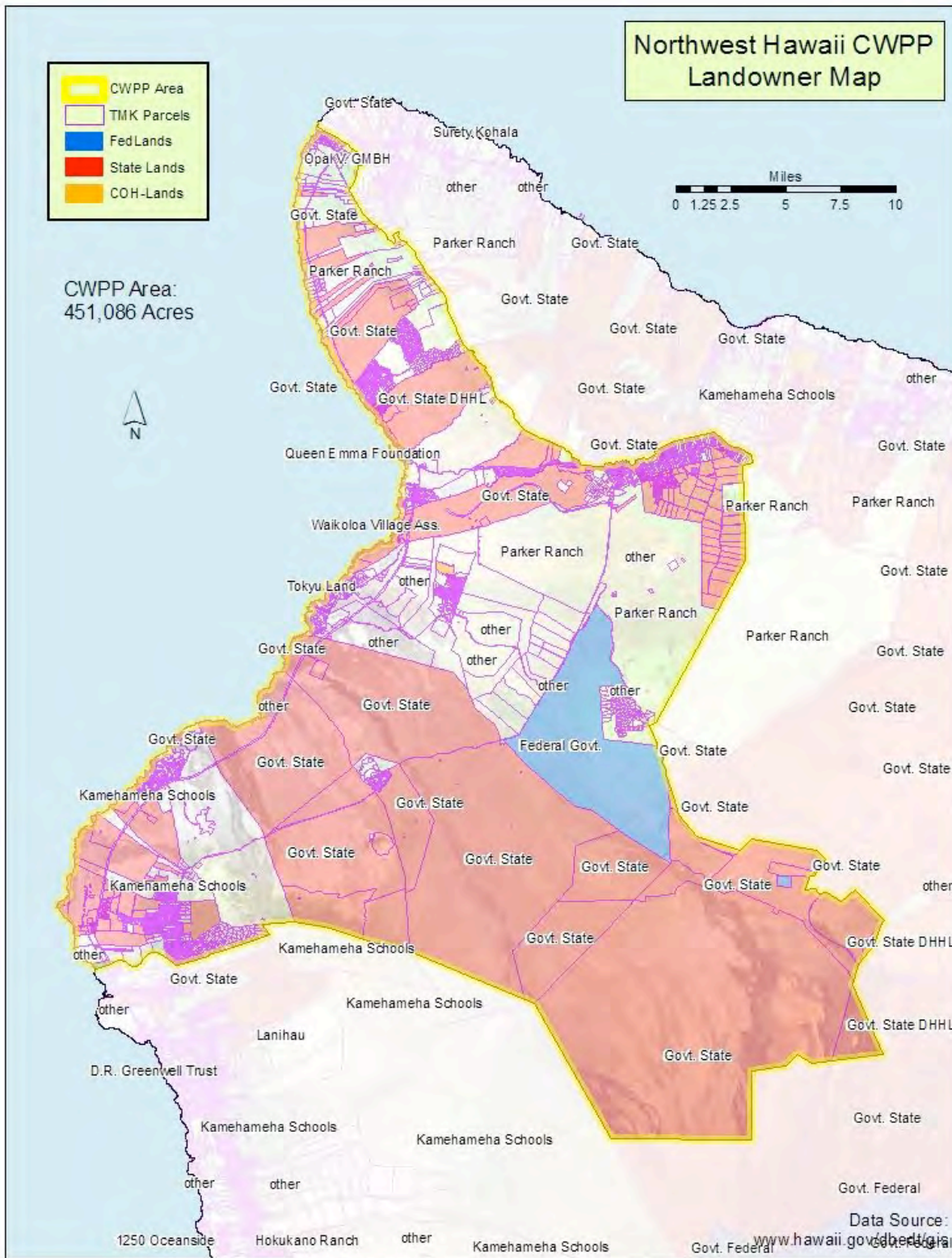


Figure 2: Map depicts major landowners within Northwest Hawaii CWPP coverage area. Reddish areas are state lands, while those in gold are county lands. Queen Emma Land Corporation, Kamehameha Schools, Parker Ranch, and the Department of Hawaiian Home Lands also own extensive land tracts.

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As seen in Figure 3 below, land use in Northwest Hawaii varies between agricultural, conservation, rural, and urban. The majority of land, or 52 percent of the area within the CWPP boundary, is used for agricultural purposes.

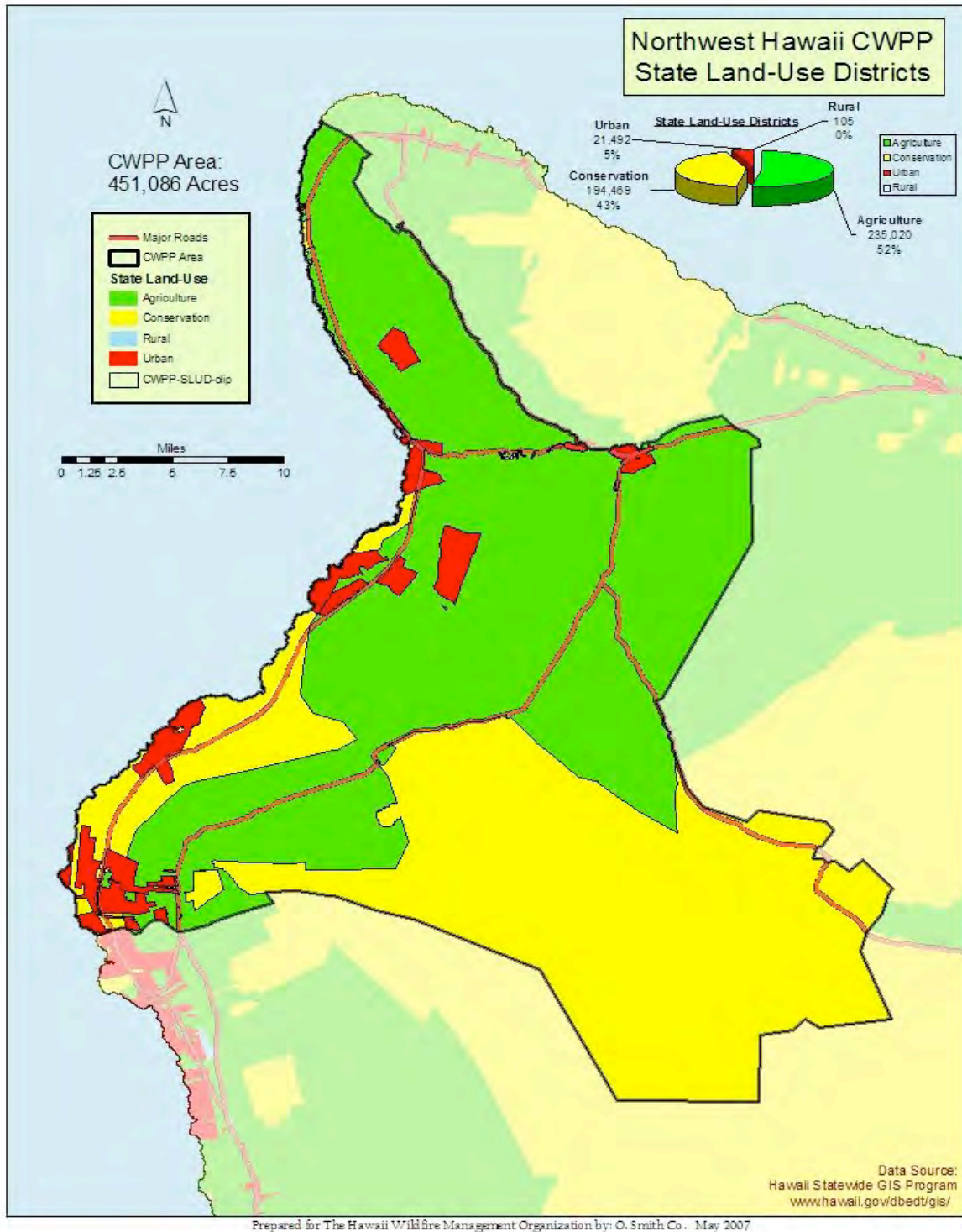


Figure 3: Map depicts land use districts within Northwest Hawaii. Green denotes agricultural areas (235,000 acres or 52 percent of CWPP area), yellow denotes conservation areas (194,469 or 43 percent of coverage area), blue denotes rural areas (0 percent), and red highlights urban areas (21,492 or 5 percent of CWPP area).

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The CWPP area encompasses historical, archeological, and cultural sites and natural areas of importance. Examples of these sites are: Pu'ukohola Heiau National Historic Site; Puako Petroglyph Archeological Preserve; Lapakahi State Historical Park; county parks and beaches, including the popular Hapuna Beach State Recreation Area; and more than 3,000 acres of State land holdings, including Pu'u Wa'a Wa'a State Wildlife Preserve.

Northwest Hawaii receives an average rainfall of 10 – 20 inches a year. Communities along the coast receive less than 10 inches of rain while higher elevations receive more precipitation. The coverage area is notoriously dry and at times can be extremely dry. Kawaihae holds the state record for the least amount of annual rainfall (0.19 inch in 1953) and Puako has the distinction of the lowest average annual rainfall (1987-2000) at 8.93 inches.



Ridge along the southern boundary of Pu'u Lani Ranch Estates subdivision. The ridge is a fire concern due to its steep slope and the high-intensity burning vegetation growing on the ridge.

Slope within the region varies by geography, although the overall terrain in the region naturally slopes from the mountains down to the sea. Gulches, as well as volcanic vents or hills several hundred feet in elevation, dot the countryside. Some subdivisions, such as Pu'u Lani Ranch Estates, have steep ridges bordering their community, others, such as Kohala by the Sea and Waikoloa; have gulches running through their communities. These ridges and gulches are covered with invasive grasses and shrubs that are high intensity burning fuels.

Vegetation zones, as depicted in Figure 4 below, vary within Northwest Hawaii between grasslands, mixed forest, high-intensity developed, scrub/shrub, bare land, estuarine shrub/scrub, and low-intensity developed, among others.

Communities and subdivisions in Northwest Hawaii are often separated by vast expanses of open grasslands containing high-intensity burning fire fuels, including grasses and shrubs. Large lava flows also dot the landscape, providing natural fuel breaks.

The dryland ecosystem in Northwest Hawaii was once referred to as the most diverse native dryland ecosystem in the state of Hawaii. Development, the lack of fine fuels mitigation, and continuous wildfires have caused the demise of much of these native forests, leaving pockets, or kipuka, of remnant plant communities dotting the countryside. Small kipukas of wili wili (*Erythrina sandwicensis*) and lama (*Diospyros sandwicensis*) trees in Waikoloa and along highway 190 are examples of these remnant forests. Attempts at reforestation are under way in Pu'u Wa'a Wa'a and Waikoloa. However, alien trees, shrubs, and grasses have invaded these kipuka. Many of the grasses, such as molasses grass (*Melinis minutiflora*) and fountain grass (*Pennisetum setaceum*), are fire-adapted and increase wildfire potential in areas they invade.



Lava flows dot the Northwest Hawaii landscape providing natural fire fuel breaks. However, invasive grasses, such as fountain grass (above) have spread across open lands and the lava flows reducing their effectiveness as fuel breaks.

The 1859 lava flow, which started from Mauna Loa and flowed westward to the sea, presently serves as a natural fuel break between the communities of Waikoloa and Pu'uana'hulu. To the south of Pu'uana'hulu, the 1801 lava flow traverses from the mountaintop of Hualalai to sea level in multiple areas. These flows, along with numerous smaller sparsely vegetated flows, serve as natural fuel breaks. However, the proliferation of fountain grass has compromised these fuel breaks. A prolific

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non-native species, fountain grass is colonizing lava flows at an alarming rate, and as a result, enabling fire to burn on the fuel break. Fountain grass is so prevalent in Northwest Hawaii that complete eradication of the plant is unfeasible.

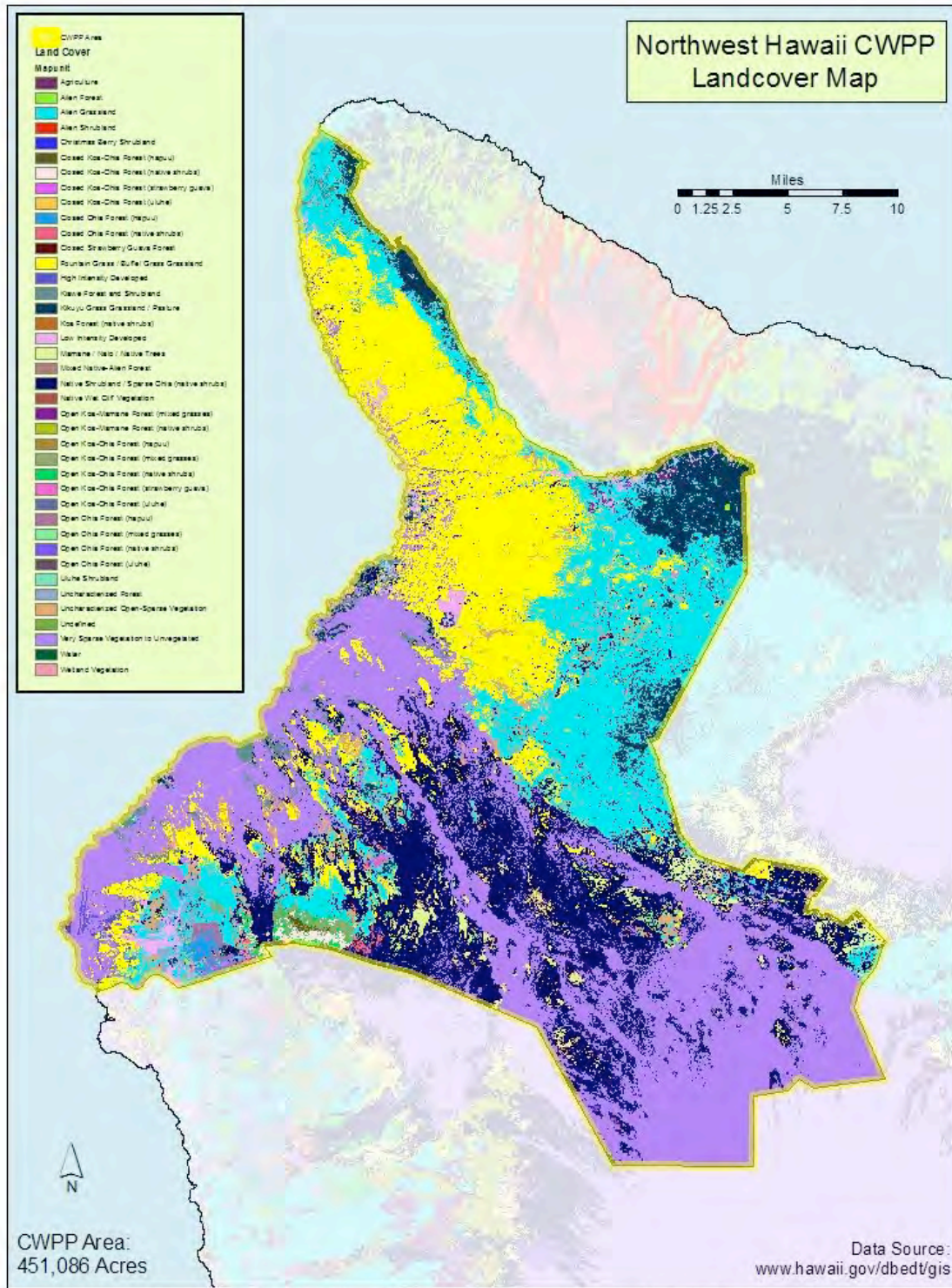


Figure 4: Land cover map of Northwest Hawaii depicting various vegetation zones. Yellow areas denote fountain grass, buffel grass, and/or grassland; purple denotes unvegetated or very sparse vegetation; light blue denotes alien grassland; and dark blue denotes native shrubland / sparse ohia (native shrubs).

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Northwest Hawaii is home to more than 54 federally-listed endangered and threatened plant and animal species, including the Hawaiian duck, (*Anas wyvilliana*), Hawaiian goose (*Branta sandvicensis*), Hawaiian hawk (*Buteo solitarius*), Palila (*Loxioides bailleui*), Akepa (*Loxops coccineus coccineus*), Hawaii creeper (*Oreomystis mana*), 'Ohai (*Sesbania tomentosa*), Hala pepe (*Pleomele hawaiiensis*), Po'e (*Portulaca sclerocarpa*), and Loulu (*Pritchardia affinis*). Figure 5 below shows a plant density map for endangered and threatened plants in Northwest Hawaii. Maps of native Hawaiian bird species locations and forest bird ranges in Northwest Hawaii can be found in Appendix A.

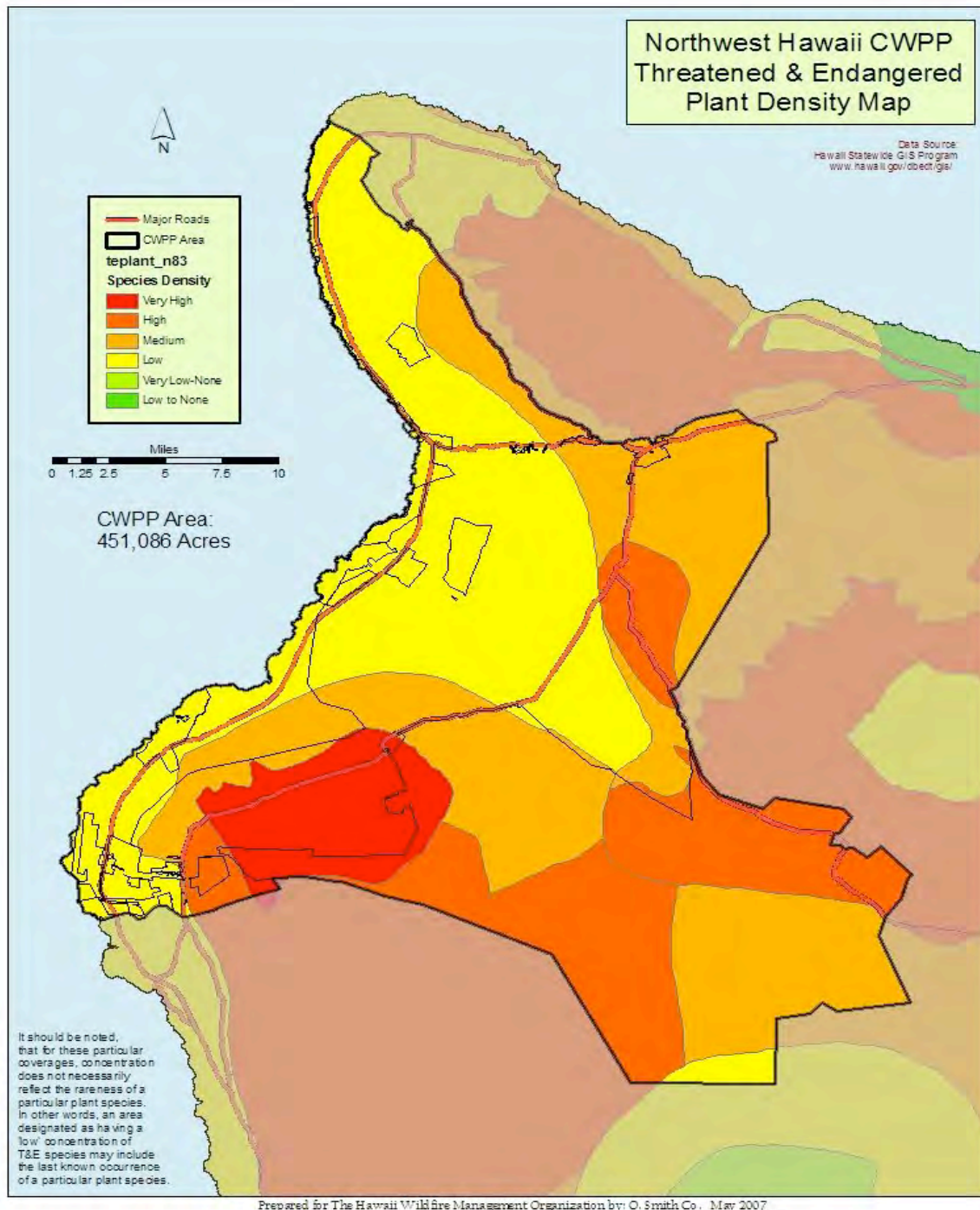


Figure 5: Map depicting endangered and threatened plant densities in Northwest Hawaii. Red zone denotes very high plant density, dark orange denotes high density, light orange is medium density, and yellow is low density of endangered plants.

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Fire History:

Different agencies are responsible for fire suppression around the county, depending on fire location. Hawaii Fire Department is responsible for fire suppression in county residential areas while the State Division of Forestry and Wildlife is responsible for fire suppression on state lands. The Pohakuloa Training Area has an organized fire department that responds to fires on the Army's federal land while the National Park Service responds to fires on Park land. All of these agencies have a Memorandum of Understanding for mutual aid in fire suppression. Each organization maintains separate fire history statistics.



Figure 6, below, is a fire history map for West Hawaii spanning from 1954 – 2005 with graphs depicting fire size and frequency. The graphs within the map can be found in Appendix B.

An August 2005 wildfire that started along Kawaihae Road in Waimea consumed 25,000 acres in West Hawaii and burned south all the way to Waikoloa Village. (Photo Credit: Wayne Ching).



The fire history map also illustrates how fuels have been managed in the region. For example, grazing objectives in the Pu'u Wa'a Wa'a area are aimed at fine fuel reduction to minimize the wildfire threat. Wildfires in this area have been infrequent and small and as a result, damage to the dryland forest ecosystem has been less severe than in Pu'u anahulu. Comparatively, grazing was removed in Pu'u Anahulu (adjacent to Pu'u Wa'a Wa'a and separated by a lava flow) in the 1960s and since then, this area has experienced numerous large catastrophic fires that have decimated much of the native dryland habitat.

While the Waikoloa fire (above right) was burning, a wildfire started by a roadside vehicle ignited grasslands north of Kohala Ranch and jumped the Akoni Pule Highway, burning more than 1,500 acres. (Photo Credit: Wayne Ching).

In the past decade Northwest Hawaii has experienced at least 39 wildfires with 13 of those burning more than 1,200 acres.

Average size for all wildland fires within the

CWPP coverage area during the past 50 years is 2,835 acres with a median size of 400 acres. However, northwest Hawaii has experienced some of the state's largest wildfires, including a 1969 fire that burned 45,000 acres and a 2005 wildfire that encompassed an area from Waimea to Waikoloa burning 25,000 acres. In 2005 there were two simultaneous wildfires burning just days apart. The first fire was the large 25,000-acre Waikoloa conflagration and the second fire was the Akoni Pule Highway wildfire that consumed 1,500 acres. These two large wildfires burning in the same region put a tremendous strain on firefighting



A March 2006 wildfire, caused by a lightning strike, burned more than 300 acres in Pu'u anahulu and the state-owned Pu'u Wa'a Wa'a Forest Reserve. (Photo Credit: Wayne Ching).

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resources and in fact, resources from other islands were brought in to assist.

Wildfire ignition or fire starts are from various sources. Vehicular fire starts, such as the Akoni Pule Highway wildfire (where a vehicle was set on fire) are a common cause of fire starts. In many cases, catalytic converters and traffic accidents, account for most of the fire starts related to vehicles, including a 60-acre blaze just north of Pu'u Lani Ranch Estates that was started when a vehicle veered over a cliff and caught fire, igniting nearby brush. Human caused fire starts are also common. Agricultural escape burns, unauthorized residential burning, and arson are some examples of fires attributed to humans. The presence of an arsonist within the Waikoloa/Kohala area is a concern for local firefighters and the community. Hawaii County fire and police departments and the state Forestry and Wildlife Division have created a task force to apprehend the arsonist(s). While natural causes are the least likely sources of wildfire ignition, they do occur. A 300-acre fire in Pu'uana'hulu was started by a lightning strike. Below is a chart showing wildfires in the CWPP coverage area from 1954 to 2005. The Hawaii Wildfire Management Organization is currently updating its fire history data. As this report is being written there has been a rash of wildfires in Northwest Hawaii that officials believe were intentionally set. Between January and mid July 2007 more than 14,000 acres burned within the CWPP coverage area.

West Hawaii Fire Data 1954 - 2005

DATE	ACREAGE	CITY
12/12/05	25.00	Kailua-Kona
10/29/05	35.00	Kailua-Kona
8/4/05	2500.00	Hawi
8/3/05	25000.00	Waikoloa
8/2/05	2500.00	Kawaihae
8/1/05	6000.00	Kamuela
7/22/05	2500.00	Kamuela
7/12/05	150.00	Hawi
6/15/05	100.00	Kamuela
6/14/05	50.00	Kamuela
6/1/05	1.00	Hawi
5/24/05	400.00	Kamuela
5/18/05	150.00	Hawi
3/2/05	10.00	Kamuela
2/28/05	7.00	Kawaihae
11/27/04	2.50	Kapaau
9/20/04	1500.00	Kamuela
9/15/04	1200.00	Kamuela
9/12/04	1500.00	Kamuela
9/7/04	400.00	Waikoloa
9/6/04	350.00	Waikoloa
8/10/04	5.00	Kamuela
7/11/04	40.00	Hawi
7/8/04	40.00	Hawi
7/7/04	40.00	Hawi
7/6/04	100.00	Kawaihae
7/5/04	40.00	Hawi
7/3/04	20.00	Kamuela
7/15/00	1.70	Waiki'i
1/15/00	70.55	Saddle Road Junction
10/15/99	4553.44	Pu'uana'hulu

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10/15/99	4382.84	Waikoloa
7/15/99	429.93	Saddle Road Junction
7/15/99	595.49	Waiki'i
7/15/99	4.13	Saddle Road Junction
4/15/99	9758.00	Pu'uuanahulu
5/15/98	3287.52	Pu'uuanahulu
4/15/98	7463.78	Waikoloa
4/15/97	102.27	Hualalai
4/15/96	113.52	Hualalai
1/15/96	84.46	Pu'uuanahulu
10/15/95	196.84	Waiki'i
5/15/95	40.01	Waiki'i
3/15/95	1072.98	Hualalai
7/15/94	24714.92	Pu'uuanahulu
12/15/93	745.40	Pu'uuanahulu
6/15/93	107.61	Pu'uuanahulu
5/15/93	352.78	Hualalai
7/15/91	193.78	Puako
3/15/91	46.28	Pu'uuanahulu
9/15/90	98.00	Puako
8/15/90	1133.50	Waiki'i
10/15/89	13.17	Hualalai
7/15/89	2835.30	Kiholo Mauka
12/15/88	2.00	Hualalai
8/15/88	551.21	Pu'uuanahulu
7/15/88	1064.98	Waikoloa
3/15/88	1160.26	Hualalai
8/15/87	5234.00	Waikoloa
7/15/87	676.24	PTA
7/15/87	1963.48	Waikoloa
7/15/87	3530.81	Pu'uuanahulu
7/15/87	794.90	Puako
9/15/86	3486.01	Pu'uuanahulu
9/15/85	18291.33	Waikoloa
9/15/85	13993.35	Waikoloa
10/6/83	1309.11	Saddle Road Junction
10/6/83	1817.41	Waikoloa
4/15/78	3510.01	PTA
10/15/77	97.38	PTA
9/15/77	854.69	PTA
11/15/75	44.40	Waiki'i
8/15/75	233.26	Waiki'i
9/15/73	53.45	PTA
7/15/73	2211.32	Pu'uuanahulu
6/15/73	27.48	Pu'uuanahulu
6/15/73	53.37	Pu'uuanahulu
4/15/73	190.34	Hualalai
4/15/73	7.78	Hualalai
3/16/73	8120.77	Kawaihae
2/15/73	2800.04	Waiki'i
9/15/69	47974.79	Pu'uuanahulu
7/15/69	984.22	Pu'uuanahulu
9/15/68	8744.35	Pu'uuanahulu
11/15/54	4179.65	Waiki'i

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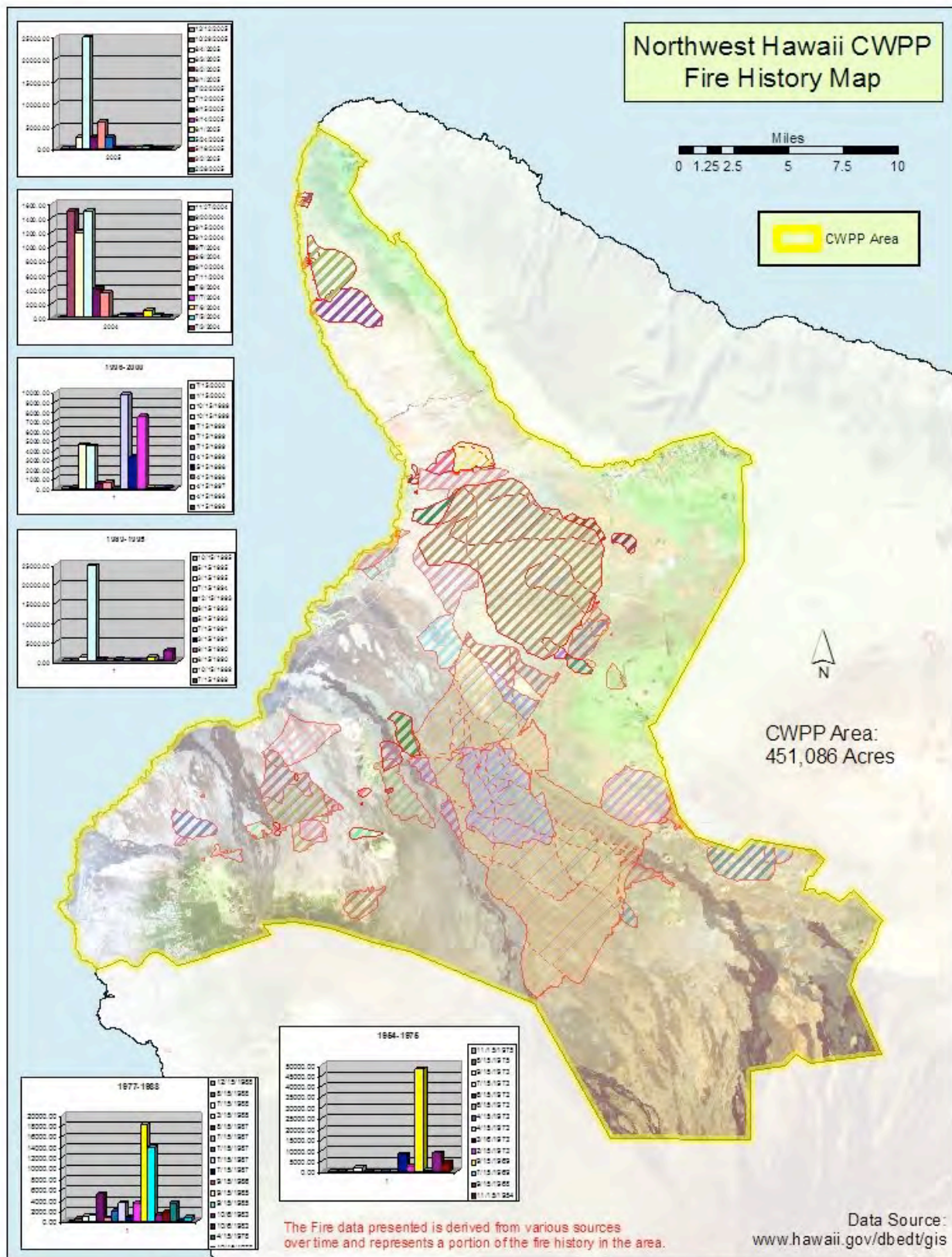


Figure 6: Fire history map of Northwest Hawaii, showing wildfires in the region from 1954 –2005. The imbedded graph charts depict fires in annual ranges by size and can be found in Appendix B.

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Stakeholders:

Stakeholders are individuals or groups who have a high level of interest in the protection of their assets from wildfire. The CWPP area encompasses lands managed by federal, state, county, and private entities. Contact information for principal government stakeholders is listed below.

Federal:

Pohakuloa Training Area (U.S. Army)

Eric Moller
Deputy Fire Chief
USAG-HI, IFSO
Box 4607, Hilo, HI 96720
(808) 969-2441
mollereh@shafter.army.mil



Hawaii Volcanoes National Park

Joe Molhoek
Pacific Island Fire Mgmt. Officer
PO Box 52, HNP, HI 96718
(808) 985-6042
Joe_Molhoek@nps.gov



State:

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

Wayne Ching
State Protection Forester
1151 Punchbowl St., Room 325, Honolulu, HI 96813
(808) 587-4173
Wayne.F.Ching@hawaii.gov



County:

Hawaii Fire Department

Fire Chief Darryl Oliveira
25 Aupuni St., Hilo, HI 96720
(808) 981-8394
Hcdf1@co.hawaii.hi.us



County:

Hawaii County Civil Defense

Troy Kindred
Civil Defense Administrator
920 Ululani St., Hilo, HI 96720
(808) 961-8229
tkindred@co.hawaii.hi.us



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Wildfire Risk Assessment for Northwest Hawaii:

In 2006, the Hawaii Wildfire Management Organization commissioned the Firewise coordinator to conduct a series of wildfire hazard assessments for a dozen West Hawaii communities, using the 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*. These hazard assessments were conducted to identify the level of wildfire risk for the West Hawaii communities included in this CWPP.



HFD personnel, Dr. Kimbal of Puako Community Association, and Earl Spence (far right), a HWMO contractor, view a map of Puako before accompanying the Firewise coordinator in a wildfire hazard assessment of Puako.

Using a pre-established point system, the Hawaii 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 the roof, siding, and attached items, such as decks, fencing, or an 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, preponderance of fuels in close proximity to structures, and lack of water, all the communities within Northwest Hawaii, with the exception of Pu'u Kapu, scored in the high-hazard range in the wildfire hazard assessment, while Pu'u Kapu scored in the medium-risk range.

While the Northwest Hawaii region as a whole shares certain common characteristics, the communities within it vary tremendously and deserve separate description in terms of slope, size, and water availability. Therefore short descriptions excerpted from the wildfire hazard assessments are provided below.

Kohala Ranch and Kohala Estates

Kohala Ranch is a developed subdivision in Kohala, Hawaii that spans from the Akoni Pule Highway, near sea level, up to Kohala Mountain Road at the 3,300-foot elevation. It is comprised of 4,000 deeded acres, with lots ranging in size from a half-acre to more than 10 acres. Kahua Ranch borders Kohala Ranch. Cattle and sheep from Kahua and Ponooho Ranches graze within the Kohala Ranch subdivision and help to reduce fuel load within the community.

The subdivision has underground utilities, paved roads, hydrants, and setbacks. There is one means of ingress and egress at the top and bottom of the subdivision (at Akoni Pule Highway and Kohala Mountain Road). Both entrances have a gate and guard shack with the Akoni Pule entrance staffed 24 hours a day and the Kohala Mountain Road entrance staffed 16 hours a day (unmanned from 10 pm – 6 am). Ala Kahua Road, a paved road on the south east side of the subdivision, leads to the neighboring subdivision of Kohala Estates but there is a locked gate separating the communities. A 12-foot wide equestrian trail with wood fencing on either side extends along the perimeter of the Heathers I section of the subdivision and the trail has been graded for 4-wheel drive vehicles. Several homes within the subdivision have locked gates blocking their driveways.

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Kohala Estates is a developed subdivision directly south of and adjacent to Kohala Ranch. Lots were originally sold in 20-acre parcels, but have since been subdivided into 3-acre lots. Kohala Estates, which also starts at Akoni Pule Highway, is ungated and side streets within the subdivision are off Ala Kahua Drive. Since Ala Kahua Drive is gated directly below the volunteer fire station, this leaves the community with one means of ingress and egress from the subdivision.



Kiawewai gulch separates Kohala Ranch and Kohala Estates.

Kohala Estates has paved roads, with hydrants spaced less than 1,000 feet apart. Some utilities are underground and some are above ground. Road signage is metal and reflectorized, however house numbers vary in size and color. There is no organized grazing of animals within Kohala Estates.

Slope within both subdivisions varies between 10 to 20+ percent. Kiawewai gulch runs along the southern boundary of the subdivision between Kohala Ranch and Kohala Estates. Property lines from both subdivisions extend to the middle of the gulch. Kiawewai gulch is a fire hazard due to the kiawe/buffel grass vegetation.

There is a 100,000-gallon water tank on the Kohala Ranch side of the gulch, which feeds all the fire hydrants within Kohala Ranch and Kohala Estates. The tank is pressurized and if there is a loss of electricity, the tank becomes gravity fed. Kohala Ranch and Kohala Estates are not part of the Hawaii County water system. Kohala Ranch Water Company controls and supplies the water for Kohala Ranch, Kohala Estates, Kohala By the Sea, and DHHL Hawaiian Homes Residence Lots subdivisions (the latter subdivisions are just south of Kohala Ranch and Kohala Estates).

Kohala by the Sea

Kohala By The Sea (KBTS) is a developed gated community directly south of Kohala Estates. KBTS covers approximately 77 acres and the general topography is a gentle slope of 9 percent. However, there is a large gulch that runs through the middle of the community. This gulch is a particular fire hazard because of the kiawe trees and haole koa brush within it.

There are 73 lots within the subdivision with 42 homes either built or under construction. The community has underground utilities, paved roads, hydrants, and setbacks, as well as one functional point of egress and ingress. There is a paved road on the north side that ties into the adjacent community of Kohala Estates, which can be used as an escape route in case of emergency.

The KBTS community is surrounded and intermixed by bunchgrass, which produces fast moving and intense fire conditions. The strong onshore winds that persist everyday make this community prone to wildfires.

Kohala by the Sea residents, concerned about the threat of wildfire to their community, went through the steps to become the first nationally recognized Firewise Community in Hawaii. They are the only community in Hawaii to earn this distinction and have maintained recognition status for three consecutive years.



Kohala by the Sea residents during a 2005 Firewise community workday. Collaborative mitigation efforts helped the community achieve national recognition as part of the Firewise Communities USA program.

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Kawaihae

Kawaihae is a community in the North Kohala district of Hawaii along the leeward coast. Akoni Pule Highway runs through the community, which includes a commercial harbor with a shipping terminal and fuel depot; Ka Ilima O Kawaihae Cultural Surf Park; Kawaihae Canoe Club and boat ramp; retail shopping centers and restaurants; Pu'ukohola National Heiau National Historic Site, an Industrial Park, Ke Hale O Kawaihae Transitional Housing, Kawaihae Village, Department of Hawaiian Home Lands Kawaihae Residence Lots, and Ke Hale O Kawaihae.

Ke Hale O Kawaihae is on the mauka side of Akoni Pule Highway, diagonally across from Pu'ukohola National Heiau National Historic Site just south of Kawaihae Harbor. The Kawaihae Industrial Park is three miles north of Ke Hale O Kawaihae, also on the mauka side of Akoni Pule Highway. The DHHL Kawaihae Makai Lots are on the makai side of Akoni Pule Highway across from the Industrial Park with the bulk of the Kawaihae Residence Lots just north of the Industrial Park on the mauka side of the highway.

Ke Hale o Kawaihae is a 24-unit facility that is part of Catholic Charities Transitional Housing Program. The program provides temporary housing to homeless families with children. There are no driveways or roads within this facility as the units are clustered around an unpaved parking lot directly off Akoni Pule Highway. Utilities are above ground along the highway. There is a power station directly south of the units on the same side of the highway. On either side and behind the units are open lands filled with grasses and brush, including fountain grass and kiawe. Units are of post and pier construction with combustible siding and non-combustible roofing.

Kawaihae Residence Lots are part of Hawaiian Home Lands. Congress created *The Hawaiian Homes Commission Act of 1920* as a land trust. The purpose of the Act was the rehabilitation of native Hawaiians, those individuals of not less than one-half Hawaiian blood. The program offered 99-year leases for residential, agricultural, and pastoral homesteads on the islands of Kauai, Oahu, Maui, Molokai, and the island of Hawaii. When Hawaii became the 50th state in the U.S., one of the conditions of statehood was that the State of Hawaii would administer this program.

The Makai Lots are directly north of the Kawaihae Canoe Club and across the highway from the Industrial Park. There are 22 house lots in the Makai Lots ranging from 15,000 to 23,489 square-feet. In the Makai Lots, one paved road, Honokoa Street, runs between Akoni Pule Highway and the ocean and accesses Akoni Pule Highway at either end. Utilities are above ground and there are hydrants along the road. Driveways are less than 100 feet long and at least 12 feet wide with 15-foot vertical clearance. There are thick groves of kiawe trees on the makai side of the highway. In addition to these Makai Lots there are 3 more house lots across from the harbor.

The 196 lots in the Residence Lots range between one-half acre to an acre in size. They have above ground utilities, paved roads, hydrants spaced less than 1,000 feet apart, and setbacks. Kalo'olo'o Drive, which starts at Akoni Puli Highway, is the main road in the Kawaihae Residence Lots, with side streets that dead end or loop around off of this main road. Road signage is metal and reflectorized, however individual house numbering is spotty to nonexistent. Driveway lengths vary in the Residence Lots, those that are shorter (less than 100 feet) tend to be paved with concrete, while longer driveways tend to be unpaved. Driveways are at least 12 feet wide with 15-foot vertical clearance. Only a few homes within the Residence Lots have locked gates blocking their driveways.

Slope in the community varies between 10 to 20+ percent. The Transitional Housing and Makai Lots are flat at or near sea level. The Industrial Park is on a slight hill above the Makai Lots. There are rolling hills throughout the Residence Lots with Kalo'olo'o Drive on a steep incline. There are gulches run to

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the north and south of the Residence Lots. These gulches are a fire hazard due to the grasses and kiawe trees growing within them.

The Residence Lots are not part of the Hawaii County water system. A single company controls the water for Kohala Ranch, Kohala Estates, Kohala By the Sea, and Hawaiian Home House lots.

Kawaihae Village is just mauka of the intersection of Queen Kaahumanu Highway and Kawaihae Road. The village complex includes rental housing used by Mauna Kea Observatories for their employees.

Much of the land area owned by Queen Emma Lands on the north side of the Kawaihae Road, although not highly suitable for grazing, was fenced and the Ranch grazes this area to reduce the amount of fire fuel that could enhance wildfires. This grazing project is a collaborative effort, including Mauna Kea Soils and Water Conservation Services, Parker Ranch, Queen Emma Lands, and the State Department of Health.

Anekona Estates and Kanehoa in Waimea

Anekona Estates and Kanehoa are developed adjoining subdivisions on the south side of Kawaihae Road at the 1,800-foot elevation in Waimea. The Kanehoa subdivision has 44 homes with two empty lots. Lots in Kanehoa were originally 5 acres in size, although some have been subdivided into 2.5-acre lots. Several lots have two houses on property, which are considered condominiums by the Kanehoa Homeowners Association. The majority of homes are owner occupied. Lots in Anekona Estates appear to be at least a half-acre to acre in size.

Anekona Estates and Kanehoa subdivisions have underground utilities, paved roads, hydrants, and setbacks. There is a drainage ditch that separates the Anekona Estates and Kanehoa subdivisions.

Road widths within Anekona Estates and Kanehoa are 20 feet within the subdivisions. Kanehoa Homeowners Association is responsible for mowing the road shoulders within its subdivision, and schedules mowing according to rainfall. The majority of driveways within Anekona Estates are paved and several are gated. House numbering within Anekona Estates is inconsistent: varying in size, some are rusty and would be difficult to see at night or in smoky conditions.

Ouli Street is the only road in the Kanehoa subdivision. Ungated, Ouli Street exits onto Kawaihae Road and dead ends at the Waimea end of the subdivision with a small turnaround. There are road shoulders on either side of Ouli Street. There are two means of egress from Anekona Estates: Kanehoa Street and Anekona Street. Kanehoa Street exits onto Kawaihae Road and dead ends with no turn around space at a road barrier blocking entrance to Ouli Ekahi subdivision. Anekona Street exits onto Kawaihae Road where there is a gate, and merges into Kanehoa Street at the other end. Several homes within Anekona and Kanehoa subdivisions have locked gates blocking their driveways. There is road signage in Kanehoa but there is no street signage for side roads in Anekona Estates. House numbers vary in size and color.

There are gently rolling hills within both subdivisions and slope varies between 0 to 10 percent. Some houses are built on the top of hills while others are on flat land. Behind the subdivision is open hilly grasslands extending for several miles to the south to Waikoloa. There are open areas within both subdivisions with tall grasses.

Hydrants, spaced 1,000-feet apart within both subdivisions, are supplied by the Hawaii County Department of Water Supply (DWS). A storage tank for the county water system is located on Kawaihae Road at the 1,800-foot elevation near the Kanehoa subdivision. The tank is maintained by the DWS. Kanehoa subdivision has its own agricultural water system for irrigation. Three reservoirs are

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located at the top of the subdivision and those residents that pay to use the reservoir can use this water. Residents within Kanehoa are oriented towards green growth for fire safety. There is a stream that runs through the subdivision through a series of ditches that runs sporadically and is available to all homeowners. This is in addition to the above-mentioned reservoirs.

Directly south of Anekona Estates is Ouli Ekahi, an affordable rental project of 33 units managed by the County of Hawaii (Housing and Community Development Corporation of Hawaii). There is a combination of houses and cottages. It has one road in and out of the subdivision with side streets at the end of the main entrance road. There are utilities above ground along the entrance road. Ouli Ekahi is separated from Anekona Estates by a road barrier. Lots are considerably smaller than Anekona or Kanehoa, averaging 10,000-square feet. Houses in Ouli Ekahi have metal roofing and combustible (wood) siding. Driveways are typically 12 feet wide with 15-foot vertical clearance. Several homes have fences, although the fences for the most part are non-combustible, i.e. of rock or metal with only one or two fences composed of wood. Most homes have defensible space because they lack vegetation.



House in Kanehoa subdivision. Built atop a slight hill, the front yard is covered in invasive grasses, a potential wildfire hazard.

In addition to area fuel load, strong winds, and minimal rainfall, there is an additional threat to these subdivisions. According to fire officials there is unexploded ordinance (UXO) in Waimea Anekona Estates, mostly small size mortar rounds and bullets. Some homes are built on unexploded ordinance. There have been explosions from UXO in residential areas during past wild fires. Per the Fire Chief's directive, no fire suppression field operations are allowed in designated UXO areas for safety reasons. It's believed there are UXO large enough to be fatal to dozer operators in the UXO areas.

Homes in all three subdivisions have Class A roofs, however some houses have wood siding and/or lanais, while others have non-combustible siding and/or lanais. Houses vary between post and pier and concrete slab construction. Some lots have defensible space around the house, while others have grasses growing right up to the house. Since Ouli Street is the only means of egress for many residents in Kanehoa, evacuation of residents and response by fire fighting personnel may be compromised if smoke or flames impede road access. According to Hawaii Fire Department personnel, some of the houses along the highway in Kanehoa are at risk because if a fire began along the highway, the wind would blow flames towards the houses.

Pu'u Kapu

Pu'u Kapu is a Department of Hawaiian Home Lands community in Waimea, on either side of Mamalahoa Highway in the South Kohala District covering an area of 11,949 acres. Pu'u Kapu I, on the Kona side of Mamalahoa Highway, is comprised of three distinct separate areas: Kuhio Village subdivision off Kamamalu Road, which contains 121 house lots; Farm lots, of which there are 75; and 204 Pastoral lots. Pu'u Kapu II is on the Kohala side of Mamalahoa Highway and borders the Kohala Forest. The information below focuses on Pu'u Kapu I.

House lots in Kuhio Village range from 10,000 square feet to an acre in size. Driveways in the subdivision are typically less than 100 feet, and few, if any, have turnarounds large enough for fire engine apparatus. Several driveways are gated or fenced. Driveways are typically at least 12 feet wide with 15 feet vertical clearance. House numbering is inconsistent and in many cases nonexistent. The majority of homes have metal roofs and wood siding. Roads are paved and there are multiple means to access Mamalahoa Highway, the main road through the Waimea community. Fire hydrants are spaced

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throughout Kuhio Village subdivision. Utilities are above ground. Hawaii County is responsible for the maintenance and repair of roadways and shoulders in Kuhio Village.

Pu'u Kapu Farm lots are between Kuhio Village House lots and the Pastoral lots and range from 1.5 acres to 30 acres in size. The majority of the road system is built to county standards, with the exception of the partially paved substandard area on Kahilu Road that merges into Mana Road. There is more than one road to access the farm lots from Mamalahoa Highway. Some of the roads in the Farm lots area are paved single lane roads and some are unpaved dirt roads. Hawaii County is responsible for the maintenance and repair of roadways and shoulders in the Farm lots. Driveways tend to be longer than 300 feet and several are gated or fenced. House numbering is inconsistent or nonexistent. As in Kuhio Village, houses in the Farm lots tend to be constructed with metal roofs and combustible siding. Vegetation is denser in the Farm lots than in Kuhio Village House lots and some properties have windbreaks of eucalyptus or pine trees. Several lot owners raise horses, sheep, and/or goats. Fire hydrants are spaced throughout the farm lots and utilities are above ground. There are several active commercial agricultural operations in the farm lots, which are well irrigated.

The first phase of the Pu'u Kapu I pastoral lot leases were awarded in 1952 with the second phase being awarded in 1990. These lots, which range from 10 – 300 acres in size, are furthest away from Mamalahoa Highway and the Waimea fire station. Fire Road 7, an unpaved dirt road less than 24 feet wide that has access off of Mana Road, and Poliahu Road, a paved road 20 feet wide, are the main access roads to the Pastoral lots, with several side roads connecting to Fire Road 7. Access to DHHL Pastoral lots is gated on both Poliahu Road, shortly after the gate the road changes from paved to unpaved, and at the intersection of Mana Road and Fire Road 7. At the present time the gates to the Pastoral lots are unlocked.

Several Pastoral lot owners raise horses, cattle, goats, and/or sheep. Driveways within Pastoral lots are typically longer than 300 feet with room to stage firefighting apparatus. House numbering is not common in the Pastoral lots. With the exception of a few of the 100-acre lots, most people do not have access to electricity with homesteaders relying on generator, solar, or wind power. DHHL, via Sandwich Isle Communications, installed an underground fiber optic system with the capability of running underground lines should electricity become available. DHHL is responsible for maintaining the roads in the Pastoral lots. The agency does not mow the road shoulders.



Landowners in the Pu'u Kapu Pastoral lots graze cattle, goats, sheep, and/or horses, which helps to reduce fire fuel load (photo on right). However, not all lot owners manage their grazing to reduce fuels (photo on left).

There are no fire hydrants in Pu'u Kapu Pastoral lots. County potable water is available to a limited number of lots via a 4-inch main line. All lots awarded in 1952 have water via this 4-inch line. There is a Department of Water Supply 12,000-gallon tank on Fire Road 11 specifically for fire department use.

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The Pu'u Kapu Pastoral Water Group has a 10,000-gallon tank opposite the 12,000-gallon tank near lot #78. There are two water meters near lots #15 and #20 that supply water to various homesteads. About 40 lots have their own water tanks that are fed through these meters with the tanks serving as the main source to individual lots and for fire protection. The majority of the lots issued in 1990 rely on catchment water. HWMO has installed a 5,000-gallon helicopter dip tank for the Pu'u Kapu community to serve as an additional water source for firefighting suppression.

For the most part, the community is on flat land, graded at less than 5 percent. The community experiences offshore winds in the morning and onshore winds in the afternoon. Normal trade winds blow north to south, although the area experiences strong, dry winds.

Puako

Puako is a developed community on the makai side of Queen Kaahumanu Highway in the South Kohala District. There are 150 homes in the Puako community with a mix of older (30-50 years old) and newer homes, incorporating varying degrees of fire-resistant construction materials. For instance, some of the older homes have wood shake roofs. Roughly one-third of the homes are owner occupied, one-third are long-term rentals, and one-third are vacation rentals. Driveways in Puako are typically less than 300 feet, and few, if any, have turnarounds large enough for fire engine apparatus. House numbering within Puako is inconsistent. While some homes have fire-resistant roofing and siding, others have wood shake roofs and wood siding. Many homes do not have defensible space around their property.



Homes in Puako range from older cottages to new, much larger models.

One road, Puako Beach Road, is a paved road less than 24 feet in width and is the main means of ingress and egress from the community. A secondary emergency access road, which is unpaved and can handle two-wheel drive vehicles traveling 25 miles per hour, is located behind the Catholic Church on the mauka side of Puako Beach Road and is locked and gated. Fire hydrants in Puako are less than 1,000 feet apart.

For the most part the community is on flat land, graded at less than 5 percent, although the terrain is at a slope at the transfer station and at the main entrance to Puako at Queen Kaahumanu Highway.

There is a kiawe forest running along the mauka boundary of the community from Queen Kaahumanu Highway down towards the community.

The community experiences offshore winds in the morning and onshore winds in the afternoon. Normal trade winds blow north to south, although the area experiences strong, dry winds.

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The 100-foot fuel break on the mauka side of the Puako community created in 2003.

In 2003, the Hawaii Wildfire Management Organization provided technical assistance in the planning and creation of a 100-foot wide fuel break, which runs along the mauka side of the community from Hokuloa Church to the end of the subdivision lots. In 2004, HWMO worked with the Puako Community Association (PCA) to reimburse them for maintenance of the fuel break. PCA and the Puako community is working on several wildfire mitigation measures, including the maintenance of access lanes between private lots to enhance fire suppression efforts, increasing the width of the community fuel break to 300 feet and maintaining it annually, establishing a secondary emergency access routes from community through the Maui Lani resort, creating buffer zone around petroglyph areas, and enhancing defensible space around individual properties.

Waikoloa

Waikoloa Village is a developed community encompassing four square miles or 2,560 acres, between Queen Kaahumanu Highway and Mamalahoa Highway on Hawaii County's leeward coast. Waikoloa Village contains more than 2,700 homes, condominiums, and apartment units; a 122-acre golf course; a recreational complex; tennis courts and swimming pool; schools; churches; a shopping center and offices; as well as two small community parks. Waikoloa Village is surrounded by miles of open land filled with non-native vegetation, such as fountain grass.

There has been a sizable increase in development in recent years, with additional condominium complexes and subdivisions built within the community. For example, in 2006, developers Castle and Cook broke ground for the first phase of constructing 54 single-family homes and 175 condos and plans to develop another 520 additional condos and homes in the future. There are also plans for 1,200 affordable housing units to be built, in addition to numerous empty lots within the Village that may be built upon at any time. House lot sizes in Waikoloa Village range from 12,000-square-foot to 18,000-square-foot, with the 12,000-square-foot size being the norm. Driveways are less than 100 feet long with no turnaround space for fire apparatus, and several are less than 12 feet wide with 15-foot vertical clearance. The majority of homes are owner-occupied although some are used as vacation rentals. Road signage within the Village is metal and reflectorized. House numbers are displayed on mailboxes and painted on curbsides in front of homes.

The community has underground utilities, paved roads, hydrants, and setbacks. Waikoloa Road, which runs east west from Queen Kaahumanu Highway at sea level up to Mamalahoa Highway, is the main means of ingress and egress to the community. Waikoloa Road is a two-lane paved road greater than 24 feet wide. Roads within the Village are paved with some as much as 40 feet wide. Paniolo Avenue, a major thoroughfare through the community, is four lanes wide. During previous fires, the community had only one

means of ingress and egress, which severely impacted the evacuation of thousands of residents. To address this concern, an emergency access road was recently built providing the community with an alternative means of egress



An emergency access road leading from Waikoloa Village to Queen Kaahumanu Highway was recently built to provide additional egress during wildfire emergencies.

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in case of wildfire. The unpaved road, composed of compacted gravel, runs from Hulu Street, in a newly built part of western Waikoloa Village down to Queen Kaahumanu Highway. The road is gated and the fire department has an emergency access key.

Slope within the community varies between 0 to 20+ percent with rolling hills throughout the Village. There are gulches within the community filled with kiawe trees. Gulches can channel fire and kiawe trees are known to carry fire and create embers that can be easily carried onto residential properties. During a 2003 fire, the gulch next to the Baptist church carried fire through the community.

Water to fire hydrants, as well as residential and commercial properties within the Village is supplied by Hawaii County Department of Water Supply.

Pu'uuanahulu

Pu'uuanahulu is a community in the North Kona District, along the Mamalahoa Highway at the 2,200-foot elevation 18 miles north of Kona and 19 miles south of Waimea. The only road through the community, Mamalahoa Highway, runs northeast from Kona to Waimea. The community is composed of several houses along the highway; a church; a community complex, including a community center, equestrian ring, and volunteer fire station; a golf course, and the gated community of Pu'u Lani Ranch Estates (PLRE). The Baptist church is considered a historical landmark. Pu'u Wa'a Wa'a Ranch is directly south of the community.



The Baptist Church in Pu'uuanahulu, on Mamalahoa Highway, is considered a historical landmark.

The Pu'u Wa'a Wa'a ahupua'a, directly south of Pu'uuanahulu, contains more than 36,000 acres of state land and is an area rich in native Hawaiian plants and animals. At one time it was a Native Hawaiian dryland forest, but wildfires and grazing have destroyed much of the forest.

Houses along the highway have been established for at least 100 years. Pu'u Lani Ranch Estates is a gated community developed within the past 20 years. When approaching Pu'uuanahulu from Kona on Mamalahoa Highway, there is a steep curve at the base of the ridge by Pu'u Wa'a Wa'a Ranch with the road winding around curves until the top of the hill at which is the entrance to PLRE and the Big Island Country Club. All the above-mentioned homes and enterprises are between the base of the ridge and the top of the hill.

Homes along the highway have above ground utilities, hydrants and setbacks. Mamalahoa Highway is the only means of ingress and egress from the community. The Big Island Country Club is behind the homes on the makai side of the highway and PLRE is behind the homes on the mauka side of the highway. Some landowners along the highway graze goats and/or horses on their property.



Typical house in Pu'u Lani Ranch Estates. This house has defensible space, although not all homes in the subdivision do.

Pu'u Lani Ranch Estates is a developed subdivision, the entrance of which is on Mamalahoa Highway. Built in phases since 1986, there are more than 146 lots in

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the subdivision, and as of February 2007 there were 72 houses built. Lots are a minimum of one-acre parcels, with some lots being two acres in size. Within Pu'u Lani Ranch Estates there are several vacant lots with overgrown brush, many owned by mainland or international investors. Within PLRE there is a community clubhouse, tennis courts, and an equestrian facilities. The subdivision has underground utilities, paved roads greater than 20 feet in width, hydrants, and setbacks. There is one road for ingress and egress from the subdivision, which is gated. Several homes within the subdivision have locked gates blocking their driveways. Road signage is metal and reflectorized, however house numbers vary in size and color.

Driveways in PLRE must be paved using asphalt or concrete, or crushed. Driveways in PLRE tend to be less than 100 feet long, while driveways of homes along the highway tend to be longer and curved.

Diagonally across the highway from PLRE (on the makai side) is the Big Island Country Club, which includes a golf course, clubhouse, and undeveloped areas. Lynch Investments owns 400 acres and The Big Island Country Club owns the golf course, which is more than 100 acres.

There is one main road in and out of the golf course. A dirt road runs along the backside or makai boundary of the golf course, through the maintenance area connecting to Mamalahoa Highway. This road could be used as a secondary means of egress in case of emergency. Beyond the boundary of the golf course are grass filled rolling hills containing more than 3,000 acres of state land.

The unmaintained areas within the golf course contain 105 house lots that are slated for high-end residential construction. Lynch Investments owns these house lots and is moving forward in the construction permit process.

Within the PLRE subdivision slope is less than 20 percent. However those homes along the ridge are at a much higher risk from wildfire since the slope is nearly 100 percent in some places and is covered with high intensity fuels. Homes along the ridge are set back more than 30 feet from the slope. The steep ridge is covered with fountain grass, a high-intensity burning fuel, as well as silver oak, which is easily ignitable due to oily resins, and kiawe, which is known for having a long burn time. Firewise community workdays have been held in the past to decrease the fuel load at the base of the ridge to reduce wildfire risk from vehicle accidents.

Pu'uanaulu, including PLRE, is not part of the Hawaii County water system. The community came together several years ago to purchase the water system supplying the area and formed their own water company, Napu'u Water Inc. Two wells supply the community: one well at the PLRE clubhouse and one well at Pu'u Wa'a Wa'a ranch. Area residents must pay for this water, which is expensive. Because Napu'u Water Inc.'s predecessor supplied subsidized water for grazing in the area; grazers now pay premium prices for water. This may impact the viability of grazing, which will have an impact on reducing fuels in the area.

At the Big Island Country Club the hydrants within the golf course are not active (hydrants are the responsibility of Lynch Investments). Of Big Island Country Club's two wells, one is working and one is currently under repair.

North Kona: Hina Lani, Kona Palisades, Kealakehe

There are several miles of open grass lands south of Pu'uanaulu and north of Kona. The subdivisions of Kealakehe, Kona Palisades, and Hina Lani are south of the grasslands and increase in proximity to the urban center of Kailua-Kona. While the wildfire risk is slightly lower in this region, due to increased industrial and residential development, it is still in the wildland urban interface. The area was originally

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dryland forest, and there is still native flora in the area, in addition to cultural sites, including refuge caves. The above communities span between Mamalahoa Highway and Queen Kaahumanu Highway.

Winds are typically north to north east trade winds averaging 5 – 15 mph, although the area does experience strong south winds on occasion. While homes in these subdivisions are generally built on flat land, the communities themselves are built on steep grade, particularly Kona Palisades, which runs from 1,500 foot elevation to sea level in the span of less than four miles.

House lots are smaller in size (10,000 – 15,000 square feet) than the more rural areas to the north. Driveways are also shorter, generally only 50 to 100 feet in length, with no turnaround. Driveways are typically 12 feet wide with 15 feet of vertical clearance. Almost all homes in these subdivisions have non combustible roofing, although many have combustible siding and/or lanais. Houses vary in level of defensible space, with many homes using gravel and landscaping to create defensible space. However, those homes closest to undeveloped areas have kiawe growing in close proximity to the homes.



Houses in subdivisions in North Kona, such as the ones in Kealahou, above, tend to be closer together than other communities.

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; scenic, cultural, and archeological sites; ranchlands; and structures. The following were identified as valued resources within Northwest Hawaii that would be adversely affected by wildfire.

Commercial / community resources:

Resorts, shopping centers, schools, community centers, churches, restaurants, industrial parks, and retail establishments.

Natural / Cultural Resources:

Pu'ukohola Heiau National Historic Site, Puako Petroglyph Archeological Preserve, Lapakahi State Historical Park, county parks and beaches including Hapuna Beach State Recreation Area, Wailea Bay, Spencer Beach Park, Pu'u Wa'a Wa'a State Wildlife Preserve, as well as native dryland forest, rare and endangered plants and animals, and cultural and archeological features, such as refuge caves. Importantly, the North Kohala coastline has the most numerous intact archeological sites in the state.

Houses and residences are at risk to wildfire in Northwest Hawaii. Overgrown vegetation close to homes and an increase of non-native high-intensity plants was found in every northwest Hawaii community. Northwest Hawaii as a whole has experienced tremendous development in recent years. Waikoloa Village already contains 2,700 single-family houses, condominiums, and apartment units and there are plans for nearly 2,000 additional homes and condominiums. New subdivisions are being built on either side of Hina Lani in North Kona. Many new residents are from other parts of the United States and unfamiliar with the wildfire risks of Hawaii communities.

The majority of homes within residential areas in Northwest Hawaii have Class A roofing, however, several homes can be found in almost every subdivision with wood shake roofs. Many homes in West

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side communities also have combustible siding and/or lanais (decks). Homes vary widely in defensible space regardless of socio-economic background, with lava serving as a natural fuel break on some lots and vegetation growing close to the home on other lots. Few driveways have turnaround access for emergency vehicles.

Community Concerns for West Hawaii:

Community meetings specifically on the CWPP process held in May 2007 with community members and fire agencies identified the most pressing fire concerns in Northwest Hawaii. They include, in order of priority:

1. Insufficient water infrastructure to adequately and quickly suppress wildfires;
2. Inadequate fire suppression resources, such as vehicles;
3. Fuel load along roadsides, in community open areas, and individual homes;
4. Regional and local planning and development standards that do not require communities' and subdivision designs to consider and/or mitigate fire risk
 - 4 a. Structures' design, materials, and placement and landscaping that promotes or does not mitigate fire risk;
5. Community egress and firefighting vehicle ingress during a wildfire;
 - 5a. Identification of evacuation route roads within subdivisions;
6. Lack of emergency access staging areas within subdivisions for evacuation purposes;
7. Need to reduce and/or control invasive species that possess inherent fire or ignition properties;
8. Arson;
7. Need to Increase/integrate communication equipment between state, federal, and county agencies; and
9. Lack of public awareness of the wildfire threat;
 - 9a. Need for awareness regarding restricting vehicle access and/or those vehicles with catalytic converters.

Recommended Actions for Northwest Hawaii:

Based on identified community concerns, the following recommendations are made to reduce the wildfire threat in Northwest Hawaii. The implementation of a multi-modal approach will increase firefighting efficiency, reduce fire fuels, and improve community and firefighter safety. Mitigation measures to reduce wildfire risk and/or impact in Northwest Hawaii include in order of priority:

1. Installation of pre-staged static water and helicopter dip tanks;
2. Acquisition of adequate resources for first responders, including off road tankers;
3. Reduction of fuel load and/or appropriate conversion of fuels along road sides, in community open areas, and individual homes. Appropriate conversion would include transition to vegetation with low ignition potential and low ability to carry fire, especially native plants;
4. Creation of development standards and community planning that requires the mitigation of wildfire risks at the regional, community/subdivision, and individual structure levels;
5. Creation/improvement of secondary access roads for those communities with only one means of ingress/egress; identification of evacuation route roads within subdivisions;
6. Development of emergency staging areas within communities and promoting awareness of such areas within the community, including holding mock disaster drills;
7. Reduction and/or control of invasive species that increase fire risk and, where appropriate, conversion to vegetation as described in priority number three;

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8. Continued fire prevention education and outreach; including arson prevention education and the development of a fire danger rating system.
9. Integration of current and future communication equipment utilized by federal, state, and county fire suppression personnel to increase effective firefighting response.

Based on the results of the community risk assessment, priority ratings have been selected for Northwest Hawaii 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
Kawaihae	Mechanical	Need for additional pre-staged static water and helicopter dip tanks	Very High
Kohala, Kawaihae, Pu'u Kapu, Waimea, Puako, Waikoloa, Pu'uanahulu, North Kona	Mechanical / Chemical / Hand Labor	Reduction of fuel load along roadsides, community open areas, and individual homes	Very High
Kohala, Kawaihae, Pu'u Kapu, Waimea, Puako, Waikoloa, Pu'uanahulu, North Kona	Mechanical	Acquisition of adequate resources for first responders, including off road tankers	High
Kohala by the Sea, Waimea Anekona, Puako, Pu'u Lani Ranch Estates	Mechanical / Chemical / Hand Labor	Creation of secondary emergency ingress/egress roads	High
Kohala, Pu'u Kapu, Waikoloa, Pu'u Lani Ranch Estates	Mechanical	Street signage identifying evacuation routes	High
Kohala, Kawaihae, Pu'u Kapu, Waimea, Puako, Waikoloa, Pu'uanahulu, North Kona	Mechanical	Development of emergency staging areas within communities, promoting awareness of such areas within the community, including holding mock disaster drills	High
Kohala, Kawaihae, Pu'u Kapu, Waimea,	Mechanical / Chemical / Hand Labor	Reduction and/or control of invasive species	High

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Puako, Waikoloa, Pu'uanahulu, North Kona			
Kohala, Kawaihae, Pu'u Kapu, Waimea, Puako, Waikoloa, Pu'uanahulu, North Kona	Public Education and Outreach	Continued fire prevention education and outreach, including arson prevention education	Medium
Kohala, Kawaihae, Pu'u Kapu, Waimea, Puako, Waikoloa, Pu'uanahulu, North Kona	Mechanical / Political	Increase effective integrated communication between federal, state, and county fire suppression agencies	Medium

Community organizations, federal agencies, and private landowners in Northwest Hawaii were invited to submit projects that provide protection and reduce wildfire risk. The following table displays a list of projects based on recommendations from community and fire-related organizations. HWMO 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
Kawaihae, leeward N Kohala coast, Pu'uanahulu; S Waimea, Pu'u Wa'a Wa'a, Waikoloa	Installation of pre-staged static water and helicopter dip tanks	Multiple Agencies: federal, state, county, and private	Cooperative Funding \$128,000	2008 - 2009	Yes
Kohala, Kawaihae, Pu'u Kapu, Waimea, Puako, Waikoloa, Pu'uanahulu, North Kona	Reduction and/or conversion of fuel load along roadsides, community open areas, and individual homes	Multiple Agencies: county	Cooperative Funding \$850,000	2008 - 20012	Yes
All communities and areas in the CWPP planning	Creation of development standards and community planning that	Multiple Agencies: county and state	Cooperative Funding \$150,000 for outreach, any needed	2008-2009	

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planning area	planning that requires the mitigation of wildfire risks		impact studies and education		
Kohala by the Sea, Waimea Anekona, Puako, Pu'u Lani Ranch Estates	Creation of secondary emergency ingress/egress roads	Multiple Agencies: federal, state, county, and private	Cooperative Funding \$750,000 if environmental assessments required	2008 - 2010	Yes
Kohala, Pu'u Kapu, Waikoloa, Pu'u Lani Ranch Estates	Street signage identifying evacuation routes	Multiple Agencies: federal, state, county, and private	Cooperative Funding \$50,000	2008 - 2012	Yes
Kohala, Kawaihae, Pu'u Kapu, Waimea, Puako, Waikoloa, Pu'uuanahulu, North Kona	Development of emergency staging areas within communities, promoting awareness of such areas within the community, including holding mock disaster drills	Multiple agencies: private	Cooperative Funding \$33,000 for planning and outreach	2008 - 20010	Yes
Kohala, Kawaihae, Pu'u Kapu, Waimea, Puako, Waikoloa, Pu'uuanahulu, North Kona	Reduction, control, and or conversion of invasive species	Multiple Agencies: federal, state, county, and private	Cooperative Funding \$1,500,000 includes maintenance, grazing, and conversion projects	2008 - 2012	Yes
Kohala, Kawaihae, Pu'u Kapu, Waimea, Puako, Waikoloa, Pu'uuanahulu, North Kona	Continued fire prevention education and outreach, including arson prevention education	Multiple agencies: federal, state, county, and private	Cooperative Funding \$30,000	2008 - 2012	Yes
Kohala, Kawaihae, Pu'u Kapu, Waimea, Puako, Waikoloa, Pu'uuanahulu, North Kona	Increased effective integrated communication between federal, state,	Multiple agencies	Cooperative Funding	2008 - 20011	Yes

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Waikoloa, Pu'uanahulu, North Kona	and county fire suppression agencies				
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Installation of pre-staged static water and helicopter dip tanks

Lack of water for fire suppression was identified as one of the most important challenges facing Northwest Hawaii communities. Pre-staged static water and helicopter dip tanks will greatly increase effective fire suppression and firefighting efficiency.

Acquisition of adequate fire suppression resources

Acquisition of additional fire suppression vehicles, particularly smaller off-road vehicles, may help fire fighting personnel reach remote fires quicker.

Reduction and/or appropriate conversion of fuel load

Reducing vegetation or appropriately converting fuels to species with low ignition potential in the vicinity of valued resources (houses, churches, community centers, cultural resources), in community common areas, and along road sides and fuel breaks will decrease fire risk to important resources and improve fire suppression capabilities. Whenever possible, fuels conversion should incorporate native plants.

Development standards and community planning that requires the mitigation of wildfire risks

Adopting development standards and community plans that mitigate wildfire risk will prevent many of the problems that set the stage for loss during fires and will greatly assist in suppression efforts and maximizing responder safety.

Creation / improvement of secondary access roads

Creation or improvement of secondary access roads to provide emergency egress should be pursued, secured, and improved where appropriate. Other secondary roads that may be used for fire suppression activities should be clearly signed and maintained.

In order to remain effective, the secondary emergency egress roads must be maintained on a regular basis. Funding should be secured to ensure that the roads are maintained at least twice a year. The organization that is determined to be responsible for the access roads may want to consider the purchase of a dozer or other equipment to maintain the roads.

Also, evacuation routes should be clearly identified within Northwest Hawaii subdivisions with signage posted marking these roads for express egress in case of emergency.

Development of emergency staging areas within communities

Recognizing that evacuation may not always be possible during a wildfire, community association and/or neighborhood groups may want to develop emergency staging areas within their community for times when evacuation is not possible. Once these staging areas are identified, communities should promote awareness of such areas within the community, as well as hold periodic mock disaster drills.

Reduction, control, and/or conversion of invasive species

Invasive grasses, such as molasses grass and fountain grass are high-intensity burning fuels that carry fire to other fuels. The ability of fountain grass to establish on barren lava flows compromises natural fire breaks for use by fire agencies. Proactive measures should be taken to mitigate the growth of fire fuels on these natural fuel breaks. Current strategies to address fine fuel build-up along roadsides should be continued, including developing vegetated fuel break corridors consisting of plants less likely to ignite or carry fire with an emphasis on native plants. It is recommended that community associations

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in Northwest Hawaii adopt CCRs that address fire fuels build-up within their community. It is also strongly recommended that outreach efforts include alerting residents and developers to the wildfire risk caused by invasive grasses and ways to prevent their spread. Periodic inspection of the each home site and sanitation strategies should be suggested by the homeowners associations. Landscaping with fire resistant plant species and especially native plant species should be recommended by the homeowners associations.

Continued fire prevention education

Fire agencies in Hawaii County and the Hawaii Wildfire Management Organization have partnered with Firewise to promote community wildland fire 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 continued influx of residents from other parts of the United States who are unaware of Northwest Hawaii's unique fire risks, it is crucial to continue a comprehensive fire education and outreach campaign. This program should consist of the following:

- a. Continued development and coordination of community meetings and outreach events. Coordination with other community groups, such as the local disaster preparedness committee and civic organizations, to provide wildland fire safety information on defensible space and fire-resistant Firewise building materials. Provide outreach at community events.
- b. Develop educational materials specific to community fire threat and continue outreach in local publications. Continued outreach is needed with large numbers of new residents moving into the area.
- c. Development of fire prevention outreach materials, including TV and radio public service announcements, posters, and handouts.
- d. Development of arson prevention outreach materials, including TV and radio public service announcements, posters, and handouts.
- e. Creation and promotion of a systematic fire danger rating system. Such a system has been in development for a couple of years and when finalized the fire danger rating system should be promoted in Northwest Hawaii, so residents know when fire hazards within their community are at their highest.

Increased effective communication between emergency personnel agencies during disaster

Fires, earthquakes, and hurricanes are among the risks that threaten Northwest Hawaii communities. It is imperative that current and future communication equipment utilized by federal, state, and county fire suppression agencies are integrated to increase effective firefighting response.

Reducing Structural Ignitability:

Individuals and community associations can reduce structural ignitability throughout their community by taking the following measures recommended by the Firewise program.

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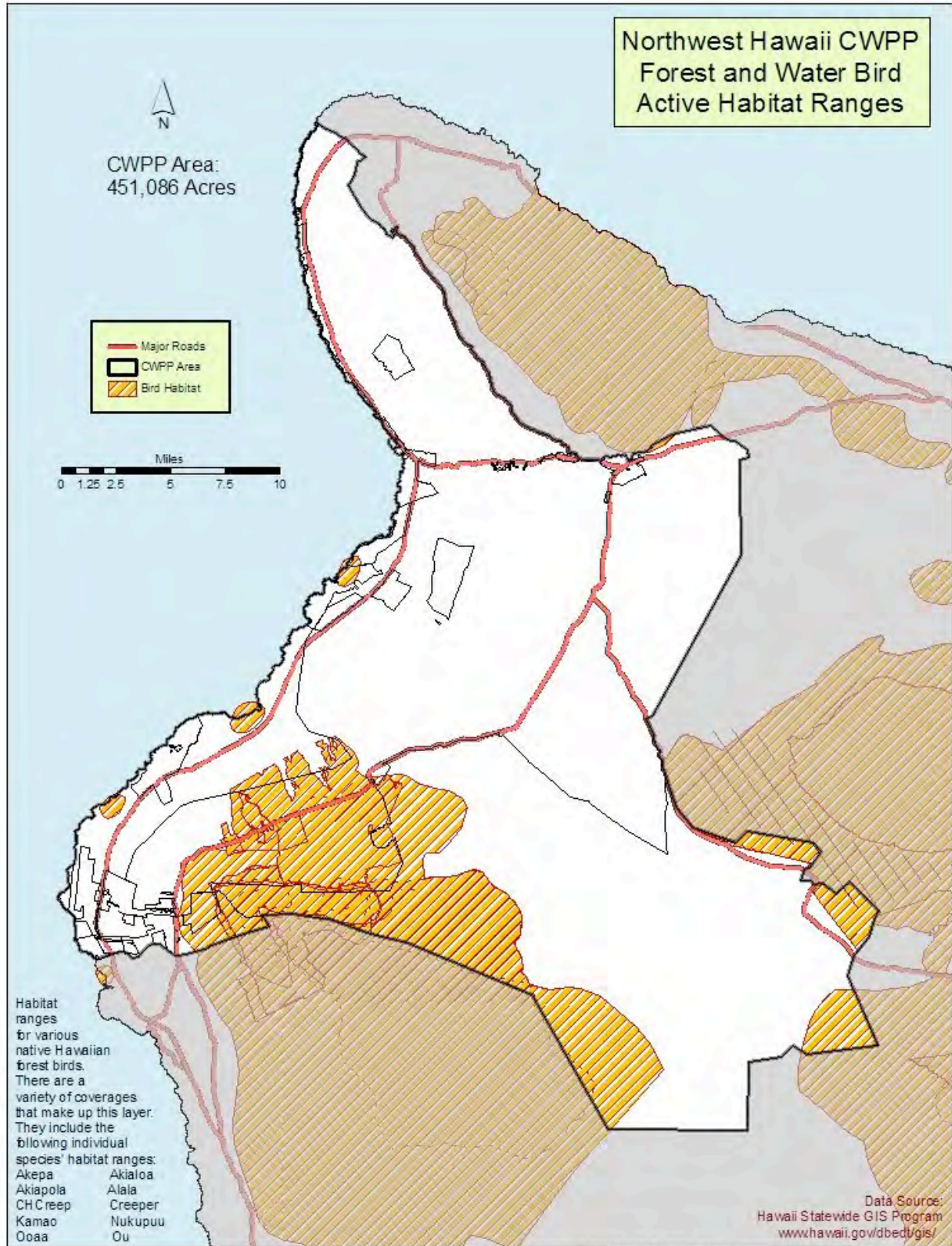
- Create a buffer zone of defensible space around a property of at least 30 feet or to the property line if the house has less than 30 feet of yard. Remove flammable vegetation and combustible growth within 30 feet of the house.
- Prune tree limbs 6 – 10 feet above the ground.
- Space trees and shrubs 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.

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Appendix A: Native Hawaiian Bird Species and Forest Bird Ranges in West Hawaii



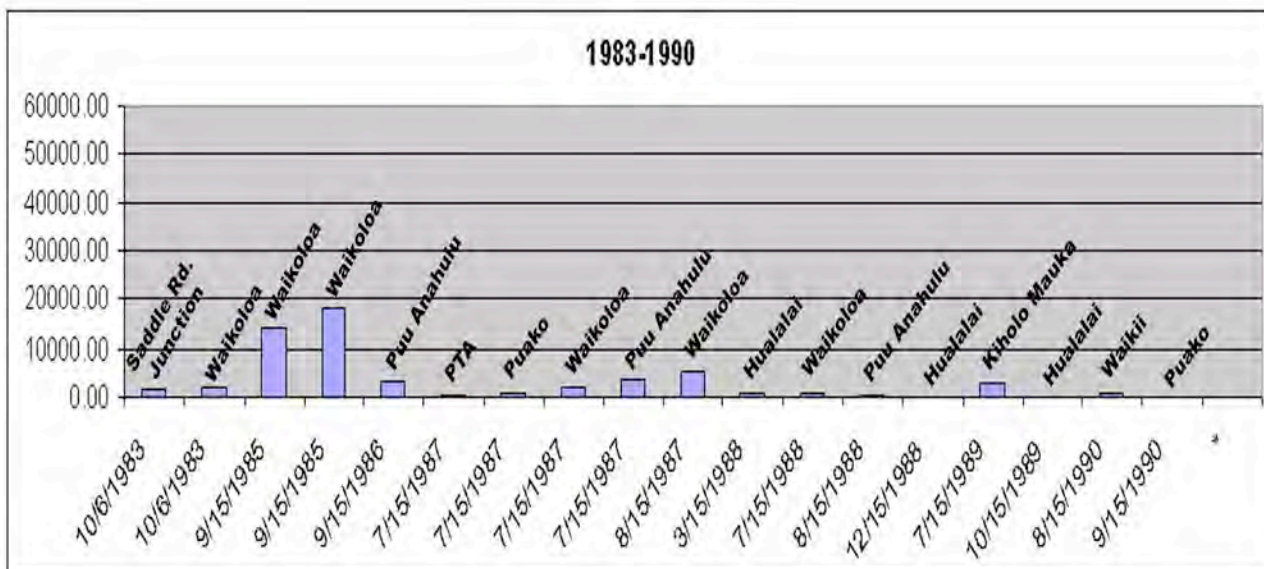
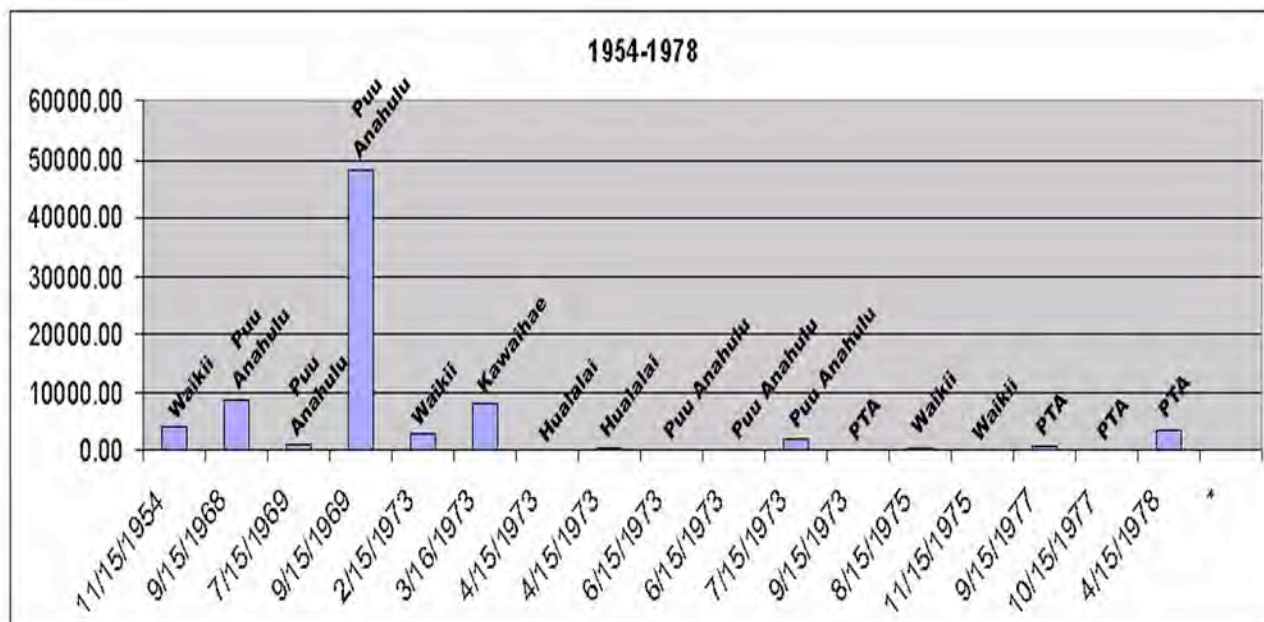
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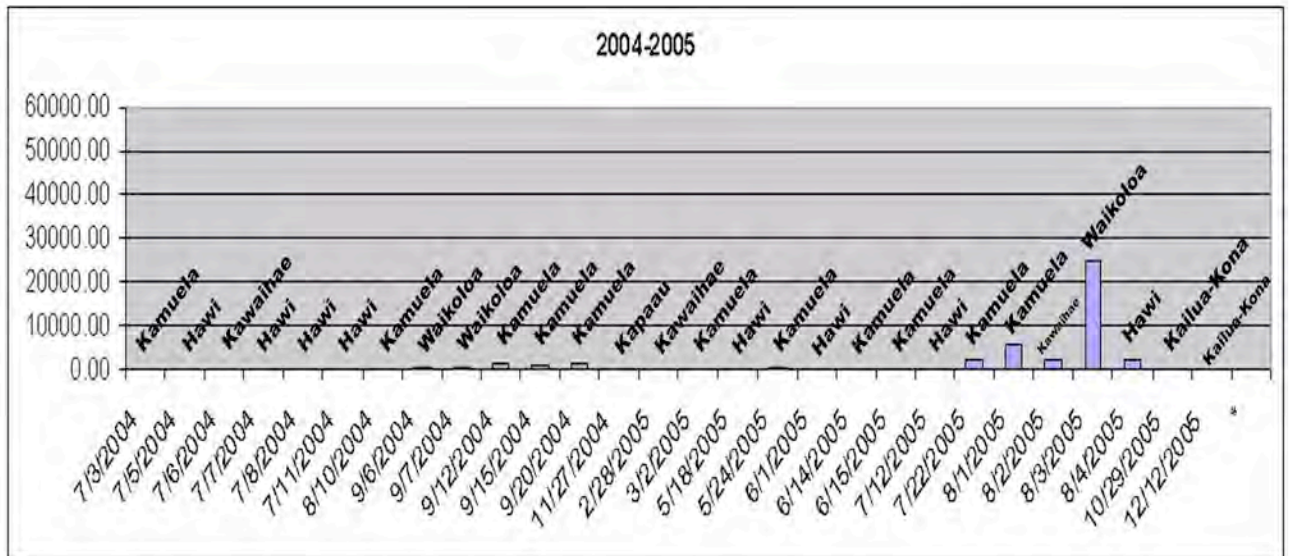
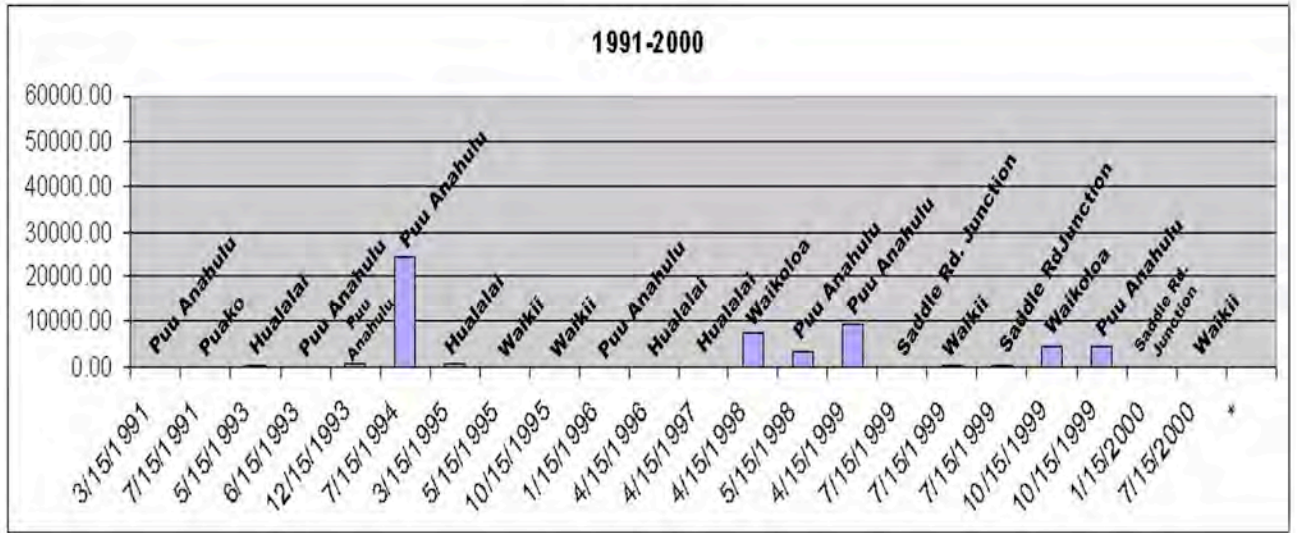
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Appendix B: Fire History Graphs for Major Fires 1954 - 2005

Graphs from Northwest Hawaii Fire History map depict fire size for different periods of time. Data unavailable for the period 1978-1983.



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Appendix C: Updated Project List 2009-2012

Federal agencies and private landowners in Northwest Hawaii 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	Funding Needs	Timetable	Community Recommendation
Kawaihae, leeward N Kohala coast, Pu'uuanahulu; S Waimea, Pu'u Wa'a Wa'a, Waikoloa	Installation of pre-staged static water and helicopter dip tanks	Multiple Agencies: federal, state, county, and private	Cooperative Funding \$128,000	2008 - 2009	Yes
Kohala, Kawaihae, Pu'u Kapu, Waimea, Puako, Waikoloa, Pu'uuanahulu, North Kona	Reduction and/or conversion of fuel load along roadsides, community open areas, and individual homes	Multiple Agencies: county	Cooperative Funding \$850,000	2008 - 20012	Yes
All communities and areas in the CWPP planning area	Creation of development standards and community planning that requires the mitigation of wildfire risks	Multiple Agencies: county and state	Cooperative Funding \$150,000 for outreach, any needed impact studies and education	2008-2009	
Kohala by the Sea, Waimea Anekona, Puako, Pu'u Lani Ranch Estates	Creation of secondary emergency ingress/egress roads	Multiple Agencies: federal, state, county, and private	Cooperative Funding \$750,000 if environmental assessments required	2008 - 2010	Yes
Kohala, Pu'u Kapu, Waikoloa, Pu'u Lani Ranch Estates	Street signage identifying evacuation routes	Multiple Agencies: federal, state, county, and private	Cooperative Funding \$50,000	2008 - 2012	Yes
Kohala, Kawaihae, Pu'u Kapu, Waimea	Development of emergency staging areas within	Multiple agencies: private	Cooperative Funding \$33,000 for planning	2008 - 20010	Yes

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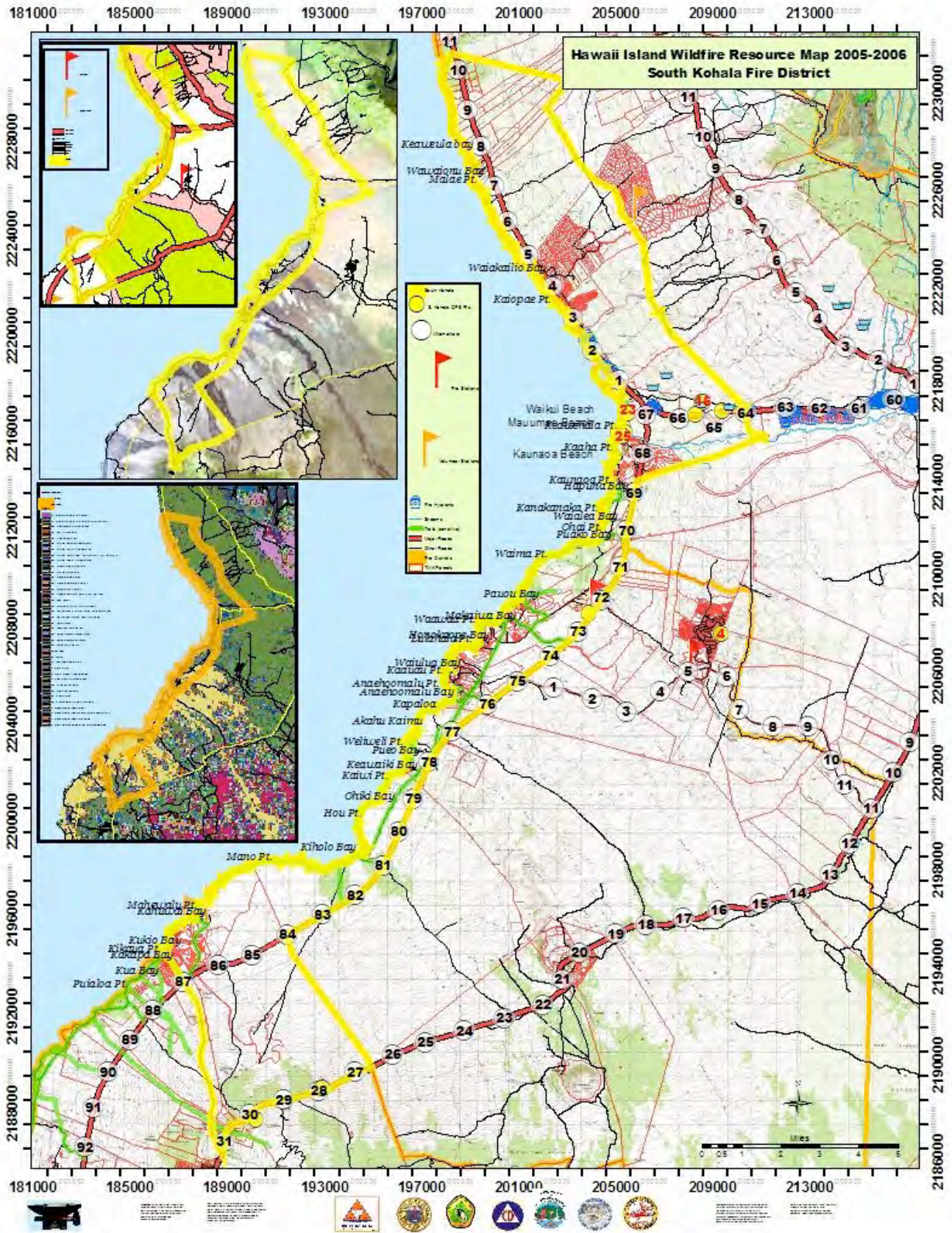
Waimea, Puako, Waikoloa, Pu'uanahulu, North Kona	communities, promoting awareness of such areas within the community, including holding mock disaster drills		and outreach		
Kohala, Kawaihae, Pu'u Kapu, Waimea, Puako, Waikoloa, Pu'uanahulu, North Kona	Reduction, control, and or conversion of invasive species	Multiple Agencies: federal, state, county, and private	Cooperative Funding \$1,500,000 includes maintenanc e, grazing, and conversion projects	2008 - 2012	Yes
Kohala, Kawaihae, Pu'u Kapu, Waimea, Puako, Waikoloa, Pu'uanahulu, North Kona	Continued fire prevention education and outreach, including arson prevention education	Multiple agencies: federal, state, county, and private	Cooperative Funding \$30,000	2008 - 2012	Yes
Kohala, Kawaihae, Pu'u Kapu, Waimea, Puako, Waikoloa, Pu'uanahulu, North Kona	Increased effective integrated communication between federal, state, and county fire suppression agencies	Multiple agencies	Cooperative Funding	2008 - 20011	Yes

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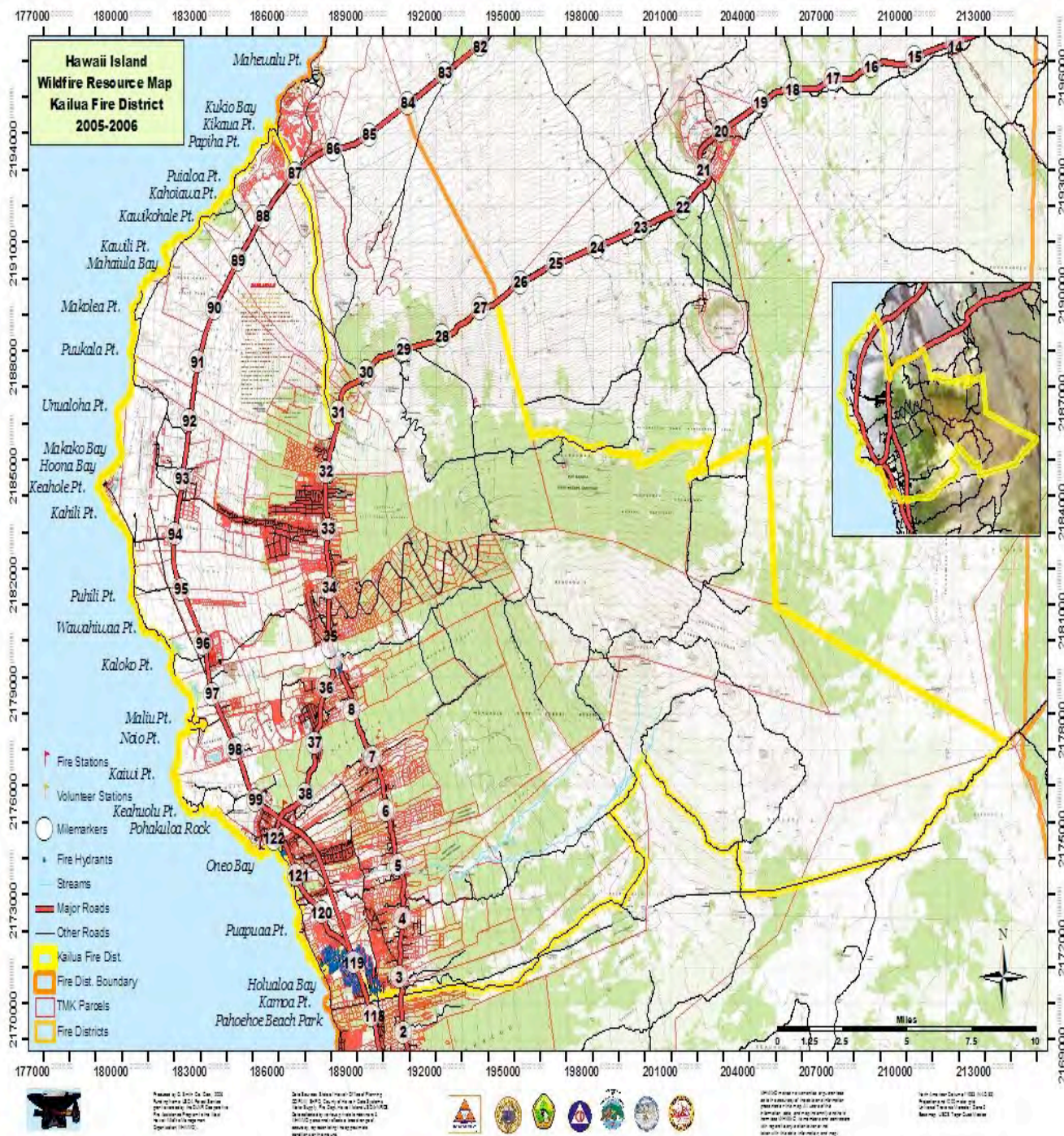
Appendix D: Fire Resource Maps for Northwest Hawaii, Hawaii
Maps courtesy of Hawaii Wildfire Management Organization.



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Appendix E: List of Potential Grant Resources

Below is a list of potential grant sources to help fund mitigation projects described within this CWPP. The list below is by no means exhaustive and potential community groups should also research grant funding sources available to them.

Grant Program	Deadline	Contact Information	Matching Funds Required?
<p>State Fire Assistance Grants. Funds target hazard mitigation in the Wildland Urban Interface for mitigating risks of hazardous fire conditions through hazardous fuels reduction, information and education, and homeowner and community defensible space treatments.</p>	<p>September 7, 2007 for 2008-2009 competitive funding</p>	<p>Division of Forestry and Wildlife Attn: Wayne Ching, 1151 Punchbowl St., Rm. # 325 Honolulu, HI 96813 http://www.state.hi.us/dlnr/dofaw/fmp/wui0809.htm</p>	<p>Yes: 50/50 match</p>
<p>Rural Fire Assistance Grants (RFA) The Dept. of the Interior receives an appropriated budget each year for a rural fire assistance (RFA) grant program. This funding will enhance the fire protection capabilities of rural and volunteer fire departments through training, equipment purchases, and fire prevention work on a cost-shared basis. This program is primarily for rural departments serving populations under 10,000 and which have responsibilities to provide mutual aid to Dept. of Interior lands (e.g., Tribal, National Parks etc.) The DOI assistance program targets rural and volunteer fire departments that routinely help fight fire on or near DOI lands.</p>	<p>Varies by state</p>	<p>Hawaii Volcanoes National Park Joe Molhoek Pacific Island Fire Mgmt. Officer PO Box 52, HNP, HI 96718 (808) 985-6042 Joe_Molhoek@nps.gov</p>	<p>The maximum award is \$20,000. This year RFA grants will require 90/10 cost-share.</p>

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<p>One of these four agencies administers those lands: Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), U.S. Fish and Wildlife Service (FWS) and the National Park Service (NPS).</p>			
<p>Volunteer Fire Assistance Grant (VFA): The VFA program, formerly known as the Rural Community Fire Protection program, is administered by state forestry agencies through 50-50 cost-sharing grants to local fire depts. in rural communities. The program's main goal is to provide federal financial, technical, and other assistance in the organization, training, and equipping of fire departments in rural areas with a population of 10,000 or less. Congressionally appropriated VFA funds are provided to the State forestry agencies through the USDA Forest Service. The State forestry agencies pass this money on to needful fire departments within their states. Any fire agency or volunteer fire department that serves a community of 10,000 or less may apply.</p>		<p>Wayne Ching Division of Forestry and Wildlife 1151 Punchbowl St., Rm. # 325 Honolulu, HI 96813 (808) 587-4173 Fax: (808) 587-0160 wayne.f.ching@hawaii.gov</p>	<p>50/50 cost share.</p>

Of note, Hawaii County Civil Defense is acquiring firefighting apparatus through a Department of Homeland Security grant, however, these grants are only available to government agencies.

Community Wildfire Protection Plan for Ocean View, Hawaii

Sponsored by Hawaii Volcanoes National Park
in collaboration with the Big Island Wildfire Coordinating Group



September 2006

Written by Denise Laitinen
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Ocean View Community Wildfire Protection Plan
September 2006

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Appendix A: Hawaii Wildland Fire Risk and Hazard Severity Assessment Form

Appendix B: Updated Project List 2008-2009

Appendix C: Additional Pre-attack maps

Cover image: 2003-2004 fire resource map of Ocean View for pre-attack wildfire planning. Map courtesy of West Hawaii Wildfire Management Organization.

Ocean View Community Wildfire Protection Plan
September 2006

Ocean View Community Wildfire Protection Plan Mutual Agreement Page

The Community Wildfire Protection Plan (CWPP) developed for Ocean View, Hawaii by the Hawaii Volcanoes National Park (HAVO):

- Was collaboratively developed. Interested parties and federal land management agencies managing land in the vicinity of Ocean View 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 Ocean View.
- 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

Darryl Oliveira
Fire Chief, Hawaii County Fire Department

Date

Troy Kindred
Administrator, Hawaii County Civil Defense

Date

Ocean View Community Wildfire Protection Plan
September 2006

Executive Summary:

The community of Ocean View in Hawaii County on the island of Hawaii abuts Hawaii Volcanoes National Park (HAVO) and is in a wildland urban interface (WUI) environment - that is where wildlands and houses meet. This interface area poses 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 the contiguous 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 our ocean reefs.

The overwhelming majority of wildfires in 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 the community of Ocean View from wildfire include Hawaii County Fire Department, Hawaii Volcanoes National Park, which sponsored this CWPP, as well as the Big Island Wildfire Coordinating Group, composed of federal, state, and county agencies, including Hawaii County Civil Defense, Department of Land and Natural Resources, U.S Army, and the U.S. Fish and Wildlife Service. These decision makers were invited to participate in the development of this Plan.

A wildfire hazard assessment determined that WUI areas in this community have an extreme risk of wildfire. Wildland fires originating within the Park can threaten the nearby community of Ocean View, including homes along Lorenzo Road in Ka'u. Conversely, wildland fires caused by human error in the community could impact the Park. The community of Ocean View, which is directly down slope of an active volcano, is susceptible to fast-moving lava flows, earthquakes, tsunamis, hurricanes, and wildland fires. The community does not have municipal water with residents and businesses relying on catchment water basins. There has also been an increase in invasive, non-native plant species that are high-intensity burning fuels, further increasing the wildfire risk within the community.

Meetings with community members and fire agency personnel identified several mitigation measures to reduce the chances of a fire starting in Ocean View. These include: (1) creation of secondary emergency egress roads; (2) reduction of fuel load along roadsides; (3) reduction of invasive species that possess inherent fire or ignition properties, such as fountain grass; (4) need for additional pre-staged static water tanks; and (5) continued fire prevention education.

Hawaii County has been fortunate in controlling large wildland fires in the communities to date. However, given the fire history of the area and the fact that HAVO is home to the world's most active volcano, one need only look at the community's fire history and fuel load to understand the severe wildfire risk. The mitigation measures outlined in this Plan will enable the community of Ocean View to reduce their 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 wildland fire.

Ocean View Community Wildfire Protection Plan
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Background:

Covering a swath from sea level to a 13,000-foot mountaintop, the 377-square miles (333,000 acres) of Hawaii Volcanoes National Park on the island of Hawaii encompasses Mauna Loa, the world's largest volcano, as well as Kilauea, the world's most active volcano. The Park's ecological zones include coastal strand, dry lowland, mesic and wet rain forest, seasonally dry montane, sub-alpine, and alpine. It is home to more than 50 federally-listed endangered, threatened, and candidate endangered species, as well as numerous rare species.

Continually erupting for nearly 23 years, Kilauea has made HAVO the state's largest tourist attraction with more than 2.5 million visitors annually. The primary tourist attractions within the Park are on the south of the Park, however, the bulk of Park lands extend north of Highway 11 for more than 40 miles as far west as Manuka State Park and as far north as the summit of Mauna Loa. In the past, lava flows within the Park have caused several wildland fires, some as large as 5,000 acres. Wildfires originating within the Park could threaten the homes along Lorenzo Road in Ka'u. Conversely, wildland fires caused by human error in Ocean View or along Lorenzo Road, could impact the Park.

To the west of the community of Volcano, Park lands containing the southwest rift zone of Mauna Loa are adjacent to Lorenzo Road. Lorenzo Road, which lies between mile marker 69 and 70 on Highway 11, is an unpaved road running north-south along the border of Park lands. There are only a handful of homes along the road but they are in a wildland urban interface area.

Park lands containing the southwest rift zone of Mauna Loa are also directly north and to the east of the community of Ocean View. Ocean View encompasses the 11,500-lot Hawaiian Ocean View Estates (HOVE) north of Highway 11 and Hawaiian Ranchos and Kula Kai View Estates subdivisions on the south side of Highway 11. Ocean View is bordered by the Manuka Natural Area Reserve to the west, the southwest rift zone to the north, the 1887 and 1907 lava flows to the east, and the Pacific Ocean to the south. Given its proximity directly down slope of an active volcano, which last erupted in 1984, Ocean View is susceptible to fast-moving lava flows, earthquakes, tsunamis, and hurricanes, in addition to wildfires. A 20-acre wildfire in January 2006, caused by fireworks, came dangerously close to several homes in HOVE.

Ocean View has experienced tremendous development in recent years. Many new residents are from other parts of the United States and unfamiliar with the wildfire risks of the community.

HAVO recently acquired 119,000 acres from Kahuku Ranch in Ka'u. Located at the 1,000 – 2,000 foot elevation, the area encompasses native Hawaiian forests, pasture lands, and three dormant volcanic craters. Park lands now stretch 50 miles from lower Puna to Ocean View. Given the right wind and fuel conditions wildland fire could travel the length of this land tract, causing substantial damage.

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Fire History:

Ocean View	
Hawaii County FD Fire history 2004-2005	Date
Building fire	18-Mar-05 11:54:07
Building fire	16-Dec-04 08:20:13
Cooking fire, confined to container	26-Dec-05 17:04:18
Cooking fire, confined to container	21-Dec-05 17:43:28
Cooking fire, confined to container	22-Oct-05 05:38:53
Cooking fire, confined to container	07-Oct-05 17:39:12
Cooking fire, confined to container	24-Nov-04 15:52:15
Trash or rubbish fire, contained	22-Dec-05 10:32:30
Trash or rubbish fire, contained	07-Dec-05 13:39:10
Trash or rubbish fire, contained	04-Nov-05 17:51:28
Trash or rubbish fire, contained	30-Oct-05 14:21:23
Trash or rubbish fire, contained	06-Apr-05 17:59:41
Passenger vehicle fire	07-Oct-05 13:31:49
Passenger vehicle fire	09-Jul-05 23:59:25
Passenger vehicle fire	15-Apr-05 22:46:11
Natural vegetation fire, other	25-Oct-05 15:34:54
Forest, woods or wildland fire	09-Jun-05 13:11:21
Brush, or brush and grass mixture fire	13-Dec-05 15:01:35
Brush, or brush and grass mixture fire	22-Nov-05 09:42:26
Brush, or brush and grass mixture fire	19-Nov-05 15:03:49
Brush, or brush and grass mixture fire	12-Nov-05 17:22:02
Brush, or brush and grass mixture fire	05-Jul-05 08:57:33
Brush, or brush and grass mixture fire	05-Jul-05 08:49:31
Brush, or brush and grass mixture fire	30-Dec-04 14:27:40
Outside rubbish, trash or waste fire	07-Jul-05 18:27:01
Outside rubbish, trash or waste fire	16-Apr-05 06:12:27
Outside rubbish, trash or waste fire	08-Mar-05 09:28:30
Outside rubbish, trash or waste fire	14-Feb-05 18:59:28
Outside rubbish, trash or waste fire	22-Dec-04 17:25:51
Outside rubbish, trash or waste fire	14-Dec-04 18:07:27
Special outside fire, other	09-Nov-05 18:07:44
Unauthorized burning	20-Nov-05 12:45:39
Unauthorized burning	11-Nov-05 19:12:55
Barbecue, tar kettle	23-Nov-05 01:42:39
Barbecue, tar kettle	15-Oct-05 18:10:26
Barbecue, tar kettle	18-Dec-04 07:42:37
HAVO Fire History 2004 -2005	Date
Pinao – human cause	7/29/04
Kipuka Pepeaio - lightening	12/6/04
Kahuku - human cause	8/14/05

Above is a 2004-2005 fire history chart for the Ocean View community. Since Hawaii County Fire Department is responsible for fire suppression in residential areas and HAVO is responsible for fire suppression within the Park, each organization maintains separate fire history statistics. However, the two agencies have a Memorandum of Understanding for mutual aid in fire

Ocean View Community Wildfire Protection Plan
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suppression. Average size for all wildland fires in Ocean View responded to by Hawaii County Fire Department in the past two years was 3.2 acres. However, a 20-acre fire in HOVE in January 2006 came dangerously close to homes. Between 2004 and 2005 there were three fires within Park boundaries, the Kipuka Pepeaio fire that burned more than 600 acres, the Kahuku fire that burned less than 5 acres in Kahuku, and the Pinao fire that burned less than 1 acre. In past decade HAVO has experienced 54 fires within the Park with 5 of those burning more than 1,000 acres.

Stakeholders:

Stakeholders are individuals or groups who have a high level of interest in the protection of their assets from wildfire. HAVO shares approximately 10 miles of boundary with the communities of Ocean View and Lorenzo Road in wildland-urban interface areas. Additional lands adjoining or within Ocean View include those managed by federal, state, county, and private entities.

The State of Hawaii's Department of Land and Natural Resources (DLNR) Division of Forestry and Wildlife (DOFAW) manages the Manuka Natural Area Reserve that runs the entire western length of Ocean View and the Ka'u Forest Reserve that lies above Lorenzo Road. The County of Hawaii owns several tracts of land within HOVE in Ocean View, ranging in size from one acre to 30 acres. The entire northern and eastern boundary of HOVE is Park land.

Community groups representing private landowners within the Ocean View community, such as the Ocean View Community Association (OVCA) are also concerned about the level of fire risk in the community. Contact information for principal stakeholders is listed below.

Federal:

Hawaii Volcanoes National Park

Joe Molhoek
Pacific Island Fire Management Officer
PO Box 52, HNP, HI 96718
(808) 985-6042
Joe.Molhoek@nps.gov



State:

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

Wayne Ching
State Protection Forester
1151 Punchbowl St., Room 325, Honolulu, HI 96813
(808) 587-4173
Wayne.F.Ching@hawaii.gov



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County:

Hawaii County Fire Department

Fire Chief Darryl Oliveira
25 Aupuni St., Hilo, HI 96720
(808) 961-8297

Hcfd1@co.hawaii.hi.us



County:

Hawaii County Civil Defense

Troy Kindred
Civil Defense Administrator
920 Ululani St., Hilo, HI 96720
(808) 961-8229

tkindred@co.hawaii.hi.us



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Base Map of Ocean View:

Figure 1 is a base map of the community of Ocean View and adjacent landowners. The inhabited areas at potential risk to wildland fire include HOVE, Hawaiian Ranchos, Kula Kai View Estates, and further to the east Lorenzo Road in Ka'u.

Areas containing critical human infrastructure, such as escape routes include HOVE and Ranchos. Within HOVE, the Community Center could be used as "defend in place" zone if deemed necessary by fire officials given wildfire conditions.

Areas of community importance include the OVCA Community Center and churches with HOVE; restaurants and retail establishments along Highway 11; Manuka Natural Area Reserve; native dryland forest; cultural and archeological features; and caves.

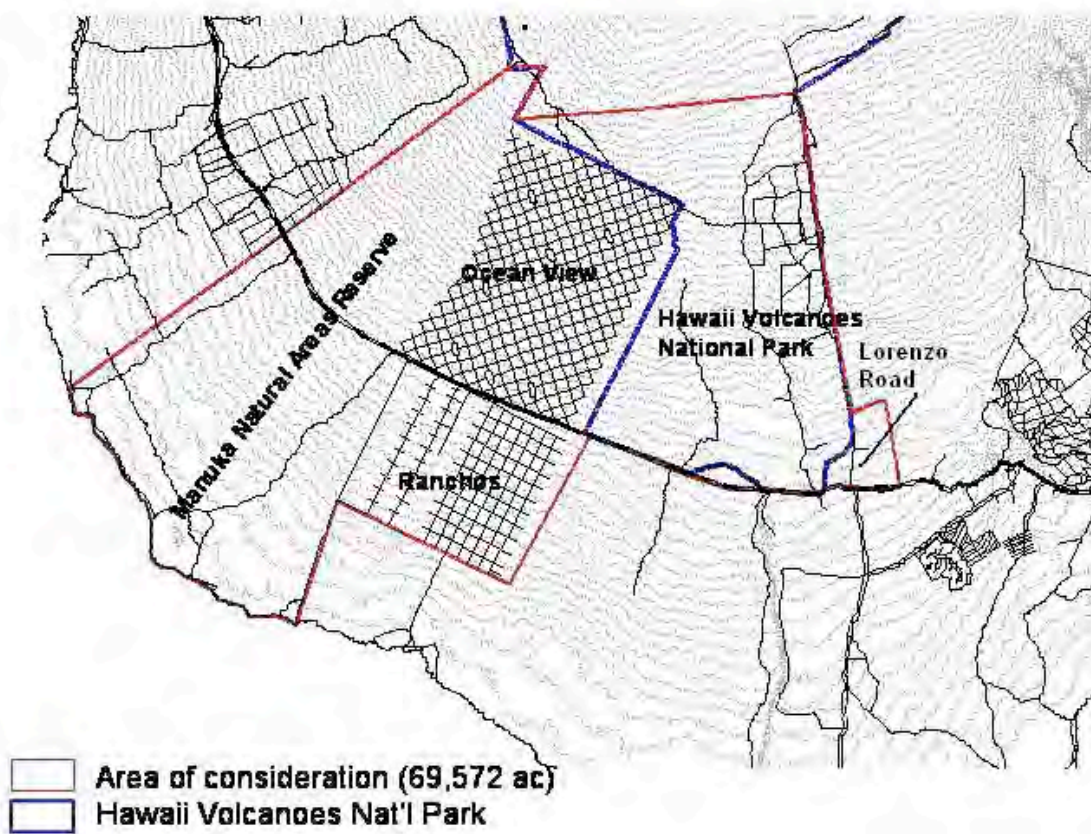


Figure 1: Area of consideration for the Ocean View CWPP is outlined in red covers more than 69,000 acres.

Ocean View Community Wildfire Protection Plan
September 2006

Fire Risk Assessment for Lorenzo Road and Ocean View:



Typical house lot within HOVE.

Ocean View encompasses the 11,500-lot Hawaiian Ocean View Estates (HOVE) north of Highway 11 and Hawaiian Ranchos and Kula Kai View Estates subdivisions on the south side of Highway 11. Ocean View is hilly with slope above 20 percent throughout the community. Classified as Zone 1 and 2 for volcanic activity (zones closest to an active volcano), a'a flows dominate large areas within the subdivisions.

Ocean View is bordered by Manuka Natural Area Reserve to the west, the southwest rift zone to the north, the 1887 and 1907 lava flows to the east, and the Pacific ocean to the south. There are scattered retail establishments along

Highway 11 between HOVE and Hawaiian Ranchos. There are an estimated 6,000 residents in HOVE, which contains several churches and a community center used daily by various community groups. HOVE starts at the 2,000-foot elevation along Highway 11 up to the 7,000-foot elevation along the northern boundary of the subdivision.

Roughly 250 residents live in Hawaiian Ranchos and Kula Kai View Estates has roughly a dozen homes. There are multiple means of ingress and egress from Highway 11 to the HOVE and Ranchos subdivisions. Roads within the community are paved and 20 feet in width with shoulders. However, if Highway 11 were to be closed or compromised by wildland fire or lava, it would severely impact evacuation efforts.

To the east of Ocean View, Park lands containing the southwest rift zone of Mauna Loa are adjacent to Lorenzo Road, which lies between mile marker 69 and 70 on Highway 11. It is an unpaved road running north-south along the border of Park lands. There are only a handful of homes along the road but they directly border HAVO land and are in a wildland urban interface area.



Typical house on Lorenzo Road - note the lack of defensible space.

A county fire station comprised of both paid and volunteer members is located within HOVE. The station has a 33,000-gallon soft cover catchment tank that can be used as a dip tank for fire suppression; however, the tank must also service station needs, such as showering, cooking, etc. There is no municipal water in Ocean View with residents relying on catchment water. The nearest fire hydrant is 13 miles east in Discovery Harbor and to the west, the nearest hydrant is 20 miles away in Honaunau. The community receives 30-40 inches of rainfall during the year.

Pockets, or kipuka, of native dryland forest occur throughout Ocean View. At lower elevations, these kipuka have been invaded by alien trees, shrubs, and grasses. Many of the grasses, such as molasses grass (*Melinis minutiflora*) and fountain grass (*Pennisetum setaceum*) are fire-adapted and increase wildfire potential in areas they invade.

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The 1887 and 1907 lava flows traverse HOVE and communities below the highway. These flows along with older sparsely vegetated flows serve as natural fuel breaks. However, the introduction of fountain grass has compromised these fuel breaks. A non-native species, fountain grass is becoming prevalent across the lava flow, enabling fire to travel on the fuel break. Fountain grass is so prevalent in Hawaiian Ranchos that complete eradication of the plant is unfeasible. Fountain grass is less prevalent in HOVE and the community is working proactively with DOFAW and HAVO to eradicate fountain grass along the roadsides and prevent its spread onto lava flows.

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 and HAVO firefighting personnel on April 12, 2006 to identify the level of wildfire risk for the communities of Ocean View, including Hawaiian Ocean View Estates, Hawaiian Ranchos, Kula Kai View Estates, and Lorenzo Road.

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 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, preponderance of fuels in close proximity to structures, and lack of water, Ocean View scored within the extreme-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; scenic, cultural, and archeological sites; ranchlands; and structures.

The following were identified as valued resources within the Ocean View community that would be adversely affected by wildfire.

Commercial / community resources:

OVCA Community Center, churches, restaurants, and retail establishments.

Natural Resources:

Manuka Natural Area Reserve, native dryland forest, rare and endangered plants and animals, cultural and archeological features, and caves.

This Plan focuses on structures within the wildland urban interface in Ocean View. Overgrown vegetation close to homes, an increase of non-native high-intensity plants, and a lack of water create unsafe fire conditions. In addition, all residential areas within Ocean View are experiencing rapid development. The majority of homes within Ocean View have Class A

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roofing, however, several homes have combustible siding and/or lanais (decks). Homes also vary widely in defensible space, with lava serving as a natural fuel break on some lots and vegetation growing close to the home on other lots. Few driveways have turnaround access for emergency vehicles. Signage for interior roads within Ocean View subdivisions are metal and reflectorized.

Community Concerns for Ocean View:

Residents within HOVE recently formed a community disaster preparedness committee and are aggressively pursuing means to reduce disaster threats, including wildfire, within their community. Multiple meetings specifically on the CWPP process held between April and June 2006 with community members and fire agencies identified the most pressing fire concerns in Ocean View. They include, in order of priority:

1. Lack of water;
2. Effective communication between emergency personnel and residents during a wildfire or other disaster;
3. Community egress and firefighting vehicle ingress during a wildfire;
 - 3a. Identification of evacuation route roads within subdivisions;
4. Fuel load along roadsides;
5. Reduction of invasive species possessing inherent fire or ignition properties;
6. Public awareness of the wildfire threat; and
7. Strengthening of Hawaii County fire ordinances.

Recommended Action for Ocean View:

Based on identified community concerns, the following recommendations are made to reduce the wildfire threat in Ocean View. The implementation of a multi-modal approach will increase firefighting efficiency, reduce fire fuels, and improve community and firefighter safety. Mitigation measures to reduce wildfire risk in Ocean View include in order of priority:

1. Pre-staged static water tanks;
2. Increased communication to residents regarding evacuation during an emergency;
3. Creation/improvement of secondary access road; identification of evacuation route roads within subdivisions;
4. Reduction of fuel load along road sides and in common areas;
5. Reduction of invasive species that increase fire risk;
6. Continued fire prevention education and outreach; and
7. Strengthening of Hawaii County fire ordinances.

Based on the results of the community risk assessment, priority ratings have been selected for Ocean View 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.

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Community, structure or area at risk	Type of Treatment	Method of Treatment	Overall Priority
Ocean View	Mechanical	Need for additional pre-staged static water tanks	Very High
		Improved communication between emergency personnel and residents regarding evacuation	Very High
Ocean View	Mechanical / Chemical / Hand Labor	Creation of secondary emergency ingress/egress roads	Very High
Ocean View	Mechanical	Street signage identifying evacuation routes	High
Ocean View	Mechanical	Reduction of fuel load along roadsides	High
Ocean View	Mechanical / Chemical / Hand Labor	Reduction of invasive species	High
Ocean View	Public Education and Outreach	Continued fire prevention education and outreach	High
Ocean View	Political	Strengthening of County fire ordinances	High
Lorenzo Road	Mechanical / Chemical / Hand Labor	Reduction of fuel load along roadsides	High
Lorenzo Road	Public Education and Outreach	Continued fire prevention education and outreach	High

Community organizations, federal agencies, and private landowners surrounding Ocean View were invited to submit projects that provide protection and reduce wildfire risk. The following table displays a list of projects based on recommendations from community and fire-related organizations. HAVO 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
Ocean View	Creation of pre-staged static water tanks	Multiple Agencies: federal, state, county, and private	Cooperative Funding	2006 - 2007	Yes
Ocean View	Improved communication between emergency officials and residents regarding	Multiple Agencies: OVCA, County	Cooperative Funding	2006 - 2007	Yes

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	evacuation				
Ocean View	Creation of secondary emergency ingress/egress roads	Multiple Agencies: federal, state, county, and private	Cooperative Funding	2006 - 2007	Yes
Ocean View	Street signage identifying evacuation routes	Multiple Agencies: federal, state, county, and private	Cooperative Funding	2006 - 2007	Yes
Ocean View	Reduction of fuel load along roadsides	Private	Cooperative Funding	2006 - 2007	Yes
Ocean View	Reduction of invasive species	HAVO	Cooperative Funding	2006 - 2007	Yes
Ocean View	Continued fire prevention education and outreach	Multiple agencies: federal, state, county, and private	Cooperative Funding	2006 - 2007	Yes
Ocean View	Strengthening of County fire ordinances	Multiple agencies	Cooperative Funding	2006 - 2007	Yes
Lorenzo Road	Reduction of fuel load along roadsides	Multiple agencies	Cooperative Funding	2006 - 2007	Yes
Lorenzo Road	Continued fire prevention education and outreach	Multiple agencies	Cooperative Funding	2006 - 2007	Yes

Pre-staged static water tanks

Given that residents rely on catchment water, the area experiences nominal rainfall, and there are no fire hydrants within Ocean View, lack of water for fire suppression was identified as one of the most important challenges facing the community. Pre-staged static water tanks will greatly increase effective fire suppression and firefighting efficiency.

Communication between emergency personnel and community members during disaster

Fires, earthquakes, and lava flows are among the risks that threaten the Ocean View community. These risks can be fast moving, necessitating quick dissemination of safety and evacuation information to residents. The creation of block captains and use of walkie-talkies is recommended for use to alert residents to fast moving dangers, such as wildfires.

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Creation / improvement of secondary access roads

Creation or improvement of secondary access roads to improve emergency egress and facilitate fire suppression activities should be examined and implemented where appropriate. There are only two access road that connects Hawaiian Ranchos Subdivision and the adjacent subdivisions to Highway 11. Kula Kai and Lorenzo Road are each connected by a single access road to the highway. Positioning of secondary emergency access roads should be evaluated and appropriately implemented to allow for more effective fire suppression and emergency egress. Currently, there are two unpaved jeep trails to the east of HOVE that connect to Highway 11. Improving these access roads may provide residents with another escape route and improve emergency egress.

In order to remain effective, the secondary emergency egress roads must be maintained on a regular basis. Funding should be secured to ensure that the roads are maintained at least twice a year. The organization that is determined to be responsible for the access roads may want to consider the purchase of a dozer or other equipment to maintain the roads.

Also, evacuation routes should be clearly identified within the subdivision with signage posted marking these roads for express egress in case of emergency.

Reduction of fuel load

Reducing vegetation in the vicinity of valued resources (churches, Community Center, houses), in common areas and along road sides and fuel breaks will decrease fire risk to important resources and improve fire suppression capabilities.

Reduction of invasive species

Invasive grasses, such as molasses grass and fountain grass are high-intensity burning fuels that carry fire to other fuels. The ability of fountain grass to establish on barren 'a'a flows compromises natural fire breaks provided by lava. Current efforts to eradicate roadside populations and prevent its spread to lava flows should be continued. It is recommended that the Ocean View Community Association adopt CCRs prohibiting fountain grass within the community. For Hawaiian Ranchos and other subdivisions where the grass is well established and eradication may be unfeasible, mapping the current distribution and density of individuals is needed to develop alternative strategies for reducing fire potential. Such alternatives may include containing the spread of the invasion or maintaining fountain grass "free" zones. It is also strongly recommended that outreach efforts include alerting residents and developers to the wildfire risk caused by invasive species and ways to prevent their spread (e.g. inspection, sanitation, landscaping with native species).

Continued fire prevention education

Fire agencies in Hawaii County have partnered with Firewise to promote community wildland fire 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 continued influx of residents from other parts of the United States who are unaware of Ocean View's unique fire risks, it is crucial to continue a comprehensive fire education and outreach campaign. This program should consist of the following:

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- a. Continued development and coordination of community meetings and outreach events. Coordination with other community groups, such as the 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.
- b. Develop educational materials specific to community fire threat and continue outreach in local publications. The Firewise coordinator is currently providing monthly editorial to local publications in Ka'u and Ocean View on fire prevention. Continued outreach is needed with large numbers of new residents moving into the area.
- c. Development of fire prevention outreach materials, including TV and radio public service announcements, posters, and handouts.

Strengthening of county fire ordinances

Currently, there is a county ordinance prohibiting open burning, although there is a caveat permitting cooking fires. Fire ordinances should be incorporated as part of the Uniform Fire Code adopted by the County and the language defining cooking fires should be strengthened. It is recommended that Hawaii County create and enforce citations of ordinance violations, giving the Hawaii County Fire Department the necessary "teeth" to enforce such ordinances. It is recommended that changes be made to federal, state, and county rules and regulations to support and promote proactive and preventative measures to reduce the threat of wildfire. County planning requirements should incorporate proactive fire prevention measures, such as mandating the use of residential fire sprinklers in all new single-family dwellings, the use of fire-resistant building materials for new home construction, and the creation of defensible space around communities and homes.

Reduce Structural Ignitability:

As part of its fire prevention education efforts, Firewise provides recommendations to reduce structural ignitability. Individuals and the Volcano 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.

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Appendix A:

Please see attached Hawaii Wildland Fire Risk and Hazard Severity Assessment Form.

Appendix B:

Updated Project List 2008-2009

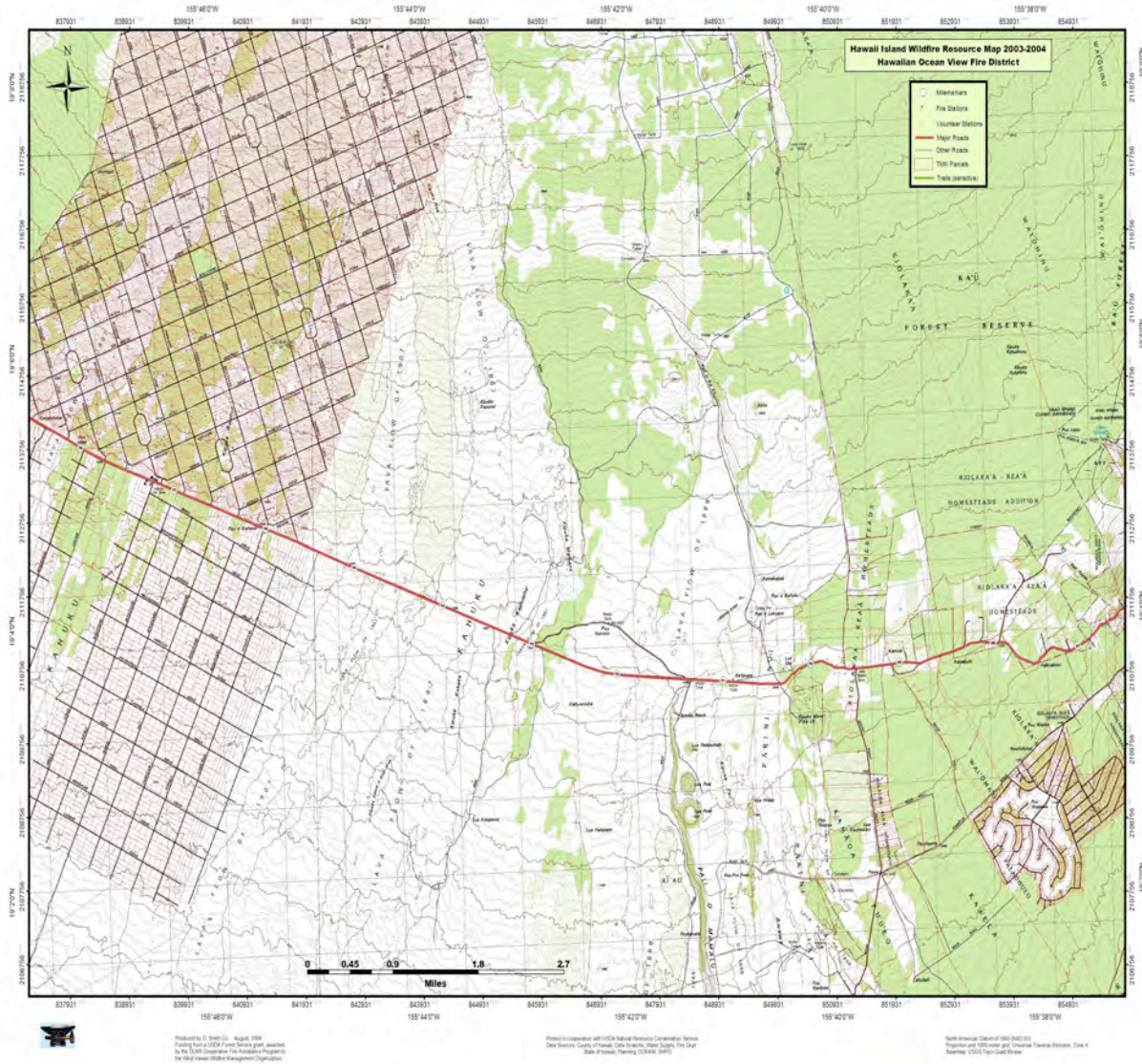
Federal agencies and private landowners surrounding Ocean View were invited to submit projects that provide wildfire protection and reduce risk. The following table displays a list of recommended projects.

Community, structure or area at risk	Project	Agency / landowner	Funding Needs	Timetable	Community recommendation
Ocean View	Creation / Maintenance of pre-staged static water tanks	Multiple Agencies	Cooperative Funding	2008-9	Yes
Ocean View	Improved communication between emergency officials and residents regarding evacuation	Multiple Agencies	Cooperative Funding	2008-9	Yes
Ocean View	Maintenance of secondary emergency access road	HAVO, Private	Cooperative Funding	2008-9	Yes
Ocean View	Maintenance of street signage identifying evacuation routes	Multiple Agencies	Cooperative Funding	2008-9	Yes
Ocean View, Lorenzo Road	Reduction of fuel load along roadsides	Multiple Agencies	Cooperative Funding	2008-9	Yes
Ocean View, Lorenzo Road	Reduction of invasive species	Multiple Agencies	Cooperative Funding	2008-9	Yes
Ocean View, Lorenzo Road	Continued fire prevention education and outreach	Multiple Agencies	Cooperative Funding	2008-9	Yes
Hawaii County	Strengthening of County fire ordinances	Multiple Agencies	Cooperative Funding	2008-9	Yes

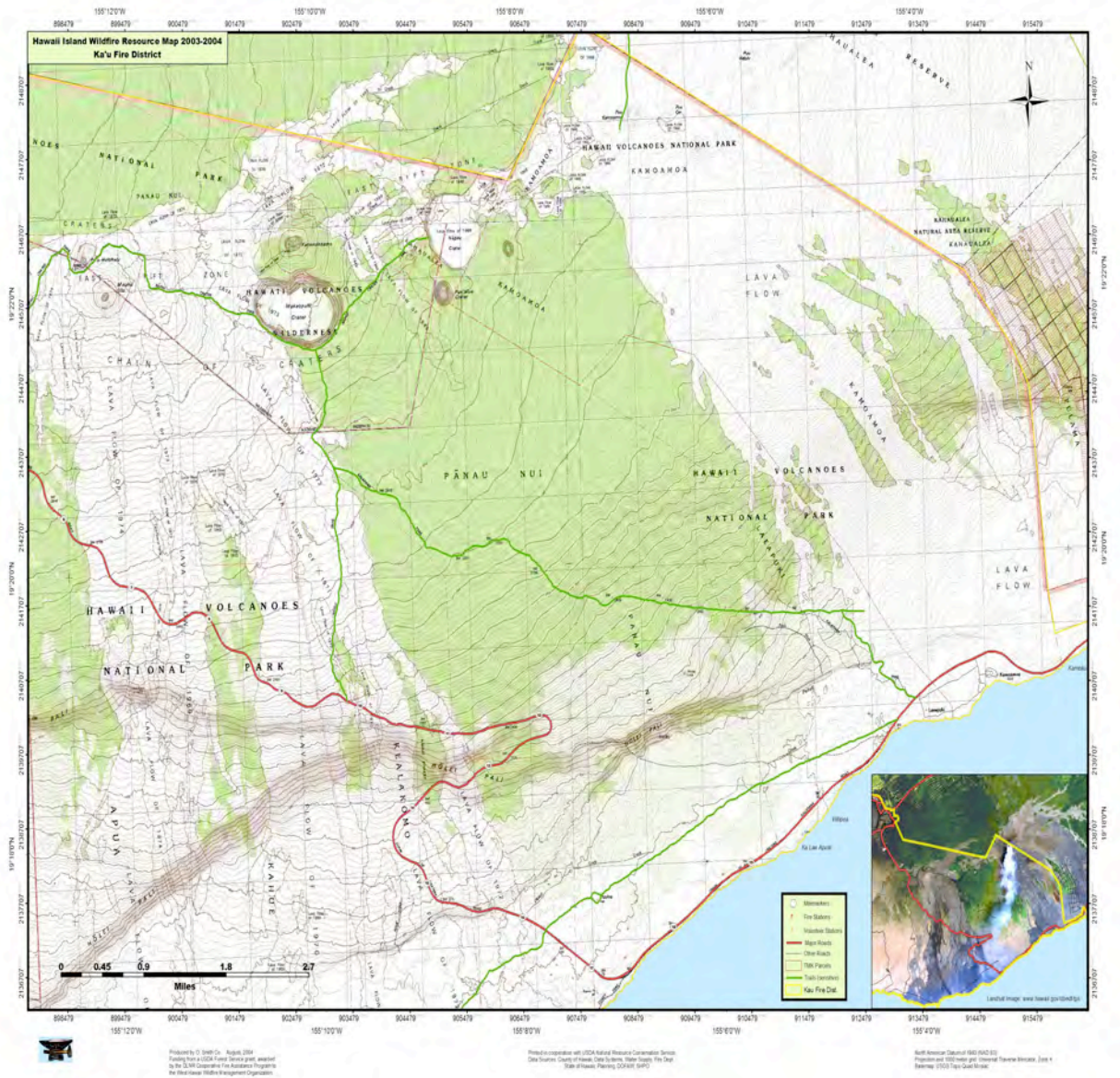
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Appendix C:

Pre-Attack Maps for Ocean View, Hawaii



Ocean View Community Wildfire Protection Plan
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Maps courtesy of West Hawaii Wildfire Management Organization.

Community Wildfire Protection Plan for Volcano, Hawaii

Sponsored by Hawaii Volcanoes National Park
in collaboration with the Big Island Wildfire Coordinating Group



September 2006

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

Appendix B: Updated Project List 2008-2009

Appendix C: Additional Pre-attack maps

Cover photo: An a'a lava flow in Hawaii Volcanoes National Park sparks a wildfire.
Picture: Greg Funderburk, HAVO staff.

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Volcano Community Wildfire Protection Plan Mutual Agreement Page

The Community Wildfire Protection Plan (CWPP) developed for Volcano, Hawaii by the Hawaii Volcanoes National Park (HAVO):

- Was collaboratively developed. Interested parties and federal land management agencies managing land in the vicinity of Volcano 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 Volcano.
- 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

Darryl Oliveira
Fire Chief, Hawaii County Fire Department

Date

Troy Kindred
Administrator, Hawaii County Civil Defense

Date

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Executive Summary:

The community of Volcano in Hawaii County on the island of Hawaii abuts Hawaii Volcanoes National Park (HAVO) and 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 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 Volcano from wildfire include Hawaii County Fire Department, Hawaii Volcanoes National Park, which sponsored this CWPP, as well as the Big Island Wildfire Coordinating Group, composed of federal, state, and county agencies, including Hawaii County Civil Defense, Department of Land and Natural Resources, U.S Army, and the U.S. Fish and Wildlife Service. 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. Wildland fires originating within the Park via human or natural causes have threatened the community of Volcano, which encompasses the Volcano Village, the Volcano Golf Course Community, Mauna Loa Estates, and Ohia Estates. Conversely, wildfires caused by human error in neighboring towns, such as Volcano, could impact the Park. The community does not have municipal water with residents and businesses alike relying on catchment water basins. There has also been an increase in invasive, non-native plant species that are high-intensity burning fuels, further increasing the fire risk within the community.

Meetings with community members and fire agency personnel identified several priority mitigation measures to reduce the chances of a wildfire starting in Volcano. These include: (1) creation of secondary emergency egress roads; (2) reduction of fuel load along roadsides and in subdivision common areas; (3) reduction of invasive species that possess inherent fire or ignition properties; (4) need for additional pre-staged static water tanks; and (5) continued fire prevention education and outreach.

Hawaii County has been fortunate in controlling large wildland fires in the community to date. However, given the fire history of the area and the fact that HAVO is home to the world's most active volcano, one need only look at the community's fire history and fuel load to understand the severe wildfire risk. The mitigation measures outlined in this Plan will enable the community of Volcano 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:

Covering a swath from sea level to a 13,000-foot mountaintop, the 377-square miles (333,000 acres) of Hawaii Volcanoes National Park on the island of Hawaii encompasses Mauna Loa, the world's largest volcano, as well as Kilauea, the world's most active volcano. The Park's ecological zones include coastal strand, dry lowland, mesic and wet rain forest, seasonally dry montane, sub-alpine, and alpine. It is home to more than 50 federally-listed endangered, threatened, and candidate endangered species, as well as numerous rare species.

Continually erupting for nearly 23 years, Kilauea has made HAVO the state's largest tourist attraction with more than 2.5 million visitors annually. The primary tourist attractions within the Park are on the south side of the Park, however, the bulk of Park lands extend north of Highway 11 for more than 40 miles as far west as Manuka State Park and as far north as the summit of Mauna Loa.

HAVO recently acquired 119,000 acres from Kahuku Ranch in Ka'u. Located at the 1,000 – 2,000 foot elevation, the area encompasses native Hawaiian forests, pasture lands, and three dormant volcanic craters. Park lands now stretch 50 miles from lower Puna to Ocean View. Given the right wind and fuel conditions wildland fire could travel the length of this land tract, causing substantial damage.

In the past, lava flows within the Park have caused several wildfires, some as large as 5,000 acres. Wildland fires originating within the Park have threatened the nearby community of Volcano, which encompasses Volcano Village, the Volcano Golf Course Community, including the Golf Course Subdivision, Mauna Loa Estates, and Ohia Estates. Conversely, wildland fires caused by human error in neighboring towns, such as Volcano, could impact the Park. The Kilauea Forest Reserve separates Volcano Village and the Golf Course Subdivision. To the east of Volcano Village is the Ola'a Forest Reserve, a land tract of Native Hawaiian forest largely untouched by invasive species.

Volcano has experienced tremendous development in recent years. Volcano Fairway Estates is a new subdivision currently under construction adjacent to the Volcano Golf Course and Country Club.

Fire History:

Below is a 2004-2005 fire history chart for Volcano. Since Hawaii County Fire Department is responsible for fire suppression in residential areas and HAVO is responsible for fire suppression within the Park, each organization maintains separate fire history statistics. However, the two agencies have a Memorandum of Understanding for mutual aid in fire suppression. Average size for all wildland fires responded to by Hawaii County Fire Department in Volcano during the past two years was 0.4 acres. Between 2004 and 2005 there were three fires within Park boundaries, the Kipuka Pepeaio fire that burned more than 600 acres, the Kahuku fire that burned less than 5 acres in Kahuku, and the Pinao fire that burned less than 1 acre. However, a 2002 wildfire burned more than 1,000 acres of Park land in eight hours on the

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north side of Highway 11 in Volcano. The fire jumped Mauna Loa Strip Road, which runs in a north-south direction to the west of the Volcano Golf Course Subdivision and threatened several homes along the north boundary of the Golf Course Subdivision. In the past decade HAVO has experienced 54 fires within the Park with 5 of those burning more than 1,000 acres.

Volcano	
Hawaii County FD Fire history 2004-2005	Date
Building fire	15-May-05 23:54:04
Building fire	10-Oct-05 04:51:33
Trash or rubbish fire, contained	26-Feb-04 10:02:00
Trash or rubbish fire, contained	14-May-05 22:46:52
Fire in mobile property used as a fixed structure, other	24-Jul-04 02:12:37
Fire in mobile property used as a fixed structure, other	26-Jan-05 13:57:19
Passenger vehicle fire	29-Apr-05 19:32:27
Passenger vehicle fire	14-May-05 05:38:15
Passenger vehicle fire	30-Jul-05 22:02:24
Passenger vehicle fire	04-Nov-05 22:11:28
Forest, woods or wildland fire	23-Feb-05 09:55:31
Brush, or brush and grass mixture fire	04-Sep-05 16:37:39
Brush, or brush and grass mixture fire	29-Dec-05 14:07:14
Brush, or brush and grass mixture fire	30-Dec-05 18:44:55
Outside rubbish, trash or waste fire	07-Aug-05 14:22:56
Outside rubbish, trash or waste fire	25-Sep-05 13:58:47
Outside rubbish, trash or waste fire	21-Nov-05 16:08:11
Outside gas or vapor combustion explosion	18-Aug-05 12:28:57
Unauthorized Burning	14-Mar-05 20:39:43
Unauthorized Burning	23-May-05 10:01:00
Unauthorized Burning	27-Aug-05 15:35:39
Unauthorized Burning	25-Nov-05 22:48:50
HAVO Fire History 2004-2005	
	Date
Pinao – human cause	7/29/04
Kipuka Pepeaio - lightning	12/6/04
Kahuku - human cause	8/14/05

Stakeholders:

Stakeholders are individuals or groups who have a high level of interest in the protection of their assets from wildfire. HAVO shares nearly 11 miles of boundary with the Volcano community in wildland-urban interface areas. Additional lands adjoining Volcano include those managed by federal, state, county, and private entities.

The State of Hawaii’s Department of Land and Natural Resources (DLNR) Division of Forestry and Wildlife (DOFAW) manages the ‘Ola’a Forest Reserve that lies adjacent to the Volcano

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community. The state-owned Kilauea Forest Reserve separates Volcano Village and the Golf Course Subdivision. There are also several large-scale private landowners in the area, who in turn lease land to other organizations. For example, Kamehameha Schools leases land to Ohia Ranch and owns large tracts of land near Volcano Village. The Keauhou Bird Conservation Center - Hawaii Endangered Bird Conservation Program is located next to the Volcano Golf Course Subdivision. Contact information for principal stakeholders is listed below.

Federal:

Hawaii Volcanoes National Park

Joe Molhoek
Pacific Island Fire Management Officer
PO Box 52, HNP, HI 96718
(808) 985-6042
Joe_Molhoek@nps.gov



State:

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

Wayne Ching
State Protection Forester
1151 Punchbowl St., Room 325, Honolulu, HI 96813
(808) 587-4173
Wayne.F.Ching@hawaii.gov



County:

Hawaii County Fire Department

Fire Chief Darryl Oliveira
25 Aupuni St., Hilo, HI 96720
(808) 961-8297
Hcfd1@co.hawaii.hi.us



Hawaii County Civil Defense

Troy Kindred
Civil Defense Administrator
920 Ululani St., Hilo, HI 96720
(808) 961-8229
tkindred@co.hawaii.hi.us



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Base Map of Volcano:

Figure 1 is a base map of the community of Volcano and adjacent landowners. The inhabited areas at potential risk to wildfire include Mauna Loa Estates, Ohia Estates, Volcano Village, and the Volcano Golf Course Community, which includes a golf course and subdivision.

Areas containing critical human infrastructure, such as escape routes and communication structures include Volcano Village and the Golf Course Community. Within Volcano Village, the Peter Lee School and the Cooper Community Center could be used as “defend in place” zones if deemed necessary by fire officials given wildfire conditions.

Areas of community importance include: Cooper Community Center, Volcano Winery, Kilauea Lodge and Restaurant, Shipman Ranch House, Lee House, Ola’a Forest Reserve, ‘Ola’a Rain Forest Tract, Thurston Rain Forest, Keauhou Ranch, Ohia Ranch, Keauhou Bird Conservation Center - Hawaii Endangered Bird Conservation Program, local bed and breakfasts, farms, restaurants, and schools.

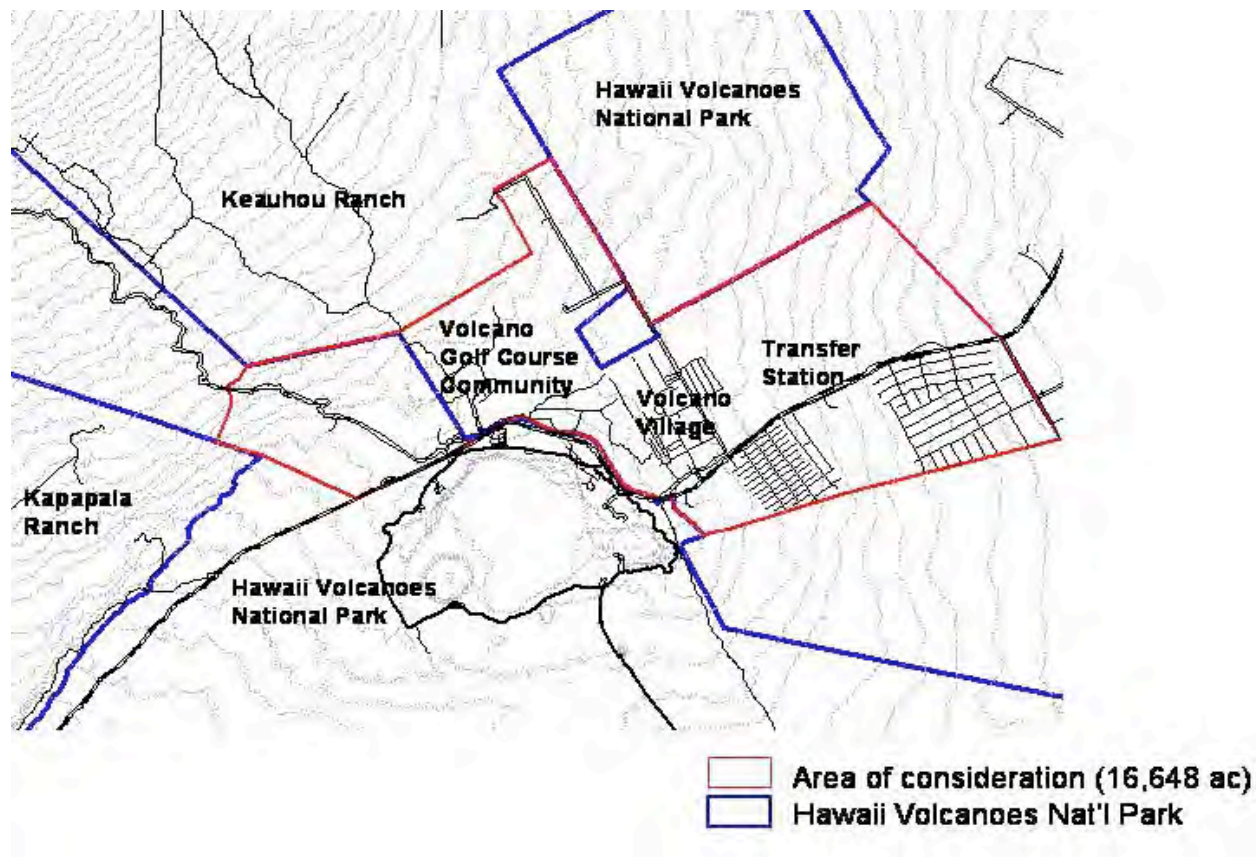


Figure 1: Area of consideration for the Volcano CWPP encompasses more than 16,000 acres and is outlined in red.

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Fire Risk Assessment for Volcano:

The Volcano community, a federally listed community at risk, is at the 4,000-foot elevation and is composed of Volcano Village, including the commercial district within the Village, the Volcano Golf and Country Club and its neighboring subdivision to the east, Mauna Loa Estates and Ohia Estates to the southeast on the south side of Highway 11. There are several commercial agricultural farm lots north of the residential units in Volcano Village. Both the Village and the Golf Course Subdivision are densely populated with lots generally smaller than an acre. Houses are spaced slightly farther apart in Mauna Loa Estates and Ohia Estates. There are two main roads each out of Volcano Village and Mauna Loa Estates and one means of ingress and egress from the Golf Course Subdivision and Ohia Estates. Roads within Volcano Village are extremely narrow, roughly ten feet in width with little or no shoulders. Roads within Mauna Loa Estates, Ohia Estates, and the Golf Course Subdivision are 18 - 20 feet wide with shoulders. Volcano Village, Ohia Estates, and the Golf Course Subdivision have little to no slope within the community. There is a slight slope within Mauna Loa Estates, although most lots are on flat land. There is no municipal water in any of the residential or commercial areas of Volcano, with homeowners and businesses relying on catchment water. A volunteer fire station is located in Volcano Village at the Cooper Community Center and a County fire station is located within the Park at the Kilauea Military Camp. There is no community association for any of the subdivisions in Volcano.



Typical road width in Volcano Village.

Much of Volcano Village is within densely vegetated rain forest. The state-owned Kilauea Forest Reserve separates Volcano Village and the Golf Course Subdivision. To the east of Volcano Village is the state 'Ola'a Forest Reserve and the Park's 'Ola'a Rain Forest Tract. These native rain forests provide critical habitat for a number of endangered plant and animal species.

Extensive land clearing has removed most of the native forest in the Volcano Golf Course Subdivision. Several fire-adapted alien grasses, such as bushy beardgrass (*Schizachyrium condensatum*), broomsedge (*Andropogon virginicus*), and molasses grass (*Melinis minutiflora*) have become widespread and increased the wildfire potential in the subdivision. The Faya tree (*myrica faya*) has also invaded the Golf Course Subdivision, pushing out native ohia (*Metrosideros polymorpha*) trees. Its rapid invasion into common areas that were originally set-aside as defensible spaces in the event of wildfire has resulted in increased fuel loads and the conversion of open spaces to dense alien forest. Keauhou Ranch, owned by Kamehameha Schools, lies to the north of the Golf Course Subdivision. The recent cessation of cattle operations is expected to result in increased fuel loads of invasive fire-adapted grasses.

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 and HAVO firefighting personnel on April 26,

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2006 to identify the level of wildland fire risk of Volcano Village, the Golf Course Subdivision, Mauna Loa Estates, and Ohia Estates.

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 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, preponderance of fuels in close proximity to structures, and lack of water, Volcano 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; ranchlands; and structures.

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

Commercial resources:

Volcano Winery, Kilauea Lodge and Restaurant, local bed and breakfasts, farms, restaurants, and schools.

Historical resources:

Shipman Ranch House and Lee House. There are several structures within the Village 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:

Ola'a Forest Reserve, Ola'a Rain Forest Tract, Thurston Rain Forest, Keauhou Ranch, Ohia Ranch, Keauhou Bird Conservation Center - Hawaii Endangered Bird Conservation Program. Native Hawaiian plants and animals, including rare and endangered species.

This Plan focuses on structures within the wildland urban interface in Volcano. Overgrown vegetation, narrow streets, and a lack of water create unsafe fire conditions. While the majority of homes in Volcano have metal roofs, a large number of homes within Volcano Village, the Golf Course Subdivision, Ohia Estates, and Mauna Loa Estates 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. Several driveways do not have 15 feet of vertical clearance for emergency vehicle access due

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to overgrown vegetation. Fewer still have turnaround access for emergency vehicles. Signage for interior roads within the Village, Golf Course Subdivision, Mauna Loa Estates, and Ohia



Estates is metal and reflectorized.

In addition, all residential areas within Volcano are experiencing rapid development. A new subdivision, Volcano Fairway Estates, is being built adjoining Volcano Golf Course and Country

Houses within Volcano Village differ dramatically in their amount of defensible space. Both houses pictured above have metal roofs and wood siding.

Club. The developer and/or lot owners are often clear cutting individual lots and dumping the green waste in common areas within the community, greatly increasing the community's fire risk. Associated with land clearing is the increased potential for invasive plants to establish. Some of these invaders (e.g. fire-adapted grasses) may have the potential to increase fuel loads and alter fire regimes.

Community Concerns for Volcano:

Multiple meetings with community members and fire agencies specifically on the CWPP process between April and June 2006 identified the most pressing fire concerns in Volcano. These include in order of priority:

1. Lack of water;
2. Community egress and firefighting vehicle ingress during a wildfire;
3. Fuel load in common areas;
4. Reduction of invasive species possessing inherent fire or ignition properties; and
5. Public awareness of wildfire threat.

Recommended Action for Volcano:

Multiple meetings with community members and fire agencies specifically on the CWPP process between April and June 2006 identified the most pressing fire concerns in Volcano. These include in order of priority:

1. Lack of water;
2. Community egress and firefighting vehicle ingress during a brushfire;
3. Fuel load in common areas;
4. Reduction of invasive species possessing inherent fire or ignition properties; and
5. Public awareness of wildfire threat.

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Based on the results of the community risk assessment, the following mitigation measures were identified to reduce wildfire risk in Volcano. The community and fire agencies collaborated to prioritize mitigation efforts in the following order of importance:

1. Creation of secondary emergency ingress/egress roads;
2. Reduction of fuel load along roadsides and in common areas;
3. Need for additional pre-staged static water tanks;
4. Reduction of invasive species; and
5. Continued fire prevention education and outreach.

Based on the results of the community risk assessment, priority ratings have been selected for Volcano 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
Volcano Village	Mechanical	Creation of secondary emergency ingress/egress roads	Very High
Volcano Village	Mechanical / Chemical / Hand Labor	Reduction of fuel load along roadsides and in common areas	Very High
Volcano Village	Mechanical	Need for additional pre-staged static water tanks	High
Volcano Village	Mechanical / Chemical / Hand Labor	Reduction of invasive species	High
Volcano Village	Public Education and Outreach	Continued fire prevention education and outreach	High
Golf Course Community	Mechanical	Reduction of fuel load along roadsides and in common areas	High
Golf Course Community	Mechanical / Chemical / Hand Labor	Need for additional pre-staged static water tanks	High
Golf Course Community	Mechanical / Chemical / Hand Labor	Reduction of invasive species	High
Golf Course Community	Public Education and Outreach	Continued fire prevention education and outreach	High
Mauna Loa Estates	Mechanical / Chemical	Reduction of fuel load along roadsides	Medium
Mauna Loa Estates	Mechanical / Chemical	Reduction of invasive species	Medium
Mauna Loa Estates	Public Education and Outreach	Continued fire prevention education and outreach	High
Ohia Estates	Mechanical / Chemical	Reduction of fuel load along roadsides	Medium
Ohia Estates	Mechanical / Chemical / Hand Labor	Reduction of invasive species	Medium
Ohia Estates	Public Education and Outreach	Continued fire prevention education and outreach	High

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Community Federal agencies and private landowners surrounding Volcano 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. HAVO 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
Volcano Village	Creation of secondary emergency ingress/egress roads	HAVO	Cooperative Funding	2006 - 2007	Yes
Volcano Village	Reduction of fuel load along roadsides and in common areas	Private	Cooperative Funding	2006 - 2007	Yes
Volcano Village	Reduction of invasive species	HAVO	Cooperative Funding	2006 - 2007	Yes
Volcano Village	Need for additional pre-staged static water tanks	Multiple agencies: federal, state, county, and private	Cooperative Funding	2006 - 2007	Yes
Volcano Village	Continued fire prevention education and outreach	Multiple agencies	Cooperative Funding	2006 - 2007	Yes
Golf Course Community	Reduction of fuel load along roadsides and in common areas	Multiple agencies	Cooperative Funding	2006 - 2007	Yes
Golf Course Community	Need for additional pre-staged static water tanks	Multiple agencies	Cooperative Funding	2006 - 2007	Yes
Golf Course Community	Reduction of invasive species	Multiple agencies	Cooperative Funding	2006 - 2007	Yes
Golf Course Community	Continued fire prevention education and outreach	Multiple agencies	Cooperative Funding	2006 - 2007	Yes
Mauna Loa Estates	Reduction of fuel load along	Private	Cooperative Funding	2006 - 2007	Yes

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	roadsides				
Mauna Loa Estates	Reduction of invasive species	Multiple agencies	Cooperative Funding	2006 - 2007	Yes
Mauna Loa Estates	Continued fire prevention education and outreach	Multiple agencies	Cooperative Funding	2006 - 2007	Yes
Ohia Estates	Reduction of fuel load along roadsides	Private	Cooperative Funding	2006 - 2007	Yes
Ohia Estates	Reduction of invasive species	Multiple agencies	Cooperative Funding	2006 - 2007	Yes
Ohia Estates	Continued fire prevention education and outreach	Multiple agencies	Cooperative Funding	2006 - 2007	Yes

Secondary road for ingress/egress

With narrow interior roads and only two roads connecting to the main highway, a secondary emergency access road for emergency vehicles is needed for more effective fire suppression. Currently there is an unpaved access road parallel to Mauna Loa Strip Road that runs along the western border of the golf course subdivision. This firebreak is on HAVO land and the Park maintains the road, removing overgrown vegetation twice a year. However, this fuel break dead ends behind golf course homes adjacent to the Volcano Winery. An additional access road is needed to connect the end of this fuel break to the interior roads within the Golf Course Subdivision to increase effective safe firefighting operations.

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 fuel load

Reducing vegetation along roadsides will improve accessibility of emergency vehicles. Reduction of green waste in common areas within the community will also reduce the wildfire threat. The creation of fuel breaks in common areas, as well as green waste pick-up projects are recommended to reduce fuel load. It is also strongly recommended that outreach efforts include alerting residents and developers to the fire risk of dumping green waste. The organization that is determined to be responsible for fuel load reduction may want to consider the purchase of a chipper to remove vegetation. For examples of how communities in other states have developed effective green waste removal projects, please go to www.firewise.org.

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Pre-staged static water tanks

Given that area residents rely on catchment water and there are no fire hydrants within Volcano, lack of water for fire suppression was identified as one of the most important challenges facing the community. Pre-staged static water tanks for ground and aerial fire suppression will greatly increase effective fire suppression and firefighting efficiency.

Reduction of invasive species

Invasive non-native plant species have the potential to alter fire regimes, and inhibit the recovery of native plants and animals from wildfire. Invasive fire-adapted grasses are high-intensity burning fuels that carry fire to other fuels. Faya trees rapidly displace native ohia trees as the dominant canopy tree after wildfire. Its invasion into common areas within the Golf Course Community has increased fuel loads, converted open areas to dense forest, and compromised defensible spaces used in wildfire suppression.

Continued fire prevention education

Fire agencies in Hawaii 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 and a continued influx of residents from the mainland who are unaware of Volcano's unique fire risks, it is crucial to continue a comprehensive fire education and outreach campaign. 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 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, such as the Kilauea Cultural Festival.
2. Develop educational materials specific to community fire threat and continue outreach in local publications. HAVO staff and the Firewise coordinator are currently providing monthly editorial to local publications on fire prevention. Continued outreach is needed with large numbers of new residents moving into the area. A handbook "How to Build in the Forest" is currently available to area residents. Handbook should be updated to include Firewise recommendations for defensible space and fire-resistant building materials.
3. Development of fire prevention outreach materials, including TV and radio public service announcements, posters, and handouts.

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Reduce Structural Ignitability:

As part of its fire prevention education efforts, Firewise provides recommendations to reduce structural ignitability. Individuals and the Volcano 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.

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Appendix A:

Please see attached Hawaii Wildland Fire Risk and Hazard Severity Assessment Form.

Appendix B:

Updated Project List 2008-2009

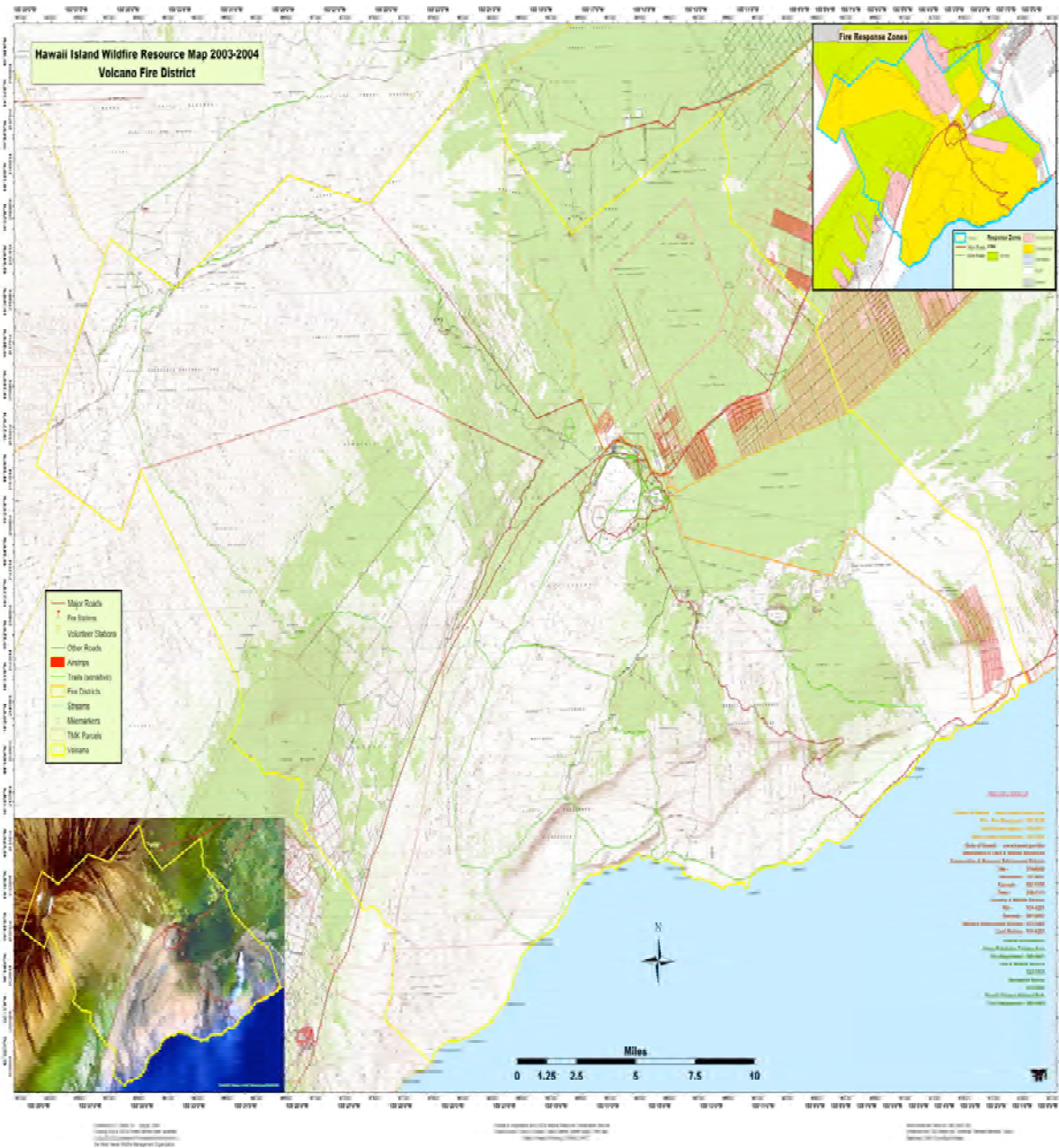
Federal agencies and private landowners surrounding Volcano were invited to submit projects that provide wildfire protection and reduce risk. The following table displays a list of recommended projects.

Community, structure or area at risk	Project	Agency / landowner	Funding Needs	Timetable	Community recommendation
Volcano Village	Maintenance of secondary emergency access road	HAVO	Cooperative Funding	2008-9	Yes
Volcano Village, Golf Course Community, Mauna Loa Estates, Ohia Estates	Reduction of fuel load along roadsides and in common areas	Private	Cooperative Funding	2008-9	Yes
Volcano Village, Golf Course Community, Mauna Loa Estates, Ohia Estates	Reduction of invasive species	HAVO, Private	Cooperative Funding	2008-9	Yes
Volcano Village, Golf Course Community, Mauna Loa Estates, Ohia Estates	Continued fire prevention education and outreach	Multiple Agencies	Cooperative Funding	2008-9	Yes

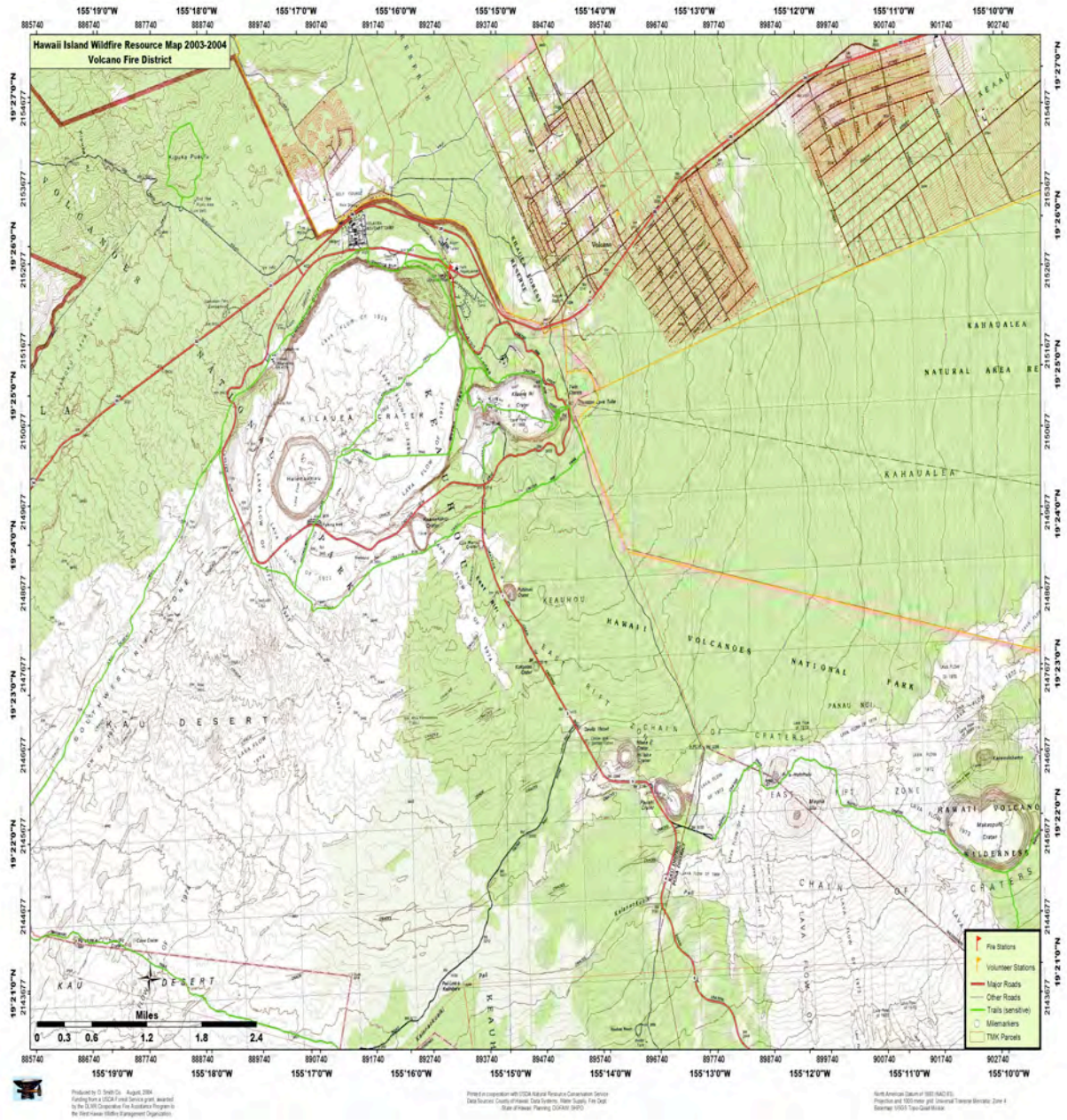
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Appendix C:

Pre-Attack Maps for Volcano, Hawaii



Volcano Community Wildfire Protection Plan
September 2006



Maps courtesy of West Hawaii Wildfire Management Organization.

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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Waihe'e Community Wildfire Protection Plan
March 2007

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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
March 2007

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

Waihe'e Community Wildfire Protection Plan
March 2007

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.

Waihe'e Community Wildfire Protection Plan
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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

Wayne Ching
State Protection Forester
1151 Punchbowl St., Room 325, Honolulu, HI 96813
(808) 587-4173
Wayne.F.Ching@hawaii.gov



County:

Maui County Fire Department

Fire Chief Carl Kaupalolo
Maui County Department of Fire and Public Safety
200 Dairy Road
Kahului, HI 96732
(808) 270-7561
Carl.kaupalolo@co.maui.hi.us



Maui County Civil Defense Agency

Gen Iinuma, M.P.H.
Administrator
County of Maui Civil Defense Agency
200 High Street, 1st Floor
Wailuku, HI 96793
(808) 270-7285
gen.iinuma@co.maui.hi.us



Maui Coastal Land Trust

Dale Bonar
Executive Director
2371 Vineyard Street
P.O. Box 965
Wailuku, HI 96793
(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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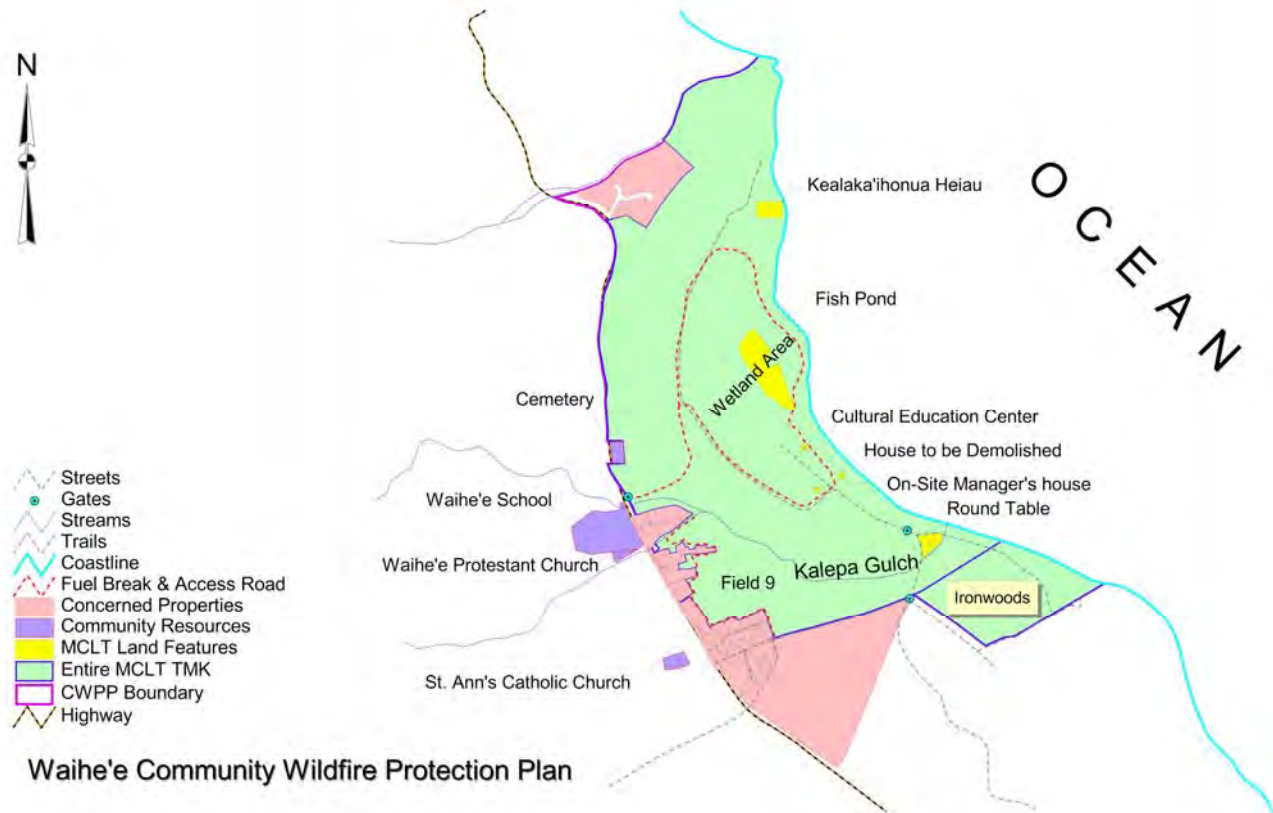


Figure 1: Area of consideration for the Waihe'e CWPP.

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.

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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.

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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

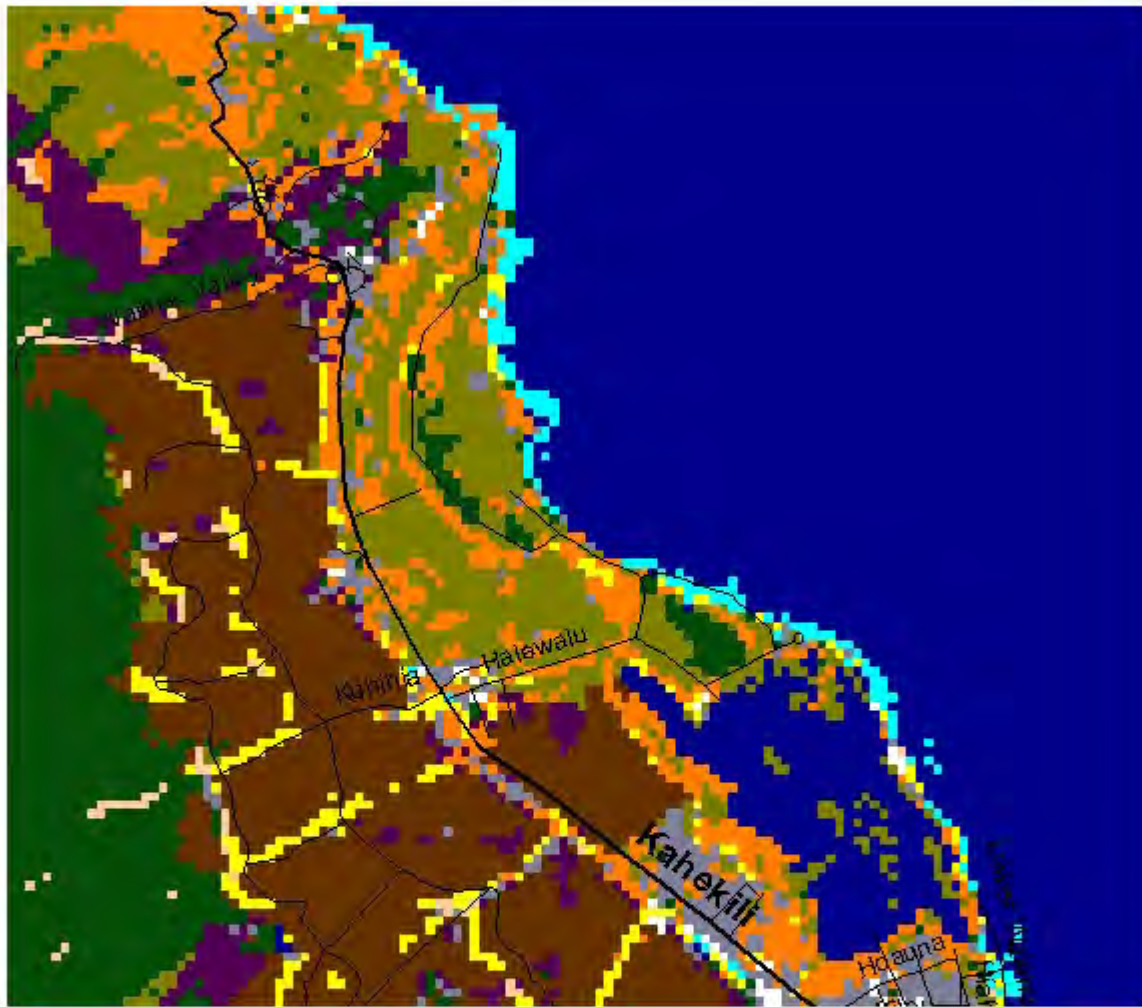
Agencies and private landowners surrounding Waihe'e were invited to submit projects that provide wildfire protection and reduce risk. The following table displays a list of recommended projects.

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

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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

Appendix E

Conservation Education

Information and Education:

One goal of the DLNR - Division of Forestry and Wildlife (DOFAW) is to play an active role in the development of a more environmentally literate citizenry. It is necessary to communicate with the public and educate them on the complexity of issues surrounding land management with the Department's dual mandate of providing opportunities for the public to engage in recreation while protecting and preserving natural and cultural resources. A well-informed public, including policy makers, special interest groups, educators, and the general public, is essential for ensuring the DOFAW has the resources and support to successfully manage healthy and sustainable forests. It also is very important to provide educational opportunities across all age groups and audiences in order to facilitate a better understanding of forest and natural resource management, health, protection, sustainability and other related issues. Conservation and environmental education can be utilized to inform the public about all the program areas overseen by the DOFAW.

The Division of Forestry and Wildlife recognizes that Conservation Education and the dissemination of information is an issue that is inextricably linked to all other issues and is demonstrated as such throughout the matrices. It is none-the-less important to share, in a coordinated manner, the history of CE in Hawaii, present efforts, and future goals.

This chapter includes information on the current status of EE in DOFAW, the history of Environmental Education (EE) in Hawaii, and future goals. The following issues are highlighted:

- **EE in Select DOFAW program areas**
- **Select Local and National Environmental Education Resources Hawaii (those most utilized by the DOFAW)**
- **Environmental Education in Public Schools**
- **Public Perceptions of Natural Resource Management**
- **Internal communication training for the DOFAW personnel**
- **Pending national education that will affect the DOFAW**

Hawaii's Division of Forestry and Wildlife

The Hawaii Division of Forestry and Wildlife (DOFAW) is the largest land managing Division within the Department of Land and Natural Resources. As such, DOFAW is an integral part of forestry and wildlife education in the state. The DOFAW is coordinated into 5 Program Areas: Na Ala Hele Trails and Access, Forest Health, Wildlife, Native Ecosystem Protection and Management, and Information and Technology. These program areas include employee specialization in the following areas: fire management and suppression; forest pests; natural area reserve systems; watershed partnerships; entomology; legacy land conservation program; trails and access; information and

education; wildlife; hunting; seabirds, migratory birds, and waterbirds; urban and community forestry, Plant Extinction Prevention, landowner assistance, among others.

Information below details some of the EE efforts within DOFAW's program areas:

Fire Program: The goal of the fire program is to provide protection for forest, brush, natural areas, and grassland to the extent needed to hold fire damage below the level at which it would interfere with high-level, sustained yield of products and services from these lands. The objective is to provide fire protection coverage on 3,360,000 acres throughout the State. The Division promotes fire suppression and safety and distributes fire prevention materials and brochures to the public at the DOFAW administrative and branch offices.

Smokey Bear is an important educational tool for use in festivals, parades and school programs. Smokey helps ingrain the message, "Remember: Only You Can Prevent Wildfires." Smokey's message continues to be relevant in Hawaii, where natural fires are extremely rare (except in the immediate vicinity of active lava flows) so native ecosystems are not fire-adapted.

Urban and Community Forestry Program: This section provides technical assistance to municipalities, cities and towns throughout Hawaii helping them prepare for tree plantings and providing assistance to establish tree projects.

Landowner Assistance Programs: Hawaii has a number of landowner assistance and acquisition programs including, the Conservation Reserve Enhancement Program, Forest Legacy Program, Forest Stewardship Program, and Legacy Land Conservation program. Staff facilitate community workshops to and provide one-on-one support to spread awareness about these opportunities.

Some of DOFAW's Landowner Assistance Programs:

Conservation Reserve Enhancement Program: The Conservation Reserve Enhancement Program (CREP) started in April of 2009. It is a federal-state natural resources conservation program that addresses state and nationally significant agricultural related environmental concerns. Through CREP, program participants receive financial incentives from U.S. Department of Agriculture (USDA) and the State to voluntarily enroll in the Conservation Reserve Program in contracts of 15 years. Participants remove cropland and marginal pastureland from agricultural production and convert the land to native grasses, trees and other vegetation. The USDA Farm Service Agency (FSA) administers the CREP for USDA. CREP staff presents to interest groups such as the cattleman's council and soil and water conservation districts.

Forest Legacy Program: The Forest Legacy Program is a Federal grant program that aids States in identifying important private forest lands that are threatened by development or fragmentation. Through the program, interested landowners are provided with alternatives to selling their land for development in order to cover costs associated with increased taxes, management of the land, among others by selling the land or a conservation easement on the property to a government organization.

Forest Stewardship Program: Hawaii's Forest Stewardship Program (FSP) provides technical and financial assistance to owners of nonindustrial private forest land that are interested in conservation, restoration, and/or timber production. The Forest Stewardship Handbook contains all of the information that is needed by the forest landowner to participate in the program. Procedures for application, proposal and management plan content, forestry practices, cost-share rates, and more can be found within the Handbook.

Information and Technology: The I&T program provides the bulk of environmental education programming offered by the DOFAW. Staff manage the Project Learning Tree program; coordinate DOFAW's Youth Conservation Corps program and other youth conservation internship opportunities including the Student Conservation Association; participate in public outreach events, offer presentations for schools, universities, and civic clubs, lead field experiences; and engage in other events as requested.

The History of Environmental Education in Hawaii

Hawaii's conservation education ethic began with the first colonizers, the Polynesians. As with any landscape that evolved without humans, the arrival of humans dramatically modified the island ecosystems. The initial impact of humans on the natural environment included modifying the landscape for agricultural practices, housing, and cultural and practical gathering of resources to sustain line. These actions led to the extinction of a number of flightless birds, other animals, and plants.

The arrival of Europeans sounded the start of world import export and with this the exploitation of natural resources and the introduction of innumerable invasive species augmented the rate of extinction, land degradation, and insufficient water supplies in some areas.

In an attempt to repair the mismanaged and exploited resources, a number of restoration efforts took place on public and private lands. The Hawaii Division of Forestry and the Division of Fish and Game were established in the early 1900's. The Civilian Conservation Corps outplanted numerous trees to improve the health of Hawaii's watersheds. A greater conservation and land ethic became engrained in this generation and water became recognized as one of Hawaii's most valuable natural resources.

1959 marked the Statehood of Hawaii and the Department of Land and Natural Resources was established. Hawaii's held a constitutional convention in 1978. At that meeting environmental education in schools was made a state constitutional requirement. In the early 1980's, The Hawaii Department of Education established an environmental education office.

The 1980's and 1990's marked a very active time for environmental education in Hawaii. Many governmental and private organizations including the DLNR developed and promoted environmental education and field opportunities for youth. A few of the notable resources developed/coordinated during this time include the: Ohia Project, a curriculum for grades K – 8 was developed by the Moanalua Gardens Foundation; the Hawaii

Environmental Education Association (HEEA), the DOFAW's Youth Conservation Corps, and the establishment of the Hawaii Nature Center.

In the early 2000's the No Child Left Behind Act was established, this has significantly impaired environmental education in Hawaii's public schools as they have shifted school time to English and math.

The HEEA (more information below) was a catalyst for communication and collaboration in the environmental community in the 1980's and 1990's dissolved in 2002. For a number of years, the organization was a leader in EE in the state. HEEA developed a strategic plan, hosted annual conferences, and served as the state affiliate for the national organization – the North American Association for Environmental Education (NAAEE). After HEEA dissolved, efforts of EE organizations in the early 2000's, although numerous, were fractured in structure and often reinvented the wheel. In 2010, the Division of Forestry and Wildlife reinvigorated the HEEA with funding from the USFS and support from 25 working group members representing 20 different organization.

Sub Issue: Select Local and National Educational Resources:

There are a number of local and national Environmental education opportunities and resources that exist in Hawaii the DOFAW's mission and vision. Some notable programs and resources are detailed below.

Hawaii Environmental Education Alliance: The Hawaii Environmental Education Association, as described above, was created in 1987 to facilitate collaboration and communication among both formal and informal environmental educators. Their goal is to develop strategies and skills to develop a citizenry that understands the environment and is engaged in responsible environmental behavior. The newly reinvigorated Hawaii Environmental Education Alliance (www.heea.org) has the goal to 1) provide support and guidance in the development of the statewide comprehensive environmental literacy plan and 2) populate and disseminate information about the on-line searchable database of state and national environmental education resources. Future goals include hosting conferences and registering as the affiliate for the nation organization, NAAEE.

Project Learning Tree – For more than 30 years, PLT (www.plt.org) has used the forest as a "window to the world" to increase students' understanding of our environment, to stimulate students' critical and creative thinking, to develop students' ability to make informed decisions on environmental issues, and to instill in students the commitment to take responsible action on behalf of the environment. The goals of PLT include:

- To develop students' awareness, appreciation, skills and commitment to address environmental issues.
- To provide a framework for students to apply scientific processes and higher order thinking skills to resolve environmental problems.
- To help students acquire an appreciation and tolerance of diverse viewpoints on environmental issues and develop attitudes and actions based on analysis and evaluation of the available information.

- To encourage creativity, originality and flexibility to resolve environmental problems and issues.
- To inspire and empower students to become responsible, productive and participatory members of society.

In Hawaii, PLT was coordinated by the United States Forest Service through 2008. In 2009, DOFAW became the State coordinator for the program. Since 2009 over 150 educators throughout the state have become certified PLT educators. Facilitators recognize the importance of place based learning in this and all programming. As such facilitators strive to connect the PLT materials with issues of local relevance and use local curricula including Hoike o Haleakala, the Ohia Project, and DOFAW developed materials to enhance the PLT offerings.

Additional Curricula used to enhance the PLT workshops:

Ohia Project - From 1986 to 1989, Moanalua Gardens Foundation (MGF), along with Bishop Museum and the Hawaii Department of Education (DOE), developed and disseminated the Ohia Project curriculum. The goal of the Ohia Project is to assist Hawaii schools in implementing effective environmental education curricula to aid teachers and students in making informed choices for our island environment. The Ohia Project is comprised of three guide books covering grades K-3, 4-6, and 7-8 and was an extremely popular environmental education curriculum in Hawaii. Recently after its inception, more than one-third of the K-6 teachers in the state have been trained in its use. However, the Ohia Project is now out of print and the DOE has developed new content standards in each subject area to identify important ideas, concepts, issues, and skills to be learned by all students. The Ohia Project needs to be aligned to these new standards. Also, current scientific data and cultural traditions need to be integrated. For more information, visit: <http://www.mgf-hawaii.org/HTML/School/ohia.htm>

Aloha Aina - The Aloha Aina project is designed to reconnect native Hawaiian traditional knowledge inherent in the Ahupuaa, or land division extending from the mountain to sea, to the 21st century education System. The program is coordinated by the Pacific American Foundation located in Oahu and the PAF hosts workshops to provide teachers with: a culture-place-based teacher's guide with standards-based lesson plans, activity sheets, and rubrics, CDs, a DVD and other resources; hands-on sessions to try the activities with other educators; pre-post tests to measure student achievement in core content area benchmarks; preview of field sites with partial-day field excursions. For more information visit: <http://alohaaina.thepaf.org/>

Hoike O Haleakala - This curricula is a multi-disciplinary, science-based environmental education curriculum designed to help sustain the native Hawaiian landscape and culture by helping students establish and deepen connections to the land and the culture it supports. The Hoike curriculum supports State of Hawaii high school educational standards, particularly in the science disciplines. Each activity is correlated to state science standards, offering educators a way to fulfill educational requirements using local ecosystems and issues as a context. These materials help bring science home for students

while fostering a strong science background and critical-thinking skills. For more information visit: <http://www.hear.org/hoike/>

Navigating Change - The Teacher's Guide to Navigating Change is a five part, Hawai'i DOE Standards (HCPS 3) aligned curriculum for grades 4-5. The guide includes five units that are designed to help students explore their relationships to the environment and ways that they can “navigate change” in their own communities. The instructional activities focus on Hawai'i DOE science, social studies, and language arts standards as well as Na Honua Mauli Ola, guidelines for culturally healthy and responsive learning environments in Hawai'i that were developed by the Native Hawaiian Education Council in partnership with the Ka Haka `Ula O Ke`elikolani, College of Hawaiian Language, UH-Hilo. <http://www.hawaiiatolls.org/teachers/NavChange.php>

Each year for the past 2 years the program has promoted their curricula to the masses but also for a select region that serves as a demonstration site for education. The demonstration site receives guidance for natural and cultural resource experts, teacher workshops, and the students are engaged in site visits. For year 3, the demonstration site for Navigating Change is the West Side of Oahu and the landscape to be featured is DOFAW's Kaena Point Natural Area Reserve.

Hawaii Experimental Tropical Forest: The goal of the Hawaii Experimental Tropical Forest: (HETF) is to connect scientists and the community with Hawaii's unique natural resources in order to more effectively engage in future conservation actions. The Mission of the Hawaii Experimental Tropical Forest (HETF) is to provide landscapes, facilities, and data/information for those wishing to conduct research and education activities contributing to a better understanding of the biological diversity and functioning of tropical forest and stream ecosystems and their management. Since the establishment of the HETF in 2007 plans have been underway to construct an education and science center at both the Laupahoehoe and Puu Waawaa Units of the HETF. As part of the process, the public is invited to participate in the planning of the education and science center at the Laupahoehoe Unit (LHH) of the HETF.

The Laupahoehoe Charter School conversion was just approved by the Hawaii DOE Charter School Review Panel and the Natural Inquirer. It will likely use the HETF extensively.

Children's Forests: HETF has the potential to be a valuable resource for the Children's Forests and the “Forest for every classroom” initiative. The concept of the Children's Forest is to give youth a role in planning & management. Currently there are 7 official Children's Forests. The DOFAW is interested in the possibility of pursuing this unique education and resource opportunity in the future and is fortunate to have the opportunity to learn from and potentially model itself after the existing Children's Forests. Potential resource partners include the Children's Forest in San Bernardino, CA and the Chugach in Alaska.

FOCUS: Forest Oceans Climate and Us (FOCUS) is a nationwide campaign in partnership with the U.S. Forest Service, the National Oceanic and Atmospheric Administration (NOAA), and the Wyland Foundation, which uses the beauty of art and the wonder of science to make kids aware of the shared relationship between the health of each ecosystem and the health of the planet. As Wayland is from Hawaii, DLNR-DOFAW would be a natural partner for this initiative.

Association of Fish and Wildlife Agencies (AFWA): The success of plant, animal, and insect species in Hawaii are inextricably linked as is ecosystem health. Another organization that the DOFAW works with is AFWA. In particular, the DOFAW is a partner for the Western AFWA study: “Improving conservation education and connecting families to nature through programs targeting the wildlife values of the public” This project is intended to improve the conservation education efforts of state/province fish and wildlife agencies through development of more targeted educational initiatives that account for the wildlife values of the public. Building on existing agency programs and research supported by the 2003 Multistate Conservation Grant Program, the project will develop, implement, and evaluate (using focus groups) prototypical programs for connecting children/families to nature and promoting natural resource stewardship. The specific focus will be on enhancement of programs for connecting children/families to nature by taking into account variables such as changing wildlife values in the United States and barriers to participation in informal education programs. The project has a specific focus on populations that have been historically under-served by programs about nature and science.

Priority focus areas that the DOFAW will focus on in the next five years:

- A. *Facilitate access to environmental education resources for educators, community members and youth.*
- B. *Evaluate and improve how the state connects with historically underserved populations.*

Sub-issue: Environmental Education in Public Schools

Traditional Public Schools: No Child Left Behind (NCLB) legislation has fundamentally changed the way that education is delivered in this country. It has defined the core content that all students in the United States must learn to be considered proficient at each grade level. As of 2007, this includes content standards in reading, math and science. In many school districts, this has resulted in educators teaching only those subjects and the standards that are assessed in the national tests. This has led to a severe reduction of environmental education in schools. Upon graduation from high school, most students do not have an understanding of natural resource management, how their actions impact native ecosystems, or how Hawaii’s natural resources impact them. This lack of awareness lends itself toward an attitude of apathy when confronted with land management issues at the policy making level. Curricula such as PLT that integrate math, language and science content with environmental studies should still be useful

under No Child Left Behind, but substantial work in teacher-training and integration with school curricula will be necessary before teachers and administrators can master that approach.

Public Charter Schools: A small number of the public have vocalized their connection to and value of natural and cultural ecology education in Hawaii's schools. Hawaii's 31 Public Charter Schools offer educational programs reflective of the community from which they were established. These dynamic public charter schools are blending the historic and culturally diverse landscape of Hawaii's past with innovation, new technologies and academic excellence to allow the students in Hawaii's public charter school system to attain the skills and knowledge necessary to succeed in a global world while maintaining an appreciation and respect for the people, places and languages of Hawaii. Many charter schools integrate EE in their curricula.

Home Schools: Hawaii's homeschooler population is also growing in Hawaii. These educators are a regular presence at outreach events and educator workshops.

Through a grant from the USFS, the DLNR-DOFAW in cooperation with the HEEA is developing a comprehensive list of accessible environmental education resources that often cross disciplines. Additionally, the DOFAW staff offers presentations to civic clubs and school groups. For example, staff may offer a presentation on wetlands to meet 3rd grade standards; forest products to impart information life cycles and the roll of government to a 2nd grade class; natural and cultural coastal ecology to a 7th grade class studying native ecosystems. These offerings are typically by the request of a proactive teacher already promoting environmental literacy in their classroom. It is in the interest of the DOFAW to reach a broad audience so all teachers can better understand and articulate forestry, environmental, and conservation issues. Partnering with the state's teaching colleges would allow access to pre-service teaching communities and make environmental education opportunities and resources available to them.

The DOFAW professionals, including those in the state, private and industrial sectors, should be utilized to impart a cross-section of natural resource management knowledge. To some degree, PLT workshops accomplish this, but more can be accomplished by reaching the pre-service teaching communities that will ultimately be molding the minds of the next generation.

Priority focus area that the DOFAW will focus on in the next five years:

- A. *Identify the best way to reach students, schools and parents with mission specific messages, opportunities and literature.*
- B. *Continue to coordinate and sustain the momentum of the reinvigorated Hawaii Environmental Education Alliance.*
- C. *Identify ways to connect with pre-service educators.*

Sub-issue: Public Perceptions of Natural Resource Management

Hawaii is home to over 25% of the threatened and endangered species in the nation. 71 species or subspecies of Hawaiian birds disappeared before the arrival of Captain James Cook in 1778 and since then 24 more species have disappeared. 69% of the 35 remaining songbirds and perching birds are federally listed as Endangered species, and 10 may be extinct. Native plants and insects are not faring any better. Despite this fact, there are common and widespread misconceptions about the practice of conservation and natural resource management in Hawaii.

In Hawaii, like many states, there is an inherent mistrust of government. Conservation actions are often interpreted as actions to assert public limitations on publicly owned land. It has been commonly discussed among outreach staff and PR professionals in Hawaii's conservation and natural resource management circle that the best way to communicate with the public about the value of conservation is through things that they know: two key issues being health and economics. However, it is hard to put a value on the amount of carbon a tree sequesters, or the health of a watershed forested by natives versus a watershed forested by invasives.

Hawaii's current fiscal downturn has translated to a severe reduction in the capacity for the DLNR and partners to manage existing projects. For the Plant Extinction prevention program, this could mean the loss of another species. For the invasive species committees, this results in a constant state of playing "catch-up," having to respond reactively instead of proactively. These past couple years in particular, the DLNR's been competing for funding alongside children's health care programs and public education.

The DOFAW staff reach out to groups, including schools, civic organizations, churches and community organizations, giving audience members an opportunity to expand their knowledge and learn how to make sound decisions about the resources. However, staff are limited in their capacity to meet the needs of such groups due to other job duties.

In summary, the natural resource management and conservation community must find more effective ways to positively promote and educate their members to be ambassadors for Hawaii's resources and the positive benefits that they contribute to the public.

Priority focus area that the DOFAW will focus on in the next five years:

- A. *Assess the best methods for communicating the benefits of Hawaii's natural resource and the subsequent financial, health importance of natural resource management.*

Sub-issue: Lack of internal communication training for DOFAW personnel

Natural resources managers are more often scientists than teachers. However, some of these scientists are well-spoken and all have knowledge of natural resource management subjects, including fire prevention, forest management, watershed protection and management, and forest health issues that students and the public often find very interesting. Although they will not likely be trained as formal classroom teachers, many could be trained to become excellent informal teachers, especially in the subject of

environmental education. To have a strong base of statewide presenters would greatly facilitate environmental literacy in Hawaii's classrooms and the community at large.

While the DOFAW has a small number of trained instructors/informal educators, the program is in its infancy and many more are needed. The DOFAW needs to focus on training more of its staff to be ambassadors, not only for the agency but also for the ecosystems and the protection of Hawaii's unique natural and cultural resources. The natural resources issues facing staff in Hawaii are often urgent and usually complex, so environmental education must be effective and consistent. Staff must be able to communicate effectively to the public about what natural and cultural resource management is to the State, how the public affects the natural world and how the natural world affects the public.

Priority focus area that the DOFAW will focus on in the next five years:

- A. *Develop and present opportunities to train DOFAW and partner natural resource personnel to prepare and carry out forestry, environmental and conservation education and public relations programs.*
- B. *Provide opportunities for staff to learn about and train with social medial networking tools to facilitate the dissemination of natural resource knowledge to a broad group of constituents.*
- C. *Provide opportunities for staff to share their natural resource knowledge with carious community groups in informal, educational settings.*

Sub-Issue: Pending National Legislation that will affect EE in Hawaii

Congress is currently involved in the process of bipartisan reform of the Elementary and Secondary Education (ESEA) Act. One proposed component of the reform of ESEA, also commonly referred to as the No Child Left Behind (NCLB) Act, is the No Child Left Inside Act (NCLI). On the NCLI website, the Congressional committee on Education and Labor features the following:

“One of the greatest challenges facing current and future generations is to build a more sustainable, energy-efficient world. By teaching students about the role of the environment as an important national resource, we can prepare them to take on critical issues – energy conservation, air pollution, climate change, wildlife protection – and become better stewards of the earth. Studies show that environmental education can help boost student achievement, build students’ critical thinking and social skills, improve student behavior, and can enhance teaching. And as more and more businesses ‘go green,’ environmental education will help prepare today’s students for the innovative, green jobs of tomorrow – strengthening our environment, our economy, and our competitiveness.”

The “No Child Left Inside” Act was introduced on Earth Day in 2007. As described earlier, NCLB has fundamentally changed the way that education is delivered in this country.

The Hawaii Department of Education has focused on NCLB and, unfortunately, reduced the focus on environmental education. In particular, administration abolished the EE program coordinator position. The public is recognizing that although EE is not currently in NCLB requirement, there is great importance of an environmentally literate citizenry. The NCLI Act would increase the value of and provide funding for EE in schools. The adoption of the current NCLI Act legislation would:

Help schools and states enhance and expand environmental education

- Extends the National Environmental Education Act of 1990 (NEEA), which provides funding for teacher training and support programs.
- Helps states develop and implement state academic content standards, student academic achievement standards, and state curriculum frameworks in environmental education.
- Encourages the development of outdoor environmental education activities as a regular part of the curriculum.

Place qualified, expert teachers in the nation’s classrooms

- Creates opportunities for ongoing professional development for teachers such as distance learning programs and summer workshops.
- Gives more people a stake in creating the next generation of environmentally conscious students by connecting teachers and professionals from environmental fields.
- Encourages mid-career professionals in environmental fields to pursue careers in environmental education.

Strengthen and develop environmental literacy plans

Creates the National Capacity Environmental Education Grant Program (NCEEG), competitive grants that are awarded to non-profits, state and local education agencies, and institutions of higher education to create and strengthen state environmental literacy plans. Funds could also be used to conduct studies on effective teaching models for environmental education, replicate or disseminate information about proven model environmental education programs, and develop methods to increase the number of K-12 environmental educators.

Hawaii’s Environmental Literacy Plan Development

The Department of Land and Natural Resources is working with the Hawaii Department of Education and Hawaii Environmental Education Alliance (HEEA) to develop a comprehensive environmental literacy plan (ELP) for the State of Hawaii. An environmental literacy plan will position Hawaii to bring broad-based support for environmental education (EE) through national legislation, titled the “No Child Left Inside Act” (NCLI). The plan will promote environmental learning and experiential education with an emphasis on outdoor settings. It is a framework to guide schools

(PreK-12) and non-traditional educators in integrating place-based learning that is supported by community partners and will ensure that all students graduate as environmentally literate citizens. The Plan will result in no new educational mandates, nor will it take away from current educational programs.

Congress has mandated that each state will need this plan in place if the state is to be eligible for future federal funding. Once this plan is in place and/or the “No Child Left Inside” act is passed, the responsibility of the DLNR and, subsequently, SDLNR-DOFAW to support execution of the plan will increase.

Priority focus area that the DOFAW will focus on in the next five years:

- A. *Continue to support national EE efforts that meet the DLNR’s mission and vision.*
- B. *Sustain partnerships with DOE and HEEA and foster relationships with other relevant national and local organizations.*
- C. *Research and secure funding to implement NCLI legislation in the event it passes. In the event it does not secure funding to implement the Hawaii Environmental Literacy Plan.*

Appendix F

Timeline of Forest History

Appendix F: Timeline of Forest History

This document was prepared by Ronald Cannarella, Forester with the Hawaii Division of Forestry and Wildlife during the process of developing Hawaii's Statewide Assessment of Forest Conditions and Resource Strategy in June 2010. This timeline grew organically; it was not intended to be a scholarly work for publication, and started out as an on-line collection of dates and events that would help me to understand the historical context of forest management in Hawaii. All of the information was compiled from public sources, many of them on-line web sites. I have included this timeline for the general interest of the reader. Please do not cite this document as a scholarly work.

There are two sections in this appendix. The first section is a chronological history of the land area of Hawaii and the events that have contributed to the present condition of our forests; particularly as it relates to the connection between healthy forests and water.

The second section is a report entitled "GENERAL DESCRIPTION OF THE HAWAIIAN FORESTS 1902" written by U.S. Forester E.M. Griffith on hawaiian forests and presented in Yokohama, Japan on March 5, 1902. The following year, in 1903, Hawaii hired its first Territorial Forester.

- 70,000,000 BP - A hot spot develops in the center of the Pacific tectonic plate, which initiates the development of what would eventually become known as the Hawaiian Islands - the most isolated island archipelago in the world. As the crust moves over the hot spot, a new volcanic island is formed. Wind, rain and oceanic waves immediately begin to act on/affect each new island. As the Pacific plate continues to move over the hot spot, the older islands are continually eroded until they no longer rise above sea level. For several millennia, the ancient islands maintain their existence as coral atolls. These atolls are known today (2010) as the Northwest Hawaiian Islands and as of 2009 are Federally protected - and the largest Marine Sanctuary in the world. More ancient atolls that continue to subside as the Pacific plate moves to the northwest become known as seamounts. Thus, an unbroken series of high volcanic islands from the Big Island of Hawaii to the Emperor seamounts serve as a series of transient but continuous landfalls for the terrestrial and marine organisms that comprise the endemic species found in Hawaii and nowhere else in the world.
- 34,000,000 BP - Corals first established on Midway Atoll, the oldest island in the Hawaiian archipelago (Paleoceanography of Coral Reefs in the Hawaiian-Emperor Chain Richard W. Grigg, Hawaii Institute of Marine Biology, University of Hawaii). www.sciencemag.org/cgi/content/abstract/240/4860/1737.
- 400-600 AD - First humans/Polynesians arrive in Hawaii, bringing with them new non-native species. Population centers develop first in the flat lowlands (wet and mesic areas) across the main Hawaiian Islands. With time, the lands are cleared and converted to agriculture. Practices such as burning to clear drier areas for agriculture take place to encourage growth of pili (*Heteropogon* spp.) grass for thatching. This starts the

conversion of lowland to dry-mesic forests to "taiga" predominantly grasslands.

- 600-1778 - Hawaii experiences its first wave of native species extinctions and significant impacts to ecosystems start to occur. The fossil record and pollen analysis indicate the extinction of many species of endemic native birds and the destruction of unique lowland forests, dominated by loulou palm (*Pritchardia*) occurred shortly after the first permanent settlements are established. Introduced animals, particularly seed-eating rats, dramatically change the regeneration dynamics of native vegetation, rendering some dominant species stressed/rare. After the arrival of the Polynesians, but prior to the arrival of the Europeans, the fossil record indicates the extinction of "at least seven species of Hawaiian geese (many of them flightless). Also, the extinction of two species of flightless ibises, a sea eagle, a small hawk, seven species of flightless rails, three species of owls belonging to an extinct genus, two large crows, one honey eater and at least 15 species of Hawaiian finches" [likely became extinct]. (S. Olson and H. James. Science. Vol. 217. 13 August 1982, p 633-635) and "First Wave Adaptations: The Ahupua`a System; blending technology" (fish ponds unique in Polynesia properly. Jared Diamond "Guns, Germs and Steel" W.W. Norton & Company, New York, New York, 1999, 1997), and the Kapu (off limits) System of religion and politics [codifying] social structure, land tenure behavior to develop a sustainable economy was implemented. Traditional land use practices are developed and the islands supported thriving sustainable population
- 1778 – The second Wave of Challenge: Impact of new culture, new economic system and the introduction of non-native invasive species occurred. The arrival of Captain Cook, first well-documented European, and contact occurred with native Hawaiians. Captain James Cook first introduced goats to Hawaii in 1778, leaving one ram goat and two ewes on Niihau Island, and on Kauai. (James Cook. A Voyage to the Pacific Ocean. Undertaken by the Command of His Majesty, for Making Discoveries In the Northern Hemisphere, 3rd ed. 3 vols.; London: G. Nicholl and T. Caddell, 1784), 2: 22425.) www.state.hi.us/dlnr/dofaw/pubs/history.html.
- 1790 - 1839 - Sandalwood harvesting begins, reaches peak from 1811- 1826. Sandalwood trade was the monopoly of Kamehameha I until his death in 1819. His successor, Liholiho (Kamehameha II) allowed other chiefs to profit from sandalwood, and by 1826 commoners were allowed to trade sandalwood. As a result, by 1845 the more accessible mesic and dry forests of Hawaii are virtually devoid of mature sandalwood trees. (8. St. John, "Sandalwood," 1920. For a summary of the sandalwood trade, see: Thomas R. Cox, "Sandalwood Trade," in Historical Dictionary of Oceania, Robert D. Craig and Frank P. King, eds. (Westport, Conn. Greenwood Press, 1981), 25859.)
- 1793 – Captain George Vancouver introduces cattle and sheep to Hawaii. Kamehameha I places a kapu (taboo) on them to encourage natural proliferation of goats, cattle and sheep for future generations.
- Other second Wave Impacts: Population of Native Hawaiian species (plants & animals)

plummets drastically due to introduced disease, loss of access to land and natural resources, introduced animals reproduce rapidly in the wild, producing abundant game, all at the expense of the forested lands/ecosystem integrity.

- More Second Wave Adaptations (three main components): 1) transformation of government (1795 - 1893) from island-states to Kingdom to Constitutional Monarchy), 2) transformation of religion (1819 `Ai Noa widespread practice of men and women eating together as an act of Civil Disobedience, 1820 first Christian missionaries arrive **uninvited**, 1831 formal ending of Kapu system and adoption of Christianity, 3) transformation of the land tenure system (1848).
- 1795-1810 - Kingdom of Hawaii established by King Kamehameha I, brilliant military strategist, charismatic leader and visionary statesman transforms fractious island chain into a modern nation state. "The unification ended the Ancient Hawaiian Society of the Hawaiian islands transforming it into an independent constitutional monarchy crafted in the tradition of European monarchies." copied and pasted from Wikipedia by Ron C April 9, 2010. Capital located at Lahaina, Maui. "Government in the Kingdom of Hawaii was transformed in phases, marked by the promulgation of the constitutions of 1840, 1852, 1864 and 1887. Each successive constitution reduced the power of the monarch in favor of an elected legislature increasingly dominated by the interests of those American and European descents." Directly copied from Wikipedia by Ron Cannarella on April 9, 2010.
- Third Challenge/Wave of change - the water crisis of the 19th century. Likely caused by massive deforestation, waves of epidemics devastating native Hawaiian populations, and Hawaii was brought into the global economy - adopts unsustainable land stewardship practices/loses sight of centuries of enlightened cultures that were in tune with sustainable land management.
- 1809 - John Palmer Parker, a sailor from Massachusetts arrives on the islands. He marries the Hawaiian chiefess "Kipikane" in 1816 and begins the Parker Dynasty, which domesticated wild cattle and horses that freely roamed the Big Island.
- 1819 - Kamehameha I dies.
- 1819 - the first whaling ships visit Hawaii in the fall. Between 1824 and 1861, whaling ships arrive at ports in Hawaiian ports a total of 10,340 times, (Korte, A Brief History of Forest Destruction" 1961 Unpublished Manuscript).
- 1820 - First Christian missionaries come to Hawaii.
- 1826 - Mosquitos, vectors of bird malaria, are introduced to Hawaii by the SS Wellington, in Lahaina Harbor. As mosquitoes spread, and introduced birds are brought to Hawaii, and dramatic declines of native birds are seen in the lowlands during the remainder of the 1800's and into the 20th century.

- 1830 - Kapu lifted on slaughter of wild cattle and goats due to large population. (hawaii.gov/hdoa/ag-resources/history).
- 1831 - Queen Kaahumanu, wife of King Kamehameha I and father of Liholiho (Kamehameha II) formally abolishes ancient Kapu System and establishes Christianity as the official State Religion of the Kingdom, stating. "Worshipping of idols such as sticks, stones, sharks, dead bones, ancient gods and all untrue gods is prohibited. There is one God alone, Jehovah. He is the God to worship. The hula is forbidden, the chant (olioli), the song of pleasure (mele), foul speech, and bathing by women in public places. The planting of awa (or kava, a mildly narcotic drink prepared from the root of Piper methysticum) is prohibited. Neither chiefs nor commoners are to drink awa." (Kamakau, 1992, p. 298-301).
- 1839 - First forestry law passed in Kingdom of Hawaii restricting cutting of sandalwood, but only few remnant individual trees remain. (9. Ralph S. Kuykendall, The Hawaiian Kingdom, (3 vols.; Honolulu: University of Hawaii Press, 1938-67) 1: 85-95; Theodore Morgan, Hawaii: A Century of Economic Change, 177B-1876 (Cambridge, Mass.: Harvard University Press, 1948), 61-68; Edward Y. Hosaka, "History of the Hawaiian Forest" (typescript; Honolulu: University of Hawaii, 1931).
- 1846 - King Kamehameha III passes a law declaring forests to be government property. (hawaii.gov/hdoa/ag-resources/history).
- 1848 - First public distribution of water taken from Nuuanu Stream to residents of Honolulu.
- 1848 - King Kamehameha III "Great Mahele" abolishes the traditional land tenure system of the Hawaiian Kingdom, and institutes a new system of land ownership. Roughly 1/3 of the lands in the Kingdom were reserved for the Government, one third reserved for the Crown, and one third made "fee simple" with the intent that the lands would be granted to individuals for their own use. The now privatized fee simple lands could then be bought or sold.
- "In 1846 the lately created right of private ownership of land in fee and the sudden creation of what at that time seemed to be an inexhaustible supply of available government land combined to inaugurate a selling spree. From September, 1846, to December 31, 1857, the sale of government lands totaled 162,013.51 acres." . . . "Conclusions: The factual history of the public domain of Hawaii admits of the following conclusion: (1) the public domain has been sacrificed to avidity and political expediency; (2) conservation has been notably absent in the administration of land laws." (1946 Report of the Land Laws Revision Commission).
- 1850 - Botanists recognize damage to Hawaiian forests, call for control of feral animals (7. E. Bailey, "Report on Trees and Grasses," Transactions of the Royal Hawaiian Agricultural Society, 1 (1851): 80 [quotation]; Edward Y. Hosaka, "The Problems of Forestry and the Work in Progress toward Reforestation in the Territory of Hawaii")

(unpub. thesis, University of Hawaii, 1930).

- 1850 - Commercial Timber Milling begins on Maui, but the industry never develops due to availability of cheaper, better quality lumber products from Pacific Northwest. (10. Hosaka, "History," 10; T. Metcalf, "Report on Saw Mills," Transactions of the Royal Hawaiian Agricultural Society, 2 (1854): 14445 (quotation).
- 1859 - Hawaiian Kingdom legislature passes "An Act to Authorize the Minister of the Interior to Take Possession of Whatever Land and Water may be required for use of the Honolulu Water Works". This act marks the first time the government asserts ownership and direct responsibility over the management of water resources (Cox, 1992 as quoted in Derrickson, et al "Watershed Management and Policy in Hawaii: Coming Full Circle")
- 1870 - Horace Mann writes the comprehensive book "Flora of the Hawaiian Islands," spurring interest in the natural history of the Hawaiian Islands. (12. Sanford B. Dole to [Minister of Interior?], April 25, 1870, Hawaii, Interior Dept., Misc. files: Agriculture and Forestry [hereafter AF], 1860-1876 correspondence (Hawaiian State Archives, Honolulu). Dole had a deep interest in natural history. He had published A Synopsis of Birds of the Hawaiian Islands in 1869.)
- 1870 - First plantings of Eucalyptus spp. on Maui.
- 1876 - Hawaii legislature passes "An Act for the Protection and Preservation of Woods and Forests" in response to water crisis in Honolulu due to deforestation and decrease in stream flow Nu'uanu Stream, the main source of water for Honolulu. The Act authorizes the creation of forest reserves, and establishes the position of "Superintendent of Woods and Forests" to manage the forest reserves. The preamble to the Act stated: "Whereas, it is an established fact that the destruction of forests in any country tends to diminish the supply of water..."
- 1876 - The Reciprocity Treaty between Kingdom of Hawaii and the United States of America allows for the duty-free importation of sugar into the USA. The growing and manufacture of sugar becomes the dominant industry in Hawaii for the next 100 years.
- 1880 - Hawaii legislature passes a law to protect from trespass by domestic animals all watershed areas contributing to domestic water supplies.
- 1880 - Minister of the Interior's annual report to the legislature states "Let all the mauka lands be kapu, let the forests be protected, and not only protected, but have planted trees over the whole of our mauka lands..."
- 1882 - First government tree nursery established to provide tree seedlings for reforestation of mauka lands above Honolulu. 50,000 tree seedlings are planted on the denuded slopes of Tantalus (Honolulu). (Cox from Derrickson).

- 188? (exact date unknown) - "A great fire occurred in Kula that burnt for weeks" (Korte, Forest Reserves of Hawaii Series, #2).
- 1884 - Jim Kukona hired as Hawaii's first forest ranger for the protection of government forest lands from Manoa to Kalihi.
- 1876 – 1910 - Government and agricultural sectors recognize importance of Hawaiian forests in providing water for urban consumption and irrigation of sugar cane. Forested areas are fenced, cattle removed, and trees are planted but efforts are undertaken on an individual basis and not coordinated. Large numbers of non-native species are introduced in effort to identify best species for establishing forest cover. Honolulu experiences many droughts, water related epidemics and two catastrophic urban fires underscoring the need for increased, safe and reliable public water supply.
- 1889 - The first artesian well in the Hawaiian islands is drilled by Cattle Rancher James Campbell in Ewa, Oahu, ushering in the use of groundwater for irrigation and human consumption. (hawaii.gov/hdoa/ag-resources/history).
- 1889 - Bishop Museum is built by Charles Reed Bishop, a Hawaiian philanthropist and co-founder of Kamehameha Schools and First Hawaiian Bank, in memory of his late wife Bernice Pauahi Bishop. The museum grows to become the largest repository of Hawaiian cultural and biological
- 1892 - Legislature passed three bills (1) To Create The Bureau of Agriculture and Forestry under the Minister of Interior. (2) An Act was passed making it unlawful to cut or to destroy any forest tree or shrubbery within 250 feet of any road through a natural forest. (3) It was provided that forest lands be exempt from taxation under certain conditions.
- 1892 - Bureau of Agriculture and Forestry immediately implements a program to control or eliminate wild goats and cattle and several forest reserves are created (Walker, Ronald "A History of the Division of Fish and Game, April 1978).
- 1893 - The Monarchy was abolished and succeeded by the Provisional Government under an executive council.
- 1894 - Republic of Hawaii is proclaimed.
- 1894 - Joseph Marsden, Commissioner of Agriculture and Forestry, reports to the Minister of Interior that the combined effect of drought and indiscriminate pasturing of cattle in the Hamakua and Kohala Districts on the island of Hawaii had dried up important water holes and springs and that in some cases matters had become so critical that water had to be shipped from Honolulu in barrels.
- 1895 Hawaii Sugar Planter's Association (HSPA) formed with the goal of promoting research and development of the sugar industry. HSPA becomes active in water

management and the establishment of the forest reserves.

- 1898 Republic of Hawaii is annexed by the United States. 1.75 million acres of land still classified as Government and Crown in the Great Mahele are ceded to the United States, and are henceforth referred to as the "Ceded Lands".
- 1900 - The Hawaii Organic Act is passed on April 30, 1900, and officially establishes the Territory of Hawaii. Ownership of the Ceded Lands is transferred to the US Federal Government, and administrative control and use of the lands is granted to the government of the Territory of Hawaii.
- 1898-1959 -Federal Government retains 373,719 acres of Ceded Lands; 227,972 acres of those lands are set aside as Volcanoes National Park and Haleakala National Park. The remainder are reserved mainly for military use (US Army Schofield Barracks on Oahu, Pearl Harbor Naval Base on Oahu, Marine Corps Base on Oahu, Hickham Air Force Base on Oahu and the entire island of Kahoolawe). (Native Hawaiian Rights Handbook p 26-30.)
- In an important article of September, 1899 Mr. Walter Maxwell, agriculturist of the H.S.P.A., urged that there be a thorough, expert examination to determine the Islands' "requirements in permanent forest areas." (Source ("The Conservation, Development and Protection of the Water Resources of the Honolulu Urban Area."))
- 1900 - A wildland fire in the Hamakua district of the island of Hawaii burns an area 15 miles long and 2 miles wide (Korte, Forest Reserves of Hawaii Series, #2)
- 1900 - "Albert Koebele, Entomologist of the Board of Agriculture and Forestry wrote: "The greatest enemies of the beautiful Hawaiian forests, the worst and most destructive ever introduced among tropical forests are cattle, which will sooner or later, but positively and entirely destroy the forests. I doubt that anything else in nature, axe and fire included, would have in the same space of time brought the once densely clothed islands to the present condition." (Korte, "A Brief History of Forest Destruction", p.1).
- 1902 "GENERAL DRIPTION OF THE HAWAIIAN FORESTS" documents 3 key issues; 1) most important ecosystem service of Hawaiian forests is water, 2) destruction of Hawaiian forests by feral ungulates, and 3) wildfire, previously unknown in forested ecosystems, rapidly converting forested ecosystems to fire-dominated ecosystems. Prepared by U.S. Forester E.M. Griffith for Governor Sanford Dole, in a Paper Presented at Yokohama, Japan, on March 5, 1902 (www.state.hi.us/dlnr/dofaw/wmp/griffith.htm).
- 1902 - Gifford Pinchot renowned head of the U.S. Forestry Department, makes a personal inspection of Nu'uau and Tantalus forests.
- 1903 - Hawaii Territorial Legislature passes Act 44 establishing the Board of Agriculture and Forestry, predating the USDA Forest Service by one year. Act 44

expands on the Forestry Act of 1876 and provides the legal vehicle for the creation of reserves encompassing private as well as public lands. In 1903 the Legislature passed a comprehensive forestry law. The Department of Agriculture and Forestry was reorganized under a Board of Commissioners of Agriculture and Forestry whose specific duties included (and still include) the custody, control, and regulation of all land set aside as forest reserves; also, "to devise ways and means of protecting, extending, increasing and utilizing the forests and forest reserves, more particularly for protecting and developing the springs, streams and sources of water supply so as to increase and make such water supply available for use" and to make recommendations to the Legislature from time to time with respect to desirable additional legislation. However, the Territory of Hawaii does not have sufficient funds to pay for fencing and cattle removal as provided for in Act 44.

- 1903 Forester William L. Hall of the US Department of Forestry is sent by Washington DC to Hawaii to assess condition of Hawaii's forests. Hall recommends sending Frank S. Hosmer to Hawaii.
- 1904 Frank Hosmer hired as first Territorial Forester and immediately begins the creation of first forest reserves to protect upper watershed areas. Forest reserves managed by fencing, feral animal elimination, and reforestation with native and exotic tree species.
- 1907 Hunting License system established and 35 District foresters were commissioned as "Special Territorial Police Officers". (Walker, Ronald "A History of the Division of Fish and Game, April 1978).
- 1904 - 1914 First Territorial Forester Frank S Hosmer establishes Hawaii's Forest Reserve System on Oahu, Kauai, Maui, Molokai, and Big Island on private and public land. The primary function of the Forest Reserve System is to protect Hawaii's watersheds to assure dependable supplies of water on all islands. The forestry policy and programs started in 1904 were substantially sustained for more than 50 years.
- 1907 - Frank Hosmer distinguishes two types of forests in Hawaii; 1) protection forests, those on the wet windward slopes, the most important product of which was water, and 2) commercial forests, the most important product of which was wood. Commercial forests, having no springs or surface streams, were considered nonessential with regard to water. The only large area of commercial forest was on the leeward side of the Big Island of Hawaii. (Woodcock)
- 1904 - 1938 Many people key to forestry efforts in Hawaii, including Hosmer, Rock, Judd, and Lyon, import and conduct planting trials for hundreds of species of plants and trees. Many of these species prove useful [and} many turn out to be detrimental due to their ability to replace native species.
- 1908 - Governor Frear attends the "Governor's Conference in Conservation" in Washington, DC. As a result, USGS begins operations in the Territory of Hawaii to

assist with watershed protection and research on the extent and characteristics of Hawaii's groundwater resources.

- 1908 - Governor Frear appoints a "Territorial Conservation Commission of Hawaii" which was to investigate the natural resources of the Territory and recommend wise development and use. This is the beginning of a true conservation program in the Islands(Walker, Ronald "A History of the Division of Fish and Game, April 1978).
- 1909 - Legislature enacts a special income tax, designated a "Conservation Tax," the purpose of which was "to promote the conservation and development of the natural resources of the Territory. With certain amendments the law remained in effect until 1915 when it was merged with the general income tax.
- 1910 - Completed construction of The Hamakua Ditch. The ditch was originally designed to transport sugar cane, rather than irrigate it. The 25-mile-long system tapped verdant Waipio Valley's springs and streams and flumed (floated) hand-cut sugar-cane stalks from upper fields to processing plants along the Hamakua Coast. As sugar production became more mechanized over the years, the water was used to wash the plants at the mills before eventually irrigating approximately 6,000 of the Hamakua Sugar Co.'s 21,400 acres of sugar cane. When the plantation closed, the ditch, which had been neglected for several years, was a decrepit mess and experienced a series of calamitous failures. Able to transport as much 40 million gallons of water a day in its heyday, the ditch was collecting just 8 million gallons a day (MGD) with only 2 MGD actually making it through the system, a 75 percent loss rate. (www.hawaiibusiness.com/Hawaii-Business/November-2005/The-Coast-Is-Clear/), accessed April 25, 2010).
- 1904-1926 - Support for Hawaiian forestry from US Forest Service is sporadic.
- 1912 – The population of Honolulu was 50,183. The Sanitary Commission recommends "...if we are to profit by the experience of the past, we ought to plan for nearer 500,000 people than simply to provide for the present needs." ("The Conservation, Development and Protection of the Water Resources of the Honolulu Urban Area.")
- 1912 – “The Outdoor Circle” was created, a civic organization dedicated to "keeping Hawaii clean, green and beautiful by preserving, protecting and enhancing our environment for future generations.
- 1913-1968 - Construction of the Waiahole Ditch irrigation system completed. The ditch transported almost 30 mgd of fresh water from rainy Windward Oahu, through the Ko’olau Mountain Range, to the parched Leeward side of the island and its thirsty sugar cane fields. The diversion of the water fueled the Islands’ economy and shaped Oahu’s development for nearly 80 years.
- 1915 - "General feeling of alarm and crisis was reported with respect to the poor water

situation in Honolulu."

- In a paper dated May 10, 1915 - which has become recognized as one of the principal contributions to present knowledge, Dr. Arthur Alexander, prominent local civil engineer, recommended that the government acquire "all private rights to the water from the valleys back of Honolulu" also, "the control of the entire artesian supply underlying Honolulu."
- 1916 - Hawaii Volcanoes National Park established.
- 1917 - Act 217 passed, protecting bird, animal and vegetable life on several islands off Oahu and Molokai and gave the responsibility to the Division of Forestry. Thus began the system of wildlife sanctuaries and refuges we have today.
- 1918 - The Hawaiian Sugar Planters Association adds a Department of Forestry to their Experiment Station.
- 1918 – W.M. Giffard writes "(For Honolulu) water itself, as well as the forest that clothes the catchment areas, must be conserved, and what is more, action must be taken at once. The people of this island face a serious condition, one that can no longer brook delay".
- 1919 - "The Fish and Game Commission" was established under the Board of Agriculture and Forestry. However, hunting and fishing laws were almost non-existent with no seasons, bag limits or other restrictions. (Walker, Ronald "A History of the Division of Fish and Game, April 1978).
- 1923 - Surface water no longer supplied to Honolulu residents. All municipal water supplies pumped from artesian wells.
- 1923 - First quantitative report on potential water supplies for Honolulu is produced.
- Mr. C. S. Judd's report to the Forestry Board for the biennium 1923-1924 renewed his recommendation that, whenever the owners of private lands within the forest reserves are found to be uncooperative in the protection of forests, "the way should be cleared by legislative action for the government to acquire their lands." Mr. Judd listed 18,390 acres of this class, none of which were in Honolulu.
- 1926 - Financial assistance is extended to the Territory by the Forest Service to support production of tree seedlings for reforestation under authorization by the Federal Clarke-McNary Act of 1924. (Nelson, Robert E. 1989. The USDA Forest Service in Hawaii: The First 20 Years (1957-1977). USDA Forest Service General Technical Report PSW-111.
- 1927 - The Division of Fish and Game is established under the Board of Agriculture and Forestry. The mission then was to provide law enforcement, expand the

importation program for shellfish and fish, develop the game farm to increase game bird distribution and experiment with mullet production at the Mokapu facility. (Walker, Ronald "A History of the Division of Fish and Game, April 1978).

- 1928 - First Nene (native Goose) restoration project by State Senator Robert Hind. (Walker, Ronald "A History of the Division of Fish and Game, April 1978).
- 1929 - "The conservation of this most valuable asset (ground water) should be the prime consideration of each and every citizen of the community." Report of W.M. Chaffe, Honolulu Board of Water Supply. (Conservation, Development and Protection Report, Vol. p. II-62).
- 1930 - Forest Reserve System in Hawaii includes 1,000,000 acres, roughly one quarter of the land area of the Territory.
- 1931 - Additional Federal financial assistance is extended to Hawaii to support forest fire protection activities. ((Nelson, Robert E. 1989. The USDA Forest Service in Hawaii: The First 20 Years (1957-1977). USDA Forest Service General Technical Report PSW-111.
- 1932 - In his report to the Board of Water Supply for the years 1931 and 1932 Mr. Ohrt, the Manager and Chief Engineer of the Honolulu Board of Water Supply states that "he felt, for the first time, that the problem of Honolulu's water supply could be said to have been solved." (Conservation , Development and Protection Report, Vol. p. II-65)
- 1933 - Due to the Great Depression most of the paid staff in forestry had been laid off. However, 500 men hired by the Civilian Conservation Corps (CCC) begin emergency conservation work in the forest reserves.
- 1935 - 1940 number of workers in the CCC rises to 1,200. These men laid trails, built fences, shot animals, and planted 1.2 million trees in Forest Reserves throughout the Territory (Woodcock).
- 1938 - Boundaries of the Honolulu Forest Reserve are moved makai (seaward) in the valleys of Kalihi, Nuuanu, Makiki and Manoa.
- 1948 - Report "The Conservation, Development and Protection of the Water Resources of the Honolulu Urban Area" (Large PDF files Volume 1, and Volume 2).
- 1954 - Territory of Hawaii creates the State Park System.
- 1957 - Territorial legislature passes three major pieces of legislation regarding land use planning. The first establishes a Land Study Bureau to describe all lands as a basis for determining their best uses. The second establishes Forest and Water Reserve zones regulated and administered by the Territory. The third establishes the Territorial

Planning Office (later the State Office of Planning) to prepare a long-range comprehensive plan to guide physical and economic development.

- 1957 - Eugene V. Roberts examines the forestry situation in the islands at the request of the Board of Agriculture. His report recommends implementing a program including a forest inventory, wood, utilization research, silviculture and related research, and watershed research. Subsequently, and encouraged by the Territorial legislation, the Forest Service and Territorial officials developed specific proposals for the desired programs. (Nelson, Robert E. 1989. The USDA Forest Service in Hawaii: The First 20 Years (1957-1977). USDA Forest Service General Technical Report PSW-111.)
- 1957 - USDA Forest Service experiment station established for forestry research in Hawaii; eventually becomes the Institute of Pacific Islands Forestry.
- 1950's - value of forest products in Hawaii is \$2 million, the value of sugar and pineapple industries output was approaching \$200 million annually; defense expenditures \$400 million. (Nelson, Robert E. 1989. The USDA Forest Service in Hawaii: The First 20 Years (1957-1977). USDA Forest Service General Technical Report PSW-111).
- 1957-1977 - Robert Nelson serves as Director of the USDA Forest Service Institute of Pacific Islands Forestry located in Honolulu.
- 1957 - Forest Resource Inventory begins and the resulting report "Publication of the Report Forest Resources of Hawaii -1961."
- 1959 - "Hawaii Timber Production Conference" is held and evolves into an annual forestry conference for the next 18 years (check this number).
- 1960 the Department of Agriculture and Forestry was reorganized and re-titled Department of Agriculture and Conservation.
- 1960 - Second annual forestry conference is organized jointly by the Honolulu Chamber of Commerce and the Hawaii Department of Agriculture and Conservation. The result was the report "A Wildland Research Plan For Hawaii" published by the Department of Agriculture and Conservation.
- 1961 - Hawaii State Land Use Law (Act 187, also called "The Greenbelt Law") is passed by the legislature. All lands in the state regardless of ownership are classified in one of three zones; The Conservation Zone, The Agricultural Zone and The Urban Zone. The boundaries of the Conservation Zone are based largely on the original Forest Reserve boundaries. The Department of Land and Natural Resources is assigned regulatory authority over lands in the Conservation Zone. State-owned lands in the Conservation Zone become the new Forest Reserves. (A fourth zone, The Rural Zone is added in 1963 (reference State of Hawaii Land Use Districts and Regulations Review).

- 1961 - Hawaii State Legislature passes The Groundwater Use Act giving the State Board of Land and Natural Resources (BLNR) broad powers and responsibilities to oversee, manage, and control all ground water uses statewide, including the authority "to regulate the use of ground water in areas designated by the board as being endangered or likely to become endangered by excessive or improper use."
- 1961 - The Division of Forestry is transferred to the Department of Land and Natural Resources (a reorganized agency that had been the Department of Public Lands).
- 1961 - Hawaii Forest Resource Inventory, a major project, is completed and a report published in 1963.
- 1962 - Forest Service Program is 1) Plan and accomplish an inventory of the forest resources (high-lighting timber potentials) of the Hawaiian Islands, in cooperation with the Hawaii 1957 Division of Forestry, 2) Provide (or help obtain) technical assistance to the Territory on forestry matters as occasions demanded, 3) Represent the State and Private Branch of the Forest Service in the Federal cooperative assistance programs with the Hawaii Division of Forestry, and 4) determine the need for research in the various aspects of forestry, and recommend, plan, and lead a broad program of research in cooperation with the Hawaii Division of Forestry and other agencies in the islands. (Nelson, Robert E. 1989. The USDA Forest Service in Hawaii: The First 20 Years (1957-1977). USDA Forest Service General Technical Report PSW-111).
- 1962 - First comprehensive statewide forestry plan State Division of Forestry and Institute of Pacific Islands forestry releases first modern era forest planning document "Multiple Use Program for the State Forest Lands of Hawaii". The program Is built around multiple use policy for the management and development of the renewable natural resources--water, timber, forage, recreation, and wildlife habitat--of State-owned forest lands. In addition it points the way for promoting forestry practices on private forest lands.
- 1962 - Report "A Program for Watershed Management Research in Hawaii Wildlands." (large PDF).
- 1961-1968 - Plantations of potential commercial timber species established in Waiakea forest reserve and Laupahoehoe forest reserve on the island of Hawaii.
- 1961 - Haleakala National Park on the island of Maui re-designated as a separate entity (formerly part of Volcanoes National Park, Island of Hawaii).
- 1963 - (updated in 1965) Legislative Reference Bureau publishes "Public Land Policy in Hawaii: The Multiple-Use Approach."
- 1964 the Board of Land and Natural Resources officially sets aside 9,939 acres of land on the Island of Kauai as the "Alakai Wilderness Preserve" for the expressed purpose to conserve native Hawaiian ecosystems.

- 1965 – 1972 - Major environmental laws enacted by Federal government, including The Clean Water Act, The Endangered Species Preservation Act (1966) Coastal Zone Management Act and the National Environmental Protection Act, placing many layers of regulatory controls and multiple agency jurisdictions on the use of land and water resources. Grants provided by the Federal government via these programs have a significant impact on policy and programs of the Division of Forestry and Wildlife. State agencies begin to work cooperatively with their Federal counterpart.
- 1969 - Hawaii is the first state to establish its own system requiring environmental impact statements when it passes the Hawaii Environmental Protection Act (HEPA). The preamble to HEPA states "The legislature finds that the quality of humanity's environment is critical to humanity's well being, that humanity's activities have broad and profound effects upon the interrelations of all components of the environment, and that an environmental review process will integrate the review of environmental concerns with existing planning processes of the State and counties and alert decision makers to significant environmental effects which may result from the implementation of certain actions."
- 1969 - State of Hawaii Land Use Districts and Regulations Review prepared for the State Land Use Commission (209 pages, extremely detailed and thorough document).
- 1970 - Legislature establishes the Hawaii Natural Area Reserve System (NARS).
- 1970 - Hawaii passes its own Environmental Protection Act (Act 132, Session Laws of Hawaii 1970 codified as, HRS Chapter 341). The Act creates the Office of Environmental Quality Control; The Environmental Center (Univ. of Hawaii); and the Environmental Council.
- 1970 – 1990 - Jurisdiction over water use, water quality and watershed management is fragmented among federal, state, and county agencies (Derrickson).
- 1971 - Forest Conservation Research Plan for the 70's is produced by DOFAW.
- 1973 - A Plan for Hawaii's Environment: A Report by the Temporary Commission on Statewide Environmental Planning prepared at request of Hawaii legislature. Addresses issue of "carrying capacity", and contains 200 suggested environmental policies and proposed amendments to 1970 Hawaii EPA Act HRS 341).
- 1973 Federal Endangered Species Act is passed. Hawaii contains nearly 30% of the federally listed Threatened & Endangered Species in the country.
- 1973 - The state Supreme Court rules in *McBryde vs. Robinson*, saying private entities have rights to use surplus water, but the state is the actual water owner. (from PDF History of Water in Hawaii by Ramsay Taum, Feb 16, 2006. www.wrrc.hawaii.edu/seminars/Wai-6perpage.pdf, Source: (www.hawaiibusiness.com/Hawaii-Business/April-2003/Hawaiis-H20-History/).

- 1974 - USDA Agricultural Stabilization and Conservation Service publishes Hawaii Rural Environmental Conservation Program State Program Handbook
- 1975 - Second comprehensive statewide forestry plan "A Program for the State Forest Lands of Hawaii 1975" At that time, only two Natural Area Reserves had been established; the 1949 Lava Flow (Island of Hawaii) and Ahihi-Kinau (Maui).
- 1976 - Hawaii Water Resources Regional Study Completed (multiple volumes).
- 1978 - The Hawaii State Plan passed by Legislature to provide a long range guide to influence the direction, rate, and timing of growth in the State signaling a policy of "growth management" in Hawaii's public policy (Derrickson). Focus of DOFAW gradually shifts towards the protection of endangered species and away from commercial forestry.
- 1978 - Constitutional Convention establishes a new water resources agency (State Water Commission) whose role was to protect, manage, and regulate water resources. The Con-Con also passed landmark amendments that constitutionally reaffirmed native Hawaiian traditional and customary practices.
- 1980 - The Nature Conservancy opens Hawaii office, although they have been active in biodiversity planning since the 1960s. The Hawaiian Forest Bird Campaign (1981-83) was the first land acquisition campaign of the Hawaii Office, and used recently completed comprehensive endemic forest bird surveys on all islands to identify high priority areas for acquisition.
- 1981- Working Conference on Forestry and Related Natural Resources of Hawaii, a two-day workshop, is produced by The University of Hawaii College of Tropical Agriculture and Human Resources (CTAHR). The resulting Final Report and Action Plan identify and prioritize issues and bottlenecks for managing ecosystem services provided by Hawaii's forests.
- 1985 - Third comprehensive statewide forestry plan "Hawaii Renewable Resources Research Plan for the Eighties."
- 1988 - Threatened and Endangered Species Plan for Wildlife, Plants and Invertebrates released by DLNR Division of Forestry and Wildlife.
- 1986 – Multi-resource Inventory of Oahu, Multi-resource Forest Inventory for Kauai and Multi-resource Forest Inventory for Molokai Completed (published in 1988).
- 1987 - The Hawaii Legislature adopts the State Water Code. The code establishes the state Commission on Water Resource Management (CWRM). (Source; PDF History of Water in Hawaii by Ramsay Taum, Feb 16, 2006; accessed 4/25/090 www.wrrc.hawaii.edu/seminars/Wai-6perpage.pdf (www.hawaiiibusiness.com/Hawaii-Business/April-2003/Hawaiis-H20-History/).

- 1989 - Hawaii Forest Industry Association founded to promote a balance of forest land uses, to represent forest industry and provide training information education and advocacy for Hawaii's \$29 million annual forest industry.
- 1987 - Enactment of the State Water Code sets precedence on the allocation of water with the shutdown of a plantation irrigation system. (hawaii.gov/hdoa/ag-resources/history).
- 1990 - The CWRM adopts the Hawaii Water Plan (HWP) for planning and resource management. (Source; PDF History of Water in Hawaii by Ramsay Taum, Feb 16, 2006). www.wrrc.hawaii.edu/seminars/Wai-6perpage.pdf =
- 1990's to 2010 - Sugar plantations close, and water usage drops dramatically.(Source; PDF History of Water in Hawaii by Ramsay Taum, Feb 16, 2006; (www.wrrc.hawaii.edu/seminars/Wai6perpage.pdf(www.hawaiibusiness.com/Hawaii-Business/April-2003/Hawaiis-H20-History/)).
- 1991 - First voluntary Watershed Partnership is established on East Maui with 7 partners and 4 associated partners, and encompasses 100,000 acres.
- 1991 – 2007 - Watershed Partnerships consisting of public and private lands are established on all major Hawaiian islands. By 2007, 1.6 million acres from nine watersheds are operating.
- 1992 - Hawaii Tropical Forest Recovery Act passed by Congress.
- 1994 - Fourth comprehensive statewide forestry plan "Hawaii Tropical Forestry Action Plan", (plus Appendices 1 and 2) are completed. Tropical Forestry Action Plan advocates for expansion of forest industry and establishment of Experimental Forest for Hawaii. The Hawaii Forest Industry maintains an excellent website for accessing the concepts, recommendations and action items in the Hawaii Tropical Forestry Action Plan.
- 1994 - Congressional Office of Technology Assessment releases a study documenting that five new plant species per year became established in Hawaii during the 20th century. For the 50-year period from 1937 to 1987, the Islands received an average of 18 new insects and other species annually; more than a million times the natural rate and almost twice the number absorbed each year by all of North America.
- 1994 - Hamakua Sugar Co. harvests last crop (September 30). www.hawaiibusiness.com/Hawaii-Business/April-2004/Unwanted-Dead-Or-Alive/. Accessed April 25, 2010.
- 1994 - Hawaii Forest Investment Memorandum is prepared by DLNR and Consulting Firm Groom Poyry and released by Dept. Business Economic Development and Tourism (DBEDT); released in an effort to stimulate investment in commercial forestry

in Hawaii.

- 1994 -1998 - (exact date unknown) Hawaii Forestry and Communities Initiative (HFCI) implemented with numerous projects, including inventory of commercial forestry resources, training, active recruitment of investors for forest industry.
- 1997 - Private, commercial eucalyptus plantations begin on former cane lands in Hamakua, Hawaii Island.
- 1998 - The Nature Conservancy completes the Hawaiian High Islands Ecoregional Plan.
- 1998 - Summary of Financial and Technical Assistance Programs for the Conservation of Natural Resources is produced for Hawaii Office of Planning. Comprehensive review of programs, laws, statutes and regulations relevant to natural resource conservation in Hawaii.
- 2000 - The Hawaii Supreme Court upholds CWRM's power to protect streams and traditional water rights in the Waiahole Ditch case (page 22). The court remands the case back to CWRM, with questions. (source; PDF History of Water in Hawaii by Ramsay Taum, Feb 16, 2006. www.wrrc.hawaii.edu/seminars/Wai-6perpage.pdf(<http://www.hawaiibusiness.com/Hawaii-Business/April-2003/Hawaiis-H20-History/>))
- 2002 - The Waiahole-Waikane communities, Hawaii's Thousand Friends and Kamehameha Schools appeal CWRM's final ruling, dividing Windward and Leeward water. The appeal is before the Hawaii Supreme Court. Kamehameha Schools (the second largest landowner after the state of Hawaii) withdraws a request to use 4.2 million gallons of Waiahole water daily on the Leeward side, citing its new strategic plan. (source; PDF History of Water in Hawaii by Ramsay Taum, Feb 16, 2006; www.wrrc.hawaii.edu/seminars/Wai-6perpage.pdf(<http://www.hawaiibusiness.com/Hawaii-Business/April-2003/Hawaiis-H20-History/>)).
- 2003 - The Hawaii Forest Institute is incorporated as a 501(c)(3) nonprofit organization to promote awareness of the intrinsic value of Hawaii's forests to the local and international community.
- 2003 - Hawaii Association of Watershed Partnerships (HAWP) is established. The Hawaii Association of Watershed Partnerships (HAWP) is comprised of nine Watershed Partnerships on six islands. Watershed Partnerships are voluntary alliances of public and private landowners and other partners working collaboratively to protect forested watersheds for water recharge, conservation, and other ecosystem services. HAWP seeks to increase the management and protection of such areas by raising the capacity of Watershed Partnerships, facilitating the sharing of watershed management knowledge, building public support and awareness of watershed values, and developing

sustainable funding sources.

- 2004 - The Hawaii Supreme Court issues its opinion In the Matter of Water Use Permit Applications, Petitions for Interim Instream Flow Standard Amendments, and Petitions for Water Reservations for the Waihole Ditch Combined Contested Case Hearing (www.state.hi.us/dlnr/cwrm/current/waiahole/24873.pdf).
- 2006 - Hawaii Gap Analysis Project (GAP) completed, resulting in detailed landcover maps, stewardship maps and analysis of gaps in lands required for the conservation of native species.
- 2006 - Office of Planning releases Report on Urban Lands in the State of Hawaii projecting the future needs for urban land expansion in Hawaii.
- 2006 - The Hawaii Conservation Alliance is formed, establishing a cooperative partnership of 15 government, education and non-profit organizations that are strongly committed to environmental conservation in the Hawaiian Islands through land management, scholarly research and financial incentives. The Hawaii Conservation Alliance is dedicated to promoting effective, long-term management of Hawaii's native ecosystems through collaborative research, training and outreach among land managers, scientists, educators and the general public. Currently, the HCA member organizations are University of Hawaii at Manoa, U.S. Department of Agriculture (The Natural Resources Conservation Service, and The US Forest Service), The National Park Service, The Hawaii Department of Land and Natural Resources (Division of Aquatic Resources and Division of Forestry and Wildlife), Kamehameha Schools, National Oceanic and Atmospheric Administration, The National Marine Fisheries Service, Pacific Islands Regional Office, The National Marine Sanctuaries, The U.S. Fish and Wildlife Service-Ecological Services and National Wildlife Refuge Complex, The U.S. Geological Survey, The Office of Hawaiian Affairs, The Nature Conservancy, and the U.S. Army Garrison Hawaii Natural Resource Program. These groups and organizations supervise and maintain over 80% of Hawaii's indigenous terrestrial ecosystems and 100% of Hawaii's marine reserves.
- Hawaii - 2050 Sustainability Plan is produced at the request of the Hawaii Legislature.
- June 2008 - Farm Bill requires that all States, Territories and Freely-Associated States produce a comprehensive analysis of forest conditions and trends; "Statewide Assessment of Forest Conditions and Resource Strategy" (SWARS) and submit the documents to the Secretary of Agriculture within two years (due June 18, 2010) in order to qualify for Farm Bill funds in a variety of competitive grant programs.