

Issue 4: Urban & Community Forestry

Overview

Tropical urban forests are complex ecosystems that provide a wide range of important functions that are invaluable to humans and native & non-native species in Hawaii. Urban forests provide essential green infrastructure for diverse lowland and coastal plant and animal communities. They are the first line of defense from catastrophic storms and inland water runoff that can deleteriously impact coral reefs and near shore marine ecosystems. These forests also reduce city temperatures by providing shade, provide temporary refuge for migrating birds and reduce air pollutants. Urban forests also play a contributing role to carbon storage and sequestration as they are home to the majority of parks in the state and they minimize the effects of climate change occurrences such as sea level rise and coastal erosion. These essential areas provide environmental, psychological and social benefits; as well as a dramatic and visual backdrop for Hawaii's greatest economic engine--tourism.

During November 4-5, 2009, the “Tropical Urban and Community Forestry Summit” was held. The purpose of the summit was to clarify urban forestry conditions, threats, trends, visions and strategies. The collaboration included “Kaulunani”, an urban forestry program of the Division of Forestry and Wildlife, the USDA Forest Service, the Friends of Hawaii's Urban Forest, and The Outdoor Circle. Forty-two participants from across the state and the Pacific shared insights on key urban forestry issues and priorities in Pacific urban and community forests. Their findings contribute to the outcomes reflected in this statewide Assessment and Strategies Report.



Figure 4.1 Kaulunani Council members convene with other urban forestry leaders at the Summit at the East-West Center in Honolulu. Photo courtesy of Heidi Bornhorst.



Hawaii's Kaulunani Urban and Community Forestry Program is funded by the USDA Forest Service and the Division of Forestry & Wildlife in Hawaii. Goals of this program are: to improve the understanding of the benefits of trees in urban areas and communities, increase tree canopy cover, reduce carbon emissions, conserve energy, improve air quality and increase other environmental benefits, support community tree planting and tree demonstration projects, support Arbor Day activities, enhance the technical skills and knowledge of the urban forest industry, and expand research and educational efforts. Kaulunani's Mission is:

Balance the urban and natural environment by encouraging, empowering and equipping the people of Hawaii to Malama the trees in our aina.¹

Since its inception in 1991, Kaulunani has awarded \$2.1 million to more than 400 organizations across the state in the form of cost-share grants, which were matched with \$6.1 million in cash and in-kind contributions. The key to the success of this program is the blend of partners, people, and projects. Project elements such as environmental change, advanced planning, leadership, volunteer commitment, community involvement, interagency partnerships, appropriate plant selection, proper horticultural procedures and maintenance are important indicators of successful urban forestry projects.²

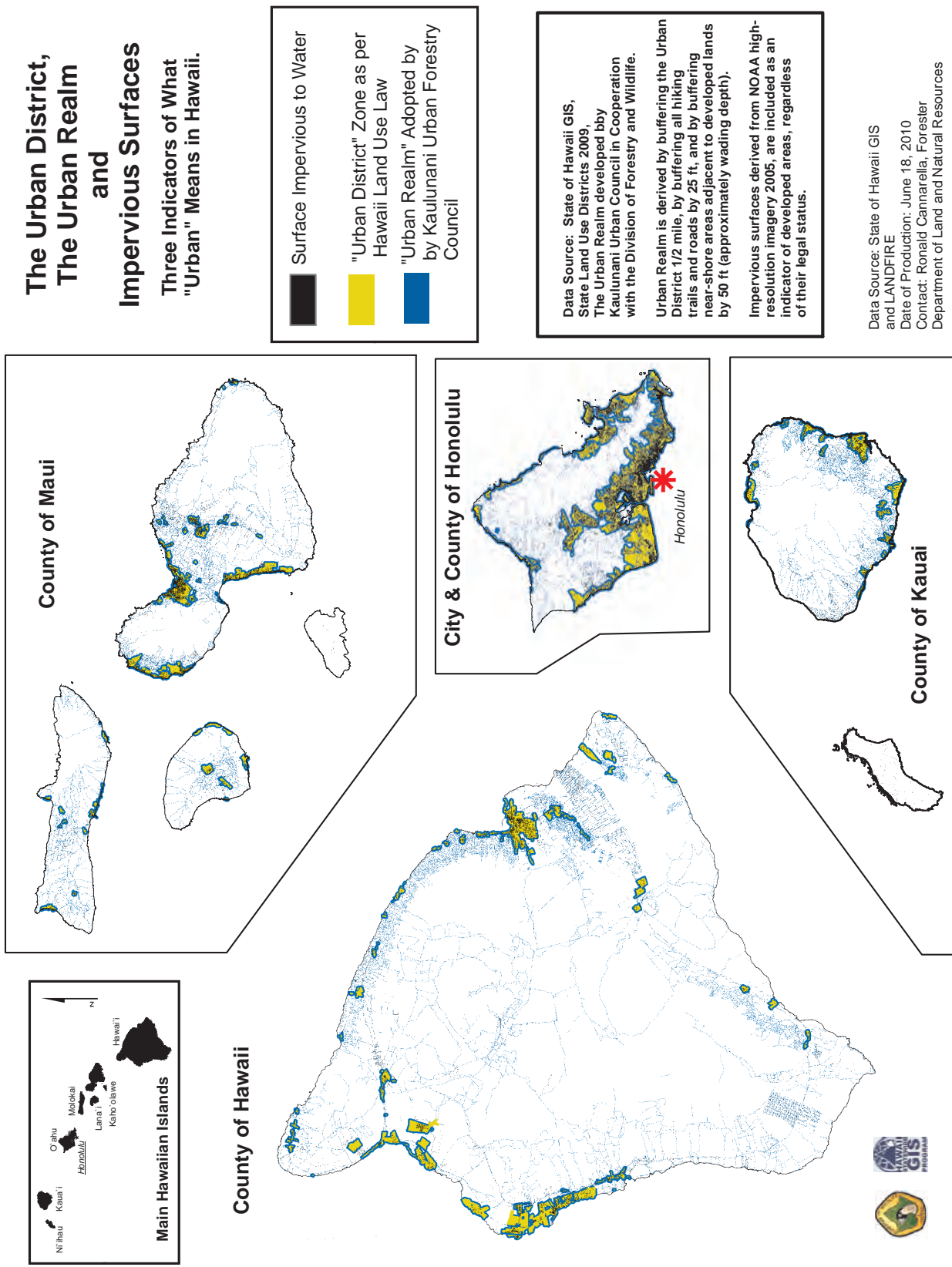
Kaulunani has grown from a program focusing primarily on tree planting projects and education, to one that engages in challenging topics such as invasive species control, the role of trees in shoreline protection and restoration practices, measuring the environmental benefits of street trees, and supporting chemical trials to control of the erythrina gall wasp.

Invasive Species Weed Risk Assessment Development Project

In 2001, Kaulunani hosted a gathering of urban foresters, botanists, conservationists and educators to discuss the relationship between invasive species in urban areas and those found in upland wild areas. This collaborative working group recommended an integrated course of action to reduce the negative impacts of invasive species on the native ecosystems. The Hawaii-Pacific Weed Risk Assessment (HP-WRA) was developed with the intent of identifying plants that pose a high weed risk in Hawaii and on other Pacific Islands. By the time this urban forestry project was completed in 2004, more than 600 plants had been analyzed and given a weed risk score. Presently, the HP-WRA is widely used and recognized as one of the primary measurement systems predicting invasive plant probability across all ecosystems in Hawaii. (See Issue 2: Forest Health: Invasive Species, Insects and Disease for additional information.)

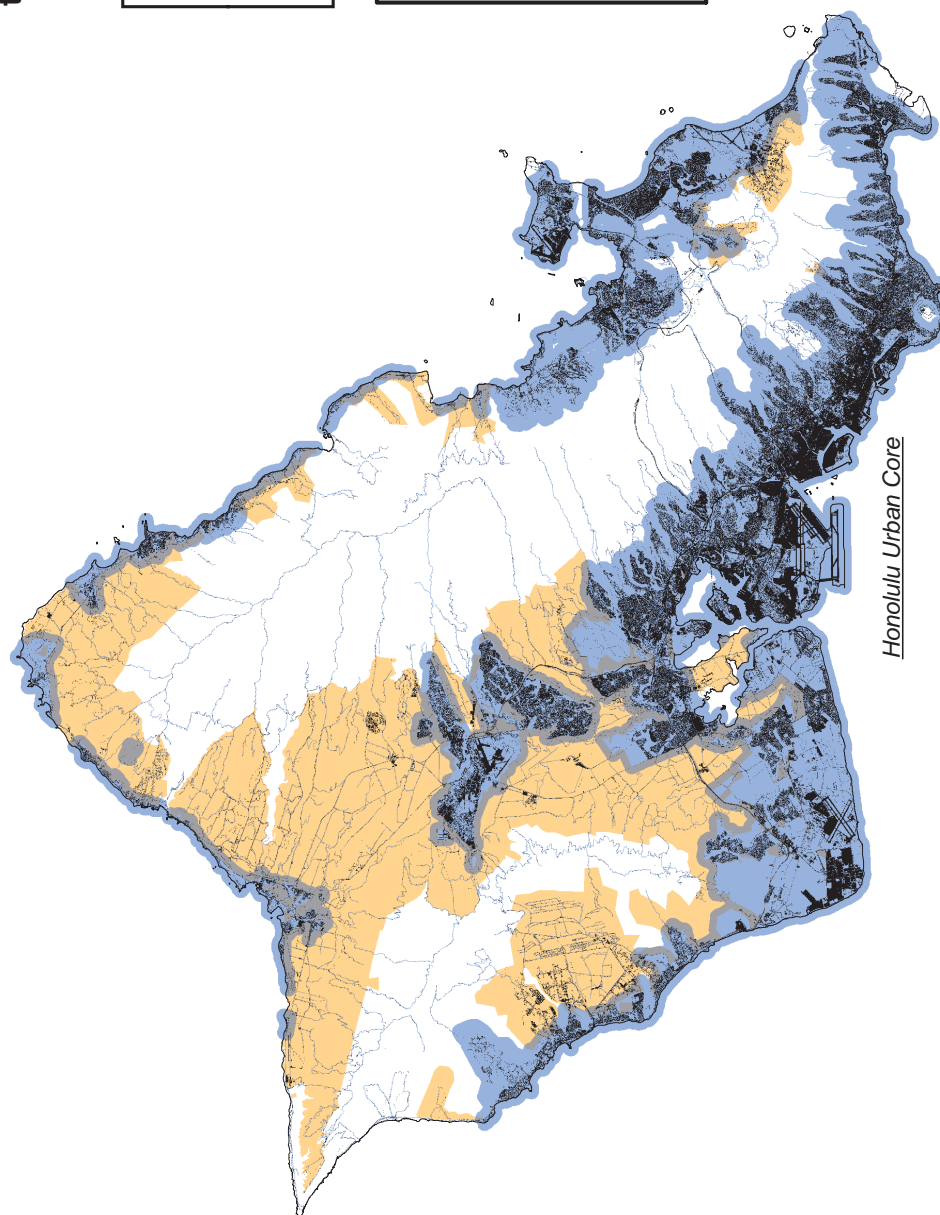
Hawaii's Urban Realm/Priority Areas

Urban forestry is about tree management in any area influenced and utilized by the urban population.³ Islands ecosystems are more dramatically and intricately connected than those on



Map 4.1. The Urban Realm in Hawaii.

Urbanized Areas and the Agricultural District Island of Oahu



Impervious Surface

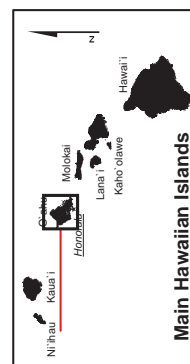
Hawaii's Urban Realm

Land in the Agricultural District

Data Source: State of Hawaii GIS, State Land Use Districts 2009, The Urban Realm developed by Kaulanani Urban Council in Cooperation with the Division of Forestry and Wildlife.

Urban Realm is derived by buffering the Urban District 1/2 mile, by buffering all hiking trails and roads by 25 ft, and by buffering near-shore areas adjacent to developed lands by 50 ft (approximately wading depth).

Impervious surfaces derived from NOAA high-resolution imagery 2005, are included as an indicator of developed areas, regardless of their legal status.



Main Hawaiian Islands

Data Source: State of Hawaii GIS

Date of Production: June 18, 2010

Contact: Ronald Cannarella, Forester

Department of Land and Natural Resources

Map 4.2. Map of the island of Oahu showing impervious surfaces including roads and buildings; the urban realm where people live, work and play; and the Agricultural District.

continents. Because of these tight connections, integrating urban forest issues into landscape and island-wide management efforts are necessary. The importance of the urban environment was echoed by partners and stakeholders stating that “*urban forest stewardship is critical to our forests and reefs*”.⁴ Map 4.1 depicts the Hawaii Urban Realm; that area that urban forestry will focus. Map 4.2 depicts the urbanized areas and the agriculture lands on Oahu. These close proximity areas are one of the many reasons that urban forestry must be considered when prioritizing land management on other parts (upland and lowland resources) of the island.

Benefits

Urban forests, whether public or private, offer a multitude of benefits. Research indicates that healthy trees can decrease negative impacts of urbanization while improving human health. Trees and plants buffer wind and noise, and generally are recognized as positive influences on health and well being. Trees are one of the natural world’s most efficient multi-taskers. Trees can reduce energy costs, cool “heat islands” by providing shade, sequester carbon, trap pollutants, and slow storm runoff. The right tree in the right place can provide beauty, a shady place to shelter from the sun, food, soil stabilization, increase property values, conservation and cultural benefits.



Figure 4.2, Monkey Pods, *Samanea saman*, are a staple in urban forests & provide significant

In 2006, Kaulunani funded an assessment of Hawaii’s urban trees utilizing the Street Tree Resource Analysis Tool for Managers (STRATUM) to gather baseline data on benefits of urban trees in tropical settings. Using STRATUM in The City & County of Honolulu Municipal Forest Resource Inventory, data from 43,817 street trees were analyzed by the Center for Urban Forest

Research, Pacific Southwest Research Station. Hawaii's urban trees were found to provide extensive environmental benefits. For example the annual environmental benefits were calculated at \$90 per tree, and provide \$2.98 in benefits for every \$1 spent on tree care. The replacement value of urban trees was calculated at \$1,665 per tree.⁵ The report identified benefits such as electricity savings and climate effects, carbon storage, air pollution removal, and rain interception. A summary of the environmental benefits of trees in Honolulu are found in Table 4.1.

Table 4.1: A summary of the environmental benefits of trees in Honolulu

Benefit	Value
Electricity saved from shading & climate effects	\$343,356 or \$8/tree
Carbon storage	25,529 tons
Air pollution removal (ozone & sulfur dioxide)	21,441 lbs. or \$32,175
Rain interception – reduce runoff by 35 million gallons per year	\$350,104
Annual total benefit	\$3.9 million or \$90/tree
Based on 43,817 street trees	

Present Conditions of Hawaii's Urban Forest

Human Population and Urbanization

Hawaii is approximately 4.1 million acres in size distributed over the main islands of Kauai, Oahu, Maui, Hawaii, and several smaller islands; Lanai, Molokai, Niihau, and the unpopulated Northwestern Hawaiian Islands. According to the July 1, 2009 census data, the State of Hawaii had a total resident population of 1,295,178 people and an average daily de facto population of 1,388,605 people. The de facto population is defined as the number of persons physically present in an area, regardless of military status or usual place of residence; it includes visitors present but excludes residents temporarily absent.⁶

Hawaii's population is concentrated in the Honolulu Urban Core on the island of Oahu, and the other Counties are primarily composed of small towns and rural communities. Table 4.2 shows the average daily de facto population in the State in 2008.

Table 4.2 shows the average daily de facto population in the State in 2008

Year	State total	City & County of Honolulu	County of Hawaii	County of Kauai	County of Maui
2008	1,388,605	934,262	192,691	80,054	181,598

Land Use

In Hawaii 48% of all land is zoned for conservation, 47% is zoned agriculture, and 5% is zoned urban. However, urbanization is occurring at a rapid pace on non-urban zoned lands across the State. Development and urbanization without conserving and planting trees contributes to many environmental issues including a decline in the quality and quantity of water, increases in erosion, pollution and sedimentation of coastal watersheds and damage to the near shore reefs. Poor development practices have resulted in the increases of impervious surfaces, which added to waste management issues. De-vegetation, top soil erosion and soil compaction has lead to more frequent flooding. Population growth and increased housing demands heavily impact existing resources resulting in pressure to change current zoning. In fact, the percentage of population (53%) living in coastal areas and the rising number of predicted high intensity storms has created highly vulnerable coastal areas.

Coastal Readiness Project

Effects from the devastating tsunamis in the Indian Ocean showed that coastal communities with high tree density and appropriate species selection were not only more defensible to intense storms, but also more resilient. The disaster resulted not only from these tsunamis but also from the lack of coastal area preparedness for storm events. This prompted Kaulunani to assemble a committee of experts to investigate the issue in Hawaii. The committee included



Figure 4.3 Ironwood Trees, *Casuarina equisetifolia*, line Hawaii's shoreline on many beaches. Photo courtesy of Teresa Truman-Madriaga.

the Pacific Disaster Center, the University of Hawaii Civil Engineering and Tropical Plant and Soil Sciences Departments, arborists, landscape architects, Louisiana State University Department of the Coast and Environment, and the University of Florida. Phase One of this project was a global literature review of the role of vegetation and engineered defenses in coastal areas for the protection of people against tsunamis, hurricanes, cyclones and typhoons. This lead to a comprehensive report and database entitled, "The Protective Role of Natural and Engineered Defense Systems in Coastal Hazards:

Effectiveness of Vegetation for Mitigating the Coastal Impact Due to Storm Surges, Hurricanes and Tsunami," completed by Spatial Information Group LLC.⁷ Phase Two focused on the investigation of the existence and arrangement of vegetation in several coastal areas in Hawaii and in Samoa after their recent tsunami in 2009. This information will be used to gain an understanding of the effects of vegetation on the reduction of ocean wave run-up, inundation and overall coastal vegetation resiliency.

Water Issues

Most polluted runoff results from human activities on the land and in the water. Polluted runoff is the greatest threat to Hawaii's surface and ground water quality, which make it unsafe for drinking, swimming, fishing, wildlife and other recreational uses. Polluted runoff, or non-point source pollution, results from storm water or irrigation water washing pollutants off the land—from farms, urban areas and construction sites—into streams and coastal watersheds and waterways.⁷ Roads, buildings and parking lots prevent rain water from soaking into the ground. This increases the volume and speed of water runoff, increases erosion and washes pollutants through storm drains into streams and eventually into the ocean.⁸

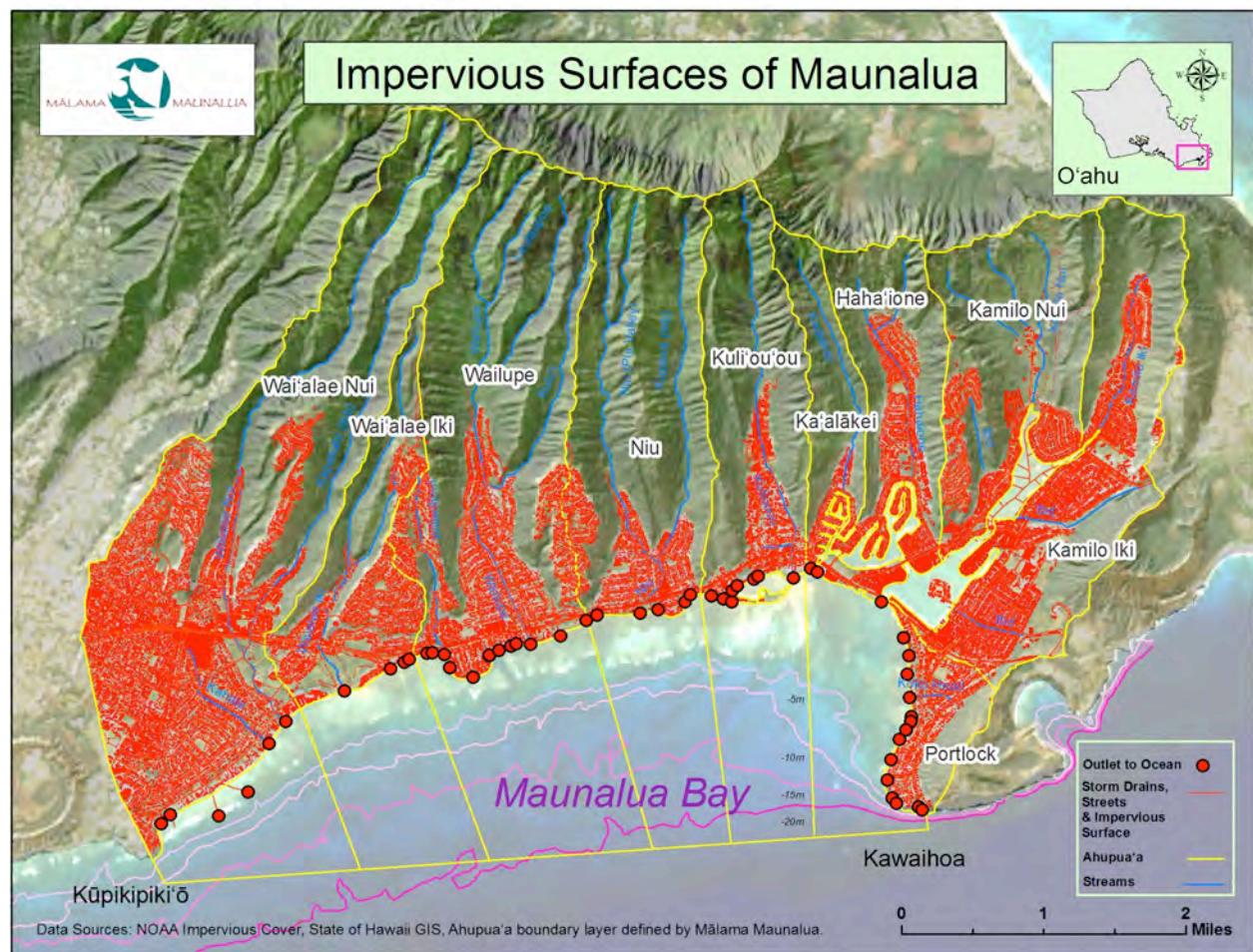


Figure 4.4 Impervious cover in the urbanized region of Maunalua located in East Oahu. These surfaces, including streets, drainage canals, parking lots, driveways and rooftops cause excessive overland water flow into nearshore aquatic ecosystems. This decreases vegetation and groundwater percolation areas where water uptake and filtration occurrence restores hydrologic function of the urban watersheds of Maunalua. Map courtesy of University of Hawaii, Sea Grant Extension Program.

Invasive Species

The Hawaiian Islands are at risk from imported plants, insects and diseases. It is estimated that 10,000 plant species have been introduced in Hawaii, 200 of which have become environmentally harmful. Many more species worldwide could potentially become harmful if they are allowed to be introduced. Ninety-one percent of the invasive species found in the forest were intentional introductions to Hawaii.⁹ (See Issue 2: *Forest Health: Invasive Species, Insects and Disease* for additional information.) Introduced pests and disease can cause devastating effects on upland/rural and urban trees. Recently, widespread death of *Erythrina* spp. (Wiliwili) trees was caused by the Erythrina gall wasp, a tiny insect that was only recently discovered. The wasps have created one of the most serious epidemics ever caused by an invasive species in Hawaii, and thousands of trees throughout Hawaiian forest have been victims of these tiny insects.¹⁰

Chemical Trials for Erythrina Gall Wasp Management Project



Figure 4.5 Erythrina gall wasp damage

The erythrina gall wasp was first detected in Hawaii on Oahu in April 2005. The insect quickly spread throughout the state infesting *Erythrina variegata*, *E. sandwicensis* and *E. cristagalli*. Extensive damage occurred throughout the state, including in urban and natural forests. Little was known about controlling this pest. The University of Hawaii (2007)¹¹ along with collaborative partners from the Department of Agriculture, the Department of Land and Natural Resources, and the USDA Forest Service conducted trials using different cultural and chemical treatments to control the gall wasp. Figure 4.5 shows damage from the erythrina gall wasp. The study found that there was not one perfect solution and all of them have advantages

and drawbacks. Injecting trees to inoculate them successfully required practice and was difficult to duplicate from tree to tree. Trenching showed little or no effects. The work to determine longevity of treatments and to improve reliability of treatment results following trunk injections is ongoing.

Urban Forestry Tree Health & Best Management Practices

Hawaii's urban forest has a mixture of young and mature canopies. Like most cities there is a mixture of established new community developments. Some newer urban areas have a limited number or are devoid of trees. Frequent tree damage problems include topping, trimming, poisoning of street trees, charcoal damage to park trees, and asphalt or concrete proximity damage to root systems. Tree maintenance does not always follow the American National Standards Institute (ANSI) standards.¹¹ On a positive note federal and state contracts have

adopted the City and County of Honolulu's tree specifications that require qualified arborists to supervise tree work on military bases, along state highways, and on state property.¹²

Tree Inventories

There are no active inventories, other than at Schofield Army Base, in any Hawaiian county to measure or monitor tree health, form, structure and public safety.

Tree Assessment

There is no active assessment of the urban forestry canopy and there is an over dependence on a limited tree palette.

Tree Best Management Practices

Generally, some Best Management Practices have been implemented but are inconsistent with poor application in both the public and private sector.

Public Relations and Education

There is no overall marketing initiative regarding increasing an awareness of trees and the benefits that they provide. Urban forestry activities are celebrated on Earth Day and Arbor Day, are well received, and include public, private and nonprofit partners.

Cultural Respect for Trees

The cultural respect for trees is an important social norm in tropical areas. In many tropical areas forests provide not only food and shelter but also form an integral part of cultural and spiritual traditions¹³ The use of native trees and culturally important trees in urban areas has not been promoted, although state legislation is in place that requires the planting of natives around public buildings whenever possible. There is also a lack of integration of tribal knowledge relating to urban trees and a need to develop a culturally appropriate strategy for restoring balance.

Threats & Concerns in the Urban Forest

The threats to the urban forest are extensive. Table 4.3 highlights threats and concerns from Council and stakeholder discussions and ties them to the Forest Service National Themes.



Figure 4.6. Winning poster representing Hawaii in the 2009 National Arbor Day Poster Contest. Artist 5th grade student from Mililani Mauka Elementary School.

Table 4.3 Threats and Concerns to Urban & Community Forestry Linked to National Themes	
Threats & Concerns (Multi-state issues are identified with **)	Forest Service National Themes
Best Management Practices - Tropical Urban Forestry	
• Overdependence on limited plant palette - monocultures**	1.2
• Treeless communities = reduced ecosystems benefits**	2.2
• Poor tree trimming = increased accidents or failure**	3.4
• Increased impervious surfaces = more heat islands**	
• Lack of knowledge about the urban forest canopy**	
• Lack of research on best tree species for tropical urban areas**	
• No working inventory used by any county to measure or monitor tree health, form, structure and public safety**	
• Inadequate tree replacement policies**	
• Low staffing & funding	
• Staff qualifications	
• Tree protection	
Climate Change	
• Increase in number and intensity of tropical storms **	1.1
• Decrease in water quality and quantity**	3.1
• Salt water intrusion in drinking water supplies**	3.5
• Inundation of wastewater treatment infrastructure	3.7
• Coastal sea level changes**	
• Increases in temperature = tree line changes, mosquito range increases, hyper evolution of species adapted, fecundity changes, etc.	
• Other as yet unknown impacts	
Coastal Zone	
• Shoreline erosion**	1.1
• Development and urbanization has increased in coastal areas, escalating the potential for significant shoreline damage and loss of life should storms occur	1.2
• Impacts of hazards on social groups such as homeless when storms occur as well as the ability to recover	2.2
Economics	
• Decline in tourism	
• Increase in fuel costs	
• Inadequate funding sources and rely too heavily on federal funds**	

Table 4.3 Threats and Concerns to Urban & Community Forestry Linked to National Themes	
Threats & Concerns (Multi-state issues are identified with **)	Forest Service National Themes
Education and Culture	
• Lack of awareness of the value of urban trees**	3.6
• Loss of indigenous knowledge**	
• Trees as source of food	
Funding	
• Lack of funding results in inadequate tree care, planning and missed opportunities at state and county levels	
Human Health	
• Concerns with food security including marine productivity	3.1
• Population increases	3.2
• Poverty**	3.3
• Oil Scarcity	3.7
• Genetically Modified Organisms	
Invasive Species	
• Continued use of invasive species in the urban landscape	2.2
• Concerns of new urban forest pests and ability to quickly respond	
• Codes of Conduct not widely used or accepted	
• Lack of understanding regarding pathways for tropical invasive and exotic species**	
Policy & Planning	
• Legislation for parking lot trees needs to improve	
• Agency inconsistencies	
• Lack of planning relating to urbanization and population increase	
• Land use trends	
• Concerns with continued use of impervious surfaces	
• Need for local and regional ordinances to implement comprehensive land use plans **	
• Need for GIS tree inventories, assessments, and mapping to reflect composition and baseline values**	
• Need for more tree planting or demonstration projects	
Urban Sprawl	
• Demands for urban sprawl influence land use policy and degrade ecosystem services	

Table 4.3 Threats and Concerns to Urban & Community Forestry Linked to National Themes	
Threats & Concerns (Multi-state issues are identified with **)	Forest Service National Themes
• Loss of Agriculture lands	
• Land use trends	
Watershed/Water Issues	
• Urban is not an active partner in <i>ahupuaa</i> management	
• Dedicate resources to address priority watersheds	
• Need to address sediment and polluted runoff, work to increase pervious surfaces**	
• Poor water quality	
Wildfire	
• Wildfire Fuels - grasses	2.1
• Urban / wildland interface concern with fuels and fire	

Trends & Opportunities

There is growing local and national support for increasing the urban forests efficiency in the infrastructure. Fortunately, the trend in Hawaii is towards adopting a 21st Century *ahupuaa*: A culturally appropriate and biophysical paradigm for restoring balance and sustainability to our communities. The wisdom of our native Hawaiian ancestors, coupled with technological innovations of today, will make our islands sustainable for the future.

IslandAbility—Living Pono

The need for Hawaii to be more sustainable and the urban forestry industry to be more proactive has been echoed throughout the industry. The subcommittee of the Urban & Community Forestry Council that was established to focus on this Statewide Assessment labeled the effort “IslandAbility” which echoes Living *Pono*. *Pono* is one of the values that we have embraced from the native Hawaiians that stresses living right with the land and the sea, living in harmony with each other, being sustainable, having a good quality of life and having prosperity. The name “*Hawaii*” itself means breath, water and creative energy.

Green Movement

There is increased public interest in the green movement, ecotourism and awareness of the environment. This creates an opportunity for urban forestry to link to the visitor industry. Funding for urban forestry projects could be attained through federal, state and local sources such as Hawaii Tourism Authority, Livable Communities grants, U.S. Forest Service, Department of Transportation (DOT), Department of Housing and Urban Development (HUD), and Environmental Protection Agency (EPA) grants. Hawaii could consider incorporating biofuels, vertical landscaping, green roofs, use of permeable surfaces, and increased use of native

species and non invasive plants. New legislation could be considered such as Complete Streets and Sustainable Transportation. Construction ordinances with mandatory pervious surfaces, revised and updated landscape ordinances, and stormwater management legislation should be enacted. Urban development, and land use trends (changes in the use of agriculture lands) combined with the economic crisis and a heightened awareness of environmental issues could lead to more support for the effective use of trees and innovation in the landscape.

Water

Water is a primary factor in regards to aquifer and well recharge, smart channeling, reef health and other environmental concerns. Water quality and quantity are all affected by urbanization. Using trees in urban area can positively affect all of these factors.

“Urban trees and forests are considered integral to the sustainability of cities as a whole. Yet sustainable urban forests are not born, they are made. They do not arise at random, but result from a community-wide commitment to their creation and management.”

Quote from “A Model for Urban Forest Sustainability” Jim Clark, et.al.¹⁴



Figure 4.7. Hawaii stream, just above, or mauka of residential area.

Priority Areas and Issues

The following represent priority landscapes and issues identified by the Kaulunani Council in collaboration with representatives from our Pacific Island colleagues, partners, and stakeholders at the Tropical Urban Forestry Summit held in Honolulu on November 4-5, 2010.

Spatially Explicit Priority Issues

1. Urban, rural and agriculture zoned lands
2. Buffer zones - including trails into uplands and marine areas
3. Canopy assessment data
4. Urban/coastal zone interface
5. Future urban development
6. Highly polluted bays overlapped with prime tourism destinations
7. Impermeable surfaces
8. Invasive species in the urban/wildland interface as a point of entry
9. Priority Watersheds: most impacted; most pristine; those within a certain area (not upland ones)
10. Stream channels that run through urban realm
11. The Wildland/Urban Interface (WUI)
12. Non geospatial priority issues
13. Improve best management practices for the tropics
14. Emphasize cultural aspects of urban trees
15. Improve economic stability & create green jobs
16. Focus on creating a sense of place such as the Lei of Green concept
17. Increase the emphasis on public awareness, education and outreach
18. Examine, revise and implement tree ordinances & guidelines
19. Improve policies and planning
20. Conduct exploratory and baseline tropical urban forestry research
21. Advance quality of life issues by demonstrating the benefits of green infrastructure

Needed Tropical Urban Forestry Research, Gaps & Opportunities

1. Tropical Urban Forestry Research
2. The need for research on tropical urban forests was noted not only in Hawaii, but also at the Tropical Urban Forestry Forum in Puerto Rico in 2008. The resulting report advised the Forest Service to support research and technology transfer by developing a tropical urban forestry strategic plan.
3. A model for island-wide land use plans.
4. Research at the local level.
5. Standardized tropical nursery standards and inclusion of all tropical islands in the Forest Service Inventory.
6. Strategies to share research across disciplines and networks.
7. Assess the urban canopy and identify the environmental benefits of trees.
8. Inventory the number and tree species in the tropical urban forests.

9. Identify examples of green infrastructure for island ecosystems.
10. Assess tropical root structures and benefits.
11. Assess environmental benefits of urban trees across the state.
12. Research important maintenance needs for tropical urban forests.
13. Develop alternatives to minimize risks associated with monocultural landscapes and buffering critical root zones.
14. Identify the entities in Hawaii working on sustainability and identify where there is an overlap with urban forestry.
15. Map the historic path of devastating hurricanes, floods, tsunamis, and storm surges and you will also find some of the fastest growing communities.
16. Identify the type of tropical urban forestry research needed. Such as: recommended tree species for the tropical urban forests; examples of good green infrastructure for island ecosystems; Roots structures and benefits for storm runoff; an Urban Forest Effects Model including assessment of the entire tree benefits across the state and a canopy assessment; information on trees; identification of a numerical target for forest cover; and a model for energy savings based on the cooling and shade that trees provide.
17. Map invasive species through the urban communities, and point of entry.
18. Examine and revise policies, ordinances, and best management practices across the state.
19. Create urban forest management plans at the county and state levels.
20. Create a better understanding of green infrastructure in tropical urban environments.

Maps to identify:

1. Invasive species in the urban/wildland interface
2. Urban/watershed impacts
3. Urban/coastal impacts
4. Canopy assessment
5. Exceptional trees
6. Historic path of devastating hurricanes, floods, tsunamis, and storm surges with communities especially the fastest growing communities.
7. Identify the true economic and social costs of not implementing green infrastructure practices (including the cost in pollution, lost visitor dollars, etc.).

Summary

Hawaii's trees are a dynamic resource. Tropical urban forests have a critical role to play in island communities. Using trees as green infrastructure in the watershed addresses water quality and quantity, reduces storm run-off, cools "heat islands" by providing shade, and improves human health. The need for Hawaii to be more sustainable and for the urban forest industry to be more proactive has been voiced. A number of issues that are of highest concern include: the importance of measuring the tree canopy; the need for tropical urban forestry research; the need to educate the community about trees and gain their support; the lack of the use of trees and vegetation to intercept and catch water; and, the need to update the infrastructure using tested tools such as green roofs, permeable paving, bioinfiltration and rain gardens, drainage swales, and naturalized detention basins. Coupled with these concerns are worries about loss of

agriculture lands and food security, the number of communities without trees, the lack of basic tree inventories and canopy assessments, and a lack of a plan to achieve these goals collaboratively. This assessment and the strategy provide the road map.



Figure 4.8. This Monkey Pod Tree (*Samanea saman*) is one of Hawaii’s nationally recognized “Exceptional Trees” at Moanalua Gardens. Photo courtesy of Kevin Eckhart

Strategy Matrix for Issue 4: Urban & Community Forestry

Strategies for Issue 4: Urban & Community Forestry

The Hawaii Urban & Community Forestry Program (Kaulunani) recently updated its Strategic Plan incorporating input from a number of stakeholder meetings, including the Urban Forestry Summit held in Honolulu in mid 2009. Representatives from various Hawaiian professional groups and agencies attended this summit; as well as number of people from the Federated States of Micronesia and the Commonwealth of Mariana Islands. The strategies and priority landscapes identified below strive not only to define issues and spatial priority areas related to urban forestry issues in Hawaii, but they also demonstrate those vulnerable areas that are also corridors for invasive species from many entry points in these islands. Urban areas simply cannot be held to the same standards that other areas are held to. Urban areas are the most vulnerable, and the most human populated, and the most impacted of any areas & ecosystems in Hawaii. It is important to note that many of the issues portrayed below are highlighted in most of the other US Pacific and US Caribbean Island Assessments and Strategies. Please see the Reference Section pertaining to the US Tropical Islands for more details.

Urban and Community Forestry: Improve Spatial & Vegetative Understanding of HI Urban Forests Through Technology						
Long Term Strategy	Priority Landscape Areas	Secondary Issues Addressed	Program Areas that Contribute	Key Stakeholders	Resources Available & Partners	Measures of Success
1) Acquire the "Urban Canopy Assessment & Inventory" from UV/USFS; used with local existing satellite & LiDar imagery	See State-Wide Urban Realm Map	Partner on imagery & get it utilized more by urban groups; carbon credit programs; stimulate use of (UFORE, STRATUM), UH Blue Line	HI Counties, FSCG, U&CF grants, UH, City of Honolulu Arborists, C&C, AAA, CZM	Counties, State Utility Companies, private landowners, DOD, DOT, Na Ala Hele, DAR	TNC, State & National Parks, Non-profits, Friends of Urban Forests, HCA, HFIA, HISC, CGAPS, Friends, SOPAC, HARC, SAF, HFIA, FSCG	Define vegetation imagery at a micro & macro-scale; Impact growth of Kapolei?; Education efforts focus on city planners & policy makers; Impact how \$ is spent.
2) Establish a tropical urban & community forestry research center (virtual / internet based is a real potential)	Global tropical island impact potential.	Tropical island research, conservation technology & education integration; Children's Forest	FSCG, U&CF, SPREP, CZM, NOAA, F&WS, NRCS, HFIA, AAA, PSW, Forest Service, HARC	HI C&C Gov., UH, US & International Pacific Islands	PSWRS, UH, Arboretums, Botanical Gardens, Non profits, FHUF, FAO, SPREP, SPC, Friends, SPOAC, HFIA, SAF	Research strategic plan completed; protective mechanisms in place in more islands across Pacific; political impact/money, more biocontrols.
3) Take advantage of existing imagery / previous efforts to examine specific areas of interest	See State-Wide Urban Realm Map – likely a highly motivated community.	Partner on imagery & get it utilized more by urban groups; carbon credit programs; stimulate use of (UFORE, STRATUM), UH Blue Line	HI Counties, FSCG, U&CF grants, UH, CHA, Any county not included in #1, AAA	Counties, State Utility Companies, private landowners, DOD, DOT	TNC, State & Nat. Parks, Non-profits, Friends, HCA, HFIA, HISC, CGAPS	Define vegetation imagery at a micro scale; have a REAL impact on policy decisions at the local scale.
						Supports National Objectives 1.2 3.4 1.1 1.2 2.2 3.1 3.2 3.4 1.1 1.2 2.2 3.1 3.2 3.4

Strategies for Issue 4: Urban & Community Forestry

Urban and Community Forestry: Local, Regional, National and International Outreach							
Long Term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Program Areas that Contribute	Key Stakeholders	Resources Available & Implementing Partners	Measures of Success	Supports National Objectives
1) Develop, introduce, implement and integrate the HI State-wide Environmental Literacy Plan with other Pacific CE plans.	Industry, School Age Students, Public, and Tourists	Learn about climate change issues & mitigation technologies elsewhere in the Pacific.	UCF, CE, FSCG, HI Counties, FSCG, U&CF grants, UH, C&C, AAA	Practitioners, scientists, non profits, governments, Hawaii Tourism Authority	Use UCF grant for inventory. Private/stakeholder donations, SOPAC, YCC, DOFAW EE, HFIA, SAF, FSCG, HEEA	Execution, dissemination and or Implementation of the State ELP. Sink actions with the FSM Micronesian Challenge. Take any CE plan to the next level.	1.2
							2.2
2) U&CF management plans for all major cities in Hawaii.	All Hawaii counties	Identify plans, policies, ordinances, rules and laws impacting Hawaii's urban forest, sink actions with the Micronesian Challenge.	UCF, CE, FSCG, HI Counties, FSCG, U&CF grants, UH, C&C, AAA	Public, policy makers, county parks, county arborists county planning, practitioners	Counties, non-profits, UCF funds, University, SOPAC, HARC, HFIC, FSCG	UCF management plan template developed and implemented;	2.2
							3.4
3) Discuss new BMP's with EPA as they affect parks and public lands so they can- mitigate environmental impacts of urbanization.	Watersheds, areas with high impervious surfaces.	Base line research for tropical low impact development tools; Future plans, resource agency BMP updates.	Watershed, DOFAW, UCF, HI Counties, FSCG, U&CF grants, UH, City of Honolulu Arborists, C&C, AAA	Counties, watershed partnerships, University, USACE	Watershed partnerships, use UCF funds, University CTAHR, Counties, non profits, SOPAC, FSCG	New standards for low impact development developed; develop new BMP's for urban areas such as grating standards or 'green' LEED development.	2.2
							3.1
4) Children's Forest	Statewide	Invasive spp. control. Hunting vs. native spp. devastation.	UCF, CE/EE, FSP, FH	Private landowners, UCF, FSCG, HISC,	ELP, SAF, HFIA, HCA, TNC		3.1 2.1 3.4
5) Demonstration urban-watershed project	Id partners, project site and urban watershed.	Collaboration with watershed partners.	U&CF, watershed partners	UCF, watershed partners,	Watershed partners, UCF to fund trees	Template for urban-watershed projects.	3.1 3.4 3.6

Strategies for Issue 4: Urban & Community Forestry

Urban and Community Forestry: Climate Change, Coastal Watersheds & Carbon Sequestration							
Long Term Strategy	Priority Landscape Area(s)	Secondary Issues Addressed	Program Areas that Contribute	Key Stakeholders	Resources Available & Partners	Measures of Success	Supports National Objectives
1) Mitigate impacts of invasive species from the urban forest on native ecosystems.	Urban invasive species outbreaks in the urban & upland areas, industrial areas, ports, nurseries & botanical gardens.	More native and non-invasive plants in trade; grower rewards.	State, U&CF, competitive grant	Private nurseries, UH, colleges, botanical gardens, ASLA, DLNR, DOFAW, HI Invasive Species Committee	State, federal, UH, CGAPS, Use UCF grant for inventory. Private/stakeholder donations, SOPAC, YCC, DOFAW EE, HFIA, SAF, FSCG	Mapped invasive species in urban/wildland interface.	2.2 3.6
2) Use trees as a tool to mitigate the effects of sea level rise.	Vulnerable urban forest areas based on sea level rise.	Tree species in coastal area, urban planning, research hypotheses development.	UCF, Coastal, western competitive grant	State, County, U&CF	State - Office of Conservation and Coastal Lands, UCF funds, FSCG	Vulnerable areas and appropriate coastal tree species.	3.4 3.6 3.7

Acronyms Used:

1. CZM – Coastal Zone Management
2. OHA – Office of Hawaiian Affairs
3. C&C – City & County of Government of Hawaii
4. AAA – Aloha Arborists Association
5. NARF – Natural Area Reserve Fund
6. Friends – Friends of Urban Forests
7. FRS – Forest Reserve System
8. DOFAW – EE – Environmental Educational
9. HARC – Hawaii Agriculture Research Center
10. LLCF – Legacy Land Conservation Program
11. FLP – Forest Legacy Program – Forest Service
12. FSCG – Forest Service Competitive Grants
13. DAR – Division of Aquatic Resources
14. Na Ala Hele – State Na Ala Hele Trails & Access Program
15. HISC – Hawaii Invasive Species Council
16. FSP – Forest Stewardship Program
17. CGAPS – Committee Group on Alien Pest Species
19. HCA – Hawaii Conservation Alliance
20. IPIF – Institute of Pacific Island Forestry
21. UCF – Urban & Community Forestry (Kaulunani)
22. NOAA – National Oceanographic and Atmospheric Administration
23. USGS – US Geological Service
24. YCC – Youth Conservation Corps
25. STDP – Special Technology Development Program
26. PSWRS – Pacific Southwest Research Station
27. HFIA – Hawaii Forest Industry Association
28. SPC – The Secretariat of the Pacific Community
29. SPREP – South Pacific Regional Environmental Program
30. FAO UN – Food and Agriculture Organization of the United Nation
31. SOPAC – Secretariat of the Pacific Applied Geoscience Commission
32. HFIA – Hawaii Forest Industry Association
33. SAF – Society of American Foresters
34. HEEA – Hawaii Environmental Education Alliance
35. ELP – Environmental Literacy Plan
36. BMP – Best Management Practices

Section References

- ¹ Kaulunani. Hawaii's Urban and Community Forestry Program : Kaulunani 2005--2009 Strategic Plan, 2009.
- ² Carroll, Colleen. Kaulunani Tree Planting Project Assessment: Phase I. Koloa, 2002.
- ³ Jorgenson quoted in Konijnendijk C.C., Ricard R.M., Kenney A., Randrup T.B. "Defining Urban Forestry - a Comparative Perspective of North America and Europe." *Urban Forestry and Urban Greening* 4, no. 3-4 (2006): 93-103.
- ⁴ Case, Susan. "Mauka to Makai – Coastal Impacts and Climate Change." In *Urban and Community Forestry Summit*, edited by Teresa Truman-Madriaga & Colleen Carroll, Ed.D. East West Center, Honolulu: Kaulunani Urban Forestry Council,, 2009.
- ⁵ Vargas, Kelaine E., E. Gregory McPherson, James R. Simpson, Paula J. Peper, Shelley L. Gardner, and Qingfu Xiao. *City of Honolulu, Hawaii Municipal Forest Resource Analysis*, 2007.
- ⁶ EPA. Population projections. Retrieved on March 15, 2010 from http://www.epa.gov/ttn/naaqs/ozone/areas/pop/popp_hi.pdf.
- ⁷ State of Hawaii Department of Health Clean Water Branch, "Polluted Runoff Control Program" <http://hawaii.gov/health/environmental/water/cleanwater/prc/cleanwater/prc/index.html> (accessed January 28 2010).
- ⁸ Hawaii Department of Health Clean Water Branch Polluted Runoff Control Program and U.S. Environmental Protection Agency. "What's Going Down with the Rain?" 2pp. Honolulu.
- ⁹ Wilkinson, M. "Invasive Species and the Urban Forest." In *Urban and Community Forestry Summit* edited by Teresa Truman Madriaga & Colleen Carroll, Ed.D. East West Center, Honolulu: Kaulunani Urban Forestry Council, 2009.
- ¹⁰ Earth Times, "Tiny Wasps Killing Hawaiian Trees" <http://www.earthtimes.org/articles/show/124720.html> (accessed January 28 2010).
- ¹¹ Tree Care Industry Association, "American National Standards Institute (ANSI) 300 Series of Standards for Tree Care Operations" http://www.standardsportal.org/usa_en/sdo/tcia.aspx. (accessed March 16, 2010).
- ¹² Oka, S., Koike, T. (2010) City and County of Honolulu, Department of Parks and Recreation, Division of Urban Forestry. personal communications. Honolulu, 2010
- ¹³ Thompson, Robin, Steve Marshall, Robert Prather, Nancy Stremple. *A Comprehensive Look at Tropical Urban Forestry; Executive Summary to the Secretary of Agriculture*. Washington, DC: National Urban and Community Forestry Advisory Council (NUCFAC), 2008.