URBAN REFORESTATION
MASTER PLAN

CITY AND COUNTY OF HONOLULU
Department of Parks and Recreation
Division of Urban Forestry

December 2006
MAYOR’S MESSAGE
(To be added)
Honolulu’s *Urban Reforestation Master Plan* consists of four related components:

- This report sets the policy direction for the other *Plan* components and establishes goals, objectives and performance measures to be used as benchmarks for future updates of the plan.

- The second component concerns the City and County of Honolulu’s management operations relative to the urban forest, focusing on the planting, protection and maintenance of the Street Tree population. *The Tropical Urban Forestry Management Plan* was actually published prior to this report, in May 2003. It has since been revised to update information and conform to the other, more recent *Plan* components.

- The third component is the *Design Guidelines*, which covers appropriate tree selection and planting locations in the context of the Island of O’ahu’s diverse urban settings and environmental conditions.

- The fourth component is the *Tree Technical Manual*, which provides detailed standards and procedures for the planting, maintenance and protection of trees. It is intended primarily as a resource document for professional designers, arborists and other trained tree workers, agency staff and contractors.

The Department of Parks and Recreation, Division of Urban Forestry (DPR/DUF), as well as others who are involved in some way with the protection of the urban forest, recognized the need for this *Plan*, for several reasons:

- There are complex agency roles and relationships, and often overlapping jurisdictions, with respect to issues that affect the urban forest.

- There are complex rules and regulations and standards that apply directly or indirectly to the urban forest, especially trees and other landscaping within or adjacent to public rights-of-way.

- The fragmented nature of the urban forest – multiple landowners, competing public objectives, diverse urban and environmental settings – make coordination of effort to sustain the urban forest quite challenging.

- There is little public awareness of the significant benefits of the urban forest, some of which are not readily apparent, and there is little public knowledge about proper care of the urban forest.
Below are some guiding principles for the development of this Plan:

- Green infrastructure is as important as the gray infrastructure to urban life.
- Successful urban forest management improves the environment and accommodates development.
- Education is as important as regulation.
- Planting “the right tree in the right place” saves time and money.
- Trees are a long-term investment that must be managed wisely.

This report is organized in four chapters:

- Chapter I describes the setting of and defines the scope of Honolulu’s Urban Forest, and identifies the benefits of the urban forest.
- Chapter II identifies the legal mandates and organizational structure that currently influence the management of Honolulu’s urban forest.
- Chapter III analyzes issues and opportunities relative to the management of Honolulu’s urban forest.
- Chapter IV sets forth goals, objectives and performance measures for the management of Honolulu’s urban forest.
CITY AND COUNTY OF HONOLULU
URBAN REFORESTATION MASTER PLAN

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CHAPTER I

HONOLULU’S TROPICAL URBAN FOREST

INTRODUCTION

Honolulu’s urban forest is a significant attribute of the environment, the economy, culture, and identity of the City and County of Honolulu, and the State of Hawai’i as a whole. This Chapter describes Honolulu’s setting, the definition and scope of the “urban forest”, and the many environmental, psychological and economic benefits that the urban forest provides to the community.

A. THE SETTING

The City and County of Honolulu constitutes the island of ‘O’ahu, as well as some off-shore islands and hundreds of islets and reefs extending 2,000 miles from just beyond Ni’ihau to the Kure Atoll, excluding Midway Island. The latter islands and atolls include no urban areas in the conventional sense, so the Urban Reforestation Master Plan addresses just the Island of O’ahu. Nevertheless, O’ahu itself is quite diverse, with varied micro-climates and vegetation zones and urban settlement patterns that range from high-density inner-city neighborhoods, to suburban towns, to low-density, outlying rural communities.

There are several aspects of O’ahu’s physical setting and history that shape the considerations for Honolulu’s urban forest:

ECOLOGY

• The Hawaiian archipelago is the most isolated island group on Earth, located about 2,300 miles from North America. The Hawaiian Islands have a set of unique animals and plants that are renowned for their evolution in geographic isolation. These animals and plants flourished within native ecosystems that are directly related to O’ahu’s climate and topography.

• Geologically, O’ahu is classified as a “high volcanic island,” with characteristically steep mountains, deep valleys, and a large central plateau and coastal plains created by lava flows. Its diverse topography has created a high level of biological diversity and uniqueness. Approximately 80% of Hawai’i’s plants, 100% of its forest birds, and 67% of its arthropods are found nowhere else in the world.

CLIMATE

• The Island of O’ahu is located in the strategic center of the Pacific Ocean, at approximately 158 degrees longitude west and 21.5 degrees latitude north. It is just below the Tropic of Cancer, which classifies O’ahu’s climate as
“tropical”; i.e., where the sun is always high in the sky and there is little variation in temperature or climate. O‘ahu’s temperature and climate, indicative of a mild tropical climate, is further stabilized by the vast surrounding of Pacific Ocean, with temperatures ranging between 65 and 90 degrees Fahrenheit.

- Rainfall averages from 63 to 75 centimeters per year over the open ocean near Hawai‘i, yet O‘ahu itself receives up to 15 times as much rain in some places and less than one-third as much rain in other places. These great differences in rainfall are the result of the moisture-laden trade winds flowing from the northeast over the steep, complicated terrain of the islands. The difference in average annual rainfall between the leeward and windward sides of the two parallel mountain ranges – the Ko‘olau Range on the east and the Wai‘anae Range on the west – is striking.

**HYDROLOGY**

- As a high volcanic island, O‘ahu’s geology and topography sustains a groundwater basal lens through a hydrologic cycle that is intricately dependent upon trees, their leaf litter, and other shrubs and ground cover. The trees and ground cover capture the rainfall and slow its rate of descent down the steep mountain slopes enough to allow the rainfall to percolate through the soil underground rock “filters,” which replenishes the reservoir of clean, fresh water, safely store beneath the island in the basal lens, the largest of which underlies the central plateau. It is through this hydrological process that O‘ahu is able to support human settlement and growth.

**HUMAN INFLUENCES**

- Over time, the attributes of O‘ahu’s location, climate, and resulting flora and fauna have translated into liabilities. For example, O‘ahu’s strategic location in the middle of the Pacific Ocean also placed it within trade routes, which significantly altered Honolulu’s environmental and socio-cultural make-up. New species introduced by travelers easily adapted and flourished in Hawai‘i’s tropical climate. Human colonization of the islands has had a severe impact on native plant and animal populations. More than 75% of the historically known endemic bird species are now either extinct or endangered. Of Hawai‘i’s nearly 1,300 endemic plant species, 104 are considered extinct and 267 of the remaining taxa either are listed or are proposed as endangered or threatened species. More native species have been eliminated in Hawai‘i than anywhere else in the United States and most places in the world.

- Both plantation agricultural and military occupation, especially during World War II, triggered dramatic changes to O‘ahu’s landscape. But it was the two decades following the advent of jet travel and the admission of Hawai‘i to statehood in 1959, that stimulated the most rapid pace of urban development on the island. Today, 72% of the Hawai‘i’s resident population lives on
O‘ahu. About half of O‘ahu’s population resides on the southern coastal plain of the island, which includes the urban core of Honolulu, containing Hawai‘i’s seat of government and principal financial district and visitor destination.

- O‘ahu’s economy has become increasingly dependent on the visitor industry, which generates an estimated 24.3% of Hawai‘i’s Gross Domestic Product (GDP) and approximately 31.5% of the state’s employment. Therefore, it has become increasingly important to maintain O‘ahu as an attractive place to visit. Both U.S. and Japanese visitors, who make up the largest share of Hawai‘i’s tourism market, consistently rate scenic qualities and favorable weather as the most positive attraction of Hawai‘i.\(^1\) Visitors rate as the most negative aspects the high cost of visiting Hawai‘i, the long travel time and perceived “commercialization” or “overdevelopment”.\(^2\) In recognition of the importance of remaining competitive with other resort destinations, the City and State governments have invested over $50 million in the past 5 years and are currently spending another $20 million to improve public areas in Waikiki alone. A large share of this investment is for aesthetic enhancements, such as landscaping. This clearly recognizes the economic value of the urban forest.

**Figure I-1: Map of Island of O‘ahu with State Land Use Districts**

The State Urban District covers approximately 27% of O‘ahu’s land area. The Conservation District is under the Jurisdiction of the State of Hawai‘i Board of Land and Natural Resources. Jurisdiction over the Agricultural District is shared by the City and the State.

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B. THE DEFINITION AND SCOPE OF THE URBAN FOREST

Most residents of urban Honolulu or the outlying suburban and rural towns of O'ahu would not think of themselves as living in a forest, yet they do. The urban forest is clearly different from the natural forests that they visit on hiking or camping trips, but the plants of the urban forest interact with each other and respond to other environmental conditions, just as plants in a more natural setting do. They also contribute significantly in a positive way to the urban environment, as pointed out later in this chapter.

Biological systems such as forests do not adhere neatly to jurisdictional boundaries. For that reason, an urban forestry plan must consider the interface between the “urban” forest and the “natural” forest, especially when they are contiguous by land. This is one of the issues that are addressed in Honolulu’s Urban Reforestation Master Plan. Nevertheless, it is necessary to identify the geographic coverage of the urban forest in order to analyze the issues and opportunities related to this forest system and the roles of the various actors who influence its health and management.

On O'ahu, the most useful way to distinguish the geographic scope of the urban forest is to think of it as all of the vegetative growth within the State Urban District boundary (see Figure I-2.) This does not capture all of the human settlements or areas of human activity, but it certainly contains most of what people think of as “urban” O'ahu and is the area where most people come into daily contact with trees and other plant life.

Within this “boundary” are many diverse physical and environmental conditions. In some areas, plant life is relatively sparse, in other areas relatively abundant. Plants do not know the distinctions between “public” and “private” property, so the more aggressive and hardy species can take root almost anywhere, even if not deliberately planted. In an urban environment, however, such spontaneous growth is generally undesirable. Weedy plants are the most apt to thrive in harsh conditions without care and maintenance, and can conflict with urban use and compete with more desirable plants, as anyone who has tended a lawn or garden fully knows. Even “desirable” plants can become a nuisance, at least from the perspective of human use of the land, if they are poorly maintained or not planted in an appropriate location.

The urban forest, then, needs even greater management attention than do natural forests. The management of the urban forest needs to take into account all of the planting and plant maintenance activities that occur in the urban environment, and the relationship between those planted areas and urban land uses, including activities as well as built facilities. Figure I-2 illustrates conceptually the various components of the urban forest and the principal actors who influence those components. In actuality, there are many overlaps and interactions between the components of the urban forest and the actors that influence them, adding complexity to this conceptual diagram. This is discussed in Chapters II and III of this report.
C. THE BENEFITS OF TREES AND THE URBAN FOREST

Studies have shown that trees in the urban environment have social, economic and environmental benefits. There is a compendium of research on this subject, but here is a sample of findings:

**SOCIO-ECONOMIC BENEFITS**

- **Human health and well-being.** Desk workers who can see nature from their desks experience 23% less sick leave and report higher job satisfaction than those who do not have exposure to such views. Similarly, hospital patients having access to views of trees require less medicine and recover significantly...
faster than those who lack such views.³ Appealing aesthetic features in urban environments, such as landscaping, have also been found to contribute to reduced domestic violence and neighborhood crime rates.⁴

- **Economic vitality and property value.** By enhancing the aesthetic sense of place, trees contribute to the economic vitality of neighborhoods and increase property values. For example, in a nationwide study customers reported a willingness to pay about 11% to 50% more for goods in business districts with attractive landscaping than in districts without these features.⁵ Several studies have analyzed the effects of trees on actual sales prices of residential properties. In one area a 6% increase in value was found to be associated with the presence of trees; an increase of 3.5 to 4.5% was reported in another study.⁶

- **Noise, glare and traffic safety.** A U.S. Department of Energy study reports that trees reduce noise pollution by acting as a buffer and absorbing 50% of urban noise. People who viewed a video of a drive down a scenic, landscaped parkway scored lower on a test of frustration than did those who viewed a drive through a metro area cluttered with buildings, utility poles and signage, even though the scenic parkway actually carried more traffic.⁷ Tree-lined streets reduce traffic speeds, thereby reducing the rate of serious accidents. Drivers tend to slow down where there are tall trees, giving the perception of making a street feel narrower, or where there are closely spaced trees, giving the perception of higher vehicular speed. Street trees also forewarn drivers of upcoming curves. If the driver sees tree trunks curving ahead before seeing the road curve, they will slow down and be more cautious when approaching curves.⁸

- **Maintenance of paved surfaces.** Tree shading of asphalt paving on streets and parking lots reduces maintenance costs. Without the shading, oil binding in the asphalt heats up and volatizes more rapidly, leaving the aggregate unprotected. Vehicles then loosen the aggregate and, much like sandpaper, the loose aggregate grinds down the pavement. A slurry seal overlay costs approximately $0.27 per square foot, or $50,000 per linear mile. With tree

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⁸ National Arbor Day Foundation pamphlet #90980005.
shading of the paved surface, the slurry seal overlay can be deferred from every 10 years to every 20-25 years.9

**PHYSICAL ENVIRONMENTAL BENEFITS**

- **Stormwater management.** A typical urban forest of 10,000 trees will retain approximately 10 million gallons of rainfall per year.10 The principal benefit of this is improved water quality rather than flood control. Floods usually occur during major storms, well after tree canopy storage is exceeded. However, small storms are responsible for most annual pollutant loading, and it’s during these events when urban forest interception is greatest. In any case, large storms are infrequent, so receiving waters have relatively long periods of recovery between events.

- **Energy conservation.** The shade from urban tree canopy results in substantial energy conservation. A 15-year study in California found that, as the result to tree shading, utility companies saved $485.8 million annually and customers saved about twice that amount in retail expenditures for air-conditioning.11 Homeowners that properly place trees in their landscape can realize savings of up to 58% on daytime air conditioning.12

- **Air quality.** Trees absorb carbon dioxide (CO₂) and ozone from the atmosphere to reduce the "greenhouse effect."13 Trees act as a carbon sink by removing carbon during photosynthesis and storing it as cellulose in their trunk, branches, leaves and roots while releasing oxygen back into the air. A single mature tree can absorb carbon dioxide at a rate of 48 lbs. per year and release enough oxygen back into the atmosphere to support two human beings.14 Over a 50-year lifetime, a tree generates $31,250 worth of oxygen, and provides $62,000 worth of air pollution control.15

The benefit/cost ratio for a community urban forest can be as high as 7.9 to 1.16 Many communities have attempted to quantify this ratio to help determine the return on their investment in urban forest management. Table I-1 represents a more generic benefit/cost analysis based on a prototype of a 100-tree forest over a 40-year term. The analysis assumed a population of 50 large trees, 30 medium trees, and 20 small trees, which is a fairly typical age and size distribution for an urban forest. Applying this analysis to Honolulu’s population of 51,000 Street Trees alone suggests a net benefit of nearly $73 million over 40 years.

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15 U.S. Department of Agriculture, Forest Service, Pamphlet # R1-92-100
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| Total Net Benefits        | $110,352 | $29,556 | $3,176 | $143,084 |

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CHAPTER II
MANDATES AND CURRENT MANAGEMENT

INTRODUCTION

Policy and statutory mandates at the federal, state and local levels of government provide a context for the management of Honolulu’s urban forest. The urban forest also comes under the influence of City and County of Honolulu’s organizational structure and regulatory framework. But there are many other influence on the management of the urban forest, as well, including educational institutions, state agencies, utility companies and community and professional organizations.

A. FEDERAL, STATE AND CITY MANDATES

1. Federal Mandates

 Several U.S. statutes place mandates on state and local governments that are relevant to urban forest management:

Endangered Species Act (ESA). Under the provisions of this law, the U.S. Fish and Wildlife Service (USFWS) has listed many plant species in Hawai‘i as either endangered or threatened. It has also designated Critical Habitats for the protection of these species on the Island of O‘ahu. While the designated Critical Habitats are located mostly within the State Conservation District, there remains a concern about the impact of urban uses, including the urban forest, on these habitats. Invasive, non-native plants in the urban forest can pose a threat to the viability of native ecosystems if their seeds are carried into relatively pristine areas by air, water or animal (including human) traffic. Hawai‘i has initiated several projects to prevent and control the spread of invasive species, most of which are centered in the Department of Land and Natural Resources.

The University of Hawai‘i’s Weed Risk Assessment Project also addresses the invasive species issue. While the City and County of Honolulu has been involved in this continuing project, but has not yet developed a policy regarding invasive species and their use, or continued existence, in the Street Tree population.

Clean Water Act (CWA). The CWA established the basic framework for regulating discharges of pollutants in the waters of the U.S. through the National Pollution Discharge Elimination System (NPDES). The NPDES regulates point and non-point sources of pollution, including stormwater runoff from urban areas.

Section 303(d) of the CWA established the Total Maximum Daily Load (TMDL) Program, which requires states to develop lists of impaired waters that do not meet water quality
standards set by the state. The State of Hawai‘i’s 2004 list for the Island of O‘ahu included 34 streams and 61 coastal water sites. The federal law also requires the State to develop total maximum daily loads (TMDLs) specifying the maximum amount of pollutants that a waterbody can receive from all sources and still meet water quality standards. Since urban stormwater runoff is a major contributor to pollutants, the City and County of Honolulu is required to develop a management plan to achieve the TMDL standards. Trees and other vegetation, which help to absorb rainfall and filter stormwater runoff, play a key role in the water quality management strategy.

**Safe Drinking Water Act (SDWA).** The SDWA, enacted in 1974 and amended in 1986 and 1989, requires a number of actions by states and municipalities to safeguard waters and their sources that are potentially or actually designed for drinking use. With respect to the urban forest, the most relevant provision is the Underground Injection Control (UIC) Program, which created a permit system that protects underground sources of drinking water by regulating five classes of injection wells. In the State of Hawai‘i, UIC permit system is administered by the Department of Health. Trees and vegetation can improve the quality of surface and ground water and reduce the need for sumps, drywells or artificial injection of stormwater.

### 2. State Mandates

As noted in the previous section, responsibility for setting standards to fulfill federal mandates is generally delegated to the states. Also, the relationship between these federal mandates and the urban forest is indirect.

The State of Hawai‘i, through implementation of federal mandates and programs, and through its management of urban lands under State ownership or control, does have a role in the urban forest, but it has not mandated county governments to maintain an urban forest. An exception is the statute enacted in 1975 that requires counties to designate and protect Exceptional Trees. The City and County of Honolulu has implemented this mandate, as discussed in Section II.B.1.

### 3. City and County of Honolulu Policy Plans

The City and County of Honolulu sets forth its policies for land use and development in an islandwide General Plan and regional Development Plans/Sustainable Communities Plans. The General Plan consists of broad policy statements and objectives. The Development Plans/Sustainable Communities Plans articulate more specific policies, guidelines and standards for land use and development in the eight regions of the island, and each includes an Open Space Map and Land Use Map to illustrate the desired land use pattern.

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19 Underground injection is any system, structure or activity that places fluid below the ground, including stormwater systems such as sumps, drywells and trench drains.
21 Chapter 58, Hawai‘i Revised Statutes
While there is no explicit mention of “urban forest” in these policy plans, there are many references that clearly imply a very prominent role for the urban forest in implementing the vision, policies and guidelines for shaping desired future development and enhancing existing urban areas. For example the vision statement in the Primary Urban Center Development Plan is replete with phrases such as “shaded sidewalks”, “stream greenbelts”, and “street trees and a park or plaza nearby” to create attractive, high-density living environments in urban Honolulu.

Each of the Development Plans/Sustainable Communities Plans contains a section that addresses open space elements and promotes measures to integrate natural environmental features within the context of urban areas. O‘ahu’s eight planning regions represent diverse settings in terms of land use patterns as well as environmental conditions, so each of the Development Plans/Sustainable Communities Plans provides guidance on how the urban forest should be managed to respond to the regional context.

B. CITY AND COUNTY OF HONOLULU ORGANIZATION

The management and administration of Honolulu’s urban forest is not consolidated in one department. Several departments have responsibility for certain components of the urban forest. However, the two agencies having the greatest responsibility are the Department of Parks Recreation, Division of Urban Forestry and the Department of Planning and Permitting. Their roles in managing the urban forest are described below, followed by summaries of other departments in alphabetical order.

1. Department of Parks and Recreation, Division of Urban Forestry (DPR/DUF)

DPR/DUF administers Honolulu’s Street Tree and park tree maintenance programs, the Exceptional Tree ordinance, the City’s landscape nurseries, and the Botanical Garden system.

Administration of the division’s Street Tree and Exceptional Tree functions is covered by the following regulations:

Rules and Regulations Relative to Planting and Maintenance of Street Trees, June, 1971.\(^{22}\)
These regulations establish that it is unlawful for any person to injure or destroy Street Trees in any manner, and provide criminal penalties for violations of the rules. The regulations also authorize DPR/DUF to trim obstructing or hazardous portions of any tree standing on private property which overhangs or projects into a street and to perform all general maintenance of Street Trees. Abutting property owners are assigned responsibility for watering and weeding the area around trees. Finally, the rules prohibit removing, relocating, replacing, pruning or spraying of Street Trees without first obtaining a permit from DPR/DUF. Standards relating to the planting of Street Trees as part of new developments have been superseded by the DPP rules adopted in 1999 and 2001 (see Section II.B.2.)

Rules and Regulations Regarding the Pruning of Exceptional Trees, January, 1984.\(^{23}\)
Designated Exceptional Trees are listed individually in the enabling ordinance based on a

\(^{22}\) Regulations concerning Street Trees and park trees are promulgated under the authority of Chapter 10, Article 1, Revised Ordinances of Honolulu.

\(^{23}\) The regulations are promulgated under the authority of Chapter 41, Article 13, Revised Ordinances of Honolulu.
review and recommendation of the Mayor’s Arborist Advisory Committee. More than 100 trees have been listed for protection under this law to date. The regulations provide specific procedures and guidelines for the designation and protection of Exceptional Trees. In addition, the Mayor’s Arborist Advisory Committee has published guidelines for pruning Exceptional Trees.24 The DPR/DUF rules are enforced through a civil fine system.

The general organization of DPR/DUF is shown in Figure II-1 below, followed by a discussion of each of Branch and Section:

Figure II-1: DPR/DUF Current Organization

The Administration Services Office provides the Division’s overall direction and planning. It also accounts for all monies and purchasing services expended, and personnel and management services.

The Honolulu Botanical Gardens Branch plans, develops, curates, maintains, and studies documented collections of tropical plants in an aesthetic setting for the purpose of conservation, botany, horticulture, education, and passive recreation.

The Horticulture Services Branch is responsible for the management of the Arboriculture Section and the Nursery and Landscape Section. The Arboriculture Section prunes, removes, and relocates trees along City and County streets, parks, and facilities throughout Honolulu. It also provides emergency tree hazard removal services and oversees tree permits, directives, and contracts. The Nursery and Landscape Section operates and maintains City and County nurseries and tree farms, Queen Kapi‘olani Garden, Civic Center Grounds and landscape projects. It also provides specialized landscape gardening in high visibility areas, municipal parking lots and fountains.

24 Guidelines for Pruning an Exceptional Tree, April 2002. There is some inconsistency between these guidelines, which are advisory only, and DPR/DUF rules for Exceptional Trees. See City and County of Honolulu, Division of Urban Forestry, Tropical Urban Forestry Management Plan, May 2003, pages II-19 through II-23.
Currently, about one-third of DPR/DUF’s staff positions are vacant. They are unable to fill these vacancies because a certain amount of the money allocated to salaries is withheld each year. In addition, it is difficult to recruit qualified candidates for some of the positions. In FY 2005, the DPR/DUF was appropriated approximately $5.7 million, which included approximately $3.0 million in salaries and wages, approximately $2.7 million for tree pruning and removal contracts, and other expenses. Most tree pruning and removal work is performed through outside contractors. Contracts are defined by contiguous geographic areas, but are not currently broken up by Council District or any other recognized political or formal community organization units.

2. **Department of Planning and Permitting (DPP)**

DPP prepares and administers the policy plans mentioned in Section II.A.3. DPP also administers all development permitting functions, including the approval of plans for landscape planting, buildings and installation of paving and other impervious or semi-porous surfaces.

Many of the codes and regulations administered by DPP directly or indirectly affect the urban forest. Key regulatory requirements are summarized below:

**Standards and Procedures for the Planting of Street Trees.** This policy, which went into effect in 1999, is applicable to all Street Tree planting, removal, relocation or replacement activities not initiated by DPR/DUF. Adoption of these standards was an outgrowth of the DPP-initiated “Green Streets” project, whose purpose was to promote more generous and healthier Streets Tree planting.  

The revised standards reduced the number of species on the Official Street Tree List – i.e., those that are “pre-approved” for planting – from 80 to 40 species. DPP may grant exceptions to the tree list in order to maintain a consistent planting of tree species within or along existing roadways.

Permit applicants must submit a Street Tree Planting Plan to DPP for review and approval. During the review, DPP may consult with other agencies, including DPR/DUF, especially if the proposed tree is not on the Official Street Tree List. Applicants are required to file the approved plan with DPR/DUF at least two weeks prior to starting construction and notify DPR/DUF at least one week prior to tree installation. DPR/DUF is authorized to inspect the project during construction and may stop work and require plan revision or remedial work if it finds that the work is likely to jeopardize property or public safety. DPR/DUF provides written certification to DPP once the street trees have been installed and all related work has been completed and accepted.

**Subdivision Rules and Regulations.** DPP revised its Subdivision Rules and Regulations in 2001 to reflect the recommendations of the “Green Streets” project. The new standards generally require wider planting strips along new streets, with the width varying according to

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26 Promulgation of these regulations is authorized by Chapter 22, Revised Ordinances of Honolulu.
the classification of the street. In addition, the amended rules created the “alley” as a new class of street to provide service access. The purpose is to eliminate or reduce driveway curb cuts along wider frontage streets and allow more Street Tree planting sites.

**Land Use Ordinance (LUO), as Amended.**  
27 The LUO requires landscaping as part of almost all new development projects. In some instances, these requirements are embedded in development standards; for example, the landscaping of required yards or surface parking lots. In other cases, landscaping is required as a condition of approval for a land use permit. Frequent examples of the latter are projects that are approved under a Conditional Use Permit, Special Management Area Use Permit, Cluster Housing Permit or Special District Permit. The LUO establishes seven Special Districts, all but one of which are located in Honolulu’s urban core.  
28 Some of the Special Districts have specific standards for Street Tree landscaping (Hawai‘i Capitol and Thomas Square/Honolulu Academy of Arts Special Districts), while others have less prescriptive standards for tree selection. All of them, however, require a DPP permit to remove a “major tree” (i.e., with trunk diameter size of 6 inches or greater) within the District or certain areas of the District. Criteria for removal of a major tree are specified in the Special District. When DPP approves tree removal, it requires replacement plantings and, in some cases, relocation of the tree.

**Grading, Soil Erosion and Sediment Control, Grubbing and Stockpiling Ordinance.**  
29 This ordinance requires a permit for grading and grubbing activity related to urban uses, with certain exceptions for minor or emergency work. The soil erosion and sediment control standards, which have been amended over the years to respond to mandates of the federal Clean Water Act (see Section II.A.1.), incorporate Best Management Practices, for construction sites, such as the use of silt fences, sediment basins, construction scheduling and phasing, limiting soil exposure, and other methods. No recognition is given to the value of retaining existing trees in a construction area, whose root structures and canopies can help abate erosion, nor is there any requirement that sites with steeper slopes that are potentially more susceptible to long-term soil erosion be required to maintain or plant trees on the site.

**Drainage, Flood and Pollution Control Ordinance.**  
30 This ordinance requires the review and approval of stormwater management plans for new developments. Similar to the grading ordinance (see above), it incorporates Best Management Practices (BMPs) to comply with the mandates of the federal Clean Water Act. The BMPs listed in the ordinance do not include on-site tree preservation or planting as a method to mitigate stormwater management.

**Sidewalk, Curb and Driveway Ordinance.**  
31 This ordinance requires sidewalk areas to conform to engineering standards adopted by the DPP. “Unimproved” sidewalk areas – i.e., those that lack paved sidewalks that conform to City specifications and are typically located in

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27 Chapter 21, Revised Ordinances of Honolulu.
28 The exception is the Hale‘iwa Special District. The Special Districts in urban Honolulu are Chinatown, Diamond Head, Punchbowl, Hawai‘i Capitol, and Thomas Square/Honolulu Academy of Arts.
29 Chapter 14, Articles 13 to 16, Revised Ordinances of Honolulu.
30 Chapter 14, Article 12, Revised Ordinances of Honolulu.
31 Chapter 14, Article 18, Revised Ordinances of Honolulu. The formal title of the ordinance is “Regulations Governing the Construction of Sidewalk, Curb or Driveway Within the Right-of-Way of Public Streets”.

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older urban areas – are required to be maintained as grassed surfaces. However, many frontage property owners plant trees or other types of landscaping in these areas, often without knowing that they need approval from DPP to do so. DPP may authorize such plantings either before or after the fact as a “surface encroachment” provided that the plantings do not unduly interfere with the public use of such space for utilities and pedestrian traffic. The owner assumes responsibility for maintenance and liability for the plantings and must remove them if DPP determines that the space is needed for public use. A Street Tree inventory conducted in 1999-2000 estimated that approximately one-third of the inventoried “street tree” population consisted of “private” trees within the public right-of-way.32 No estimate was made of the number of such trees that were planted without permission.

Within the DPP organization, the key units with respect to the administration of the above regulations are:

The **Urban Design Branch** (UDB) reviews Street Tree Planting Plans, and applications for Special District and Cluster Permits. In addition, other branches and divisions DPP often refer certain types of plans to UDB for review and comment. For example, other branches of the Land Use Permitting Division may ask UDB to review landscape plans related to Special Management Area Use Permits of Conditional Use Permits. The Building Division typically routes to UDB any construction plans that will affect existing Street Trees or vacant planting sites, or that propose landscaping in compliance with a prior land use permit reviewed by UDB. The Site Development Division often consults with UDB on “surface area encroachment” requests for planting in unimproved sidewalk areas.

The **Site Development Division** administers the Subdivision Rules and Regulations and the three engineering-related ordinances listed above, concerning grading, stormwater management and sidewalk standards.

The **Building Division** reviews construction plans for building permits, including the landscape sheets, to check for their compliance with all development codes and prior land use permit conditions. There are no plans checkers in this division with training or expertise in landscape architecture or horticulture, so they sometimes request advice from DPR/DUF when they have questions about the suitability of plant material. For projects that involve prior land use permits with conditions concerning landscaping, the plans checker refers the plan to the appropriate DPP staff person or branch for response.

The **Customer Services Office** is responsible for site inspection and code enforcement. All development codes administered by DPP incorporate a civil fine system to enforce compliance, although criminal penalties are also available for LUO violations. However, DPP does not have site inspectors who are specifically trained or assigned to monitor compliance with landscaping standards and requirements. DPR/DUF arborist are sometimes asked to inspect a site and provide advice when it appears that there has been a violation of a landscaping standard or permit condition under DPP’s administration.

32 *Tropical Urban Forestry Management Plan, op. cit.*
3. **Department of Design and Construction (DDC)**

DDC is responsible for designing and constructing City infrastructure, including some Street Tree planting projects, and landscaping for parks and the grounds of public buildings. Most of the design work, including landscape plans, is done by consultants under contract to DDC.

The DDC project manager and/or design contractor is expected to consult with DPR/DUF in the conceptual design stage when developing plans for planting Street Trees or landscaping in City parks. However, this consultation process often does not take place at an early stage, and is sometimes overlooked until the construction stage, especially for projects that may affect Street Trees or other protected trees, but are not focused on landscaping as a primary purpose; e.g., sidewalk ramp construction.

4. **Department of Enterprise Services (DES)**

DES is responsible for maintaining trees in municipal golf courses, the Blaisdell Center, the Honolulu Zoo, and the Waikiki Shell. They hire private contractors to do all pruning work.

5. **Department of Environmental Services (ENV)**

ENV is responsible for managing the quality of stormwater runoff into and discharging from City’s storm drainage systems. They have sponsored education campaigns to promote Best Management Practices for homeowners, businesses and the general public in an effort to improve the quality of stormwater. Their education material does not specifically suggest the use of landscaping to help filter pollutants in the runoff.

6. **Department of Facility Maintenance (DFM)**

DFM has responsibility for the repair of curbs, gutters, sidewalks and roadway surfaces damaged by tree roots. The department also cleans streets of leaves and other tree debris and clears vegetation from “improved” (i.e., concrete- or riprap-lined) drainage channels and certain public, but non-standard roads.

DFM does not employ arborists or specialized crews to perform these repair and maintenance tasks. Instead, its general mason and construction crews perform the sidewalk repair and general labor crews clear vegetation from the drainage channels and roadways.

7. **Department of Transportation Services (DTS)**

DTS, along with DDC, has responsibility for designing and installing traffic related improvements, which can affect existing Street Trees or introduce new landscaping. For example, DTS has implemented “traffic-calming” projects that involve the planting of trees of other landscaping in the public right-of-way and bicycle-related improvements that also involve new landscaping or alter existing trees.

While most street design standards are now administered by DPP, DTS maintains responsibility for standards related to traffic safety and control devices. The standards are contained in a
manual that has not been updated since 1976. Some of the standards – such as restrictions on tree planting within sight distance triangles at intersections – have been superseded by subsequent DPP standards, so the manual should be modified to reflect that.

DTS sometimes hires contractors to prune trees on private properties that overhang the public right-of-way and/or obscure traffic control devices, but typically asks DPR/DUF to do this.

8. **Fire Department (HFD)**

HFD is concerned primarily with the interface between vegetation and human habitations, especially where structures are located in or near natural areas in dry regions with fire-prone introduced vegetation. The fire risk is greatly reduced by a well-managed urban forest.

9. **Police Department (HPD)**

HPD officers are called upon to investigate and cite property owners or others who vandalize or otherwise destroy protected Street Trees. They may also refer to DPR/DUF any obstructions to traffic control devices that are caused by trees or other landscaping.

10. **Board of Water Supply (BWS)**

BWS has several roles in the management of the urban forest. BWS designs water mains and reviews Street Tree plans that may affect existing mains. Root barriers are usually ineffective for the protection of water mains because the mains are deeper than typical root barriers, so the location of the tree roots relative to the alignment of the water main trench is important.

BWS also manages watersheds under a joint arrangement with the State of Hawai‘i Department of Land and Natural Resources.

Finally, BWS is an advocate for water-conserving landscaping, maintaining a xeriscape garden and nursery and providing public information on the benefits and care of xerophytic plants.

C. **OTHER ORGANIZATIONS**

Many institutions and organizations besides the agencies of the City and County of Honolulu have a role in the management of the urban forest. Below are key partners, resources and co-managers:

1. **Educational Institutions**

The University of Hawai‘i (UH) offers a number of research and technical resources in support of urban forestry. The Hawai‘i Weed Risk Assessment Project, for example, is centered at the UH College of Tropical Agriculture and Human Resources, which also houses the Hawai‘i Forestry Extension program. The latter program provides technical assistance in the form of research reports, training workshops and conferences and data gathering.

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Secondary Schools, both public and private, have environmental education curricula and sometimes sponsor community service projects which involve students in “hands-on” forestry management activities.

2. **Utility Companies**

All utility companies with overhead or underground utility lines are involved to some extent in the management of the urban forest through maintenance tree pruning, but the Hawaiian Electric Company (HECO) is the most active in this role because of the need to maintain adequate clearances for reliable power. HECO prunes about one-quarter of all Street Trees on a regular schedule. While there is usually notification to DPR/DUF, this occurs without a permit or formal review.

3. **State Agencies**

The Department of Land and Natural Resources (DLNR) administers the Kaulunani Urban and Community Forestry Program. This program, funded by the U.S. Department of Agriculture Forest Service, focuses on improving the health and viability of trees in Hawaiian communities through educational programs; financial support in the form of cost-share grants; technical training; and Arbor Day promotions and partnerships with the public and private sectors, community groups and non-profit organizations.

The Department of Transportation (DOT) plants and manages landscaping along State highways. DOT’s Highways Division has a landscape architect in its Design Branch who oversees the landscaping program. In 1999, DOT produced a technical manual with guidelines for landscape planting and maintenance in State highways. Many State rights-of-way are rather wide and offer many opportunities for additional landscape planting.

The Department of Accounting and General Services and Department of Education maintain landscaping on state building and school campuses, respectively.

4. **Nonprofit Organizations**

Volunteer groups such as The Outdoor Circle and Scenic Hawai‘i promote and bring public attention to the benefits of trees and the urban forest. They do this in a variety of ways, such as sponsoring landscaping awards programs, producing and distributing informational material, advocating for the protection of landscaping before legislative bodies and in the courts, and providing technical assistance or advice to government bodies and the general public. They also organize and sponsor landscape planting and beautification projects, often in partnership with DPR/DUF.

Community-based organizations such as residential neighborhood or business associations also partner in urban forestry. In some cases, the associations plant and/or maintain landscaping on private properties. In other instances, the association may be involved in maintaining landscaping in public areas. The City’s “Adopt-a-Park” program is an example of

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this partnership. Business Improvement Districts are a potential partner in street landscape maintenance, although they have not yet assumed this role.

**Profession-based organizations** for landscape architects or related design professionals; arborists, botanists or horticulturalists; and nursery growers and retailers provide both advocacy and public education programs, similar to what that of the volunteer groups mentioned above, as well as technical support to improve the management of the urban forest.
CHAPTER III
ISSUES AND OPPORTUNITIES

INTRODUCTION

As pointed out in Chapter I, trees and other plantings make a positive contribution to public health and the quality of the urban environment. On the other hand, proper urban forestry management is necessary to ensure that plants survive the challenges of an urban environment and provide the optimal desired benefit.

Proper urban forestry management incorporates several principles and considerations:

- **The urban forest is an ecosystem in which vegetation exists in association with people and their developments.** Consequently, tree selection must assume that the urban forest is dynamic, needing to continually respond to changes in land uses in the urban environment. It must also consider human behavior that may either intentionally or unintentionally harm a tree or other plants.

- **The urban forest consists of all vegetation that occurs in an urban environment.** For this reason, it is important to recognize the relationship between plantings in public areas and on private properties, especially where there is a close interface between these two areas, such as along public rights-of-way.

- **The urban forest is distinct from, but related to, natural forests.** There is inevitably some biological transfer between the urban and natural ecosystems via seeds and pollen carried by wind, water, vehicles, humans or other animals. While there is currently no consensus on what constitutes “invasive species” in the context of an urban forest, care needs to be taken to avoid the planting of more aggressive introduced species that could threaten O‘ahu’s native forests.

- **The urban forest, unlike the continuous vegetation of a natural forest, is fragmented and discontinuous.** The space available for tree planting and growth is often quite confined, especially in downtown cores and other intensive commercial and industrial areas. Not only is much of the land itself covered with buildings and paving, but underground and overhead utility lines compete for space with tree roots and branches. While relatively barren urban areas present challenging conditions for trees, they are also the areas where reforestation could produce some of the greatest public benefits.

- **Environmental conditions tend to be more varied in urban areas than in natural settings.** The built environment – buildings and paved surfaces – can cause abrupt changes in light, wind, temperature and soil conditions. In addition, trees must contend with air pollution from car exhaust and polluted run-off. For this reason, it is wise to assess each planting site individually and take into account planned changes in land use for the vicinity, even if they have not yet been implemented.
In addition to man-made conditions, the urban forest is subject to natural environmental factors.  O'ahu’s diverse terrain of ridges, valleys and flat lands creates a mosaic of microclimates with wind, precipitation, and temperature varying significantly from place to place. Moreover, salt borne in the trade winds or in ground water can have a deleterious effect on some species of urban trees.

Careful tree selection and maintenance are paramount considerations for the urban forest. For all of the above reasons, it is important that the right trees are planted in the right places and manner, and that they are nurtured, pruned and protected from harm in such a way that they can thrive in an urban setting and contribute optimally to the public welfare.

The following sections discuss issues related to space for tree planting and growth, the selection of tree type, and the maintenance and protection of the urban forest.

A. SPACE FOR TREE PLANTING AND GROWTH

Certain characteristics of the urban environment, such as buildings, roads, paved areas, street lights, utility poles, fire hydrants, water meters, gas meters, traffic signs, driveways, sidewalks, alleys, and cross streets, limit the opportunities for planting trees and constrain their natural growth due to physical limitations or safety concerns.

This condition is generally more pronounced in the urban core of Honolulu and other older urbanized areas that developed prior to modern subdivision and public works regulations.

1. Planting Strip Width for Street Trees

The Department of Planning and Permitting adopted the City and County of Honolulu’s Standards and Procedures for the Planting of Street Trees in 1999 to incorporate new Street Tree Planting Standards recommended in the “Green Streets” study. The new standards require an additional 5 feet on each side to enlarge planting strips along new rights-of-way with a pavement width of 36 feet or greater. This requirement also applies to new developments along existing rights-of-way. The developer has the option of either dedicating the additional planting strip area to the City or establishing a landscape easement to preserve the Street Trees and planting strip. When it is not feasible to locate a Street Tree in the planting strip or sidewalk area, the Director of Planning and Permitting may require the Street Tree to be planted on private property within 10 feet of the public sidewalk or walkway, and be maintained by the landowner.

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35 City and County of Honolulu Department of Planning and Permitting, Honolulu Green Streets Project Final Report, 1998.
While the 1999 standard promotes the planting of Street Trees in developing or redeveloping areas, many of Honolulu’s existing streets in “built-out” neighborhoods continue to have planting strips that do not meet the standards.

An inventory of Street Trees conducted in 1999-2000 identified several different types of conditions for planting areas on older streets. Below are diagrams that represent typical conditions on these streets:

**Figure III-1: Typical Planting Space Allocations on Older Streets in Honolulu**

- **Major streets:**
  - Sidewalk
  - Planting space
  - Curb
  - Street
  - Right-of-way

- **Secondary streets:**
  - Sidewalk
  - Planting space
  - Curb
  - Street
  - Right-of-way

- **Minor streets:**
  - Planting space
  - Curb
  - Street
  - Right-of-way

Most of the older streets, especially in residential areas, have a standard sidewalk width of 4 feet, but its location varies within the right-of-way; i.e., the sidewalk is at the edge of the street curb in some places, and, at other places, it abuts the property line, leaving a narrow planting strip near the curb. Thus, the Street Tree inventory identified six different types of planting strips or grow spaces:

- Parkways – a planting strip between a curb and sidewalk.
- Reverse Parkway – a planting strip located between the sidewalk and the property line.
- Improved Parkway – a planting strip behind a curb, but with no sidewalk present.
- Unimproved Parkway – a planting strip between the paved roadway and the property line where there is no curbing or sidewalk.
- Asphalt Berm – a planting strip in the midst of asphalt curbing and walkway.
- Tree Well – a planting area cut-out in a sidewalk.

Photos on the following page illustrate each of these conditions.

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36 City and County of Honolulu Division of Urban Forestry, *Tropical Urban Forestry Management Plan*, May 2003, Appendix A.
Tree well

Parkway planting strip

Asphalt berm planting strip

Reverse parkway planter strip

Improved parkway planting

Unimproved parkway planting strip
2. **Overhead Wires**

Overhead utility lines constrain tree growth in some urban areas. Electric utilities are required by law to maintain minimum clearance to nearby vegetation, but no mandates exist for other utilities (i.e., telephone and cable.) In addition, Hawaiian Electric Company (HECO) typically has an easement or right of way in which it conducts all maintenance for high voltage electrical transmission lines. As a result, HECO has specially trained staff to maintain clearances, while telephone and cable companies typically do not. Even without mandated clearances, non-electric utility lines pose an obstruction that can impact the growth of Street Trees.

The maintenance of adequate clearances for overhead utility lines – especially the electrical lines – can result in substantial pruning of mature trees, depending on the type and size of the tree. The problem is compounded when there are multiple overhead lines mounted on a crossbar that aligns the cables in a horizontal manner, as shown in the photo to the right. Low-lying cables also present a problem because even smaller trees must be pruned to maintain clearances. Dramatic alterations to the shape of trees diminish their aesthetic and environmental value and may be detrimental to their long-term health.

The 1999-2000 Street Tree inventory noted the presence or absence of overhead utility lines and distinguished between three types:

- **Primary** – high voltage electrical transmission line
- **Secondary** – high voltage electrical distribution line (of lower voltage than “primary” lines)
- **Other** – telephone and cable lines.

Figure III-2 indicates that overhead lines are present on 20 percent of planted Street Tree sites in Honolulu, with the majority of these being electrical lines. This number is not anticipated to substantially increase, because new subdivisions in Honolulu have been required to underground their utility lines since 1967. Moreover, Special District regulations, which cover a large portion of urban Honolulu, require that new utility lines be placed underground. 37 On the other hand, regulations allow utility companies to repair and replace their existing overhead lines in Special Districts. Since utility companies are not required to obtain a building permit to add new overhead lines to existing utility poles, the City has maintained a *de facto* policy of allowing additional lines when bundled with existing cables. The effect of this policy is most evident in communications lines, which have grown bulkier in appearance as lines have proliferated in number in recent decades.

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37 Section 21-9.20-4, Revised Ordinances of Honolulu.
Due to high costs, it is unlikely that many of the existing overhead utility lines in urban Honolulu will be placed underground. In any event, relocation of utility lines to underground conduits would not necessarily favor Street Trees because this would merely shift potential conflicts with tree growth from the branches to the roots (see Section II.A.3.)

It is possible to substantially reduce the extent and frequency of tree branch pruning for overhead electrical lines by using shielded “spacer cable”, which allows overhead lines to be bundled, thereby shrinking the necessary space for clearance. Spacer cables not only have the electrical strength to resist faults due to tree contact, but also have the mechanical strength to support fallen palm fronds and tree branches, and to weather severe storms.  

Initial construction costs are about 25 percent higher than for an equivalent bare-wire system. On the other hand, utility companies that have installed these cables report up to 80 percent savings in tree pruning costs.

The use of spacer cables is permitted by the National Electrical Safety Code (NESC), which is applicable to all states except California and Hawai‘i. In Hawai‘i, the applicable regulation is the Public Utility Commission’s (PUC) General Order No. 6 (GO-6), which has essentially been unchanged since 1966 and does not allow the use of spacer cables. Nevertheless, PUC regulations do allow for waivers, especially in cases where PUC standards have not kept pace with widely accepted changes in industry practices. HECO has reportedly received waivers many times in the past for such instances.

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39 Ibid.
40 Website of Hendrix Wire and Cable Company (www.hendrix-wc.com)
43 Ibid.
Redesigning the utility pole itself is another means to reduce tree pruning. For example, replacement of the horizontal cross-arm at the top of pole that supports multiple electrical distribution lines with an alley arm that extends to the side of the utility pole and beyond the reach of major tree branches can reduce the need for pruning. However, this is probably a feasible or attractive solution only for certain limited locations.

3. **Underground Utilities**

In Honolulu, public utilities have traditionally been installed under the sidewalks or the roadway pavement, allowing space under the planting strip for tree planting. In some areas, underground utilities do restrict the planting of trees; however, there is no collected information on the prevalence of this situation.

As discussed in the previous section, placing overhead lines in underground conduits could restrict tree root growth or even require the removal of existing Street Trees or potential tree planting sites if the right-of-way lacks sufficient width to provide adequate separation between utility conduits and water and sewer lines. This is a more salient issue for electrical lines than for communications lines.

Conflicts between tree roots and underground utilities can be avoided in many instances by selecting the appropriate type of tree to respond to the constraints of the particular location (see discussion in Section III.B.4.) Where it is not possible or desirable to avoid potential conflicts between roots and utilities, the use of a root barrier may be appropriate. Nevertheless, highly constrictive barriers, such as those that encircle the entire root ball, endanger the health of the tree and increase the likelihood of the tree’s dying or toppling.

The City lacks a consistent set of standards with respect to the use of root barriers. When construction plans are submitted for projects involving tree planting, the engineers that review those plans on behalf of utility agencies and departments, who are generally unfamiliar with the growth characteristics of particular species of trees in varied settings, sometimes call for excessive root barriers that are not in the best interest of the tree’s health. Often a root barrier requirement is imposed without any consultation with the Division of Urban Forestry (see discussion in Section III.C.5.)

4. **Hardscape**

Paved areas can significantly restrict root growth and a tree’s ability to thrive. Conversely, the roots of trees can cause damage to surrounding pavement, uplifting the surface of the paved area. The 1999-2000 Street Tree inventory identified sites where there was pavement damage adjacent to a tree, distinguishing sites with less 3/4” displacement from those with more than 3/4” displacement. Typically, sites with less than 3/4” displacement are patched, while sites with more than 3/4” displacement are subject to additional action, which may include sidewalk replacement and root pruning.
As shown in Figure III-3, approximately 11 percent of the Street Tree sites are associated with some level of sidewalk displacement. Two-thirds of these sites have minor damage of less than 3/4”; while one third have displacement of more than 3/4”. Unfortunately, there is no information on the prevalence of displacement of other paved areas, such as curbs, gutters or roadways. The Department of Facility Maintenance (DFM), with primary responsibility for maintaining roadways and sidewalks, does not currently track what percentage of sidewalk repair is associated with trees as opposed to other causes and does not track costs by work type, making the annual costs related to hardscape displacement by tree roots difficult to accurately estimate.

Both DFM and the Department of Parks and Recreation’s Division of Urban Forestry (DPR/DUF) acknowledge the need for closer collaboration between the two agencies with respect to repairs to curbs, gutters and sidewalks that involve tree root intrusion issues. At present, this collaboration occurs on an ad hoc basis, but there have been instances where DFM workers in the field have made decisions without consulting DUF that have adversely affected protected trees. DFM, on the other hand, states that DPR/DUF has not always been able to respond with timely technical assistance. In many cases, an on-site consultation between a DPR/DUF arborist and DFM construction supervisor is necessary to find a solution that satisfies both hardscape maintenance and tree protection concerns. Tree removal or root pruning may be necessary in some instances, but the consultation process can also consider other options, such as the realignment of a section of sidewalk that conflicts with the roots or trunk of a tree. To reduce the demand for DPR/DUF personnel to be on call at all times for

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44 Interviews with Department of Facilities Maintenance representatives on September 9, 2004 and with Department of Parks and Recreation representatives on August 31, 2004.
such field consultations, alternative approaches to address hardscape maintenance and repair problems could also be covered in an illustrated technical field manual, and in training sessions for DFM supervisors and crews.

5. **Traffic Signals and Signs**

Branches and leaves can obstruct the visibility of traffic signals and signs. In the interest of public safety, adequate sight clearances from moving traffic to these traffic control devices must be maintained.

The 1999-2000 Street Tree inventory found that approximately, 6 percent of the Street Trees in urban Honolulu required some sort of safety clearance pruning, and in nearly all instances this was due to a branch or foliage obscuring the view of a traffic signal or stop sign. The inventory did not indicate whether the placement of the tree itself met current minimum distance standards from traffic signals and stop signs.

The City’s present Street Tree Planting Standards, based on the recommendations of the “Green Streets” study, take into account growth characteristics of different types of trees in establishing the minimum distance between tree planting sites and various traffic control devices. These standards were intended to reduce the need for pruning near traffic control devices by anticipating the shape and size of trees as they mature.

**B. TREE SELECTION**

Following the precept of “planting the right tree in the right place” can prevent problems in managing the urban forest. The following sections discuss considerations for tree selection.

1. **Climate**

Honolulu experiences little seasonal variation in temperature. The ocean waters surrounding the Island of O‘ahu have a moderating effect on air temperatures and encourage the retention of moisture in the air. As a result, the climate supports year-round vegetative growth.

At the same time, O‘ahu’s diverse terrain, combined with near constant trade winds from the northeast, creates a mosaic of localized microclimates and a variety of growing conditions. For example, there is a marked difference in the rainfall rate from the windward side (e.g. Kāne‘ohe), which is typically wet, to the leeward side (e.g. Downtown Honolulu), which is typically arid (see Figure III-4). There is also a marked difference in rainfall rates from the coastline to the mountains, and rainfall rates can change greatly over very short distances. Solar radiation is inversely related to rainfall, with the mountainous and windward areas receiving the least sun and the southern and leeward shores receiving the most sun (see Figure III-5). Finally, the temperature difference can be as much as 10 degrees between the coast plain and urbanized areas at higher elevation, such as Wahiawā.

Another contributor to the local microclimate is the exposure to car and truck exhaust and heat emanations from adjacent pavement; i.e., the “heat-island” effect. These conditions require site-specific analysis when developing a planting plan. More broadly, however, climate is a key indicator of what types of trees would be most appropriate for a general environmental zone or “biome”.
Figure III-4: Mean Annual Rainfall on O'ahu

Figure III-5: Solar Radiation on O'ahu

Source: State of Hawai'i, Office of Planning, March 2001
2. **Soils**

Most Hawaiian soils have formed on volcanic rocks, cinders, and ash of a basaltic or andesitic nature. Some coastal soils have formed on coral limestone and coral sands, while valley-floor and coastal-plain soils are commonly on alluvium (sediment deposited by rivers and streams). Figure III-6 below shows the primary soil types for O‘ahu.\(^{45}\)

![Figure III-6: Soils on O‘ahu](image)

As shown in Figure III-6, the natural soils on O‘ahu typically vary with location and climate conditions. In higher elevations with higher rainfall rates, soils are predominantly red in color, acidic in pH, with moderate draining capacity. Soils near the coastline are typically alluvial plain soils eroded from the mountains above. These are finer clay soils, darker in color, basic in pH, with less drainage capacity.

Urban soils have been manipulated, disturbed, or transported by human activities. The physical, chemical, and biological properties of these soils are generally much less favorable as a rooting medium than undisturbed soil found in natural areas. Their structure and fertility is often very poor. Soil structure is important as it determines porosity and the amount of water and air the root system receives. For example, sandy soils drain very quickly, while clay soils drain too slowly and can become water logged. Fertility is dictated by the pH, mineral elements, and compounds available to be used by a plant to give energy and build tissues.

\(^{45}\) Additional information about the soil orders presented in Figure III-6 can be accessed at [http://www2.ctahr.hawaii.edu/tpss/research_extension/rxsoil/hisoi.htm](http://www2.ctahr.hawaii.edu/tpss/research_extension/rxsoil/hisoi.htm)
The implications of this to the urban forest is that special care must be given to the selection of hardy tree types and preparation of the planting sites in order to promote the survival of the tree in challenging and varying soil environments.

3. **Water Availability and Salt Tolerance**

A majority of urban Honolulu lies in a very dry area where water is not readily available. Irrigation is uncommon for most of Honolulu’s existing urban forest. Restricted natural water availability is compounded by urban heat islands that increase plant water loss, and large amounts of pavement that block water infiltration in the soil. Many new plantings fail and some established trees are stressed and in decline primarily due to water restrictions.

In addition to the challenges of arid zones, a segment of the urban forest is in close proximity to the ocean and susceptible to salt damage. Even trees that have some salt tolerance can show foliage damage from salt during dry periods if they are not irrigated.

Appropriate tree selection – namely, drought-tolerant and salt-tolerant species – can mitigate these problems in managing the urban forest. Nevertheless, irrigation will still be necessary, at least for young trees, and even for mature trees during prolonged dry spells or in locations with pronounced salt intrusion.

The present zoning code (i.e., the “Land Use Ordinance”) requires the installation of irrigation for all required landscape areas. In addition, DPR/DUF now requires mechanical irrigation for significant new Street Tree planting projects. However, it is not feasible to retrofit all existing Street Tree sites and replanting and “infill” planting sites with irrigation systems, so DPR/DUF continues to rely on manual irrigation using “water wagons.” This is a labor-intensive effort, but there are opportunities to achieve efficiencies by acquiring smaller trucks to carry 55-gallon water tanks to more efficiently water plants at dispersed locations.

4. **Growth and Other Physical Characteristics of the Tree**

In a sparse urban environment dominated by paving, such as along public streets, it is tempting to plant a tree whose canopy fills as much of the available space as possible. Honolulu’s daytime temperatures can be uncomfortably hot, especially when trade winds are weak or absent, so pedestrians enjoy the refreshing shade of a Street Tree. In addition, the striking form and soft texture of a large canopy tree is often a welcome aesthetic contrast to the harshness and hardness of the built environment. In some locations, a large canopy tree may be the right choice. In other places, however, such a tree may appear to be suitable when it is young, but its canopy grows too large for the space as it matures. Similar problems can arise with trees having aggressive root systems that extend into adjacent surface and subsurface areas. Tree roots and branches may need substantial pruning to remedy conflicts with adjacent buildings, hardscape and overhead and underground utilities. A mature tree canopy may also compete with surrounding trees and other landscaping and obscure desired access to sunlight and public views. In the worst case, a tree may have to be removed if it outgrows the space that it was intended to occupy.

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46 Section 21-4.70, Revised Ordinances of Honolulu
47 Interview with Bill Balfour and staff of the Department of Parks and Recreation, August 31, 2004
Branch structure is an important consideration in selecting Street Trees because poor branch attachments can require extensive pruning to maintain adequate horizontal and vertical clearances as the tree matures. Sidewalks typically need 10 feet for vertical clearance for pedestrians and streets need 14 feet clearance for vehicular traffic. These clearances are not absolutely necessary in all situations, however, and they often cannot be attained until the tree reaches maturity.

Some other physical characteristics make certain types of trees undesirable candidates for planting within public rights-of-way or other high-use areas, such as:

- Production of large amounts of seeds that easily sprout into saplings, often in inappropriate areas
- Production of root suckers (small trees that sprout directly from underground roots), increasing maintenance costs
- Production of staining berries
- Production of large fruits that lead to citizen complaints (see Section III.C.3)
- Susceptibility to termite infestation

Finally, the use of invasive species in the urban forest population can have a wide-ranging impact because of the ease in which the seeds or vegetative reproductive parts may be transported from the urban environment to Hawaii’s fragile natural environment. This issue is subject to on-going study, but at this point there is no indication that any of species that are currently listed as acceptable Street Trees pose a threat to the native forest.49

C. MAINTAINING AND PROTECTING THE URBAN FOREST

The urban forest is dynamic and requires continuous, active maintenance, not only for the care of existing trees, but also for the replacement of trees and the infilling of available planting sites to attain a desired overall tree canopy. As the urban forest interacts closely with other dynamic elements of the urban environment, including new construction and human activity, it also requires protective and public education programs to ensure its survival. The following sections discuss these considerations.

1. **Planting Available Sites**

Despite the constraints on tree planting locations discussed in Section III.A.1. Honolulu still has an abundance of vacant planting sites. The 1999-2000 Street Tree inventory counted over 30,700 such sites in the areas that were inventoried.50 This figure represents approximately 37 percent of all the tree sites inventoried. The inventory likely underestimates the total number of vacant planting sites because it did not include information on the North Shore, Koʻolaupoa, Mōkapu, and Waimānalo communities or the areas that

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49 Tropical Urban Forestry Master Plan, op. cit.
50 City and County of Honolulu Division of Urban Forestry, Tropical Urban Forestry Management Plan, May 2003
were covered near the end of the field data collection process, such as Kapolei and Wai‘anae.

As shown in Figure III-7, the “parkway” grow space type offers the greatest potential for additional Street Tree planting, accounting for 93 percent of the vacant sites. (Refer to Section III.A.1 for the definitions of the grow space types.)

Figure III-7: Percent of Vacant and Planted Sites by Grow Space Types

<table>
<thead>
<tr>
<th>Grow Space Type</th>
<th>Percentage Vacant Sites</th>
<th>Percentage Planted Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parkway</td>
<td>2%</td>
<td>57%</td>
</tr>
<tr>
<td>Parkway Improved</td>
<td>5%</td>
<td>43%</td>
</tr>
<tr>
<td>Parkway Reverse</td>
<td>4%</td>
<td>3%</td>
</tr>
<tr>
<td>Parkway Unimproved</td>
<td>3%</td>
<td>5%</td>
</tr>
<tr>
<td>Parkway Tree Well</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Parkway Asphalt Berm</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Figure III-8 shows that, while the size of the grow spaces varies from one foot to over nine feet in width, the most common grow space width is three feet. Over half of the planted grow spaces (55 percent) are three feet or less, but almost one third (32 percent) of the planted sites are nine feet in width or greater. Of the vacant planting sites, the majority (88 percent) are

Figure III-8: Percent of Vacant and Planted Sites by Grow Space Size

<table>
<thead>
<tr>
<th>Grow Space Type</th>
<th>Percentage Vacant Sites</th>
<th>Percentage Planted Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parkway</td>
<td>23%</td>
<td>6%</td>
</tr>
<tr>
<td>Improved Parkway</td>
<td>2%</td>
<td>12%</td>
</tr>
<tr>
<td>Reverse Parkway</td>
<td>4%</td>
<td>13%</td>
</tr>
<tr>
<td>Unimproved Parkway</td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td>Tree Well</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Asphalt Berm</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

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three feet in width or less, and only six percent are nine feet in width or greater.

From a practical standpoint, therefore, most vacant planting sites cannot accommodate anything more than a very modest size tree without some modification, such as a curb extension, to increase the width of the planting space. On the other hand, as shown in Figure III-9, most of the vacant planting sites are unencumbered by overhead utility lines. This suggests that, at most vacant planting sites, conditions tend to constrain the size of the root ball rather than the height of the tree.

**Figure III-9: Presence of Overhead Utilities at Vacant Street Tree Sites**

Since the inventory of vacant planting spaces was confined to highly urbanized areas and excluded State of Hawai‘i rights-of-way, it is likely that there are many more opportunities for additional tree plantings along suburban and rural streets and roads and State highways, which tend to have rights-of-way that include a greater proportion of unpaved area, such as wide but unimproved road shoulders.

The Department of Transportation (DOT) Highways Division plants and maintains landscaping within State rights-of-way, but often allows others, including DPR/DUF, to plant landscaping in the right-of-way if they are willing to assume responsibility for maintenance and liability. Highway landscaping has relatively low budget priority for DOT compared to its primary mission of building, maintaining and operating the highways for transportation purposes.

Another reason that DOT cites for its reluctance to engage in highway beautification projects is that Hawai‘i is not a “sovereign immunity” state; i.e., the state can be held liable for damage that may be attributable in part to landscape elements in the right-of-way. This is also cited as the reason why Hawai‘i is one of the few states in the U.S. not to have a federally-funded
Scenic Byways program. A remedy for this problem is to grant “limited sovereign immunity” to DOT for highway beautification projects and programs.

2. Age and Species Diversity

Planting new trees in unoccupied sites and replacing trees that are removed is critical to enhance and maintain the overall health of the urban forest. DPR/DUF estimates that it plants approximately 2,500 trees per year, including both street and park trees. In addition, private developers plant trees as part of new development or as improvements related to redevelopment of existing areas. When properly planned and managed, new and replacement plantings ensure that the Street Tree population remains diverse in both age and species.

A proper mix and distribution of young and mature trees minimizes the risk of large-scale tree loss from normal age decline, hazard and mortality, or in the event that any specific age group succumbs to disease. Not only is wholesale tree loss environmentally and aesthetically damaging, but the cost of re-planting and nurturing the replacement tree population is much greater at that scale than if done incrementally.

Age diversity does not necessarily imply that trees should be selected for a uniform rate of growth. In the absence of hard data on long-term maintenance costs, some tree managers assume that fast-growing species are more costly to maintain than are trees with slower rates of growth. While that may be a reasonable assumption, it is also useful to bear in mind that, in the constantly changing urban environment, some planting sites are available only for a few decades. In such cases, fast-growing or short-lived trees, as well as those that exhibit undesirable traits in the later stages of life, may be appropriate.

Maintaining a diversity of species in the urban forest is important to prevent the widespread loss of tree population in the event that a particular species is afflicted with a disease or pest infestation. Based on the experience of cities that have experienced such large-scale losses, researchers suggest that no more than ten percent of the trees in a community be represented by one genus, and no more than five percent by one species.

The principle of species diversity does not mean to suggest that species distribution be entirely random. It is often desirable from an urban design perspective to plant a particular species as a Street Tree along the length of an entire corridor in order to establish a consistent design theme or neighborhood identity. The Monkeypod trees along Kapiolani Boulevard and Rainbow Shower trees along King Street are striking examples of this. Likewise, Coconut palm

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51 Notes of the Green Hawai‘i Committee meeting on September 15, 2004
plantings along Waikiki’s Kalakaua Avenue and Kuhio Beach complement similar landscape treatments on adjacent properties and the remnants of historic Coconut groves that once dominated the area. To allow for such district-wide design concepts, a previous report to DPR/DUF recommended that the species diversity guidelines be applied to smaller divisions, such as individual city blocks, considering all trees, public and private, within the block.55 This would necessitate more discretionary review of planting plans for private properties than what presently occurs in the City’s development permitting process.

3. **Vehicle and Vandalism Damage**

Honolulu’s Street Trees occasionally are hit by cars that veer off the street and into the tree, either severely scarring or destroying the tree. Vandalism, including unauthorized tree removal, also occurs on occasion. Some abuse of street or park trees occurs more out of ignorance or thoughtlessness rather than malicious intent; for example, the practice of dumping hot coals from barbecues at the base of trees in parks. Since there is little documented information on the extent of damage to trees due to vehicular accidents or vandalism or the circumstances under which the damage occurred, it is hard to estimate the extent of such damage or analyze its sources.

DPR/DUF regulations define prohibited acts on Street Trees and park trees and establish a fine and/or imprisonment as criminal penalties for violating these restrictions.56 However, perpetrators are rarely caught in acts of vandalism or abuse, making it difficult to prosecute offenders. Where there is evidence of damage that can reasonably be traced to a suspect, such as an adjacent landowner, DPR/DUF will ask the Honolulu Police Department to investigate. A police inquiry and warning to a suspect probably has a deterrent effect if the act of vandalism or abuse is in progress or can be reversed, but offenses against trees are not likely to get much attention from prosecutors or criminal court judges if the enforcement process needs to move into the penalty phase. As the Department of Planning and Permitting has found in its experience with enforcing zoning and building codes, civil proceedings are a more effective way to achieve compliance or recompense damages in egregious cases of willful violations.

DPR/DUF is authorized to issue civil fines and use civil remedies, including injunctive relief, to enforce protective standards and guidelines for designated Exceptional Trees.57 However, it has not been necessary to exercise these enforcement mechanisms because most of the trees are on public property and are cared for by the responsible public agency, which is often DPR/DUF itself, and the City has not listed any tree on private property over the objections of the landowner.

4. **Landowner/User Objections and Preferences**

As mentioned in the introduction to this chapter, the urban forest encompasses all vegetation, including that on private property. Landowner and site user objections and preferences arise when tree protection and landscaping requirements extend to private property or where a Street Tree directly fronts the property.

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56 Department of Parks and Recreation, Rules and Regulations Relative to Planting and Maintenance of Street Trees, June 1971.
57 Chapter 41, Article 13, Revised Ordinances of Honolulu.
Street Trees, park trees and Exceptional Trees are clearly protected by regulation, but other trees and landscaping on private property are also covered by a limited form of regulatory protection under the Land Use Ordinance (LUO). In general, LUO provisions do not emphasize the preservation of existing trees; they are intended primarily to improve the general landscape character of properties and their vicinity by establishing minimum landscape standards and, in some cases, requiring the review and approval of site-specific landscape plans as a precedent to building permit approval. As mentioned in Section II.B.2 of this report, tree removal in certain locations of designated Special Districts require permit approval from the Department of Planning and Permitting (DPP). Other sections of the LUO require the landscaping of yards, landscaping screening for certain types building features or uses, and landscaping (including shade trees) in parking lots. In addition, DPP often attaches site-specific landscaping requirements as a condition to land use permit approvals.

Landowners and site users raise a variety of concerns about trees. Residential property owners often object to the amount or nature of debris or droppings produced by trees or tree pests, such as:

- Leaves and flowers in yards, gardens, and hardscape areas, adding to maintenance requirements
- Fruits and leaves on sidewalks that get wet and create fall hazards
- Birds landing and causing droppings on cars and other areas
- Insects causing droppings on cars, sidewalks and elsewhere

In addition, some residents want a tree removed or dramatically pruned to open a line of sight to a scenic view.

Many commercial property owners and site users have similar concerns, although the viewplane issue typically focuses on making business signs or display windows readily visible from the street. Also, some commercial owners resist code-mandated landscaping requirements for visual screening and parking lots, by eventually removing the trees and other plant material or allowing them to decline through neglect.

Complaints about Street Trees typically come from owners of adjoining or nearby residential properties, perhaps in part because they were not involved in Street Tree selection. Some owners remove newly planted Street Trees or call the City to request their removal. On occasion, Street Trees are replaced with other trees considered more desirable by the adjacent property owner, but they are often replaced with shrubs, other non-tree ornamental plantings, or crushed rock and other paving-related material. Most of these alterations are done without required permits.

Conversely, some residential property owners take the initiative to plant a Street Tree, but not always with the required permits. This tends to occur more frequently in unimproved sidewalk areas where there is ample planting space available between the front property line and roadway pavement edge. Adjoining owners fill the sidewalk area with landscaping for aesthetic or privacy screening purposes, to abate soil erosion, to prevent vehicles from parking in the sidewalk area, or a combination of these purposes. The owner can obtain a Surface
Area Encroachment approval from DPP for such landscaping if he can show that there is adequate clearance for pedestrian passage in the sidewalk area and sufficient width in the right-of-way to park vehicles outside of travel lanes. If the owner is seeking after-the-fact approval for plantings that have already been installed, DPP may require the removal of plants that obstruct necessary clearances or pose a public hazard, such as thorns or aggressive growth characteristics. If the Surface Area Encroachment is approved, the owner must agree to maintain the approved landscaping in an acceptable condition; to remove it, if and when the City so orders; and to hold the City harmless for any damages or claims that arise from the landscaping.

Many of the conflicts cited above could be reduced through a more concerted public education effort to raise awareness about the value of the urban forest, proper procedures for planting a new tree or getting a Street Tree replacement, and the characteristics of alternative species that would be acceptable as either a public or private Street Tree.

Public education could also help build support for regulatory initiatives or new incentives for growing more of the urban forest on private lands. For example, at present, zoning code standards allow up to 50 percent building coverage on residential lots and place no limit on the extent of impervious surface, making it possible for an owner to literally pave the entire lot. While there has been no documentation of this trend, there is a widespread perception that urban Honolulu’s residential neighborhoods are being incrementally transformed with higher percentages of lot coverage as properties are redeveloped. The cumulative effect of this transformation is increased volumes of polluted stormwater runoff, more intense peak discharges, and elevated ambient temperatures through the “heat-island” effect. Another regulatory measure to consider, for similar reasons, is the retention or replacement of existing tree canopy on sites that are graded, especially those on sloped land in zones of higher rainfall.

Regulatory measures are generally better accepted if their purpose is well understood and they are combined with incentives. A good example of an incentive that complements a regulatory measure is the State of Hawai‘i’s recently adopted income tax deduction for owners of properties with designated Exceptional Trees.59 The credit is intended to offset the expenses of the special maintenance requirements for such trees, thereby encouraging the listing of additional Exceptional Trees on private properties.

5. **Street Tree Maintenance**

Proper and regular maintenance of Street Trees is necessary to insure that they thrive and provide their intended functional and aesthetic benefits. Maintenance activities include mulching, pruning, pest and disease control, fertilization, irrigation, and monitoring of growth, structure, safety and appearance. Green waste utilization, the by-product of pruning and removal, is also an important component of urban forest maintenance.

Experience and research have demonstrated that the following maintenance practices will ensure good tree health and cost-effective management of the urban forest.60

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59 Chapter 235-19, Hawai‘i Revised Statutes
60 Tropical Urban Forestry Management Plan, op. cit., describes in greater detail the basis for these practices, and makes specific recommendations for Honolulu’s Street Tree maintenance program.
Conduct regularly scheduled tree pruning on an appropriate schedule within designated geographic areas based on species growth rates and work efficiency
- Conduct pruning according to current best management practices and standards
- Identify and utilize the most effective irrigation methods for each situation
- Monitor and manage trees that are identified in poor or fair condition
- Implement an Integrated Pest Management Program
- Use fertilizers according to current best management practices and standards
- Develop standards and processes for green waste utilization

For example, proper pruning practice yield several benefits:
- It prevents the tree from developing a poor branch structure (e.g. crossing/rubbing limbs, poor limb connections at the stem) or inappropriate growth response to limb damage from environmental and human interactions (e.g. resprouting from broken limbs or wounded trunks resulting in poor connections), either of which can be detrimental to the health and safety of the tree.
- It prevents resprouting growth from obstructing traffic control devices and signs, thereby reducing safety hazards and public complaints.
- It prevents hazards to people and property from falling limbs and branches due to natural dieback and disease.
- It reduces overall maintenance expenses by avoiding the more costly tree access challenges and heavy debris generation that result from overgrown conditions.
- Performing pruning on all trees within a designated area, as opposed to pruning individual trees on a request or as-needed basis, has also been demonstrated to significantly reduce costs because it minimizes significant nonproductive travel time between trees. It also provides for good public relations because all trees are pruned at once eliminating the concern by residents that their street tree was missed.

Technical expertise is also important in the actual planting and care of the urban forest. It is not feasible for DPR/DUF to carry out all of the functions of planting, monitoring and maintaining all of the Street Trees and park trees, let alone the entire urban forest, with only its permanent staff. The agency necessarily relies on the assistance of contract arborists, horticulturalists and tree workers. Contractors for City-initiated construction projects involving protected trees are required to retain a certified arborist to monitor the construction activity. Contractors for maintenance of protected trees, such as pruning, are also required to retain qualified tree workers. However, the standards for what constitutes a “qualified” arborist or tree worker are unclear. If work in the field is not properly supervised, monitored and executed by qualified personnel, there can be unfortunate and costly consequences not only the health of the affected trees, but also to public safety. Better standards for determining personnel qualifications are needed.

Some cities have had success in out-sourcing tree maintenance to private contractors via residential or business community associations and special assessment districts. DPR/DUF has not done this to date, but there is an opportunity to do so. For example, the ‘Ewa by Gentry Community Association collects quarterly fees from residents that are used in part for tree pruning within common areas in the community. The pruning is conducted by contractors whose work is audited by the community association maintenance supervisor. For areas of new development, DPR/DUF and DPP could require that a portion of the community association fees be dedicated to Street Tree maintenance, as well.

A similar model could be applied to Honolulu’s commercial districts through the establishment of Business Improvement Districts (BID). At present, there are two such districts – the Waikiki BID and the Fort Street Mall BID. Property owners in a BID pay a property tax surcharge to fund various types of supplemental services. In Waikīkī for example BID assessments are used to fund streetscape maintenance, security and hospitality services, and promotional events. The use of this assessment could be expanded to pay for Street Tree maintenance, especially in view of the extent of public-funded landscaping in that district.

6. Plan Review and Permitting

With the reorganization of the City and County of Honolulu’s government in the mid-1990’s, the Department of Planning and Permitting (DPP) assumed responsibility for all permitting and regulation related to land use and development. This includes the review and approval of Street Tree plantings and the administration of the Street Tree Planting Standards.

Tree planting projects can originate from the private sector and through a number of public agencies. Most planting plans, except those initiated and maintained by the State of Hawai’i or the U.S. government, require review and approval by DPP. The most common types of urban tree planting projects, their points of origin and approval process are summarized in the table on the following page.

There are several instances noted above where DPR/DUF may be involved in the plan review process. However, this takes place on an ad hoc basis and there is no written policy or specific criteria that define when DPR/DUF review of plans would be useful or necessary.

DPP also reviews plans and issues permits for construction that does not involve tree planting but affect existing Street Trees under the jurisdiction of DPR/DUF. For instance, construction in the public right-of-way or on adjoining private property frontages can have immediate impact on Street Trees or long term effects on the tree’s grow space. These plans are not routed to DPR/DUF for review.

In interviews and meetings, DPR/DUF expressed frustration that they do not get an opportunity to review Street Tree Planting Plans during the preliminary design phase and often do not learn until the construction stage about proposed planting projects that will ultimately be left under their care. When they express objections to certain elements of the plan at that point, it is

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often too late or too expensive to revise or remedy, so their concerns are overridden. In some projects, however, where DPR/DUF has pointed out implications for costly maintenance problems as the trees mature, construction activity has been stopped until a solution is reached. Contractors and sponsoring agencies reluctantly comply, but at the consequence of increasing the project schedule and cost. Under a well-defined system of plan distribution and review, these unexpected and costly delays can be avoided.

Despite the scope of the DPP’s responsibilities with respect to the review and approval of landscape planting plans, and construction plans that may affect existing protected trees, DPP does not currently have a single licensed or certified landscape architect, arborist or horticulturalist on its staff. Nearly all of the City’s employees with such qualifications are within DPR/DUF. For several years, DPP has tried, without success, to get approval to create either a landscape architect or arborist position within its department to carry out the landscape plan review and permit monitoring functions.

Due to the lack of in-house expertise to decide, in some cases, whether the selection of plant material is appropriate or there is good cause to allow an applicant to remove a tree, DPP staff often turns to DPR/DUF for technical advice. However, as discussed in the previous section, this consultation occurs on an informal, ad hoc basis. DPP’s accessibility to this expertise is hampered by the DPR/DUF’s limited time to respond to matters that are not directly within their responsibility, and by the difficulty of reaching the staff, which are headquartered at another location and are often in the field.

Consolidating all of the land use and development permitting into a single agency was one of the most salient features of the reorganization of the City and County of Honolulu’s government in the 1990’s. One of the manifestations of this reorganization was the creation of a “one-stop permit counter” on the ground floor of the Frank F. Fasi Municipal Building. While a limited number of development permit functions are still retained by other agencies – such as connections to the water system by the semi-autonomous Board of Water Supply (BWS) – it is possible for a development permit applicant to consult with appropriate agency personnel and submit the permit application at that one location. For simpler requests, it is even possible to obtain the permit in a single visit.

The physical presence of at least a one or two DPR/DUF staff at the “one-stop permit counter” would not only enhance the purpose of this operation, but also make DPR/DUF expertise much more accessible to DPP staff. Many of the questions concerning plants that come up in the review of plans could be handled more efficiently by an informal “over-the-counter” or “at-the-desk” consultation. The considerable daily traffic through the “one-stop permit counter” location would also give DPR/DUF broader public exposure and support public education efforts. For example, at the entry to the “one-stop permit counter”, DPR/DUF could display brochures concerning a variety of topics, from regulatory requirements, to advice for homeowners, to the benefits of the urban forest.

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63 Interview with Bill Balfour, Stan Oka and other representatives of the Department of Parks and Recreation, August 31, 2004; and meetings with Stan Oka and Terri Ramos of Division of Urban Forestry on August 18, 2004 and September 28, 2004.
64 The Department of Design and Construction (DDC) has two landscape architect positions.
<table>
<thead>
<tr>
<th>Type</th>
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<tr>
<td>New subdivision development</td>
<td>Subdivision developer</td>
<td>Developer’s landscape architect</td>
<td>DPP; DPR/DUF may be asked to review if the plan involves exceptions to standards</td>
<td>DPP (although DPR/DUF has control over release of the developer’s performance bond)</td>
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<tr>
<td>Landscaping of parking lots, required yards and projects with permit conditions</td>
<td>Landowner/developer</td>
<td>Developer’s landscape architect</td>
<td>DPP; DPR/DUF occasionally asked for advice on selection of plant material</td>
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<td>Unimproved sidewalk surface area encroachment</td>
<td>Adjoining frontage owner</td>
<td>Owner (although tree is often existing)</td>
<td>DPP; DPR/DUF rarely asked to review</td>
<td>DPP (DPR/DUF has no maintenance responsibility)</td>
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<td>Beautification project on public land</td>
<td>Mayor, City Council member or community group</td>
<td>Landscape architect under contract to DDC</td>
<td>DPP; DPR/DUF may be asked review</td>
<td>DPP (DDC may waive DPP comments; DPR/DUF usually assigned maintenance responsibility)</td>
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<tr>
<td>Landscaping related to transportation project (e.g., highway, traffic calming, bicycle facility, transit)</td>
<td>Department of Transportation Services (City) or Department of Transportation (State)</td>
<td>Landscape architect under contract to DTS or DOT</td>
<td>DPP; DPR/DUF may be asked review if the project is DTS-initiated</td>
<td>DPP (for DTS-initiated projects only; DPR/DUF usually assigned maintenance responsibility if on City property)</td>
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<tr>
<td>New planting or tree replacement as part of ongoing Street Tree program</td>
<td>DPR/DUF or adjoining frontage owner</td>
<td>DPR/DUF</td>
<td>DPR/DUF</td>
<td>DPR/DUF</td>
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<tr>
<td>New planting or tree replacement in public parks</td>
<td>DPR/DUF (City) or Department of Land and Natural Resources (State Parks) or Hawai‘i Community Development Authority (Kaka‘ako)</td>
<td>Staff or contract landscape architect of respective public agency</td>
<td>The respective public agency</td>
<td>The respective public agency, which is also responsible for maintenance</td>
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CHAPTER IV
POLICIES, GOALS AND OBJECTIVES

INTRODUCTION

The policies, goals and objectives of this plan are intended to address the features of the urban forest that were summarized in the introduction to Chapter III, as well as the issues and opportunities that were discussed in the body of that chapter, including management and regulatory issues.

The section below lists the policy statements, which is followed by a section setting forth the goals and objectives to implement the policies. Performance measures are provided in order to monitor and evaluate progress toward achieving the goals and objectives. This, in turn, can assist in future updates of the Plan.

A. POLICIES

COORDINATE. Coordinate the roles, responsibilities, policies and projects of City and County of Honolulu agencies and partners for planning and managing the urban forest.

- Designate the Division of Urban Forestry (DPR/DUF) as the lead organization, not only within the City and County of Honolulu, but also as the representative of and advocate for the urban forest where entities outside the City are involved.
- Participate actively in the development of policies by other entities that may affect the urban forest, such as the Hawai‘i Weed Risk Assessment project being conducted by the University of Hawai‘i.
- Forge partnerships with community organizations such as The Outdoor Circle, Scenic Hawaii, civic clubs, business and neighborhood associations and other community-based groups for tree planting and landscape maintenance projects.

DOCUMENT. Characterize, inventory, and document the health and condition of Oahu’s urban forest.

- Continuously update the 1999-2000 Street Tree Inventory to maintain an accurate database, and expand it to cover all protected trees under the care of the DPR/DUF, including park trees and Exceptional Trees.
- Incrementally expand the tree condition inventory to include other mature trees on private properties in the State Urban District, beginning with properties that are located within a Special District where permits are required to remove such trees.

65 The policies embodied in this Plan borrow heavily from the Portland (OR) Urban Forestry Management Plan, 2003, which sets forth broad, comprehensive statements that are applicable to virtually any urban forest context. The goals and objectives of this Plan, however, are tailored more specifically to the needs and conditions of the City and County of Honolulu.
- Establish baseline data on tree canopy cover for the various urbanized areas of the island in order to monitor performance in achieving tree canopy goals.

- Provide a means to input data on the type, condition and health of the tree directly into the Geographic Information System database layer for street and park trees as the information is collected in the field during routine maintenance and monitoring.

**PRESERVE. Develop and coordinate effective stewardship programs to maintain, restore and preserve the urban forest and protect the safety of the public.**

- Publish a technical manual to be used as a reference by anyone who plans and designs improvements for City-owned property or performs or supervises maintenance or construction work relating to or affecting trees that are protected by City ordinances.

- Conduct training sessions for City and County of Honolulu employees and contractors who perform or supervise maintenance or construction work that does or could affect protected trees.

- Establish cost-effective preventive maintenance programs to improve the health and safety of protected trees.

- Utilize new technologies such as structural soil and pervious pavement to improve growing conditions in harsh environments such as streets with narrow planting strips or small tree wells, parking lots and industrial areas.

- Prepare plans and educate the DUF staff and public on how to address outbreaks of pests and diseases and avoid the planting of species that may threaten either the urban or natural forest.

**INCREASE. Identify and utilize areas where additional trees and other planting can be added to enhance the urban forest, especially with large canopy trees in appropriate locations.**

- Establish islandwide tree canopy goals for urban areas and more specific tree canopy goals for various types of urban land uses in order to have measurable performance standards.

- Develop criteria and priorities for designating planting areas, focusing planting efforts on tree deficient areas and/or places with high exposure to human activity, especially where increased pedestrian use would be desirable.

- Identify and utilize planting opportunities in building setback areas and yards and non-traditional planting areas such as curb extensions, rooftops and parking lots.

- Promote the use of diverse species and canopy types that are appropriate for the particular planting location.
EDUCATE. Increase awareness and understanding about the value and benefits of the urban forest and promote proper care of the urban forest.

- Develop programs and materials that explain the benefits of the urban forest, proper planting and maintenance practices, and promote the planting of trees and vegetation.
- Create and support educational outreach programs in coordination with schools, community and neighborhood organizations.
- Promote Arbor Day, the Exceptional Tree and Street Tree program and awards programs that recognize the values of the urban forest.
- Provide volunteer opportunities for citizen involvement in urban forestry projects and events.

ENCOURAGE. Develop and implement incentives that provide tangible benefits for the planting, care and permanent protection of the urban forest.

- Adopt financial incentives to property owners who dedicate and agree to maintain trees for preservation, such as the State income tax deduction for owners of properties with designated Exceptional Trees.
- Provide free plant material, technical assistance and logistical support to residential property owners and community-based organizations who initiate tree planting projects, especially as part of a neighborhood revitalization effort and in areas where there is presently a relative dearth of trees.

FUND. Establish stable funding and adequate resources and staff to maintain, preserve, restore and increase all aspects of the urban forest.

- Ensure that the DPR/DUF has adequate funds to manage the urban forest, including necessary maintenance contractors as well as regular staff.
- Provide funding for Street Tree and park tree plantings to meet street tree canopy goals, and concomitant increases in DPR/DUF’s operating budget to monitor and maintain the new plantings.
- Promote the creation or expansion of special assessment districts to support the maintenance of the urban forest in commercial areas, following the models of the Fort Street Mall and Waikiki Business Improvement Districts.

REGULATE. Develop and enforce effective regulations and planting and design standards that ensure the health, quality and benefits of the urban forest.

- Provide DPR/DUF with a more direct and timely role in the review of plans that affect protected trees, including those on private as well as public properties.
- Provide a physical presence by DPR/DUF staff at the Frank F. Fasi Municipal Building’s One-Stop Permit Counter to facilitate better communication among development permit regulators and more appropriate and consistent review of Street Tree and other landscaping plans that are submitted to the City for approval.
Emphasize the use of published technical standards, plan reviews, existing permit procedures and site inspection rather than the creation of additional permit processes to enforce regulations.

Expand the protection of the urban forest into private properties by establishing re-planting standards for sites where existing tree canopy will be significantly diminished due to tree removal and/or grading and grubbing.

Clarify regulatory responsibilities for Street Trees between DPP and DPR/DUF by either replacing the two agencies’ rules with a new, jointly adopted set of rules or by a new set of DPR/DUF rules that omits standards that have been superseded by DPP’s more recently adopted rules.

Improve the effectiveness of enforcing against intentional damage to protected trees by providing for civil remedies as an alternative to criminal penalties in instances where this approach is not presently available (e.g., for Street Trees.)

B. GOALS AND OBJECTIVES

GOAL 1: Extend the benefits of the urban forest through additional tree plantings.

The urban forest improves the quality of life for residents and the experience of Honolulu for visitors, increases property values, enhances comfort, and improves health.

OBJECTIVE: Increase tree canopy cover and provide an equitable distribution of trees throughout the urbanized areas of the island.

Plant additional trees to achieve an overall tree canopy goal for urban areas and more specific canopy goals for certain types of urban land use, based on the recommended standards of American Forests.\(^6^6\) Comparative standards adopted by various municipalities are contained in Appendix A. Provide a mechanism for monitoring tree canopy to identify geographic locations where tree planting projects are needed to achieve canopy goals. Also, remove impediments to tree planting along State highways.

Performance Measures:

Below are the desired guidelines for percentage of tree canopy cover in urban areas of O‘ahu:

- 40% overall in the Urban District
- 15% in commercial and industrial zones
- 25% in higher density urban residential zones

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\(^{66}\) American Forests, founded in 1875, is the nation’s oldest nonprofit citizens’ conservation organization. Their recommended tree canopy goals are based on 20 years of research on urban landscapes and have been adopted by many municipalities throughout the U.S. as a basis of urban forestry management plans. See [www.americanforests.org](http://www.americanforests.org)
• 60% in lower density urban residential zones, parks, stream corridors, large institutional campuses and other open areas within urban boundaries

Establish a program for periodic monitoring of tree canopy cover, using the above guidelines to identify locations for priority tree planting projects (see Goal 12.)

Plant available sites for Street Trees, increasing the stocking level\(^{67}\) by 10 percent in the next 10 years and 20 percent in the next 20 years until 100 percent of available sites have been planted.

Plant two Street Trees for every Street Tree that is removed.

Grant “limited sovereign immunity” to the State of Hawai’i Department of Transportation (DOT) through a legislative act and/or amendment to the State Constitution and establish a Scenic Byways program for Hawai’i.

**GOAL 2: Educate the public about the management and care of the urban forest.**

Proper stewardship of the urban forest cannot depend solely on the resources of DPR/DUF. A well-informed public is a very important partner in carrying out this responsibility.

**OBJECTIVE:** Provide information about best management practices for tree planting, preservation and care.

Develop a variety of outreach programs and informational materials designed to reach a broad segment of the population.

**Performance Measures:**

Establish a Community Forestry Section within DPR/DUF to prepare and conduct a public education and community outreach program. This can be accomplished primarily by reallocating existing positions within DPR/DUF.

Produce “user-friendly” educational materials and conduct informational programs to explain and illustrate technically correct and appropriate practices for the tree selection, planting, preservation and care.

Implement “hands-on” public involvement through community planting projects in coordination with neighborhood associations, businesses and community organizations.

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\(^{67}\) “Stocking level” is the percentage of available spaces for Street Trees. See Section III.C.1 for discussion of available planting sites for Street Trees.
GOAL 3: Protect the urban forest from pests and diseases.

Maintaining a diversity of species lowers the risk of catastrophic loss of trees due to pests and diseases.

OBJECTIVE: Provide a diversity of species.

An area where many different types of species are present is less likely to experience widespread loss of trees due to an epidemic that afflicts and destroys only particular species of trees. This does not imply, however, that existing trees should be removed. Rather, the diversity should be achieved incrementally through the planting of new trees and replacement of dying or dead trees.

Performance Measures:

When designing a new planting or replacing trees that have been removed:

- No species should be selected and planted such that it causes the total population of that species to exceed 5 percent.
- No genera should be selected and planted such that it causes the total population of that genus to exceed 10 percent.

These guidelines do not apply when a single tree is planted in an area with very few total trees.

GOAL 4: Ensure the continuity of the urban forest over time.

Age diversity and environmentally appropriate tree selection perpetuate the life of the urban forest.

OBJECTIVE: Provide a diversity of ages among trees in the urban forest and select trees that are most likely to survive in the environments where they are planted.

A healthy mix of young, medium and mature trees provides a constant turnover of generations that maintains the urban forest in a steady state as new trees replace those that die. Considering the tolerances of a tree species to environmental conditions of a particular planting site increases the likelihood that they will thrive to maturity.

Performance Measures:

Plant at least 2,500 young trees per year, combining Street Trees in new developments, Street Tree planting projects conducted by the DPR/DUF, and trees in park areas, and set higher planting goals in each successive year.

Publish tree planting guidelines based on the “biome” concept, with a list of appropriate species for each biome.
GOAL 5: Maintain and restore healthy habitats.

A healthy urban forest habitat is one that is sustainable and naturally appropriate for the island’s ecosystem.

OBJECTIVE: Control invasive pest species and reintroduce the use of native species in the urban forest.

Non-native pest species, through their aggressive habits, threaten the long-term viability of O‘ahu’s native forests and watersheds. The use of native plants creates a more stable and sustainable landscape environment, generally requiring less irrigation and maintenance than does the use of non-native species.

Performance Measures:

Replace non-native pest species in the urban forest through attrition; i.e., when the tree dies or is otherwise destroyed or diseased, replant the site with a native (preferably) or suitable non-native species.

Prohibit the use of non-native pest species in new Street Tree planting projects and in other landscape planting plans that are submitted to DPP for approval.

GOAL 6: Extend the benefits of Street Trees.

Healthy and abundant Street Trees improve the quality of life for all residents and visitors, particularly the pedestrian experience.

OBJECTIVE: Provide adequate growing environments and maintenance programs for Street Trees.

To thrive in a sometimes harsh urban environment, the canopies and roots of Streets Trees require adequate space to grow and proactive and technically appropriate maintenance.

Performance Measures:

Amend appropriate provisions of the Land Use Ordinance (LUO) and other development codes, as necessary, to create opportunities for wider Street Tree planting strips and property development occurs; for example:

- Use all or portions of LUO-required front yards in commercial zones for sidewalks so that a minimum 5-foot width can be dedicated to obstructed “pedestrian travel zone” and a minimum 5-foot width of the existing sidewalk area next to the curb line can be dedicated to a “utility zone”; i.e., signs, light fixtures, bus shelters, traffic control boxes and other fixtures, as well as Street Trees (see illustration in Section 7.4 of the Design Guidelines.)
• Increase available planting spaces along streets with substandard planting strip widths by applying “Ordinance 2412” requirements to require additional right-of-way width along the frontages of properties as they are redeveloped.

Retrofit existing street rights-of-way with curb extensions, tree wells or structural soils to provide more ample planting spaces where existing spaces are inadequate and the potential for gaining additional tree planting in front yard landscaping through property redevelopment is low.

Include Street Tree planting as part of all street improvement projects.

Encourage utility companies to relocate or realign overhead utility lines, using approaches such as those described in Section III.A.2, and require this where possible, such as in Special Districts.

Publish a technical manual for the maintenance and care of Street Trees and require all frontage owners, property developers, public agencies, contractors and others to abide by those standards and procedures.

Follow recommended Street Tree maintenance programs and schedules of the DPR/DUF 2003 Tropical Urban Forestry Management Plan.

**GOAL 7: Ensure public safety.**

Dead, decaying or overgrown trees can pose a hazard to persons and property, especially in high use areas such as public rights-of-way and parks, where there is greater susceptibility to harm from fallen trees, branches or other debris, or foliage that obscures line-of-sight to traffic or traffic control devices.

**OBJECTIVE: Organize and coordinate maintenance of Street Trees and park trees.**

A systematic maintenance program and adequate staffing or contractual assistance can prevent public safety hazards from Street Trees and park trees.

**Performance Measures:**

Implement the maintenance program recommendations of the DPR/DUF 2003 Tropical Urban Forestry Management Plan, and apply these recommendations to park trees as well as Street Trees.

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68 The codified reference to “Ordinance 2412” is Section 14, Article 21, Revised Ordinances of Honolulu. This ordinance requires that, when commercial- or apartment-zoned properties with frontage along a street that is designated for right-of-way widening and/or improvement is redeveloped or substantially repaired, the owner must dedicate the area to be widened and construct all of the planned street improvements, including curbs, gutters, sidewalks, road surface and any drainage or other infrastructure.
GOAL 8: Improve water quality and abate stormwater runoff.

Tree canopies provide an important natural filtering function and capture rainfall that would otherwise fall directly to the surface and contribute to polluted stormwater runoff. Moreover, the shade from trees cools surface water and promotes the recharge of ground water.

OBJECTIVE: Increase riparian vegetation and tree canopy cover on sloped land.

Tree canopy and other vegetative cover can complement and help achieve the water quality and stormwater drainage management objectives that are embodied in various City and County of Honolulu engineering and environmental standards and regulations.

Performance Measures:

Amend the City’s grading ordinance69 to require tree canopy preservation on sites with slopes of 20 percent or greater and provide the option of planting additional trees as a method to fulfill erosion control standards. Other municipalities have adopted tree preservation ordinances that can serve as a model for Honolulu in this regard.70 DPP would be the lead agency for this project.

Identify concrete-lined stream channels and other degraded stream corridors that can be partially restored to natural riparian conditions by replacing stream walls with rock rip-rap or gabion armoring and replanting streamside vegetation.71 DDC would be the lead agency for this project.

GOAL 9: Promote the integration of the urban forest with urban design.

Trees and other plants should be an integral part of the urban design objectives for specific localities, reflecting the historic, cultural or other design themes and supporting the functionality of the desired land use pattern.

OBJECTIVE: Use urban design objectives and standards of land use policy plans, neighborhood-level plans, Special District regulations and site master plans as a guideline for landscape planting plans.

There is already a well-establish urban design context in many parts of Honolulu. New landscape plantings help implement the desired future urban design conditions that are expressed in various policy plans, neighborhood plans, regulations and major projects that have been adopted, published, or initiated by the City.

69 Chapter 14, Articles 13 to 16, Revised Ordinances of Honolulu.
70 See, especially, the tree preservation regulations and standards in Chapter 33.630, Portland (OR) Municipal Code.
Performance Measures:

Publish design guidelines for tree planting plans that are reviewed and approved by the City and County of Honolulu.

**GOAL 10: Provide effective and efficient plan review and permitting.**

The plan review and permitting process is an importance mechanism for ensuring consistent and appropriate decisions affecting the health of the urban forest.

**OBJECTIVE:** Involve DPR/DUF more directly and at an earlier stage in the review of plans and permits affecting trees and other landscaping.

Since City and County arboricultural knowledge and experience reside solely within DPR/DUF, DPR/DUF should approve all tree removal requests related to a tree hazard or public nuisance diagnosis. More direct and timely involvement of DPR/DUF staff in plan review or permit processes would better ensure appropriate planting and maintenance of trees and other landscaping, and avoid costly delays and late-stage design changes that have sometimes occurred under the existing review system.

Performance Measures:

Establish a DPR/DUF physical presence at the Honolulu Municipal Building “One-Stop Permit Counter” and refer plans and permit applications affecting protected trees or proposing required landscape planting to the DPR/DUF staff for review and approval. The DPR/DUF station at the “One-Stop Permit Counter” would be staffed by a landscape architect and an arborist from the proposed Community Forestry Section (see Goal 2.) The arborist position may be filled on a rotating rather permanent assignment basis, giving the arborists field assignments during the interim periods.

**GOAL 11: Provide effective enforcement for the protection of trees and landscaping.**

Without effective enforcements mechanisms, the regulations and standards for protecting trees and landscaping have greatly diminished value.

**OBJECTIVE:** Utilize methods and procedures that have proved to be most effective for the particular purpose of code enforcement.

Experience in Honolulu and elsewhere has shown that criminal enforcement procedures are generally ineffective mechanisms for enforcing zoning and development codes. Consequently, Honolulu amended most of its development-related codes in the late 1980’s to enable civil enforcement procedures. Civil enforcement should also be available for the protection of trees.

Performance Measures:

Enact ordinance and/or regulatory amendments, as necessary, to enable civil enforcement procedures for Street Tree and other protected trees. [NOTE: Civil enforcement is already available for trees that are protected under the LUO – e.g., a
“major tree” in a Special District, which cannot be removed or destroyed without a permit from DPP.]

**GOAL 12: Provide effective mechanisms for monitoring the urban forest.**

An effective system for monitoring the status of the urban forest provides the information necessary to measure progress towards meeting goals and assess where intervention is needed to maintain the health of the urban forest.

**OBJECTIVE: Develop systems for periodic monitoring on island-wide as well as regional and local scales.**

Periodic monitoring at the island-wide scale, often done through aerial photography and digital mapping, gives a picture of overall progress in meeting urban forestry goals and identifies patterns of regional differences. Monitoring at the regional or local scale, typically done through on-the-ground observation, gives a more detailed assessment of progress and needs.

**Performance Measures:**

Develop and maintain a computerized Street Tree Management System. This should be updated on a “real-time” basis by equipping DPR/DUF arborists in the field with hand-held devices to input field observations and reports directly into the database.

Conduct aerial photographic surveys of tree canopy conditions on a periodic basis (e.g., every 2 to 5 years), using high-altitude infra-red imagery or other technology, and integrate this information into the City’s Geographic Information System as a data layer. This project could possibly be done by, or in cooperation with, other organizations, such as the University of Hawai‘i or U. S. Department of Interior.

Organize Community Planting Programs by Council District, rather than Island-wide, to provide better governmental focus and support for the program and permit more effective reporting of planting programs to the City Council and others.

**GOAL 13: Provide adequate and reliable financial support for expanding and maintaining the urban forest.**

In the long run, deferred maintenance of the urban forest – not only in the pruning and care of trees, but also in the replacing and planting of new trees – results in greater cost. Investments in the urban forest more than pay for themselves in public benefits, as discussed in Chapter I.

**OBJECTIVE: Make efficient use of available public funds and supplement public funding through a variety of measures to increase private sector support.**

DPR/DUF must compete with other agencies for the allocation of City budget resources. The use of contractual, rather than permanent staff, economizes on operational costs because personnel can be hired to perform specific tasks as the need arises. In addition, there are opportunities to tap private funding sources for
maintaining the urban forest, particularly in neighborhoods that derive specific benefits from tree and other landscape plantings in their area.

Performance Measures:

Expand the use of contract personnel to perform planting, maintenance, and removal work.

Expand the use of private financing to maintain the urban forest through Business Improvement Districts and community associations in new master-planned development projects.
## COMPARATIVE CANOPY COVER GOALS

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REFERENCES


City and County of Honolulu, Department of Facilities Maintenance, interview with department representatives conducted on September 9, 2004.

City and County of Honolulu, Department of Parks and Recreation, interview with department representatives conducted on August 31, 2004.

City and County of Honolulu, Department of Parks and Recreation, interview with Bill Balfour and other staff conducted on August 31, 2004.

City and County of Honolulu, Department of Parks and Recreation, Rules and Regulations Relative to Planting and Maintenance of Street Trees, June 1971.

City and County of Honolulu, Department of Planning and Permitting, Honolulu Green Streets Project Final Report, 1998.

City and County of Honolulu, Mayor’s Arborist Advisory Committee Guidelines for Pruning an Exceptional Tree” April 2002.


Green Hawai‘i Committee, notes of meeting conducted on September 15, 2004.

Hawai‘i Administrative Rules, Chapter 11-55, Water Quality Standards.

Hawai‘i Revised Statutes, Chapter 58, Exceptional Trees.


Hendrix Wire and Cable Company Website (www.hendrix-wc.com)


Michigan State University Extension, Urban Forestry, Benefits of Urban Trees, Publication #07269501,

National Arbor Day Foundation pamphlet #90980005.

Oka, Stan, Division of Urban Forestry, Department of Parks and Recreation, City and County of Honolulu, interviews conducted on August 18, 2004 and September 28, 2004.


Portland (OR) Municipal Code, Chapter 33.630, Tree Preservation.


Ramos, Terri, Division of Urban Forestry, Department of Parks and Recreation, City and County of Honolulu, interviews conducted on August 18, 2004 and September 28, 2004.

Revised Ordinances of Honolulu, Chapter 10, Article 1, Rules and Regulations Pertaining to Street Trees, Hedges, and Shrubs.

Revised Ordinances of Honolulu, Chapter 14, Article 12, Drainage, Flood and Pollution Control.

Revised Ordinances of Honolulu, Chapter 14, Article 13, General Provisions for Grading, Soil Erosion and Sediment Control.

Revised Ordinances of Honolulu, Chapter 14, Article 14, Permits, Bonds and Inspection for Grading, Soil Erosion and Sediment Control.
Revised Ordinances of Honolulu, Chapter 14, Article 15, Grading, Grubbing and Stockpiling.

Revised Ordinances of Honolulu, Chapter 14, Article 16, Violations, Penalties and Liabilities for Grading, Grubbing and Stockpiling.

Revised Ordinances of Honolulu, Chapter 14, Article 18, Regulations Governing the Construction of Sidewalk, Curb or Driveway Within the Right-of-Way of Public Streets.

Revised Ordinances of Honolulu, Chapter 21, Article 9, Special District Regulations.

Revised Ordinances of Honolulu, Chapter 21, Land Use Ordinance.

Revised Ordinances of Honolulu, Chapter 22, Subdivision of Land.

Revised Ordinances of Honolulu, Chapter 41, Article 13, Protective Regulations for Exceptional Trees.

Revised Ordinances of Honolulu, Ordinance 2412 which codified Section 14, Article 21.


State of Hawai‘i, Department of Transportation, Highways Division, Master Guidelines for Landscaping and Maintenance of the Highways in Hawai‘i, December 1999.

State of Hawai‘i, Hawai‘i Revised Statutes, Chapter 235-19, Exceptional Trees, Tax Deduction.


U.S. Department of Agriculture, Forest Service, Pamphlet #R1-92-100.


Uehara, Goro, Ikawa, H., and Hue N.V., University of Hawai‘i at Mānoa, College of Tropical Agriculture and Human Resources, Department of Tropical Plant and Soil Sciences,
“Soils of Hawai‘i,” website: [http://www2.ctahr.hawaii.edu/tpss/research_extension/rxsoil/hisoi.htm](http://www2.ctahr.hawaii.edu/tpss/research_extension/rxsoil/hisoi.htm).


