

Planning for Sustainable Tourism



Part II: Infrastructure Overview Study

Volume I: State Summary

Prepared for

DBEDT
THE DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM
STATE OF HAWAII

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Planning for Sustainable Tourism in Hawaii

INFRASTRUCTURE &
ENVIRONMENTAL OVERVIEW STUDY

Volume I: State of Hawaii



Prepared for the State of Hawaii
Department of Business,
Economic Development
and Tourism
By Carter & Burgess, Inc.

December, 2002

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Introduction to the State of Hawaii

Purpose of Study

This report is an investigation into hundreds of federal, state, county, district / community / regional and private documents reviewing public and private infrastructure elements and environmental features to establish a baseline of data for the year 2000 and to identify constraints and opportunities for the State and county agencies through the year 2020. The baseline data includes identifying the current condition of the physical infrastructure and environment. This includes the present capacity and usage, existing problems and opportunities, future capacity and usage, future changes, anticipated costs for changes, problems and opportunities associated with costs, visitor impact versus residential impact and any major assumptions.

The report endeavors to outline the limiting factors for key natural resources and physical infrastructure, and then propose mitigating measures to circumvent or alleviate the limiting factors. Additionally, identification of interrelationships between infrastructure elements, natural resources and projected growth is key to uncovering potential bottlenecks and latent possibilities.

Background

Act 259 of the 2001 Legislature requested the Department of Business, Economic Development and Tourism (DBEDT) to conduct a study on Hawaii's capacity to sustain future growth in tourism. Impetus for study came from nearly 7 million visitors in 2000 and prospects for future growth bring back concerns about the impact of visitors on the environment, public and private infrastructure residential standard of living and the visitor experience. Another concern is the need for a tool to effectively measure the impact tourism has on the physical infrastructure and natural environment.

Structure of Report

This report consists of five volumes covering the state summary and each county. Each county volume begins at the county level, and then proceeds to each planning district or community level. Each infrastructure element is reviewed at each level. Environmental features are reviewed at the county level. When information was available for a particular visitor related area, like Waikiki, Lahaina, Kohala or Poipu, a comprehensive summary, based on an Environmental Impact Statements submitted for developments in the areas, were compiled. Close attention was paid to county planning documents and district or community plans where available.

Research was conducted in four phases. The first phase of research was to review the most recent (1990 or later) county and community or district general plans. These documents tended to provide the parameters of present capacity

and usage, existing problems (possibly visitor impact), opportunities, some future changes and major assumptions. In the second phase, governmental master plans and capital improvement project budgets were reviewed. These documents supplied parameters regarding future and planned usage, future and planned requirements or changes, anticipated costs for future requirements and problems, issues and opportunities associated with costs. The third phase of research involved searches of the Internet, agency libraries and state libraries for referenced material from the aforementioned documents. Additionally, any documents requested by DBEDT were reviewed for information. In the final phase, faxes and phone calls were made to various agencies to accumulate any outstanding information.

The following are the infrastructure and environmental features reviewed. The evaluation parameters are listed at the end. A response of N/A within the summaries means that either the parameter did not apply to the environmental feature discussed or that there was no infrastructure element present in that area. Examples: future usage of beach erosion and no harbors on Central Oahu.

- Public Infrastructure
 - Terrestrial Water Quality and Quantity
 - Sewage
 - Solid Waste Disposal
 - Storm Water
 - Roads
 - Airports
 - Harbors
 - Parks
 - Police, Fire and Emergency Services
- Private Infrastructure
 - Visitor Accommodations
 - Private Transportation
 - Energy Systems
 - Sewer Systems
- Environmental features
 - Coastal Water Quality
 - Marine Ecosystem Health
 - Forestry / Green Space
 - Air Quality
 - Beach Erosion
 - Invasive species
 - Natural / Scenic Resources
 - Native and Extinction Issues
 - Riparian/Wetlands
 - Trails
- Evaluation Parameters

- Present capacity and usage
- Existing problems, issues and opportunities
- Future and planned usage
- Future and planned requirements and changes
- Anticipated costs for future
- Problems, issues and opportunities associated with costs
- Current and future visitor and resident impacts
- Major assumptions

The following outline is the overall structure to the report. Each geographic area is followed by the infrastructure and environmental feature summaries. An introduction is supplied at the beginning of each county and recommendations follow the county level summaries. Visitor related area summaries, supplied by environmental impact statements for various developments, are interspersed at geographically appropriate intervals.

- Hawaii State
 - Hawaii County
 - Puna
 - South Hilo
 - North Hilo
 - Hamakua
 - North Kohala
 - South Kohala
 - North Kona
 - South Kona
 - Kau
 - Maui County
 - Wailuku- Kahului
 - Lahaina
 - Kihei-Makena
 - Makawao-Pukalani-Kula
 - Paia-Haiku
 - Hana
 - Lanai
 - Molokai
 - City and County of Honolulu
 - Primary Urban Center
 - Central Oahu
 - Ewa
 - Waianae
 - North Shore
 - KoolauLoa
 - KoolauPoko
 - East Honolulu
 - Kauai County

- Lihue
- Kawaihau
- North Shore
- West Side
- Koloa-Poipu

Source Citation

Each volume of this report contains a bibliography list of all sources used in this report. Each source is assigned an arbitrary number. Superscripts are used throughout the report to identify the bibliographic source of a particular statement or paragraph. The superscript includes two numbers; the bibliographic source number is first, followed by the year of the source.

Limitations

This study excludes much of the information from military bases. This is due to security issues involving the events of September 11, 2001. Information regarding infrastructure in and around military bases is available on a very limited basis.

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Recommendations for State of Hawaii

The following recommendations are being made for the State of Hawaii. They have been outlined by infrastructure element. Two notable issues need to be addressed prior to delving into infrastructure recommendations – coordination and organization. There needs to be more effective and efficient coordination between various levels of government. Federal, state and county governments need to harmonize their labors. This will minimize duplication of manpower, and maximize funding. Coordination with involved outside stakeholders can also improve. This is especially noticeable in the beach erosion and invasive species environmental features. The various governmental levels for coastal zone management and invasive species appear a confusing, yet well-intentioned approach. Organization, as part of coordination, is needed to delineate a clear lead agency and define roles for other agencies and stakeholders. This is especially true for projects involving environmental features.

Public Infrastructure Elements

Terrestrial Water Quality and Quantity

The term “sustainable yield” is used throughout the Water Summaries. According to the Commission on Water Resource Management, it means the maximum rate at which water may be withdrawn from a water source without impairing the utility or quality of the water source as determined by the Water Commission.

Water quantities are approaching sustainable yields in some areas – most notably on Oahu, Molokai and West Hawaii. In these areas, alternative sources of potable water need to be identified. Alternative sources include water conservation measures, reallocation of potable water from communities that have not yet reached their sustainable yield, desalinization and water reclamation.

In other areas, permitted use has not reached sustainable yields. Most of the island of Kauai and Hana area permitted usage has not reached the sustainable yield for the aquifers on island. However, other problems exist. Reallocation of resources from the haves to the have-nots is a legitimate concern. Careful consideration should be taken. Aging infrastructure and remote lines make repairs and upgrades difficult. For Kauai, it is recommended to follow the repair / replacement schedule proposed.

Water quality needs to continue to be monitored. Hawaii has traditionally had a large agricultural contingent. Chemicals utilized in these areas are known to leach into the groundwater. Another source of concern is groundwater quality in areas of injection wells for disposal of wastewater.

Other water quality issues go to watershed or ahupuaa. Take care of forests that act as filtration for our water. Hawaii is lucky and has some of the high water quality. Caring for our watersheds and forests is part of caring for water quality. Issues related to this are invasive species and storm water drainage. Invasive species, such as *miconia*, take over environments. However, their shallow root system cannot withstand the stresses of the environment that native species can. Landslides occur and release sediment, which is detrimental to water quality. Storm water picks up loose sediment and non-point sources pollution and moves it into our water system and coastal waters. Non-point source pollution is one of the biggest environmental threats to Hawaii's waters.

Sewage

Cesspools around the state are in varying conditions. These conditions relate to age, soil, proximity to fresh water sources and state. Connection to municipal sewer systems, while preferable, is not always economically feasible, especially in smaller rural communities. Lower-income homeowners are also less likely to be able to afford connection to municipal lines. Some regions in Hawaii County depend on on-site wastewater disposal systems and cesspools. Some of these do not satisfactorily treat the wastewater. It is recommended that a wastewater feasibility study be developed, which would aid in the recognition of deficient areas of treatment and in the placement of further infrastructure. At the other extreme, Kauai has untapped capacity for sewage at three of its four wastewater treatment plants. However, a long-term master plan should be developed prior to a modifications or approval of new developments.

Homeowners in areas surrounding sewage treatment plants would appreciate any dampening of air, noise and odor pollution. Landscaping can help.

Solid Waste Disposal

Reduce, reuse, and recycle. All methods should be utilized to decrease the pace at which Hawaii is filling its landfills. Statewide and county efforts should be made to identify and address the issues involved with new landfill sites on each island. A master plan should then be developed at both the state and county levels for allocation and usage of the landfills. Further study should be conducted toward research about resource recovery and energy generation.

Storm Water

A significant problem with storm water is non-point sources pollution or polluted runoff. Non-point source pollution is any contaminant picked up by water from a variety of sources as it flows to the ocean. It is difficult to identify and is not easily controlled. This is one of Hawaii's biggest environmental threats. Continued monitoring of storm water, where possible, tracing non-point source pollution and enforcement of health violations is needed.

Retention and detention ponds for storm waters are needed. These helps with flood control and allow more water to infiltrate into the groundwater. This also allows for settling of debris and sediment and decreases pollution runoff. Master plans for storm water drainage are needed for all islands. Policy changes such as it relates to flood plain, high surf, and tsunami hazard areas need to be considered.

Tracking climate changes and the seasonality of storm water and drainage in conjunction with land use is key to non-point source pollution prevention.

Roads

The time it takes to commute to and from work for most residents has increased over the past decade. However, some places, like much of Oahu, have had difficulty in implementing plans to alleviate traffic problems until public support is behind such improvements.

Minor changes such as traffic signal synchronization and staggered work shifts can temporarily alleviate some traffic problems, but major changes are needed. The Bus system alleviates congestion. Consideration for expansion of The Bus through addition of more buses and routes should be noted.

Several studies have been done regarding transportation on all the islands. However, consideration of community, environmental and cultural concerns should also be taken into account. Areas, such as Ewa, with planned development will only add to the already congested highways. Alternative methods of transport are needed. Long Range Transportation Plans supporting projected growth should be implemented. It is also recommended that alternative funding sources be identified for future maintenance and new infrastructure.

Airports

Current statistics show that the majority of passenger airports are underutilized; therefore, expansion of passenger terminals is not a current need. However, maintenance of passenger areas and modifications in organization and physical layout can maximize lease space and minimize passenger congestion and confusion within the airport.

There is a need to expand cargo facilities to get Hawaii's exports out. Monies should be spent toward improved cargo facilities, especially in Hilo, to support the diversified agricultural industry and export of Hawaii's goods.

Harbors

Improvements, as outlined by the Harbors Division, should be implemented. Hilo, Kawaihae and Nawiliwili Harbors are in need of improvements. Expansion of Barber's Point as a commercial harbor will greatly alleviate congestion at

Honolulu Harbor. Expansion and improvements of harbor facilities (Nawiliwili and Port Allen) need to be made to accommodate larger ships in Kauai. However, reopening of Honolulu's Keehi channel to ship traffic should be studied further to determine the impact of the open channel on the reef runways.

As the cruise ship industry expands, there is also a need to improve and expand cruise ship terminals and facilities.

Parks

State and county parks are in need of alternative sources of funding to improve, and maintain park facilities. Improvements vary from design and construction of measures to alleviate crowding to expansion where possible. New capital works need to be put in place to control further degradation of the park system. Opportunities for funding do exist; however, further study is needed to determine the most economical and desirable method. Some possibilities include entrance fees, charging group/tour fees, and private concessions (snorkeling, and surfing rentals at beach parks, food).

Two other opportunities are developing mauka park facilities and encouraging developers to create parks within their developments. Mauka parks facilities can help alleviate congestion at beach parks. Developers of both residential and resort areas should be required to create and set aside funds for marinating recreational facilities within their developments.

Police, Fire and Emergency Services

Further long-range planning, cost projections and study of demographics within each district are vital to efficiently and strategically place manpower and emergency response equipment and facilities, especially for the County of Hawaii. The dispersed structure of various counties' resident and visitor populations stretches the limited resource of the police, fire, and emergency services from one end of the island to the other. Additional funding is needed to replace equipment and add satellite stations in locations consistent with long range growth plans.

Private Infrastructure Elements

Visitor Accommodations

The key to the future of visitor accommodations is to monitor visitor unit growth to assure that it does not outpace existing infrastructure growth. On Kauai, the supply of land designated for resort development is greater than the project demand. Another desire is for communities to maintain their character, whether rural or urban. In the case of rural character, the visitor accommodations should focus on small scale and alternative forms of lodging.

Private Transportation

There is inadequate information available to make a thorough assessment of private transportation at the county level in Hawaii. Further research into the type of data needed and collection of that data is required.

Energy Systems

Statewide and county efforts should be made to identify and address the community, environmental and cultural issues involved with new energy generating sites on each island. Further study, as recommended in the solid waste disposal section, should be conducted toward research about resource recovery and energy generation. Reduction in solid waste and generation of energy is a boon to both infrastructures. Additional power, especially on Hawaii Island, is greatly needed.

Sewer Systems

Many of the Hawaii County private sewer systems are owned and maintained by the resort management companies. Information regarding sewer systems is limited in availability.

Environmental Features

Coastal Water Quality

The coastal water quality for Hawaii is excellent except when impaired by severe storms and construction where best management practices were not followed. The greatest threat to coastal water quality is non-point source pollution. Non-point source charges have a greater impact on streams and near shore waters than point source discharges. Effective monitoring of storm water discharge and enforcement of health violations is a step toward remedying this threat. Procedures to further control non-point supplies and identifying point source sources, especially upland of streams and bays should be taken. Educational programs, regarding the importance of coastal water quality and the uniqueness of Hawaii's natural marine environment, help.

Marine Ecosystem Health

Along with providing educational information and interpretive programs to residents and visitors regarding the importance and uniqueness of Hawaii's natural marine environment, the County also needs to avoid over fishing along the coast, which creates localized depletion of various marine biota. Reefs along less populated coasts show higher fish abundance and diversity than the more populated main Hawaiian Islands. Consideration should be given to promoting County specific research into marine ecosystem health and designating unique or popular areas of Marine Life Conservation Districts.

Forestry / Green Space

Sufficient funding must be provided to maintain the State reserves, forests and trails. Opportunities mentioned in the Parks section apply to Forests as well.

Air Quality

Overall, Hawaii's air quality is excellent. It is well above federal and State standards. There is a lack of major polluting industries and trade winds blow any air pollution out to sea. The biggest threat to air quality, especially in Hawaii County, is volcanic related haze and fog. On other islands, burning of sugarcane and vehicular emissions are of concern. Consideration should be given to diversifying the locations of monitoring stations in high-risk areas.

Beach Erosion

The state owns the beaches, and as trustee of that resource, the state should take the lead in beach / coastal management. However, beach erosion is a naturally occurring phenomenon. It will continue to occur at varying rates on all islands. The best that can be done is to reduce the rate of erosion and mitigate any accelerated effects. Given that, the following recommendations regarding beach erosion are suggested.

- Organization and responsibility
 - Develop, fund, and empower a single lead state agency and county agencies to manage coastal erosion,
 - Enhance interagency at federal, state and county levels through coordination of research, manpower and funding,
 - Define of the shoreline and which agency is responsible for what areas within each island.
- Research
 - Develop a beach/shoreline monitoring program that should include the regular (every 5 years) collection of aerial photos or other means of determining the shoreline position at that time to integrate into a historical shoreline variability assessment model,
 - Determine rate of retreat, conduct periodic field or aerial surveys.
 - Study the economic factors governing the implementation and feasibility of various coastal management alternatives are poorly understood in Hawaii,
 - Establish and maintain a comprehensive coastal shoreline survey, database, and research products resulting from technical studies of coastal processes and sand resources.
- Management plan
 - Simplify the permit process,
 - Create the master plan for state erosion management addressing the nature and cause of erosion problems, problem assessment, and immediate, medium, and long-term mitigating activities.
 - There are five options for erosion management: abandon the shoreline, restore the beach, control erosion rate with sand fill and

structures, adapt human occupancy to accommodate erosion, and hardening the shoreline. Each option has its pluses and minuses. Abandoning a shoreline allows nature to take its course, but is impractical on heavily developed areas. Beach restoration may be the most desirable in some localities, however it is not a one-time cost, but an on-going process. Controlling the erosion rate is expensive and communities may reject the structures. Adaptation to accommodate erosion is difficult, often impractical and requires new zoning regulations and procedures. Hardening the shoreline results in beach loss, access decreased, and other environmental impacts. ^{203,2002}

- Decision-making authorities and regulators need clear and unambiguous information on littoral processes, sand resources, historical erosion and accretion rates and projected future patterns, development patterns, land ownership histories, land-use trends, structure permitting histories, and other scientific and socio-economic trends and patterns at areas where erosion management decisions must be made.
 - Develop technical guidance Manual that provides direction or the development, restoration, and redevelopment of the coastline.
 - Develop a technical approach to control interim coastal erosion on residential lands where a short-term or seasonal wave-related erosion hazard exists, and where long-term erosion trends have created user conflicts.
- Distribute the cost of preventive erosion measures between the State, counties and coastal landowners.
- Policy and enforcement
 - Establish a minimum setback and building requirements for all new construction.
 - Enforce more strictly all regulations affecting coastal development and beach preservation.
 - Adopt or alter for adoption, the OEQC guidelines for Environmental Assessment of shoreline projects that were submitted for public commentary in the 11/23/95 OEQC Environmental Notice.
 - Remove illegal shoreline structures.
 - Prohibit the use of vertical seawall structures in areas where this form of protection is not wide-spread and where future seawall requests are likely.

Invasive Species

The silent invasion of Hawaii by insects, disease organisms, snakes, weeds, and other pests is the single greatest threat to Hawaii's economy and natural environment and the health and lifestyle of Hawaii's people. Stopping the influx

of new pests and containing their spread is essential to Hawaii's future well being. One of the most cost-effective solutions to this problem is to find and eradicate these species before they proliferate beyond control. This avoids the damage costs created by the pests themselves as well as the costs of perpetual pest control and mitigation.

A critical need is directed leadership and coordinated actions among all state agencies. The State currently lacks an adequate rapid response capability but has been involved in multi-agency efforts to fill this gap using multi-partner Invasive Species Committees, which have been formed on Oahu, Maui, and Hawaii islands. Continued support of these committees is critical as they represent innovative and cost-effective models of governmental partnerships.

Although inadequate funding is a major impediment to effective invasive species prevention and control, State laws also do not address the problem in a comprehensive and coordinated fashion. Consequently, gaps in authority and lack of clear policy direction hinder efforts to prevent and eliminate alien species invasions. ^{58, 2001}

It is recommended for the State to garner public support for programs, through public relations, media and education, encourage nurseries and landscape business to stock and cultivate native plant species.

Other Appropriate Natural and Scenic Resources

Scenic Resources

Hawaii is known for its scenic beauty and variety in environments. However, there is little documentation of the scenic beauty. This may be due to the difficulty in quantifying scenery. It is recommended that public input be gathered to establish perception of the scenic quality in Hawaii until further research of quantitative value can be conducted.

Riparian / Wetlands

The biggest threat to riparian zones and wetlands, as mentioned in storm water and coastal water quality sections, is non-point source pollution. Please see recommendations for those sections.

Native Species and Extinction Issues

Extinction, endangered and threatened status of various species is a threat to Hawaii's environment. Laws and appropriate management policies have been established to protect native endangered and threatened species. However, inadequate funding does not allow for adequate enforcement. Public awareness programs directed toward both visitors and residents about the plight of Hawaii's environment can help.

State of Hawaii – Water Quality and Quantity

Present Capacity and Usage

Potable water usage and capacity information is available at the county and district / community level. Water quality standards are mentioned in this summary, but any problems associated with a particular watershed or aquifer is detailed at the county or district / community level. It should be noted that watersheds and aquifer recharge areas are not the same as planning communities or districts. (See maps of each island with their sustainable yields and aquifer codes in the Appendix.)

Review of several federal, state, county and agency documents concludes that potable water supply is variable within each island and community / district. Areas that are approaching the aquifer's sustainable yield are West Hawaii, most of Oahu (with the exception of the North Shore and Windward side), Lanai and Molokai. (Sustainable yield is the maximum rate that water can be withdrawn from an aquifer without impairing the utility or quality, as determined by the Water Commission.)

Further review concludes that overall, water quality in Hawaii is good. Contaminant levels are observed well below federal standards. Any problems associated with a particular area is noted at the community / district level.

Existing Problems, Issues and Opportunities

After reviewing several water related documents and general plans the main problems with water infrastructure include lack of adequate water supply, concerns about water resource allocation, poor sewage infrastructure possibly affecting water quality, destruction of native forests/watershed affecting water quality and aging or at-capacity water infrastructure.

The protection of these aquifers is established by designating areas now being used or will be used in the future for drinking water supply. The Underground Sources of Drinking Water (USDW) will be protected from pollution by adequate control of sewage effluent, pesticide and other ground water pollutants. Injection wells are allowed in exempted areas.

Future and Planned Usage

Water infrastructure projects are planned primarily at the county level. Mandates or regulatory changes are made at the State level. The following long-term goals are, according to *Public Comment Draft 2002 List of Impaired Waters in Hawaii, Prepared under Clean Water Act 303D*, as follows:

- Ensure that Hawaii's coastal waters are safe and healthy for people, plants and animals and protect and restore the quality of Hawaii's

- streams, wetlands, estuaries, and other inland waters for fish and wildlife, recreation, aesthetic enjoyment and other beneficial uses by 2013.
- Identify impaired water bodies and restore their designated uses through a Statewide approach to watershed management within 15 years.
 - Develop and implement economically achievable management measures that are appropriate to Hawaii's physical, economical, cultural, and social environment by 2013.

The State will continue to rely on partnerships with stakeholders to develop and implement *Public Comment Draft 2002 List of Impaired Waters in Hawaii, Prepared under Clean Water Act 303D*. Streamlining the activities of various partners is necessary to efficiently and effectively address non-point source pollution in Hawaii. This is a key factor in successfully managing water quality in the State. ^{249, 2002}

Future and Planned Requirements or Changes

According to *Public Comment Draft 2002 List of Impaired Waters in Hawaii, Prepared under Clean Water Act 303D*, the State seeks to develop a single, coordinated program to address non-point source pollution with the DOH and the Office of Planning designated as the lead coordinating agencies. ^{249, 2002}

According to *Public Comment Draft 2002 List of Impaired Waters in Hawaii, Prepared under Clean Water Act 303D*, the key to the watershed approach is tailoring efforts of federal, state, and local governments, and the private and public sector to the particular needs of an individual watershed. It helps identify the most cost-effective pollution control strategies to meet clean water goals. It encourages public involvement since efforts to protect and restore water quality are geared towards local communities in a given watershed. It provides greater accountability and progress in reaching clean water goals.

Adjacent watersheds with degraded water resources drain into a single water body creating an impaired designation of the water body. Addressing individual watershed units may not significantly improve water quality problems in an associated water body. Designating each island as stand alone or individual watershed would create the complex task of solving a comprehensive, water quality problem.

The State's water quality problems vary greatly from watershed to watershed and from region to region. Variation in environment necessitates the prioritization of regions with seriously degraded water resources. The State is in an economic recession. Resources are limited and must be used to address the more serious water quality problems in the State.

The following chart identifies the five priority regions and timetables in *Public Comment Draft 2002 List of Impaired Waters in Hawaii, Prepared under Clean Water Act 303D*:^{249, 2002}

Table 1.01-- The Hawaii Unified Watershed Assessment (1998)^{249,2002}

Island	Watershed Region	Implementation Plan
Hawaii	Pelekane Bay	1999-2003
Kauai	Nawiliwili	1999-2003
Maui	West Maui	2000-2004
Oahu	Koolaupoko	2000-2004
Molokai	South Molokai	2000-2004

Source: *Comment Draft 2002 List of Impaired Waters in Hawaii, Prepared under Clean Water Act 303D*:

According to the *Statewide Framework for updating the Hawaii Water Plan*, a couple of the framework objectives are as follows:

- To achieve a coordinated plan for the protection, conservation and management of out water resources
- To better define roles and responsibilities of all state and county agencies with respect to the development and updating of the HWP components
- To facilitate permitting and to identify potential critical resource areas where increased monitoring or baseline data gathering should proceed

The following complexities in planning for the future use and development of water resources further support the need for a more effective and coordinated planning process:

- There is growing competition for available potable water resources in the aquifers that have been designated as ground-water management areas. As agriculture increasingly uses non-potable water, that allocation goes toward developments.
- Major changes, such as businesses opening and closing, have occurred and are still occurring at the agricultural industry
- The availability of existing and inexpensive water resources is declining and in certain aquifers has reached levels that warrant closer monitoring and the implementation of management strategies to protect the aquifer from degradation due to over-withdrawal. Aquifers are reaching the sustainable yield as determined by the Water Commission.
- The resulting increase in development costs for recycled water facilities or desalinization plants will make use of alternative resources such as reclaimed water and desalinated water more attractive.
- There is a need to recognize and plan for the water requirements for legally protected water rights under the water code.

DLNR's Land Division has jurisdiction over state projects and, in conjunction with other state agencies, is responsible for preparation of the *State Water Projects Plan*. The *State Water Projects Plan (SWPP)* major objective is to provide a

framework for planning and implementation of water development programs to meet projected water demands for state projects. The plan shall be implemented in coordination with the County WUDP's to insure orderly authorization and development.

The Department of Agriculture shall be responsible for preparation and regular updating of a *State Agricultural Water Use and Development Plan (AUWDP)*. The major objective of the AWUDP is to develop a long-range management plan that assesses state and private agricultural water use, supply and irrigation water systems.

Each of the four counties is responsible for the preparation of a *Water Use and Development Plan* in accordance with the requirements of the State Water Code. The framework should additionally guide the preparation of each county WUDP if the WUDP's are to be effectively implemented by the county and utilized by the CWRM for resource management purposes. The WUDP believes the roles and responsibilities of the lead agency or agencies are envisioned as follows:

- To develop a scope of work and budget for the WUDP update
- To secure funding for the project ^{42, 2000}

Anticipated Costs for the Future

There was little documentation for costs of the planned water resource plans, however, there are few projects for water at the state level; most are at the county level. (See County level Water Summaries for details regarding actual water projects, such as upgrading and replacing water related facilities and transmission lines.) However, listed in the appendix under Department of Hawaiian Home Lands and Department of Land and Natural Resources are a total of ten water related projects with their budgeted costs.

The Safe Drinking Water Act was authorized by the Environmental Protection Agency (EPA) to establish safe standards of purity and required all owners or operators of public water systems to comply with primary (health-related) standards. The effect of the SDWA on water service providers may be an increase in the cost of providing potable water due to increases in the primary, or health-related, standards set in the future.

Problems, Issues and Opportunities Associated with Costs

See each county and the appropriate community or district Water Summary for details.

Compare Visitor and Resident Impact

Both visitors and residents need potable water. Few documents differentiate between the two needs.

Review of tourism related documents reveals that tourism is a water intensive industry. Annual, seasonal and overall demand forecasting for water resources for visitor industry areas is needed. These assessments need to be realistic and account for all water needs, including wastewater.

Major Assumptions

The need for potable water will grow as the population does. As long as the semi-autonomous water agencies supply can keep pace with population projections, and maintain adequate infrastructure, there should be no problems. However, once the sustainable yield for an aquifer has been reached, conservation measures and alternative sources of potable water will need to be found.

State of Hawaii – Sewage

Present Capacity and Usage

Sewage capacity and usage details are available at the county or district / community level. This section is primarily an introduction to overall sewage in Hawaii.

According to the *Annual Report: Fiscal Year 1999-00 - Public Utilities Commission*, the Hawaii Public Utilities Commission regulates 31 privately owned water and sewage treatment utilities that serve suburban, rural, and resort areas throughout the State. The wastewater utilities are listed below. This is a list of privately operated sewer systems within the State. Further research can illuminate the corporate structure of the companies (as some are subsidiaries of others) and possibly capacity, usage and the geographic distribution. This would reveal the inadequacies or lack of public sewer infrastructure, opportunities and problems. ^{90,2000}

American Water Works Company, Inc.
CTF Hotel Sewage Treatment Corp
East Honolulu Community Services fka Hawaii Kai Co
Hawaii-American Water Co., Inc.
Kaanapali Waste Water Corporation
Kapalua Waste Treatment Company, Ltd.
Kaupulehu Waste Water Company
Keauhou Community Services, Inc.
Kiahuna Investors, Ltd. nka PWC
Mauna Lani STP, Inc.
Maunaloa Associates, Inc.
Mosco, Inc.
Poipu Wastewater Corp fka Kiahuna Investors
Princeville Utilities Company, Inc.
Puhi Sewer and Water Company
Pukalani STP Co., Ltd.
Punaluu Water & Sanitation Corporation
South Kohala Wastewater Corp (SK Water Co.)
South Shore Community Services
Waikoloa Resort Utilities, Inc. dba West Hawaii Ut
Waikoloa Sanitary Sewer Co dba West Hawaii Sewer
Waimea Wastewater Company, Inc.
West Hawaii Sewer (Waikoloa Sanitary Sewer dba)
West Hawaii Utility (Waikoloa Resort Utilities dba)

Existing Problems, Issues and Opportunities

According to various county and agency documents, replacement of aging sewer lines and facilities is of concern in addition to enhancements to accommodate any increase in population. Opportunities exist in areas of new development. Part of the permitting process may require developers to establish appropriate infrastructure elements within the development.

See county level Sewer Summaries for more information.

Future and Planned Usage

See each county and the district / community Sewage Summaries for details.

Future and Planned Requirements or Changes

See each county and the district / community Sewage Summaries for details.

Anticipated Costs for the Future

A review of Capital Improvement Project budgets was conducted. The results are posted in the county and the district / community Sewage Summaries.

Problems, Issues and Opportunities Associated with Costs

A review of Capital Improvement Project budgets was conducted. The results are posted in the county and the district / community Sewage Summaries.

Compare Visitor and Resident Impact

Few documents differentiate between residential sewage and visitor sewage. Unless the resort itself has a sewage treatment plant, like some on the neighboring islands, there is no distinction. Waikiki is hooked into the municipal sewage system, along with most of Manoa Valley. In this case, there is no distinction.

Major Assumptions

See each Introduction to Hawaii State, Introduction to each county, individual county and the district / community Sewage Summaries for details.

State of Hawaii – Solid Waste Disposal

Present Capacity and Usage

The following table from *The Environmental Report Card, 2001* shows the total amount of municipal solid waste generated and the amount recycled and composted. Amounts diverted do not include waste sent to H-Power for incineration and power generation. (Diverted is the amount recycled or prevented from entering the landfill.) The Environmental Council’s year 2002 goal for municipal solid waste generated per capita is the present nationwide average of 4.3 pounds per day.

Table 1.02-- Solid Waste Generation and Diversion in Hawaii, 1994-2000.^{74, 2001}

Federal Fiscal Year	Produced Statewide (1,000 tons)	De facto Population	Daily per Capita (lbs.)	Disposed Statewide (1,000 tons)	Diverted Statewide (1,000 tons)	Percentage Diverted
1994	1,953	1,276,171	8.4	1,616	337	17%
1995	2,023	1,281,732	8.6	1,620	403	20%
1996	2,122	1,284,594	9.1	1,619	503	24%
1997	2,132	1,305,611	8.9	1,599	533	25%
1998	2,004	1,309,366	8.4	1,524	481	24%
1999	1,884	1,307,639	7.9	1,424	460	24%
2000	1,794	1,337,991	7.3	1,441	353	20%

Source: *The Environmental Report Card 2001*

The Report of the Twenty-First Legislature Relating to Integrated Solid Waste Management, 2001 lists:

Paper: As of 2001, 14 buildings were participating in the State Office Recycling Program on the Island of Oahu. Reported figures for recycling office paper on Oahu for the year 2001 were of 1,366,000 lbs. The remaining state office buildings in the downtown area that are not part of the program already have an established recycling program in place.

Glass Recycling: Statewide glass recovery program is funded through and advance disposal fee collected at the state level. It affords flexibility to the counties in their program design and operation by providing annual funds for glass recovery.^{86, 2001}

The Environmental Report Card mentions:

Solid Waste Generation and Diversion: Wise management of solid waste through programs of waste prevention, energy resource recovery, and recycling reduces human impact on the environment. Waste minimization, recycling and composting also reduce the amount of solid waste that we send to our landfills. The goal of the state is to reduce the solid waste stream prior to disposal by 50%

by January 1, 2000. Recent data show that we have only met half our goal.^{74,}
2001

Existing Problems, Issues and Opportunities

Much of the information related in this section uses Oahu as an example because it is the largest city and the State seat of government. For more specific problems see county and district / community level Solid Waste Disposal Summaries.

According to the *Report to the Twenty-First Legislature Relating to Integrated Solid Waste Management*: of the four Superfund sites listed by the 1999 strategic plan, Schofield Barracks has been removed from the National Priority List. Honolulu Harbor is still a work in progress. Previous tenants/users/property owners of the area are being identified, contacted, and are implementing a comprehensive strategy to solve past, present and future environmental contamination problems (primarily petroleum products). Voluntary compliance with the strategy is being sought.

Other issues being dealt with by the Hazardous Evaluation and Emergency Response Office include:

- Remediation and cost recovery,
- Aggressive initiative regarding six Brownfield sites, and
- Risk assessment and hazard evaluation.

The State did not achieve the waste reduction goal of 50% by the year 2000. Now the Environmental Protection Agency (EPA) has changed its posted goal to 35% by the year 2005, finding that the state needs more time to reach higher total waste reduction. Legislation and public awareness are two methods of achieving waste reduction. The recently passed Bottle Bill charges an up front fee for recycling the container. Awareness and education address the recycling methodology and benefits to the public.

One of the challenges for recyclers in the islands is the cost of shipping materials to the mainland, which has increased over the year 2000. The decreasing value of recycled materials nationwide is also causing an additional strain to recycling businesses.

Paper: The neighbor islands do not have the volume of paper that Oahu generates, therefore the recyclers charge for pickup.

Electronic Waste: Used electronics account for a fast-growing component of the solid waste stream and about one third of all electronics are monitors that contain cathode ray tubes (CRTs). These CRTs can contain up to four pounds of lead per monitor.

Bottle Bill: Existing drop-off systems on Oahu and the neighbor islands are capturing approximately 20% of the available recyclable materials, while container deposit systems in 10 states around the country achieve 80% recovery on average. ^{86, 2001}

Future and Planned Usage

The Report of the Twenty-First Legislature Relating to Integrated Solid Waste Management ^{86,2001} states that the OSWM is partnering with the City & County of Honolulu to run collection events aimed at capturing obsolete computer that may otherwise end up in the landfill. OSWM also believes that the container deposit law (Bottle Bill – 2002) significantly increases recovery of aluminum, glass, and plastic recyclable containers, and reduces litter.

There has not been a significant increase in the amount of crushed glass used in road paving. However, other uses for crushed glass have increased over the last two years. Off-island shipping for the production of new glass products continues to be an important aspect to the glass-recycling program. ^{86, 2001}

Affirmative Procurement: The Office of Solid Waste Management (OSWM), DBEDT, State Procurement Office (SPO) (partially funded by the EPA) are working on a program that will include a survey of state offices to establish purchasing patterns that include or could include recycled content product. The output from the program will be a web page and publication listing Hawaii Statutes and resources, and a case study of successful Buy-Recycled efforts.

Used Lead-Acid Battery Collection Program: The Department of Health through the OSWM contracted with the Salvation Army to participate in a three-month pilot project that was implemented to determine the need for either a more widespread or prolonged collection program. Only used lead-acid batteries from householders, including automotive, motorcycle, and commercial size were collected by the Salvation Army, just in the island of Oahu due to limited funding. From this program, 180 batteries were collected. The total cost for the project was of \$2,540, start up costs for equipment and training were \$2,000 and the Salvation Army charged \$3.00/battery.

Future and Planned Requirements or Changes

According to the Report to the *Twenty-First Legislature Relating to Integrated Solid Waste Management*, ^{86,2001} planned changes include:

- OSWM plans to use the research project from this program to ensure compliance with EO 13101, which mandates that all projects using a minimum of \$10,000 of federal funds use recycled content, as well as to support the State's recycled product procurement program.
- HRS Chapter 342I-4 requires lead-acid battery retailers to accept one battery in exchange for every new battery sold. In addition, the cost of the new battery is to include the cost for disposal.

- The OSWM believes that the container deposit law, Act 176, (SLH 2002), could significantly increase recovery of aluminum, glass, and plastic recyclable containers, and reduce litter. ^{86, 2001}

According to the *Strategic Plan Update for Hawaii's Environmental Protection Programs*, ^{177, 2001} planned changes include:

- A reduction in municipal waste to 1.4 million tons per year by commercial, special and industrial sectors. (Reduce solid waste by 50% before disposal through recycling, reuse, source reduction and composting) by 2005,
 - Increased awareness of a pay-as-you-throw programs for residential collection,
 - Reduce toxic pollutants by 25% (This includes pollutants released, disposed of, or combusted.),
- Reduction of risk to human health and the environment due to contaminated dumping sites by 2005,
 - Reduce open dump sites by 50%
 - Clean up of high risk contaminated sites.
- By 2005 ensure full compliance of all municipal landfills to State and Federal regulations:
 - Increase owner awareness of operational and budgetary needs,
 - Require licensing
 - Streamline inspection and enforcement procedures.

Anticipated Costs for the Future

Review of state and county documents found little mention of costs associated to any of afore mentioned planned changes. However, review of capital improvement project budgets at the county level detailed plans and costs for the future. These costs are outlined at the county and community / district level Sewage Summaries.

Problems, Issues and Opportunities Associated with Costs

The Report to the Twenty-First Legislature Relating to Integrated Solid Waste Management, 2001, ^{86, 2001} revealed that the OSWM has one permitted recycler on Oahu that accepts obsolete computers for a fee. Because the computers are shipped to the mainland and obsolete equipment has little resale value at this time, this is a very costly system and funding is essential before any steps can be made to prevent the public from disposing electronics.

New contracts and the recently passed "Bottle Bill" for glass recycling will ensure recyclers receiving advance deposit fee funds only after the glass reaches its end use of is proven to be shipped to an off island market with weight tickets. This will discourage stockpiling of glass and stimulate the reuse and recycling of the glass. ^{86, 2001}

Compare Visitor and Resident Impact

The Report of the Twenty-First Legislature Relating to Integrated Solid Waste Management states the majority of the information was directed at residential, governmental, commercial and industrial sectors. The visitor industry was not specifically targeted.^{86, 2001} Further research is required to determine if visitor generated solid waste has a significant impact.

Major Assumptions

The recently passed Bottle Bill will encourage recycling efforts throughout the islands. Further study is required to obtain details regarding major assumptions by the State.

State of Hawaii – Storm Water

Present Capacity and Usage

The parameter for present capacity and usage of storm water is difficult to measure. Few state or county documents stated an actual measurement for storm water.

The age and rate of erosion for each island affects each island's capacity to handle storm water. On Kauai, the valleys and watersheds are naturally well defined after millions of years of erosion. Storm water is geographically directed into defined channels. Hawaii, a geologically young island, does not have well defined watersheds. Sheet flow predominates. In both cases, storm water drainage tends to be flashy in nature. This means flash flooding is a possibility with each precipitation event. (See Appendix for more drainage information.)

Existing Problems, Issues and Opportunities

The Annual Report to the Twenty-First Legislature-Regular Session 2002/Hawaii Coastal Zone Management lists the following as issues and problems.

- Coastal water quality affected by non-point pollution.
- A legal opinion on whether existing State back-up enforcement authorities can be used to control non-point pollution was submitted in December 2000 to the State Attorney General with no response to date. If the State can authorize personnel for non-point pollution control, it can enforce standards.
- Feasibility of implementing the federally mandated Coastal Non-point Pollution Control Program management measures in an economically achievable manner. ^{61, 2001}

Future and Planned Usage

Future usage for storm water remains relatively the same as present capacity and usage. Any development in drainage area requires modification of drainage channels or basins.

Future and Planned Requirements or Changes

The Annual Report to the Twenty-First Legislature-Regular Session 2002/Hawaii Coastal Zone Management states that development and implementation of changes need to fulfill *Hawaii's Implementation Plan for Polluted Runoff Control 15-year strategies and 5-year implementation plans.* ^{61, 2001}

Anticipated Costs for the Future

Review of county plans and capital improvement project budgets related to storm water are outlined in the Anticipated Cost section in county and district or community Storm Water Summaries.

Problems, Issues and Opportunities Associated with Costs

Review of county plans and capital improvement project budgets related to storm water are outlined in the Anticipated Cost section in county and district or community Storm Water Summaries.

Compare Visitor and Resident Impact

Storm water and its drainage affect visitors and residents alike. There is no differentiation in the documents reviewed.

Major Assumptions

Climate changes and seasonality influence storm water and drainage. The key to this infrastructure element is preventative measures.

State of Hawaii - Roads

Present Capacity and Usage

The Department of Transportation manages approximately 2,675 lane miles of highways on six islands. The Department continues to increase the capacity and make the highways safer facilities. ^{102, 2000} (See Appendix for capital improvement budget for roads.)

The *Statewide Transportation Improvement Program (STIP) – FY 2002 – 2004*, has been prepared in accordance with the requirements of the Transportation Equity Act for the 21st Century (TEA-21). It identifies and establishes the implementation priority for the State and County projects, statewide, to be funded in part by the Federal Highway Administration (FHWA) and the Federal Transit Authority (FTA) for the program period. The STIP is the document upon which the US Department of Transportation bases its obligation of federal transportation funds for projects in Hawaii. ^{70, 2001}

Table 1.03—Length of Streets and Highways, Paved and Unpaved, by Island: December 31, 1998 AND 1999 ^{64, 2001}

[Excludes private roads and military roads not regularly open to public use]

Island	Total mileage	Paved		Unpaved
		Freeways	Other	
1998				
State total	4,216.95	88.58	3,930.44	197.93
Hawaii	1,484.23	-	1,424.93	59.30
Maui	617.77	-	561.07	56.70
Lanai	129.26	-	117.26	12.00
Molokai	46.59	-	35.59	14.00
Oahu	1,527.11	88.58	1,405.09	33.44
Kauai	411.99	-	389.50	22.49
1999				
State total	4,256.14	88.58	3,969.63	197.93
Hawaii	1,493.69	-	1,434.39	59.30
Maui	620.08	-	563.38	56.70
Lanai	134.86	-	122.86	12.00
Molokai	47.54	-	33.54	14.00
Oahu	1,547.56	88.58	1,425.54	33.44
Kauai	412.41	-	389.92	22.49

Source: *Hawaii State Department of Transportation, Highways Division, records*

Existing Problems, Issues and Opportunities

Review of various development plans reveal that neighbor island residents have generally opposed widening two-lane highways to four lanes, constructing bypasses, and constructing new roads because they want to “keep country the

country.” This has delayed the implementation of highway improvements planned to accommodate increasing traffic, particularly on Maui and Hawaii. The post September 11, 2001 economic downturn has decreased DOT revenues.^{94, 2002}

Future and Planned Usage

The *Hawaii Statewide Transportation Plan* goals include:

- Achieve an integrated multi-modal transportation system that provides mobility and accessibility for people and goods.
- Ensure the safety and security of transportation systems.
- Protect and enhance the environment and improve the quality of life.
- Support Hawaii’s economic vitality
- Achieve a statewide planning process that is comprehensive, cooperative, and continuing.^{69, 2002}

The *Environmental Report Card Goals/Objectives for FY 2002*, a State document, includes the following plans:

1. Continue training of personnel and random monitoring of sites regarding pollution violations until no violations are achieved.
2. Remove/abate lead based paint on steel bridges and other structures in the State Highway System
3. Complete a statewide Solid Waste Management Program assessment of current work practice and educate Highways Division staff regarding proper solid waste management.^{74, 2001}

According to the *Ewa Development Plan*, there is anticipation for further population growth but the State does not anticipate sufficient revenue and resources to plan, design, and construct adequate highways to accommodate the existing population and growth.^{94, 2002}

Future and Planned Requirements or Changes

The *Statewide Transportation Improvement Program (STIP)* states that the Federal Highway Administration (FHWA) funds are appropriated by Congress. Currently, TEA-21 authorizes funding levels through FY 2003. The following is the anticipated apportionment levels for FY 2002 and the authorized amount for 2001:

For Hawaii, it is estimated that approximately \$150 million of FHWA funds will be available for FY 2002. Historically, the FHWA program, TEA-21, annual rate of growth in authorization levels for Hawaii is 4.6%. If adjusted for inflation in Year 2000 dollars, the growth rate is 2.0%. Therefore, it is reasonable to assume that approximately \$153 million and \$156 million will be available for FY 2003 and FY 2004, respectively.^{70, 2001}

According to the Harbors Division, in Oahu we are continuing studies to construct a North-South Road in Ewa between the Kapolei Parkway and Interstate Route-H-1, to improve the H-1 Lunalilo On-Ramp, the Vineyard Boulevard Off-ramp and to widen Interstate Route H-1 between Waiawa and Halawa.

Continuing studies regarding construct of a North-South Road in Ewa between the Kapolei Parkway and Interstate Route-H-1, to improve the H-1 Lunalilo On-Ramp, the Vineyard Boulevard Off-ramp and to widen Interstate Route H-1 between Waiawa and Halawa.

In Maui, coordination continues with a private developer to jointly construct the Lahaina Bypass Highway. They have decided, based on public input, to extend the southern limit of Launiupoko and are nearing completion of the project's *Final Supplemental Environmental Impact Statement*. For the new highway linking the Kihei Technological Park with the scientific facilities at Haleakala, we have held public hearings and are now preparing archaeological inventory and cultural impact studies to include in the final environmental impact statement.^{102, 2000}

The *Ewa Development Plan* states that the Highways Division is short staffed and needs to fill authorized vacant positions to meet changing federal requirements and to construct improvement projects in a timely manner. Future changes may include working more closely with the County governments to plan future development that is more independent of the automobile. Raising the fuel tax is a planned change.^{94, 2002}

Anticipated Costs for the Future

According to the *Ewa Development Plan*, anticipated costs for 2002 to 2005 are estimated at \$300 million to \$325 million per year.^{94, 2002}

The *Statewide Transportation Improvement Program* (STIP) identifies transportation programs totaling approximately \$967 million to be implemented during the three-year program period (Oahu - \$482 million; Hawaii - \$262 million; Maui - \$169 million; and Kauai - \$32 million). The projects include those eligible for federal funding assistance as well as regionally significant locally funded projects.^{70, 2001}

Problems, Issues and Opportunities Associated with Costs

According to *Hawaii Statewide Transportation Plan*, the State Highway Fund was established under Section 248-8 HRS, as amended. The principal sources of revenue are a 16 cent per gallon fuel tax and a vehicle weight tax of $\frac{3}{4}$ cent per pound for vehicles weighing less than 4,000 pounds, 1 cent per pound for vehicles between 4,000 and 7,000 pounds, 1 and $\frac{1}{4}$ cent per pound for vehicles 7,000 to 10,000 pounds and a flat \$150 for vehicles over 10,000 pounds.^{69, 2002}

State funding for highways accounts for more than 60 percent of all public support for highways, amounting to more than \$160 million. State sources of funding for highways are divided from the state Highway Special Fund. The primary sources of revenue for the Highway Special fund are indirect users fees in the form of fuel taxes, weight taxes and vehicle registration fees. The state highway fund is required by law to generate revenues necessary to carry out the operations, maintenance, and the capital improvement programs for the Department of Transportation highway programs. ^{101, 2002}

According to the *Ewa Development Plan*, the State's transfer of \$122 million from the State Highway Fund into the General Fund over a six-year period has put the State behind on its highway maintenance, which will result in higher future costs for deferred maintenance. Future federal funding levels available for highways depend on the next authorization, which should start in federal fiscal year 2004 (October 1, 2003). An emerging issue is the increasingly larger share of the Highways Division's revenue that goes for debt service. Opportunities may arise from closer coordination and cooperation with other State departments and the County governments. ^{94, 2002}

Compare Visitor and Resident Impact

According to the *Ewa Development Plan*, visitors use the State highways to see the islands, adding to the traffic congestions. Most of our State highways are at or near capacity during peak hours. If all the tourists traveled during peak hours, our highways probably could not handle the traffic generated by the present amounts of tourists. ^{94, 2002}

Table 1.04 -- New Passenger Car and Light Truck Registrations, Import and Domestic: 1999

Place of manufacture	Cars and trucks	Cars			Trucks		
		Total	Retail	Rental	Total	Retail	Rental
1999, total	82,928	73,452	35,927	37,525	9,476	9,127	349
Domestic	51,439	45,362	12,323	33,039	6,077	5,736	341
Imports	31,489	28,090	23,604	4,486	3,399	3,391	8

Source: *State of Hawaii Data Book - 2001*

According to the 1999 table above, 51.1% of cars and 3.7% of trucks are rentals compared to the overall State vehicle registrations. This is the 1999 statewide capacity of rental cars. This does not factor in other forms of private transportation or the usage. Therefore, it is difficult to evaluate the visitor impact on roads statewide or at any level. Additional data is needed to evaluate this parameter.

Major Assumptions

According to the *Ewa Development Plan*, the major assumptions used to determine the future requirements are as follows:

- Visitors will continue to come to Hawaii,
- The population will continue to grow,
- Maintenance costs will increase,
- Construction costs will increase,
- Highway widening and new alignments will still be needed,
- Highway improvements can never keep up with the demand for transportation, so better coordination between land use planning and the Highways Division will be necessary.^{94, 2002}

State of Hawaii – Airports

Present Capacity and Usage

The following tables usage statistics according to *The State of Hawaii Data Book 2000: A Statistical Abstract*. The tables show visitor arrivals by island in 2000; and passengers, cargo and mail by airport for 1999.

Table 1.05—Visitor Arrivals, Domestic and International, by Area Visited:
 2000 ^{64,2001}

Areas visited	2000		
	Total	Domestic	Inter-national
State total	6,948,595	4,446,936	2,501,659
Oahu	4,719,244	2,485,058	2,234,186
Kauai	1,074,821	884,407	190,414
Maui County	2,304,666	1,834,631	470,035
Maui	2,246,253	1,783,820	462,433
Molokai	64,559	55,572	8,987
Lanai	87,662	76,391	11,271
Hawaii County	1,267,965	925,356	342,609
Hilo side	370,193	272,964	97,229
Kona side	1,101,401	809,863	291,538

Source: *The State of Hawaii Data Book 2000: A Statistical Abstract*

Table 1.06 -- Passengers, Cargo and Mail, Overseas and Inter-island, by Airport: 1999 ^{64,2001}

Airport	Passengers		Cargo (tons)		Mail (tons)	
	Enplaned	Deplaned	Enplaned	Deplaned	Enplaned	Deplaned
OVERSEAS						
Total	7,737,494	7,699,676	207,339	179,714	30,705	55,488
Honolulu	6,604,650	6,392,667	193,282	171,115	29,267	55,487
Hilo	-	-	-	-	-	-
Kahului	854,706	969,881	6,945	5,937	1,102	1
Kona	198,599	253,630	7,070	2,562	336	-
Lihue	79,539	83,498	-	100	-	-
INTERISLAND						
Total	10,173,069	10,173,069	69,184	69,184	23,893	23,893
Honolulu	4,493,189	4,693,657	41,221	24,858	18,381	5,496
Hilo	778,771	808,154	10,906	8,980	1,193	2,491
Upolu	3	-	-	-	-	-
Waimea-Kohala	931	906	5	20	147	873
Kona	1,166,265	1,049,688	5,513	8,172	805	4,748
Kahului	2,129,704	2,017,788	5,324	14,911	2,263	7,592
Hana	4,184	3,909	42	11	-	-
Kapalua	68,336	66,966	277	360	-	-
Molokai	132,540	137,212	441	967	35	204
Kalaupapa	4,150	3,996	15	174	1	3
Lanai	88,598	87,043	112	665	15	113
Lihue	1,306,322	1,303,694	5,328	10,066	1,053	2,373

Source: *The State of Hawaii Data Book 2000: A Statistical Abstract*

Total Airport Revenue Fund earnings at beginning of 2000 - \$1,076,282,823.

Air terminals servicing inter-island transportation are located at Hilo, Waimea, Upolu, and Kona. The terminals at Hilo and Kona are overseas facilities. Overseas flights through Hilo International Airport have been important to agriculture in East Hawaii. However, overseas passenger carriers underutilize the terminal. A statewide need for a second gateway, especially for cargo, still exists. ^{27, 2001}

Domestic and international passenger traffic is up 0.2% at Kona International Airport, making it the fourth busiest airport in the State. ^{64,2001}

Existing Problems, Issues and Opportunities

The State, in coordination with the County and the affected communities, has been developing master plans for each of the four airport facilities to assess current and future demand as well as specific recommended improvements. ^{27, 2001}

Another issue according to various general plans and airport plans is accommodating overseas, in particular international, flights. There are issues with checking baggage for invasive species and maintenance of part-time customs personnel.

Future and Planned Usage

Plans are currently underway to construct a new cargo facility at Hilo International Airport to centralize cargo operations at a location closer to terminal facilities.

Future and Planned Requirements or Changes

Review of state and county documents and capital improvement projects is outlined in the county and appropriate community / district level Airports Summaries.

Anticipated Costs for the Future

Review of state and county documents and capital improvement projects is outlined in the county and appropriate community / district level Airports Summaries.

Problems, Issues and Opportunities Associated with Costs

An opportunity is that the *State of Hawaii Airport Activity Statistics Calendar Year 2001* states that the DOT is required by law to generate its own monies to fund programs and projects. Revenue sources are the aviation fuel tax, landing fees, airport use charges, concession fees, rental and miscellaneous earnings and investment income. 5% of special fund's gross revenues after debt service are contributed to the State General Fund for central services. Since the Capital Improvement Program is large, the DOT continues to rely on reimbursable General Obligation Bonds and federal aid to help fund programs and projects.
212,2001

This opportunity to be self-sufficient allows the *Hawaii Statewide Transportation Plan* to meet all of the expenditures of the statewide system of airports. State airports are thus developed, operated and maintained on a self-sustaining basis. The three sources of revenue available to the airports division of the DOT are:

- The Airport Special Fund,
- Grants from the federal government through the FAA, and
- State revenue bonds.

Of these, only the Airport Special fund can be used for operation and maintenance on an ongoing basis. All three can be used for capital improvements. Federal grants can sometimes be used for major non-recurring operations and maintenance expenditures.^{101, 2002}

Compare Visitor and Resident Impact

No documentation was uncovered regarding visitor versus residential impact on the airports.

Major Assumptions

Visitor industry growth rates and visitor census are important to planning and project for the future at Airports.

State of Hawaii – Harbors

Present Capacity and Usage

The *Hawaii Statewide Transportation Plan* states that the State of Hawaii Department of Transportation, the Harbors Division, is responsible for the statewide commercial harbors system. The Harbors Division exercises control and management of the commercial harbors, commercial harbor and waterfront improvements, docks, ports, wharves, quays, bulkheads and landings belonging to, or controlled by, the State of Hawaii. This control of operations includes the authority to establish and enforce schedules of fees for use of State facilities.^{101, 2002} (See Appendix for capital improvement budget for harbors.)

According to Harbors Division, the Harbor Special Fund was established under Section 266-19, HRS. The majority of the fund revenues come from fees and charges for wharfage, dockage, demurrage, and the rental of land and wharfs space at the state’s commercial harbors. The remaining amount is generated from various service charges, permits, and licenses.^{102, 2000}

Table 1.07 -- State Commercial Harbors: 2000^{64,2001}

Island and harbor	Harbor entrance depth (ft)	Harbor basin	Length (ft)	Width (ft)	Piers (linear ft)	Storage area (1,000 sq. ft)	
		Depth (ft)				Shedded	Open
Hawaii:							
Hilo	35	35	2,300	1,400	2,669	122	566
Kawaihae	40	35	1,500	1,450	1,562	23	427
Maui:							
Kahului	35	35	2,400	2,050	3,019	113	1,223
Molokai:							
Kaunakakai	23	23	1,500	600	691	7.4	129
Oahu:							
Honolulu:							
Main	45	40	3,300	1,520	29,347	1,303	9,209
Kapalama			3,400	1,000			
Barbers Point	42	38	2,100	1,800	1,860	36	1,703
Kauai:							
Nawiliwili	40	35	1,950	1,540	1,916	70	1,379
Port Allen	35	35	1,500	1,200	1,200	35	32

Source: *State of Hawaii Data Book 2000: A Statistical Abstract*

Table 1.08 -- Overseas and Inter-island Passenger Arrivals and Departures for Honolulu Harbor: 1995 TO 2000 ^{64, 2001}

Type of passenger	1995	1996	1997	1998	1999	2000
Overseas:						
In	17,517	14,851	18,262	25,570	45,494	31,767
Out	17,957	16,128	17,527	28,932	44,389	31,845
Inter-island:						
In	68,699	44,982	46,825	43,522	47,950	52,570
Out	68,849	45,159	40,558	43,754	47,782	52,883

Source: *State of Hawaii Data Book 2000: A Statistical Abstract*

The Division of Boating and Ocean Recreation (DOBOR) manages and administers the statewide ocean waters and navigable streams of Hawaii. This includes 21 small boat harbors, 54 launch ramps, 13 offshore mooring areas, 10 designated ocean water areas, 108 designated ocean recreation management areas, associated aids to navigation and beaches encumbered with easements in favor of the public.

Nearly all residents enjoy some form of ocean recreation; and according to *DBEDT's 1990 State Comprehensive Outdoor Recreation Plan*, 85% of the State's visitors engage in some form of ocean recreation activity during their visit. Approximately 4,000 boats are moored at DOBOR's small boat harbors. An additional 11,000 trailered boats launch at DOBOR's launch ramps. Another 200 to 2,000 customers per day board commercial vessels in the small boat harbors for activities such as whale-watching excursions and deep-sea fishing expeditions. Ocean recreation is a major industry in Hawaii, and currently contributes about \$800 million a year to our State's economy. ^{129, 2002}

Existing Problems, Issues and Opportunities

According to the *Hawaii Tourism Product Assessment*, Hawaii's current cruise facilities are unattractive and inadequate for current and projected needs of the industry. ^{91, 1999}

From the Department of Land & Natural Resources, Division of Boating & Ocean Recreation:

- Aged and deteriorating facilities; many facilities have outlived their life expectancy.
- Insufficient revenues to repair and maintain facilities. The Boating Special Fund (monies paid by boaters) is not nearly enough to pay for the \$250 million needed to repair, operate, and manage our State's small boat harbors. Hawaii's boaters pay fees that have not substantially increased since the 1980's and are currently the lowest in the nation. Hawaii's fees average 50% lower than our boating counterparts on the mainland West Coast.

- Unprecedented pressure on the carrying capacity of small boat harbors due to cruise ship passengers. Hawaii's small boat harbors were never intended to serve as ports for the loading and unloading of thousands of cruise ship passengers. Additional strains on resources were imposed from the new security measures because of the terrorist acts of 9/11.
- Increasing conflicts amongst the various and diverse crowd of ocean recreation enthusiasts, commercial operators and subsistence practitioners. Thrill seeking sports such as tow-in surfing present safety concerns. Impact on the environment is of continuous concern.
- Insufficient staff to maintain the responsibilities of the program. Additionally, many positions are under-classified in the civil service pay schedule and the division loses valuable employees to better paying jobs that have equal or less job responsibilities.^{129, 2002}

Future and Planned Usage (in the department/service)

Environmental Goals/Objectives for FY 2002 include:

1. The Harbors Division perseveres to balance environmental and economic concerns in the improvement/allocation of harbor facilities.
2. The Harbors Division encourages management practices that control and abate pollution.
3. To support Hawaii's lifestyle, the Harbors Division develops transportation facilities in compliance with environmental laws and regulations.^{74, 2001}

According to the *Kauai General Plan*, Statewide, the number of cruise ship passengers is expected to increase from 106,500 in 1998 to 496,500 in 2020.^{4, 2000}

From State Airports, Harbors and Highways,

- Facilitate the rapid, safe and economical movement of people and goods into, within, and out of the state by providing and operating transportation facilities and supporting services.^{37, 2001}

From the Department of Land & Natural Resources, Division of Boating & Recreation:

- Continue to carry out statutory requirements in accordance with the provisions of Chapter 200, Ocean Recreation and Coast Areas, Hawaii Revised Statutes.^{129, 2002}

Future and Planned Requirements or Changes

According to the *Hawaii Statewide Transportation Plan*, the State of Hawaii Department of Transportation, the *Statewide Harbor System Plan* (SHSP) is developed at the statewide level using statewide planning parameters similar to those used by the Airports Division. Because the vast majority of the cargo is brought into and is exported from the state through Honolulu Harbor, the SHSP is first used to estimate harbor requirements for Honolulu Harbor. Once the

Honolulu Harbor requirements are defined, the harbor requirements for the commercial harbors are estimated along with the requirements for Kalaeloa Barbers Point Harbor. Harbor master plans for each of the individual facilities are based on the requirements identified through this process.

As part of its continuing planning effort, the Harbors Division is also responsible for the development of 20-year master plans for each of the state-owned and/or operated port facilities. Since the future plans for a specific port facility will directly affect the users of the facility and the private businesses that depend on the shipping services provided by users, the Harbors Division pursues joint private sector/government efforts by coordinating the planning process with representatives from facilities users, the local business community and Federal, State and County government agencies.^{101, 2002}

From the Department of Land & Natural Resources, Division of Boating & Recreation: Implement changes as required by legislature, rule or law.^{129, 2002}

Anticipated Costs for the Future

Anticipated costs from the Department of Land & Natural Resources, Division of Boating & Recreation include:

- Developing a 5-year and 2-year Capitol Improvement Program:
 1. 5-year program, \$250 million for 236 Boating CIP projects that will restore the facilities to an acceptable condition;
 2. 2-year program, \$56.6 million, for 106 highest priority CIP projects.^{129, 2002}

Problems, Issues and Opportunities Associated with Costs

From the Department of Land & Natural Resources, Division of Boating & Recreation:

- Changes to the existing fee structure will require authorization through passage of new legislation or rule changes.^{129, 2002}

From State Airports, Harbors and Highways:

- The DOT is required by law to generate its own monies to fund programs and projects.
- Revenue sources are fees and charges for wharfage, dockage, demurrage, and the rental of land and wharf space at the state's commercial harbors and various service charges, permits and licenses.
- 5% of special fund's gross revenues after debt service are contributed to the State General Fund for central services.
- Since the Capital Improvement Program is large, the DOT continues to rely on reimbursable General Obligation Bonds and federal aid to help fund programs and projects.^{37, 2001}

According to the *Hawaii Statewide Transportation Plan*, State of Hawaii Department of Transportation, financing for the water-related transportation facilities comes from two primary sources. The Harbors Special Fund is used to finance the operations and maintenance as well as the capital improvement program for the harbor system. The state also uses revenue bonds to fund its capital improvement program. The harbor revenue bonds are collateralized by a charge and lien on the gross revenues of the program and upon all improvements and funds and securities created in whole or in part from the revenues or from the proceeds of the bonds. The Certificate requires that the Harbor Division impose, prescribe and collect revenues that will yield net revenues and taxes at least equal to 1.35 times the total interest, principal and sinking fund requirements for the ensuing 12 months.^{101, 2002}

Compare Visitor and Resident Impact

There was little information regarding visitor impact on harbors uncovered.

From the Department of Land & Natural Resources, Division of Boating & Recreation:

- Since nearly all residents and 85% of visitors participate in some form of ocean recreation, the impact of declining facilities or services would be tremendous. Various aspects of recreation, culture, and Hawaii's economic health would be affected.^{129, 2002}

Major Assumptions

There were no documented assumptions regarding DOT Harbors.

From the Department of Land & Natural Resources, Division of Boating & Recreation:

- The division anticipates existing challenges (as detailed in above answers) to continue or grow in future years. The carrying capacity for facilities and ocean recreation areas/uses will continue to be one of the division's highest priorities.^{129, 2002}

State of Hawaii – Parks

Present Capacity and Usage

In accordance to the Hawaii Department of Land and Natural Resources: Division of State Parks, the following tables show the national parks, with acreage in Hawaii; state park acreage by island; visitation to the major state parks and county parks and acreage. (See table of recreation areas by acreage in Appendix.)

Table 1.09 – National Parks: 1992 to 2001 ^{64, 2001}

Year and area	Acreage, Dec. 31, 2001			Visits
	Total	Federal	Non-federal	
1992	247,349	235,885	11,464	5,701,769
1993	247,349	235,885	11,464	5,828,583
1994	247,349	235,885	11,464	6,077,475
1995	247,349	235,885	11,464	6,213,924
1996	247,349	235,885	11,464	6,192,178
1997	247,349	235,885	11,464	6,738,001
1998	247,349	235,885	11,464	6,274,424
1999	249,001	237,731	11,270	7,469,412
2000	249,001	237,731	11,270	6,517,693
2001	249,001	237,731	11,270	6,215,669
AREAS: 2001				
Hawaii Volcanoes National Park	207,643	207,643	-	2,631,649
Haleakala National Park	29,195	29,195	-	1,440,062
Puuhonua o Honaunau National Historical Park	182	182	-	402,071
Kaloko-Honokohau National Historical Park	1,161	616	545	54,000
Puukohola Heiau National Historic Site	83	61	22	180,925
U.S.S. Arizona Memorial	11	11	-	1,443,956
Kalaupapa National Historical Park	10,726	23	10,703	63,006

Source: *State of Hawaii Data Book 2000: A Statistical Abstract*; U.S. Department of the Interior, National Park Service, Pacific Islands Support Office, records

Table 1.10 -- State Parks / Historic Sites by Island: 1991 TO 2001 ^{64, 2001}

Year and island	Number of areas, June 30	Acreage, June 30		Visits, yr. ending June 30 (1,000)
		Total	Developed	
1991	77	24,896	897.3	19,023
1992	80	25,056	921.7	19,255
1993	70	24,779	772.7	15,112
1994	69	24,790	772.2	14,260
1995	69	25,476	772.2	14,221
1996	68	26,784	772.2	14,221
1997	68	26,554	711.2	12,852
1998	68	26,814	771.2	12,676
1999	68	26,815	772.1	12,661
2000	68	26,815	772.1	13,004
2001	69	27,626	772.1	13,884
ISLANDS: 2001				
Hawaii	16	2,694	272.9	4,126
Maui	9	332	37.9	1,715
Molokai	1	234	10.0	32
Oahu	21	9,590	259.8	3,646
Kauai	10	13,756	131.5	2,831

Source: *State of Hawaii Data Book 2000: A Statistical Abstract; Hawaii State Department of Land and Natural Resources, Division of State Parks, records*

Table 1.11—Major State Parks: 2001 ^{64, 2001}

Acreage, June 30 Park	Total	Developed	Visits, year ended June 30 (1,000)
2001			
Old Kona Airport State Rec. Area	103.7	20.4	1,176
Hapuna Beach State Rec. Area	61.8	20.5	1,198
Wailua River State Park	1,130.7	37.4	1,144
Diamond Head State Monument	475.0	8.0	1,000
Haena State Park	65.7	2.0	665
Wailoa River State Recreation Area	131.9	97.7	589
Na Pali Coast State Park	6,175.0	4.0	80
Kahana Valley State Park	5,256.5	26.0	88
Kokee State Park	4,345.0	55.0	304
Waimea Canyon State Park	1,866.4	10.0	345
Kekaha Kai State Park	1,642.5	5.0	(NA)
Sacred Falls State Park	1,375.9	10.0	0

Source: *State of Hawaii Data Book 2000: A Statistical Abstract; Hawaii State Department of Land and Natural Resources, Division of State Parks, records*

Table 1.12—National and State Historic Sites by Island: 2001 ^{64, 2001}

Island	Total sites	Listed Hawaii Register only	Listed National Register only	Listed both Hawaii and National Register	Eligible for National Register
State total	667	290	110	231	36
Hawaii	128	59	23	41	5
Maui	66	30	4	31	1
Kahoolawe	1	-	1	-	-
Lanai	2	-	-	2	-
Molokai	93	41	10	40	2
Oahu	295	122	68	82	23
Kauai	82	38	4	35	5

Source: *State of Hawaii Data Book 2000: A Statistical Abstract*; Hawaii State Department of Land and Natural Resources, Division of State Parks, records

Table 1.13—County Parks by Island: 2001 ^{64, 2001}

	Number	Acreage
State totals	632	9,015
Hawaii	135	1,377
Maui	124	1,107
Lanai	5	16
Molokai	14	75
Oahu	288	6,440
Kauai	66	412

Source: *State of Hawaii Data Book 2000*

Table 1.14 -- 2001 Recreation Visit/Visitor Days for Hawaii National Parks

Parks	Recreation Visits	Percent Change	Recreation Visitor Days	Percent Change
Haleakala NP	1,410,974	-12.9%	282,364	-11.1%
Hawaii Volcanoes NP	1,343,286	-11.3%	740,873	-7.2%
Kalaupapa NHP	63,006	-27.6%	42,004	-27.6%
Kaloko-Honokohau NHP	54,000	22.3%	11,688	23.5%
Puuhonua O Honaunau NHP	402,071	-4.2%	33,506	-4.2%
Puukohola Heiau NHS	54,745	0.9%	2,281	0.9%
USS Arizona Memorial	1,436,006	-0.6%	239,334	-0.6%
Subtotal Hawaii	4,764,088	-8.1%	1,352,050	-7.5%

Hawaii Volcanoes National Park	
<u>Acreage</u>	FY 2001
Gross Area Acres	209,695
<u>Visitation</u>	FY 2001
Total Recreation Visits	1,406,376

Haleakala National Park	
<u>Acreage</u>	FY 2001
Gross Area Acres	29,830
<u>Visitation</u>	FY 2001
Total Recreation Visits	1,496,271

Kalaupapa National Historical Park	
<u>Acreage</u>	FY 2001
Gross Area Acres	10,779
<u>Visitation</u>	FY 2001
Total Recreation Visits	96,143

Kaloko-Honokohau National Historical Park	
<u>Acreage</u>	FY 2001
Gross Area Acres	1,161
<u>Visitation</u>	FY 2001
Total Recreation Visits	50,003

Puuhonua O Honaunau National Historical Park	
<u>Acreage</u>	FY 2001
Gross Area Acres	182
<u>Visitation</u>	FY 2001
Total Recreation Visits	418,762

Puukohola Heiau National Historic Site	
<u>Acreage</u>	FY 2001
Gross Area Acres	86
<u>Visitation</u>	FY 2001
Total Recreation Visits	52,413

U S S Arizona Memorial	
<u>Acreage</u>	FY 2001
Gross Area Acres	11
<u>Visitation</u>	FY 2001
Total Recreation Visits	1,486,502

Source: *National Park Service Statistical Abstract 2001*

According to the National Park Service Statistical Abstract 2001,^{136, 2002} Hawaii State Recreation Visits in 2001 were 4,764,088. This is a decrease of 8.1%. The tables above give acreage and visits for 2001.

Existing Problems, Issues and Opportunities

Review of various documents reveals that lack funding is one of the biggest problems facing the State park system. The ability to adequately maintain and operate park facilities is hampered by budget cut backs.

According to *The Updated Wailuku-Kahului Community Plan*, increasing vandalism and homelessness, among other societal ills, plague the community as a whole, impacting adversely on public parks as well. Conflicting usage, fair and equitable access, acquisition, and development of parks and recreational facilities are all issues that continue to warrant priority community attention.

Expanding partnerships with schools, military commands, other agencies, non-profit organizations, and the private sector are among the significant opportunities helping the department to meet the community's needs.^{31, 2000}

Future and Planned Usage

According to the *Funds Required for Reconstruction of Park Facilities 2002-2015*, generally as usage increases within the parks and more visitations, upgrades will need to be made. For the parks in Hawaii, there are plans for improving roadways, parking lots, restrooms, walkways, and pavilions.^{243, 2002}

Future and Planned Requirements or Changes

According to *The Updated Wailuku-Kahului Community Plan*, the City's *General Plan* and eight distinct *Development Plans/Sustainable Community Plans*, planned usage includes providing comprehensive objectives and policies relating to the future development of parks and recreation.

Please see Appendix: Funds Required for Reconstruction of Park Facilities 2001-2012 for a list of requirements for statewide park reconstruction.

Anticipated Costs for the Future

According to the Department of Land and Natural Resources, \$84,149,000 is required for reconstruction of the State Parks. A table, Funds Required for Reconstruction of Park Facilities 2001-2012, is available in the appendix with a listing of required changes.

Problems, Issues and Opportunities Associated with Costs

As stated in the existing problems, funding is a major problem for the State park system. Research into obtaining outside (private, national organizations, or federal) funding should be looked into as an opportunity. Another opportunity is privatization of park concessions and operations. Another issue is crowding, especially at water resource based parks.

Compare Visitor and Resident Impact

According to *Hawaii Tourism Product Assessment*, Hawaii's beaches, parks, and other facilities are key visitor resources, which are inadequately developed and maintained. There is a strong perception of competition between visitors and residents over limited resources.^{91, 1999}

According to *The Updated Wailuku-Kahului Community Plan*, visitor impacts on parks and recreational facilities are mostly concentrated at significant beach parks such as Hanauma Bay Nature Preserve and along the North Shore. Large urban parks in close proximity to major visitor destinations such as Kapiolani Kuhio Beach and Ala Moana Beach require additional maintenance support and security, park rangers and police.

As a future point of reference, the National Park Service has developed economic models that estimate the impacts park visitors have on the local economy. Such models produce quantifiable measures of park economic benefits that can be used for park planning, concessions, budget justification, policy analysis and marketing.^{31, 2000}

Major Assumptions

Major assumptions for Hawaii State Parks, county parks and federal parks include visitor projections and availability of funding.

State of Hawaii – Police, Fire and Emergency Services

Present Capacity and Usage

Police, Fire and Emergency Services are primarily handled at the county level. The State handles the Sheriffs. Sheriffs are in charge of the prison and parole system, which is not covered in this study.

Existing Problems, Issues and Opportunities

See county level Police, Fire, and Emergency Services

Future and Planned Usage

See county level Police, Fire, and Emergency Services

Future and Planned Requirements or Changes

See county level Police, Fire, and Emergency Services

Anticipated Costs for the Future

See county level Police, Fire, and Emergency Services

Problems, Issues and Opportunities Associated with Costs

See county level Police, Fire, and Emergency Services

Compare Visitor and Resident Impact

See county level Police, Fire, and Emergency Services

Major Assumptions

See county level Police, Fire, and Emergency Services

State of Hawaii – Visitor Accommodations

Present Capacity and Usage

The following tables give the capacity and usage for various different types of visitor accommodations, year 2001, throughout the State. The hotel occupancy rates give approximate usage for visitor accommodations.

Table 1.15 -- Types of Visitor Accommodations Utilized By Island: 2001

	State	Oahu	Maui	Molokai	Lanai	Kauai	Hawaii
Total	6,303,791	4,257,535	2,048,768	70,233	84,905	1,008,698	1,181,551
Hotel	3,889,439	3,193,151	1,270,236	35,819	53,235	585,045	773,916
Condo	872,162	430,011	540,875	16,154	11,377	205,774	177,233
Time-share	N/A	149,014	118,829	N/A	N/A	133,148	90,979
Cruise	135,744	N/A	98,341	14,187	18,679	82,713	89,798
Other	N/A	395,951	118,829	7,445	6,708	68,592	109,884

Source: *Annual Visitors Research Report: 2001*

Table 1.16 -- State Hotel Occupancy Rates: 2001

	Hotel	Oahu	Maui	Kauai	Hawaii
JANUARY	76.5	78.6	79.5	62.2	70.6
FEBRUARY	86.8	88.3	86.5	81.7	84.9
MARCH	78.9	75.9	84.8	76.1	80.9
APRIL	70.0	67.6	78.0	70.8	62.8
MAY	68.0	67.1	73.2	70.5	58.4
JUNE	72.3	73.8	76.7	68.0	62.8
JULY	76.3	74.0	82.0	79.2	70.1
AUGUST	78.9	77.8	81.5	83.7	71.3
SEPTEMBER	57.8	57.0	58.5	64.7	52.6
OCTOBER	55.9	53.0	60.5	65.9	58.0
NOVEMBER	58.2	54.1	66.5	64.5	52.5
DECEMBER	57.4	58.4	57.7	56.5	54.0
TOTAL	69.8	68.8	73.8	70.3	64.9

Source: *Annual Visitor Research Report 2001*

Table 1.17 -- 2001 Visitor Arrivals by Out-of-State Ships

2001	# OF SHIP ARRIVALS	VISITOR ARRIVALS	
		ARRIVED BY SHIPS	ARRIVED BY AIR BOARDED THE SHIPS
JANUARY	9	5,559	1,531
FEBRUARY	3	2,968	0
MARCH	7	6,510	1,675
APRIL	4	5,161	3,789
MAY	4	3,900	3,890
JUNE	0	0	0
JULY	0	0	0
AUGUST	0	0	0
SEPTEMBER	4	3,101	3,439
OCTOBER	10	9,150	11,252
NOVEMBER	9	5,635	8,994
DECEMBER	3	4,587	3,725
TOTAL	53	46,571	38,295

Source: *Annual Visitor Research Report 2001*

Table 1.18—Percentage of Total Accommodations by Type: 2001

Note - not all B&B's and private homes rented out as vacation rentals are accounted for.

Accommodations	% Total Properties	% Total Units
Hotels	17.6%	69.4%
Condominiums	22.1%	22.4%
Individual Vacation Units	33.5%	2.0%
B&B's	16.3%	0.8%
Others	6.8%	3.8%

Source: *2001 Visitor Plant Inventory*

According to the *2001 Visitor Plant Inventory*, based on 914 properties statewide, the largest percentage of rooms is categorized as standard (43.9%), followed by Deluxe (29.4%), Budget (20.7%), and Luxury (5.9%); Budget being the least expensive, followed by Standard, Deluxe, and Luxury being the most expensive.

The majority of individual vacation units (59.9% or 750 units) were listed as Budget, while the majority of Condominium, hotels (63.1% or 9,849 units) categorized their units as Standard. Among hotels, 40.1% (20,107 units) categorized their units as Standard and 33.8% (16,937 units) were categorized as Deluxe. Among all types of properties, hotels have the largest percentage of their rooms in the Luxury category. ^{80, 2001}

Table 1.19 – Hotel Rooms, Occupancy Rates and Daily Room and Guest Rates: 1990 TO 2000 ^{64,2000}

Year	Hotel units 1/			Percent occupied	Daily rates per room (dollars)	Guests per room
	State total	Oahu	Other islands			
1990	71,266	36,899	34,367	78.8	102.10	2.01
1991	72,275	36,623	35,652	72.4	101.89	2.01
1992	73,089	37,279	35,810	72.6	105.59	2.02
1993	69,502	37,032	32,470	72.0	103.26	2.04
1994	70,463	36,194	34,269	76.5	105.46	2.04
1995	(NA)	(NA)	(NA)	76.6	110.27	2.05
1996	70,288	36,146	34,142	75.5	127.95	2.07
1997	71,025	35,971	35,054	74.0	135.94	2.08
1998	71,480	36,206	35,274	72.1	140.80	2.09
1999	71,157	35,861	35,296	72.9	144.53	2.09
2000	71,506	36,303	35,203	70.0	159.78	2.08
2001	72,204	36,824	35,380	61.1	159.28	2.05

(annual); PKF-Hawaii, *Trends in the Hotel Industry*, Hawaii (December issues), and records.
 Source: *The State of Hawaii Data Book 2000: A Statistical Abstract*:

Existing Problems, Issues and Opportunities

According to the *Hawaii Tourism Product Assessment*, cruise ships are an area of growth and facilities need improvement. The aging and deteriorating visitor physical plant in Waikiki is also a problem. Many beaches, parks, and facilities are key visitor resources, which are inadequately developed and maintained. There is a strong perception of competition between visitors and residents over limited resources.

Government issues include:

- Lack of shared vision and coordination among State, County, and inter-departmental agencies
- Lack of communication and cooperation among government, private sector, and general community
- Land use and other laws prohibit or hinder all forms of tourism
- Residents tend to think that tourism hurts, not helps, the most important community problem – cost of living, and causes traffic and recreational annoyances

Clear tourism plan and vision to support the industry has not been developed:

- Limited new development of new tourism facilities and minimal success in attracting new investment capital

- Lack of review and update of land use policies and laws that discourage interaction desired by resident and visitors, as well as development of both traditional tourism and new tourism niche products
- Insufficient funding for marketing to promote the industry on a globally competitive basis

Neither the state nor any of the Counties have established a cohesive and comprehensive set of policies or plans of action to guide the actual development of new forms of tourism products in Hawaii. Hawaii’s State land use system presents fundamental obstacles to the development of non-traditional, low impact forms of tourism products. County land use laws and approval processes are also very inflexible and make it difficult to permit, much less encourage new forms of visitor accommodations and attractions. Designated resort areas create distinct separations between visitor and resident areas. More extensive and on-going coordination and cooperation with the State government and between the state, counties, and private sector is needed to effectively guide the future development of the tourism industry, especially in regard to land use and planning. Currently, no on-going coordination exists at the state and county levels.^{91, 1999}

Future and Planned Usage

According to the *2001 Visitor Plant Inventory*, future planned accommodations include:

Table 1.20 – Future Planned Accommodations^{80,2001}

	Properties	Units	Date	Types of Accommodations
Oahu	10	9,953+	2010	Timeshare, hotel
Hawaii	34	5,111	Unknown	Lodge, hotel, timeshare, B&B, inn, condo, other
Kauai	30	7,499+	Unknown	Apartment/hotel, resort/residential, timeshare
Maui	5	1,149	Unknown	Timeshare, hotel
State	79	23,712		

Source: *2001 Visitor Plant Inventory*

Table 1.21 -- Hawaii Visitors: Actual and Projections through 2025

Year	1998	2000	2005	2010	2015	2020	2025
Ratio Between Average Daily Census and Occupied Visitor Rooms							
State	3.1	3.1	3.1	3.2	3.2	3.2	3.2
Oahu	2.8	2.8	2.8	2.9	2.9	2.9	2.9
Maui	3.3	3.3	3.3	3.4	3.4	3.4	3.4
Kauai	3.7	3.7	3.7	3.8	3.8	3.8	3.8
Hawaii	3.5	3.5	3.5	3.6	3.6	3.6	3.6
Number of Occupied Visitor Rooms							
State	51,551	54,256	62,685	68,483	75,197	82,567	90,657
Oahu	26,720	28,242	32,380	35,131	38,426	42,027	45,964
Maui	13,577	14,378	16,744	18,405	20,289	22,365	24,653
Kauai	4,669	5,002	5,889	6,529	7,236	8,018	8,884
Hawaii	6,585	6,634	7,671	8,417	9,246	10,157	11,156
Share of Occupied Visitor Rooms (%)							
Oahu	51.8	52.1	51.7	51.3	51.1	50.9	50.7
Maui	26.3	26.5	26.7	26.9	27.0	27.1	27.2
Kauai	9.1	9.2	9.4	9.5	9.6	9.7	9.8
Hawaii	12.8	12.2	12.2	12.3	12.3	12.3	12.3
Minimum Hotel Occupancy Rate When New Hotels Are Needed (percent)							
State	72.1	75.9	81.7	82.5	82.8	83.0	83.0
Oahu	73.8	78.0	82.0	82.5	83.0	83.0	83.0
Maui	72.8	77.1	82.0	82.5	82.5	83.0	83.0
Kauai	67.0	71.8	82.0	82.5	82.5	83.0	83.0
Hawaii	68.2	68.7	79.5	82.5	82.5	83.0	83.0
Number of Visitor Rooms Demanded							
State	71,480	71,480	76,744	83,010	90,867	99,479	109,226
Oahu	36,206	36,206	39,488	42,584	46,296	50,635	55,378
Maui	18,650	18,650	20,419	22,309	24,593	26,946	29,702
Kauai	6,969	6,969	7,182	7,914	8,771	9,661	10,704
Hawaii	9,655	9,655	9,655	10,202	11,207	12,237	13,442
Number of Visitor Rooms (average annual growth rate, %)							
State	0.5	0.0	1.4	1.6	1.8	1.8	1.9
Oahu	0.0	0.0	1.8	1.5	1.7	1.8	1.8
Maui	0.6	0.0	1.8	1.8	2.0	1.8	2.0
Kauai	3.3	0.0	0.6	2.0	2.1	2.0	2.1
Hawaii	0.3	0.0	0.0	1.1	1.9	1.8	1.9

Source: *Populations and Economic Projections for the State of Hawaii to 2025*

Numerous priorities for Hawaii, as stated in the *Hawaii Tourism Product Assessment* include:

- Aggressively selling the Hawaii Convention Center;
- Improving visitor-related facilities (parks, trails, visitor centers, public restrooms, etc);
- Developing products for specialized niche markets;
- Improving cruise berthing facilities;
- Restore some or all lei-greetings: this was considered to be the single most magical greeting technique;
- Developing and expanding new markets;
- Facilitating roadway, traffic and other infrastructure changes;

- Improving communication and coordination between State and County agencies and visitor groups;
- Japanese visitors need to have specific, concrete information on new ways to experience Hawaii; and
- The state should strive to highlight its distinct peoples, cultures, foods, music, attraction, and lifestyles to sell the destination. ^{91,1999}

Future and Planned Requirements or Changes

Few documents contained information regarding plans for visitor accommodations. Those that did were deemed questionable. Further study into this area is advised.

See County Plans for more information.

Anticipated Costs for the Future

No documentation regarding actual costs for future changes or requirements was uncovered.

Problems, Issues and Opportunities Associated with Costs

According to the *Hawaii Tourism Product Assessment*, an opportunity associated with costs is the need to increased government funding for product development. Tourism Special Fund and dedicated funding, tourism marketing is actually paid by tourists themselves from a portion of the transient accommodations tax. ^{91,1999}

Visitor accommodations are primarily a pay-as-you-go proposition. It is a service that, when used, is paid by the user to the provider. Varying levels of service require varying levels of payment. As a private business, visitor accommodations are also a part of a competitive environment. Profitability, innovation and other incentives are key to staying at the top of the market.

Compare Visitor and Resident Impact

The following table gives an estimate of visitor impact on visitor accommodations by island. This assumes that the remaining units are for residential and other uses (renovation). See County and Community District Plans for other information.

Table 1.22 – Total Properties and Percentage Available for Visitor Use by Island: 2001

Island	Total Properties	% Total Properties	Total Units	% Total Units
Oahu	205	22.4%	36,824	51.0%
Maui	251	27.5%	17,574	24.3%
Hawaii	185	20.2%	9,944	13.8%
Kauai	257	28.1%	7,202	10.0%
Molokai	10	1.1%	292	0.4%
Lanai	6	0.7%	368	0.5%
Totals	914	100.0%	72,204	100.0%

Source: 2001 Visitor Plant Inventory

Major Assumptions

Visitor growth rates and visitor census projections, such as the *Population and Economic Projections for the State of Hawaii to 2025*, are important to planning for visitor accommodations.

State of Hawaii – Private Transportation

Present Capacity and Usage

Public Utilities Commission Annual Report states that the Hawaii Public Commission regulates 624 passenger carriers and 370 property carriers in the State. Passenger carriers are classified by authorized vehicle seating capacity. They include tour companies, limousine services, and other transportation providers. The types of commodities transported and the nature of services performed classify property carriers.

Many of the State’s motor carriers belong to the Western Motor Tariff Bureau, Inc. (WMTB) or the Hawaii State Certified Common Carriers Association. These are non-profit organizations engaged in the research, development, and publication of motor carrier tariffs.

The table below shows the total number of registered motor vehicles in Hawaii. The Council’s year 2002 goal for the number of motor vehicles per capita is 0.61.
 74, 2001

Table 1.23 – Number of Registered Motor Vehicles in Hawaii:1991-2000.^{74,}
 2001

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Number of Motor Vehicles (in thousands)	897	886	880	875	878	885	884	893	907	941
State de facto Pop. (Million)	1.24	1.25	1.26	1.26	1.28	1.28	1.28	1.31	1.31	1.34
Vehicles per Person	0.72	0.71	0.70	0.69	0.69	0.69	0.69	0.68	0.69	0.70

Source: Environmental Report Card 2001

Existing Problems, Issues and Opportunities

Hawaii has a high vehicle per capita. This means there are several vehicles with a single occupant (driver). This increases the number of vehicles on the roads. It unknown how rentals, tour buses and taxis impact this situation without further study.

Future and Planned Usage

As a privately run business, private transportation adapts. It expands when business booms and contracts when business slacks. Further analysis is required to gain more insight into this infrastructure element. More measures of usage are required.

Please see county summaries for information.

Future and Planned Requirements or Changes

Please see county summaries for information.

Anticipated Costs for the Future

Please see county summaries for information.

Problems, Issues and Opportunities Associated with Costs

Please see county summaries for information.

Compare Visitor and Resident Impact

Please see county summaries for information.

Major Assumptions

Please see assumptions for visitor accommodations and county summaries for information.

State of Hawaii – Energy Systems

Present Capacity and Usage

The following tables on energy generation and usage have been taken from the *State Data Book*:

Table 1.24 – Electricity Production by Source, by Island: 1998

[Million kWh]

Island	Total	Petroleum	Biomass	MSW 1/	Hydroelectric
State total	10,455	8,010	178	364	87
Hawaii	1,040	627	-	-	49
Maui	1,171	1,008	112	-	21
Lanai	28	28	-	-	-
Molokai	38	38	-	-	-
Oahu	7,723	5,937	-	364	-
Kauai	455	372	66	-	17

Island	Wind	Geothermal	Coal	PV 2/	Other
State total	21	220	1,555	(Z)	20
Hawaii	21	220	123	(Z)	-
Maui	-	-	30	(Z)	-
Lanai	-	-	-	-	-
Molokai	-	-	-	-	-
Oahu	-	-	1,402	(Z)	20
Kauai	-	-	-	-	-

Z. Less than 500,000 kWh.

1/ Electricity generated from Honolulu municipal solid waste plant.

2/ Electricity generated from photovoltaic.

Source: Hawaii State Department of Business, Economic Development & Tourism, Energy, Resources and Technology Division, records; Hawaii State Department of Commerce and Consumer Affairs, records.

Table 1.25 – Electric Utilities by Island: 2000

County or island	Customers, Dec. 31			Gross System Peak 2/ (mW)	Power sold (1,000 kWh)		
	Total	Residential 1/	Other		Total	Residential 1/	Other
State total	430,354	370,928	59,426	(X)	9,690,598	2,764,619	6,925,980
Oahu	278,260	245,027	33,233	1,203	7,211,760	1,897,691	5,314,069
Hawaii	63,778	53,263	10,515	170.8	954,453	355,281	599,172
Kauai	30,715	23,612	7,103	71.8	418,922	137,415	281,506
Maui County	57,601	49,026	8,575	(X)	1,105,463	374,231	731,232
Lanai	1,494	1,296	198	5.0	27,108	6,855	20,253
Maui	53,204	45,379	7,825	185.1	1,042,006	354,689	687,317
Molokai	2,903	2,351	552	6.5	36,349	12,687	23,661
County or island	Average annual use (kWh) 3/		Average rate (dollars per kWh)		Revenues (\$1,000)		
	Residential 1/	Other	Residential 1/	Other	Total	Residential 1/	Other
State total	7,453	116,548	0.16409	0.13083	1,359,756	453,650	906,106
Oahu	7,745	159,903	0.14477	0.11402	880,663	274,733	605,930
Hawaii	6,670	56,983	0.21762	0.19169	192,174	77,316	114,858
Kauai	5,820	39,632	0.23666	0.21874	94,096	32,520	61,575
Maui County	7,633	85,275	0.18459	0.16922	192,823	69,080	123,743
Lanai	5,289	102,288	0.22184	0.22112	5,999	1,521	4,478
Maui	7,816	87,836	0.18232	0.16582	178,638	64,668	113,970
Molokai	5,397	42,865	0.22787	0.22376	8,186	2,891	5,294

X Not applicable.

1/ Residential refers to single-metered residential customers which may include condominiums for visitor use but excludes master-metered apartment and condominium buildings used by residents which are classified as commercial customers.

2/ System peak is the maximum amount of energy required by the electrical system at a point in time. The island electrical systems are not interconnected, therefore, peaks are reported separately for each island. (Hawaii County-net peak).

3/ Based on number of customers at end of year.

Source: Hawaii State Department of Commerce and Consumer Affairs, Division of Consumer Advocacy, records.

The Hawaii Public Utilities Commission regulates four electric utility companies engaged in the production, purchase, transmission, distribution, and sale of electric energy in the State:

- Hawaiian Electric Company, Inc. (HECO), on the island of Oahu;
- Maui Electric Company, Ltd. (MECO) serving the islands of Maui, Lanai, and Molokai;
- Hawaii Electric Light Company (HELCO) on the island of Hawaii;
- Kauai Electric Division of Citizens Utilities Company (KE) serving Kauai.

According to *Potential Sources of Permanent Funding*, Hawaii is the most oil-dependent state, relying on imported petroleum (primarily from foreign nations), for 89% of its primary energy (based on data from *Hawaii Energy Strategy 2000*).

Hawaii's electric utility sector used 32% of the imported oil in 2000. Air conditioning consumes 35%-45% of a typical hotel or office building's energy. In 2000, isle residents and businesses spent \$3.38 billion on energy, or about nine percent of Hawaii's \$39.4 billion GSP (in 2000 dollars). This is an increase of two percentage points over the percentage of GSP spent on energy in 1999.

Efforts are underway to improve efficiency and to provide non-oil alternatives. Puna Geothermal Venture (PGV) received approval from Hawaii County to expand production incrementally to 60 megawatts. Hawaii is the national leader in the federal Million Solar Roofs program, to date; these solar systems have saved nearly 500 megawatt-hours of electricity and over \$61 million in utility bills. In 15 years, more than 900,000 barrels of oil will be displaced. Solar electricity powers part of Kauai County's Sensory Control and Data Acquisition (SCADA) system, which monitors and transmits information from critical, remote water storage tank sites. The use of biodiesel, a fuel made from vegetable oils, expanded significantly in 2001. Electric vehicles received a boost from a Hyundai demonstration that brought 15 prototype Santa Fe SUV's to Honolulu for a two-year test drive. The vehicles are being used by the City and County, the State, HECO, and Hickam Air Force Base; information from the test will be used for design improvements.^{77, 2001}

The world's largest hybrid solar energy project, Parker Ranch's hybrid solar/wind power station, was dedicated in 2001, as was a simple solar parking lot lamp. Both are examples of the expanding role of solar energy in Hawaii's economy. The 175-kilowatt photovoltaic array is mounted on a tracking system that rotates the panels from east to west to maximize solar exposure. Five wind turbines with a combined capacity of 50 kilowatts supplement the solar power. The installation, which takes two of the ranch's total of 225,000 acres, provides electricity to booster pumps needed to deliver water to Parker Ranch's 20,000 cattle. The grid-intertwined system is located on the western slopes of Mauna Kea.^{77, 2001}

One of Hawaii's goals is to replace energy produced from fossil fuels with alternate and renewable sources such as solar power, biomass, hydro-electric, wind, geothermal and solid waste. The following table shows the amount of energy used in Hawaii in trillion British thermal units (BTU) used.^{74, 2001}

Table 1.26 -- Total Energy Used in Hawaii in Trillion BTU: 1994-2000. ^{74, 2001}

Source	1994	1995	1996	1997	1998	1999	2000
Petroleum	285.5	274.0	277.1	278.3	269.1	272.5	290.2
Coal	136.	16.5	16.9	16.8	14.8	14.5	15.5
Biomass	16.4	11.8	10.4	9.0	7.5	9.2	7.1
Solar Hot Water	2.3	2.8	3.1	3.1	3.1	3.5	3.6
Hydroelectric	1.5	1.1	1.1	1.0	0.8	1.2	1.0
Wind	0.2	0.2	0.2	0.2	0.2	0.0	0.2
Geothermal	1.8	2.3	2.4	2.4	2.3	2.0	2.6
Solid Waste	6.2	6.4	4.7	5.3	5.1	5.1	5.1
Photovoltaic	0.0003	0.0003	0.0005	0.0008	0.0020	0.0027	0.0043
Total	327.5	315.1	315.9	316.1	302.9	308.0	325.2

Source: Environmental Report Card 2001

Existing Problems, Issues and Opportunities

According to *Potential Sources of Permanent Funding*:

- The islands' electricity grids are not interconnected.
- Fuels must be transported inter-island by sea.
- Residents pay among the nation's highest costs for electricity and gasoline.
- Energy continues to be a key factor shaping Hawaii's economy, environment and standard of living; it is essential for the economic stability of the state.

Future and Planned Usage

According to *Potential Sources of Permanent Funding*, the goals of the State's energy program have been incorporated into the *Hawaii State Plan* and codified in the Hawaii Revised Statutes, which require planning for and giving due consideration to the following four objectives:

- Dependable, efficient, and economical statewide energy systems capable of meeting the needs of the people;
- Increased energy self-sufficiency where the ratio of indigenous to imported energy use is increased;
- Greater energy security in the face of threats to Hawaii's energy supplies and systems; and
- Reduction, avoidance, or sequestration of greenhouse gas emissions from energy supply and use.

According to the *State Energy Resources Coordinator: Annual Report 2001*:

- Approvals for the 10-megawatt Kahua Power Partners wind farm at Kahua Ranch, North Kohala
- The Zond project, on Maui, has received State land use approval and successfully negotiated a price to sell its electricity to MECO.
- The power purchase agreement is still being negotiated for the 27-turbine, 20-megawatt project proposed for Kealaloloa Ridge above Maalaea.

- Hawaii Renewable Energy Development has signed a power purchase agreement with HELCO for its proposed 5.28-megawatt project near Upolu Point.
- A third Big Island wind farm, Apollo Energy Corporation at South Point, is working toward an agreement with HELCO to repower its 9.25-megawatt wind farm to 20 megawatts.
- Wind power has been proposed for Kauai. Kauai Electric Company is discussing a 5.4-megawatt wind farm with Pacific Winds, Inc.
- A new 9,000-foot pipeline, which will bring as much as 28,000 gallons of cold, deep ocean water to the Natural Energy Laboratory of Hawaii Authority facilities at Keahole Point, was deployed in late 2001. A second pipeline will bring in up to 40,000 gpm of warm surface water.
- Photovoltaics are proposed for the Mauna Loa Observatory
- As part of the Hawaii Volcanoes National Park's movement to reduce fossil fuel consumption, sixteen park vehicles, including pickups, dump trucks and earth moving equipment, are utilizing biodiesel.
- An electric tram with zero emissions will begin service at the Honolulu International Airport in 2002, with intentions to eventually replace the existing diesel-powered Wikipiki shuttles. ^{77, 2001}

Future and Planned Requirements or Changes

According to *Potential Sources of Permanent Funding*, by law, the State's energy policy requires that the total costs and benefits of all energy resource options—including efficiency—be compared. Alternative transportation fuels and efficient transportation practices must also be promoted.

Hawaii residents can now sell independently generated renewable electricity to their local utilities at more favorable rates due to the new "net metering" law. However, the net metering law, Act 272, limits individual systems to no more than 10 kilowatts capacity. Net metering allows the owners and operators of small, renewable energy facilities to sell surplus electricity to the utilities at the same retail rate they pay to the utilities for purchased electricity. Utilities will provide a credit for electricity sold to the grid. ^{77, 2001}

Other plans include:

- On Hawaii, work began on retrofits to the Hilo Public Safety Building and the Kona Police Station. Incorporating new lighting and air conditioning, this \$1.4 million project was funded, like previous retrofits, through a tax-exempt municipal lease.
- The contractor guarantees annual energy cost savings of at least \$139,000 for both facilities.
- Lighting retrofits to 27 Fire and Police Stations, completed in February, resulted in energy and operational savings of \$57,000. Efficiency measures installed at the Hawaii County Building in Hilo also tallied over

- \$65,000 in savings during its fourth year of operation. So far, cumulative savings from these projects has exceeded \$364,000.
- Kauai County is also very active in efficiency retrofits. The new Police/Civil Defense Operating Center's completion is anticipated in the fall of 2002. Of the total cost of \$142,000, rebates from Kauai Electric will cover approximately \$111,000.
 - Improvements to lighting at Kauai Country's Water Department were completed in August 2001. At a cost of \$6,128, 40% of which was covered by Kauai Electric rebates, 163 fixtures were updated to T8 fluorescent lamps with electronic ballasts.
 - A non-profit organization on the island of Hawaii is spearheading an effort to install 100 low-cost solar water heaters for low-income residents. The first systems were installed in mid-2001.
 - The City and County of Honolulu is forming a team to implement energy performance contracting in its facilities.
 - Maui Community College will study the efficiency of its energy management system, as well as the feasibility of ice storage.
 - Public awareness activities regarding new gas technologies will be introduced by The Gas Company.
 - Three new high schools, one on Hawaii and two on Oahu, will join the Energy Smart Schools initiative.
 - The U.H. School of Architecture will develop cooling guidelines for the portable classrooms used at many public schools.^{77, 2001}

Anticipated Costs for the Future

In fiscal year 1999-00, the Commission approved expenditures totaling over \$25 million for electric capital improvements: HECO was authorized \$19.3 million, \$1.5 for MECO, \$4.3 for HELCO, and \$0.7 was authorized for KE.^{90, 2002}

According to *Potential Sources of Permanent Funding*, the estimated benefits to Hawaii's economy from ongoing energy efficiency initiatives include:

- 95.2 gigawatt-hours of energy savings per year;
- \$12.1 million in annual cost savings;
- 935 jobs created;
- \$60 million in direct income to Hawaii's economy
- 90,000 tons of carbon dioxide reduction.

Problems, Issues and Opportunities Associated with Costs

According to *Potential Sources of Permanent Funding*, in Hawaii, every barrel of oil saved translates to more dollars available to the local economy, in addition to the environmental benefits. Also, implementing energy conservation measures and renewable energy technologies generates jobs.

Other opportunities for costs include:

- Cold seawater can provide air conditioning as demonstrated by a small system at NELHA. Preliminary feasibility analyses are being completed for at least six locations.
- Efficiency retrofits of County facilities on Hawaii and Kauai, initiated under the auspices of the Rebuild Hawaii program are providing significant savings to local governments in these times of tight budgets.
- The third year of a performance contract covering lighting retrofits at 29 County buildings ended March 1. Savings were determined to be 98% of the goal, totaling 350,000-kilowatt hours and \$80,000 in energy and operational costs.^{77, 2001}

Compare Visitor and Resident Impact

No documentation of actual visitor impact versus residential impact regarding energy systems was uncovered.

Major Assumptions

According to HECO, energy will continue to be used in direct relation to projected population trends.^{90, 2002}

State of Hawaii – Sewer Systems

Present Capacity and Usage

Sewer systems are closely related to public sewage. The data was often tied together, therefore the sewer system data is written into the Public Infrastructure Sewage Summary.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

State of Hawaii – Introduction to Environmental Features

Hawaii's Unique Environment and Species

Ninety percent of Hawaii's plants and animals, more than 10,000 species, exist nowhere else on Earth. The only tropical rainforests in the U.S. are found in Hawaii, as well as 84 percent of all coral reefs under U.S. jurisdiction. There is no private ownership of coastal resources. Hawaii's beaches, its near shore reefs, the ocean, and all that impact them from land, are at the heart of its appeal and an annual economy that accounts for more than \$10 billion in tourism revenues. Hawaii is also steeped in an ancient cultural heritage that reflects a life-affirming relationship with the islands' landscape, native species, and ecological processes. At the same time, attempts to protect delicate ecosystems are balanced with increasingly overpopulated coastlines and business development.

In Hawaii and the Pacific, taking care of the islands' coastal resources is critical to people's livelihoods, lifestyles, and general well being. More effective resource management will ensure sustainable use of these resources while providing long term benefits to Hawaii residents, as well as ensuring a quality visitor experience.
128, 2002

Evaluation Parameters

Many of the evaluation parameters developed for the Overview Study were not conducive to the evaluation of environmental features, so modifications have been made to the context and content of the parameters. Any modifications to the interpretation of the parameters will be noted in the text. An example is Present Capacity and Usage for Beach Erosion. While it could be taken literally to infer how much beach erosion is possible, it was taken to presume the average unit of beach erosion taking place. Interpretation of the evaluation parameters was used to deduce the most logical measurement or factors involved with that environmental feature.

Research at State Level

Many of the environmental features to be reviewed for this report are reviewed at the State level. Research and data regarding these features are just beginning to be collected. Because of this, there is little information at the County or district/community level.

Much research is conducted at broader scales than defined by this project. Although plant communities thrive at the planning community scale, they are generally studied at a larger scale to get a broader picture of the environment or ecosystem as a whole and its interactions. Larger scale is defined as the island or even entire Hawaiian Archipelago. Occasionally there is info at the visitor

related area, community, or county level, however, it may be one of several study sites within an entire study. That information taken at that level can skew results of the study as a whole because it tells a completely different story than when taken in context of the entire study.

In addition, the environmental movement has only recently (within the past decade or two) changed its focus from descriptive analysis to a more metric and quantifiable measure. Data of this type is just beginning to be collected in Hawaii. Until sufficient data is gathered to adequately quantify Hawaii's natural resources, judgments that are more subjective may be made. This can be in the form of questionnaires to the public regarding perceptions (Public Input Study) and/or professional evaluations.

Another problem with studies concerning environmental features is that they know no political boundaries. Environmental boundaries include elevation, rainfall, solar radiation and to a lesser degree- soil temperature and salt tolerance.

Major Assumptions

Review of several environmental documents has revealed the following assumptions. Due to Hawaii's dependence upon the tourism industry and its dependence upon Hawaii's environment, preservation of Hawaii's natural resources should be of paramount concern. As the environment is degraded, so is the visitor experience. People may choose not to visit Hawaii if the visitor experience declines significantly.

State of Hawaii – Coastal Water

Present Capacity and Usage

It was often difficult to distinguish where information for coastal water quality ended and marine ecosystem health began. Due to this, please check both Coastal Water Quality Summaries and Marine Ecosystem Health Summaries at the county level.

Federal authority applies to the navigable waters of the United States, which extend from the mean high water mark seaward to the 200-mile limit of the Exclusive Economic Zone. Hawaii's coastal zone includes all lands and all waters from the shoreline to the seaward limit of the state's jurisdiction.

Beaches Posted as Unsafe Due to Pollution

The following table shows the number of times beaches were posted with warning or closure signs (unsafe due to water pollution) by the Department of Health. Beach closures increased 50% in 1999 largely due to the DOH requiring more precautionary closures. The Environmental council's year 2002 goal for beach closure days is 5. ^{74, 2001}

Table 1.27-- Days Beaches Posted as Unsafe Due to Pollution by DOH: 1994-2000. ^{74, 2001}

<i>Year</i>	Days beaches closed
1994	20
1995	16
1996	45
1997	28
1998	13
1999	26
2000	20

Source: *Environmental Report Card 2001*

Existing Problems, Issues and Opportunities

Factors that impact coastal water quality:

- Coastal hardening increased turbulence and turbidity.
- The direct flow of domestic sewage products into coastal waters because of the prevalence of sewage soil filtration on shoreline plots.
- Non-point source pollution flows to drainage systems and ends up impairing our streams and near shore coastal waters.

Future and Planned Usage

According to *The Annual Report to the 21st Legislature-Regular Session 2002/ Hawaii Coastal Zone Management* from the State Office of Planning, there is a need to develop strategies to facilitate revision and implementation of the *Ocean*

Resource Management Plan (ORMP) and planning of a proposed Ocean Summit, streamline the permitting process for fishponds and assist the State and Counties in their efforts to develop hazard mitigation plans.^{61, 2001}

According to the *Environmental Report Card for 2001*, Oil and chemical spills pollute our ocean, streams, and groundwater. In addition to the environmental and ecological damage, cleanup costs run into the millions of dollars.

The following table shows the number of oil and chemical spills in Hawaii. They directly impact the coastal water quality in Hawaii.^{74, 2001}

Table 1.28 -- Oil and Chemical Spills in Hawaii: 1995-2000.^{74, 2001}

Federal Fiscal Year	Oil Releases	Chemical Releases	Total Spills
1995	126	222	348
1996	237	230	467
1997	295	205	500
1998	225	305	530
1999	240	286	526
2000	163	303	466

Source: *Environmental Report Card 2001*

Future and Planned Usage

According to *The Annual Report to the 21st Legislature-Regular Session 2002/ Hawaii*, the future needs and usage are as follows:

- Integrate industrial storm water discharge into water pollution control program.
- Require municipalities with populations over 100,000 to submit permit applications for storm water discharge.
- Require construction activities of more than 5 acres to submit permit applications for storm water discharge.
- Plans to reduce polluted runoff in six areas:
 - Agriculture
 - Forestry
 - Urban
 - Marinas and recreational boating
 - Hydro modification
 - Wetlands and riparian zones
- Three-day Ocean Summit November 2002.
- Facilitate integrated ocean and coastal management, including watershed management.
- Facilitate fishpond restoration and reuse.^{61, 2001}

Future and Planned Requirements or Changes

Under the federal Clean Water Act, an applicant requiring a federal license or permit to conduct work in state waters must also obtain a Water Quality Certification from DOH.

Recommendations:

- Establish a broad, pervasive and enduring public education and awareness-building campaign in coordination with the *Ocean Resources Management Plan* and other resource management efforts.

Planned improvements include:

- Identification of impaired water bodies for their restoration, report to the Environmental Protection Agency.
- Assessment of streams entering recreational beaches.
- Report to EPA on conditions of recreational waters.
- Improve water quality in priority watersheds.^{177, 2001}

Anticipated Costs for the Future

Federal funding for FY 01-02 amounts to \$1,620,000. Contracts for the following:

County of Hawaii	\$351,060
County of Maui	\$499,833
County of Kauai	\$284,312
City and County of Honolulu	\$321,614
Coastal Hazards	\$35,500
Ocean Resources: Ocean Resources Management Plan	\$35,500
Cumulative and Secondary Impacts	\$36,000
Clean Water Initiative: Hawaii's CNPCP high priority	\$41,000
Facilitate the Implementation of CNPCP	\$280,000
Smart Growth Initiative	\$50,000
Environmental Impact Assessment Process & Outreach Activities	\$55,000
Alien Aquatic Organism Prevention Program	\$31,091
GIS for Open Ocean Aquaculture and Related Applications	\$69,161
Coral Reef Management Contracts:	
DLNR	\$253,000
Community-Based Management/Monitoring & Education	\$100,000

Problems, Issues and Opportunities Associated with Costs

Alternative sources of funding for these planned usages and changes should be sought. Federal funds and private funding are potential sources. Further study is required to identify other sources.

Compare Visitor and Resident Impact

There was no documentation of separate residential and visitor impacts on coastal water quality.

Major Assumptions

As ocean resources are more heavily used for a variety of reasons, it increases the chance for pollutants and negative impacts on coastal water quality. Therefore, monitoring of coastal water quality is necessary.

State of Hawaii – Marine Ecosystems Health

Disclaimer: The majority of studies have been done at the local level (bays). Few statewide studies have been done. Therefore, the studies reviewed are not representative of each island or entire state. Areas most frequently studied are Hanauma Bay and Kaneohe Bay. Neither of which can represent the entire state of Hawaii.

Present Capacity and Usage

In accordance with the *National Marine Fisheries Honolulu Laboratory*, the U.S. Pacific Islands comprise about 94% of the nations coral reefs with about 69% being in the Northwestern Hawaiian Islands, about 15% being in the Main Hawaiian Islands and about 10% in U.S. territories and possessions.^{181, 2001}

According to the *Hawaiian Streams: the Mauka to Makai Connection*, the isolation of the Hawaiian Archipelago in the Pacific Ocean has resulted in a sparse fish population but many are endemic to the island. There are only about 550 species of marine fishes, as compared to about 2,000 fish species in the Philippines. Hawaiian streams have only five native species of fishes (four endemic, one indigenous), two species of crustacean (all endemic) and three species of mollusk (all endemic). The fishes consist of two closely related families, *Gobiidae* and *Eleotridae*, collectively referred to as oopu in Hawaiian language. The fused pelvic fins, at least for the gobies, are particularly adapted to the rocky, steep, flashy-flow nature of Hawaiian streams. The native crustaceans, the opae kuahiwi, or mountain opae, prefer the higher sections of the streams where there is abundant cool, clear and fast-flowing waters; and the opae oehaa, and is most common in the lowest stream section in slow-flowing water. There are three endemic species of river opihi (limpets) but most common is the larger hihiwai which are active at night and are most common in the lower to mid stream sections. The two species can mostly be found at the mouth of rivers. Most native Hawaiian stream animals share a unique life cycle pattern, called amphidromy, which is a specialized pattern where the animals live in two different environments during different life stages.^{182, 2001}

According to the *Hawaii Marine Life Conservation Districts*, over 400 species of inshore and reef fishes inhabit Hawaii's coastal waters. The coral reef is the best known and most impressive of Hawaii's near shore habitats. A healthy reef provides fish with abundant food resources and protection from predators. Marine Life Conservation Districts (MLCDs) are designed to conserve and replenish marine resources. MLCDs were introduced to Hawaii in the fall of 1967 with Hanauma Bay on Oahu. Currently, there are ten MLCDs statewide, and other sites are being considered as well. These include public accessibility, marine life and future potential values, safety from a public usage standpoint, compatibility with adjoining area usage, and minimal environment or ecological changes from the undisturbed natural state.^{178, 2001}

As stated in the *Hawaii Department of Aquatic Resources Agency*, the seven main Hawaiian Islands – Hawaii, Maui, Lanai, Molokai, Oahu, Kauai, and Niihau – comprise over 99% of the total land area and have virtually all of the State’s population of over 1 million residents.

Table 1.29 -- 1994 Commercial Catches of Hawaii ^{179, 2001}

Hawaii's Commercial Catch by Island ^{179, 2001}	
Island	Percent
Oahu	76%
Hawaii	18%
Kauai	4%
Maui	2%

Source: *Hawaii Department of Aquatic Resources Agency*

The fisheries of the State of Hawaii are quite diverse and vary from hand harvesting algae to large vessel fisheries, such as long lining and lobster fishing. Of approximately 16,000 vessels in Hawaii, about 80% are pleasure boats, 10% commercial fishing or charter boats. In 1994, there were currently about 3,200 licensed commercial fishermen required to submit monthly reports to DAR. ^{179, 2001}

Stated in the *Hawaii Stock Management*, in the first scientifically document enhancement efforts in the U.S., hatchery raised fish comprised 65 to 80% of the total catch of mullet in nursery habitat during the years when release experiments were conducted. In 1997, OI produced and released 200,000 moi into selected habitats. Fish from these scientifically designed releases accounted for more than 10% of the recreational fishery along the windward coast of Oahu. ^{180, 2001}

Health of Hawaii Fisheries

According to the *Environmental Report Card 2001*, ocean resources are an integral part of Hawaii’s heritage. Aquatic resources are extremely valuable for ecological, social, and economic reasons. Sustaining and enhancing Hawaii’s living aquatic resources and their habitats make environmental and economic sense.

The tables below show the figures for the bottom fish spawning potential ration (SPR) compiled by the Honolulu Laboratory of the National Marine Fisheries Service. Archipelago values of less than 20% indicate recruitment over fishing for the stock. Similar values for more localized areas, such as the Main Hawaiian Islands, indicate locally depleted resources. Localized depletion is still a serious problem, but not as serious as over fished stocks. The Environmental Council’s year 2002 goal for onaga within the Main Hawaiian Islands is 15%. ^{74, 2001}

Table 1.30 -- Main Hawaiian Islands Bottom Fish Spawning Potential Ratio: 1990-2000 ^{74, 2001}

Bottom fish	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Ehu	12	7	4	5	6	7	8	9	9	7	8
Hapuupuu	37	34	37	26	33	21	20	23	23	28	25
Onaga	14	9	10	13	9	6	5	4	5	6	7
Opakapaka	42	39	44	32	37	35	27	32	27	28	35
Uku	30	26	28	46	37	40	41	34	33	47	33

Source: *Environmental Report Card 2001*

Table 1.31 -- Archipelago-Wide Bottom Fish Spawning Potential Ratio: 1990-2000 ^{74, 2001}

Bottom fish	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Ehu	44	44	51	54	38	41	45	42	40	37	40
Hapuupuu	57	58	67	65	51	48	51	49	47	48	49
Onaga	36	42	41	53	39	33	40	25	23	34	27
Opakapaka	57	57	68	67	53	54	53	53	49	46	52
Uku	52	53	61	73	52	56	60	54	51	55	52

Source: *Environmental Report Card 2001*

According to the *Coral Reef Assessment and Monitoring Program – Final Report 2000*, bottom relief (rugosity) is a significant factor in determining fish habitat quality, with a significant relationship between rugosity and fish biomass. Coral cover appears to be controlled primarily by local variation in dominant environment factors such as wave energy, bathymetry, watershed influences, substrate type, etc. The most significant anomaly in coral coverage and reef conditions occurs off south Molokai. Coral Cover along this coast is extremely high. The two sites with highest coral cover in the state are located here. Large zone of damaged reef occurs in the middle portion or the south Molokai coastline, between these two high-cover survey sites. Within this damaged zone is another survey site, which has the lowest coral coverage in the state.

Areas protected from fishing have distinct assemblages and had higher biomass compared to areas where all fishing was permitted. The marine protected areas that were fully protected from fishing showed a much higher fish biomass than partially protected or open access sites. Fish assemblages in Kaneohe Bay, Oahu was distinct and differed greatly from all other fish assemblages around the state. Results of the trawling investigation clearly demonstrate the impact of direct contact on shallow coral reefs in Hawaii.

The near shore recreational catch is likely equal to or greater than the near shore commercial fisheries catch, and these recreational fishers take more species using a wider range of fishing gear. Hawaii provides most of the ornamental fish

and invertebrates caught in the USA, because quality is high and the rare endemic species are highly prized.

Current management strategies do not address the habitat associated with these species and therefore may not be appropriate for the long-term sustainability of these resources. Diversity, quality, and extent of habitat are among the most important environmental determinants of distribution, abundance, and diversity for coral reef fishes.

Reef fish assemblages can be influenced by the physical structure of the associated reef. Habitat complexity provides refuges and barriers that fragment the area, resulting in assemblages that are more heterogeneous. Habitats with low spatial relief and limited shelter are often associated with low standing stocks for many fish species while highly complex habitats harbor high fish biomass. A relationship between fish size and reef complexity may suggest the importance of shelter as a refuge for certain fishes in avoiding predation. Many coral reef fishes show considerable site fidelity and associate with particular habitats of rather limited size.^{195, 2000}

Coral Reef Assessment and Monitoring Program – Final Report 2001, in a study made in Hanalei Bay the fish assemblage characteristics showed very little change over the five-year period since the last survey was conducted with overall fish biomass increasing between 1994 and 1999. The endemic saddle wrasse and the introduced bluestripe snapper are the two most dominant species numerically in Hanalei Bay, although their order of dominance changes among years. All of the top ten species observed on transects in 1999 were also in the top ten in 1993 and 1994 except for the introduced blacktail snapper and the orange band surgeonfish.^{196, 2001}

Existing Problems, Issues and Opportunities

According to the *Hawaii Marine Life Conservation Districts*, a reef habitat that becomes degraded because of polluting or siltation will lose its ability to support diversity of marine life. Protecting reef and other near shore ecosystem is necessary and challenging.^{178, 2001}

As stated in the *Hawaii Stock Management*, U.S coastal fish populations have drastically declined during the past decade, but until 1990, increased fishing effort and use of alternate species masked the full extent of those declines. The decrease is causing loss of jobs and revenue and a decrease in commercial and sport fishing opportunities.^{180, 2001}

National Marine Fisheries Honolulu Laboratory states that coral reef ecosystems are among the most diverse and biological complex ecosystems on earth. They are under threat from over-exploitation, pollution and marine debris, habitat

destruction, diseases, invasive species, bleaching, climate change, and coral reef ecosystems worldwide are deteriorating at alarming rates.^{181, 2001}

In accordance with *Alien Species in Hawaiian Streams*, some of the impacts these alien species are having on Hawaii's native stream animals and habitats are readily apparent. Suckermouth catfish and crayfish, for example, dig holes in reservoir and stream banks, causing erosion and increasing the amount of silt in stream water.^{183, 2001}

According to the *Coral Reef Assessment and Monitoring Program – Final Report 2000* coastal fisheries are facing severe depletion and overexploitation. This decline in abundance, particularly around the more populated areas of the states is likely the cumulative result of years of chronic over fishing. A growing population who no longer recognize traditional conservation practices has greatly contributed to the decline in inshore fisheries.^{196, 2001}

Fisheries catch statistics are unreliable owing to under-reporting by commercial fishers and a large resident recreational and subsistence fishing population whose catch goes unreported. High levels of fishing pressure are expected to affect the abundance and distribution of reef fishes. Mean standing stock of biomass of fishes on shallow unfished reefs at remote uninhabited locations in the Northwestern Hawaiian Islands was about twice as high as means reported from shallow fished reefs in the Main Hawaii Island, particularly in more populated areas.

Recent scientific and policy activities indicate a new interest in marine reserves, primarily due to the failure of conventional management practices to promote sustainable fisheries. The traditional system in Hawaii emphasized social and cultural controls on fishing with a code of conduct that was strictly enforced. Some of Hawaii protected marine areas provide little to no protection from consumptive practices. In addition certain Marine Life Conservation Districts are very popular tourist destinations and experience intensive non-consumptive impacts.

Less than 1/3 of one percent of all coral reef habitats around the main Hawaiian Islands has complete no-take marine protected area status. They must include the diversity of habitats necessary to accommodate a wide range of fish species and life histories.

It is not entirely clear what specific characteristics of reef are most attractive and how these habitat characteristics are quantitatively related to the abundance, distribution, and community composition of the fish inhabitants. Therefore, it is difficult for managers to predict the quantity and character of the fish assemblage that will be associated with particular reef habitats. This difficulty limits managers' ability to prioritize habitats for protection or enhancement, to develop

effective artificial habitats, and to select appropriate areas as marine reserves.^{195, 2000}

According to the Coral Reef Assessment and Monitoring Program – Final Report one of the greatest frustrations to scientists and managers in Hawaii has been lack of information of mechanisms responsible for reef decline and lack of an integrated coral reef research and monitoring programs. Scientific studies and surveys had been conducted piecemeal throughout the State with little consistency in methodology or large-scale experimental design. A second major problem facing Hawaii has been its geography. Scientist in Hawaii have been faced with increasing evidence and a growing consensus among leading scientists that coral reef throughout the world will undergo massive changes within the next few decades. The cause is increasing levels of anthropogenic atmospheric gasses that are responsible for global warming and a reduction in carbonate saturation in tropical surface waters. The first factor is leading to increasingly severe mass bleaching and mass mortality of reef corals on a global scale. The second factor will result in a reduction in the ability of reef corals and other reef organisms to calcify with possible dire consequences to existing populations.

On the island of Hawaii, over-fishing by commercial, recreational, and subsistence fisherman is considered the most severe problem facing coral reefs. Along Kona coast the major issue is collecting of reef fishes for the aquarium industry.

Initial studies, which constitute baseline surveys before closure of the reserve system, confirmed that aquarium collectors are causing significant reductions in abundance of targeted fishes in four of the six proposed Fish Replenishment Areas (FRA). Significant declines were found in the density of six aquarium species in the Honokohau FRA, Honaunau FRA, Red Hill FRA, and the Puako FRA. There were no significant differences between control and impact sites at the North Kohala or Kailua FRAs.^{196, 2001}

Future and Planned Usage

According to the *Coral Reef Assessment and Monitoring Program – Final Report*, there are continued plans for fishing. By protecting habitat and their associated fish populations, reserves can provide a precautionary approach to management that reduces the risks against overexploitation of fish stocks.^{195, 2000}

Future and Planned Requirements or Changes

Improved management through research and policy changes is forthcoming.

Anticipated Costs for the Future

According to the *Coral Reef Assessment and Monitoring Program – Final Report*, the Pacific mapping effort eventually will cost in the range of ten million to forty

million dollars. Ultimately, remote-sensing data must be verified by ground-truthing using in site methods. ^{196, 2001}

Problems, Issues and Opportunities Associated with Costs

Due to the current economic crunch, funding is tight. One opportunity possible is funding from requiring fishing licenses.

Compare Visitor and Resident Impact

According to the *Hawaii Sea Grant College Program*, in Hawaii and the Pacific, taking care of the islands' coastal resources is critical to people's livelihoods, lifestyles, and general well being. More effective resource management will ensure sustainable use of these resources while providing long term benefits to Hawaii residents, as well as ensuring a quality visitor experience. Ninety percent of Hawaii's plants and animals, more than 10,000 species, exist nowhere else on Earth. The only tropical rainforests in the U.S. are found in Hawaii, as well as 84 percent of all coral reefs under U.S. jurisdiction. There is no private ownership of coastal resources. Hawaii's beaches, its near shore reefs, the ocean, and all that impact them from land, are at the heart of its appeal and an annual economy that accounts for more than \$10 billion in tourism revenues. Hawaii is also steeped in an ancient cultural heritage that reflects a life-affirming relationship with the islands' landscape, native species, and ecological processes. At the same time, attempts to protect delicate ecosystems are balanced with increasingly overpopulated coastlines and unharnessed business development. ^{128, 2002}

Another impact of concern is ships and boats anchoring into marine life / coral reefs. Areas of interest, areas for snorkeling and SCUBA diving, can have repeated anchor damaged.

Major Assumptions

According to the *Coral Reef Assessment and Monitoring Program – Final Report*, the data collected from different surveys by CRAMP support the following conclusions:

- Eutrophication – The increase in algae coverage since the removal of the sewer outfalls in 1979 corresponds to the increase in septic systems and cesspools on the watershed of this sector. Presumably, there has been an associated increase in nutrient supply of the middle sector through increased ground water discharge. Recommended management: implement plans are to extend the sewer mains into the highly populated areas in the middle sector and connect all users to the existing sanitary waste system.
- Alien species - The major algae species competing with the corals in Kaneohe Bay has been and continues to be the native “bubble algae.” The alien algae, have spread throughout the bay since their introduction, but are not competing with corals on a bay-wide scale although isolated patches of these algae may directly impact some corals. ^{196, 2001}

According to the *Coral Reef Assessment and Monitoring Program – Final Report* species richness, species diversity, and biomass were all significantly different among locations protected from fishing, partially protected and unprotected locations excluding locations within Kaneohe Bay. Values for all assemblage characteristics were significantly higher in the areas protected from fishing.

Areas protected from fishing varied greatly in values for fish assemblage characteristics. Species richness was highest at the shallow Hanauma Bay followed by south and north Honolulu Bay. Species richness at the Moko O Loe site was 3.8 times lower than the highest site, possibly reflecting the limited habitat provided by patch reef habitats in Kaneohe Bay. Species diversity followed a somewhat similar trend with Hanauma Bay, Oahu, Kanahena Bay, Maui, and Honolulu Bay, Maui having the highest diversity indices among all the protected areas surveyed. Both deep and shallow sites at Moko O Loe had low diversity along with Kanahena Point on Maui. The low diversity at Kanahena Point is owing to the large number of surgeonfish and black surgeons at this site. This site harbored the highest overall fish biomass followed by Honolulu Bay South and Moko O Loe shallow. Honolulu Bay biomass was dominated by gray chubs, ringtail surgeonfish, brown surgeonfish, and spectacled parrotfish.^{195, 2000}

State of Hawaii – Forestry / Green Space

Present Capacity and Usage

According to the *Places We Protect - Watershed Partnerships and Preserves*, two million acres of native forest remain in Hawaii. The Hawaiian Islands support forest types ranging from low elevation tropical rain forests to arid scrub forests to temperate sub alpine woodlands to cloud forests. These forests still cover roughly 1.7 of Hawaii's 4.1 million acres, or about 41 percent of the state's total land area. ^{149,2002} (See tables of trails and their length by segment and forest reserves by acreage in the Appendix.)

The Annual Report to the Twenty-First Legislature Regular Session of 2002 Relating to the Forest Stewardship Program states that about 700,000 acres, or roughly 50 percent of Hawaii's relatively productive forestland are considered to be timberland, capable of producing timber and wood products on a sustainable basis. Only 60,000 of these acres are currently being used for plantation forestry. ^{87, 2001}

According to the *Progress Report on Expenditures and Effectiveness of Invasive Species Progress*, a 1999/2000 inventory of non-native resources was conducted on 1,160 acres in Kalopa, Waimea, Honuaula, and Kiolakaa-Keaa on the island of Hawaii. The timber plantation maps for the four Hawaii Supplemental Survey (HSS) locations contained 40 timbers stands totaling 1,158 acres, excluding 2 acres of clearings. Total wood volume estimates from the HSS exceeded 7,4000,000 net cubic feet. ^{85, 2001}

The Places We Protect - Watershed Partnerships and Preserves states that forest watersheds supply Hawaii with almost all of the fresh water Hawaiians need. Healthy forests act like giant sponges that intercept rainfall and allow it to slowly percolate into groundwater aquifers and streams—bringing potable water to homes and businesses and irrigating farms to grow crops.

There are currently 7,986 acres of private forest land in Hawaii that are being successfully managed for a variety of private and public forest products and benefits, as a result of Forest Stewardship program assistance. In the present, the Department has entered into formal forest Stewardship contract agreements with 22 landowners on the Islands of Kauai, Molokai, and Hawaii. ^{149,2002} (A list of forest reserves is included in the appendix.)

An Inventory of Non-Native Timber Resources on Hawaii - A Supplement to the 1999 Waiakea and Hamakua Timber Inventory states that the non-native timber plantings measured in the HSS appeared to exhibit poor to moderate mean annual increment (MAI) growth rates both within, and among species. Species adaptation to the study locations, stand age and climatic conditions were

probably the primary factors that influenced stand growth. Analysis of MAI and climatic conditions suggested that soil conditions and annual rainfall exerted the primary influence on timber productivity in Honuaula and Kiolakaa-Keaa. ^{89, 2001}

In accordance with the *Rx for Hawaii's Dry Forests: It's Not Limiting Grazing*, one of Hawaii's largest remaining areas of dry forest is in the North Kona region. However, the forest is broken into small fragments, and most of these have been grazed for more than 150 years by cattle and feral goats. The North Kona Dry Forest Working Group and local volunteers have planted more than 2,000 native dry forest plants in the preserve. ^{125, 2000}

Table 1.32 – Number of Plant Species in Hawaii by Status: 1999-2000 ^{74, 2001}

Year	Listed Endangered or Threatened	Proposed Endangered or Threatened	Candidate for Endangered or Threatened Listing	Species of Concern	Total Rare Plant Species
1999	292	0	92	204	588
2000	292	0	92	204	588

Source: *Environmental Report Card 2001*

The Forest Stewardship Program enables private landowners to restore and manage important forest resources throughout Hawaii, providing important socioeconomic and environmental benefits and services. Project areas currently range in size from 5 to 3,500 acres and management objectives include high-value timber production, agro forest crop production, watershed restoration, native forest restoration, and the provision of educational and recreational opportunities.

Report to the Twenty-First Legislature Regular Session of 2002 states that user profiles of a combination of 14 trails and parks were used to determine frequency, preparedness, and demographic information of trails and park users. The study revealed that more than 3 out of every 4 trail users were visitors from out of state (78%) and predominantly Caucasian. ^{87, 2001}

Commercial Trail Tour Activity (CTTA) Management and Revenue includes:

- Act 106 (1997 SLH), allows for user fees from commercial use of public trails and access routes to go directly into the Special Land and Development Fund. This provision affords the opportunity of possibly offsetting the costs of NAH Program management, and trail maintenance, and regulating and monitoring the commercial trail tour industry's best interest to protect hiking trails and access roads used by the industry through some form trails and access roads used by the industry through some form of intervening regulation.
- A major challenge for the NAH Program has been to provide a reasonable method for commercial tour vendors to reserve and utilize the limited number of commercial patron slots in a manner that meets the needs of the tour industry and minimized NAH staff time spent in managing the

process. A scheduling method is in place to insure that commercial activities by multiple vendors do not exceed the daily capacities and/or number of groups established for the CTTA trails and roads. After an application for a commercial trail tour is processed and accepted, a permit is issued. The approved vendor is provided instructions on the CTTA Internet reservation system and issued a confidential PIN# and ID code for accessing the reservation system. The system records the reservation, date and calculates the fee.

- Fees are imposed per unit and based upon the potential trail impact of the mode of transport:

Hike	Bike & Horse	Motorcycle	4WD (5)	4WD (8)	4WD (12)	4WD (15)
\$5.00	\$7.00	\$10.00	\$25.00	\$50.00	\$75.00	\$100.00

- Payments are required after reservations are made, and vendors receive monthly invoices for the total amount of patron slots reserved, less any cancellations due to inclement weather. NAH has determined that inclement weather, such as high precipitation, may reduce public safety and increase trail or access road impact. Because of the September 11th tragedy, NAH waived September reservation fees for vendors whose patrons either could not fly into Hawaii, or cancelled their travel plans.

It is anticipated that there will be future modifications based upon what NAH has learned since going on-line, such as adding or deleting certain trails, adjusting capacities, and correcting mistakes. For now, NAH will continue to submit invoices to vendors based upon their reservations. Over time, if the vendor load increases to a level that makes it impractical for staff to continue invoicing, it may be necessary to consider offering other payment options such as credit card or direct deposit. NAH staff continues to examine and monitor commercial tour operations on DOFAW-NAH features to determine the long-term feasibility and impacts associated with allowing this activity. An incentive for the CTTA vendors to participate via a CTTA permit is that their company is listed on the NAH public informational portion of the NAH Internet site, which provides linkages to potential global customers. NAH Administration submits monthly invoices to the vendors. FY00-01 net revenue from commercial fees is @ \$39,968.00, staff labor managing and monitoring this activity was 1,228 hours @ \$23,571. Twenty percent of the total revenue has been allocated to the Office of Hawaiian Affairs.^{58, 2001}

Table 1.33 -- FY00-01 CTTA Revenue

FY00-01 CTTA Revenue	
Kauai	\$27,800
Oahu	\$3,240
Maui	\$6,116
Hawaii	\$2,212
Subtotal:	\$39,368
OHA @ 20%	\$9,892
Total:	\$49,260

Source: *Report to the Twenty-First Legislature Regular Session of 2002 on Progress Report*

According to the *Hawaii Trail Analysis: Survey & Risk Management Data Profile*:

OAHU

- Diamond Head Trail– visited primarily by tourists (85% non-local hikers)
- Manoa Falls Trail – high use trail, visited by both locals and tourists (45% local and 55% non-local)
- Maunawili Falls Trail – 82% Hawaii residents, 16% out of state visitors
- Nakoa Trail – 58% local visitors

KAUAI

- Awaawapuhi Trail – 9% local, 91% non-local
- Kalalau Trail – 13% local, 87% non-local
- Keahua Arboretum Trail – 29% resident, 71% visitor
- Pihea Trail – 11% local, 89% non-local

HAWAII

- Ainapo Trail – low use (no users surveyed)
- Hamakua Ditch – 53% local, 47% non-local
- Kahauloa Trail – low use (no hikers surveyed)
- Muliwai Trail – 12% local, 88% non-local

MAUI

- Waihee Ridge Trail – 66% local, 34% visitors
- Waikamoi Ridge Trail – 3% local, 97% visitors ^{72, 2001}

According to the *Report to the Twenty-First Legislature Regular Session of 2002, Trail and Access Issues, Projects and Accomplishments*, most of the trails managed by DOFAW are included as part of the NAH trail system. In addition, NAH administers trails on other State land and trails traversing private land.

Currently, there are approximately 580 miles of trails and access roads managed by DOFAW, with support provided by NAH. Primary NAH Program goals are to:

1. Improve and maintain the conditions of all appropriate public trails and access to the standards and specifications of the NAH program
2. Document and when feasible, restore ancient and historic trails for managed public access
3. Attempt to resolve various access disputes and initiate planning and development efforts for trails or accesses that may be suitable for inclusion into the Program, or receive NAH technical or developmental support. In FY00-01, staff spent approximately 8,821 hours @ \$122,341 (\$20,640 of LNR 804 funds, and \$101,701 of federal RTP funds) for trail maintenance.

Trail and Access Issues, Projects and Accomplishments states that appropriate public trails managed by DOFAW are included as part of the NAH trail system. In addition, NAH administers trails on other State land and trails on private land through Memorandums of Agreement. Currently, there are approximately 580 miles of trails and accesses that are managed by DOFAW, with support provided by NAH. Primary NAH Program goals are to:

1. Improve and maintain the conditions of all appropriate trails and access to the standards and specifications of the NAH Program
2. Document and when feasible, develop historic trails for managed public access

Attempt to resolve various access disputes, and initiate planning and development efforts for trails or accesses that may be suitable for inclusion into the Program, or receive NAH technical or developmental support. New Program activities include the monitoring and management of commercial trail tours and establishing Risk Assessment procedures.^{58, 2001}

Existing Problems, Issues and Opportunities

The Annual Report to the Twenty-First Legislature Regular Session of 2002 Relating to the Forest Stewardship Program states that many landowners are not able to follow the program due to the lack of proper equipment, environmental conditions, temporary financial hardship, planting activities and difficulty following their planned practice implementation schedule.

In accordance with *the Annual Report to the Twenty-First Legislature Regular Session of 2002*, since 1999 the Office of Environmental and Quality Control (OEQC) ruled that commercial forestry projects could no longer be exempted from the environmental assessment (EA) requirements. Landowners who plan to harvest the trees they plant with Program assistance are now required to prepare EAs. EAs must include detailed descriptions of tree planting activities, as well as descriptions of proposed harvesting prescriptions. Adherence to this new requirement has proven difficult in some cases, since harvesting plans are

usually not prepared until a forest plantation nears maturity- when all necessary information affecting harvesting decisions is obtainable. ^{87, 2001}

An Inventory of Non-Native Timber Resources on Hawaii states that visible defect in standing trees ranged from 1-22% in sampled timber stands. The entire inventory of timber volume measured in the HSS is essentially a mature or over-mature resource, and future wood volume growth could potentially be offset by volume losses due to mortality, decay, and breakage. ^{89, 2001}

Future and Planned Usage

The Forest Stewardship Program activities will target the following specific objectives:

- Restore, enhance and conserve the values and benefits of Hawaii's forests
- Adequately expand landowner and acreage enrollment
- Promote ethnic, geographical and scale diversity among program participants through public awareness campaigns
- Continuously tailor the program to meet changing landowner constraints, need and objectives.
- Develop and disseminate practical forest management information that is useful to program participants and all private forest owners and industry people throughout the state.
- Increase landowner ability to
- Assess forest resources and identify forest management strategies to achieve individual forest management objectives. ^{87, 2001}

According to the *Report to the Twenty-First Legislature Regular Session of 2002, in FY00-01*, staff spent approximately 8,821 hours @ \$122,341 (\$20,640 of LNR 804 funds, and \$101,701 of federal RTP funds) conducting trail maintenance.

KAUAI BRANCH

- Collaborated with the University of Hawaii Extension Service and the Department of Agriculture to determine effective herbicide techniques to combat the spread of invasive alien weed species along program trails and associated recreational areas. Conducted the semi-annual herbicide research application on the Nualolo-Awaawapuhi Crossover Trail and the Koaie Trail in Waimea Canyon, totaling over 6 miles.
- Continued to manage the CTTA. Kauai has nine active commercial vendors with activities ranging from hiking, 4-wheel drive tours to equestrian tours.
- Continued trail monitoring on designated commercial activity trails.
- Assisted members of the National Tropical Botanical Garden plant survey crew along the proposed new alignment of the Pihea Trail.

- Assisted Location Managers from Universal Films for the use of Wailua Forest Management Road for a major motion picture that was filmed during the summer of 2001.
- Revised the Kauai Recreation Map to include new information and cautionary statements.
- Conducted a drizzle herbicide workshop in cooperation with the University of Hawaii Extension Service.
- Assisted the Kokee Resource Center with trail maintenance of the Mohihi-Waialae Trail. Over 600 hours of volunteer time went to this project, which opened over five miles of trail for public use for the first time since Hurricane Iniki closed it in 1992.
- Assisted the Land Division with trail construction design for the Lumahai Beach Access Trail.
- Installed seven composting toilets within the Waimea Canyon Camping Areas and the Na Pali Kona Forest Reserve using Capital Improvement funds.
- Completed yearly trash removal from Waimea Canyon and Waialae Camp sites.
- Continued routine maintenance of 108 miles of trails, 72 miles of roads, 34 trail shelters, 66 acres of arboreta, and two acres of the Kokee Field Station, and 11 composting toilets.

OAHU BRANCH

- Issued 17 film permits for the use of Oahu NAH Program trails and adjacent forest reserves. The permits ranged from local community advertisements to international advertisements intended to promote tourism. One of the permits included Baywatch Hawaii who donated a “No Dumping” sign. Another permit was issued to the Hawaii Nature Center for a TV commercial within the Honolulu Forest Reserve, depicting local residents involved in projects showing how to better protect Hawaii’s natural environment.
- Issued 7 Trail and Access Activity permits to public or non-profit groups who engaged in organized hikes with more than 12 people on the Manoa Falls trail.
- Permitted and collaborated with the Hawaiian Ultra Running Team (HURT), in hosting the 10th annual “Tantalus Trek” trail foot race. The event involved 130 runners utilizing ten miles of the Honolulu Mauka Trail system. Also through HURT, issued a Trails and Access Activity permit for the first annual 100-mile foot race called the “H.U.R.T. 100” that used 20 miles of the Tantalus Mauka Trail System.
- Installed or replaced 52 directional and/or informational trail signs.
- Supervised approximately 3332.5 hours of volunteer trail service projects.
- Contracted Pono Pacific Land Management Inc., a private natural resource maintenance company, for weed clearing and general vegetation maintenance of the Maunawili Trail.

- Conducted improvements on the Kuliouou Trail with volunteer support from the Hawaii Trail and Mountain Club, Sierra club and the Church of the Crossroads. The project involved installing over 70 steps to improve public safety, and a bench for comfort.
- Participated in and co-sponsored the 1st annual Malama Hawaii, volunteer Service Network Workshops.
- Engaged in preliminary discussion and meetings with elected officials, community members, and the Hawaii Tourism Authority, on addressing appropriate management response to increasing visitor, commercial and local use of the Manoa Falls Trail.

MAUI BRANCH (INCLUDES MOLOKAI AND LANAI)

- Continued maintenance of 150 feet of stepped walkway with handrails and scenic lookout for the mobility impaired at Mokuleia Bay in Napili for public access to the shoreline.
- Continued monitoring and management of the CTTA Permit process.
- Developed, with the assistance of DLNR's Division of Conservation and Resources Enforcement (DOCARE), a Personal Guide Identification Number for CTTA operators utilizing NAH trails.
- Continued monitoring trail bed stability, non-native lantana invasion and the condition of archaeological resources on the Mamane, Waihee Ridge, and Old Lahaina Pali Trails, utilizing a photo-point management system.
- Identified and mapped portions of the historic Piilani Trail (King's Highway) in Hamakua Loa, Nahiku and Kahakuloa.
- Continued to reconstruct the Waiakoa Trail with Volunteer labor within State-owned lands of the Kula Forest Reserve.
- Coordinated and supervised trail service work of 168 individual volunteers for a total of 2,285 hours on various trails and access projects.
- Installed/Completed total of approximately 117 plant identification signs in Keane Arboretum Walk.
- Continued Draft Environmental Assessment to create the Kahakapao Loop Trail in the Makawao Forest Reserve.
- Continued negotiation with the Maluhia Ranch Acres for the Memorandum of Agreement for the Piilani Trail within privately owned lands in Kahakuloa.
- Coordinated with the Historic Preservation and Land Division and DOFAW for a 4-wheel drive vehicle road to be moved off of archaeological sites within the Keoneoio area.
- Continued discussions with Haleakala Ranch to investigate the possibility of developing the Old Haleakala Bridal trail (Kalialinui).
- Constructed a fence enclosure for *Sesbania tomentosa*, Ohai, with the help of Forestry and Wildlife, the Maui AC, the Native Plant Society and volunteers.

- Continued Draft Environmental Assessment to create the Ohai Trail within the Kahakuloa Forest Reserve and circulated the document for comments between Maui DOFAW.
- Installed signage at Hoapili Trail, Keane Arboretum and all NAH trailheads designating status of commercial operations.
- Worked with the DOFAW Field Crews and volunteers to maintain in the Kula, West Maui, Koolau, and Waihou Springs Forest Reserves and on the Old Lahaina Pali Trail a total of 42 miles of recreational trails.
- Began planning and implementing the full development of the Waikamoi Ridge Trail to accommodate 2-lane traffic with an imported hardened surface.
- Began planning and implementing a recycled rubber matting design to be installed on the Waiakoa Loop Trail and the Mamane Trail to maintain tread stability damaged by bicycle use.
- Began reconstruction efforts on the Waipouli Road in the Kula Forest Reserve.

MOLOKAI

- Continued improvements to the Waikolu Lookout and Campsite by reconstruction of overlook facilities, rubble clearing and debris from the campsite area, and construction of a fence utilizing recycled materials. A covered pavilion, restroom facilities and picnic tables are currently being replaced.
- Reconstructed 3 major drainages in the Molokai Forest Reserve road (Maunahui Road) with the assistance of The Nature Conservancy of Molokai.
- Continued efforts in responding to community and legal concerns related to reestablishing the Halawa Valley/Moanalua Falls Trails for public use.
- Initiated the dormant Molokai AC and filled vacant seats.
- Continued re-negotiations with the Department of Hawaiian Home Lands for the License Agreement of the Maunahui/Makakupaia Road.

LANAI

- Completed construction of 2-mile Lanai Fisherman's Trail.
- Re-activated the dormant Lanai AC and filled 2 vacant seats.
- Monitored the condition of certain historic trails and ancillary sites.

HAWAII BRANCH

- NAH collaborated with the County of Hawaii in fixing the location of a segment of trail fronting 49 Black Sand Subdivision.
- Conducted investigation with DOCARE concerning the allegation of altering the location of the coastal trail at THE BLUFFS AT MAUNA KEA.
- NAH assisted TREE (Tropical Reforestation and Ecosystem Education Center) in procuring GPS points and plotting a section of a pedestrian and mountain bike trail at the Makaula-Ooma tract.
- Installed beach warning sign at the top of Pololu valley for the Land Division.

- NAH was successful in obtaining \$72,725 of Federal Emergency Management Agency funding incurred by flooding and completed approximately 6 miles of repair and restoration of the Ainapo Road.

Maintenance operations were conducted on the Muliwai Trail and Waimanu campgrounds during the week of January 22-26, 2001.^{58, 2001}

Future and Planned Requirements or Changes

See Future and Planned Usage in Hawaii State and Forestry Summaries for each county.

Anticipated Costs for the Future

According to the *Hawaii Trail Analysis: Survey & Risk Management Data Profile Hawaii*, this project and report were funded by a \$20,000 grant to NAH through the Kahoomiki Program, Department of Health. The Tobacco Settlement was the source of the grant. The intent of the project was to select specific trails statewide and then conduct a user survey and environmental profile with the goal of determining trail user preparedness in relation of the environmental characteristics of the trail. The grant allowed NAH to fund the travel of 5 University of Hawaii, Department of Urban and Regional Planning graduate students to gather information of user preparedness by interviewing approximately 2000 trail users statewide over a period of a few months.^{72, 2001}

The Progress Report on Expenditures and Effectiveness of Invasive Species Programs states that general funds were provided to the appropriations for Forests and Wildlife resources in the amount of \$150,000 for Fiscal year 2002-2003. One of the most cost-effective solutions to this problem is to find and eradicate these species before they proliferate beyond control. This avoids the damage costs created by the pests themselves as well as the costs of perpetual pest control and mitigation.^{85, 2001}

Problems, Issues and Opportunities Associated with Costs

According to the *Report to the Twenty-First Legislature Regular Session of 2002*, a primary NAH Program goal is to: attempt to resolve various access disputes and initiate planning and development efforts for trails or accesses that may be suitable for inclusion into the Program, or receive NAH technical or developmental support. In FY00-01, staff spent approximately 8,821 hours @ \$122,341 (\$20,640 of LNR 804 funds, and \$101,701 of federal RTP funds) for trails maintenance.^{58, 2001}

The Forest Stewardship Program has been funded almost entirely by federal grants, but the long-term future is likely to depend on increasing administrative funding support at the State level.^{87, 2001}

An Inventory of Non-Native Timber Resources on Hawaii states that in order to implement intensive forest management activities, some road sections would

have to be improved prior to heavy equipment operations. Careful weighing or scaling of timber removed from harvest sites is highly recommended for all harvested contracts. If current commercial timber resources were harvested, control of invasive species would probably be required at some locations prior to planting and establishment of future forests.^{89, 2001}

Compare Visitor and Resident Impact

The availability of open space and forests for scenic and recreational usage is important. However, few documents distinguish between resident and visitor usage. Documentation regarding eco-tourism in Hawaii was not found.

See Kauai Forestry Summary for relevant impacts.

Major Assumptions

An Inventory of Non-Native Timber Resources on Hawaii states that productivity of the timber species studied would probably increase significantly with intensified stand management and modified species-site selections in future rotations.^{89, 2001}

State of Hawaii – Air Quality

Present Capacity and Usage

Typically, the free troposphere (above 2 km) over Hawaii is very clean. During spring, Asian dust and pollution is often carried over Hawaii and has been measured for many years at the Mauna Loa Observatory. Overall, Hawaii’s air quality meets federal and state environmental health standards because Hawaii’s trade winds and the lack of major polluting industries reduce the buildup of air pollution over the islands. Under the Clean Air Act, the United States Environmental Protection Agency set National Ambient Air Quality Standards (NAAQS) for a variety of “criteria pollutants.” These include ground level ozone, nitrogen dioxide (NO₂), particles less than 10 microns in diameter (PM 10), sulfur dioxide (SO₂) and carbon monoxide (CO). The State Department of Health (DOH) has set standards that are up to twice as stringent as the EPA criteria for most of the criteria pollutants. Nevertheless, air pollution is damaging to Hawaii’s environment. ^{137, 2001}

Table 1.34 -- Air Quality Measurements in Honolulu, 1994-2000 ^{74, 2001}

	1996	1997	1998	1999	2000	Federal Standard
PM ₁₀ (µg/m ³)	14	8	9	14	14	50
CO (µg/m ³)	2127	4133	6726	4788	3990	40,000
SO ₂ (µg/m ³)	3	2	2	2	1	80

Source: Analysis of Renewable Portfolio Standard Options for Hawaii

Estimated Greenhouse Gas Emissions

The earth’s climate is changing due to anthropogenic effects altering the composition of the atmosphere through the buildup of greenhouse gases, primarily carbon dioxide, methane, nitrous oxide, and chlorofluorocarbons. The energy sector produces 90 percent of the greenhouse gases. The table below shows the estimated greenhouse gas emissions in Hawaii.

Table 1.35 -- Estimated Emissions in Millions of Tons Carbon Dioxide, 1900-2000. ^{74, 2001}

Year	Greenhouse Gasses
1990	18.9
1991	18.7
1992	18.8
1993	19.5
1994	20.1
1995	20.5
1996	20.3
1997	20.5
1998	20.6
1999	20.6
2000	20.7

Source: Environmental Report Card 2001

Air Quality Measurements in Honolulu

Breathing polluted air can cause health problems ranging from difficulties in breathing to aggravation of asthma, cancer and even death. Air pollution can also damage buildings and vegetation. United States metropolitan areas (with populations greater than 200,000) are required to report their air quality to the EPA. The table below lists the number of days the air quality in Honolulu exceeded EPA standards.

Table 1.36 -- Number of Days Air Quality Unhealthy by EPA Standards, 1990-1998. ^{74, 2001}

	# Monitoring Sites	1990	1991	1992	1993	1994	1995	1996	1997	1998
Honolulu	6	0	0	0	0	0	0	0	0	0

Source: Environmental Report Card 2001

The Department of Health has 17 air quality monitoring stations on Oahu, Kauai, Maui, and Hawaii. Most commercial, industrial and transportation activities and their associated air quality effects occur on Oahu where nine of the stations are located.

Hawaii's annual average concentrations of sulfur dioxide are so low that they do not pose a health concern. The following tables are annual average concentrations of carbon monoxide, sulfur dioxide and particles less than 10 microns in diameter from the Honolulu, Waikiki, West Beach and Kapolei air monitoring station. All measurements fall well below federal standards.

Table 1.37 -- Annual Average of Daily Maximum Carbon Monoxide (in $\mu\text{g}/\text{m}^3$)^{74, 2001}

	Honolulu	Waikiki	West Beach	Kapolei	Federal Standard
1996	2,127	2,159	594	477	40,000
1997	4,133	1,939	598	541	40,000
1998	6,726	1,672	470	419	40,000
1999	4,788	1,634	299	387	40,000
2000	3,990	4,332	1,596	2,508	40,000

Source: Environmental Report Card 2001

Table 1.38 -- Annual Average Sulfur Dioxide (in $\mu\text{g}/\text{m}^3$)^{74, 2001}

	Honolulu	West Beach	Kapolei	Waikiki	Federal Standard
1996	3	3	2	1	80
1997	2	6	2	1	80
1998	2	4	2	3	80
1999	2	1	2	2	80
2000	1	3	1	1	80

Source: Environmental Report Card 2001

Table 1.39 -- Annual Average 24-Hour Sampling of PM-10 on Oahu (in $\mu\text{g}/\text{m}^3$)^{74, 2001}

	Hono-lulu	Liliha	Pearl City	Wai-manalo	West Beach	Kapolei	Federal Standard
1996	14	16	14	16	18	19	50
1997	8	15	14	18	17	13	50
1998	9	15	16	20	16	15	50
1999	14	15	14	18	13	15	50
2000	14	15	16	17	14	17	50

Source: Environmental Report Card 2001

Existing Problems, Issues and Opportunities

Existing problems range from locally produced air pollution to long distance impacts. Local air pollution includes agricultural operations, industrial pollutants, vehicle emissions and volcanic haze. Agricultural operations produce the greatest air quality impacts on Maui and Kauai. DOH will continue to monitor and respond to complaints regarding sugarcane burning. Impacts on ambient air quality from activities associated with geothermal energy production and volcanoes eruptions are being monitored on the island of Hawaii. A Vog Index Hotline has been established for residents. Part of this study included a physical and chemical study of vog.^{67, 2000 177,2001}

The impact of air pollution produced by human activity may be felt long distances from where they are released. Even at remote locations, typified by

observatories in Hawaii and Alaska, elevated amounts of gases such as carbon monoxide and ozone, and particles of dust and soot are periodically encountered. Long-range transport of these pollutants carrying them to the continental U.S. they may compound the deterioration of air quality caused by local sources of pollution. Phenomena such as Asian episodes and Arctic haze are examples of the long-range transport of pollution seen at Mauna Loa, Hawaii and Barrow, Alaska. ^{120, 2000}

Hawaii has very clean air in general. The abundant wind and rain, plus the relatively low population (even on Oahu population density is not considered “high”) help keep the air clean. The lack of heavy industry, dumping lots of pollutants into the atmosphere is significant. Hawaii does have a large automobile density and this contributes to photochemical smog in Honolulu that is noticeable on low wind days. Also, two natural processes (volcanic activity at Kilauea and the formation of marine aerosols by wind action on the sea surface) helps give us a relatively high sulfate and general aerosol levels in our air, particularly during Kona weather times. These two things are considered pollutants and health risks. In general, Hawaii’s air and water are very clean for the reasons mentioned. There is not much Hawaii can do about Pele’s activity on the Big Island or the wind blowing over the sea. ^{115, 2001}

Future and Planned Usage

The Department of Environmental Planning has several ongoing special projects including a study of the agricultural practice of burning sugar cane and a study of the impacts of volcanic haze. The Department is also monitoring air pollutants in Campbell Industrial Park to assess air quality and strategies for dealing with growth. Stack testing is part of the continuous operational and emissions monitoring to maintain an accurate emissions inventory. Review of the permitting procedures and its efficiency will also be done. ^{177, 2001}

Future and Planned Requirements or Changes

Establishment of monitoring stations on all major islands is planned. Further study is required for the monitoring and identification of special monitoring programs. ^{177, 2001}

Anticipated Costs for the Future

Little information is available regarding costs for planned projects.

Problems, Issues and Opportunities Associated with Costs

Funding for basic air monitoring comes from the State, however, due to current economic difficulties, operating budgets for all agencies are being negatively affected.

Further study is required to obtain funding for special interest monitoring projects, such as sugarcane burning and volcanic haze. ^{177, 2001}

Compare Visitor and Resident Impact

Further study is required to separate the visitor impact from the resident impact on Hawaii's air quality. Although the following recommendations are geared toward residents, visitors, if informed of the issues, can assist in these steps. Steps Hawaii residents can take to make the air even cleaner include:

- Limited use of oil burning for electricity generation by finding alternative sources of energy and
- Installation of emission control devices on our automobiles. ^{115, 2001}

Major Assumptions

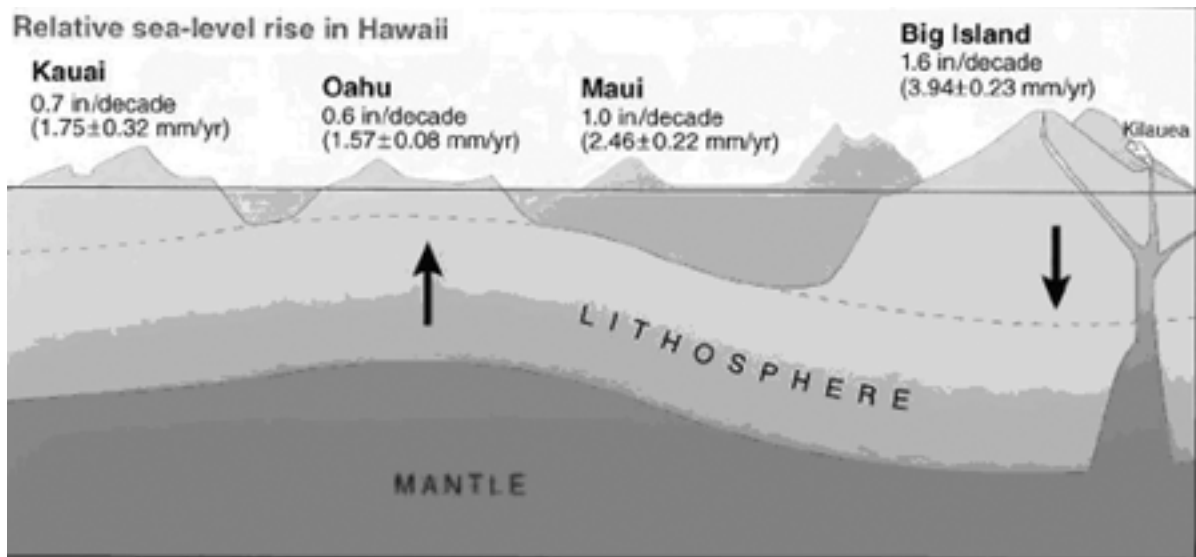
Even though Hawaii is fortunate enough to be geographically isolated and have the trade winds to clear the islands of air pollution, as the population and industry continue to grow, air quality will become more of an issue.

State of Hawaii – Beach Erosion

Present Capacity and Usage

Nearly 25% (17 miles) of Oahu’s beaches have been lost or significantly narrowed over this century due to hardening of the shoreline. Greater losses are reported on the island of Maui. One-third of Maui’s beaches are lost due to hardening. Beaches are 50-70% narrower in front of walls. Effects of coastal hardening include coastal access is decreased, littoral ecosystem is damaged, coastal dunes are destroyed, and cultural practices and tourism economy are impacted. ^{203,2002}

According to *Learning to Live with the Dynamic Hawaiian Shoreline*, the global sea level is rising nearly 1 inch per decade. The sea level rise on the Big Island is quite rapid, approximately 1.5 in. per decade. In Maui, relative sea level is rising approximately 1.2 in. per decade and in Oahu and Kauai is approximately 0.6 in. per decade. The reason Hawaii and Maui display faster rates of sea level rise is a complex issue, but primarily due to their age. As younger islands, the Earth’s lithosphere is still adjusting to the weight of lava (the islands) and is sinking beneath them (See Relative sea-level rise in Hawaii image by NOAA below.). Sea level rise, in addition to other factors, results in approximately 47.5% of the shoreline eroding at a mean rate of 0.27 m. per year and 52.4% is accreting at a mean rate of 0.23 m. per year. For a mean sea level rise of 0.24m by the year 2050, beaches will recede 36m. ^{203,2002}



Researchers at the University of Hawaii have found that on Oahu 10.7 miles of beach has been narrowed by shoreline hardening and 6.4 miles has been lost. This is approximately 24% of the 71.6 miles of originally sandy shoreline on Oahu.

Table 1.40 -- Beach Narrowing and Loss on Oahu

	Mokuleia	Kaaawa	Kailua-Waimanalo	Maili-Makaha	Island wide
Range of shoreline change rates for armored sites (m/y)	- 0.1 to -0.3	0 to -1.7	0.2 to -1.8	-0.2 to -1.0	No calculated

Source: *Learning to Live with the Dynamic Hawaiian Shoreline*

According to *Learning to Live with the Dynamic Hawaiian Shoreline*, Hawaii’s coastal zone includes all lands and all waters from the shoreline to the seaward limit of the state’s jurisdiction. Federal authority applies to the navigable waters of the United States, which extends from the mean high water mark seaward to the 200-mile limit of the Exclusive Economic Zone.

Hawaii requires the four counties to establish a “shoreline area” with setbacks not less than 20ft and no more than 40 ft inland from the shoreline wherein no development is allowed. City and County of Honolulu has increased it’s setback for new construction from 40 ft. to 60 ft. Maui County has a setback up to 150 ft. depending on lot size and other aspects, and Kauai County and Hawaii County have maintained the minimum 40 ft. except where county rules permit a lesser setback.

Table 1.41 -- General Coastline and Tidal Shoreline of Counties and Islands

Islands	Coastline	
	Statute miles	Kilometers
State total	750	1,207
Hawaii	266	428
Maui	120	193
Lanai	47	76
Molokai	88	142
Oahu	112	180
Kauai	90	145

Source: *State of Hawaii Data Book: 2001*

The Hawaii Coastal Erosion Management Plan (COEMAP) states that reasons to protect Hawaii’s Beaches for current and future usage include:

- Sandy beaches are the backbone of Hawaii’s multi-billion dollar visitor economy, which provides the bulk of the state’s jobs and income.
- Beaches are critical in flood and erosion prevention by serving as a natural buffer to prevent property damage from storm waves.
- Sandy beaches are a part of Hawaii’s culture and heritage. All of Hawaii beaches are public.

- Beaches and dunes are important elements of our shoreline environment and are critical to the health of the coastal marine ecosystem.^{103, 2000}

Existing Problems, Issues and Opportunities

According to *USGS Geological Survey Programs in Hawaii & the Pacific*, coastal erosion is a widespread, chronic, and locally severe problem in Hawaii. The beaches of Hawaii derive their sediment from the surrounding reefs. Factors affecting the growth and health of living reefs, such as deterioration in water quality or severe storms have an adverse effect on beach sediment supply. The beaches are important to the people of Hawaii, who have a very strong cultural attachment to the beaches, and because tourism in Hawaii is a multibillion dollar industry that is inextricably linked to the health of the beaches. Loss of beaches through erosion has an adverse effect on the economy of the State.^{124, 1996}

Learning to Live with the Dynamic Hawaiian Shoreline states that beach erosion is caused by several factors. The following activities are indications of poor sand management and can severely restrict public access to state conservation lands and natural resources. Human impacts include:

- Sand impoundment,
- Dune leveling/filling,
- Sand mining,
- Long shore trapping (all affect sand availability),
- Shoreline hardening,
- Beach narrowing and loss (both affect waves and currents moving sand),
- End scour,
- Zoning, and
- Drainage channel dredging.^{203,2002}

According to *Hawaii Coastal Erosion Management Plan (COEMAP)*, coastal hardening can also produce negative coastal water quality impacts. Water quality suffers through increased turbulence and turbidity from wave reflection, and fleshy algae growth from direct flow of domestic sewage products into coastal waters. Littoral ecosystems in these areas can be heavily damaged. In heavily armored sectors, sand impoundment mauka of walls can lead to general sand volume decreased causing or exacerbating sector-wide erosion trends.

Traditional zoning tools have promoted erosion control through shoreline hardening rather than accommodation and enhancement. The problem can be characterized as a weak federal presence with respect to servicing local agencies with the latest scientific and technical solutions to deal with beach loss, and equally weak linkages between state and county agencies responsible for beach and shore conservation.

Coastal resource managers lack sufficient scientific data and analysis to make informed decisions regarding the occurrence, magnitude, continued threat, causes, and mitigation of coastal erosion and other coastal hazards.

Several well-documented realities about the management of coastal lands in Hawaii are now evident:

- Poor management of beaches and dunes in the past;
- A weak federal presence with respect to servicing local agencies with the latest scientific and technical solutions to deal with beach loss, and equally weak linkages between state and county agencies responsible for beach and shore conservation.
- Traditional zoning tools have promoted erosion control through shoreline hardening rather than accommodation and enhancement.
- Coastal hardening as a solution of chronic erosion is environmentally destructive;
- Historical patterns of erosion management have been inadequate and have ignored resulting impacts.
- Existing regulatory framework for coastal conservation and hazard mitigation is not sufficient comprehensive, it can be improved and its effectiveness can be increased; and
- The improvement of these failings will not be easy, rapid, inexpensive, or simple.^{103,2000}

According to the *Annual Report: Fiscal Year 1999-00 - Public Utilities Commission*, another management problem faced when restoration is needed is that large-scale beach restoration requires a total of 13 permits or actions to obtain the agreement of federal, state, and county agencies. The defined shoreline is based upon an inherently ephemeral and unobservable phenomenon that is identified by interpretation and judgment, leading to problems of inconsistency and disagreement.

Many shorelines in Hawaii experience both accretion and erosion in different areas, with island-wide rates of shoreline change appearing to be in relatively close balance. Given the balance between sediment inputs and outputs on Hawaiian beaches, small perturbations in the local sediment supply, either natural or artificial, can have dramatic consequences on the shoreline. Human interference with the natural dynamism of coastal sediment will usually have a much greater impact on the sediment supply to a beach than will changes in water quality and health of living reefs.^{90c, 2002}

Future and Planned Usage

According to *Hawaii Coastal Erosion Management Plan (COEMAP)*, the following goals represent targets for improving the erosion management system in Hawaii:

- The Coastal Lands Program needs to be empowered, and funded with a specific revenue source with a nexus to coastal lands.

- Consider erosional trends and processes, and other coastal hazards, at the zoning and subdivision stages.
- Implement a continuous source of scientific data and research products so that land managers can achieve expert status on the physical processes and geographic patterns of erosion hazards and the technical aspects of its management.
- Create and maintain a continuous public education and awareness campaign.
- Establish coastal land acquisition programs.

Environmental sequencing for reducing erosion hazards can be integrated with efforts to reduce exposure to other coastal hazards. Sequencing is an environmental decision-making framework based on the concepts of avoidance, minimization, and compensatory mitigation.^{103, 2000}

According to *USGS Geological Survey Programs in Hawaii & the Pacific*, the USGS, in cooperation with the University of Hawaii, is documenting the magnitude and extent of beach loss and is studying the causes of erosion unique to the Hawaii environment. Recent activities include profiling of eroding beaches on Oahu and Maui, establishment of a historical shoreline position database, and comparison of beach profiles and sediment samples with those collected in the 1960's. Results from this program provide information useful to planners, engineers, and resource managers.^{124, 1996}

Future and Planned Requirements or Changes

Learning to Live with the Dynamic Hawaiian Shoreline states that if Hawaii is to pursue beach and dune restoration using marine sand sources as a policy of erosion management, it will require conducting activities seaward of the mean high water mark and area that is regulated by the U.S. Army Corps of Engineers (COE). If a significant impact to the environment is identified, then a federal Environmental Impact Statement (EIS) must be submitted. Under the federal Clean Water Act, an applicant requiring a federal license or permit to conduct work in state waters must also obtain a Water Quality Certification from DOH.

There are five options for erosion management: abandon the shoreline, restore the beach, control erosion rate with sand fill and structures, adapt human occupancy to accommodate erosion, and hardening the shoreline. Each option has its pluses and minuses. Abandoning a shoreline allows nature to take its course, but is impractical on heavily developed areas. Beach restoration may be the most desirable in some localities, however it is not a one-time cost, but an on-going process. Controlling the erosion rate is expensive and communities may reject the structures. Adaptation to accommodate erosion is difficult, often impractical and requires new zoning regulations and procedures. Hardening the shoreline results in beach loss, access decreased, and other environmental impacts.^{203,2002}

According to the *Annual Report: Fiscal Year 1999-00 - Public Utilities Commission*, the following recommendations will move Hawaii toward the attainment of its goals:

1. Enhance and streamline Interagency Coordination and funding.
2. Develop master plan for state erosion management or technical guidance Manual for state and county decision makers based on erosional trends and processes, and other coastal hazards, at the zoning and subdivision stages of land development so that structures can be safely and properly located away from hazard areas.
3. Analyze economic factors to identify the necessary funding and benefit/cost rationale of management options.
4. Establish a continuous database, and formalize an enduring data source from UH-SOEST.
5. Use aerial surveys and a computer-aided digitizing method for monitoring the total coastline of Hawaii, supplemented with shoreline surveys at selected high-risk locations.
6. Restoration is not a Permanent Solution – Plan for Renourishment and Redevelopment. ^{103,2000 90c, 2002 61,2001}

Anticipated Costs for the Future

According to the *Annual Report: Fiscal Year 1999-00 - Public Utilities Commission* and *Hawaii Coastal Erosion Management Plan (COEMAP)*, future costs would include: costs for beach/shoreline monitoring, continuous research and public education/outreach efforts, and perhaps, costs for periodic maintenance of renourished beaches, etc. Beaches, like any other resource, can be managed well or poorly. Given their tremendous importance to the state, it is worth making the investment to better manage and preserve them. The direct hit of a hurricane on a densely populated area of Hawaii has the potential to cause financial losses exceeding the total annual state budget. ^{90c, 2002 103, 2000}

According to the *Executive Supplemental Budget FY 2003*, the State of Hawaii is in the process of acquiring the Ka Iwi shoreline on the South coast of Oahu for approximately \$10 million to protect it from commercial development.

Waikiki Beach Environmental Impact Statement \$500,000 - to restore and improve portions of Waikiki Beach.

Beach Maintenance Project \$650,000 - to pump 20,000 cubic yards of sand onto Waikiki Beach. ^{194,2002}

Problems, Issues and Opportunities Associated with Costs

According to *Hawaii Coastal Erosion Management Plan (COEMAP)*, several problems and opportunities were identified associated with costs for future changes.

- Mitigating damage from coastal hazards reduces the heavy burden placed on limited public fiscal resources.
- One-time planning grants for mitigation development are available to states (\$75,000) and to communities (\$25,000). The amount is capped at \$5,000,000 to any state or community over a 2-year period. Amounts are subject to 75/25 matching funds.
- Mitigating damage from coastal hazards reduces the heavy burden placed on limited public fiscal resources. FEMA offers Flood Mitigation Assistance one-time planning grants for mitigation development for states (\$75,000) and communities (\$25,000). The amount is capped at \$5,000,000 to any state or community over a 2-year period. Amounts are subject to 75/25 matching funds. ^{103, 2000}
- Maui County budgeted \$15 million for coastal land purchases in FY'98 and the City and County of Honolulu has \$12.5 million available for the same purpose.
- A statewide shoreline study requires considerable expense and extensive resources. This project requires coordination between State, County and Federal agencies and possibly requires new legislation to obtain necessary funding and resources. ^{61, 2001}

Compare Visitor and Resident Impact

The *Hawaii Coastal Erosion Management Plan (COEMAP)* states that tourism in the state is closely tied to the quality of Hawaiian beaches. As visitors find access difficult to shorelines lined by seawalls and crowded with development, they will come to realize that Hawaiian beaches are degraded. Coastal vistas are no longer pristine, and opportunities to experience Hawaiian shore depicted by the visitor industry are rare. ^{103, 2000}

Major Assumptions

According to *Hawaii Coastal Erosion Management Plan (COEMAP)*, the most up-to-date projection of future sea level indicates a 50 cm (20 in) rise higher than today by the year 2100, with a range of uncertainty. One engineering study suggests from 53% to 88% of the total erosion (1.7 to 5.5 m/yr) experienced on some continental shores can be attributed to sea level rise, and the remainder to net sand losses from the site.

- Beach loss seriously impacts the visitor economy in Hawaii.
- Public access to beaches and the ocean is a right that is preserved by the State of Hawaii constitution.
- Beach loss and narrowing, and coastal dune grading that accompanies coastal development causes environmental and ecological damage to natural resources and habitats. ^{103, 2000}

State of Hawaii – Invasive Species

Present Capacity and Usage

The *Impact on Alien Plants on Hawaii's Native Biota* states that alien species are considered species transported or established outside their native range, while invasive species are alien species that disrupt native communities or the function of the ecosystem. Invasive species are considered invasive when they become dominant within the plant community or have the capability of dominating native plant communities as they have in comparable areas (Guam and Fiji are examples of comparable areas.).

The three most dreaded invasive species are the brown tree snake, red imported fire ants and miconia. The brown tree snake has already decimated the avian population in Guam and could easily do the same in Hawaii. Introduction of the red imported fire ant to Hawaii would be disastrous, as it has been on the mainland. So far, the primary known factor preventing the spread of RIFA northward is the frost line. As Hawaii lacks this climatic feature, there is nothing to prevent its spreading across the State island by island. Miconia, already present in Hawaii, is proving to be disruptive to the native ecosystems by supplanting native species and disrupting the absorption of rainwater into the watershed.

The most invasive plant species can be found on the species list developed by the Hawaii State Alien Species Coordinator at the Department of Land and Natural Resources <http://www.state.hi.us/dlnr/dofaw/hortweeds/specieslist.htm>. Another invasive species site, which includes vertebrates, invertebrates, plants and fungi, is: <http://www.hear.org/AlienSpeciesInHawaii/index.html>.

While statutes exist which regulate the importation of plants, but they are only cursorily enforced except for those plants that come in under permit. The State's overriding concern is to protect and promote agricultural and other economically attractive interests, whereas protection of native ecosystems has received little consideration.

The lowland ecosystems, along the coastlines, have suffered the most disruption from alien species because of agriculture, fire, and urbanization. The ecosystems least impacted are alpine habitats, rain forests, and bogs are more remote, but they are under increasing pressure.^{134, 1998}

The *Impact on Alien Plants on Hawaii's Native Biota* states there are over 4,600 alien species in Hawaii, of which over 600 have become naturalized. Eighty-six are considered pests in areas not cultivated or urbanized. Many other weeds are confined to agricultural areas. Twenty-eight species appear to be a problem on one island only. Fourteen (50%) of them occur on Hawaii, 5 (18%) on Kauai, 4

(14%) on Maui, 3 (11%) on Oahu, and one each (4%) on Lanai and Molokai. Most of these species occur on other islands but have not escaped, probably because they have not been introduced into a suitable environment.

It is somewhat surprising that Oahu does not have the highest number of problem weeds. It is the principal port of entry for the Islands as well as the location of three botanical gardens. It is the most probable area where weeds would become established. However, the largest number of weeds occurs on the island of Hawaii. Although no obvious single explanation is available, it is known that several ranchers on Hawaii have introduced large numbers of plants and birds for various reasons, particularly at elevations between 800-1,700 m. The recent formation and volcanic activity of much of the Island and the large expanses of open forest may provide favorable conditions for alien plant establishment.^{134, 1998}

Existing Problems, Issues and Opportunities

Oceanic islands are particularly vulnerable to invasive species and Hawaii especially so because of its role as a transportation hub. Because of their evolution in isolation from many forces shaping continental organisms, ecosystems of the Hawaiian Islands are perhaps an order of magnitude more vulnerable than most ecosystems of the continental U.S. Hawaii has one-third of the endangered species in the United States, and invasive alien species pose the greatest threats driving these and other native species toward extinction. More native species have been eliminated in Hawaii than anywhere else in the United States.^{58, 2001}

PLANTS

The *Environmental Report Card* states that we have become more familiar with some invasive alien species in recent years with news headlines featuring a weed called *Miconia*, tiny but loud tree frogs in our backyards, and more recently, a statewide outbreak of dengue fever, spread by mosquitoes. While these events may seem unrelated, all are symptoms of a larger problem – the uncontrolled influx of destructive alien pests and disease organisms to Hawaii. In fact, Hawaii's invasive species problem is the most severe of any state.^{74, 2001}

The *Impact on Alien Plants on Hawaii's Native Biota* states that invasive plant species are threatening Hawaii's native species and forests. Alien plants seriously threaten the unique flora and fauna of the Hawaiian Islands. Many native species have already been extirpated. Unless importation of aliens and the continuing disturbance of the native ecosystems are stopped, the prognosis for the remaining native biota is grim.^{134, 1998}

According to *Hawaii's Most Invasive Horticultural Plants*, most invasive species arrive in Hawaii via introduction for horticulture use for ornamental purposes. This pathway accounts for approximately 70% of all documented invasive plant

species in Hawaii. Other pathways include for use as crops, livestock forage, or forestry species, and accidental introduction of weed seeds as contaminants in other products. What attributes of plants make them invasive?

- Propagules (seeds, spores) dispersed by animals or wind
 - Plants disperse to new areas via movement of seeds and spores,
 - Plants using animals or wind as dispersal mechanisms are capable of quickly invading native ecosystems in areas remote from where the adults themselves are planted, and
 - Animal or seed dispersed propagules have high potential to be invasive in Hawaii.
- High fecundity
 - Plants that produce many seeds per plant each year are far more capable of quickly invading native ecosystems than are those that produce fewer seeds.
- Rapid growth rate
 - Fast growing plants that quickly reach maturity will be more invasive and harder to control than slower-growing plants. ^{204, 2001}

The *Impact on Alien Plants on Hawaii's Native Biota* states that lowland ecosystems have suffered the most disruption from alien species because of agriculture, fire, and urbanization. It is not possible to make any meaningful assessment of weed invasions of Hawaiian ecosystems on the basis of elevation because of the significant differences in climatic conditions around the major islands. Vegetation zones have been subdivided into 10 zones to provide a convenient framework for a discussion of the impact of alien plants on Hawaii's vegetation.

Land below 300 m elevation receiving less than 500 mm of rain each year is now almost totally dominated by alien forbs and shrubs. Formerly open native scrub grasslands; these areas were the principal habitation of the aboriginal Hawaiians. The lands were greatly disturbed by fire and in many instances have been severely eroded. When fires were suppressed as western civilization took hold, the native vegetation began to recover. However, the introduction of koa haole and its subsequent aerial broadcasting resulted in its rapid colonization and ultimate domination of these areas. In the driest areas of most islands, a few native species still predominate.

On land too steep for plantations, various timber trees were planted, principally for watershed management. This community is still predominantly native because most weeds cannot tolerate the salt-water stress. Where cattle graze, the small shrubs have disappeared due to trampling and overgrazing. Many of these stress-resistant native species also occur elsewhere. Above 300 m on old unweathered lava flows or where there are many boulders, pockets of native dry forest have survived, e.g. Auwahi, Maui. Unfortunately, these woodlands

frequently have a heavy ground cover of alien grasses, e.g., kikuyu grass, as well as heavy infestations of lantana.

In areas between sea level and 1,300 m where the annual rainfall ranges from 1,000-1,500 mm and where there is sufficient soil, sugar cane, pineapple, and more recently macadamia nut, plantations are found below approximately 650 m. Above this elevation most of the native forests have been converted to grassland. Some forest plantations have also been established in this zone. Pockets of native vegetation still survive, but if feral pigs are not excluded from these areas, they will soon be converted into guava woodlands.

In areas between sea level and 2,300 m where the annual rainfall exceeds 1,500 mm, the land below 1,350 m has been greatly altered by agriculture. Sugar cane is grown below 500 m although some plantations reach above 650 m. The gullies at these lower elevations are forested by a tropical weed flora in which few native species survive. Between approximately 650 and 2,500 m, much of the land has been designated forest reserve for watershed protection. These forested areas are also maintained as hunting preserves, particularly for feral pigs.

Below 1,200 m, strawberry guava is frequently dominant, forming monotypic stands. Between 1,000 and 1,650 m, alien species are creating significant problems. However, there are large tracts of ohia forest, generally in wetter areas, that have not been invaded by alien species other than a few relatively unimportant herbaceous plants. Between 1,650 and 2,200 m, there are numerous mires, which have been undisturbed until quite recently. The resistance of Hawaiian mires to alien plant invasion is unclear, but the environmentally sub optimal conditions of these areas for plant growth may reduce the competitive advantage of the weeds.

In the inversion layer zone between 2,000 and 2,300 m, where the annual rainfall is less than 1,250 mm, the native koa forests have been converted to cattle ranches and few intact segments remain. Most of the grasses in these parklands are aliens, principally kikuyu grass, although a few native grasses remain. The dense growth and allelopathic secretions of grasses prevent the successful germination of koa and other native seeds.

Above 2,300 m, depending on the elevation that the inversion level reaches, the annual rainfall is less than 1,250 mm. This is one of the least impacted areas and alien species are not common except on deep ash or where feral goats and sheep have opened the forest. Above 2,650 m, the climatic conditions are so severe that there is little vegetation. Any plant that does emerge is promptly eaten by feral herbivores. These high elevation environments are generally protected from alien plant introductions because most of the ports of entry are in the tropical lowlands.

Oahu does not have the highest number of problem weeds, however it is the principal port of entry for the Islands and could be the most probable area where weeds would become established. The largest numbers of weeds occur on the island of Hawaii.

ANIMALS

Three species of 'Caribbean' frogs have been spreading throughout Oahu, Maui, and the Big Island. Their range is further expanded by the movement of infested plants to new locations (bromeliads, for example, make great hiding places!). *Eleutherodactylus coqui*, *E. martinicensis*, and *E. planirostris* are tiny frogs with huge appetites. Studies conducted indicate that an infested acre (8,100 frogs) could consume as many as 46,000 prey items every night! Native plants that depend on pollination from particular insects are indirectly affected, and a disruption to the food chain could impact our rare forest birds. Currently, their known population on Maui is limited to more than 30 sites, and efforts toward containment may halt the otherwise rapid spread of these frogs from turning into epidemic proportions. If these frogs become well established, they could also threaten Hawaii's agricultural export industry: shipments of tropical flowers or live plants that might have hitchhiking frogs will certainly not be accepted by other states or countries! This could add to the existing burdens imposed on Hawaiian agriculture.

The absence of terrestrial mammals in the Hawaiian fauna has resulted in the lack of defense mechanisms against such animals. The introduction of mammals, especially ungulates, produced a new selective pressure on the native flora. Coupled with simultaneous introduction of alien plants, many are components of early secondary succession in their native habitat, Hawaiian ecosystem were faced with serious threats to their integrity.

Animals, which dig up subterranean foods as part of their normal foraging activity, are frequently important disseminators of plants propagules and play a role in nutrient cycling. In their native habitats, such disturbance is followed by a successional series of vegetation ultimately leading to some sort of climax community. In Hawaii, a natural successional series of this nature does not exist. Disturbance here as a significant deleterious impact on the native ecosystem, destroying ground water cover, damaging roots, and opening up the understory. Many native species cannot tolerate this disturbance; however many aliens are dependent on it for their establishment. ^{134, 1998}

According to the *Annual Report to the Twenty-First Legislature 2001 Regular Session on Act 152 SLH 2001 the Control of feral animals* in key watersheds has been a priority of Hawaii's forestry programs since their inception in 1903. In remote regions where hunters seldom venture---serious damage is continuing today, especially by feral pigs. Feral animals are important resources for hunters. Smaller animals also may become serious pests in the watershed. Rats,

feral cats and dogs, mice, mongoose, and certain nonnative birds are established on East Maui and are known to destroy or compete with native species.

The State's Natural Area Reserve System is overcome by lack of finances and manpower. The number of areas formally designated is low. But even after areas are designated, no management is conducted because there are no funds. The resources of these areas are poorly known. Yet disturbances continue, sometimes on a large scale, resulting in the further degradation of ecosystems and the continued spread of alien species. ^{134, 1998}

Future and Planned Usage

Although many beneficial non-native plants have been introduced to Hawaii, a number of serious weeds have also invaded native watersheds and threaten their stability. Weeds are a serious problem because they displace native plants, diminish habitat for the native animals that rely on native vegetation. Some weeds displace economically or culturally important native plants, or convert beautiful forest areas into impassable, thorny tangles. Others promote wildfire. Many weeds gain a foothold in the forest by sprouting in areas opened up by feral animals. The weeds may be spread by birds, or by hikers or vehicles that enter the forest with mud and seeds from other areas. ^{99, 2002}

The *Impact on Alien Plants on Hawaii's Native Biota* states that the replacement of a relatively diverse native ecosystem by monotypic stands of alien species is a serious disruption of the ecosystem. In Hawaii, the loss of diversity in even small areas can have a devastating effect on the survival of species, many of which are already endangered, almost extinct, or confined to very small areas. The highly restricted distributions of many endemic species are not understood but are probably related to loss of dispersability characteristic of many island species. Native primary consumers rarely adapt to aliens, and in the majority of instances, they are excluded from the alien ecosystems.

The creation of monotypic stands of alien species may in fact be followed by a more disastrous event. As the weed exploits and exhausts the particular resource that it is able to use, it may outgrow itself. Or, as the natural processes of aging and diseases take their toll, the population may crash, resulting in accelerated erosion or further weed invasions, but rarely in the reestablishment of even a semblance of the original native ecosystem. These population crashes are not uncommon events elsewhere but have not been recorded in Hawaii. Such crashes rarely provide sufficient time for the orderly reestablishment of a diversified ecosystem.

Although it has been proposed that fire is a frequent natural formative agent in Hawaiian ecology; one area of Hawaii Volcanoes National Park has found that carbon-dated charcoal deposits and other evidence suggested a very low fire frequency. Human activity and the introduction of weeds, particularly grasses,

have changed that. Since 1910, most fires in the Park have been started by man. Fires, ignited by infrequent lava flows, were common. However, these fires were small in area because of the natural firebreaks in the vegetation mosaic.

Many weeds introduced into oceanic islands come from temperate areas of Europe and America. Their phenology is occasionally not in synchrony with local climatic conditions, which results in significant changes in the edaphic ecology of the area. ^{134, 1998}

Future and Planned Requirements or Changes

According to the *Annual Report to the Twenty-First Legislature 2001 Regular Session on Act 152 SLH 2001*, control methods for weeds include manual pulling, chemical treatment, and biological control (the use of insects or diseases from the weed's homeland to control the weed in Hawaii). For several important weeds, no effective control method currently exists for large infestations. It is important to invest in measures to prevent additional noxious weeds from becoming established in the first place, and to support long-term research programs to improve control methods. Incipient *Miconia* populations have been cleared from Oahu and Kauai, but more aggressive and sustained efforts are needed for Maui and Hawaii.

According to the *Annual Report to the Twenty-First Legislature 2001 Regular Session on Act 152 SLH 2001*, a weed control plan should provide a strategy to prevent new weeds from entering the watershed area, and will target those species that pose the greatest threat. The plan should describe a system for informing the public of weeds to watch for, how to report new infestations, and contingency plans for quick removal of reported infestations.

For established weeds, a plan should determine which species merit control work and will develop a coordinated interagency approach for controlling these. As in the Feral Animal Control program, the plan should also identify clear methods for monitoring the success of weed control efforts to aid in refining management techniques. It will identify problem species for which no effective control method exists, and set priorities for research to develop improved methods. ^{99, 2002}

The *Impact on Alien Plants on Hawaii's Native Biota* states that a number of strategies are discussed which help to ameliorate weed problems. Greater effort by government is needed to educate the public on the need for importation control and to enforce regulations. Mechanical and herbicidal control is discounted except in small areas. Biological controls offer considerable hope, but there are many problems associated with this strategy. ^{134, 1998}

According to the *Annual Report to the Twenty-First Legislature 2001 Regular Session on Act 152 SLH 2001*, an animal control plan should provide a balanced strategy that includes public hunting opportunities in accessible areas as well as

effective protection of remote or sensitive parts of the watershed. This entails an assessment for the need for trails, roads or other access improvements in hunting areas as well as minimizing liability and other concerns for private landowners. A coordinated fencing and animal removal strategy for remote or sensitive watershed areas should be completed. Specific management units are identified based on topography and other natural features. The strategy should specify fence routes and costs, timetable and costs for systematic treatment of management units. It should also describe the systems that will be put in place to monitor animal activity and gauge the effectiveness of these programs. This monitoring will be used to improve management methods as the project grows. A plan should also lie out a program of public information, regulatory and other measures to prevent the introduction of new pest animals to the watershed area.
99, 2002

The *Impact on Alien Plants on Hawaii's Native Biota* states that The National Park Service began a major resource management program to rid the park of feral goats. After most goats were removed, the grasses were no longer grazed and consequently colonized the many ash-filled cracks in lava flows, creating a continuous ground cover between islands of native scrub forest. The flowering stalks of these species are persistent after death, creating excellent fuel. These grasses are fire-stimulated, rapidly resprouting from basal sprouts after burning.
134, 1998

Three separate programs are needed to manage the alien pest problem in Hawaii:

- Prevent further introductions: The preventions of further importations of alien species are imperative if we are to manage our native habitats effectively. The money spent on controlling pests would be much better spent on productive enterprises.
 - Implement plans to prevent new potentially devastating alien species from coming to Hawaii
 - Urge the landscaping and nursery industries to identify and prevent introductions of new plant pests and prevent the spread of existing plant pests.
 - Strengthen the capacity of state agencies to conduct incoming quarantine inspections.
- Stop disturbances of Ecosystems: Two separate actions are necessary to reduce disturbance. The first is to change the State Constitution so that preservation of the State's natural resources is really mandated of the land managers. The second is to develop feral ungulate management programs to the point that these animals no longer significantly disturb the native forests.

- Secure immediate and long-term funding to develop the capacity of Island Invasive Species teams to contain *Miconia* and to carry out early detection/rapid response of other alien pests.
- Develop strategies to encourage native species reestablishment: Two programs are needed. The first is the formulation and implementation of research on the biology of the most troublesome weeds. The second is the development of an integrated pest management system.
- Continue to provide dedicated funding for the State's Natural Area Reserve fund. (The Natural Area Reserve fund receives income from a small portion of the state's Conveyance tax. This fund is used to support: the Natural Areas Partnership program, watershed partnerships, and the Youth Conservation Corps.)^{134, 1998}

Community Action and Education

The *Big Island Invasive Species Committee* lists:

- Make it easier for private citizens to use native Hawaiian plants for home landscaping and use primarily native and Polynesian introduced plants for landscaping of all publicly funded projects.
- Support programs that train and share volunteers who work to protect biodiversity and control alien species on public and private lands.
- Support and expand programs that increase public awareness of alien species, targeting all incoming plants, both residents and visitors. Resources will be needed to educate people to not import biological material indiscriminately, as well as to intercept deliberate attempts to smuggle material into the State. An immediate political step would be to require that all future government-sponsored landscaping use native species or plants that are known not to naturalize in Hawaii.^{205, 2000}

The Impact on Alien Plants on Hawaii's Native Biota states that a total prohibition on importations is not necessary. However, an outright ban on certain plant groups is imperative. Bans on the further importation of species known to be problems in other tropical islands. Species known to be part of primary or secondary succession in tropical or subtropical areas should be evaluated before they are permitted entry. The evaluations should be conducted by a group of botanists familiar with weeds in tropical and temperate areas. Applications for permission to import should follow a format similar to an environmental impact statement.

The Environmental Council is playing a small but important role in increasing public awareness of this issue by working closely with other key groups and volunteers to produce educational "flashcards" on 20 of the most serious alien species threats to Hawaii's environment and way of life. These soon-to-be-printed resources will be distributed statewide to teachers and Island Invasive Species Committees.^{134, 1998}

Anticipated Costs for the Future

According to the *Environmental Report Card 2001*, in addition to costing the State roughly \$500 million annually in lost agricultural revenue and property damage, invasive alien species cause irreversible damage to native ecosystems and watersheds. To protect our special natural resources, it is important to work at a landscape level, across landowner boundaries, and with the ahupuaa land principles in mind. ^{74, 2001}

Problems, Issues and Opportunities Associated with Costs

According to the *Report to the twenty-first legislature*, cooperation among the various government agencies with responsibilities in this area could result in effective management of invasive species. The recent signing of a memorandum of agreement between various State and Federal agencies regarding forest pest control is encouraging. However, the contributions of each of the agencies will be largely influenced by the internal budgets of each. Act 259, Section 18 of Session Laws of Hawaii 2001, provided general fund appropriations for Forests and Wildlife resources in the amount of \$150,000 for fiscal year 2002-2003 to be expended for the purposes of invasive species committees. This section also required that a progress report concerning the effectiveness of invasive species programs, amounts expended for the programs broken down by cost element, means of finance, and island, and justification for all expenditures on invasive species programs be submitted to the legislature prior to the convening of the 2002 and 2003 Regular Session. ^{58, 2001}

Compare Visitor and Resident Impact

The *Impact on Alien Plants on Hawaii's Native Biota* states without the cooperation of the public, there is little chance that a preventive program will work.

The best place to conduct the education of tourists and visitors is on the plane prior to arrival in the Islands. A 5-minute "commercial" explaining the problem and the importance of preventing plant and animal introductions would be much more effective than the printed form currently handed out in an almost cavalier fashion by the airlines. "Amnesty" boxes should be provided in the baggage claim area where people can discard material prior to leaving the airport.

Quarantine of imported material is important to minimize the introduction of associated pests and diseases. A more visible and concerned presence by the State's agriculture inspectors at ports of disembarkation is also necessary. Periodic inspection of baggage similar to the procedure on departure for main lands would help keep people honest. The constant disclaimer by the State that it does not have sufficient funds to support such a program is a tacit acknowledgement that it does not consider alien plant introductions to be a major problem. Failure to enforce current regulations has resulted in the importation of

Miconia magnifica and its consequent establishment in Hilo, which may turn out to be a very serious problem. ^{134, 1998}

Major Assumptions

The Impact on Alien Plants on Hawaii's Native Biota states that many biologists have stressed the relationship between the disturbance of ecosystems and alien establishment. Two separate actions are necessary to reduce disturbance. The first is to change the State Constitution so that preservation of the State's natural resources is really mandated of the land managers. The second is to develop feral ungulate management programs to the point that these animals no longer significantly disturb the native forests.

State of Hawaii – Native/Extinction

Present Capacity and Usage

The Hawaiian Islands are home to several species of plants, birds, mammals, fish, invertebrates and insects that are found nowhere else on the planet. These species exhibit a staggering array of adaptations to life in their unique habitats away from predators. Many have lost their natural defenses as they evolved. Introduction of alien species take advantage of their lack of defense.

Hawaii is also home to the greatest number of endangered, threatened and extinct species. Listed below are the numbers of species in each taxa that are extinct, endangered or threatened.

- Endangered or threatened Mammals--2 species
- Hawaii's Extinct Species – Birds, 24 taxa
- Endangered or Threatened Birds--32 taxa
- Endangered or Threatened Reptiles and Amphibians--5 species
- Hawaii's Extinct Species – Snails (72 taxa)
- Endangered or Threatened Snails-1 genus

Hawaii's Extinct Species – Insects (77 taxa)

- Hawaii's Extinct Species – Plants [97 total taxa (55 extinct; 42 possibly extinct)]
- Endangered or Threatened Plants--289 taxa ^{104c,2002}

Prior to human disturbance, Hawaiian bird life was abundant from the montane cloud forests to the rain forests by the sea in what are thought to have been the highest densities of any birds on earth. These natural treasures are integral elements of the biological and cultural heritage of the Hawaiian Islands and their people. Unfortunately, many Hawaiian bird species are highly endangered or already extinct. Of the more than 140 native breeding species and subspecies present prior to the colonization of the islands by humans, more than half have been lost to extinction. Among the remaining 71 endemic forms, 30 are federally listed as endangered, and fifteen of these are literally on the brink of extinction, numbering fewer than 500 individuals. The causes of these declines are numerous and extensive, including loss and degradation of habitat, and introduced diseases, predators and competitors. The task of preventing further declines and recovering imperiled species will require wide-ranging efforts to address and mitigate the diversity of threats faced by species in natural populations.

Existing Problems, Issues and Opportunities

According to the *Places We Protect - Watershed Partnerships and Preserves*, there is no way to replace a species once it is gone. For thousands of species, Hawaii is their only home. Loss of species is an indicator that points to the

deterioration of an ecosystem that human beings need to survive. Unfortunately, there are many threats to Hawaii's native ecosystems and unique plants and animals. ^{149,2002} Some of the threats include:

- Invasive species,
- Non-point source pollution,
- Alteration of the environment, and
- Other human impacts.

Hawaii relies on native plants and animals for 75% of all the medicines and pharmaceutical use and new discoveries are made annually. Yet, fewer than 10% of Hawaii's species have been tested for their potential medicinal value. Without protection of Hawaii's natural lands and biodiversity, Hawaii may never know the value of what it is losing.

Future and Planned Usage

Future and Planned Usage of Native Species and Extinction Issues are a difficult parameter to measure. For the purposes of this Summary, Future and Planned Usage has been interpreted to mean Future and Planned policies and protection for native species. There are several laws, regulations and agencies established for the protection of native species.

Hawaii's Endangered Species states that one reason the Monk Seals are endangered is because they are attracted to the bait or light sticks that are used in long line fishing. They also get caught in excess fishing line. Hawaiian Monk Seals are protected by two federal laws: the Marine protection law and the endangered species act. There is also the state of Hawaii regulation law. If you harm the seals, or violate the laws, the consequence will be a \$25,000 fine and criminal conviction. Criminal conviction can lead up to \$100,000 fine and a maximum of one year in jail.

According to the *Places We Protect - Watershed Partnerships and Preserves*, two million acres of native forest remain in Hawaii. In the last 18 years, The Nature Conservancy has had great success in protecting some of these acres— first by establishing preserves, then by helping build state and federal support for conservation in Hawaii. ^{149,2002}

Future plans by non-profit agencies include: concrete steps to protect and restore remaining native habitat; prevent continued introduction and spread of alien species; control established alien species in critical native habitats; clean up coastal pollution; protect sensitive habitats from noise and other impacts of tour helicopter over-flights; and preserve remaining rare and threatened native birds and animals of Hawaii. Each of these steps will bring us closer to a healthier, sustainable ecosystem.

Programmatic strategies are as follows: research and management, translocation and/or cross fostering, rear and release, captive-breeding (immediate release), captive-breeding (self-sustaining population), captive-breeding (production and restoration), emergency search and rescue, and technology development program. ^{146,2002}

According to *The Hawaiian Ecoregion: A Crucible of Evolution*, the Hawaii Ecoregion is truly a paradise on Earth, but visionary leadership is essential to preserve its ecological integrity into the coming century. The Critical Ecoregions Program represents a fundamental change in the way regions are managed -- and the nation's -- finite natural resources. While agencies divide the world into small, manageable parts, ecoregions demand attention as organic, living systems. Our challenge is to build ecosystem thinking into every policy step. ^{151,2001}

Future and Planned Requirements or Changes

According to *The Hawaiian Ecoregion: A Crucible of Evolution*, in order to turn back the specific threats to the Hawaii Ecoregion -- and to help meet the five global challenges identified by the Sierra Club -- regional grassroots activists will focus on these key objectives:

- Protect and restore remaining native habitat by expanding the state's Natural Area Reserve System, designating additional areas for protection, and enacting legislation to fund fencing, firebreaks, and alien species control within protected areas.
- Prevent continued introduction and spread of alien species in Hawaii by improving and integrating laws, regulations, and enforcement practices that control alien species. A critical initial action will be to require quarantine of certain military transport vehicles to prevent invasion of the brown tree snake from infested Pacific outposts.
- Control alien species in critical native habitats by recruiting and training volunteers for service trips to remove non-native plants, restore damaged areas, and build fences to deter feral pigs. Expand the extent and effectiveness of control projects in progress on the islands of Kauai Oahu, Maui, Molokai and Hawaii.
- Clean up coastal pollution from sewage, industrial, and agricultural waste by continuing an aggressive campaign to require compliance with the Clean Water Act, organizing a public education campaign, and enforcing water quality standards using administrative appeals and litigation.
- Protect sensitive habitats from noise and other impacts of tour helicopter flights by enacting legislation to restrict flights over Hawaii National Parks, and by strengthening Federal Aviation Administration rules for other sensitive areas of the state.
- Preserve remaining rare and threatened native birds and animals of Hawaii by pressing for legal protection and designation of critical habitat. ^{151,2001}

Anticipated Costs for the Future

Many of the costs mentioned in the private documents reviewed were referring to specific programs targeting a specific species. There is no coherent, all-inclusive document mentioning funding for native species and extinction issues.

See Invasive Species Summary at State, County and district / community levels for information as a preventative measure for protection of native species.

Problems, Issues and Opportunities Associated with Costs

See Invasive Species Summary at State, County and district / community levels for information as a preventative measure for protection of native species.

Compare Visitor and Resident Impact

According to the *Places We Protect - Watershed Partnerships and Preserves*, Tourism is Hawaii's number one industry. Hawaii's lush green forests, vibrant coral reef clear waters provide scenic value beyond measure. Hawaii's uniquely rich native flora contribute immensely to Hawaii's pleasant climate and outdoor lifestyle. ^{149,2002}

Ecologically sensitive tourism development could help visitors become aware of the fragility of island resources. Yet to date, most of the tourism promoted in Hawaii reflects little or no understanding of human effects on the environment: Whale watchers may upset the whales' birthing process by approaching the animals too closely; noisy helicopter tours relentlessly buzz the wild areas of the islands, disturbing wildlife as well as people recreating; and tour buses' idling diesel motors drown out the songs of native birds at scenic spots. ^{151,2001}

Major Assumptions

Hawaii's endangered species states that it is often incorrectly assumed that self-sustaining captive populations can be easily established for endangered species. In reality, only a small percentage of all birds (9%) and mammals (19%) have bred in captivity. Obtaining consistent reproduction and survivorship under captive conditions has proven difficult with many species, and behavioral/nutritional "generalists" adapt better to captivity than endangered species with specialized husbandry requirements. Failure to reproduce in captivity can be due to inadequate captive environments, nutritional problems, behavioral incompatibilities and disease. Developing husbandry requirements to promote reproduction can be expensive, time-consuming, difficult, and may be impossible for some species. Often poor reproduction in captivity results in slowly declining, captive populations that take many generations to die out.

It has also been suggested that endangered island species may require more "effort" than related mainland species and be more susceptible to stress and

disease. Island populations may have lower reproductive fitness than related mainland populations and so may be less suitable for reintroductions.

State of Hawaii – Riparian Zones

Present Capacity and Usage

For the purposes of this report, riparian zones are the ecosystem along, and within a waterway, generally relating to a stream. This definition has been adapted from the context of several Coastal Zone Management documents. (See maps of perennial streams for each island in the Appendix.)

According to the *Hawaiian Streams: the Mauka to Makai Connection*, the west coast of the U.S is 2,400 miles away and Japan is 3,800 miles away. The eight islands from Niihau to Hawaii, make up the lower one fourth of the archipelago but represents nearly 96% of the landmass. Only five of these islands (Kauai, Oahu, Molokai, Maui, and Hawaii) are high enough to capture the rain clouds brought to the islands by the prevailing NE trade winds, and for the resulting orographic rainfalls are located on the windward side of the islands and represents the freshwater ecosystem that is home to our native stream animals. Hawaiian streams have the following characteristics:

1. Hawaiian streams resemble a mainland trout stream but are generally shorter. Only 28 or 7.4% of the streams are 10 miles or longer.
2. Numerous waterfalls

Stream flow tracks rainfall patterns. Flow spikes only lasting a couple of days contribute to the flashy characteristics of Hawaiian streams.^{182, 2001}

According to the *Alien Species in Hawaiian Streams*, more than 50 species of alien fishes, invertebrates, reptiles, amphibians and plants are established in our streams and reservoirs. Many of these species were intentionally released with the hope that they will become established, and in some way improve the quality of life in Hawaii. Some of the earliest aquatic introductions occurred during the 1800's and accompanied the first Asian immigrants to these islands. Most of these species were brought in for food, but a few, like the goldfish, were also brought in for ornamental purposes.^{183, 2001}

According to the *Kawa Stream*, this stream has a drainage area of 4.0 km² that includes the National Veterans Cemetery and most of Hawaiian Memorial Park, nearly all of the residential urban developments east of Kamehameha highway from the cemetery down to Kaneohe Bay Drive and the Bay View Golf Course. Kawa drains not the steep face of the Koolau but a ridge of hills that separates Kaneohe from Kailua. Most of the drainage within Kawa watershed is handled by street storm drains that collect runoff into underground culverts that discharge into the stream. However, several small springs and numerous seeps maintain Kawa's base flow.^{190, 2001}

In accordance with the *Economic Analysis of Critical Habitat Designations for 76 Plants from the Islands*, the state owns the largest share (70.9%) of land

proposed as critical habitat while most of the remainder is privately owned (28.8%).^{185, 2002}

It is stated in the *Kawai Nui Marsh* that the Kawai Nui Basin slopes 1 to 3 degrees seaward, ranging in elevation from 6m above to just below present sea level. The present surface of the marsh vegetation mat lies at an average elevation of about 1.5 meters above sea level. Eustatic changes in sea level have alternatively left the area submerged and emergent.

The largest natural water source into Kawai Nui Marsh is Maunawili Stream. Kawai Nui Marsh receives drainage from an area of about 25 km² within the Kailua watershed. The total fresh water input to Kawai Nui Marsh is estimated at 6.8 mgd to 9.5 million gallons per day with 6.3 mgd discharged to Kailua Bay through the Oneawa Channel and 3.2 mgd lost to evapotranspiration. The area of Kawai Nui Marsh must be divided in bulrush marsh with floating mat of live vegetation and peat development; and a bog meadow of California grass, flooded only during rainy season and resting on mineral soil rather than peat.^{187, 2001}

Six species of endemic water birds still survive in Hawaii and all require wetlands for their survival. The islands also provide wintering habitat for migratory waterfowl and shorebirds. U.S. Fish and Wildlife Service estimates that 22,475 acres of wetlands existed within the coastal plains of Hawaii around 1780. In 1990, about 15,500 acres remained. The number of wintering waterfowl has gone from 40,000 before the 1940's to 1,000 birds in 1990. The primary species that benefit are include over 40 species of shorebirds and 33 species of migratory waterfowl.^{188, 2001}

Existing Problems, Issues and Opportunities

It is stated in *Hawaii's Native Stream Animals* that Hawaii streams are also home to the larval forms of dragonflies and damselflies. Both have members that are endemic to Hawaii.^{184, 2001}

According to the *Economic Analysis of Critical Habitat Designations for 76 Plants from the Islands* that nearly all the land within the critical habitat units is unusable for development as well as for most projects, land uses and activities. This is due to their remote locations, lack of access, and rugged terrain. On Kauai, nearly all of this land is within the state conservation District.^{185, 2002}

According to Wetlands, the following are threats to coastal wetlands:

- Erosion: Excessive upstream erosion and the resulting sedimentation of coastal wetland areas are a significant maintenance and management problem.

- Nuisance or exotic species: The major threat to coastal wetlands is the invasion of nuisance and exotic species, such as mangrove and California grass.
- Freshwater input: Diversion and depletion of stream flows upstream of coastal wetlands for agriculture and other uses significantly impact the wetland areas, altering the dynamics of the ecosystem.

Development is also a significant threat to coastal plain wetlands in Hawaii.

Major gaps in addressing the programmatic objectives for the enhancement area:

- Lack of acquisition funding
- Limited state wetlands management, planning, and coordination
- Failure to consider alternative protection approaches
- Limited wetland information
- Lack of statewide wetland policies
- Limited wetland mapping^{186, 2001}

According to *Kawainui Marsh*, rapid urbanization of the Kailua watershed after 1966 increased soil erosion and produced higher rates of basin sedimentation.^{187, 2001}

As stated in the *Hawaiian Islands Initiative*, the following are endangered species:

- Endangered waterfowl: Laysan Ducks, the Hawaiian Duck (Koloa), the Hawaiian Goose (Nene)
- Endangered waterbirds: Hawaiian Coot, Hawaiian Stilt, Hawaiian Moorhen^{188, 2001}

Future and Planned Usage

The *Economic Analysis of Critical Habitat Designations for 76 Plants from the Islands* state that the U.S. Department of the Interior's Fish and Wildlife Service (FWS) has proposed that 60,636 acres be designated critical habitat for 76 endangered and threatened plant species on Kauai and Niihau. This has been divided into 23 critical habitat units, of which 21 are on Kauai (60,166 acres) and two are on Niihau (476 acres). Most of the Kauai units are in the interior and northwestern portions of the island on steep slopes, precipitous cliffs, valley headwalls, and other inaccessible regions having rugged topography.^{185, 2002}

Future and Planned Requirements or Changes

According to the *Economic Analysis of Critical Habitat Designations for 76 Plants from the Islands*, recovery goals for endangered Hawaii plant species cannot be achieved when these feral ungulates are present.^{185, 2002}

Anticipated Costs for the Future

There were no exact figures associated with the future requirements. However, the majority of the costs are indirect or the actions are preventative in nature. Preventative actions are the result of an educated public mindfully avoiding or preventing non-point source pollution. This accounts for individuals and organizations working in industrial, agricultural, urban, marine and riparian settings. Each setting has its own preventative management measures.

Problems, Issues and Opportunities Associated with Costs

It is also noted that the State economy is strained. As such, the polluted water bodies have been prioritized. Any opportunity of matching federal funds or grants are welcome.

According to *Wetlands*, the high cost of the land in Hawaii makes wetland creation too expensive, therefore the FWS allows enhancement of Hawaii wetland areas in lieu of creation. This program enables landowners to remove alien species.^{186, 2001}

Compare Visitor and Resident Impact

It has been noted that visitors come to Hawaii for its unique and spectacular environment. Any degradation to that environment directly impacts the visitor experience. The more degraded the environment, the lower quality visitor experience. A low quality visitor experience means less of a chance for repeat business and a bad reputation. As Hawaii main economic base, the decline in visitor turnout affects the residents of Hawaii. Residents of Hawaii are not only affected by an unhealthy environment, but by an ailing economy as well.

Major Assumptions

According to the *Economic Analysis of Critical Habitat Designations for 76 Plants from the Islands*, possible environmental benefits include the survival and recovery of listed plant species, greater biodiversity and healthier ecosystems, the survival and recovery of native wildlife, a reduction in erosion and soil runoff, healthier watersheds, cleaner and healthier streams and near shore marine environments, and cleaner beaches. However, a monetary value is not estimated for these incremental environmental improvements because of the difficulty of quantifying the magnitude of the changes and the lack of existing economic studies on their value.^{185, 2002}

ID	TITLE	DATE	AGENCY
1	Maui Community Plan Update Infrastructure Assessment	September-92	Maui - Department of Planning
2	West Maui Master Plan for Wastewater Collection, Treatment and Disposal	June-90	Maui - Department of Public Works
3	Maui Public Facilities Assessment; Final Report	July-92	Maui - Department of Planning
4	Kauai General Plan	November-00	Kauai - Department of Planning
6	State Land Use District Boundary Review: Oahu	January-92	State - Office of Planning
8	State Land Use District Boundary Review: Executive Summary, Kauai	January-92	State - Office of Planning
9	State Land Use District Boundary Review: Kauai	January-92	State - Office of Planning
10	State Land Use District Boundary Review: Executive Summary: Maui, Molokai, Lanai	January-92	State - Office of Planning
11	State Land Use District Boundary Review: Maui, Molokai, Lanai	January-92	State - Office of Planning
12	State Land Use District Boundary Review: Executive Summary, Hawaii	January-92	State - Office of Planning
13	State Land Use District Boundary Review: Hawaii	January-92	State - Office of Planning
14	DUPLICATE The General Plan of the County of Maui: 1990 Update	June-90	Maui - Department of Planning
15	DUPLICATE The General Plan of the County of Maui: 1990 Update	November-90	Maui - Department of Planning
16	Lahaina Community Plan of the County of Maui	December-83	Maui - Department of Planning
17	Kahoolawe Community Plan of County of Maui	May-95	Maui - Department of Planning
18	Kihei-Makena Community Plan: County of Maui	March-98	Maui - Department of Planning
19	DUPLICATE The General Plan of the County of Maui: 1990 Update	September-90	Maui - Department of Planning
20	Maui County Community Plan Update Program Socio-Economic Forecast Report	July-92	Maui - Department of Planning
21	DUPLICATE - General Plan 1990: County of Maui	January-90	Maui - Department of Planning
22	Maui County Community Plan Update Program Socio-Economic Forecast Report: Final Report	January-94	Maui - Department of Planning
23	DUPLICATE - Kihei-Makena Community Plan: County of Maui	March-98	Maui - Department of Planning
24	DUPLICATE Molokai Community Plan: County of Maui	January-84	Maui - Department of Planning
25	DUPLICATE - Makawao-Pukalani-Kula Community Plan: County of Maui	October-81	Maui - Department of Planning
26	DUPLICATE - Lanai Community Plan: County of Maui	April-83	Maui - Department of Planning
27	County of Hawaii General Plan Revision	December-01	Hawaii - Department of Planning
28	General Plan: City and County of Honolulu	January-92	Honolulu - Department of Planning and Permitting

29	The General Plan of the County of Maui	April-93	Maui - Department of Planning
30	Lanai Community Plan	December-98	Maui - Department of Planning
31	The Updated Wailuku-Kahului Community Plan	December-00	Maui - Department of Planning
32	DUPLICATE Kihei-Makena Community Plan	March-98	Maui - Department of Planning
33	Makawao-Pukalani-Kula Community Plan	July-96	Maui - Department of Planning
34	Paia-Haiku Community Plan	May-95	Maui - Department of Planning
35	West Maui Community Plan	February-96	Maui - Department of Planning
36	Hana Community Plan	July-94	Maui - Department of Planning
37	State Airports, Harbors and Highways	January-01	State - Office of Planning
38	Department of Water Supply: Water Quality Report for 2000	July-01	Maui - Department of Water Supply
39	The County of Hawaii Annual Report 1999-2000	June-00	Hawaii - Department of Planning
40	Department of Water Supply - County of Maui: Annual Report. Fiscal Year Ending June 30,2000.	June-00	Department of Water Supply
42	Statewide Framework for Updating the Hawaii Water Plan	February-00	Commission on Water Resource Management
43	Water Resource Planning	February-00	Commission on Water Resource Management
44	Water Resources on Oahu	January-01	Honolulu - Department of Planning and Permitting
45	Welcome to the Garden Island of Kauai - Access to Kauai County Agencies	January-00	Kauai - Department of Planning
46	Report to the Governor on the Effectiveness of the Capacity Development Strategy	July-01	Hawaii - Department of Planning
47	Water Plan 2020 - Department of Water: County of Kauai	March-01	Kauai - Department of Water Supply
48	Safe Drinking Water Query Results	April-02	Honolulu - Department of Planning and Permitting
49	Maui County: State of Hawaii	January-00	Maui - Department of Planning
50	County of Maui: Fiscal Year 2002 Budget	March-01	Maui - Department of Planning
51	County of Hawaii: 1999 - 2000 Annual Report	September-00	County of Hawaii

52	DEPARTMENT OF PARKS AND RECREATION	November-01	Honolulu - Department of Planning and Permitting
53	Honolulu Police Department 2000 Annual Report	September-00	Honolulu - Department of Planning and Permitting
54	Fiscal Year 2002 Operating Budget-Maui County	July-01	Maui - Department of Water Supply
55	Survey of Cruiseship Passengers in Hawaii-Fall 2000	March-01	State - Office of Planning
56	The Integrated Solid Waste Management Plan	January-91	State - Office of Planning
57	Hawaiian Streams: The Mauka to Makai Connection	April-02	State - Office of Planning
58	REPORT TO THE TWENTY-FIRST LEGISLATURE REGULAR SESSION OF 2002 ON PROGRESS REPORT ON EXPENDITURES AND EFFECTIVENESS OF INVASIVE SPECIES PROGRAMS FOR THE PERIOD JULY 1, 2001 TO OCTOBER 31, 2001	November-01	State - Office of Planning
59	PORT Hawaii Commercial Harbors System HANDBOOK	January-93	State - Office of Planning
61	Annual Report to the Twenty-First Legislature-Regular Session 2002/Hawaii Coastal Zone Management	December-01	State - Office of Planning
62	Hawaii Tourism Authority: 2001 Annual Report to the Hawaii State Legislature	December-01	State - Hawaii Tourism Authority
63	Joint State/County Maui Interim Transportation Plan	January-02	Maui - Department of Public Works
64	The State of Hawaii Data Book 2000: A Statistical Abstract	2001	State - Department of Business, Economic Development and Tourism
65	Long-Range Financial Plan and Solid Waste User Free Study	April-99	Honolulu - Department of Environmental Services
66	Koolaupoko: Sustainable Communities Plan	August-00	Honolulu - Department of Planning and Permitting
67	Annual Summary Hawaii Air Quality Data: 2000	January-00	State - Department of Health
68	Report to Legislature, Progress on the Study, Planning for Sustainable Tourism in Hawaii, January 2002	January-02	State - Department of Business, Economic Development and Tourism
69	DUPLICATE Draft Hawaii Statewide Transportation Plan	March-02	State - Office of Planning

70	Statewide Transportation Improvement Program: Fiscal Years 2002, 2003, and 2004	October-01	State - Office of Planning
71	Alternative Funding Mechanisms for Environmental Programs	January-02	State - Office of Planning
72	Hawaii Trail Analysis: Survey & Risk Management Data Profile	March-01	State - Department of Land and Natural Resources
74	Environmental Report Card 2001	January-01	State - Environmental Council
75	Identification of Rivers and Streams Worthy of Protection	November-01	State - Department of Land and Natural Resources
76	Potential Sources of Permanent Funding; REPORT TO THE TWENTY-FIRST LEGISLATURE REGULAR SESSION OF 2002 ON PROGRESS REPORT ON EXPENDITURES AND EFFECTIVENESS OF INVASIVE SPECIES PROGRAMS FOR THE PERIOD JULY 1, 2001 TO OCTOBER 31, 2001	January-02	State - Office of Planning
77	State Energy Resources Coordinator: Annual Report 2001	January-01	State - Department of Business, Economic Development and Tourism
78	2000 State of Hawaii: Facts and Figures	January-01	State - Department of Business, Economic Development and Tourism
79	150 Years of Aloha: Hawaii State Department of Health 2001 Annual Report	January-01	State - Department of Health
80	2001 Visitor Plant Inventory	April-02	State - Department of Business, Economic Development and Tourism
81	Task Force to Create a Master Plan for Water Quality and Flood Mitigation for Waimanalo	December-01	State - Department of Land and Natural Resources
82	What Could Hawaii Do With Teaming With Wildlife (TWW) Dollars?	January-00	Hawaii - Department of Planning
83	Relating to Watershed Protection	October-01	State - Department of Land and Natural Resources
84	Population and Economic Projections for the State of Hawaii to 2025	February-00	State - Department of Business, Economic Development and Tourism
85	Progress Report on Expenditures and Effectiveness of Invasive Species Programs	November-01	State - Department of Land and Natural Resources

86	Report to the Twenty-First Legislature Relating to Integrated Solid Waste Management	September-01	State - Department of Health
87	Annual Report to the Twenty-First Legislature Regular Session of 2002 Relating to the Forest Stewardship Program	November-01	State - Department of Land and Natural Resources
88	Analysis of Once-Per-Week Refuse Collection	April-99	Honolulu - Department of Environmental Services
89	An Inventory of Non-Native Timber Resources on Hawaii - A Supplement to the 1999 Waiakea and Hamakua Timber Inventory	January-01	State - DLNR Division of Forestry and Wildlife
90	Annual Report: Fiscal Year 1999-2000 - Public Utilities Commission	December-00	State - Public Utilities Commission
91	Hawaii Tourism Product Assessment	June-99	State - Hawaii Tourism Authority
92	Central Oahu Sustainable Communities Plan	February-02	Honolulu - Department of Planning and Permitting
93	East Honolulu Sustainable Communities Plan	April-01	Honolulu - Department of Planning and Permitting
94	Ewa Development Plan	August-97	Honolulu - Department of Planning and Permitting
95	Koolau Loa Sustainable Communities Plan	October-99	Honolulu - Department of Planning and Permitting
96	North Shore Sustainable Communities Plan	July-00	Honolulu - Department of Planning and Permitting
97	Waianae Sustainable Communities Plan	July-00	Honolulu - Department of Planning and Permitting
99	Annual Report to the Twenty-First Legislature 2001 Regular Session on Act 152 SLH 2001 (HB 2835, HD2, SD2, CD1) RELATING TO WATERSHED PROTECTION	October-02	State - DLNR Division of Forestry and Wildlife
100	Upcountry Town Center, Pukulani, Maui, Hawaii, Draft Environmental Impact Statement	April-02	Maui - Department of Planning
101	DRAFT Hawaii Statewide Transportation Plan, State of Hawaii Department of Transportation	March-02	State - Department of Transportation - Highway Division
102	Department of Transportation Annual Report 2000	January-00	State - Department of Transportation
103	Hawaii Coastal Erosion Management Plan (COEMAP)	January-00	State - Department of Land and Natural Resources

104	DRAFT Kailua Bay Advisory Council Master Plan	March-02	Kailua Bay Advisory Council
105	Final Technical Program Report	March-01	Kailua Bay Advisory Council
107	2000 Annual Visitors Research Report	2000	State - Department of Business, Economic Development and Tourism
108	ANNUAL REPORT TO THE TWENTY-FIRST LEGISLATURE REGULAR SESSION OF 2002 ON THE STATUS OF THE ISSUANCE OF INCIDENTAL TAKE LICENSES FOR ENDANGERED, THREATENED, PROPOSED, AND CANDIDATE SPECIES; AND THE CONDITION OF THE ENDANGERED SPECIES TRUST FUND	November-01	State- DLNR Division of Forestry and Wildlife
111	DUPLICATE Annual Summary Hawaii Air Quality Data	January-00	State - Department of Health (DOH)
112	Forest Inventory Information Needs Assessment for the State of Hawaii with Emphasis on the Island of Maui	April-00	USDA Forest Service
113	Observation of Asian Pollution Over Hawaii	March-01	Hawaii Institute of Geophysics and Planetology
114	Indicators of Environmental Quality	January-02	State - Department of Health (DOH)
115	Reply to ASK-AN-EARTH-SCIENTIST	January-01	Hawaii Institute of Geophysics and Planetology
117	Breathing Protection During Volcanic Air Pollution	January-02	American Lung Association
118	Maui Clean Air Coalition	December-98	Maui Clean Air Coalition
119	DUPLICATE WORLD HEALTH ORGANIZATION CITIES AND A HEALTH RESEARCH PROGRAM	March-00	City and County of Honolulu
120	What is baseline Air Quality?	January-00	Climate Monitoring and Diagnostics Laboratory
121	THE STATE OF THE AIR 2001 IN HAWAII	January-02	American Lung Association
122	Environmental Health - Clean Air Branch	January-02	State - Department of Health
123	Watershed Protection and Management Program	October-01	State - DLNR Division of Forestry and Wildlife
124	USGS Geological Survey Programs in Hawaii & the Pacific	November-96	U.S. Geological Survey
125	Rx for Hawaii's Dry Forests: It's Not Limiting Grazing	June-00	Society of American Foresters

126	The Lowland Mesic Forests	March-02	State - DLNR Division of Forestry and Wildlife
127	Final Statewide Airport System Plan	June-98	State - Department of Transportation
128	Hawaii Sea Grant College Program	May-02	County of Hawaii
129	Division of Boating and Ocean Recreation - DBEDT Sustainable Tourism Analysis	May-02	State - Department of Land and Natural Resources
130	Honolulu Fire Department Response to the DBEDT Sustainable Tourism Analysis	May-02	Honolulu - Fire Department
131	State Parks of the Islands	January-02	State - Department of Land and Natural Resources
132	Maui Invasive Species Committee (MISC) Pulling Together Initiative - 2002 Project Proposal	October-02	US Fish and Wildlife - Ecological Division
134	Impact on Alien Plants on Hawaii's Native Biota	May-98	University of Hawaii
135	Annual Report - Department of Public Works & Waste Management - 2000-2001	January-02	Maui - Department of Public Works
136	National Park Service Statistical Abstract 2001	January-02	National Park Service
137	Analysis of Renewable Portfolio Standard Options for Hawaii.	March-01	State - Department of Business, Economic Development and Tourism
139	The Eight Main Hawaiian Island and CRAMP study sites	September-00	Hawaii Institute of Marine Biology
140	Molokai Community Plan 2001	December-01	Maui - Department of Planning
141	Fiscal Year 2001 Budget	May-02	Maui - Department of Public Works
142	County of Hawaii Data Book - 2001	October-01	County of Hawaii
144	Big Island of Hawaii Flora and Fauna	January-01	Hawaii State Vacation Planner
145	Mauna Kea Silversword	January-02	National Wildlife Federation
146	Hawaii's Endangered Species	January-02	Maui - Department of Public Works
147	FY 2003 Budget	March-02	Maui - Department of Planning

148	The Hawaiian Endangered Bird Conservation Program The Hawaiian Endangered Bird Conservation The Hawaiian Endangered Bird Conservation Program Five-Year Program (2001-2005) Five-Year Workplan (2001 – 2005)	October-01	State - Department of Land and Natural Resources
149	Places We Protect - Watershed Partnerships and Preserves	January-02	The Nature Conservancy
150	The Dirty Dozen: America's Least Wanted	January-01	Nature Serve
151	The Hawaiian Ecoregion: A Crucible of Evolution	September-96	Sierra Club, Hawaii Chapter
152	Hawaii's Endangered Species	March-00	Bishop Museum
153	Water for Life: The History and Future of Water on Oahu.	January-02	Honolulu - Board of Water Supply
154	Report to the World Health Organization	March-00	City and County of Honolulu
155	Vision Projects FY2002	March-02	City and County of Honolulu
156	H3: The Island Interstate	August-93	U.S. Department of Transportation
157	Appendix for Hawaii	January-01	Surfrider Foundation
158	Oahu Water Recycling May Expand	August-01	Honolulu Star Bulletin
159	Recycling Water is Smart Thinking	August-01	Honolulu Star Bulletin
160	About Honolulu's Clean Water Program	January-02	City and County of Honolulu
161	Mayor Jeremy Harris' State of the City Address	January-02	Honolulu Advertiser
162	Recreation	January-01	Hawaii State Vacation Planner
163	Oahu in Focus	January-02	Destinations2go.com
164	Department Organization: Emergency Medical Services Division	February-97	Oahu - Department of Emergency Services
165	Finance Division	January-02	Honolulu - Police Department
166	STATE OF THE STATE ADDRESS BY GOVERNOR BENJAMIN J. CAYETANO BEFORE THE JOINT SESSION OF THE TWENTY-FIRST HAWAII STATE LEGISLATURE	January-02	State - Office of the Governor
167	STATE EMERGENCY MEDICAL SERVICES & INJURY PREVENTION SYSTEM	October-01	State - Department of Health (DOH)

168	Chapter Eco-activism	October-00	Surfrider Foundation
169	[Flood Control and Drainage] Flooding and Other Natural Hazards	December-01	County of Hawaii
170	Research Projects	September-01	State - Department of Health (DOH)
171	Addendum to the Integrated Solid Waste Management Plan for the County of Hawaii	May-02	County of Hawaii
172	Atlas of Hawaii	December-98	Juvik and Juvik
173	Place Names of Hawaii	December-76	Pukui, Elbert and Mookini
174	Hawaiian Word Processing Tools: Hawaiian Language Fonts	December-95	Guava Graphics
175	Hawaiian Dictionary: Hawaiian-English English-Hawaiian	December-86	Pukui and Elbert
177	Strategic Plan Update for Hawaii's Environmental Protection Programs	August-01	State - Department of Health
178	Hawaii Marine Life Conservation Districts	January-01	State - Department of Land and Natural Resources
179	Hawaii- Department of Aquatic Resources Agency	January-01	State - Department of Land and Natural Resources
180	Hawaii Stock Management (USDoC-NOAA)	January-01	USDoc-NOAA
181	National Marine Fisheries Honolulu Laboratory	January-01	National Marine Fisheries Service
182	Hawaiian streams: the Mauka to Makai Connection	January-01	State - Department of Land and Natural Resources
183	Alien Species in Hawaiian Streams	January-01	State - Department of Land and Natural Resources
184	Hawaii's Native Stream Animals	January-01	State - Department of Land and Natural Resources
185	Economic Analysis of Critical Habitat Designations for 76 Plants from the Islands of Kauai and Niihau	January-02	US Fish and Wildlife Service
186	Wetlands	January-01	State - Department of Business, Economic Development and Tourism
187	Company; Kawai Nui Marsh ('www.aecos.com/KOOLAU/Kawai_Nui_2.html)	January-01	Aecos, Co.
188	Hawaiian Islands Initiative	January-01	Ducks Unlimited
189	Kawa Stream TMDL Project Stream Assessment Report	January-02	Aecos, Co.
190	Kawa Stream ('www.pixi.com/~isd/KawaStr.html)	January-01	Pixi, Co.

191	County of Maui FY 2003 Budget	December-02	Maui - Mayor's Office
193	Comprehensive Annual Financial Report	June-01	County of Hawaii
194	Executive Supplemental Budget FY 2003	January-02	State of Hawaii - Department of Budget and Finance
195	Coral Reef Assessment and Monitoring Program (CRAMP) - Final Report 1998-99	January-00	Hawaii Institute of Marine Biology
196	Coral Reef Assessment and Monitoring Program (CRAMP) - Final Report 1999-2000	January-01	Hawaii Institute of Marine Biology
197	Fire Department	December-01	Hawaii - Department of Fire Control
198	DUPLICATE Department of Parks and Recreation	December-01	Hawaii - Department of Parks and Recreation
199	Police Department	December-01	Hawaii - Police Department
200	Department of Public Works	December-01	Hawaii - Department of Public Works
201	Department of Water Supply	December-01	Hawaii - Board of Water Supply
202	State of Hawaii 303(d) List of Water Quality Limited Waters - 1998	December-98	State - Department of Health
203	Learning to Live with the Dynamic Hawaiian Shoreline (http://www.soest.hawaii.edu/SEAGRANT/LiveWithTheHawaiianShoreline/index.htm)	April-02	SOEST
204	Hawaii's Most Invasive Horticultural Plants: An Introduction	May-01	State - Department of Land and Natural Resources
205	Big Island Invasive Species Committee	February-00	U.S. Geological Survey
206	Kapalua Mauka	December-01	Maui - Department of Planning
207	DUPLICATE Waikiki Beach Walk	January-02	Honolulu - Department of Planning and Permitting
208	DUPLICATE Ocean Bay Plantation	June-02	Kauai - Department of Planning
209	Voyager Submarines Hawaii Artificial Reef Installation	April-98	Hawaii - Department of Planning
210	Hawaiian Electric Company, Inc. Integrated Resource Plan 1998-2017	January-98	Hawaiian Electric Company
211	Kauai Electric 1997 Integrated Resource Plan	April-97	Kauai Electric
212	The State of Hawaii Airport Activity Statistics Calendar Year 2001	May-01	State - Department of Transportation

213	Final Supplemental Environmental Impact Statement Mauna Lani Cove Mauna Lani Resort South Kohala, Hawaii	October-90	Hawaii - Department of Planning
214	Environmental Impact Statement Kohanaiki Mauka Kohaniki, North Kona, Hawaii	October-91	Hawaii - Department of Planning
215	Final Environmental Impact Statement and Site Selection Study for the New Hanalei Middle School	May-99	Hawaii - Department of Accounting and General Services
216	Supplemental Environmental Impact Statement Kukuiula Bay Resort Kukuiula Planned Community Koloa, Kauai, Hawaii	August-98	Kauai - Department of Planning
217	Final Impact Statement Kauai Electric Lihue Energy Service Center	March-99	Kauai - Department of Planning
218	Ocean Bay Plantation at Hanamaulu; Hanamaulu, Kauai, Hawaii	June-02	Kauai - Department of Planning
219	Waikiki Development Plan Final Impact Statement	November-01	Honolulu - Department of Planning
220	Waikiki Beach Walk Waikiki, Oahu, Hawaii Final Impact Statement	January-02	Honolulu - Department of Planning
221	Final Impact Statement Voyager Submarines Hawaii Artificial Reef Installation	April-98	State - Department of Land and Natural Resources
222	Final Environmental Impact Statement for the Supplemental Waiialua-Haleiwa Wastewater Facility Plan	June-96	Honolulu - Department of Wastewater Management
223	Final Environmental Impact Statement Lanai Airport Master Plan Improvements; Lanai Airport, Lanai, Hawaii	December-90	State - Department of Transportation
224	County of Maui: Kalamaula Landfill Closure Project; Draft Environmental Impact Statement	February-93	Maui - Department of Public Works and Waste Management
225	Kihei Upcountry Maui Highway; Final Environmental Impact Statement	February-02	State - Department of Transportation
226	Kapalua Mauka; Draft Environmental Impact Statement	December-01	Maui - Department of Planning
227	Kona Civic Center Site Selection Study / Final Environmental Impact Statement	August-94	Hawaii - Department of Accounting and General Services
228	Final Environmental Impact Statement for Kohala Water Transmission System North And South Kohala Districts, Island of Hawaii	November-95	Hawaii - Board of Water Supply
229	Hawaii Energy Strategy 2000	December-00	State - Department of Business, Economic Development and Tourism
230	Hanalei Pier Reconstruction Final Environmental Impact Statement	June-90	State - Department of Land and Natural Resources
231	Hanalei Excursion Boat Staging Operations; Hanalei, Kauai; Draft Environmental Impact Statement	October-90	Kauai - Department of Planning
232	Draft Environmental Impact Statement Kapalawai, Kauai, Hawaii; Kapalawai Resort	October-99	Kauai - Department of Planning

233	Draft Environmental Impact Statement Kalamaula Residence Lots- Unit 1; Kalamaula, Molokai, Hawaii	May-95	State Department of Hawaiian Home Lands
234	Upcountry Town Center, Pukulani, Maui, Hawaii; Draft Environmental Impact Statement	April-02	Maui - Department of Planning
235	Manele Golf course and Golf Residential Project, Lanai, Hawaii; Final Environmental Impact Statement	October-91	Maui - Department of Planning
236	Kaupulehu Resort Final Environmental Impact Statement	October-94	Hawaii - Department of Planning
237	Final Environmental Impact Statement Amanresort Waikoekoe and Kanahonua, Hamakua district, Hawaii	February-94	Hawaii - Department of Planning
238	Maniniowali Residential Community North Kona, Hawaii Final Environmental Impact Statement	February-92	Hawaii - Department of Planning
239	DUPLICATE County of Hawaii Data Book	October-01	Hawaii - Department of Research and Development
240	Annual Report Fiscal Year 2000-2001	August-01	County of Hawaii
241	Primary Urban Center Development Plan	May-02	Honolulu - Department of Planning and Permitting
242	The Hawaii State Plan: Recreation	May-91	State - Department of Land and Natural Resources
243	Funds Required for Reconstruction of Park Facilities 2002-2012	January-02	Honolulu - Department of Planning and Permitting
244	World Health Organization Cities and a Health Research Program	May-02	Honolulu - Emergency Services
245	Six-Year CIP and Budget FY 2003-2008	January-02	Honolulu- Department of Budget and Finance
246	DUPLICATE County of Maui Fiscal Year 2003 Budget	September-02	Maui- Mayor's Office
247	Maui County Data Book 2001	June-01	Maui Office of Economic Development
248	Hawaii's Implementation Plan for Polluted Runoff Control	July-00	State - Department of Health
249	Public Comment Draft 2002 List of Impaired Waters in Hawaii Prepared Under Clean Water Act 303d	August-02	State - Department of Health
250	Maui County Department of Fire Control	January-01	Maui - Department of Fire Control
251	Visit Your Parks Park Guide	October-02	Honolulu Advertiser
252	2001 The State of Hawaii Data Book	2002	State - Department of Business, Economic Development and Tourism

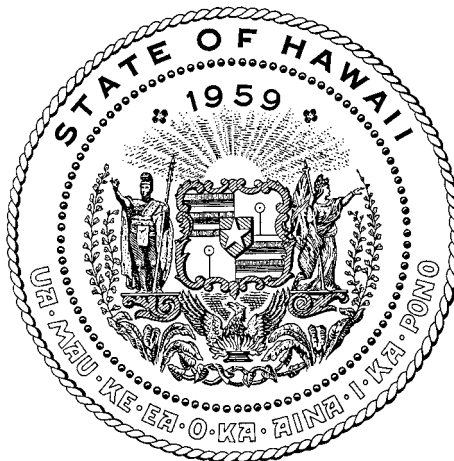
253	Transportation Plan for Oahu TOP 2025	April-01	Oahu Metropolitan Planning Organization and its Participating Agencies
254	Commission on Water Resource Management: Learn about the Water Commission- Frequently Asked Questions	January-11	State - Commission on Water Resource Management
255	The County of Hawaii Annual Report 1999-2000	January-01	Hawaii - Department of Public Works
256	The County of Hawaii Annual Report 2000-2001	January-01	Hawaii - Department of Public Works
257	Kauai Invasive Species Committee	January-02	Kauai Invasive Species Committee

ID c	FIRST NAME	LAST NAME	DATE	AGENCY
1	Deanne	Obatake	4/3/2002	Hawai'i Natural Heritage Program
2	Ben	Schlapeck	4/22/2002	State - Office of Planning
3	Fred	Pascua	4/17/2002	State - Office of Planning
4	Craig	Tasaka	4/25/2002	State - Office of Planning
5	Glen	Fukunaga	4/25/2002	State - Department of Health
6	Joan	Esposito	4/25/2002	State - Office of Planning
7	Iris	Ishida	4/23/2002	State - Office of Planning
8	Fred	Pascua	4/23/2002	State - Office of Planning
10	Fred	Pascua	4/17/2002	State - Office of Planning
11	Ron	Michols	4/13/2002	State - Office of Planning
12	Karen	Tanoie	4/13/2002	State - Office of Planning
13	Lisa	N/A	4/13/2002	Hawaii - Department of Planning
14	Eileen	n/a	4/16/2002	State - Office of Planning
15	Cathy	Tam	4/16/2002	State - Office of Planning
16	Chris	Kam	4/17/2002	State - Office of Planning
17	Stan / Shirley	n/a	4/13/2002	State - Office of Planning
18	Jeff	Hull	4/13/2002	State - Office of Planning
19	n/a	n/a	4/17/2002	State - Office of Planning
20	Glenn	Yasui	4/1/2002	State - Office of Planning
22	Steve	Kyono	4/1/2002	State - Office of Planning
23	Richard	Soo	5/3/2002	Oahu -Fire Department
25	Daniel	Quinn	6/4/2002	State - Office of Planning
26	Ian	Birnie	5/7/2002	State - Hawaii Tourism Authority
27	Thomas	Cunningham	5/7/2002	State - Hawaii Tourism Authority
28	Robert	Crowell	5/7/2002	Kauai - Department of Transportation - Harbor Division
29	David	Goode	5/7/2002	Maui - Department of Public Works
30	David	Craddick	5/7/2002	Oahu - Department of Water Supply
31	William	Balfour	4/30/2002	Oahu - Department of Parks and Recreation
32	Linnel	Nishioka	5/7/2002	Commission on Water Resource Management
33	Clifford	Jamile	5/7/2002	Oahu - Department of Water Supply
34	Barry	Kim	4/30/2002	Oahu - Department of Transportation - Harbor Division
35	Lee	Donohue	5/7/2002	Oahu -Police Department
36	Salvatore	Lanzilotti	5/7/2002	Oahu - Department of Emergency Services
37	Attilio	Leonardi	5/7/2002	Oahu - Fire Department
38	Thomas	Phillips	5/7/2002	Police Department
39	Jeffrey	Bearman	5/7/2002	Hawaii - Small Boat Harbors
40	Vaughan	Tyndzik	5/7/2002	Kauai - Small Boat Harbors
41	Charles	Penque	5/7/2002	Maui - Small Boat Harbors
42	Clayton	Ishikawa	5/7/2002	Maui - Department of Fire Control

43	Glenn	Yasui	4/30/2002	State - Department of Transportation - Highway Division
44	N/A	N/A	4/30/2002	Hawaii - Board of Water Supply
45	David	Sproat	4/30/2002	Kauai - Department of Fire Control
46	George	Fretias	4/30/2002	Kauai - Department of Fire Control
47	Dely	Sasaki	4/30/2002	State - Department of Health (DOH)
48	Darryl	Oliveira	4/30/2002	Hawaii - Department of Fire Control
50	Curt	Murimoto	5/7/2002	Maui - Department of Emergency Service
51	Mason	Young	5/7/2002	Oahu - Small Boat Harbors
52	Kevin	N/A	5/7/2002	Hawaii - Board of Water Supply
53	Fred	Nunes	5/7/2002	Oahu - Department of Transportation - Harbor Division
54	n/a	n/a	5/7/2002	Oahu - Department of Environmental Services
55	Tim	Houghton	5/7/2002	Division of Environmental Quality
56	Kenneth	Kaneshiro	5/7/2002	Natural Resources Conservation Service
57	Gary	Barbano	5/7/2002	National Park Service
58	Rae	Loui	5/7/2002	Department of Design and Construction
59	n/a	n/a	5/7/2002	Fish and Wildlife - Ecological Division
60	David	Helweg	5/7/2002	U.S. Geological Survey
61	Jill	N/A	5/7/2002	U.S. Geological Survey
62	Lorean	n/a	5/7/2002	U.S. Geological Survey
63	Charlene	N/A	5/7/2002	U.S. Geological Survey
64	Wendy	n/a	5/7/2002	National Marine Fisheries Service
65	Jim	Maskrey	5/13/2002	Hawaiian Electric Company
66	Hans	?	5/10/2002	National Weather Service
68	Pearlyn	Fukuba	5/8/2002	State - Department of Land and Natural Resources
69	Melia	Lane-Kamahele	5/21/2002	National Park Service
70	Sandra	Kirschenbaum	5/16/2002	State - Department of Transportation
71	Jack	Liu	5/20/2002	Division of Environmental Quality
72	Lowell	Chun	5/14/2002	Honolulu - Department of Planning and Permitting
73	Brian	Miskae	5/14/2002	Maui - Department of Planning
74	Tim	Blume	5/14/2002	Kauai Electric
75	Joyce	Mitsunaga	6/4/2002	Department of Parks and Recreation
76	Nancy	Murphy	5/21/2002	Hawaii - Small Boat Harbors
77	Michael	Buck	5/22/2002	State - DLNR Division of Forestry and Wildlife
78	Glenn	Taguchi	6/4/2002	State - DLNR Division of State Parks
79	Gareth	Sakakida	5/10/2002	Hawaii Transportation Association
80	Steven	Levins	5/10/2002	Department of Taxation
81	Linda	Cantorna	5/21/2002	Department of Taxation
82	Carol	Shay	5/21/2002	Maui - Small Boat Harbors
83	Phillip	Ohta	6/5/2002	State - DLNR Division of State Parks
84	Paul Scotty	Paiva	5/2/2002	Fire Department

85	Jerry	Matsuda	5/7/2002	Department of Transportation - Airport Division
86	Bob	Hobdy	6/5/2002	State - DLNR Division of Forestry and Wildlife
87	George	Kuo	4/30/2002	Hawaii - Board of Water Supply
88	Jon	Griffin	6/5/2002	State - DLNR Division of Forestry and Wildlife
90	John	Rooney	6/10/2002	Coastal Geology Group
91	James	Correa	4/30/2002	Police Department
92	Lenay	Lijima	6/26/2002	Department of Health
93	Glenn	Soma	7/2/2002	Oahu - Department of Transportation - Harbor Division
94	Brian	Minaai	5/30/2002	State - Department of Transportation
95	Neil	Reimer	7/5/2002	State of Hawaii - Department of Agriculture
96	Greer	Prince	7/22/2002	Maui - Police Department
97	Glenn	Miyao	7/9/2002	Hawaii - Department of Parks and Recreation
99	Bill	Medeiros	6/30/2002	Maui - Department of Planning
100	Gary	Hashiro	8/20/2002	Hawaiian Electric, Inc.
101	Steve	Alber	8/20/2002	State - Department of Business, Economic Development and Tourism
102	Peter	Boucher	8/1/2002	Hawaii - Department of Public Works
103	Greer	Prince	7/23/2002	Maui Police
104	Shannon	MacElvaney	7/1/2002	Hawaii Natural Heritage

Budget in Brief



Executive Supplemental Budget FY 2003

Prepared by the Department of Budget and Finance
January, 2002

The Capital Improvements Budget

Department Summaries
And Highlights

**DEPARTMENT OF HAWAIIAN HOME LANDS
(CIP Budget)**

Funding Sources:	<u>Current FY 03 Appropriation</u>	<u>Supplemental Budget Request</u>	<u>Lapses</u>	<u>Recommended FY 03 Apprn.</u>
General Obligation Bonds		32,000,000		32,000,000
Total Requirements		<u>32,000,000</u>		<u>32,000,000</u>

Highlights of supplemental CIP request:

1. Provides \$3,000,000 in general obligation bonds for Anahola Drainage Improvement, Phase 2
2. Provides \$2,000,000 in general obligation bonds for exploratory wells statewide
3. Provides \$2,000,000 in general obligation bonds for Kawaihae 1.0 million gallon water tank
4. Provides \$5,000,000 in general obligation bonds for Kawaihae water system.
5. Provides \$3,000,000 in general obligation bonds for Panaewa Unit 6 residential development
6. Provides \$1,500,000 in general obligation bonds for Molokai water project, phase 4
7. Provides \$3,000,000 in general obligation bonds for Papakolea Drainage Improvements, Phase 2
8. Provides \$5,000,000 in general obligation bonds for Waimea Paauilo watershed project.

**DEPARTMENT OF LAND AND NATURAL RESOURCES
(CIP Budget)**

Funding Sources:	<u>Current FY 03 Appropriation</u>	<u>Supplemental Budget Request</u>	<u>Lapses</u>	<u>Recommended FY 03 Apprn.</u>
General Obligation Bonds	11,481,000	32,093,000	(400,000)	43,174,000
Federal Funds	2,375,000	375,000		2,750,000
Special Funds	755,000	8,650,000		9,405,000
Reimbursable General Obligation Bonds	2,600,000			2,600,000
Revenue Bond Funds	2,000,000		(2,000,000)	0
Total Requirements	19,211,000	41,118,000	(2,400,000)	57,929,000

Highlights of supplemental CIP request:

1. Provides \$1,754,000 in general obligation bond funds for deep monitor wells at Wailuku, Maui (\$628,000), Pearl Harbor, Oahu (\$606,000), and Waimalu, Oahu (\$520,000).
2. Provides \$1,580,000 in general obligation bond funds to replace Floating Dock F at the Ala Wai Boat Harbor and \$600,000 for the Kailua Kona Wharf Improvements.
3. Provides \$600,000 in general obligation bond funds for the Puuanahulu Game Management Area, Hawaii, water system.
4. Provides \$1,000,000 in general obligation bond funds for the Kakaako Pumping Station Renovation, Oahu.
5. Provides \$700,000 in general obligation bond funds for the Hapuna State Recreation Area, Hawaii, construction of roadway, parking lot, and vehicle barriers.
6. Provides \$580,000 in general obligation bond funds for the Palaaau State Park, Molokai, reconstruction of park facilities.
7. Provides \$580,000 in general obligation bond funds for the Kokee/Waimea Canyon, Kauai, water exploration and possible drilling for a well.
8. Provides \$900,000 in general obligation bond funds for the Kokee State Park, Kauai, reconstruction of park roadway and parking lots.
9. Provides \$700,000 in general obligation bond funds for the Sand Island State Recreation Area, Oahu, to demolish unsafe park facilities, construct new pavilions, and install park furniture.
10. Provides \$600,000 in general obligation bond funds for the Malaekahana State Recreation Area, Oahu, to pave parking areas and install security lighting and gates.
11. Provides \$500,000 in special funds for Drainage Improvements at Waimanalo, Oahu, to construct a concrete culvert drainage outfall pipe.

**DEPARTMENT OF LAND AND NATURAL RESOURCES
(CIP Budget)**

12. Provides \$500,000 in special funds for Planning for the Development of State Lands, Statewide.
13. Provides special funds of \$1,400,000 for the Kalihi Stream Dredging, Oahu and \$4,600,000 for the Moanalua Stream Dredging, Oahu, projects.
14. Provides \$500,000 in special funds for the Waikiki Beach Environmental Impact Statement, Oahu, to restore and improve portions of the beach.
15. Provides \$650,000 in special funds for the Beach Maintenance Project, Waikiki, Oahu, to pump 20,000 cubic yards of sand onto Waikiki Beach.
16. Provides \$1,225,000 in general obligation bond funds for the Kaimuki Well Development, Oahu, to develop an exploratory well to provide non-potable water for landscape irrigation for various State facilities in the Diamond Head area.
17. Provides \$2,000,000 in general obligation bond funds for the East Maui Water Environmental Impact Statement, Maui, to issue water licenses in the East Maui watershed.
18. Provides \$14,250,000 in general obligation bond funds for the Waimanalo Wastewater Treatment Plant Improvements, Oahu, to bring the plant up to Department of Health water quality standards.

Highlights of lapses:

1. Lapses \$400,000 in general obligation bond funds for the Waimanalo Wastewater Treatment Plant Improvements, oahu.

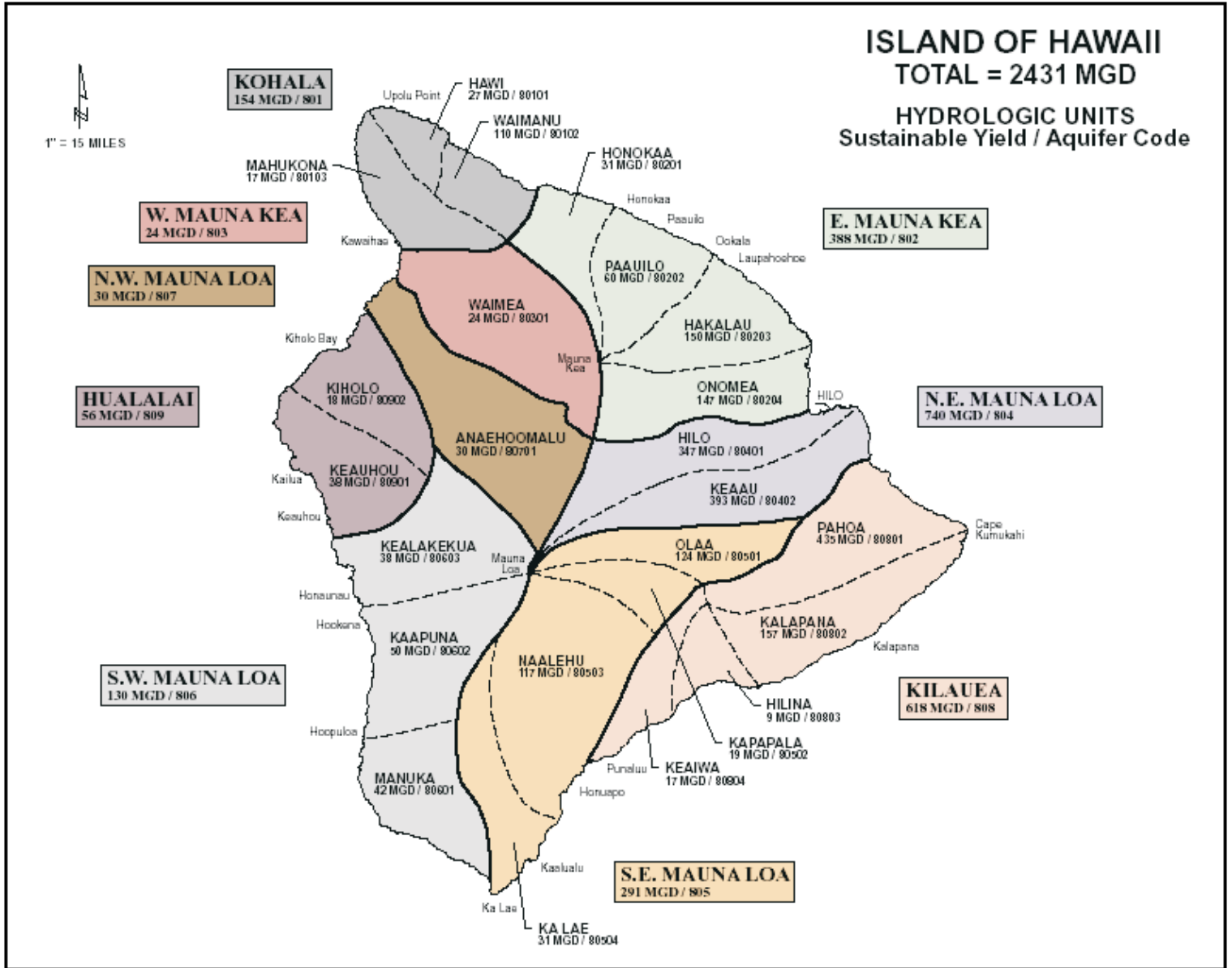
**DEPARTMENT OF TRANSPORTATION
(CIP Budget)**

Funding Sources:	<u>Current FY 03 Appropriation</u>	<u>Supplemental Budget Request</u>	<u>Lapses</u>	<u>Recommended FY 03 Apprn.</u>
Special Funds	47,825,000	95,992,000		143,817,000
Revenue Bond	32,420,000	37,305,000		69,725,000
Other Funds		100,000		100,000
Federal Funds	30,665,000	153,845,000		184,510,000
Total Requirements	110,910,000	287,242,000		398,152,000

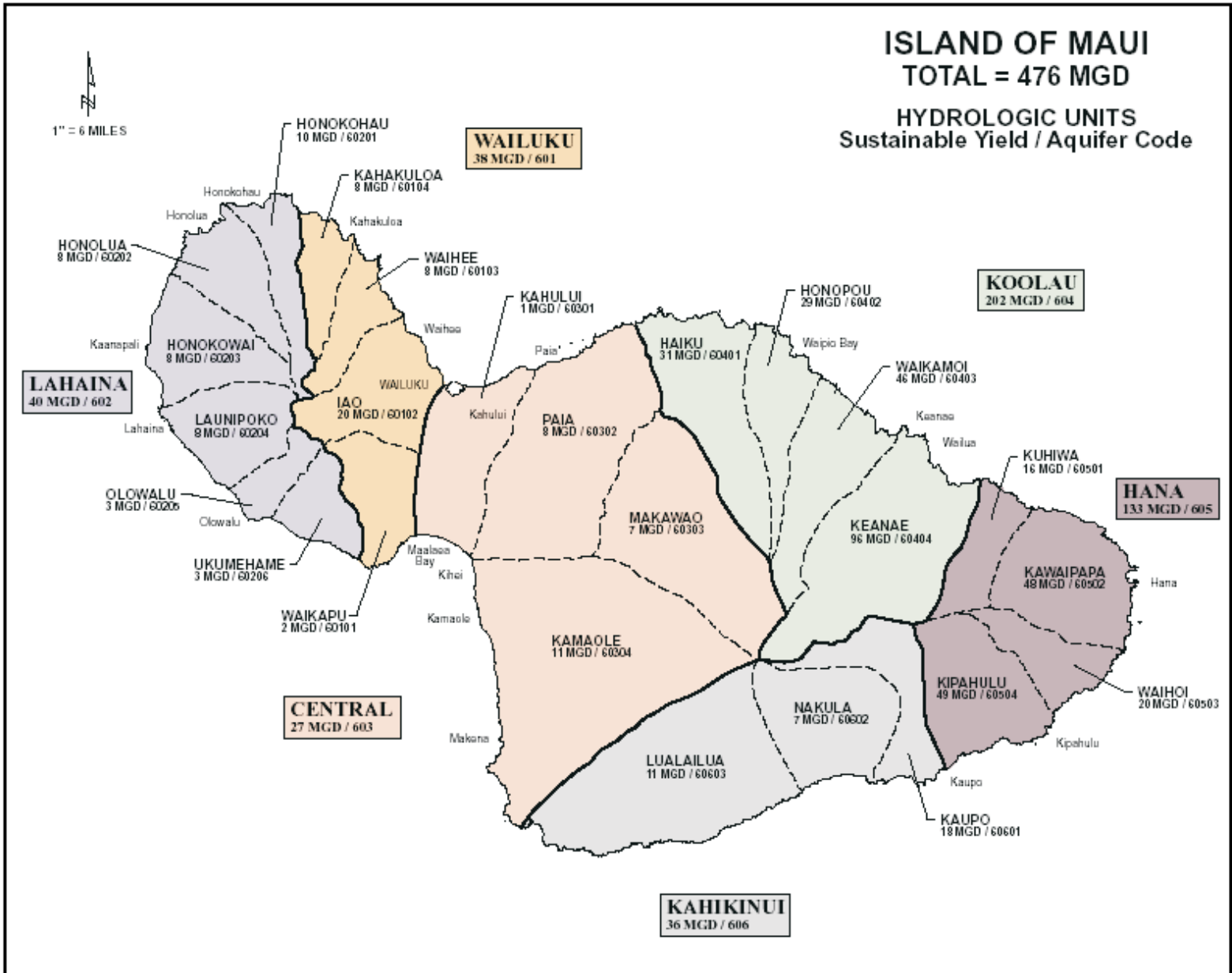
Highlights of supplemental CIP request:

1. Provides \$139,902,000 in special and federal funds for airport security statewide
2. Provides \$3,000,000 in special funds for Environmental Remediation for Harbors statewide
3. Provides \$12,750,000 in special funds for Ferry Terminal Improvements statewide
4. Provides \$2,000,000 in revenue bonds for Hana Highway Rock Mitigation.
5. Provides \$30,500,000 in revenue bonds and federal funds for Puunene Ave/Mokulele Highway Widening
6. Provides \$2,750,000 in revenue bonds for Fort Weaver Road Widening.
7. Provides \$2,500,000 in revenue bonds for Temporary Kapaa Bypass Road
8. Provides \$25,000,000 in revenue bonds for Interstate Route H-1 Widening Waiawa to Halawa

The map below outlines the hydrologic units or aquifers for Hawaii Island, it displays their yeilds and aquifer code.



The map below outlines the hydrologic units or aquifers for the island of Maui, it displays their yields and aquifer code.

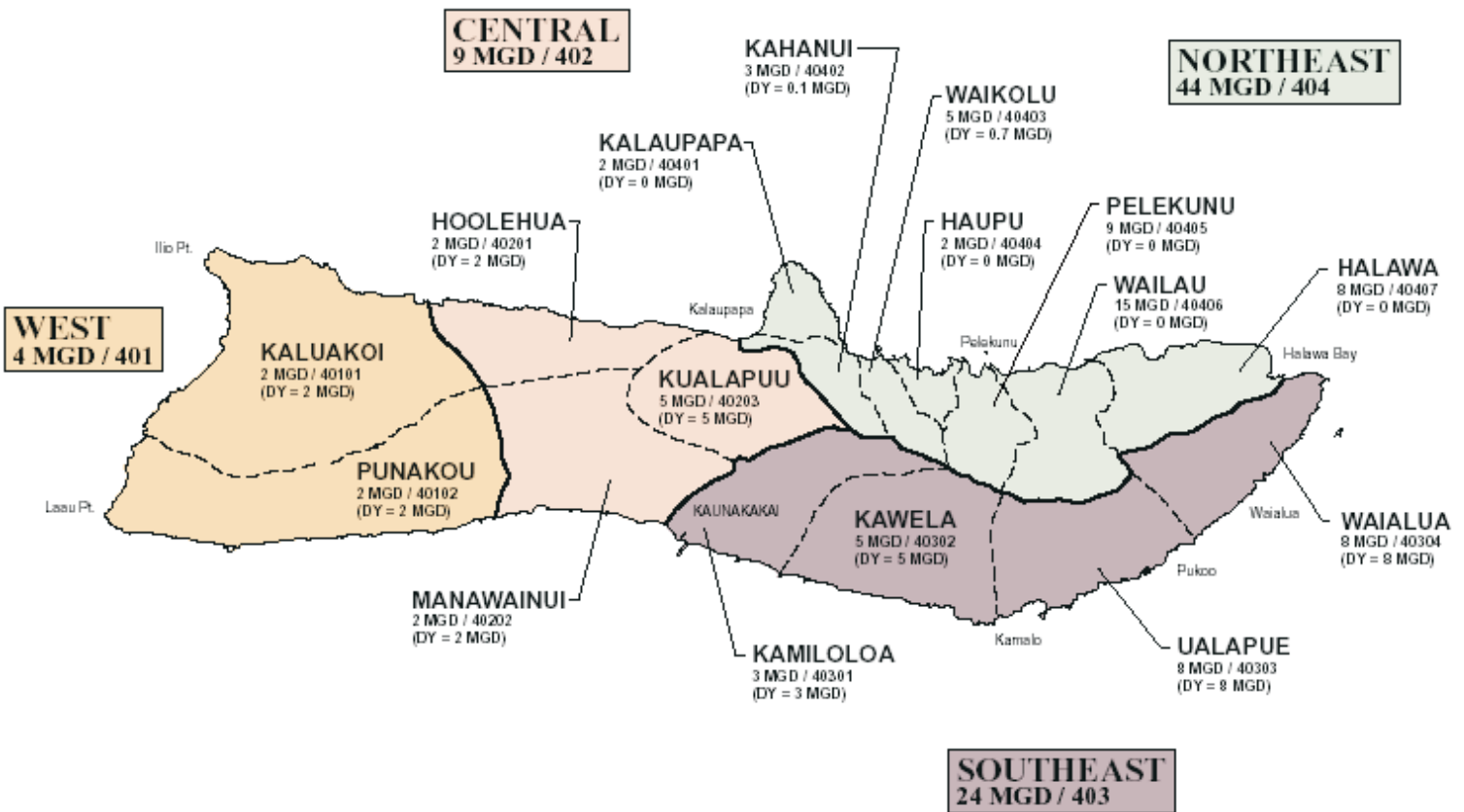




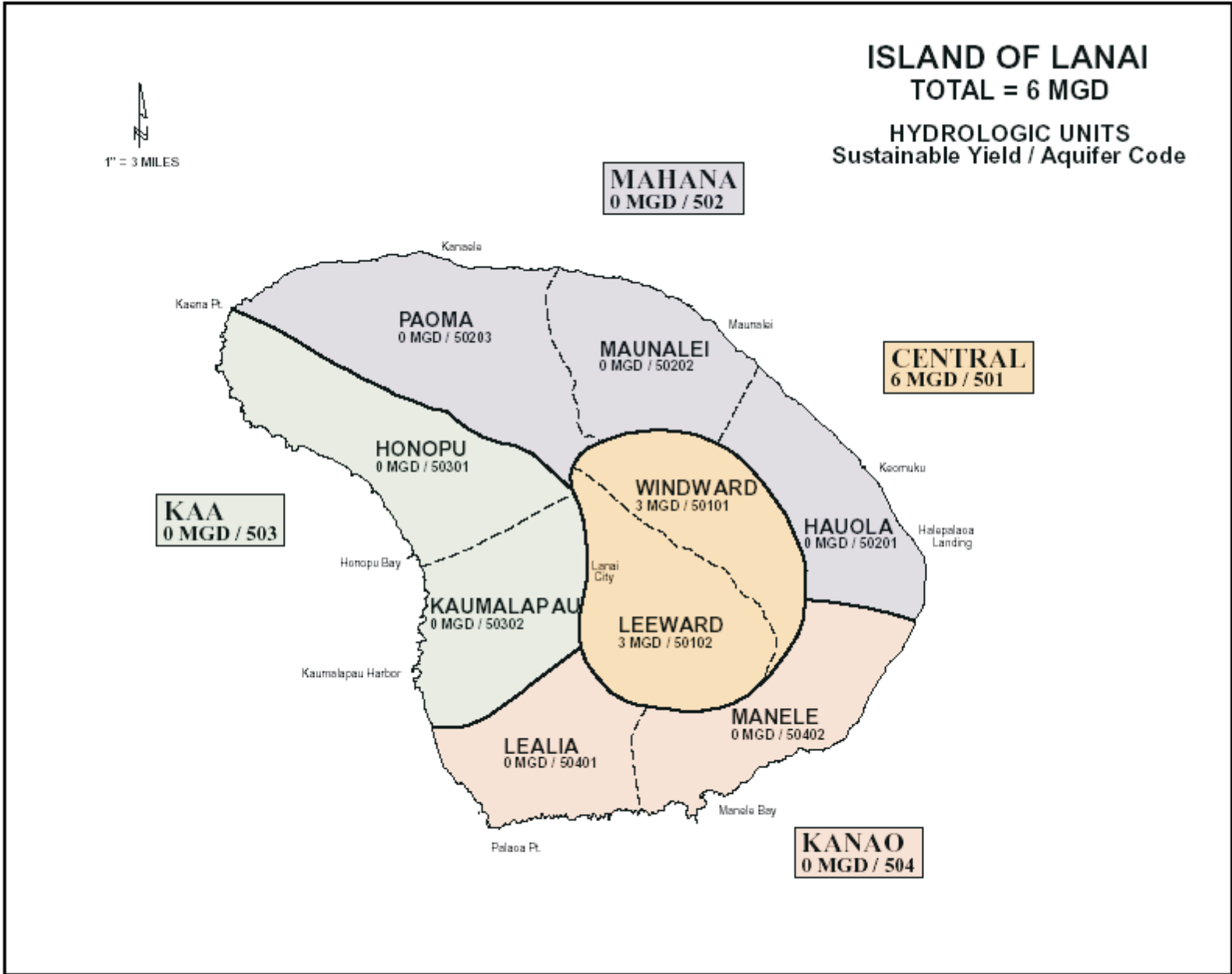
ISLAND OF MOLOKAI

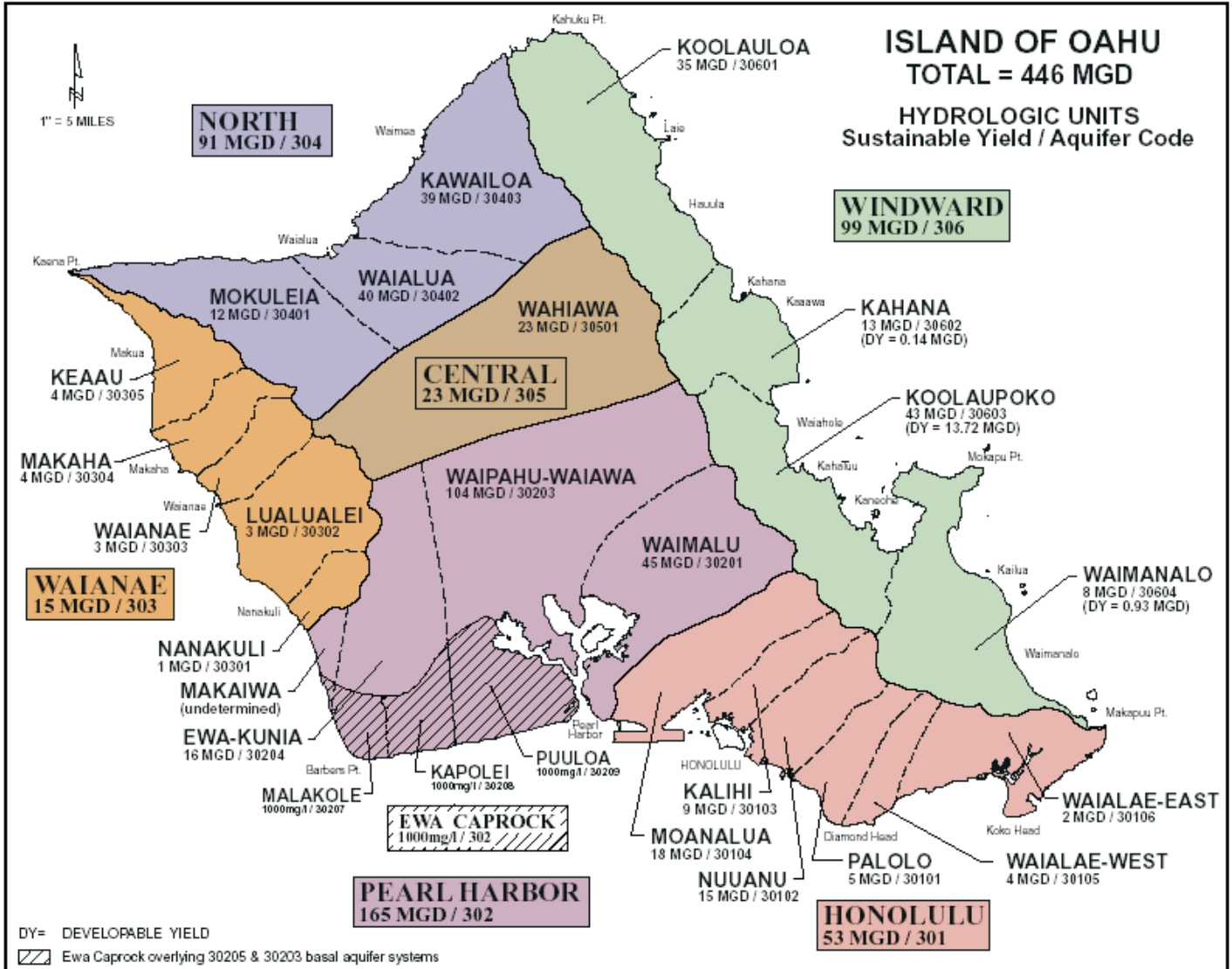
TOTAL SY = 81 MGD
TOTAL SY = 38 MGD

HYDROLOGIC UNITS
Sustainable Yield / Aquifer Code

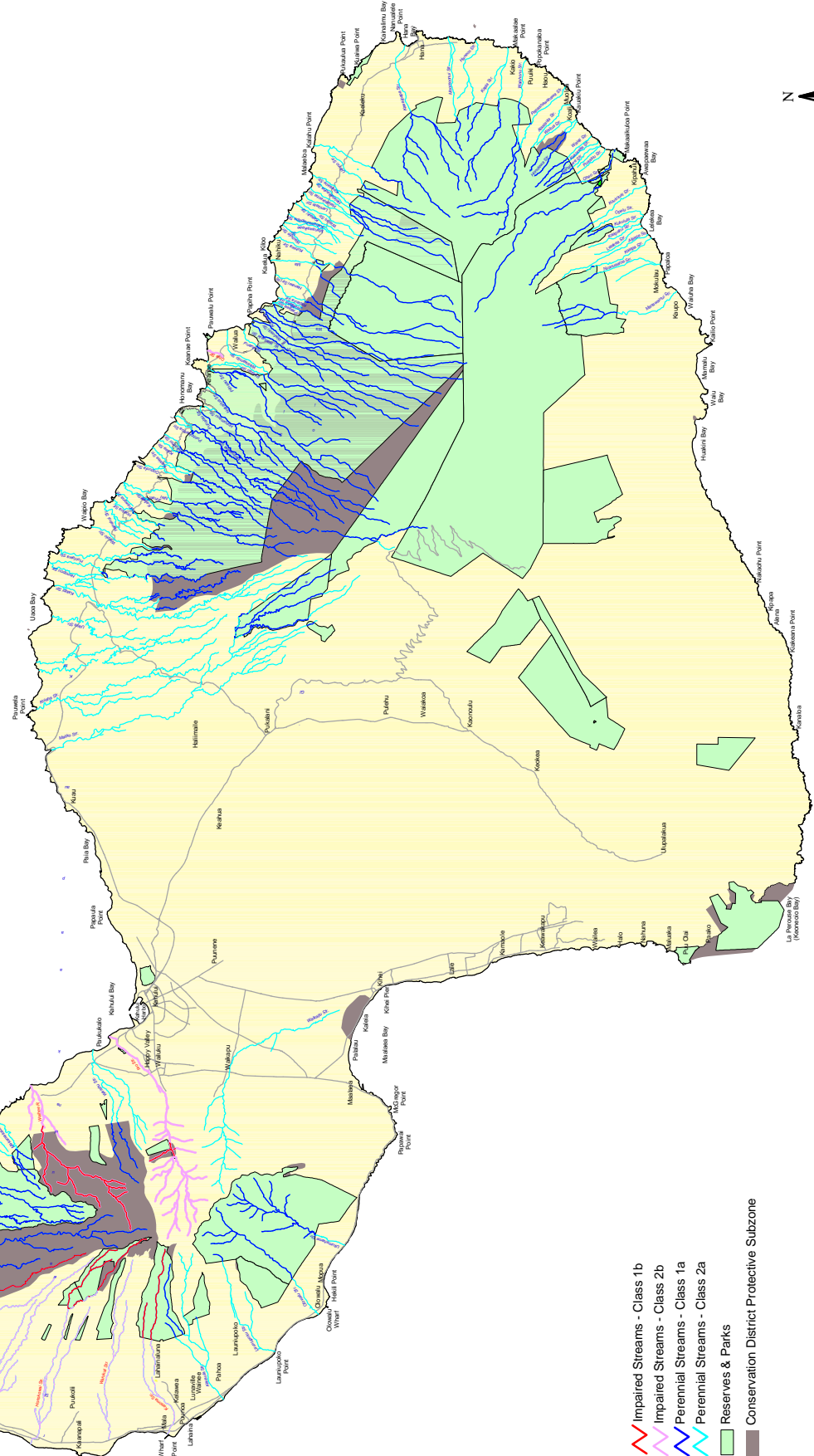


DY= DEVELOPABLE YIELD





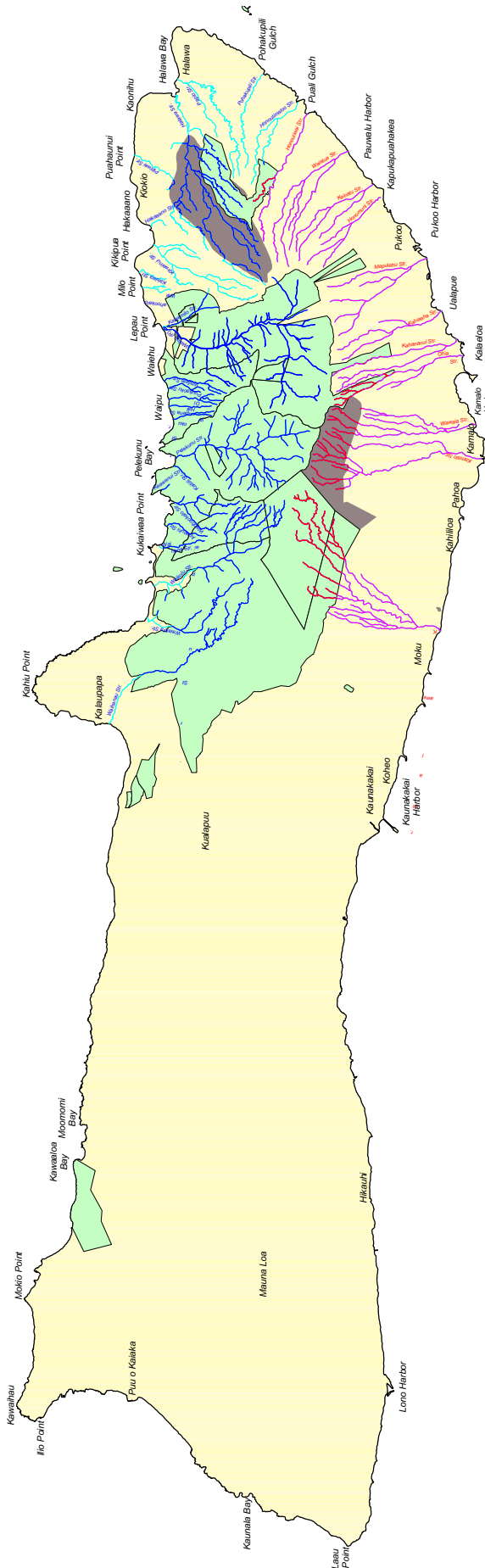
Island of Maui Perennial Stream Classification Map (July 2002)



- Impaired Streams - Class 1b
- Impaired Streams - Class 2b
- Perennial Streams - Class 1a
- Perennial Streams - Class 2a
- Reserves & Parks
- Conservation District Protective Subzone



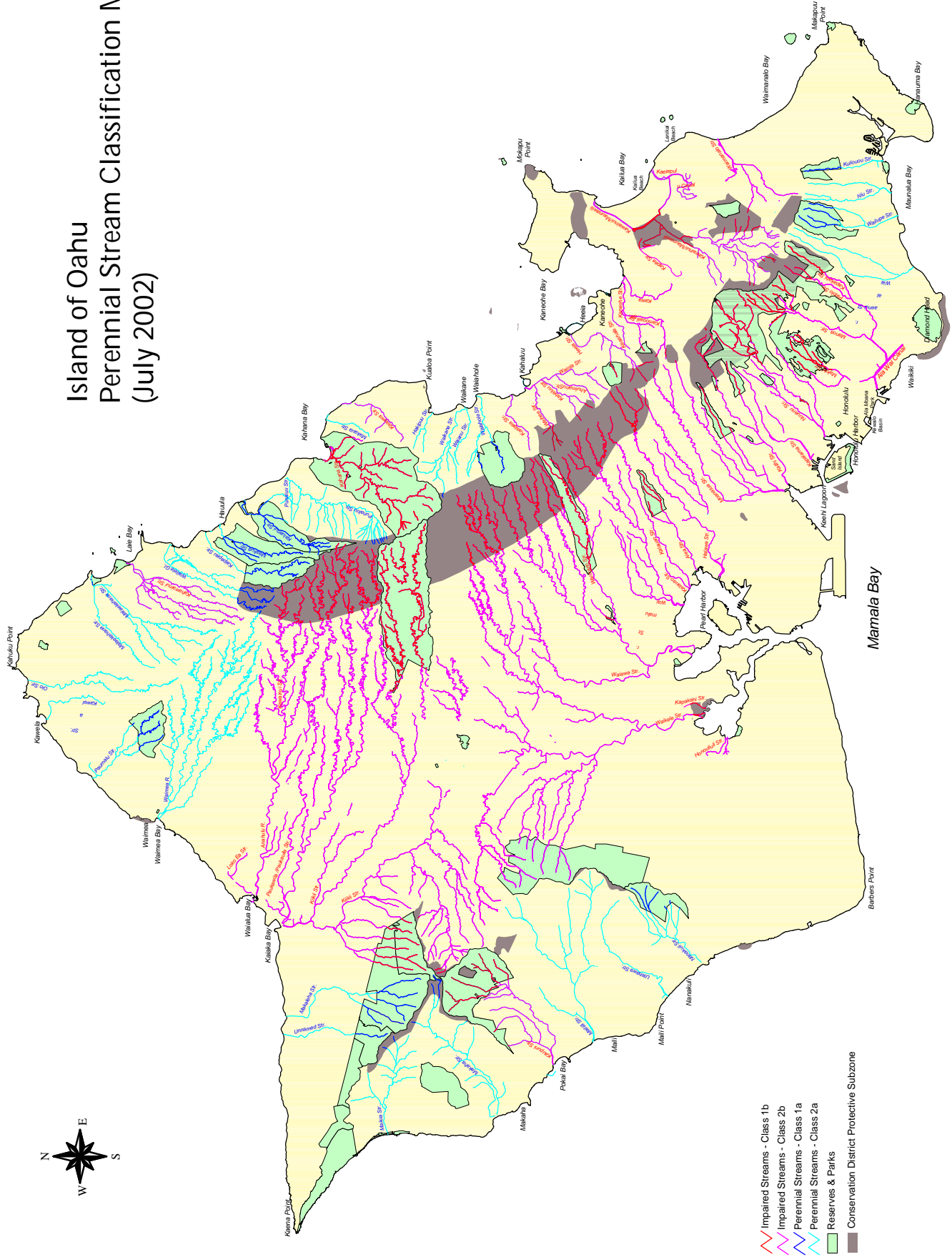
Island of Molokai Perennial Stream Classification Map (July 2002)



- / Impaired Streams - Class 1b
- / Impaired Streams - Class 2b
- / Perennial Streams - Class 1a
- / Perennial Streams - Class 2a
- Reserves & Parks
- Conservation District Protective Subzone



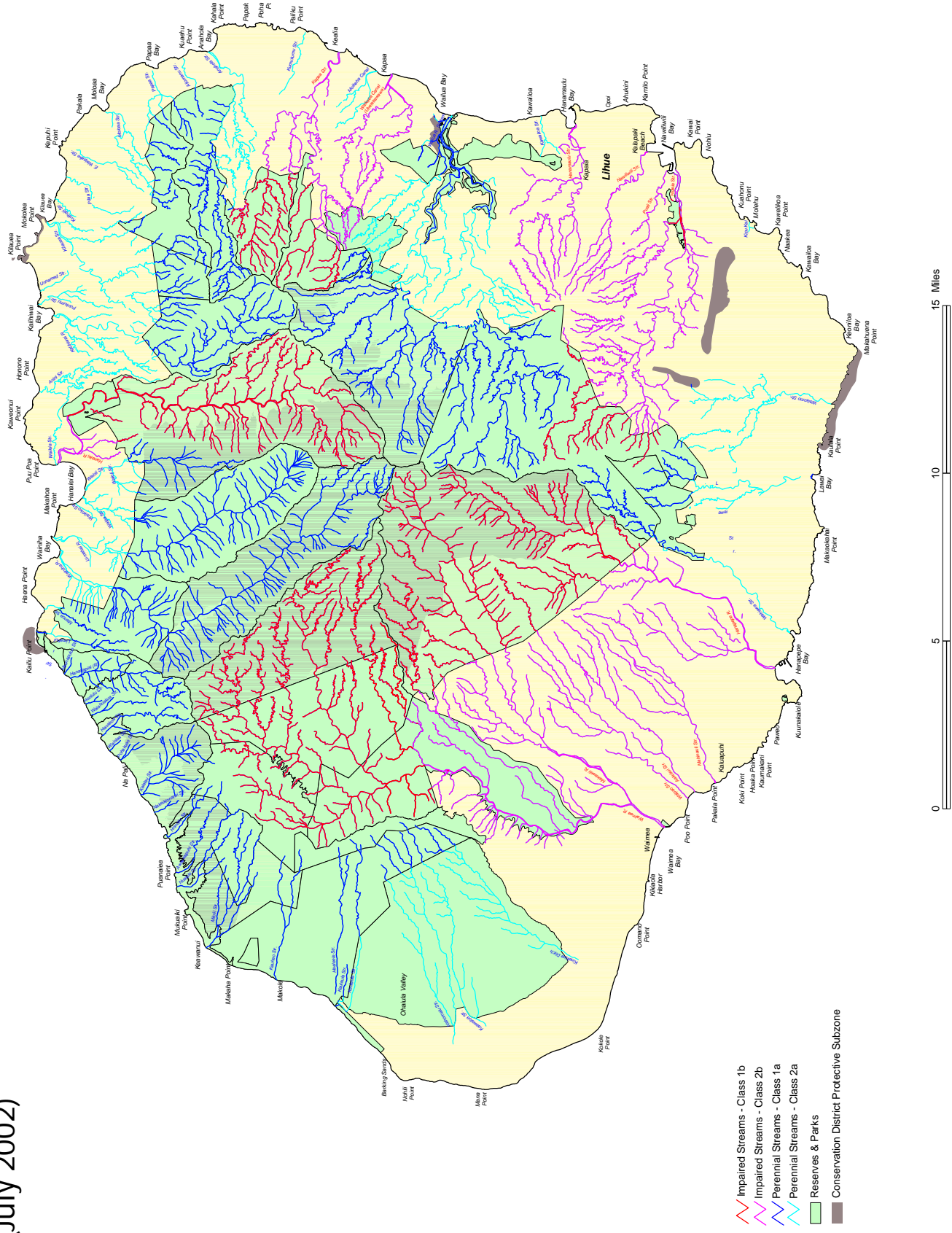
Island of Oahu Perennial Stream Classification Map (July 2002)



- Impaired Streams - Class 1b
- Impaired Streams - Class 2b
- Perennial Streams - Class 1a
- Perennial Streams - Class 2a
- Reserves & Parks
- Conservation District Protective Subzone



Island of Kauai Perennial Stream Classification Map (July 2002)



- / Impaired Streams - Class 1b
- / Impaired Streams - Class 2b
- / Perennial Streams - Class 1a
- / Perennial Streams - Class 2a
- Reserves & Parks
- Conservation District Protective Subzone

Trailname	Length	Mapno
Ala Kahakai Trail (Kawaihae-Puako)	1643.73	1
Ala Kahakai Trail (Kawaihae-Puako)	4866.38	1
Ala Kahakai Trail (Makaiwa-Anaehoomalu)	2710.70	1
Ala Kahakai Trail (Makaiwa-Anaehoomalu)	3809.72	1
Ala Kahakai Trail (Puako-Makaiwa)	6877.77	1
Awaawapuhi Trail	4442.87	1
Awalua-Kahue Coastal Trail	6434.06	1
Maunahui-Makakupaia Access Road	17707.32	1
Maunahui-Makakupaia Access Road	4612.61	1
Maunahui-Makakupaia Trail	4698.90	1
Mokuleia-Kuaokala Firebreak Access Road	9912.54	1
Mokuleia-Kuaokala Firebreak Access Road	3555.62	1
Waihee Ridge Trail	2823.92	1
Kaiolohia-Kahue Coastal Trail	4748.46	2
Keauhou-Napoopoo Trail	11103.67	2
Kuaokala Trail	4083.91	2
Lahaina Pali Trail	7273.77	2
Nualolo Cliff Trail	3787.93	2
Kealia Access Road and Trail	3832.08	3
Keomuku Trail	7409.80	3
Nualolo Trail	658.54	3
Nualolo Trail	4528.17	3
Pololu Trail	1140.03	3
Waihou Spring Trail	753.14	3
Waihou Spring Trail	643.37	3
Waihou Spring Trail	267.89	3
Lanai Fisherman Trail	2754.80	4
Milolii Ridge Road	3848.98	4
Mokuleia Trail	4006.55	4
Muliwai Trail	9313.60	4
Waiakoa Trail	8434.22	4
Mauna Kea Hunters Road	2408.23	5
Mauna Kea Hunters Road	2443.16	5
Mauna Kea Hunters Road	2450.94	5
Mauna Kea Hunters Road	4751.78	5
Mauna Kea Hunters Road	4817.23	5
Mauna Kea Hunters Road	4459.66	5
Mauna Kea Hunters Road	3963.54	5
Mauna Kea Hunters Road	1910.10	5
Mauna Kea Hunters Road	463.60	5
Mauna Kea Hunters Road	3988.49	5
Mauna Kea Hunters Road	2482.57	5
Mauna Kea Hunters Road	2273.05	5
Mauna Kea Hunters Road	2569.97	5
Mauna Kea Hunters Road	2533.98	5
Mauna Kea Hunters Road	2529.93	5
Mauna Kea Hunters Road	2352.56	5
Mauna Kea Hunters Road	2282.75	5
Mauna Kea Hunters Road	2324.59	5

Mauna Kea Hunters Road	699.23	5
Mauna Kea Hunters Road (Puu Laau Rd.)	2212.46	5
Mauna Kea Hunters Road (Puu Laau Rd.)	2461.27	5
Mauna Kea Hunters Road (Puu Laau Rd.)	2230.65	5
Milolii Ridge Trail	3718.06	5
Mokuleia Forest Reserve Access Road	5681.99	5
Waiakoa Loop	2090.98	5
Waiakoa Loop	1719.87	5
Waiakoa Loop	1180.92	5
Boundary Trail	5183.72	6
Humuula Trail	8445.71	6
Kaunala Trail	3101.99	6
Makaha Road	5646.49	6
Hauula Loop Trail	513.91	7
Hauula Loop Trail	1050.73	7
Hauula Loop Trail	1161.81	7
Hauula Loop Trail	315.19	7
Hauula Loop Trail	161.89	7
Kaluakauka Trail	226.40	7
Pine Forest Drive	1933.85	7
Waiohuli Trail	1868.19	7
Maakua Gulch Trail	2519.38	8
Makaha Arboretum Road	1597.42	8
Onomea Donkey Trail	375.62	8
Onomea Old Government Road	307.24	8
Tie Trail	570.25	8
Kauhao Ridge Road	2946.59	9
Kauhao Ridge Road	5006.46	9
Maakua Ridge Trail	3975.70	9
Plum Trail	2050.37	9
Puna Trail	3944.71	9
Haleakala Ridge Trail	1433.55	10
Kaaweiki Road	7166.97	10
Poamoho Access Road and Trail	6234.43	10
Puu Huluhulu Trail	375.79	10
Puu Huluhulu Trail	687.32	10
Mauna Loa Observatory Road	17471.05	11
Mauna Loa Observatory Road	10307.15	11
Polihale Ridge Road	651.76	11
Polihale Ridge Road	4915.79	11
Polihale Ridge Road	125.85	11
Polihale Ridge Road	1945.61	11
Polipoli Trail	835.74	11
Schofield-Waikane Trail	5866.11	11
Haeleele Ridge Road	2377.01	12
Haeleele Ridge Road	587.96	12
Haeleele Ridge Road	1519.75	12
Haeleele Ridge Road	5344.81	12
Manana Trail	7103.68	12
Puu Oo Horse Trail	5696.39	12

Puu Oo Horse Trail	2953.48	12
Puu Oo Horse Trail	2640.01	12
Redwood Trail	2040.23	12
Kaumana Trail	3451.13	13
Lapa Ridge Road and Loop	178.37	13
Lapa Ridge Road and Loop	1686.45	13
Lapa Ridge Road and Loop	834.64	13
Lapa Ridge Road and Loop	1462.00	13
Lower Waimano Trail	1288.06	13
Mamane Trail	1866.20	13
Upper Waimano Trail	9319.58	13
Waimano Trail Access	1257.32	13
Aihualama Trail	1864.52	14
Ainapo Trail	12306.00	14
Ainapo Trail	8097.22	14
Ainapo Trail Access Road	8802.19	14
Judd Memorial Loop Trail	1330.80	14
Kanealole Trail	1170.32	14
Kolowalu Trail	1645.49	14
Makiki Valley Trail	1514.37	14
Makiki Valley Trail	93.18	14
Makiki Valley Trail	83.52	14
Makiki Valley Trail	349.63	14
Manoa Cliff Trail	2328.11	14
Manoa Cliff Trail	156.35	14
Manoa Cliff Trail	2121.08	14
Manoa Falls Trail	1157.44	14
Maunalaha Trail	1219.99	14
Moleka Trail	980.49	14
Nahuina Trail	849.96	14
Nuuanu Trail	2486.51	14
Papaalai Road	10129.18	14
Papaalai Road	503.04	14
Papaalai Road	932.59	14
Papaalai Road	1166.61	14
Pauoa Flats Trail	1161.34	14
Puu Ohia Trail	1349.37	14
Puu Pia Trail	1086.46	14
Skyline Road	9048.63	14
Skyline Road	1660.63	14
Tantalus Arboretum Trail	288.00	14
Ualakaa Trail	686.31	14
Ualakaa Trail	203.70	14
Waahila Ridge Trail	2343.45	14
Contour Road	8062.28	15
Maunawili Falls Trail	866.11	15
Waikamoi Ridge Trail	348.99	15
Waikamoi Ridge Trail	626.95	15
Keanae Arboretum Walk	906.99	16
Maunawili Trail	8657.84	16

Maunawili Trail	2329.24	16
Maunawili Trail Pali Access	208.57	16
Pihea Trail	5434.08	16
Alakai Swamp Trail	5364.56	17
Ke Alaloe O Maui (Hoapili Trail)	8776.43	17
Ke Alaloe O Maui (Hoapili Trail)	9365.72	17
Ke Alaloe O Maui (Hoapili Trail)	4904.90	17
Ke Alaloe O Maui (Piilani Trail)	6802.78	17
Ke Alaloe O Maui (Piilani Trail)	5891.38	17
Ke Alaloe O Maui (Piilani Trail)	2129.85	17
Ke Alaloe O Maui (Piilani Trail)	4628.52	17
Maunawili Ditch Trail	3443.28	17
Kawaikoi Stream Trail	2350.74	18
Maunawili-Waimanalo Access Road	1324.38	18
Kaiwa Ridge Trail	1259.93	19
Mohihi-Camp 10 Road	9064.23	19
Poomau Canyon Vista Trail	357.06	20
Wiliwilinui Access Road and Trail	4255.64	20
Hawaiiloa Ridge Trail	3806.55	21
Mohihi-Waialae Trail	5486.98	21
Kohua Ridge Trail	3547.80	22
Kuliouou Valley Trail	956.72	22
Koaie Canyon Trail	3982.14	23
Kuliouou Ridge Trail	2967.18	23
Iliou Nature Loop	35.69	24
Iliou Nature Loop	228.96	24
Iliou Nature Loop	96.79	24
Iliou Nature Loop	129.05	24
Kukui Trail	3191.93	25
Waimea Canyon Trail	9432.23	26
Waimea Canyon Trail	3343.87	26
Okolehao Trail	2869.46	27
Powerline Trail	12718.44	28
Powerline Trail	3950.09	28
Moalepe Trail	3887.86	29
Kuilau Trail	3079.24	30
Wailua Forest Management Road	1841.61	31
Nounou-West Trail	1555.19	32
Nounou-East Trail	2001.57	33
Kuamoo-Nounou Trail	2529.27	34

MAUNA KEA FOREST RESERVE	307985139.12	fr	st
MAUNA LOA FOREST RESERVE	319497027.59	fr	st
MOLOAA FOREST RESERVE	12763784.17	fr	st
NA PALI-KONA FOREST RESERVE	16993710.67	fr	st
NA PALI-KONA FOREST RESERVE	36272354.96	fr	st
NANAWALE FOREST RESERVE	4877870.19	fr	st
NANAWALE FOREST RESERVE	2864124.31	fr	st
NANAWALE FOREST RESERVE	2667286.96	fr	st
NONOU FOREST RESERVE	2864010.52	fr	st
OLAA FOREST RESERVE	20437074.57	fr	st
OLAA FOREST RESERVE	15996542.13	fr	st
OLAA FOREST RESERVE	900710.78	fr	st
OLAA FOREST RESERVE	664361.97	fr	st
PUU KA PELE FOREST RESERVE	38329407.90	fr	st
PUU KAPELE\FOREST\RESERVE	19923268.61	fr	st
SOUTH KONA FOREST RESERVE	6233074.47	fr	st
SOUTH KONA FOREST RESERVE	11478970.03	fr	st
SOUTH KONA FOREST RESERVE	15735157.97	fr	st
UPPER WAIAKEA FOREST RESERVE	215476876.89	fr	st
WAIAHA SPRINGS FOREST RESERVE	361298.63	fr	st
WAIAHA SPRINGS FOREST RESERVE	1460594.34	fr	st
WAIAKEA FOREST RESERVE	40324528.72	fr	st
MOKIHANA\GAME\MANAGEMENT\AREA	20888319.94	gma	st
WAILUA GAME MANAGEMENT AREA	6825089.30	gma	st
HONO O NA PALI NATURAL AREA RESERVE	12484547.73	nar	st
KAHAULEA NATURAL AREA RESERVE	70397669.97	nar	st
KIPAHOEHOE NATURAL AREA RESERVE	23122289.98	nar	st
KUIA NATURAL AREA RESERVE	6400542.11	nar	st
LAUPAHOEHOE NATURAL AREA RESERVE	30586726.56	nar	st
MANUKA NATURAL AREA RESERVE	105339406.30	nar	st
MAUNA KEA ICE AGE NATURAL AREA RESERVE	584820.31	nar	st
MAUNA KEA ICE AGE NATURAL AREA RESERVE	15171101.78	nar	st
PUU MAKALA NATURAL AREA RESERVE	48857500.84	nar	st
PUU O UMI NATURAL AREA RESERVE	42651292.84	nar	st
WAIAKEA 1942 LAVA FLOW NATURAL AREA RESERVE	2614131.25	nar	st
ALAKAI WILDERNESS PRESERVE	40074901.57	p	st
KEE HULA PLATFORM	2750.43	pf	st
WAIMANU ESTUARINE RESEARCH RESERVE	15186629.25	rr	st
KEALAKEKUA BAY STATE HISTORICAL PARK	898338.70	shp	st
KEOLONAHIHI STATE HISTORICAL PARK	49030.16	shp	st
LAPAKAHI STATE HISTORICAL PARK	1104281.96	shp	st
KOHALA HISTORICAL SITES STATE MONUMENT	13053.88	sm	st
KOHALA HISTORICAL SITES STATE MONUMENT	4123.21	sm	st
KOHALA HISTORICAL SITES STATE MONUMENT	12391.11	sm	st
LAVA TREE STATE MONUMENT	71445.38	sm	st
AKAKA FALLS STATE PARK	266029.17	sp	st
HAENA STATE PARK	747077.71	sp	st
KEKAHA KAI STATE PARK	3392210.60	sp	st
KEKAHA KAI STATE PARK	3557675.00	sp	st
KOKEE STATE PARK	17633341.13	sp	st
MAUNA KEA STATE PARK	411154.58	sp	st
NA PALI COAST STATE PARK	4642726.61	sp	st
NA PALI COAST STATE PARK	19683598.30	sp	st
POLIHAI STATE PARK	723786.86	sp	st
WAILUA RIVER STATE PARK	4338956.41	sp	st
WAILUA RIVER STATE PARK	38376.25	sp	st
WAILUA RIVER STATE PARK	23732.42	sp	st
WAILUKU RIVER STATE PARK	21074.09	sp	st

reserves

WAILUKU RIVER STATE PARK	41969.04	sp	st
WAIMEA CANYON STATE PARK	7386195.77	sp	st
HAENA STATE PARK	202758.00	sp?	st
WAHIAWA MAUKA STATE PARK RESERVE	211346.88	spr	st
HAPUNA BEACH STATE RECREATION AREA	250727.31	sra	st
HAPUNA BEACH STATE RECREATION AREA	7296.44	sra	st
KALOPA STATE RECREATION AREA	175728.02	sra	st
KILAUEA STATE RECREATION AREA	30091.26	sra	st
MACKENZIE STATE RECREATION AREA	52272.59	sra	st
OLD KONA AIRPORT STATE RECREATION AREA	284031.42	sra	st
WAILOA RIVER STATE RECREATION AREA	454073.53	sra	st
WAILOA RIVER STATE RECREATION AREA	73814.29	sra	st
KEALAKEKUA BAY STATE UNDERWATER PARK	1211123.63	sup	st
MANUKA STATE WAYSIDE	54290.07	sw	st
HONOMALINO TRACT	11738630.09	uel	st
HONUULA TRACTS II & III	18579007.10	uel	st
MAKAULA-OOMA MAUKA TRACT	5070384.72	uel	st
KIPUKA AINAHOU NENE SANCTUARY	45467787.42	xs	st
KOAI TREE SANCTUARY	102724.34	xs	st
PUU WAAWAA I SANCTUARY	206434.89	xs	st
UPPER WAIAKEA BOG SANCTUARY	203631.70	xs	st
WAILUKU SILVERSWORD SANCTUARY	494952.83	xs	st
?	2116.05	?	
?	761.87	?	
MOLOKAI FOREST RESERVE?	112903.34	?	
MOLOKAI FOREST RESERVE?	406451.58	?	
BIRD SANCTUARY	978.94	bs	
HUELO BIRD SANCTUARY	5320.28	bs	
KANAHA ROCK BIRD SANCTUARY	3550.50	bs	
KUKUIPALAOA BIRD SANCTUARY	6011.75	bs	
MOKAPU BIRD SANCTUARY	45558.63	bs	
MOKOHOLA BIRD SANCTUARY	3436.56	bs	
MOKUHOONIKI BIRD SANCTUARY	38606.78	bs	
MOKUMANU BIRD SANCTUARY	3755.50	bs	
OKALA BIRD SANCTUARY	21453.59	bs	
PAUONUAKEA BIRD SANCTUARY	1339.06	bs	
EWA FOREST RESERVE	18708082.72	fr	
EWA FOREST RESERVE	4613400.11	fr	
HANA FOREST RESERVE	53467466.68	fr	
HAUULA FOREST RESERVE	5730861.15	fr	
HONOLULU WATERSHED FOREST RESERVE	1277979.68	fr	
HONOLULU WATERSHED FOREST RESERVE	18263651.90	fr	
HONOLULU WATERSHED FOREST RESERVE	109905.33	fr	
HONOLULU WATERSHED FOREST RESERVE	2583.91	fr	
HONOLULU WATERSHED FOREST RESERVE	9470.11	fr	
HONOLULU WATERSHED FOREST RESERVE	50084.65	fr	
HONOLULU WATERSHED FOREST RESERVE	236386.34	fr	
HONOLULU WATERSHED FOREST RESERVE	4559931.76	fr	
HONOLULU WATERSHED FOREST RESERVE	18973.33	fr	
HONOLULU WATERSHED FOREST RESERVE	62308.85	fr	
HONOLULU WATERSHED FOREST RESERVE	4025273.77	fr	
HONOLULU WATERSHED FOREST RESERVE	6179.49	fr	
HONOLULU WATERSHED FOREST RESERVE	583502.12	fr	
HONOLULU WATERSHED FOREST RESERVE	100498.36	fr	
HONOLULU WATERSHED FOREST RESERVE	113639.60	fr	
KAHIKINUI FOREST RESERVE	3095128.06	fr	
KAHIKINUI FOREST RESERVE	15252743.06	fr	
KAIPAPAU FOREST RESERVE	3926012.56	fr	

KANEOHE FOREST RESERVE	259759.25	fr	
KIPAHULU FOREST RESERVE	8986421.69	fr	
KIPAHULU FOREST RESERVE	1191909.40	fr	
KIPAHULU FOREST RESERVE	395794.47	fr	
KOOLAU FOREST RESERVE	236350.00	fr	
KOOLAU FOREST RESERVE	125549237.44	fr	
KUAOKALA FOREST RESERVE	1505913.59	fr	
KULA FOREST RESERVE	6269105.94	fr	
KULA FOREST RESERVE	13811622.90	fr	
KULIOUOU FOREST RESERVE	868179.66	fr	
MAKAWAO FOREST RESERVE	8452881.53	fr	
MAKUA KEAUAU FOREST RESERVE	3448684.83	fr	
MOKULEIA FOREST RESERVE	2179422.30	fr	
MOKULEIA FOREST RESERVE	11344688.92	fr	
MOLOKAI FOREST RESERVE	25649267.69	fr	
MOLOKAI FOREST RESERVE	4682186.66	fr	
MOLOKAI FOREST RESERVE	514249.88	fr	
MOLOKAI FOREST RESERVE	529222.91	fr	
MOLOKAI FOREST RESERVE	42620097.03	fr	
NANAKULI FOREST RESERVE	3189595.13	fr	
PUPUKEA-PAUMALU FOREST RESERVE	3457221.47	fr	
ROUND TOP FOREST RESERVE	105215.88	fr	
WAIHOLE FOREST RESERVE (IOLEKAA SEC)	1049309.94	fr	
WAIHOLE FOREST RESERVE (WAIHOLE SEC)	5005471.75	fr	
WAIANAE KAI FOREST RESERVE	9422940.24	fr	
WAIHOU SPRING FOREST RESERVE	711789.36	fr	
WEST MAUI FOREST RESERVE	126008.78	fr	
WEST MAUI FOREST RESERVE	181913.72	fr	
WEST MAUI FOREST RESERVE	996667.16	fr	
WEST MAUI FOREST RESERVE	168646.03	fr	
WEST MAUI FOREST RESERVE	1586808.16	fr	
WEST MAUI FOREST RESERVE	29850497.53	fr	
WEST MAUI FOREST RESERVE	144006.31	fr	
WEST MAUI FOREST RESERVE	525740.00	fr	
WEST MAUI FOREST RESERVE	1353039.66	fr	
WEST MAUI FOREST RESERVE	915781.44	fr	
WEST MAUI FOREST RESERVE	1812412.09	fr	
WEST MAUI FOREST RESERVE	8695130.56	fr	
KAHAKULOA GAME MANAGEMENT AREA	289409.44	gma	
KAHAKULOA GAME MANAGEMENT AREA	4770240.25	gma	
KUAOKALA GAME MANAGEMENT AREA	6956785.61	gma	
HANAPEPE SALT PONDS HISTORIC PRESERVE	45026.36	hp	
HANAPEPE SALT PONDS HISTORIC PRESERVE	8821.41	hp	
HONOLUA-MOKULEIA MARINE LIFE CONSERVATION DISTRICT	105483.46	mlcd	
HONOLUA-MOKULEIA MARINE LIFE CONSERVATION DISTRICT	69536.07	mlcd	
AHIHI-KINAU NATURAL AREA RESERVE	8369978.63	nar	
HANAWI NATURAL AREA RESERVE	31261476.41	nar	
KAALA NATURAL AREA RESERVE	4396965.15	nar	
KAENA POINT NATURAL AREA RESERVE	2753.60	nar	
KAENA POINT NATURAL AREA RESERVE	41275.89	nar	
KANAIO NATURAL AREA RESERVE	3489638.31	nar	
LIHAU NATURAL AREA RESERVE	3815857.09	nar	
OLOKUI NATURAL AREA RESERVE	6832101.53	nar	
PAHOLE NATURAL AREA RESERVE	2663263.91	nar	
PUU ALII NATURAL AREA RESERVE	5343214.22	nar	
WEST MAUI NATURAL AREA RESERVE (HONOKOWAI SEC)	2968476.45	nar	
WEST MAUI NATURAL AREA RESERVE (KAHAKULOA SEC)	14117809.88	nar	
WEST MAUI NATURAL AREA RESERVE (PANAWEA SEC)	7261213.91	nar	

HALEAKALA NATIONAL PARK	108848554.79	np	
HONOULIULI PRESERVE (NATURE CONSERVANCY)	14653768.59	p	
KAMUKOU PRESERVE	11335986.34	p	
KANEPUU PRESERVE (NATURE CONSERVANCY)	2396591.25	p	
MOOMOMI DUNES PRESERVE	3490622.78	p	
PELEKUNU PRESERVE	22248098.69	p	
WAIKAMOI PRESERVE	20804818.69	p	
KAMILOLOA PLANT SANCTUARY	67262.91	ps	
RUSSIAN FORT ELIZABETH STATE HISTORICAL PARK	69350.01	shp	
DIAMOND HEAD STATE MONUMENT	8638.55	sm	
DIAMOND HEAD STATE MONUMENT	2025554.73	sm	
HALEKII-PIHANA HEIAUS STATE MONUMENT	41380.20	sm	
IAO VALLEY STATE MONUMENT	25054.22	sm	
IOLANI PALACE STATE MONUMENT	44394.91	sm	
KUKANILOKO BIRTHSTONES STATE MONUMENT	20223.53	sm	
MOUNT OLOMANA STATE MONUMENT	847314.63	sm	
PUU O MAHUKA HEIAU STATE MONUMENT	16276.64	sm	
ROYAL MAUSOLEUM STATE MONUMENT	26685.78	sm	
ULU PO HEIAU STATE MONUMENT	5684.69	sm	
HEEIA STATE PARK	53081.91	sp	
KAENA POINT STATE PARK	36866.99	sp	
KAENA POINT STATE PARK	24257.08	sp	
KAENA POINT STATE PARK	108534.33	sp	
KAENA POINT STATE PARK	4504843.29	sp	
KAHANA VALLEY STATE PARK	21109362.03	sp	
MAKENA STATE PARK	681863.70	sp	
MAKIKI TANTALUS STATE PARK	78448.40	sp	
PALAAU STATE PARK	945963.79	sp	
SACRED FALLS STATE PARK	5556443.63	sp	
WAAHILA\RIDGE\STATE\PARK	289799.97	sp	
WAIANAPANAPA STATE PARK	458664.45	sp	
WAIMANO GULCH STATE PARK RESERVE	144999.09	spr	
AIEA BAY STATE RECREATION AREA	18023.28	sra	
AIEA BAY STATE RECREATION AREA	3208.94	sra	
AIEA BAY STATE RECREATION AREA	3632.11	sra	
KEAIWA HEIAU STATE RECREATION AREA	1558747.84	sra	
MALAEKAHANA STATE RECREATION AREA	147015.98	sra	
MALAEKAHANA STATE RECREATION AREA	299922.95	sra	
POLIPOLI SPRING STATE RECREATION AREA	8118.92	sra	
SAND ISLAND STATE RECREATION AREA	583688.26	sra	
WAHIAWA FRESHWATER STATE RECREATION AREA	271536.87	sra	
AHUKINI STATE RECREATION PIER	3937.49	srp	
WAIMEA STATE RECREATION PIER	5238.42	srp	
KAOHIKAIPIU ISLAND STATE SEABIRD SANCTUARY	41628.56	ss	
KEKEPA ISLAND STATE SEABIRD SANCTUARY	2817.34	ss	
KIHEWAMOKU ISLAND STATE SEABIRD SANCTUARY	2691.56	ss	
KUKUIHOOLUA ISLAND STATE SEABIRD SANCTUARY	6568.72	ss	
MANANA ISLAND STATE SEABIRD SANCTUARY	270334.09	ss	
MOKOLEA ROCK STATE SEABIRD SANCTUARY	1975.22	ss	
MOKU MANU ISLAND STATE SEABIRD SANCTUARY	61519.16	ss	
MOKUALAI ISLAND STATE SEABIRD SANCTUARY	2051.97	ss	
MOKUAUIA ISLAND STATE SEABIRD SANCTUARY	50267.06	ss	
MOKULUA ISLAND STATE SEABIRD SANCTUARY	48126.44	ss	
MOKULUA ISLAND STATE SEABIRD SANCTUARY	38097.63	ss	
POPOIA ISLAND STATE SEABIRD SANCTUARY	15140.22	ss	
PULEMOKU ROCK STATE SEABIRD SANCTUARY	2397.97	ss	
HANAUMA BAY STATE UNDERWATER PARK	407163.00	sup	
KAUMAHINA STATE WAYSIDE	31595.02	sw	

reserves

LAIE POINT STATE WAYSIDE	14285.30	sw	
MAKAPUU POINT STATE WAYSIDE	144720.85	sw	
NUUANU PALI STATE WAYSIDE	13410.60	sw	
PUAA KAA STATE WAYSIDE	8697.93	sw	
PUU UALAKEA STATE WAYSIDE	231569.30	sw	
WAILUA VALLEY STATE WAYSIDE	6203.47	sw	
HANAIEI NATIONAL WILDLIFE REFUGE	3761136.56	wr	
KII NATIONAL WILDLIFE REFUGE	420863.66	wr	
PUNAMANO NATIONAL WILDLIFE REFUGE	150393.87	wr	
WILDLIFE REFUGE	83265.44	wr	
WILDLIFE REFUGE	125038.43	wr	
KANAHA POND WILDLIFE SANCTUARY	591255.88	ws	
PAIKO LAGOON WILDLIFE SANCTUARY	159456.44	ws	
PAUWALU POINT WILDLIFE SANCTUARY	4476.72	ws	
PAUWALU POINT WILDLIFE SANCTUARY	44327.64	ws	
PAUWALU POINT WILDLIFE SANCTUARY	628.47	ws	
	709738.44		
	241.94		
	3020.99		
	21588529.28		
	9569.22		
	832300.05		
	3746.39		
	2906.53		
	127646.11		
	104585.34		
	19641.91		
	31640.80		
	168846.29		
	25722.12		
	19058.73		
	15778.55		
	7325.27		
	2102.09		
	15656.89		
	112882.31		
	62840.03		
	74167.16		
	271008.28		
	92451.19		
	772266.41		
	3663.53		
	1015.66		
	3268.92		
	31.97		
	25347.52		
	13770.93		
	382616.78		
	16857.89		
	3028.32		
	2782.53		
	33915.99		
	3685.22		
	11758.09		
	1597.62		
	3149.67		
	36184840.62		
	28235.16		

Name	Area	Type	Owner
PUU HONAU O HONAUNAU NATIONAL HISTORICAL PARK	737281.38	nhp	fed
PUUKOHOLA HEIAU NATIONAL HISTORIC SITE	334745.52	nhs	fed
HAWAII VOLCANOES NATIONAL PARK	841448068.03	np	fed
HAWAII VOLCANOES NATIONAL PARK	37852641.38	np	fed
HAKALAU FOREST NATIONAL WILDLIFE REFUGE	27567047.25	wr	fed
HAKALAU FOREST NATIONAL WILDLIFE REFUGE	102425474.47	wr	fed
HAKALAU FOREST NATIONAL WILDLIFE REFUGE S.KONA SEC	20982509.82	wr	fed
HULEIA WILDLIFE REFUGE	940280.39	wr	fed
KEKAHA\GAME\MANAGEMENT\AREA	60456740.32	gma	hhl
HALELEA FOREST RESERVE	34013676.67	fr	pr
HALELEA FOREST RESERVE	21077254.33	fr	pr
KEALIA FOREST RESERVE	11696965.86	fr	pr
LIHUE-KOLOA FOREST RESERVE	66901179.90	fr	pr
MOLOAA FOREST RESERVE	5340500.45	fr	pr
NA PALI-KONA FOREST RESERVE	89749795.64	fr	pr
KALEPA MOUNTAIN FOREST RESERVE	769537.88	fr?	pr
KAHUKU RANCH COOPERATIVE NENE SANCTUARY	119264311.92	xs	pr
KEAHOU COOPERATIVE NENE SANCTUARY	15820349.50	xs	pr
KEAUHOU II (HUALALAI) COOPERATIVE NENE SANCTUARY	53272837.60	xs	pr
HALELEA FOREST RESERVE	41765028.92	fr	pr.sr
HALELEA FOREST RESERVE	16615509.50	fr	pr?
PUU WAAWAA FOREST BIRD SANCTUARY	14899685.22	bs	st
HALELEA FOREST RESERVE	62027299.08	fr	st
HAMAKUA FOREST RESERVE	1296378.28	fr	st
HAMAKUA FOREST RESERVE	610649.50	fr	st
HAMAKUA FOREST RESERVE	2013865.81	fr	st
HAMAKUA FOREST RESERVE	1274832.28	fr	st
HAMAKUA FOREST RESERVE	1949719.67	fr	st
HAMAKUA FOREST RESERVE	3537564.44	fr	st
HAMAKUA FOREST RESERVE	98021.63	fr	st
HAMAKUA FOREST RESERVE	1975352.94	fr	st
HILO FOREST RESERVE	13560432.78	fr	st
HILO FOREST RESERVE	19694937.03	fr	st
HILO FOREST RESERVE	19224089.69	fr	st
HILO FOREST RESERVE	1289838.22	fr	st
HILO FOREST RESERVE	6253379.66	fr	st
HILO FOREST RESERVE	20966261.94	fr	st
HILO FOREST RESERVE	274659.03	fr	st
HILO FOREST RESERVE	160640802.38	fr	st
HILO FOREST RESERVE	7058018.97	fr	st
HONUULA FOREST RESERVE	5340366.19	fr	st
KALEPA MOUNTAIN FOREST RESERVE	2840293.21	fr	st
KALOPA FOREST RESERVE	310389.31	fr	st
KAPAPALA FOREST RESERVE	150856338.95	fr	st
KAU FOREST RESERVE	248701811.50	fr	st
KEALIA FOREST RESERVE	11339307.81	fr	st
KEALIA FOREST RESERVE	18270138.89	fr	st
KEAUOHANA FOREST RESERVE	1115829.03	fr	st
KOHALA FOREST RESERVE	6222554.97	fr	st
KOHALA FOREST RESERVE	29845042.09	fr	st
KOHALA FOREST RESERVE	16362751.66	fr	st
KOHALA FOREST RESERVE	19280287.32	fr	st
LIHUE-KOLOA FOREST RESERVE	42884364.39	fr	st
LIHUE-KOLOA FOREST RESERVE	7979186.86	fr	st
MALAMA-KI FOREST RESERVE	6084162.72	fr	st
MANOWAIALEE FOREST RESERVE	3331719.44	fr	st
MANOWAIALEE FOREST RESERVE	3172741.97	fr	st

reserves

Name	Area	Own	Tmk	Type
Spouting Horn Park	8687.98	A&B Hawaii Inc.	26003019	
Kalihi Valley Hillside Park	61204.21	City	14022004	12
Kalihi Valley Hillside Park	570.83	City	14022017	12
Mauna Lahilahi Botanical Garden	27786.95	City	84001008	12
Aweoweo Beach Park	1274.54	City	68011038	beach
Aweoweo Beach Park	1252.77	City	68011037	beach
Aweoweo Beach Park	1313.21	City	68012054	beach
Aweoweo Beach Park	1789.58	City	68012053	beach
Banzai Rock Beach Support Park	9332.05	City	59005015	beach
Barbers Point Beach Park	30178.63	City	91026027	beach
Ehukai Beach Park	3242.78	City	59020022	beach
Ewa Beach Park	19640.38	City	91005004	beach
Haleiwa Alii Beach Park	78146.88	City	66002001	beach
Haleiwa Beach Park	58260.89	City	62001002	beach
Haleiwa Beach Park Mauka	1369.39	City	62003022	beach
Haleiwa Beach Park Mauka	3454.19	City	62003020	beach
Haleiwa Beach Park Mauka	1454.30	City	62003019	beach
Haleiwa Beach Park Mauka	1279.97	City	62003017	beach
Haleiwa Beach Park Mauka	6235.19	City	62003038	beach
Hauula Beach Park	1253.62	City	54001064	beach
Hauula Beach Park	334.40	City	54001035	beach
Hauula Beach Park	587.55	City	54001036	beach
Hauula Beach Park	836.31	City	54001038	beach
Kaaawa Beach Park	5148.78	City	51002025	beach
Kaaawa Beach Park	1174.24	City	51009028	beach
Kaaawa Beach Park	819.84	City	51009027	beach
Kahe Point Beach Park	18708.75	City	92003015	beach
Kaiaka Bay Beach Park	213065.47	City	66007007	beach
Kailua Beach Park	107.30	City	43011076	beach
Kailua Beach Park	3503.00	City	43010088	beach
Kalaeoio Beach Park	3287.32	City	51009009	beach
Kalama Beach Park	16942.72	City	43016004	beach
Kawaikui Beach Park	6247.33	City	36003001	beach
Kawaikui Beach Park	6807.45	City	36003002	beach
Kokololio Beach Park	56727.34	City	55001002	beach
Kuhio Beach Park	278.34	City	26001018	beach
Kuhio Beach Park	4477.20	City	26001008	beach
Kuhio Beach Park	4506.66	City	26001004	beach
Kuhio Beach Park	2171.00	City	26001003	beach
Kuhio Beach Park	457.60	City	26001002	beach
Laie Beach Park	6795.92	City	55001048	beach
Laie Beach Park	5997.33	City	55001049	beach
Leahi Beach Park	5199.71	City	31036001	beach
Mali Beach Park	26097.25	City	87016001	beach
Mali Beach Park	2719.74	City	87015038	beach
Mali Beach Park	2652.56	City	87015037	beach
Mali Beach Park	5022.29	City	87015035	beach
Mali Beach Park	4771.16	City	87015033	beach
Mali Beach Park	37531.54	City	87015022	beach
Mali Beach Park	2499.27	City	87015012	beach
Mali Beach Park	2758.71	City	87015011	beach
Mali Beach Park	3004.21	City	87015010	beach
Mali Beach Park	3349.36	City	87015009	beach
Mali Beach Park	3480.20	City	87015008	beach
Mali Beach Park	3704.08	City	87015007	beach
Mali Beach Park	3813.02	City	87015006	beach
Mali Beach Park	3989.39	City	87015005	beach

Maili Beach Park	3773.06	City	87015004	beach
Maili Beach Park	3673.01	City	87015003	beach
Maili Beach Park	3498.94	City	87015039	beach
Maili Beach Park	3441.47	City	87015001	beach
Maili Beach Park	3417.42	City	87028023	beach
Maili Beach Park	3206.78	City	87028022	beach
Maili Beach Park	3288.72	City	87028021	beach
Makaha Beach Park	53509.80	City	84002047	beach
Makaha Beach Park	28910.52	City	84001012	beach
Makalei Beach Park	2096.50	City	31036007	beach
Makalei Beach Park	778.36	City	31036013	beach
Makaua Beach Park	561.20	City	51003003	beach
Mauna Lahilahi Beach Park	9440.08	City	84001001	beach
Mauna Lahilahi Beach Park	6054.31	City	85018002	beach
Mauna Lahilahi Beach Park	1044.98	City	85017022	beach
Mauna Lahilahi Beach Park	2912.77	City	85017007	beach
Mauna Lahilahi Beach Park	2322.09	City	85017006	beach
Mauna Lahilahi Beach Park	2200.89	City	85017004	beach
Mauna Lahilahi Beach Park	2443.51	City	85017002	beach
Mauna Lahilahi Beach Park	1637.98	City	85017001	beach
Maunalua Bay Beach Park	5728.48	City	39007008	beach
Mokuleia Beach Park	86558.15	City	68002001	beach
Mokuleia Beach Park	27706.77	City	68002001	beach
Neal S. Blaisdell Park	86389.55	City	98007008	beach
Neal S. Blaisdell Park	17917.90	City	98007001	beach
Oneula Beach Park	114443.29	City	91012025	beach
Pokai Bay Beach Park	4875.20	City	85001008	beach
Pokai Bay Beach Park	537.24	City	85011027	beach
Pokai Bay Beach Park	1563.84	City	85008036	beach
Pokai Bay Beach Park	1185.84	City	85008043	beach
Pokai Bay Beach Park	1540.52	City	85008044	beach
Pokai Bay Beach Park	788.02	City	85008035	beach
Pokai Bay Beach Park	863.42	City	85008034	beach
Pokai Bay Beach Park	852.91	City	85008041	beach
Pokai Bay Beach Park	962.63	City	85008040	beach
Pokai Bay Beach Park	1072.96	City	85008033	beach
Pokai Bay Beach Park	714.90	City	85008032	beach
Pokai Bay Beach Park	561.59	City	85008031	beach
Pokai Bay Beach Park	1045.74	City	85001006	beach
Pupukea Beach Park	7179.94	City	59002072	beach
Pupukea Beach Park	5504.98	City	59019052	beach
Pupukea Beach Park	946.76	City	59020061	beach
Pupukea Beach Park	13576.62	City	59003053	beach
Sandy Beach Park	34504.14	City	39012002	beach
Sandy Beach Park	1635.56	City	39015020	beach
Sandy Beach Park	38691.19	City	39015001	beach
Sunset Beach Park	9660.96	City	59001037	beach
Sunset Beach Support Park	4161.30	City	59015010	beach
Sunset Point Beach Park	3901.72	City	58003039	beach
Swanzy Beach Park	18621.84	City	51012011	beach
Ulehawa Beach Park	13553.48	City	87005005	beach
Waiahole Beach Park	3416.68	City	48002008	beach
Waiahole Beach Park	1829.90	City	48002009	beach
Waiahole Beach Park	4849.34	City	48002011	beach
Waiahole Beach Park	54967.99	City	48002001	beach
Waiahole Beach Park	1574.81	City	48002007	beach
Waiialae Beach Park	16976.69	City	35023004	beach
Waialeale Beach Park	4512.50	City	57005013	beach

Waialeale Beach Park	802.45	City	58001017	beach
Waialeale Beach Park	1818.95	City	58001016	beach
Waimanalo Bay Beach Park	326294.44	City	41015015	beach
Waimanalo Beach Park	248.91	City	41003020	beach
Waimanalo Beach Park	260.28	City	41003019	beach
Waimea Bay Beach Park	7480.86	City	59005019	beach
Waimea Bay Beach Park	106133.16	City	61001003	beach
West Loch Shoreline Park	41245.39	City	94048074	beach
Hoomaluhia Botanical Garden	634274.69	City	45042012	botanical garden
Foster Botanical Garden	54787.27	City	17007001	botanical garden
Hoomaluhia Botanical Garden	828324.63	City	45041009	botanical garden
Hoomaluhia Botanical Garden	22832.83	City	45041012	botanical garden
Hoomaluhia Botanical Garden	16041.30	City	45041011	botanical garden
Hoomaluhia Botanical Garden	1934.20	City	45041010	botanical garden
Hoomaluhia Botanical Garden	5105.27	City	45041010	botanical garden
Hoomaluhia Botanical Garden	1333.91	City	45041010	botanical garden
Koko Head Regional Park	437853.66	City	39012001	botanical garden
Liliuokalani Botanical Garden	31119.11	City	17020001	botanical garden
Aikahi Community Park	16203.94	City	44003015	community
Aikahi Community Park	70.90	City	44003012	community
Aina Haina Community Park	25325.94	City	36011009	community
Asing Community Park	95303.46	City	91017066	community
Beretania Community Park	21513.68	City	17026008	community
Crane Community Park	20143.60	City	27031008	community
Crestview Community Park	16005.45	City	94103001	community
Crestview Community Park	16251.48	City	94103004	community
Enchanted Lake Community Park	23611.70	City	42002037	community
Ewa Beach Community Park	53652.01	City	91001010	community
Ewa Mahiko Neighborhood Park	22483.48	City	91017046	community
Geiger Community Park	39924.68	City	91061035	community
Hauula Community Park	275.06	City	54001014	community
Hauula Community Park	2496.05	City	54001009	community
Hauula Community Park	9878.31	City	54009007	community
Hauula Community Park	2298.38	City	54001002	community
Hauula Community Park	10592.34	City	54008019	community
Hauula Community Park	1798.84	City	54008018	community
Hoaeae Community Park	40608.91	City	94107099	community
Kahala Community Park	35500.52	City	35011028	community
Kaimuki Community Park	10376.93	City	32005009	community
Kalama Valley Community Park	24433.53	City	39092039	community
Kalihi Uka Community Park	4876.09	City	13035001	community
Kamehameha Community Park	33560.34	City	13006001	community
Kaneohe Community and Senior Cente	7844.34	City	45029026	community
Kaneohe Community Park	22311.30	City	45021001	community
Kanewai Community Park	34965.97	City	28029011	community
Kanewai Community Park	2957.30	City	28029004	community
Kapaolono Community Park	22267.38	City	32025001	community
Kauluwela Community Park	10182.71	City	17023040	community
Lehua Community Park	45557.64	City	97017002	community
Maili Community Park	14829.00	City	87004042	community
Makaha Community Park	16384.21	City	84025011	community
Makakilo Community Park	34310.22	City	92019035	community
Makaunulau Community Park	23939.09	City	95033093	community
Makaunulau Community Park	42103.54	City	95032032	community
Maunalani Community Park	938.22	City	33029001	community
Maunalani Community Park	4848.92	City	33029002	community
Moanalua Community Park	43519.77	City	11009005	community
Pacific Palisades Community Park	31466.05	City	97093016	community

Pacific Palisades Community Park	5852.96	City	97059100	community
Pauahi Recreation Center	275.48	City	17003099	community
Petrie Community Park	16671.94	City	32045002	community
Pililaau Community Park	42675.72	City	85001060	community
Puunui Community Park	6563.86	City	18014001	community
Sheridan Community Park	6980.05	City	23012021	community
Waikele Community Park	51875.63	City	94007052	community
Wilson Community Park	16578.48	City	35017012	community
Isenberg Street Community Garden	19.63	City	27009049	community garden
Aiea District Park	26833.62	City	99005015	district
Aiea District Park	10645.80	City	98029001	district
Booth District Park	18401.57	City	22017002	district
Ewa Mahiko District Park	109451.23	City	91017068	district
Halawa District Park	81216.22	City	99072044	district
Kahuku District Park	11356.11	City	56006023	district
Kahuku District Park	22317.95	City	56006011	district
Kailua District Park	74939.60	City	43056009	district
Kalakaua District Park	31446.91	City	15025002	district
Kalihi Valley District Park	43473.45	City	13024002	district
Kilauea District Park	7885.52	City	32059002	district
Kilauea District Park	19086.41	City	32059003	district
Koko Head Regional Park	236505.48	City	39012001	district
Koko Head Regional Park	608.15	City	39045012	district
Makiki District Park	34180.16	City	24022001	district
Makiki District Park	349.70	City	24022045	district
Makiki District Park	337.33	City	24022034	district
Makiki District Park	358.33	City	24022026	district
Manoa Valley District Park	119553.62	City	29036003	district
McCully District Park	5757.45	City	23029002	district
Mililani District Park	85858.73	City	94005041	district
Palolo Valley District Park	676.76	City	34006003	district
Palolo Valley District Park	27558.78	City	34007010	district
Palolo Valley District Park	5565.53	City	34007003	district
Pearl City District Park	40080.24	City	97036123	district
Salt Lake District Park	342145.33	City	11063018	district
Wahiawa District Park	11497.75	City	74008002	district
Wahiawa District Park	14333.73	City	74008005	district
Wahiawa District Park	10571.77	City	74008009	district
Waialua District Park	4158.47	City	67001047	district
Waialua District Park	36574.34	City	67001044	district
Waipahu District Park	55682.74	City	94017003	district
Ewa Villages Golf Course	952908.36	City	91017075	golf course
Pali Golf Course	873338.19	City	45035001	golf course
Ted Makalena Golf Course	602226.22	City	93002009	golf course
West Loch Golf Course	382991.57	City	91017060	golf course
West Loch Golf Course	28595.34	City	91017060	golf course
West Loch Golf Course	3930.16	City	91017017	golf course
West Loch Golf Course	353538.94	City	91017006	golf course
West Loch Golf Course	6214.12	City	91021029	golf course
Kauluwela Mall	2602.25	City	17023033	mall
Kila Kalikimaka Mall	608.85	City	17026017	mall
Auld Lane Mini Park	809.84	City	16002132	mini
Date Street Mini Park	1327.48	City	27015018	mini
Fort Street Mall Mini Park	630.25	City	21010025	mini
Frank C. Judd Mini Park	458.13	City	27003048	mini
Ieie Mini Park	466.63	City	99044032	mini
Kaelepulu Mini Park	6528.62	City	42018014	mini
Kamalii Mini Park	2902.84	City	21009027	mini

Kamole Mini Park	8633.59	City	35054025	mini
Kanoa Street Mini Park	1599.08	City	16001031	mini
Kuhio Avenue Mini Park	448.00	City	26024002	mini
Likini Street Mini Park	5181.60	City	11065038	mini
Loi Kalo Mini Park	1085.14	City	16005030	mini
Loi Kalo Mini Park	7620.91	City	16005031	mini
Loi Kalo Mini Park	715.41	City	16005006	mini
Makiki Street Mini Park	757.76	City	24023054	mini
Mokauea Street Mini Park	592.86	City	12001051	mini
Mokauea Street Mini Park	703.09	City	12001050	mini
Na Pueo Mini Park	6952.70	City	18029053	mini
Palama Triangle Mini Park	222.53	City	16008001	mini
Peter Buck Mini Park	1531.37	City	16023001	mini
Peter Buck Mini Park	3547.25	City	16023066	mini
Piikoi Street Mini Park	479.87	City	24020056	mini
Pohakupu Mini Park	14302.77	City	42031016	mini
Pukele Avenue Mini Park	2360.75	City	33044023	mini
Pupuole Street Mini Park	14650.70	City	94001029	mini
Pupuole Street Mini Park	15205.03	City	94001029	mini
Puu O Kaimuki Mini Park	8851.42	City	32036001	mini
Robert W. Wilcox Mini Park	1300.07	City	21012003	mini
Waiau Gardens Mini Park	9495.93	City	98059006	mini
Wilder Avenue Mini Park	186.23	City	28013088	mini
Kawai Nui Marsh	2768978.66	City	42016001	nature pres/marsh
Kawai Nui Marsh	247865.09	City	42016006	nature pres/marsh
Kawai Nui Marsh	2156.47	City	42016005	nature pres/marsh
Mauumae Nature Park	14077.87	City	33018056	nature pres/marsh
Mauumae Nature Park	64730.70	City	33019005	nature pres/marsh
Mauumae Nature Park	15000.04	City	33017001	nature pres/marsh
Mauumae Nature Park	9898.94	City	33014015	nature pres/marsh
Mauumae Nature Park	5221.66	City	33014016	nature pres/marsh
Mauumae Nature Park	6231.41	City	33014017	nature pres/marsh
Waihee Valley Nature Park	139022.05	City	47006010	nature pres/marsh
Waihee Valley Nature Park	190486.87	City	47006022	nature pres/marsh
Aina Koa Neighborhood Park	9720.68	City	35036014	neighborhood
Aliamanu Neighborhood Park	17818.76	City	99002027	neighborhood
Auwaiolimu Neighborhood Park	7390.95	City	22008059	neighborhood
Hahaione Neighborhood Park	19964.55	City	39038001	neighborhood
Hahaione Valley Neighborhood Park	25201.27	City	39049028	neighborhood
Heeia Neighborhood Park	15928.18	City	46031021	neighborhood
Hoa Aloha Neighborhood Park	15635.79	City	11059005	neighborhood
Hokuahiahi Neighborhood Park	16261.74	City	94005038	neighborhood
Holanialii Neighborhood Park	16191.94	City	94092090	neighborhood
Honowai Neighborhood Park	25559.66	City	94053119	neighborhood
Iliahi Neighborhood Park	12622.31	City	75027002	neighborhood
Kaahale Neighborhood Park	16853.41	City	98068063	neighborhood
Kaala Neighborhood Park	8846.63	City	73019013	neighborhood
Kahi Kani Neighborhood Park	10903.10	City	71009064	neighborhood
Kalaepohaku Neighborhood Park	5586.05	City	33052010	neighborhood
Kalaheo Neighborhood Park	5791.59	City	43077048	neighborhood
Kalihi Waena Neighborhood Park	1388.17	City	13004124	neighborhood
Kaluapuhi Neighborhood Park	23319.72	City	45065002	neighborhood
Kamaio Neighborhood Park	16318.20	City	94108049	neighborhood
Kamamalu Neighborhood Park	18479.60	City	21005001	neighborhood
Kamananui Neighborhood Park	2638.46	City	67006019	neighborhood
Kamilo Iki Neighborhood Park	29163.32	City	39098090	neighborhood
Kaneohe Bayview Neighborhood Park	63283.41	City	45030036	neighborhood
Kaneohe Civic Center Neigh. Park	21621.41	City	45018002	neighborhood

Kaomaaiku Neighborhood Park	49664.65	City	95001068	neighborhood
Kaonohi Neighborhood Park	17257.76	City	98041021	neighborhood
Kapunahala Neighborhood Park	15512.98	City	45078014	neighborhood
Kawai Nui Neighborhood Park	19725.44	City	42016001	neighborhood
Kawananakoa Neighborhood Park	9687.47	City	22009012	neighborhood
Keaalau Neighborhood Park	14512.12	City	44012067	neighborhood
Kealohi Neighborhood Park	16480.07	City	94100060	neighborhood
Keolu Hills Neighborhood Park	25880.79	City	42092001	neighborhood
Kipapa Neighborhood Park	40125.88	City	95021002	neighborhood
Koko Head Neighborhood Park	27315.84	City	39022037	neighborhood
Kuahelani Neighborhood Park	16269.95	City	94005046	neighborhood
Kunia Neighborhood Park	22565.56	City	94137138	neighborhood
Laenani Neighborhood Park	5382.79	City	47010017	neighborhood
Makakilo Neighborhood Park	16084.72	City	92009059	neighborhood
Makalapa Neighborhood Park	24106.67	City	99003039	neighborhood
Manana Kai Neighborhood Park	17526.47	City	97024040	neighborhood
Maunawili Neighborhood Park	7044.31	City	42043002	neighborhood
Maunawili Valley Neighborhood Park	32545.63	City	42007006	neighborhood
Melemanu Neighborhood Park	16555.93	City	95012031	neighborhood
Mililani Neighborhood Park	20509.11	City	95022001	neighborhood
Mililani Town Center Neigh. Park	31282.82	City	95048049	neighborhood
Mililani Waena Neighborhood Park	28462.74	City	95001050	neighborhood
Moilili Neighborhood Park	13905.64	City	28005003	neighborhood
Mother Waldron Neighborhood Park	2295.23	City	21051005	neighborhood
Nahele Neighborhood Park	15946.98	City	98057093	neighborhood
Nehu Neighborhood Park	5358.98	City	36006045	neighborhood
Newtown Neighborhood Park	16200.24	City	98060008	neighborhood
Newtown Neighborhood Park	16702.23	City	98060006	neighborhood
Niu Valley Neighborhood Park	8340.38	City	37003010	neighborhood
Noholoa Neighborhood Park	29366.42	City	94005045	neighborhood
Pacheco Neighborhood Park	18624.47	City	97022011	neighborhood
Puohala Neighborhood Park	15962.91	City	45030038	neighborhood
Sunset Beach Neighborhood Park	24352.52	City	59005070	neighborhood
Waialae Iki Neighborhood Park	39749.48	City	35021001	neighborhood
Waiau Neighborhood Park	18745.95	City	98050070	neighborhood
Waikele Neighborhood Park	20248.64	City	94007038	neighborhood
Wailupe Valley Neighborhood Park	9954.45	City	36019011	neighborhood
Waimalu Neighborhood Park	13397.08	City	98008007	neighborhood
Waipahu Uka Neighborhood Park	16205.48	City	94095140	neighborhood
Waipio Neighborhood Park	49690.92	City	94115002	neighborhood
Whitmore Neighborhood Park	9300.20	City	71004023	neighborhood
Kahaluu Regional Park	1135.52	City	47012028	regional
Ala Moana Regional Park	317124.47	City	23037001	regional/cultural
Ala Moana Regional Park	860.01	City	23037023	regional/cultural
Ala Moana Regional Park	87.23	City	23037022	regional/cultural
Ala Moana Regional Park	100279.42	City	23037025	regional/cultural
Kahaluu Regional Park	3713.59	City	47011011	regional/cultural
Kahaluu Regional Park	10567.10	City	47012013	regional/cultural
Kahaluu Regional Park	10779.65	City	47012019	regional/cultural
Kahaluu Regional Park	22759.83	City	47012024	regional/cultural
Kahaluu Regional Park	39175.10	City	47012018	regional/cultural
Kahaluu Regional Park	3279.25	City	47012016	regional/cultural
Kahaluu Regional Park	5236.71	City	47012001	regional/cultural
Kapiolani Regional Park	9042.70	City	31030004	regional/cultural
Kapiolani Regional Park	4926.93	City	31030002	regional/cultural
Kapiolani Regional Park	5051.34	City	31030001	regional/cultural
Kapiolani Regional Park	511.29	City	31026016	regional/cultural
Kapiolani Regional Park	471.42	City	31026015	regional/cultural

Kapiolani Regional Park	505.77	City	31026026	regional/cultural
Kapiolani Regional Park	500.60	City	31026027	regional/cultural
Kapiolani Regional Park	367.02	City	31026024	regional/cultural
Kapiolani Regional Park	470.95	City	31026022	regional/cultural
Kapiolani Regional Park	956.16	City	31026020	regional/cultural
Kapiolani Regional Park	1945.94	City	31028029	regional/cultural
Kapiolani Regional Park	468.23	City	31026011	regional/cultural
Kapiolani Regional Park	1830.78	City	31028018	regional/cultural
Kapiolani Regional Park	4054.92	City	31031009	regional/cultural
Kapolei Regional Park	167196.66	City	91016024	regional/cultural
Kapolei Regional Park	47801.64	City	91016021	regional/cultural
Kapolei Regional Park	65473.51	City	91016002	regional/cultural
Koko Head Regional Park	2185697.05	City	39012001	regional/cultural
Koko Head Regional Park	30769.31	City	39010003	regional/cultural
Koko Head Regional Park	1957072.17	City	39012002	regional/cultural
Koko Head Regional Park	77820.91	City	39012010	regional/cultural
Koko Head Regional Park	2326.34	City	39012013	regional/cultural
Koko Head Regional Park	25660.35	City	39012004	regional/cultural
Kualoa Regional Park	612188.02	City	49004001	regional/cultural
Kualoa Regional Park	13378.27	City	49003044	regional/cultural
Waianae Regional Park	16266.99	City	85002001	regional/cultural
Waianae Regional Park	4035.59	City	85013011	regional/cultural
Waipahu Cultural Garden Park	32148.05	City	94010029	regional/cultural
Waipahu Cultural Garden Park	80668.39	City	94010041	regional/cultural
Waipahu Cultural Garden Park	64585.84	City	94010004	regional/cultural
Waipahu Cultural Garden Park	740.88	City	94010010	regional/cultural
Waipahu Cultural Garden Park	1081.86	City	94010012	regional/cultural
Waipahu Cultural Garden Park	1343.94	City	94010007	regional/cultural
Waipahu Cultural Garden Park	54.95	City	94010009	regional/cultural
Hanapepe Loop	167.73	City	39028025	road
Hauula Beach Remnant	53.00	City	54010005	road
Hoomana Place	128.48	City	68010012	road
Kaikoo Place	129.92	City	31041026	road
Kaimalino Street	200.29	City	44039060	road
Kaluanui Road	184.23	City	53010030	road
Kamehameha Highway	222.23	City	55002073	road
Kaneohe Bay Drive B	391.46	City	44021020	road
Kokee Beach Right-Of-Way	3277.59	City	39026002	road
Koko Kai Beach Right-Of-Way	2722.88	City	39028019	road
Lumahai Street	264.88	City	39013034	road
Milokai Place	117.80	City	44039059	road
Moua Street	103.92	City	84005012	road
North Kalaheo Avenue at Kawainui C	1226.56	City	43083069	road
Oneula Place	131.91	City	91025061	road
Parish Drive	57.12	City	91007039	road
Pupu Place	46.24	City	91030017	road
Waialua Beach Road	323.66	City	67014042	road
Aina Haina Slide Area	724.77	City	36021014	slide area/slope
Aina Haina Slide Area	820.20	City	36021031	slide area/slope
Aina Haina Slide Area	751.95	City	36021012	slide area/slope
Aina Haina Slide Area	701.95	City	36021030	slide area/slope
Aina Haina Slide Area	703.48	City	36021016	slide area/slope
Aina Haina Slide Area	695.00	City	36021029	slide area/slope
Aina Haina Slide Area	767.02	City	36021010	slide area/slope
Aina Haina Slide Area	687.84	City	36021017	slide area/slope
Aina Haina Slide Area	706.27	City	36021028	slide area/slope
Aina Haina Slide Area	702.54	City	36021018	slide area/slope
Aina Haina Slide Area	698.00	City	36021019	slide area/slope

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Aina Haina Slide Area	695.51	City	36021026	slide area/slope
Aina Haina Slide Area	700.77	City	36021020	slide area/slope
Aina Haina Slide Area	727.27	City	36017063	slide area/slope
Aina Haina Slide Area	685.06	City	36017062	slide area/slope
Kupehau Slopes	21329.49	City	14017027	slide area/slope
Kupehau Slopes	6219.43	City	14006051	slide area/slope
Laukahi Slopes	13558.43	City	35065005	slide area/slope
Waiomao Slide Area	470.32	City	34028047	slide area/slope
Waiomao Slide Area	474.65	City	34028046	slide area/slope
Waiomao Slide Area	492.66	City	34028045	slide area/slope
Waiomao Slide Area	497.75	City	34028044	slide area/slope
Waiomao Slide Area	501.58	City	34028043	slide area/slope
Waiomao Slide Area	545.93	City	34028049	slide area/slope
Waiomao Slide Area	492.13	City	34028042	slide area/slope
Waiomao Slide Area	477.84	City	34028041	slide area/slope
Waiomao Slide Area	540.92	City	34028050	slide area/slope
Waiomao Slide Area	543.05	City	34028040	slide area/slope
Waiomao Slide Area	506.34	City	34028051	slide area/slope
Waiomao Slide Area	510.90	City	34028052	slide area/slope
Waiomao Slide Area	520.23	City	34028053	slide area/slope
Waiomao Slide Area	507.06	City	34030001	slide area/slope
Waiomao Slide Area	497.33	City	34030004	slide area/slope
Waiomao Slide Area	490.18	City	34030005	slide area/slope
Waiomao Slide Area	473.53	City	34030028	slide area/slope
Waiomao Slide Area	457.43	City	34030027	slide area/slope
Waiomao Slide Area	453.63	City	34030026	slide area/slope
Waiomao Slide Area	458.39	City	34030025	slide area/slope
Aala Park	12331.48	City	17027002	sq/ente/tri/prom
Alahula Square	1120.13	City	75012065	sq/ente/tri/prom
Beach Walk Triangle	641.16	City	26003019	sq/ente/tri/prom
Chinatown Gateway Park	1565.56	City	21003015	sq/ente/tri/prom
Kamanele Square	8269.60	City	29003006	sq/ente/tri/prom
King Kalakaua Park	740.90	City	26016035	sq/ente/tri/prom
King Kalakaua Park	236.46	City	26016036	sq/ente/tri/prom
King Kalakaua Park	259.96	City	26016034	sq/ente/tri/prom
King Kalakaua Park	560.13	City	26016033	sq/ente/tri/prom
King Kalakaua Park	572.49	City	26016032	sq/ente/tri/prom
Pacific Palisades Entrance Park	1251.78	City	97047070	sq/ente/tri/prom
Pacific Palisades Entrance Park	14664.15	City	97092020	sq/ente/tri/prom
Princess Kaiulani Triangle	1108.63	City	26023081	sq/ente/tri/prom
Smith-Beretania Park	5403.44	City	17004004	sq/ente/tri/prom
Anini Beach Park	44907.61	County	53005005	beach
Haena Beach Park	22894.41	County	59005019	beach
Hanalei Beach Park	10305.66	County	55001004	beach
Hanalei Beach Park	5521.19	County	55002019	beach
Hanamaulu Beach Park	36089.53	County	37003008	beach
Kapaa Beach Park	3510.16	County	45011045	beach
Kapaa Beach Park	10981.64	County	45011001	beach
Kekaha Beach Park	39577.57	County	13001002	beach
Nawiliwili Beach Park	9461.17	County	32004003	beach
Nawiliwili Beach Park	16205.81	County	32004003	beach
Niumalu Beach Park	11786.51	County	32002001	beach
Captain Cooks Memorial Park	26860.78	County	16010005	
Eleele Park	11490.07	County	21004049	
Gore Park	16509.41	County	46011004	
Hanamaulu Park	15826.37	County	37003009	
Isenberg Park	37792.03	County	38015024	
Kahului Park	152475.09	County	38007097	

Kalaheo Multipurpose & Recreation Center	10993.79	County	23011001	
Kalawai Park	84735.46	County	24005013	
Kamalii Park	5672.41	County	38010013	
Kapaa Park	16992.90	County	45011006	
Kekaha Playground	34663.95	County	13002057	
Kepaniwai Park	31514.66	County	33003001	
Kilauea Park	18760.66	County	52008054	
Koloa Park	29951.95	County	28005004	
Laukona Park	10503.18	County	38013110	
Makawao Park	56092.88	County	24006005	
Maui Zoological & Botanical Gardens	21564.95	County	38007127	
Mokuhau Park	9608.84	County	34035057	
Papohaku Park	35767.34	County	34030015	
park	5459.38	County	36009038	
park	2541.52	County	36010054	
park	13386.91	County	33004020	
park	17919.37	County	33005008	
park	2279.58	County	33004043	
park	1424.25	County	46026040	
park	100117.88	County	23009026	
Poipu Pavillion	8832.88	County	28017001	
Pompaiki Park	3239.13	County	38069005	
public park	1958.14	County	16004012	
Rice Memorial Park	10476.06	County	22006067	
Spouting Horn Park	9888.80	County	26003058	
Wahiku Terrace Park	8270.27	County	45030016	
Wailua Homesteads Park	68967.32	County	42003018	
Wailuku War Memorial Center	200365.92	County	48007055	
doughnut	1793.24	doughnut	58001021	null
doughnut	1011.78	doughnut		null
doughnut	10691.81	doughnut	48004003	null
doughnut	36771.74	doughnut	48006010	null
doughnut	30496.11	doughnut		null
doughnut	1273.16	doughnut	48002006	null
doughnut	886.44	doughnut		null
doughnut	6510.48	doughnut	94005075	null
doughnut	837.98	doughnut	42016004	null
doughnut	1442.88	doughnut	91019018	null
doughnut	84536.89	doughnut	1270	null
doughnut	1081.88	doughnut	91016022	null
doughnut	695.86	doughnut	91026002	null
doughnut	3357.76	doughnut	39012006	null
doughnut	348.41	doughnut	39012009	null
doughnut	36.98	doughnut	31043016	null
doughnut	9.04	doughnut	31043018	null
doughnut	9.41	doughnut	31043018	null
doughnut	9.04	doughnut	31043017	null
doughnut	12.36	doughnut	31043018	null
doughnut	40.91	doughnut	31043015	null
doughnut	465.38	doughnut		null
Waipio Penninsula Sports Complex	1021981.65	Federal	93002001	12
Barbers Point Beach Park	17370.55	Federal	91026002	beach
Bellows Field Beach Park	854962.33	Federal	41015001	beach
Kahe Point Beach Park	171.81	Federal	92003014	beach
Manana Community Park	31555.83	Federal	97024006	community
Haleakala National Park	108743942.59	Federal		national
Kalaeloa Regional Park (Barbers Poin	176000.38	Federal	91013001	regional/cultural
Kalaeloa Regional Park (Barbers Poin	355265.82	Federal	91013001	regional/cultural

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Kalaeloa Regional Park (Barbers Poin	207451.13	Federal	91013001	regional/cultural
Kalaeloa Regional Park (Barbers Poin	245314.10	Federal	91013001	regional/cultural
Kalaeloa Regional Park (Barbers Poin	60226.73	Federal	91013001	regional/cultural
Kalaeloa Regional Park (Barbers Poin	86444.84	Federal	91013001	regional/cultural
Barbers Point Beach Park	5885.97	Other	91026004	beach
Ehukai Beach Park	1657.42	Other	5902023	beach
Hauula Beach Park	170.47	Other	54001033	beach
Kahawai Beach Support Park	4393.29	Other	59007021	beach
Kailua Beach Park	942.03	Other	43010101	beach
Kailua Beach Park	15797.21	Other	43010102	beach
Kawailoa Beach Park	2784.90	Other	61008017	beach
Kawailoa Beach Park	1545.20	Other	61008018	beach
Kawela Bay Beach Park	19439.50	Other	57006022	beach
Ko Olina Beach Park	38252.62	Other	91057017	beach
Kuhio Beach Park	928.28	Other	26001010	beach
Laniakea Beach Support Park	7660.64	Other	61005014	beach
Leftovers Beach Park	2852.80	Other	61012028	beach
Leftovers Beach Park	1688.89	Other	61012029	beach
Maili Beach Park	236.79	Other	87015013	beach
Makaiwa Beach Park	49791.79	Other	91056001	beach
Makaiwa Beach Park	25978.09	Other	91057026	beach
Makaleha Beach Park	56994.59	Other	68003039	beach
Makaleha Beach Park	54871.52	Other	68003017	beach
Makalei Beach Park	75.31	Other	31036014	beach
Mokuleia Beach Park	46293.04	Other	68002012	beach
Oneula Beach Park	13758.78	Other	91011006	beach
Oneula Beach Park	3708.19	Other	91011005	beach
Oneula Beach Park	13599.19	Other	91011007	beach
Oneula Beach Park	3429.36	Other	91011004	beach
Oneula Beach Park	3639.16	Other	91011003	beach
Oneula Beach Park	4102.47	Other	91011002	beach
Pokai Bay Beach Park	1230.97	Other	85001	beach
Punaluu Beach Park	504.97	Other	53002028	beach
Sandy Beach Park	58212.98	Other		beach
Sunset Beach Support Park	4150.34	Other	59015011	beach
Tracks Beach Park	82079.71	Other	92003026	beach
Uppers Beach Park	2851.34	Other	61003027	beach
Waialea Beach Park	1553.90	Other	58006007	beach
West Loch Shoreline Park	1596.91	Other	94048006	beach
Kamehameha Community Park	676.03	Other	13007070	community
Kamilo Iki Community Park	36419.81	Other	39014102	community
Kamilo Iki Community Park	38261.24	Other	39014009	community
Kamokila Community Park	24165.32	Other	91015018	community
Laulani Community Park	59118.36	Other	91069005	community
Maili Kai Community Park	44521.23	Other	87010002	community
Mililani Mauka Community Park	51936.49	Other	95002033	community
Waiawa Community Park #1	39562.19	Other	96004004	community
Waiawa Community Park #2	54360.27	Other	96004004	community
Isenberg Street Community Garden	1115.70	Other	27009	community garden
Ewa District Park	78743.21	Other	91012005	district
Kahuku District Park	30481.55	Other	56006015	district
Mililani Mauka District Park	65024.41	Other	95049020	district
Waiawa District Park	91603.62	Other	96004004	district
Kahuku Golf Course	350310.98	Other	56002016	golf course
West Loch Golf Course	995.16	Other	91017061	golf course
Banyan Court Mall	1072.37	Other	17031	mall
College Walk Mall	5477.77	Other	17026	mall
Fort Street Mall	3499.27	Other	21010	mall

Fort Street Mall	1587.96	Other	21012	mall
Fort Street Mall	902.23	Other	21012	mall
Fort Street Mall	1038.94	Other	21013	mall
Fort Street Mall	996.05	Other	21013	mall
Kekaulike Street Mall	1062.26	Other	17003	mall
River Street/Sun Yet Sen Mall	5746.45	Other	17026	mall
Union Street Mall	1524.88	Other	21010	mall
Kaaha Street Mini Park	656.91	Other	27016	mini
Kawaiahao Mini Park	825.98	Other	21049027	mini
Palama Triangle Mini Park	571.59	Other	17045001	mini
Hanauma Bay Nature Preserve	227.18	Other	39012005	nature pres/marsh
Mauumae Nature Park	1738.08	Other	33019002	nature pres/marsh
Waiahole/Waikane Nature Preserve	345653.48	Other	48014004	nature pres/marsh
Waiahole/Waikane Nature Preserve	1580185.22	Other	48006008	nature pres/marsh
Waiahole/Waikane Nature Preserve	99560.39	Other	48003001	nature pres/marsh
Waiahole/Waikane Nature Preserve	31557.23	Other	48003016	nature pres/marsh
Waiahole/Waikane Nature Preserve	128598.02	Other	48004004	nature pres/marsh
Waiahole/Waikane Nature Preserve	2285.31	Other	48003012	nature pres/marsh
Waiahole/Waikane Nature Preserve	3049.79	Other	48003020	nature pres/marsh
Waiahole/Waikane Nature Preserve	668.75	Other	48003042	nature pres/marsh
Waiahole/Waikane Nature Preserve	3994.48	Other	48003013	nature pres/marsh
Waiahole/Waikane Nature Preserve	8045.48	Other	48003014	nature pres/marsh
Waiahole/Waikane Nature Preserve	6061.40	Other	48003021	nature pres/marsh
Waiahole/Waikane Nature Preserve	3987.81	Other	48003022	nature pres/marsh
Waiahole/Waikane Nature Preserve	13477.49	Other	48003015	nature pres/marsh
Waiahole/Waikane Nature Preserve	915.77	Other	48003015	nature pres/marsh
Waiahole/Waikane Nature Preserve	146257.02	Other	48001010	nature pres/marsh
Aliamanu Neighborhood Park	98.85	Other	11023081	neighborhood
Aliamanu Neighborhood Park	21.21	Other	11023082	neighborhood
Hans L'orange Neighborhood Park	27922.73	Other	94002021	neighborhood
Iroquois Point Neighborhood Park	48484.00	Other	91010021	neighborhood
Kapolei Neighborhood Park	13586.44	Other	91016085	neighborhood
Kapolei Neighborhood Park	12139.78	Other	91016086	neighborhood
Makakilo Heights Neighborhood Park	21854.13	Other	92019058	neighborhood
Maukalani Neighborhood Park	18189.32	Other	92019023	neighborhood
Moanalua Valley Neighborhood Park	11614.48	Other	11012035	neighborhood
Puuloa Neighborhood Park	17360.70	Other	91004124	neighborhood
Waiawa Neighborhood Park #1	16119.38	Other	96004004	neighborhood
Waiawa Neighborhood Park #2	11190.23	Other	96004004	neighborhood
Ala Moana Regional Park	307.93	Other		regional/cultural
Ala Moana Regional Park	601.91	Other		regional/cultural
Ala Moana Regional Park	368.49	Other		regional/cultural
Ka Iwi (Hawaii Kai) Support Park	67269.97	Other	39010042	regional/cultural
Ka Iwi (Hawaii Kai) Support Park	52736.45	Other	39010041	regional/cultural
Kahaluu Regional Park	60049.77	Other	47012012	regional/cultural
Kapiolani Regional Park	70665.38	Other	31043000	regional/cultural
Kapiolani Regional Park	8964.48	Other	31043000	regional/cultural
Kapolei Regional Park	5247.01	Other	91016001	regional/cultural
Waiola Regional Park	1077515.39	Other	94005074	regional/cultural
Alii Landing Shoreline Access	115.95	Other	46007113	road
Au Street A	143.09	Other	68011042	road
Au Street B	805.43	Other	68012041	road
Banzai Rock	1236.77	Other	59003031	road
Crozier Drive	381.88	Other	68004003	road
Crozier Drive Brow Parking	990.98	Other	68013066	road
Ewa Beach Road A	128.96	Other	91006	road
Ewa Beach Road B	140.74	Other	91006	road
Ewa Beach Road C	122.92	Other	91006	road

Ewa Beach Road D	146.80	Other	91024	road
Ewa Beach Road E	132.55	Other	91024	road
Ewa Beach Road F	107.89	Other	91024	road
Ewa Beach Road G	136.81	Other	91024	road
Ewa Beach Road H	132.48	Other	91023	road
Ewa Beach Road I	160.86	Other	91023	road
Ewa Beach Road J	152.55	Other	91023	road
Ewa Beach Road K	161.93	Other	91023	road
Ewa Beach Road L	141.34	Other	91023	road
Huelo Street	169.30	Other	59001	road
Kahala Avenue at Elepaio Street	290.68	Other	35003039	road
Kahala Avenue at Hunakai Street	362.25	Other	35004053	road
Kahala Avenue at Kala Place	310.62	Other	35003041	road
Kahala Avenue at Koloa Street A	660.66	Other	35005076	road
Kahala Avenue at Koloa Street B	579.86	Other	35005073	road
Kahala Avenue at Koloa Street C	695.14	Other	35006032	road
Kahauola Street	61.97	Other	59001	road
Kalaniana'ole Highway	468.44	Other	37025002	road
Kalia Road	451.13	Other	26004	road
Kaneohe Bay Drive A	94.47	Other	44016020	road
Ke Iki Road A	359.62	Other	59003	road
Ke Iki Road B	770.44	Other	59003	road
Ke Iki Road C	424.73	Other	59003	road
Ke Nui Road A	545.79	Other	59002	road
Ke Nui Road B	670.96	Other	59002	road
Ke Nui Road C	551.65	Other	59019	road
Ke Nui Road D	211.16	Other	59019	road
Ke Nui Road E	245.73	Other	59020	road
Ke Nui Road F	275.85	Other	59020	road
Ke Nui Road G	150.63	Other	59020	road
Ke Waena Road	295.75	Other	59003000	road
Ko Olina Lagoon & Roadway Easement	7160.03	Other	91057001	road
Ko Olina Lagoon & Roadway Easement	117404.81	Other	91057001	road
Makau Street A	109.88	Other	84009017	road
Makau Street B	95.24	Other	84010017	road
Mokulua Drive A	338.12	Other	43003089	road
Mokulua Drive B	346.01	Other	43005087	road
Mokulua Drive C	287.30	Other	43007062	road
North Kalaheo Avenue at Ainoni St.	720.08	Other	43018008	road
North Kalaheo Avenue at Dune Stree	556.95	Other	43017001	road
North Kalaheo Avenue at Pueohala P	647.88	Other	43017025	road
Oopuola Street	321.55	Other	59001	road
Paiko Drive	58.17	Other	38001022	road
Paoa Place	1550.91	Other	26008	road
Paoa Place	882.03	Other	26008	road
Papailoa Road	256.55	Other	61004091	road
South Kalaheo at Kuuniu Street	281.55	Other	43013001	road
South Kalaheo at Kuuniu Street	488.80	Other	43012034	road
Upena Street	94.87	Other	84007012	road
Chinatown Gateway Park	28.75	Other	21003025	sq/ente/tri/prom
DT Fleming Beach Park	14399.69	private	42004016	beach
Baldwin Park	79816.27	private	25005046	
Kuhio Memorial Park	22637.91	private	26006002	
Kukuio'ono Park and Golf Course	727686.48	private	23005008	
park	15932.14	private	22001004	
park	7629.27	private	32012002	
Paukukalo Park	19403.16	private	33005086	
Makua Alii Senior Citizen's Center	1524.41	State	23019004	

Nuuanu Nursery	236368.98	State	19001001	12
Chun's Reef Beach Support Park	7836.91	State	61008026	beach
Diamond Head Beach Park	4221.41	State	31042004	beach
Duke Paoa Kahanamoku Beach Park	888.95	State	26005006	beach
Hauula Beach Park	23927.92	State	54002022	beach
Hauula Beach Park	3895.74	State	54001032	beach
Honokowai Beach Park	14778.34	State	44001046	beach
Kailua Beach Park	21989.30	State	43011074	beach
Kailua Beach Park	22777.17	State	43011075	beach
Kailua Beach Park	21286.14	State	43009001	beach
Kailua Beach Park	26414.63	State	43010084	beach
Kailua Beach Park	2916.66	State	43010083	beach
Kailua Beach Park	37903.95	State	43009002	beach
Kaiona Beach Park	104726.20	State	41003016	beach
Kamaole Beach Park No. 1	14193.91	State	39005030	beach
Kamaole Beach Park No. 2	10160.95	State	39005029	beach
Kamaole Beach Park No. 3	30947.44	State	39004048	beach
Kanaha Beach Park	254841.49	State	38001119	beach
Kaneohe Beach Park	3612.47	State	45006001	beach
Kapaa Beach Park	1690.08	State	45013001	beach
Kapaa Beach Park	14494.19	State	45012001	beach
Kapaa Beach Park	3346.33	State	45012015	beach
Kapaa Beach Park	15491.66	State	45008001	beach
Kapaa Beach Park	12511.50	State	45007001	beach
Kapaa Beach Park	12204.21	State	45002001	beach
Kaupo Beach Park	22520.79	State	41014006	beach
Kaupo Beach Park	11186.78	State	41014006	beach
Keaau Beach Park	198754.80	State	83001001	beach
Keehi Lagoon Park	292261.57	State	11003006	beach
Kekaha Beach Park	153942.25	State	13003001	beach
Kuhio Beach Park	274.45	State	26001015	beach
Kuilei Cliffs Beach Park	39731.29	State	31042002	beach
Kuilei Cliffs Beach Park	1064.81	State	31038029	beach
Kuliouou Beach Park	12849.50	State	38003032	beach
Laie Beach Park	5638.26	State	55001050	beach
Lualualei Beach Park	34113.46	State	86001007	beach
Lualualei Beach Park	3215.44	State	86001007	beach
Lualualei Beach Park	4721.98	State	86001007	beach
Maipoina Oe Iau Beach Park	59076.09	State		beach
Makapuu Beach Park	83476.12	State	41014005	beach
Makapuu Beach Park	85382.82	State	41014002	beach
Mauna Lahilahi Beach Park	1504.53	State	85018003	beach
Mauna Lahilahi Beach Park	7632.45	State	85018001	beach
Mauna Lahilahi Beach Park	6359.66	State	85017005	beach
Mauna Lahilahi Beach Park	3894.15	State	85017003	beach
Maunalua Bay Beach Park	2812.44	State	39007032	beach
Maunalua Bay Beach Park	3555.76	State	39007011	beach
Maunalua Bay Beach Park	8725.22	State	39007011	beach
Nanakuli Beach Park	110181.42	State	89001002	beach
Nanakuli Beach Park	19346.61	State	89006001	beach
Nanakuli Beach Park	7046.66	State	89006001	beach
Nanakuli Beach Park	10198.73	State	89006001	beach
Pokai Bay Beach Park	47479.44	State	85001062	beach
Punaluu Beach Park	11295.27	State	53002031	beach
Pupukea Beach Park	7650.45	State	59020053	beach
Pupukea Beach Park	62646.24	State	59003032	beach
Pupukea Beach Park	65875.34	State	59004019	beach
Sandy Beach Park	6394.74	State	39010002	beach

Sandy Beach Park	483.88	State	39015019	beach
Sunset Beach Park	54678.55	State	59001038	beach
Sunset Beach Park	114410.07	State	59001038	beach
Ulehawa Beach Park	7076.74	State	87005003	beach
Ulehawa Beach Park	19545.14	State	87005001	beach
Ulehawa Beach Park	65588.23	State	87006003	beach
Ulehawa Beach Park	67674.81	State	87007001	beach
Ulehawa Beach Park	57672.63	State	87008026	beach
Waiahole Beach Park	1525.03	State	48002010	beach
Waiahole Beach Park	1075.75	State	48002012	beach
Waialeale Beach Park	99921.41	State	58001015	beach
Waialeale Beach Park	15195.86	State	58001041	beach
Waialeale Beach Park	1628.63	State	58001010	beach
Waiehu Beach Pavilion	6112.32	State	32013019	beach
Waihee Beach Park	12114.00	State		beach
Wailupe Beach Park	4395.23	State	35022023	beach
Waimanalo Beach Park	29107.30	State	41006088	beach
Waimanalo Beach Park	15335.39	State	41003016	beach
Waimanalo Beach Park	17417.38	State	41003016	beach
Waioli Beach Park	9379.02	State	55003021	beach
Waioli Beach Park	10938.95	State	55004002	beach
Waioli Beach Park	5351.52	State	55005020	beach
Waipouli Beach Park	21569.61	State	43002001	beach
Wahiawa Botanical Garden	107280.26	State	74017001	botanical garden
Ahuimanu Community Park	16242.43	State	47060029	community
Ala Wai Community Park	14134.18	State	27036005	community
Ala Wai Community Park	45641.43	State	27036001	community
Ala Wai Community Park	911.69	State	27004005	community
Dole Community Park	18702.14	State	21038007	community
Fern Community Park	8675.56	State	13001059	community
Hauula Community Park	598.25	State	54001050	community
Hauula Community Park	666.63	State	54001008	community
Hauula Community Park	5853.94	State	54001010	community
Hauula Community Park	48.88	State	54001039	community
Hauula Community Park	23.18	State	54001040	community
Hauula Community Park	2338.77	State	54009008	community
Hauula Community Park	1610.43	State	54001001	community
Hauula Community Park	77.48	State	54008022	community
Kapolei Community Park	48539.42	State	91016056	community
Maunalani Community Park	2707.94	State	33029008	community
Moanalua Community Park	14148.25	State	11009006	community
Papakolea Community Park	3542.89	State	22015025	community
Pearl Ridge Community Park	36748.05	State	98013029	community
Stevenson Recreation Center	30769.57	State	24033013	community
Whitmore Community Park	3771.92	State	71006077	community
Kalihi Valley District Park	1548.88	State	13024003	district
Kaneohe District Park	76542.48	State	45023009	district
Kaneohe District Park	51187.03	State	45023010	district
Lanakila District Park	22399.95	State	17042002	district
Palolo Valley District Park	12907.54	State	34007013	district
Salt Lake District Park	257093.63	State	11063014	district
Waiau District Park	126787.89	State	98052002	district
Waimanalo District Park	102392.80	State	41009264	district
Ala Wai Golf Course	557522.70	State	27036002	golf course
Ala Wai Golf Course	28336.14	State	27036078	golf course
Ala Wai Golf Course	3683.42	State	27036009	golf course
Archie Baker Mini Park	8563.44	State	25020001	mini
Fort Ruger Mini Park	13117.02	State	31047003	mini

Frank C. Judd Mini Park	1021.01	State	27003007	mini
Kapiolani Regional Park	36005.63	State	31043001	mini
Puu O Kaimuki Mini Park	513.91	State	32036010	mini
Diamond Head State Monument	8642.19	State		monument
Diamond Head State Monument	2025612.45	State		monument
Iolani Palace State Monument	44402.84	State	21025002	monument
Kukaniloko Birthstones State Monument	20201.52	State		monument
Mount Olomana State Monument	847259.52	State		monument
Puu O Mahuka State Monument	16271.31	State	59005068	monument
Ulu Po Heiau State Monument	5678.92	State	42013002	monument
Ahihi-Kinai Natural Area Reserve	5227778.78	State		natural area reserve
Hanawi Natural Area Reserve	31261476.41	State		natural area reserve
Honokowai Natural Area Reserve	2968477.56	State		natural area reserve
Lihau Natural Area Reserve	3815859.53	State		natural area reserve
West Maui Natural Area Reserve	7259000.78	State		natural area reserve
Ala Wai Neighborhood Park	51556.66	State	27036001	neighborhood
Ala Wai Neighborhood Park	1648.23	State	27021038	neighborhood
Ala Wai Neighborhood Park	5937.94	State	27020011	neighborhood
Alewa Neighborhood Park	8068.31	State	18020013	neighborhood
Cartwright Neighborhood Park	9502.24	State	24010015	neighborhood
DeCorte Neighborhood Park	17257.25	State	13027001	neighborhood
Kalihi Waena Neighborhood Park	3711.59	State	13004123	neighborhood
Kaupuni Neighborhood Park	30448.05	State	85032039	neighborhood
Kuliouou Neighborhood Park	5141.07	State	38016081	neighborhood
Kuliouou Neighborhood Park	12576.84	State	38016083	neighborhood
Kunawai Neighborhood Park	2995.14	State	17037041	neighborhood
Manana Neighborhood Park	16374.45	State	97068004	neighborhood
Maunawili Neighborhood Park	9505.76	State	42043040	neighborhood
Mother Waldron Neighborhood Park	3704.79	State	21051006	neighborhood
Napuanani Neighborhood Park	18034.10	State	99006020	neighborhood
Aiea Bay Recreation Area	10869.86	State		recreation area
Aiea Bay Recreation Area	2472.08	State		recreation area
Keaiwa Heiau State Recreation Area	10136.91	State		recreation area
Malaekahana State Recreation Area	304802.09	State		recreation area
Sand Island State Recreation Area	104501.88	State		recreation area
Kahaluu Regional Park	6029.17	State	47012017	regional
Ala Moana Regional Park	38027.64	State	23037019	regional/cultural
Kahaluu Regional Park	7795.73	State	47012011	regional/cultural
Kahaluu Regional Park	5153.55	State	47012002	regional/cultural
Kapiolani Regional Park	169544.52	State	31043001	regional/cultural
Kapiolani Regional Park	4530.02	State	31043002	regional/cultural
Kapiolani Regional Park	10657.91	State	31043002	regional/cultural
Kapiolani Regional Park	1510.66	State	31043001	regional/cultural
Kapiolani Regional Park	189.27	State	31043001	regional/cultural
Kapiolani Regional Park	7421.34	State	31043001	regional/cultural
Kapiolani Regional Park	243767.83	State	31043001	regional/cultural
Kapiolani Regional Park	7202.62	State	31043001	regional/cultural
Kapiolani Regional Park	11860.67	State	31043001	regional/cultural
Kapiolani Regional Park	6359.48	State	31030003	regional/cultural
Kapiolani Regional Park	49.62	State	31043014	regional/cultural
Kapiolani Regional Park	1447.41	State	31043001	regional/cultural
Kapiolani Regional Park	39539.27	State	31043013	regional/cultural
Kapiolani Regional Park	3145.21	State	31031005	regional/cultural
Kapiolani Regional Park	1286.53	State	31043001	regional/cultural
Kapiolani Regional Park	10486.48	State	31031004	regional/cultural
Kapiolani Regional Park	2019.58	State	31043001	regional/cultural
Kapiolani Regional Park	5531.45	State	31043001	regional/cultural
Kapiolani Regional Park	12214.45	State	31031003	regional/cultural

Kapiolani Regional Park	9391.78	State	31031003	regional/cultural
Kapiolani Regional Park	12389.54	State	31043001	regional/cultural
Kapiolani Regional Park	813.38	State	31043001	regional/cultural
Kapiolani Regional Park	6481.18	State	31043007	regional/cultural
Kapiolani Regional Park	31621.20	State	31043001	regional/cultural
Kapiolani Regional Park	2443.82	State	31043001	regional/cultural
Kapiolani Regional Park	1028.41	State	31043001	regional/cultural
Kapiolani Regional Park	13766.83	State	31043001	regional/cultural
Kapiolani Regional Park	344.29	State	31043001	regional/cultural
Waianae Regional Park	79039.02	State	85002011	regional/cultural
Waianae Regional Park	76265.62	State	85002049	regional/cultural
Kaneohe Bay Beach Remnant	225.86	State	44021054	road
Aala Park	14419.91	State	17027001	sq/ente/tri/prom
Ala Wai Promenade	3284.61	State	23034033	sq/ente/tri/prom
Ala Wai Promenade	1049.00	State	23034033	sq/ente/tri/prom
Ala Wai Promenade	5485.57	State	23035011	sq/ente/tri/prom
Ala Wai Promenade	6777.02	State	23036036	sq/ente/tri/prom
Kunawai Springs	2389.59	State	17036010	sq/ente/tri/prom
Nuuanu Valley Park	24342.56	State	22034028	sq/ente/tri/prom
Old Stadium Park	29659.52	State	27008002	sq/ente/tri/prom
Punahou Square	2757.61	State	24008001	sq/ente/tri/prom
Queen Emma Square	2327.18	State	21018004	sq/ente/tri/prom
Thomas Square	24684.94	State	24001001	sq/ente/tri/prom
Ahukini Recreation Pier State Park	4624.07	State	37002011	state
Haena State Park	81330.21	State	59008018	state
Haena State Park	747139.31	State		state
Heeia State Park	70461.06	State	46005009	State
Kaena Point State Park	4489715.13	State		State
Kaena Point State Park	12392.53	State		State
Kaena Point State Park	36879.20	State		State
Kaena Point State Park	24255.30	State		State
Kaena Point State Park	108550.58	State		State
Kahana Valley State Park	21556589.35	State		State
Kokee State Park	17633256.56	State	14001013	state
Lydgate State Park	534997.95	State	39002004	state
Makiki Tantalus State Park	78454.88	State		State
Na Pali Coast State Park	4642695.90	State		state
Na Pali Coast State Park	19683598.60	State	59001002	state
Poli Hale State Park	600461.68	State	12002024	state
Russian Fort Elizabeth State Park	77931.72	State	17005003	state
Sacred Falls State Park	5556570.29	State		State
Waahila Ridge State Park	289798.23	State		State
Wahiawa Mauka State Park Reserve	211350.20	State		state
Wailua River State Park	4339025.79	State		state
Wailua River State Park	38373.76	State		state
Wailua River State Park	23739.57	State		state
Waimano Gulch State Park Reserve	144989.88	State		State
Waimea Canyon State Park	7386339.23	State	14001002	state
Kaumahina State Wayside Park	28969.63	State		wayside
Laie Point State Wayside	14283.77	State		wayside
Makapuu Point State Wayside	144690.36	State		wayside
Nuuanu Pali State Wayside	13414.56	State		wayside
Puu Ualakaa State Wayside	336778.41	State		wayside
Wahikuli State Wayside Park	7577.05	State	45021007	wayside
Gore Park	3038.76	State	46029001	
Hana Park	2101.17	State	14004032	
Hanapepe Heights House Lots Park	4485.91	State	18011023	
Hanapepe Park	53819.63	State	19009001	

Hanapepe Playground	4361.90	State	19005048	
Hanauma Bay Underwater Park	343930.85	State		
Hookipa Park	29977.20	State	25004025	
Iao Valley State Park	26094.86	State	33003012	
Irwin Memorial Park	14242.85	State		
Kahului Harbor Park	94633.81	State	37001021	
Kakaako Waterfront Park	115394.10	State		
Kalaheo Multipurpose & Recreation Center	11485.18	State	23003008	
Kalama Park	131522.56	State	39005052	
Kapaa New Park	73653.70	State	45015032	
Kewalo Basin Park	43620.59	State		
Lihue Park	10580.74	State	36002003	
Maluulu O Lele Park	30603.69	State	46007002	
park	40803.13	State	41016042	
park	27213.42	State	22003031	
park	4001.31	State		
Royal Mausoleum	13512.20	State	22021012	
Salt Pond Park	33455.66	State	18008043	
State Capitol	10745.11	State	21024008	
State Capitol	20172.96	State	21024001	
Valley Isle Memorial Park	69442.53	State		
Wahiawa State Freshwater Park	271537.83	State	76001006	
Wahiku Park	8849.89	State	45027001	
Wailua Valley Lookout Park	5076.01	State	11008024	
Waimea River Park	18904.44	State	16006001	
Waimea State Recreation Pier	5237.83	State		
Wainapanapa State Park	392097.50	State		
Wells Park	20360.25	State	34011002	
Anahola Beach Park	6152.97	State DHHL	48014006	beach
park	20026.88	State DHHL	48020067	
	3748.05			
	2915.30			
	127693.19			
	104635.94			
	19637.74			
	31620.42			
	168823.16			
	25723.64			
	2754.22			
	112882.31			
	62840.03			

Table 1.XX – Hawaii State Parks By Island

Island / Park	Acres	Location
<u>Hawaii</u>		
<i>Akaka Falls State Park</i>	65.4	3.6 miles SW of Honomu
<i>Hapuna Beach State Recreation Area</i>	61.8	2.3 miles S of Kawaihae
<i>Kalopa State Recreation Area</i>	100.0	5 miles SE of Honoka
<i>Kealakekua Bay State Historical Park</i>	4.0	Napoopoo at end of Beach Road
<i>Kona Coast (Kekaha Kai) State Park</i>		2.6 miles N of Keahole Airport
<i>Kohala Historical Sites State Monument</i>	6.7	1.6 miles SW of Upolu Airport
<i>Lapakahi State Historical Park</i>	262.0	12.4 miles N of Kawaihae
<i>Lava Tree State Monument</i>	17.1	2.7 miles SE of Pahoa
<i>MacKenzie State Recreation Area</i>	13.1	9 miles NE of Kaimu
<i>Manuka State Wayside</i>	13.4	19.3 miles W of Na'alehu
<i>Manua Kea State Recreation Area</i>	20.5	35 miles W of downtown Hilo
<i>Old Kona Airport State Recreation Area</i>	103.7	End of Highway 11, Kailua-Kona
<i>Wailoa River State Recreation Area</i>	131.9	Downtown Hilo
<i>Wailuku River State Park</i>	16.3	Hilo
<u>Maui</u>		
<i>Halekii-Pihana Heiau State Monument</i>	10.2	Wailuku end of Hea Place
<i>Kaumahina State Wayside</i>	6.2	End of Highway 32, Iao Valley
<i>Makena State Park</i>	164.4	S of Wailea at Puu Olai volcanic cone
<i>Polipoli Spring State Recreation Area</i>	10.0	9.7 miles upland from Kula
<i>Puaa Kaa State Wayside</i>	5.0	52.8 miles east of Kahului Airport
<i>Wailua Valley State Wayside</i>	-	32 miles east of Kahului Airport
<u>Molokai</u>		
<i>Palaau State Park</i>	233.7	End of Highway 47, Palaau
<u>Oahu</u>		
<i>Aiea Bay State Recreation Area</i>	-	Off Kamehameha Highway at McGrew Loop
<i>Diamond Head State Monument</i>	475.0	Between Makapuu Ave. and 18th Ave.
<i>Hanauma Bay State Underwater Park</i>	101.0	0.3 miles E of Hawaii Kai
<i>Heeia State Park</i>	18.5	46-465 Kamehameha Highway at Kealahi Point
<i>Iolani Palace State Monument</i>	11.0	S. King and Richards St, downtown Honolulu
<i>Kaena Point State Park</i>	778.6	End of Highway 930, Makua
<i>Kahana Valley State Park</i>	5,228.7	Highway 83, Kahana
<i>Kakaako Waterfront Park</i>	35.0	End of Ahui or Ohe Street off Ala Moana Blvd.
<i>Keaiwa Heiau State Recreation</i>	384.5	End of Aiea Heights Drive, Aiea Heights
<i>Kewalo Basin</i>	-	Off Ala Moana Blvd. at Ward Avenue

Island / Park	Acres	Location
<i>Kukaniloko Birthstones State Monument</i>	5.0	Intersection of Hwy 99 and Whitmore Ave, North side of Wahiawa
<i>Laie Point State Wayside</i>	-	Off Hwy 83 at Laie town
<i>Makapuu Point State Wayside</i>	38.2	Off Hwy 72 from either Waimanalo or Hawaii Kai
<i>Malaekahana State Recreation Area</i>	110.0	1.3 miles N of Laie town
<i>Nuuanu Pali State Wayside</i>	3.0	Nuuanu Pali summit
<i>Puu o Mahuka Heiau State Monument</i>	5.7	Off Pupukea Homestead Road from Highway 83
<i>Puu Ualakaa State Wayside</i>	50.0	Off Round Top Drive off Makiki Street
<i>Royal Mausoleum State Monument</i>	10.0	2261 Nuuanu Ave
<i>Sacred Falls State Park</i>	1,373.9	1 mile S of Hauula town
<i>Sand Island State Recreation Area</i>	14.0	Sand Island
<i>Ulu Po Heiau State Monument</i>	8.3	0.4 miles NE of Castle Hospital, Kailua
<i>Waahila Ridge State Recreation</i>	49.9	St. Louis Heights
<i>Wahiawa Freshwater State Recreation Area</i>	65.9	380 Walker Ave.
<u>Kauai</u>		
<i>Ahukini State Recreation Pier</i>	0.9	Lihue
<i>Haena State Park</i>	6.7	Haena
<i>Kokee State Park</i>	4,345.0	15 miles N of Kekaha on Kokee Road
<i>Na Pali Coast State Park</i>	6,175.0	Haena State Park
<i>Polihale State Park</i>	137.7	End of 5-mile long dirt road from Mana Village, off Highway 50
<i>Russian Fort Elizabeth State Historical Park</i>	17.3	East bank of Waimea rivermouth off Highway 50
<i>Wailua River State Park</i>	1,092.6	Along banks of Wailua River off Highway 56
<i>Waimea Canyon State Park</i>	1,866.4	11.1 miles N of Kekaha on Kokee Road

Source: *State Parks of the Islands*

From State Parks
DLVR
Dain Quinn

FUNDS REQUIRED FOR RECONSTRUCTION OF PARK FACILITIES (2002 - 2012)

PRIORITY	TITLE/DESCRIPTION	RECONSTR EST. COST
	Iao Valley State Park, Maui - Reconstr ped. bridge	300,000
	Iao Valley State Park, Maui - Sewage sys. impr.	500,000
	Iao Valley State Park, Maui - Parking lot impr.	300,000
	Iao Valley State Park, Maui - Water sys impr. & reconstr rdway	1,500,000
	Kaumahina State Wayside, Maui - Reconstr comfort station, water & sewage sys. (Funds available)	1,000,000
	Kaumahina State Wayside, Maui - Reconstr picnic facil	70,000
	Makena State Park, Maui - Picnic shelter, tables & walkways	100,000
	Polipoli Springs State Rec. Area, Maui - Reconstr cabin	100,000
	Polipoli Springs State Rec. Area, Maui - Reconstr rd.	100,000
	Polipoli Springs State Rec. Area, Maui - Reconstr water sys.	100,000
	Puaa Kaa State Wayside, Maui - Reconstr water sys.	100,000
	Puaa Kaa State Wayside, Maui - Walkway & bridge	150,000
	Puaa Kaa State Wayside, Maui - Constr pavilion	60,000
	Waianapanapa State Park, Maui - Constr new cabins	1,200,000
	Waianapanapa State Park, Maui - Reconstr caretaker's residence	100,000
	Waianapanapa State Park, Maui - Reconstr comfort station	225,000
	Waianapanapa State Park, Maui - Reconstr rd, utility sys.	1,000,000
	Palaau State Park, Molokai - Reconstr comfort station	500,000
	Palaau State Park, Molokai - Equipment storage bldg.	150,000
	Palaau State Park, Molokai - Constr sewage treatment plant	600,000
	Palaau State Park, Molokai - Reconstr water system	200,000
	Palaau State Park, Molokai - Reconstr rd & parking	600,000
	Akaka Falls State Park, Hawaii - Reconstr comfort station with sewage sys.	300,000
	Akaka Falls State Park, Hawaii - Constr. trail sys.	300,000
	Akaka Falls State Park, Hawaii - Pave parking lot	100,000
	Hapuna Beach State Recreation Area, Hawaii - Reconstr. cabins	800,000
	Hapuna Beach State Recreation Area, Hawaii - Reconstr. comfort stations	500,000

FUNDS REQUIRED FOR RECONSTRUCTION OF PARK FACILITIES (2002 - 2012)

PRIORITY	TITLE/DESCRIPTION	RECONSTR EST. COST
	Hapuna Beach State Recreation Area, Hawaii - Sewage sys. impr.	500,000
	Hapuna Beach State Recreation Area, Hawaii - Reconstr caretaker's house	150,000
	Kalopa State Rec Area, Hawaii - Reconstr dining bldg. with new kitchen equip.	250,000
	Kalopa State Rec Area, Hawaii - Reconstr rdway	250,000
	Kalopa State Rec Area, Hawaii - Reconstr caretaker's house	150,000
	Kealahou Bay State Hist. Park, Hawaii - Restroom & parking lot impr. (Funds available)	400,000
	Kohala Historical Sites State Monument, Hawaii	
	Kohala Historical Sites State Monument, Hawaii (Kukuipahu Heiau) - parking, rdway, fencing, walkways	500,000
	Kohala Historical Sites State Monument, Hawaii (Kam. Birthsite) - rdway, parking, barriers & fencing	600,000
	Kohala Historical Sites State Monument, Hawaii (Mohukini) - initial dev.	700,000
	Kekaha Kai State Park, Hawaii (Mahaiula) - Water, electrical, rdway & sewage treatment plant	3,000,000
	Kekaha Kai State Park, Hawaii (Mahaiula) - Ambassador's house	400,000
	Kekaha Kai State Park, Hawaii (Mahaiula) - Restoration of two story house	250,000
	Lapakahi State Historical Park, Hawaii - Water sys. impr., incl. well & water storage tanks	4,000,000
	Lava Tree State Monument, Hawaii - Pave rdway & parking lot	350,000
	Lava Tree State Monument, Hawaii - Reconstr. walkway	150,000
	Lava Tree State Monument, Hawaii - Reconstr pavilion	50,000
	MacKenzie State Rec. Area, Hawaii - Comfort station with sewage disposal system	400,000
	MacKenzie State Rec. Area, Hawaii - Pave rdway & parking	300,000
	MacKenzie State Rec. Area, Hawaii - Comfort station with sewage sys	400,000
	MacKenzie State Rec. Area, Hawaii - Campground impr.	100,000
	Manuka State Wayside, Hawaii - Rdway & parking	150,000
	Manuka State Wayside, Hawaii - Reconstr pavilion	50,000
	Manuka State Wayside, Hawaii - Reconstr water sys.	150,000
	Manuka State Wayside, Hawaii - Demo abandoned structures/restore grounds	80,000
	Mauna Kea State Rec. Area, Hawaii - Reconstr. cabins	1,200,000
	Mauna Kea State Rec. Area, Hawaii - Reconstr rdway/parking	800,000

FUNDS REQUIRED FOR RECONSTRUCTION OF PARK FACILITIES (2002 - 2012)

PRIORITY	TITLE/DESCRIPTION	RECONSTR EST. COST
	Mauna Kea State Rec. Area, Hawaii - Reconst. water tanks	400,000
	Mauna Kea State Rec. Area, Hawaii - Sewage sys. impr.	800,000
	Old Kona Airport State Rec Area, Hawaii - Reconst middle comfort station & 2 pavilions	1,200,000
	Old Kona Airport State Rec Area, Hawaii - Reconst maint. bldg.	250,000
	Old Kona Airport State Rec Area, Hawaii - Reconst rdway/parking	200,000
	Old Kona Airport State Rec Area, Hawaii - Night lighting	600,000
	Wailoa River State Rec Area, Hawaii - Reconst bridges	500,000
	Wailoa River State Rec Area, Hawaii - Night lighting	200,000
	Wailoa River State Rec Area, Hawaii - Reconst rd/parking lot	300,000
	Wailoa River State Rec Area, Hawaii - Reconst maint bldg	300,000
	Wailoa River State Rec Area, Hawaii - Reconst walkway	350,000
	Wailoa River State Rec Area, Hawaii - Parking & turn around for statue area	150,000
	Wailuku River State Park, Hawaii (Rainbow Fall) - Reconst comfort station (Funds available)	200,000
	Wailuku River State Park, Hawaii (Boiling Pots) - Reconst comfort station	100,000
	Diamond Head State Monument, Oahu - Demo exist National Guard structures/restore grounds	3,000,000
	Diamond Head State Monument, Oahu - Reconst. rdway & parking	1,500,000
	Diamond Head State Monument, Oahu - Sewage & drainage impr.	800,000
	Diamond Head State Monument, Oahu - Reconst trail	1,000,000
	Diamond Head State Monument, Oahu - Reconst restirm	300,000
	Diamond Head State Monument, Oahu - Reconst irrigation sys	80,000
	Heeiea State Park, Oahu - Reconst. sewage sys.	800,000
	Heeiea State Park, Oahu - Reconst. bldg.	700,000
	Iolani Palace, Oahu - Irrigation sys. impr.	300,000
	Kaena Point State Park, Oahu - Sewage & water impr.	700,000
	Kahana Valley State Park, Oahu - Reconst visitors center	1,500,000
	Kahana Valley State Park, Oahu - Sewage system impr	3,000,000
	Kahana Valley State Park, Oahu - Baseyard facility	1,000,000
	Kahana Valley State Park, Oahu - Reconstruct restrooms (4)	1,200,000

FUNDS REQUIRED FOR RECONSTRUCTION OF PARK FACILITIES (2002 - 2012)

PRIORITY	TITLE/DESCRIPTION	RECONSTR EST. COST
	Kahana Valley State Park, Oahu - Reconst'r campground facil.	500,000
	Keaiwa Heiau State Recreation Area, Oahu - Reconst'r rdway	800,000
	Keaiwa Heiau State Recreation Area, Oahu - Reconst'r water sys	300,000
	Keaiwa Heiau State Recreation Area, Oahu - Sewage sys impr.	250,000
	Keaiwa Heiau State Recreation Area, Oahu - Reconst'r pavilions	200,000
	Keaiwa Heiau State Recreation Area, Oahu - Reconst'r caretaker's house	150,000
	Kukaniloko Birthstones State Monument, Oahu - Reconst'r rd, parking & barriers	1,000,000
	Makapuu Point State Wayside, Oahu - Reconst'r rdway & drainage impr.	1,500,000
	Makapuu Point State Wayside, Oahu - Reconst'r. railings	150,000
	Malaekahana State Rec Area, Oahu (Ph. I) - Reconst'r rdway & parking	600,000
	Malaekahana State Rec Area, Oahu (Ph. I) - Baseyard	800,000
	Malaekahana State Rec Area, Oahu (Ph. II) - Rdway & parking impr.	750,000
	Malaekahana State Rec Area, Oahu (Ph. II) - Water sys impr.	250,000
	Malaekahana State Rec Area, Oahu (Ph. II) - Comfort station with sewage treatment facil	400,000
	Nuuanu Pali State Wayside, Oahu - Lighting impr.	200,000
	Puu O Mahuka Heiau State Monument, Oahu - Parking, road, drainage and install barriers	500,000
	Puu Ualakaa State Wayside, Oahu - Reconst'r roadway & parking lots	400,000
	Puu Ualakaa State Wayside, Oahu - Reconst'r drainage system	100,000
	Puu Ualakaa State Wayside, Oahu - Water system impr.	150,000
	Royal Mausoleum State Monument, Oahu - Reconst'r rdway	1,000,000
	Royal Mausoleum State Monument, Oahu - Reconst'r irrigation system	200,000
	Royal Mausoleum State Monument, Oahu - Reconst'r comfort station	175,000
	Sand Island State Park, Oahu - Irrigation sys. impr.	300,000
	Sand Island State Park, Oahu - Sewage system impr.	1,000,000
	Sand Island State Park, Oahu - Electrical sys. impr.	200,000
	Sand Island State Park, Oahu - Caretaker's house	100,000
	Sand Island State Park, Oahu - Maintenance baseyard	300,000

FUNDS REQUIRED FOR RECONSTRUCTION OF PARK FACILITIES (2002 - 2012)

PRIORITY	TITLE/DESCRIPTION	RECONSTR EST. COST
	Sand Island State Park, Oahu - Restroom impr.	600,000
	Sand Island State Park, Oahu - Walkway impr.	200,000
	Sand Island State Park, Oahu - Picnic & camping facil impr	250,000
	Sand Island State Park, Oahu - Roadway barriers	800,000
	Waahila Ridge State Recreation Area, Oahu - Roadway impr.	500,000
	Waahila Ridge State Recreation Area, Oahu - Drainage sys impr.	200,000
	Wahiawa Freshwater State Recreation Area, Oahu - Rdway impr.	500,000
	Wahiawa Freshwater State Recreation Area, Oahu - Comfort station impr.	100,000
	Wahiawa Freshwater State Recreation Area, Oahu - Drainage system impr.	100,000
	Wahiawa Freshwater State Recreation Area, Oahu - Walkway impr.	100,000
		150,000
	Ahukini Pier, Kauai - Reconstr. pier	1,000,000
	Haena State Park, Kauai - Relocate restrm & constr. sewage sys. & parking lot	1,000,000
	Kokee State Park, Kauai - Replace waterlines	1,000,000
	Kokee State Park, Kauai - Repave roads & parking lots	3,180,000
	Kokee State Park, Kauai - Dev. new well	1,500,000
	Kokee State Park, Kauai - New baseyard	1,600,000
	Kokee State Park, Kauai - Volunteer housing	300,000
	Kokee State Park, Kauai - Pave roads & parking at Puu Ka Pele picnic area	150,000
	Kokee State Park, Kauai - Reroof Kokee pavilion	40,000
	NaPali Coast State Park, Kauai - Constr restroom facil	125,000
	NaPali Coast State Park, Kauai - Install emergency phones at Hanakapiai & Kalalau beaches	35,000
	NaPali Coast State Park, Kauai - Telecommunication system impr.	25,000
	NaPali Coast State Park, Kauai - Upgrade Mililii water sys.	400,000
	NaPali Coast State Park, Kauai - Constr ranger cabin at Kalalau	800,000
	Poilihale State Park, Kauai - Reconstr. picnic pavilions	800,000
	Poilihale State Park, Kauai - Upgrade sewage system	1,200,000
	Poilihale State Park, Kauai - Reconstr restroom	225,000
	Poilihale State Park, Kauai - Constr paved park entry road	3,000,000

FUNDS REQUIRED FOR RECONSTRUCTION OF PARK FACILITIES (2002 - 2012)		
PRIORITY	TITLE/DESCRIPTION	RECONSTR EST. COST
	Polihaie State Park, Kauai - Dev. new well	400,000
	Russian Fort Elizabeth State Historical Park, Kauai - Reconst'r restroom & sewage impr.	800,000
	Russian Fort Elizabeth State Historical Park, Kauai - Reconst'r trails & signage	300,000
	Wailua River State Park, Kauai - Restore Poliahu Heiau	50,000
	Wailua River State Park, Kauai - Landscape Malae Heiau	200,000
	Wailua River State Park, Kauai - Railings at Wailua Falls lookout	25,000
	Wailua River State Park, Kauai - Chain link fence at Opaekaa Falls & Poliahu	70,000
	Wailua River State Park, Kauai - Parking & road impr. at Poliahu lookout	250,000
	Wailua River State Park, Kauai - Curbs along roads & parking lots	30,000
	Wailua River State Park, Kauai - Reconst'r marina rdway & parking lots	400,000
	Wailua River State Park, Kauai - Reconst'r sewage sys.	500,000
	Waimea Canyon State Park, Kauai - Expand & dev additional lookout	1,250,000
	Waimea Canyon State Park, Kauai - Fencing at lookout	4,000
	TOTAL	84,149,000



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